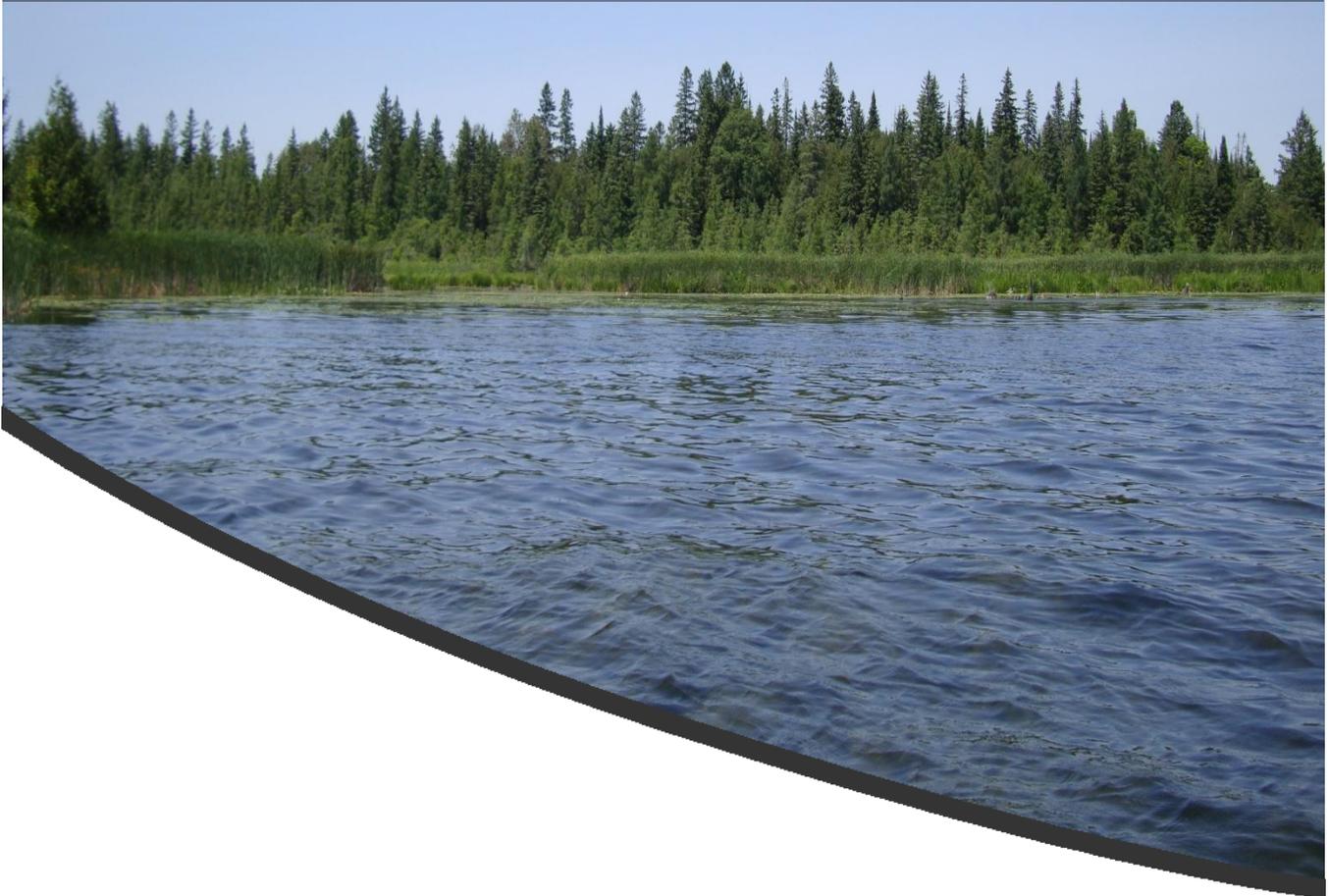


Sturgeon Lake Management Plan

2014



**KAWARTHA
CONSERVATION**

Discover • Protect • Restore

About Kawartha Conservation

A plentiful supply of clean water is a key component of our natural infrastructure. Our surface and groundwater resources supply our drinking water, maintain property values, sustain an agricultural industry and support tourism.

Kawartha Conservation is the local environmental agency that helps protect our water and other natural resources. Our mandate is to ensure the conservation, restoration and responsible management of water, land and natural habitats through programs and services that balance human, environmental and economic needs.

We are a non-profit environmental organization, established in 1979 under the Ontario *Conservation Authorities Act* (1946). We are governed by the six municipalities that overlap the natural boundaries of our watershed and who voted to form the Kawartha Region Conservation Authority. These municipalities include the City of Kawartha Lakes, Township of Scugog (Region of Durham), Township of Brock (Region of Durham), Municipality of Clarington (Region of Durham), Township of Cavan Monaghan, and Municipality of Trent Lakes.

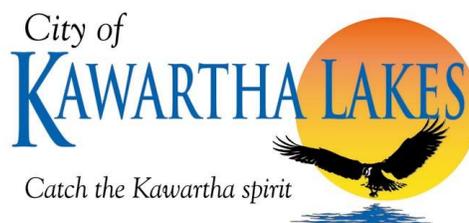
Cover photo: Bobcaygeon West wetland - north-east shore of Sturgeon Lake

Acknowledgements

This plan was written by Kawartha Conservation and developed with significant input from local community stakeholders including:

Balsam Lake Association
Bobcaygeon Shoreline Resident
Cameron Lake Moorings Association
City of Kawartha Lakes Agricultural Development Advisory Board
City of Kawartha Lakes Environmental Advisory Committee
City of Kawartha Lakes, Councillors from local Wards
City of Kawartha Lakes, Planning and Development Services Department
City of Kawartha Lakes, Public Works Department
Federation of Ontario Cottagers' Associations
Fleming College
Gamiing Nature Centre
Haliburton, Kawartha, Pine Ridge District Health Unit
Indian Point Association
Kawartha Conservation
Kawartha Lake Stewards Association
Kawartha Land Trust
Kawartha Protect Our Water
Killarney Bay Cedar Point Cottage Association
North Pigeon Lake Ratepayers Association
Ontario Federation of Anglers and Hunters
Ontario Ministry of Agriculture and Food
Ontario Ministry of Natural Resources
Ontario Ministry of the Environment
Parks Canada
Sturgeon Point Association
Trent University
Victoria Stewardship Council

Funding for this project was provided by the municipality of the City of Kawartha Lakes.



Executive Summary

Sturgeon Lake is a central hub-lake of the Trent-Severn Waterway and is highly valued for providing significant economic, social and ecological benefits to those who live, work and recreate in the Kawartha Lakes region. The *Sturgeon Lake Management Plan* is a community-driven endeavour, stemming from a common resolve to maintain a healthy lake environment in light of pressures that threaten its long-term sustainability.

What constitutes a healthy Sturgeon Lake? How do we know we are sustaining lake resources? To help steer us, a vision statement has been developed as the guiding principal for the plan:

“Ensure the long-term sustainability of a Sturgeon Lake ecosystem that provides a high-quality destination for living and working, boating, swimming, fishing, tourism, and access to water for household uses.”

The lake ecosystem is complex, with many interrelated components. The lake ecosystem changes through time, mirroring changes in land use practices and naturally occurring processes in its drainage basin and within the Kawartha Lakes system as a whole. Today, the lake is experiencing the cumulative effects of pressures such as shoreline and urban development, agriculture, climate change and invasive species, among other impacts.

The intent of the *Sturgeon Lake Management Plan* is to provide a solid framework for a collaborative approach to achieving the vision statement. It is the culmination of a four-year planning project, supported by the City of Kawartha Lakes and developed with significant input from local stakeholders. The first three years of the project were dedicated to science-based assessments of the current state of the lake and its watershed, as well as capturing the key values and lake issues of community stakeholders. Year four focused on crafting the management plan. Members of the Community Advisory Panel and the Science and Technical Committee were instrumental in providing guidance, input and review of the *Sturgeon Lake Management Plan* and associated materials.

Goals:

To ensure the *Sturgeon Lake Management Plan* addresses land use pressures and other community-based concerns, the following strategic goals were developed at the project onset:

- **Protect and improve water quality in the lake and its tributaries for human use and ecological needs.**
- **Promote sustainable human and natural resources management activities that protect and enhance overall watershed and lake health.**
- **Use science-based findings to guide *City of Kawartha Lakes Official Plan* policies, by-laws and other strategic planning documents to ensure a supportive planning policy framework with a primary goal of protecting the lake and its watershed.**

Objectives:

The project management team further defined our management approach through eight objectives. These were formed by considering all of the science-based and lake stakeholder-based issues facing the lake, and reorganizing them in a positive form to assist with framing management actions.

Objectives	Issues Addressed
1. Minimize pollution entering the lake from human sources	<ul style="list-style-type: none">• High concentration of pollution in surface water runoff from urban areas• Eutrophication through excessive nutrient and sediment inputs into the lake• Other potential sources of contamination
2. Enhance swimming opportunities at public beaches	<ul style="list-style-type: none">• High <i>E. coli</i> at certain beaches, leading to beach postings
3. Maintain the biodiversity of the lake ecosystem	<ul style="list-style-type: none">• Proliferation of exotic, invasive species• Loss and fragmentation of natural habitats• Species at risk of disappearance
4. Maintain recreational access along populated waterfront areas	<ul style="list-style-type: none">• Proliferation of aquatic plants and algae in shallow bays and canals
5. Enhance and maintain the natural integrity of the shoreline	<ul style="list-style-type: none">• Urban development along the lake shoreline• Loss of shoreline soil and property frontage
6. Maintain healthy and productive sport fish populations	<ul style="list-style-type: none">• Decline in walleye populations• Potential future decline in muskellunge due to northern pike range expansion• Contamination advisories for consumption of certain sport fishes caught in Goose Bay
7. Ensure permit application process for works projects is transparent and efficient	<ul style="list-style-type: none">• Confusion and/or frustration from shoreline owners and contractors
8. Improve our understanding of how the lake will respond to emerging pressures	<ul style="list-style-type: none">• Lack of coordination of research and monitoring initiatives, and information management

Targets:

All Areas:

- Within a 5-year period, achieve a target of increasing forest cover in the core Sturgeon Lake planning area by 1% (150 acres) of the current deficit per year by planting (50%) and natural regeneration (50%). This equates to planting approximately 45,000 to 50,000 trees and shrubs annually in targeted locations.
- Within a 5-year period, achieve a target of increasing streamside vegetation in the core Sturgeon Lake planning area by 1% (21 acres) of the current deficit per year by planting (50%) and natural regeneration (50%). This equates to planting approximately 5,000 to 10,000 trees and shrubs annually along stream corridors in targeted locations.
- Maintain the existing wetland cover at 16% in the core Sturgeon Lake planning area.

- Over the long term, achieve a 23% reduction in existing phosphorus loadings from all subwatershed inputs in the core Sturgeon Lake planning area combined, to achieve a loading target of approximately 8,500 kilograms (kg) per year.

Agricultural Areas:

- Every year, conduct 10 to 20 agricultural improvement projects in priority subwatersheds such as: creating streamside vegetated buffers, and improving manure storage and fertilizer application.
- Over the long term, achieve a 35% reduction in existing phosphorus loading from local agricultural sources, to achieve a loading target of approximately 2,000 kg per year.

Urban Areas:

- Within a 5-year period, achieve a target of 50% of urban residential and commercial properties implementing lot-level measures such as: capturing stormwater runoff, low or no phosphorus fertilizer use, and increasing infiltration.
- Over the long term, achieve a 56% reduction in existing phosphorus loading from local urban sources, to achieve a loading target of approximately 1,000 kg per year.

Shoreline Areas:

- Every year, decommission vertical retaining walls or repair severely ice-damaged shorelines on three to five properties.
- Within a 5-year period, achieve a target of 50% of shoreline properties practising lot-level measures such as: minimizing development of structures (excluding erosion protection) to 25% along shorelines, reducing fertilizer use, and retaining fallen trees in the nearshore area.
- Within a 5-year period, achieve a target of 50% of residences having greater than 25% of their shoreline naturalized to a minimum of 3 metres (10 feet) from the water's edge.
- Within a 5-year period, achieve a target of 80% (39 days) reduction in the amount of time that public beaches are posted as "unsafe for swimming".
- Over the long term, achieve a 13% reduction in existing phosphorus loading from shoreline septic systems, to achieve a loading target of approximately 940 kg per year.

Management Actions:

Upon synthesizing all available science-based information, as well as through extensive stakeholder consultations, 29 "best-bet" management actions were identified and grouped under five strategic themes:

- Stewardship
- Strategic Planning
- Urban and Rural Infrastructure
- Research and Monitoring
- Communications and Outreach.

We have tried to develop actions as specific to Sturgeon Lake as possible by identifying priority areas for our management actions. Given the similarities among lakes in the Kawarthas, in terms of management pressures, most of these management actions are transferable to other lakes and will form the framework for all future lake management plans.

For each recommended action, these details are provided: level of urgency, rationale, priority areas, agent responsible for implementation, and deliverables. The following provides a summary of key actions contained in the plan.

Stewardship Strategy:

Actions tailored to rural landowners, urban and shoreline residents, and lake users for implementing best management practices on their properties for the benefit of all and the future health of the lake.

Actions	Urgency
A1: Implement measures such as vegetated buffer strips along streams, conservation tillage, and other practices that reduce nutrient and soil loss from farms, with assistance from local cost-share programs.	High
A2: Develop a reforestation program to re-establish and manage natural cover on marginal rural lands, particularly in subwatersheds that do not meet the 30% forest cover benchmark.	Medium
A3: Implement lot-level measures such as reducing fertilizer use, increasing infiltration, capturing stormwater runoff, and other practices that conserve water and reduce pollution in targeted urban areas and waterfront communities.	High
A4: Engage school youth in environmental programming and volunteer opportunities.	Medium
A5: Implement a natural landscaping approach along shoreline properties, with particular focus on decommissioning hardened shorelines and addressing severely eroded/ice-damaged sections.	High
A6: Undertake with local communities the control of nuisance aquatic plants, using recognized and approved methods, along problem nearshore areas identified in the plan.	High
A7: Implement a septic inspection program to identify and repair, upgrade or replace faulty septic systems in heavily developed shoreline areas.	High
A8: Implement programs to educate lake recreationalists about the need for preventative boat maintenance and proper disposal of grey water to reduce the risk of pollution.	Medium
A9: Implement measures such as boat and equipment sanitization to reduce the risk of transfer of invasive species between water bodies.	High

Strategic Planning Strategy:

Actions that focus on strengthening the land use planning and policy framework, with an emphasis on updating the municipal Official Plan.

Actions	Urgency
B1: Amend and strengthen the <i>City of Kawartha Lakes Official Plan</i> and Secondary Plan policy to require protection of the natural environment through specific measures, such as development setbacks within 30 metres of shorelines or streams.	High
B2: Implement the following plans: Trent Source Protection Plan, <i>Fisheries Plan for Zone 17</i> , Kawarthas, Naturally Connected Natural Heritage Strategy, and City of Kawartha Lakes Integrated Community Sustainability Plan.	High
B3: Initiate a trial one-window permit application process for shoreline works between Parks Canada and Kawartha Conservation.	Medium
B4: Develop a site plan control by-law for shoreline areas to protect and enhance natural vegetation and significant habitat, establish buffer zones, and improve water quality.	High
B5: Develop a tree conservation by-law that requires the retention of large existing forested areas on undeveloped areas along shorelines.	High

Urban and Rural Infrastructure Strategy:

Actions that focus on maintaining sustainable operations for government infrastructure projects and other construction works, including: stormwater and wastewater network, as well as shoreline public-access areas, roads, municipal drains, and all construction sites.

Actions	Urgency
C1: Increase community enjoyment of public beaches and waterfronts by deterring geese, conducting regular maintenance, and increasing public access.	High
C2: Implement effective sediment and erosion control measures and other practices to prevent contaminants from reaching local watercourses during agricultural drain, road, and other construction projects.	Medium
C3: Through stormwater management planning, improve the quality and control of stormwater in urban settlement areas of Bobcaygeon, Lindsay and Fenelon Falls.	High
C4: Operate sewage treatment plants and landfills at maximum efficiency in terms of pollutant removal and capacity.	Medium

Research and Monitoring Strategy:

Actions focused on addressing science-based information gaps to better understand the lake's response to emerging pressures, as well as tracking environmental health and plan effectiveness through time.

Actions	Urgency
D1: Implement a coordinated lake monitoring program that regularly tracks key indicators of lake watershed health, including nutrients, forest cover, fish communities and oxygen levels.	Medium
D2: Conduct research to more accurately identify shoreline sources of nutrients, such as septic systems, and potential impacts to nearshore areas of the lake.	Medium
D3: Conduct research to identify how the lake ecosystem responds to emerging pressures such as cumulative development, climate change and invasive species.	Medium
D4: Undertake pilot projects to test the effectiveness of innovative approaches in identified priority areas with nuisance aquatic plants and poor water quality.	Medium
D5: Determine the socio-economic value of Sturgeon Lake, with an emphasis on the value of goods and services provided by natural resources.	Low

Communications and Outreach Strategy:

Actions that stimulate dialogue and information sharing among all stakeholders and promote sustainable practices to maintain a healthy lake environment

Actions	Urgency
E1: Communicate the science, issues, solutions, targets and outcomes of plan implementation.	High
E2: Maintain the Community Advisory Panel to ensure effective communication, agency support, and collaboration among lake stakeholders during plan implementation.	High
E3: Create opportunities for input to plan implementation and updates, and regularly assess target audience needs, values, concerns, interests, barriers and knowledge gaps.	High
E4: Profile the natural heritage features, social values and economic values associated with Sturgeon Lake, including a long-term vision for the lake and a shared sense of responsibility to protect it.	High
E5: Undertake Community Based Social Marketing to motivate lake and watershed friendly lifestyles.	High
E6: Work collaboratively with people and projects that contribute to the objectives and goal of the lake plan.	Medium

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Acronyms and Unit Conversions

ug/L:	Micrograms per litre
m:	Metres (1 m = approx. 3.3 feet)
km:	Kilometres (1 km = approx. 0.6 miles)
km²	Square kilometres (1 km ² = 100 hectares = approx. 250 acres)
kg:	Kilograms (1 kg = approx. 2.2 pounds)
m³	Cubic metres (1 m ³ = approx. 35 cubic feet)

1.0 Setting the Context



Official Launch of the Sturgeon Lake Management Plan at Ken Reid Conservation Area (Community Advisory Panel members and Kawartha Conservation staff, October 2010)

1.1 Introduction

The *Sturgeon Lake Management Plan* is the culmination of a four-year study coordinated by Kawartha Conservation and funded by the municipality of the City of Kawartha Lakes. The Plan is a community-driven endeavour, providing a framework for the implementation of collaborative strategies that seek to maintain a healthy Sturgeon Lake and its watershed for all uses.

Sturgeon Lake is located near the top end of a chain of lakes known as the Kawartha Lakes, which collectively form the central navigable route of the Trent-Severn Waterway system. The lake is situated entirely within the municipality of the City of Kawartha Lakes. Waters from Sturgeon Lake flow east to Pigeon Lake and continue southeast, eventually draining via the Trent River into the Bay of Quinte and out to Lake Ontario.

The overall land area that drains into Sturgeon Lake is approximately 4,600 square kilometres (km²) and encompasses over one third of the entire Trent River basin (Figure 1.1). Most of this drainage area comes from neighbouring Cameron Lake (65% of total) from the west and Scugog River (20%) from the south. The remaining lands (15%) drain directly into Sturgeon Lake through relatively small rivers and streams. The lake's surface area, at approximately 47 km², is the second largest lake entirely within the City of Kawartha Lakes, and it is the fifth largest lake out of the 13 named largest Kawartha Lakes along the Trent-Severn Waterway route.

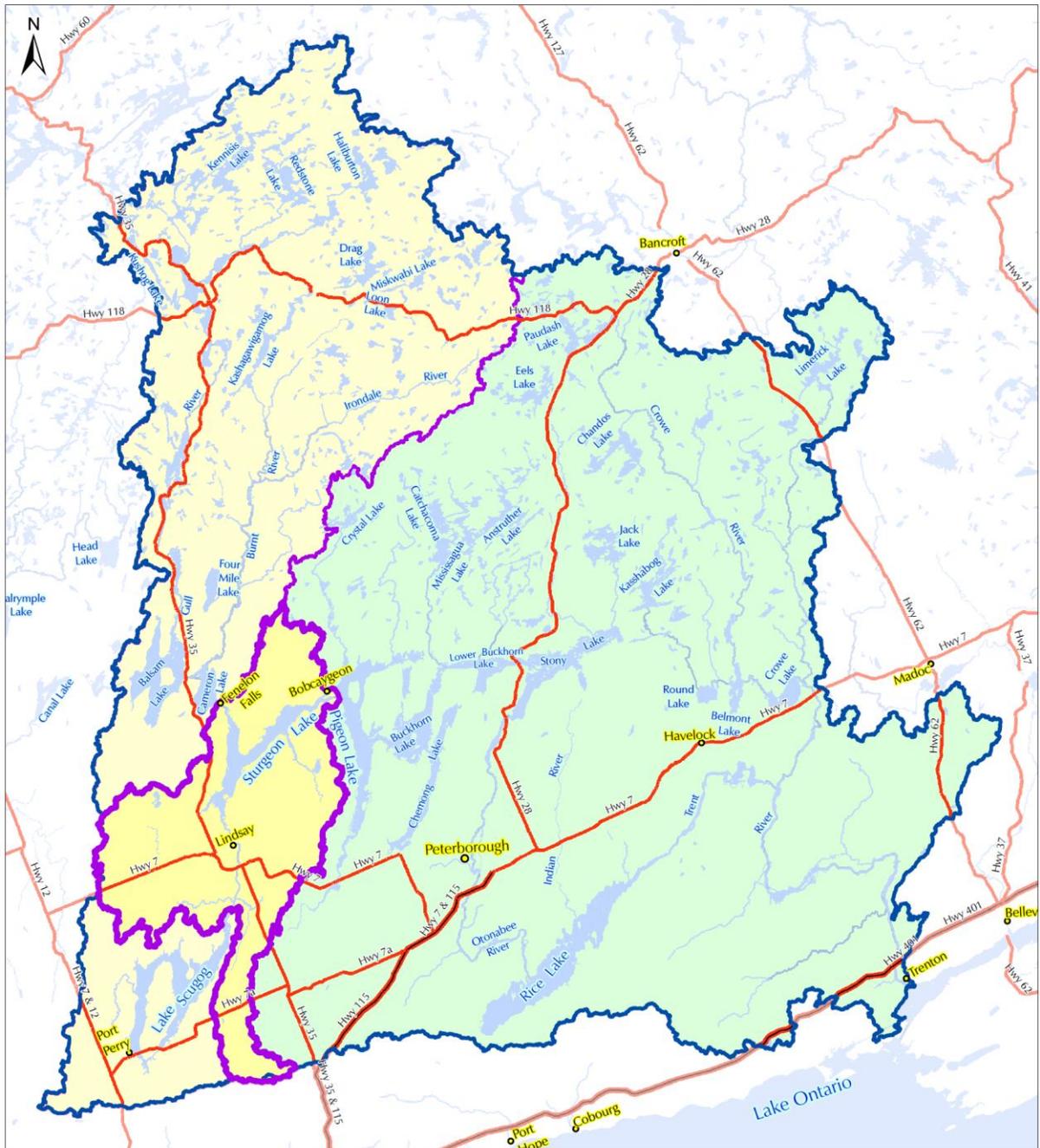
The core management planning area of the *Sturgeon Lake Management Plan*, including the lake itself, is 1,028 km² (Figure 1.2). It consists of lands that drain directly into Sturgeon Lake, excluding the Cameron Lake basin, and directly into the Scugog River, excluding the Lake Scugog basin. A comprehensive management plan for Cameron Lake is in development and scheduled for a 2015 release, while a management plan for Lake Scugog was completed in 2010.

Document Layout

Chapter 1 provides the foundation upon which the *Sturgeon Lake Management Plan* is developed and includes a summary of: lake management drivers, stakeholder values and concerns, management vision and goals, and background characterization.

Chapter 2 provides a summary of management objectives. These include the aspirations of lake-based community stakeholders and ultimately provide the foundation upon which the Implementation Plan is based. Within each objective, a number of issues hindering their achievement have been presented.

Chapter 3 presents the preferred lake management actions that address the key points and issues identified in Chapter 2. These actions are categorized into five strategies focused on sector-based action items. The strategies include: Stewardship, Strategic Planning, Urban and Rural Infrastructure, Research and Monitoring, and Communications and Outreach.



Trent Watershed



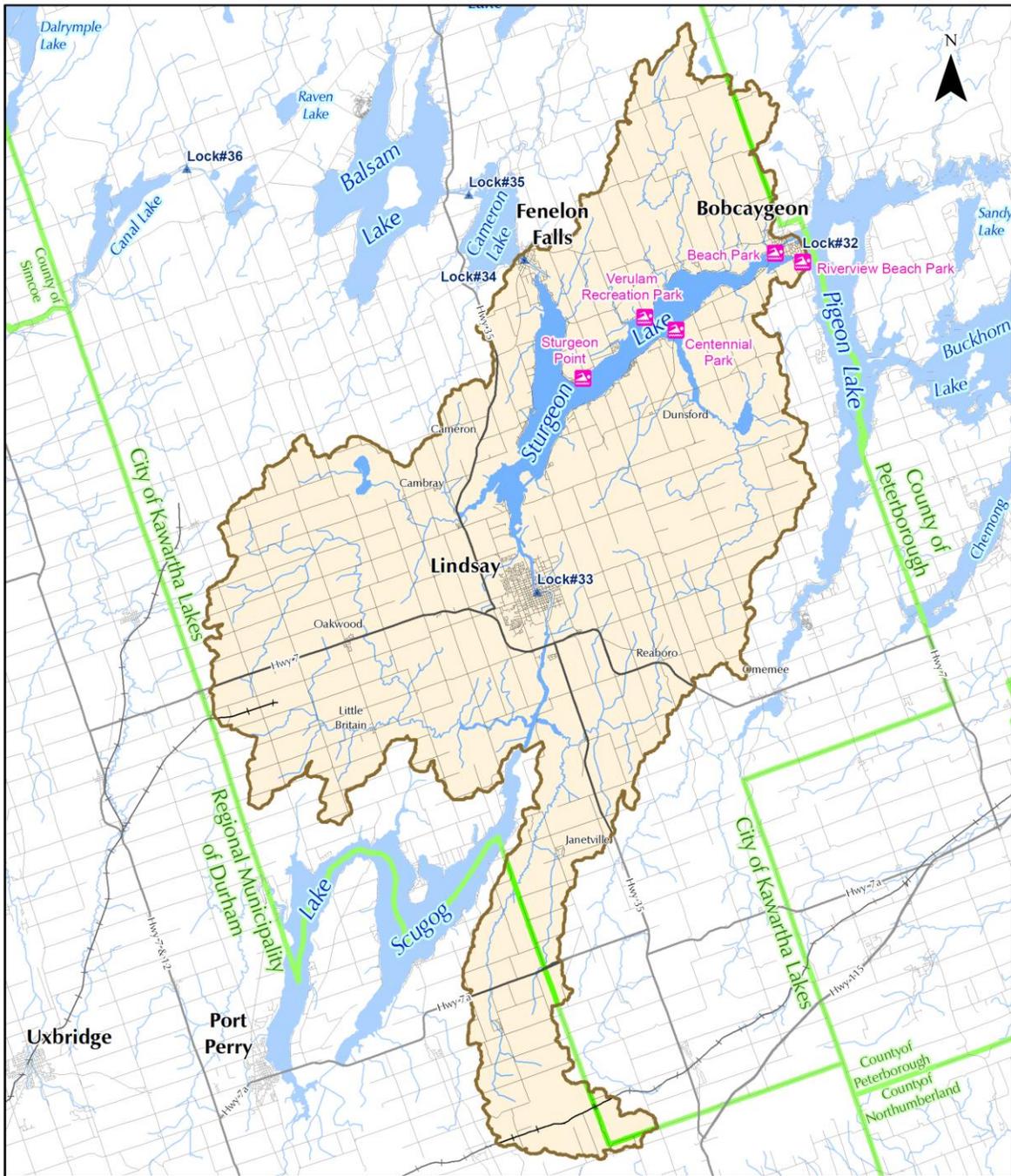
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Sturgeon Lake Management Plan

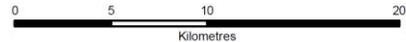
-  Core Planning Area
-  Sturgeon Lake Catchment Basin
-  Entire Trent Watershed

Figure 1.1: Map showing the core Sturgeon Lake Management Plan area, in relation to its upstream catchments and the entire Trent River drainage basin



Index Map

- | | | |
|--|---|---|
|  SLMP Planning Area |  Waterbodies |  Locks |
|  Municipalities |  Roads |  Beaches |
| |  Railway | |



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Additional Data Sources



Figure 1.2: Map showing the core Sturgeon Lake Management Plan area

1.2 Lake Management Drivers, Values and Concerns

Sturgeon Lake is a water resource of the utmost value to the municipality of the City of Kawartha Lakes, shoreline residents, seasonal visitors and local businesses. Surrounding communities benefit from its economic, environmental and recreational enjoyment opportunities. For many people, Sturgeon Lake is an integral part of their identity and livelihood.

The following reports, studies and recent developments demonstrate the imperative for lake management plans for the Kawartha Lakes:

- In 2002, a report commissioned by the City of Kawartha Lakes, titled *Shoreline Environmental Studies in Support of Official Plan Policies* (Gartner Lee and French Planning, 2002), recommended that the municipality encourage the development of individual lake management plans as a cooperative process among lake residents, the municipality, businesses, and provincial and federal agencies.
- In 2007, the *Discussion Paper #1, Natural Environment* tabled for the Panel on the Future of The Trent-Severn Waterway identified ongoing issues that threaten the sustainability of all the Trent-Severn Waterway lakes, including: cumulative and ongoing waterfront development and shoreline hardening, wetland loss, upland habitat loss and fragmentation, eutrophication (nutrient enrichment of the lake), and invasive species.
- In 2008, a report by the Panel on the Future of the Trent-Severn Waterway, entitled *It's All About the Water* (Panel on the Future of the Trent-Severn Waterway, 2008), presented 26 recommendations to address issues, challenges and opportunities in sustaining the system. Of particular note is the findings from the Executive Summary: "...we have found that the economies of communities and the lives and lifestyles of millions of Canadians depend on effective management of that water and we are not certain that current management meets the standard that will most certainly be required in the future" and, "...citizens perceive that water quality in this vast system is deteriorating."
- In 2008 and 2009, the City of Kawartha Lakes Environmental Advisory Committee hosted a series of Environmental Roundtables, inviting various community representatives to put forward initiatives to help realize their goals of protecting the environment. Twenty-two local associations and organizations with an interest or role in water quality participated. By a wide margin, lake management planning was selected as the number one priority.
- In 2009, a municipal staff report was presented to council, outlining support for lake management plans that aim to sustain healthy lakes. Council supported recommendations that lake management planning actions be coordinated by the local conservation authority. The following year, Kawartha Conservation entered into a four-year partnership with the City of Kawartha Lakes to lead the development of the *Sturgeon Lake Management Plan*, and they scheduled the planning processes for additional lakes.
- In the summer of 2011, a lake-water use restriction advisory was issued after a series of potentially harmful blue-green algae outbreaks were confirmed in sections of Sturgeon Lake (Sturgeon Point to Bobcaygeon, near Big Bob Channel, and Ellery Bay).
- In 2012, the City of Kawartha Lakes adopted a new Official Plan; the primary goal is to enhance and protect the quality of the natural environment within the municipality, with a particular emphasis on maintaining healthy water resources.
- In 2013, Parks Canada, the federal agency responsible for administering the Trent-Severn Waterway, announced funding cuts and operational restructuring. At present, details remain unclear regarding how these changes will impact the health of the system. Apparently, water levels and flow management will

remain a top priority. However, their natural heritage program has been cut dramatically. Reductions in resources typically result in less robust programs and services for promoting a healthy lake environment.

- In 2013, the City of Kawartha Lakes Integrated Community Sustainability Plan identified numerous water sustainability goals, and the municipality now seeks to achieve many of these through a lake management planning process.

Community-Based Values and Concerns

Throughout the development of the *Sturgeon Lake Management Plan*, significant effort was placed on gathering input from local community stakeholders. Particularly, guidance was received from the Community Advisory Panel, a group of committed individuals that met on a routine basis, and provided invaluable project support and insight into "what the community wants for their lake."

The following provides a list of key values (Table 1.1), and concerns (Table 1.2) that have been identified by lake stakeholders as priorities for lake management. These were obtained from consultations with public and lake-based stakeholders, primarily through: the Kawartha Conservation Blue Canoe shoreline communication program (summer of 2012), two series of public open houses (fall of 2011, summer of 2013), completed questionnaires during fall of 2011 (more than 100 responses), and Community Advisory Panel meetings.

To maintain Sturgeon Lake values, while addressing lake concerns, a coordinated management approach by all stakeholders (see Appendix A) is required. Open house events during July and August of 2013 provided a clear indication that the lake community is well aware of the issues and will work together with partners who provide effective leadership and a sound action plan.

Table 1.1: Lake values identified by community stakeholders.

Values	Details
Clean Drinking Water/ Potable Water	The Town of Lindsay, Southview Estates, and Bobcaygeon shoreline residents obtain their drinking water from the lake and connecting river systems. Many shoreline residents also draw water from the lake for personal or household use.
Abundant Wildlife	Healthy fish and wildlife populations that provide ample viewing, hunting and fishing opportunities.
Aesthetics and Scenery	Many individuals value the lakes as a place of clean water, relaxation and beautiful scenery. Kawartha Lakes is a unique place to many, offering a natural setting within close proximity to urban and agricultural areas.
Recreational Opportunities	Sturgeon Lake is known for its excellent boating, fishing and swimming potential. The lake is also a central hub-lake of the Trent-Severn Waterway.
Vacation/Cottage/Retreat	The lake provides a unique opportunity in that it provides an affordable and accessible vacation and retirement destination from urban areas within the Greater Toronto Area and beyond.
Economic Driver	The lake – and the Trent-Severn Waterway as a whole – is a significant tourist attraction that helps sustain local businesses, economies and property values that rely on or are closely linked to healthy water conditions.

Table 1.2: Lake concerns identified by community stakeholders.

Concerns	Details
Blue-green Algae Blooms	Restricting localized use of drinking water, potable water and swimming.
Condition of Public Beaches	During summer periods, public beaches are occasionally unfit for swimming as a result of contamination from <i>Escherichia coli</i> (<i>E. coli</i>) bacteria.
Excessive Aquatic Plants	Aquatic vegetation is becoming more prolific, impeding boat access and recreation, and leading to unsightly shoreline aesthetics, particularly in the more shallow bays and shoreline areas.
Excessive Nutrient Inputs	There are concerns that excessive nutrients (e.g., nitrogen and phosphorus from lawn and crop fertilizers, animal wastes and soil sediments) from runoff and human sources are causing contamination of the lakes.
Sedimentation	There are concerns that excessive sedimentation (e.g., soil carried to the lake in water) from runoff are contributing to decreasing water depth, smothering of fish habitat, and increasing productivity of aquatic vegetation.
Less Productive Fishery than in the Past	Walleye populations are seemingly in decline, and there is concern with habitat degradation, particularly sediments covering critical spawning habitats, and lack of enforcement.
Shoreline Erosion	Closely related to the sedimentation concern is the loss of shoreline property to erosion processes, particularly from ice and wave actions.
Contamination from Toxic Chemicals	Chemical contamination of sediments and aquatic life is evident from historical industrial inputs. The community is concerned about the potential impact on human health and fisheries resources.
Landfill Leachate	Concerns have been expressed regarding the seeping of contamination into waterways from existing and closed landfills and potential impacts to water quality.
Municipal Wastewater Treatment Plants	Historically, these facilities (in Lindsay and Fenelon Falls) were a significant point source of contamination. There are community concerns with respect to treatment capacity and effectiveness of removing pollutants.
Poor Water Quality in Residential Canals	There are concerns regarding the stagnant and unsightly water within some man-made canals, leading to excessive aquatic plant and/or algae growth, and potential human health concerns.
Poorly Functioning Septic Systems	Concerns have been expressed regarding the potential for faulty or inadequate septic systems/tanks from aging shoreline dwellings, resulting in high nutrient inputs and/or contamination, especially in the nearshore zone.
Invasive Species	Non-native species (plants, fishes and invertebrates) may be outcompeting or displacing native species, resulting in unbalanced ecosystems.
Water Level Management	Manipulation of water levels and flows through dams are potentially impacting fish populations and the lake ecosystem.
Geese Management	Many shorelines are frequented by Canada geese; geese droppings and grazing affect shorelines and public beach areas.

1.3 Management Vision and Goals

The *Sturgeon Lake Management Plan* aims to solidify a common respect for the lake, maintain a healthy resource for our current generation, and provide a foundation to sustain healthy conditions for future generations. The issues facing the lake will not be addressed overnight. As such, the plan should be considered as a long-term endeavour, one that will be achieved only through ongoing collaboration.

The Vision of Sturgeon Lake is to:

“Ensure the long-term sustainability of a Sturgeon Lake ecosystem that provides a high-quality destination for living and working, boating, swimming, fishing, tourism, and access to water for household uses.”

The Goals of the *Sturgeon Lake Management Plan* are to:

- Protect and improve water quality in Sturgeon Lake and its tributaries for human use and ecological needs.
- Promote sustainable human and natural resources management activities that protect and enhance overall watershed and lake health.
- Use science-based findings to guide *City of Kawartha Lakes Official Plan* policies, by-laws and other strategic planning documents to ensure a supportive planning policy framework with a primary goal of protecting the lake and its watershed.

To ensure a common approach, management actions are guided by the following principles:

- Promote an ecological approach to the use of land and water as a fundamental perspective to a healthy lake and as the foundation for effective land use planning within the lake’s watershed.
- Recognize the linkages between human health and environmental health, while maintaining and sustaining a healthy economy.
- Maintain a watershed-scale perspective and consider the implications of cumulative actions on the lake basin as a whole.
- Recognize that management is a shared responsibility and requires a shared approach to coordination and implementation of actions.

1.4 Lake Background Characterization

To provide background information regarding the current environmental state of Sturgeon Lake and its watershed, a "companion" report was developed alongside the *Sturgeon Lake Management Plan* that characterizes current lake conditions. This report, the *Sturgeon Lake Characterization Report* (Kawartha Conservation, 2014), presents current information with respect to lake resources (such as land use trends, water quality trends, etc.) as well as their functions, linkages, key issues and information gaps.

In characterizing Sturgeon Lake, Kawartha Conservation has drawn upon all available data, studies and sampling results and combined this information into a report for review and update as required. This background information, compiled primarily by specialist staff of Kawartha Conservation and vetted through science-minded peers, helped to inform management decisions and actions developed through the planning process.

The following is a summary of the report findings, presented in five key themes: Land and Lake Use, Water Levels and Flows, Water Quality, Aquatic Ecosystems, and Terrestrial Natural Heritage.

Land and Lake Use

Historical Context

The region around Sturgeon Lake was historically occupied by First Nations peoples, who likely had little, or short-term, environmental impact. As European settlement expanded into the area, there was a gradual but steady shift from exploiting the lake's resources for commercial purposes (namely as a transportation corridor for moving large quantities of cut timber to mills, along with other products, on the Kawartha Lakes system) to enjoying the lake for recreational purposes in the post-war era (such as providing a seasonal vacation retreat). In recent years, it has supported a more permanent population through conversions of seasonal to year-round residences and has steadily become more attractive as a retirement destination.

During settlement in the early to mid-1800s, steam boats and log runs were common sights on the lake. Further inland, expansive forests were cleared to fuel the timber industry (and later to allow for farming) and wetlands were drained to create fertile crop lands. To facilitate connection to Pigeon Lake, the water level of Sturgeon Lake was raised by a dam at Bobcaygeon, permanently raising water levels by about six feet and backwatering expansive areas of low-lying terrain.

By the mid-1900s, land use within the upland part of the basin was a distinctly rural landscape interspersed with remnant tracts of natural lands that have traditionally been too wet to farm productively. As more people began to settle around the lake shoreline (particularly in the urban centres of Lindsay, Bobcaygeon and Fenelon Falls, but also in several smaller lakeside communities), inadequately treated sanitary and industrial wastes were causing lake pollution. Sturgeon Lake had become an extremely nutrient-rich water body, where algae blooms and murky water conditions were the norm.

The above actions have left a lasting legacy that remains to this day. However, in the recent past, advances in wastewater treatment, reduction of algae-promoting nutrients (such as phosphorus) from household products, along with the adoption of agricultural beneficial management practices have all contributed to a gradual improvement of water quality conditions within the lake. At present, several challenges remain that continue to threaten lake sustainability in the longer term.

Current Land Use

The major land use types in the core planning area are agriculture (51%), natural areas (36%), development (8%) and open water (5%) (Figure 1.3).

The landscape around the lake is distinctly agriculture-based, with farming being the main source of economic activity within the region. Within the City of Kawartha Lakes in 2011, farming produced upwards of \$110 million in direct product sales, investing \$243 million indirectly into the local economy. Grain and hay crops dominate farm enterprises, and beef cattle production is second. Due to market forces, there is an apparent trend to more land conversion (land clearing and drainage improvements - typically tile draining) from pasture lands to crop fields. Also, there seems to be a trend towards fewer farms, managing larger areas of land. Approximately 20 municipal drains are present within the core planning area, with total combined lengths of 160 km. These are managed by the municipality to facilitate more productive field crops and are present in the subwatersheds of McLaren Creek, Jennings Creek, Scugog River Tributaries, Stoney Creek and Mariposa Brook.

The natural areas on the landscape consist mainly of wetlands with a few scattered forest areas. The majority of these features still exist today because they have historically been too difficult to farm effectively, as they are extremely wet, low-lying areas. In addition, dam construction at Bobcaygeon flooded vast areas of low-lying terrain around the lake, creating large wetland complexes adjacent to river mouths.

Most of the developed areas within the planning area are located in the Town of Lindsay, the village of Bobcaygeon, the village of Fenelon Falls, and also scattered along shoreline areas. There is a significant summer influx of seasonal residents in these areas due to cottage, tourism and recreational opportunities. Reliable tourism and manufacturing industries as well as transportation corridors to and from the Greater Toronto Area are key to sustaining the prosperity of these communities. Manufacturing within the City of Kawartha Lakes, for example, brings in gross sales greater than \$340 million. Numerous lake-related businesses and organizations cater to tourism and seasonal residents (e.g., lodges, golf courses, bed and breakfasts, entertainment, landscaping and property management).

Specific population counts for the Sturgeon Lake watershed are unknown, however the current population (as of 2011) of the City of Kawartha Lakes is 73,215. By 2031, the forecast for the municipality is a permanent population totaling approximately 100,000. The majority of this increase will occur in urban areas around lakes.

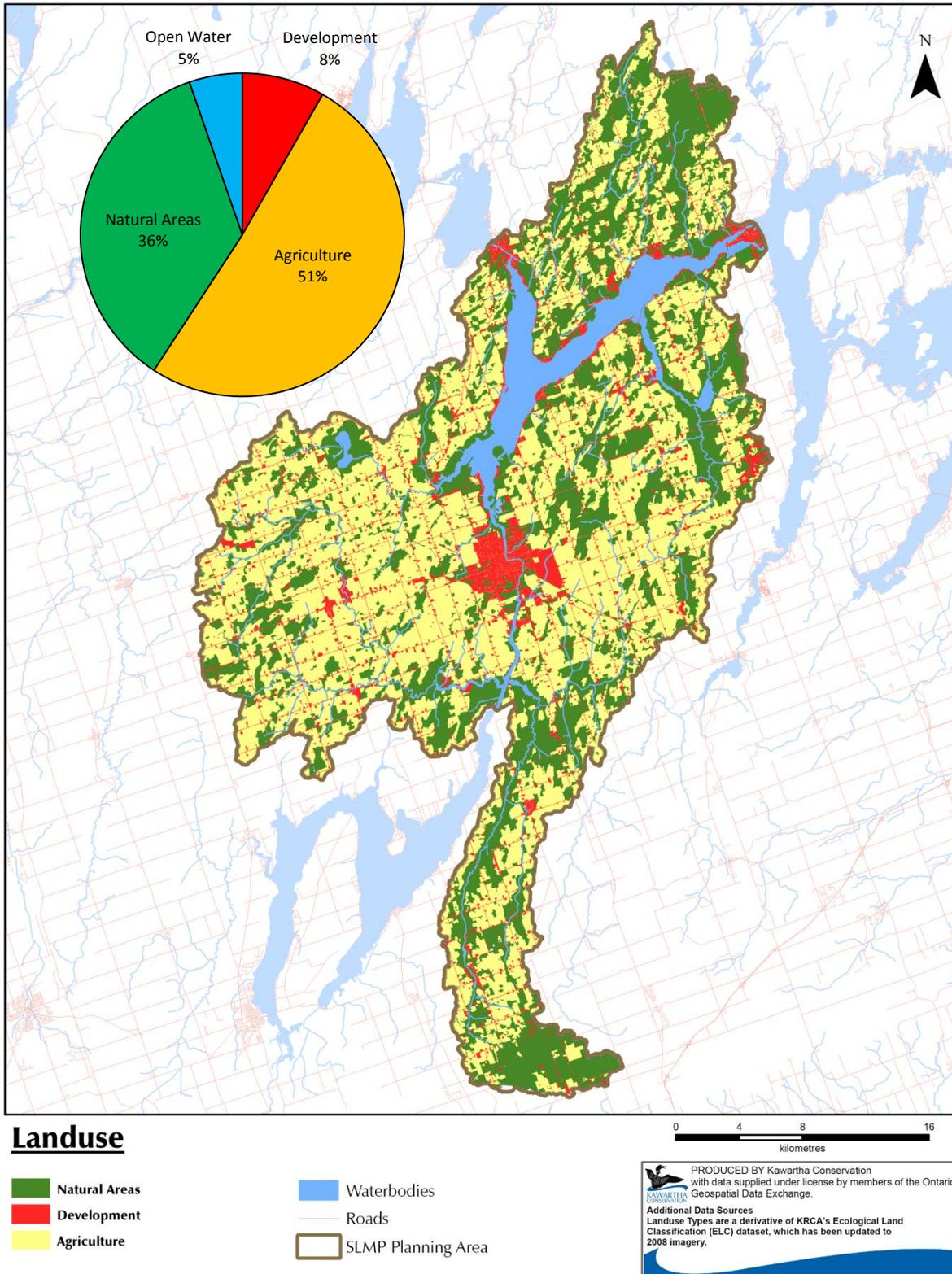


Figure 1.3: Map showing major land use types within the core Sturgeon Lake Management Planning boundary

Shoreline

The shoreline of Sturgeon Lake is approximately 100 km in length. It is relatively densely populated, with approximately 46 buildings/km, making the shoreline the third most clustered of all large water bodies within the municipality. Shoreline development consists mostly of small lot areas, with an average frontage of just over 20 metres (m). Historically, shoreline development was dominated by three-season cottage dwellings. More recently, there has been a shift to more permanent home dwellings as seasonal dwellings are being upgraded to four-season residences. At present, there are approximately 1800 residences located along the shoreline of the lake.

As shown in Table 1.3, urban development in the core Sturgeon Lake planning area is concentrated along the shoreline. As of 2008, over 50% of the shoreline has been developed within a 30 m distance from shore. Most of this area has been cleared of natural vegetation to accommodate cottage or residential property development. The shoreline has also been significantly altered at the water's edge (that is, the shore/water interface). Over 25% of the water's edge consists of artificial land use including concrete, manicured lawn, armourstone, steel and other materials (Figure 1.4).

Table 1.3: Table showing major land use types along the shoreline, from varying distances

	Distance from shore				
	15m	30m	100m	500m	1km
Developed (%)	48	52.6	48.8	21	14.6
Natural (%)	52	47.6	49	57.3	50.1
Agricultural (%)	0	0.1	2.3	21.7	35.2

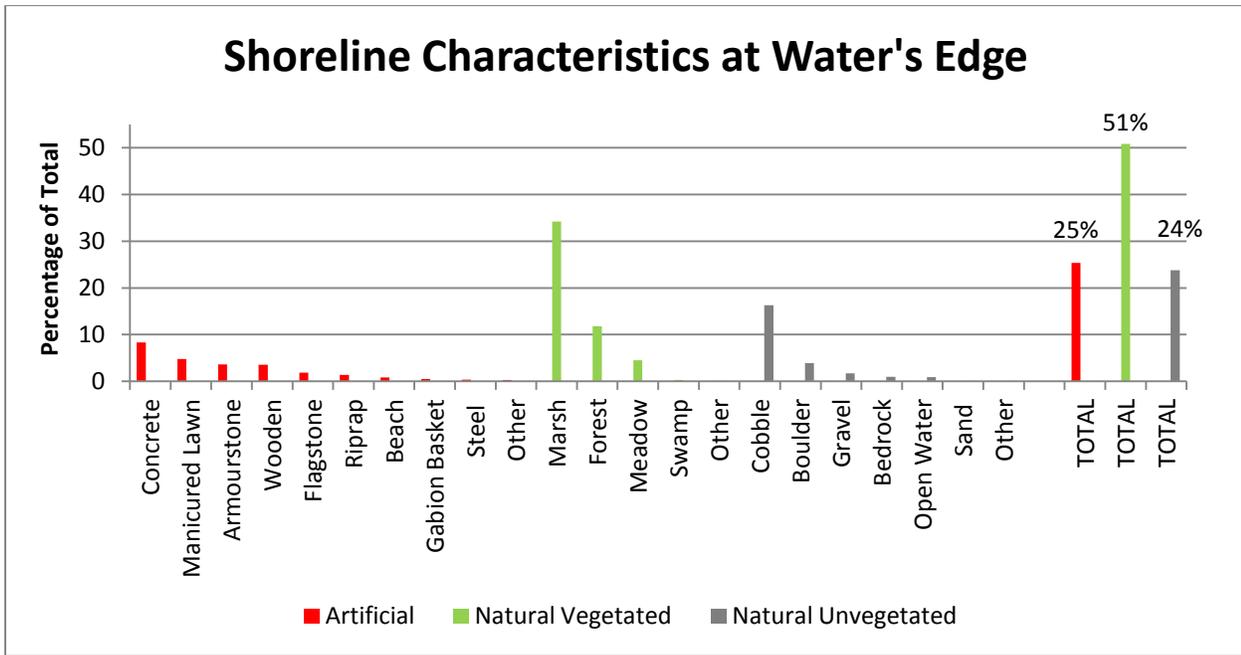


Figure 1.4: Graph showing major land use characteristics at the water's edge of the shoreline

Tourism and Recreation

Sturgeon Lake is a central hub-lake of the Kawartha Lakes and the Trent-Severn Waterway system. The lake connects, via locks, to Cameron Lake (Fenelon Falls Lock #34), Pigeon Lake (Bobcaygeon Lock #32) and Lake Scugog via Scugog River (Lindsay Lock #33). These are some of the busiest locks on the navigable system. In 2012 alone, approximately 8,000 vessels locked through Bobcaygeon (the busiest of all 42 locks on the Trent-Severn Waterway), 7,000 through Fenelon Falls (the third busiest), and 1,500 through Lindsay which provides the only boating access to and from Lake Scugog. Together, the traffic through these three locks comprised approximately 15% of all vessels travelling through the lock system annually.

The lake provides ample opportunities for swimming, boating (power, canoe and sailboat), fishing and hunting, all of which are key recreational activities on the lake. Fishing is particularly significant. A 2005 survey of recreational fishing in Ontario (Ministry of Natural Resources, 2009) indicates that the Kawartha Lakes combined provide the third-largest recreational fishery in Ontario in terms of number of days fished. Sturgeon Lake is the host of many annual fishing tournaments, and the CanUS Walleye Tournament out of Bobcaygeon is the largest. Historically, the Kawartha Lakes have been able to attract significant numbers of anglers because of highly desired fish stocks (walleye in particular) and high natural productivity of the lakes. Within Fisheries Management Zone 17 (i.e., the Kawartha Lakes region and coldwater streams along Lake Ontario), it is estimated that investment expenditures related directly or indirectly to fishing totaled approximately \$114 million in 2005 alone (Ontario Ministry of Natural Resources, 2010).

There are five active public beaches on Sturgeon Lake: Bobcaygeon Beach Park, Riverview, Centennial, Verulam Recreational and Sturgeon Point. Three of the five beaches are often considered unsafe for swimming due to high levels of bacteria in the water (Figure 1.5). Within the last five years, beaches have been posted as "unsafe for swimming" for a total of 49 days.

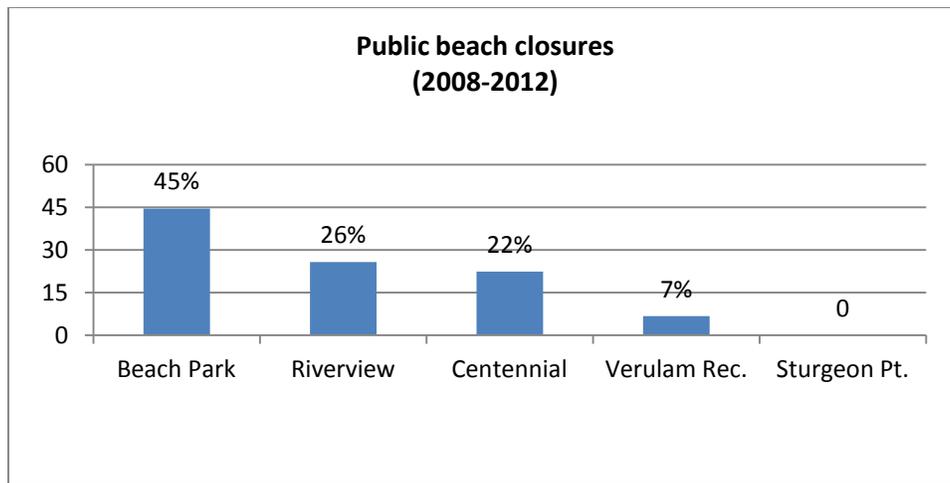


Figure 1.5: Percentage of beach closures between 2008 & 2012 from June to August

The seasonal influx of vacationers within the municipality in summer months is upwards of 17,500 (which equals an increase of 25% of the population), who mostly visit cottages and lakeside communities. The total seasonal population is forecast to grow from 31,000 (as of 2006) to approximately 37,500 by 2031. In 2008, an estimated total of 1,263,000 personal visits were made to the City of Kawartha Lakes, 56% of which were made for pleasure, making it the seventh most visited destination in Ontario. Total visitor spending that year was approximately \$111 million, with visitors being mostly Ontario residents.

Drinking Water and Wastewater

In terms of drinking water supply, there are three municipal intake systems that draw water from Sturgeon Lake or the Scugog River including: Lindsay (Scugog River, upstream of Lindsay dam), Bobcaygeon (Big Bob Channel), and Southview Estates (southwest shore of Sturgeon Lake). Many private systems have individual or communal pump intakes on lake shorelines, however, most private residences along the lake draw groundwater from wells. In terms of wastewater, the majority of residents along Sturgeon Lake are on private septic systems. Wastewater generated by urban areas within Lindsay, Fenelon Falls and Bobcaygeon is treated at the respective water pollution control plants. Treated wastewater from Lindsay, Fenelon Falls, and Bobcaygeon outlets into Scugog River, Sturgeon Lake, and Pigeon Lake, respectively.

Water Levels and Flows

The surface area of Sturgeon Lake is approximately 47 km², which makes it the fifth largest lake of the 13 large, named Kawartha Lakes. In terms of water volume, at approximately 163 million cubic metres (m³), it is the fourth largest lake. The lake is relatively shallow, with a mean depth of 3.5 m and a maximum depth of about 10.6 m. The water level of Sturgeon Lake is regulated by two Trent-Severn Waterway dams and a lock structure at Bobcaygeon. Bobcaygeon was the site of the construction of the first lock system, in 1833, along the Trent-Severn Waterway. The dams, and subsequent improvements, caused historic water levels to be raised by about six feet. This led to the backwatering of shallow low-lying areas including the outlets of Emily Creek, McLaren Creek and Scugog River.

In an average year, Sturgeon Lake receives its water – approximately 2 billion cubic metres of water flow – from the following sources (Figure 1.6): Cameron Lake (72% of total), Scugog River (16%), several tributaries that drain directly into the lake (10%), precipitation (2%) and human-derived sources (<1%), such as from Lindsay and Fenelon Falls wastewater treatment plants. Water leaving Sturgeon Lake flows east through Big Bob and Little Bob channels to Pigeon Lake and then southeast through the rest of the Kawartha Lakes, eventually draining into Lake Ontario through the Trent River and the Bay of Quinte. In an average year, the water in Sturgeon Lake is replenished with new water (that is, flushed) about 20 times. However, there are likely higher water retention times in the southwest portion of the lake (that is, in the vicinity of McLaren's Bay and Goose Bay).

Water levels in the lake are regulated by Parks Canada (Ontario Waterways division), with the primary mandate to maintain enough water in the lake during the months of late spring, summer and early fall to accommodate vessel navigation through the system. In a typical year, the summer operating water level (the high water mark) is 247.75 metres above sea level. The lake level is reduced in the fall and winter months in preparation for spring runoff, largely from the northern reservoir lakes and their watersheds extending into Algonquin Park. These fluctuations are similar to what would be expected on natural lakes, except that on natural lakes the frequency and amplitude of water levels fluctuations (that is, extreme highs and lows) are typically greater. The average annual water levels are shown in Figure 1.7.

The tributaries entering Sturgeon Lake, however, tend to exhibit well-defined seasonal flow patterns, more typical of a natural flow regime. High flows typically occur during early spring, associated with snowmelt, and throughout the year following high precipitation events. Low flows are usually observed in the summer and winter months. Groundwater discharge areas are limited within the Sturgeon Lake planning area, therefore many sections on the smaller tributaries often run dry during summer months or contain limited flow.

The several smaller tributaries that drain directly into the lake, in order of highest to lowest input volume, include: Emily Creek, several unnamed Sturgeon Lake tributaries (including Rutherford Creek), McLaren's Creek, Hawk's Creek, Martin Creek North and Jennings Creek. These creeks and their subwatershed drainage patterns are shown in Figure 1.8. In certain times of the year, some of the tributaries at their downstream sections (e.g., Scugog River, McLaren's Creek and Emily Creek) may actually flow upstream, or backwards, as significant inputs from Cameron Lake increase the lake water level higher than the outlets of the systems.

Abundant wetlands and forested areas in the northern portion of the Sturgeon Lake watershed provide significant benefits for surface water by moderating stream flow, providing high and low flow mitigation, and assisting in groundwater recharge.

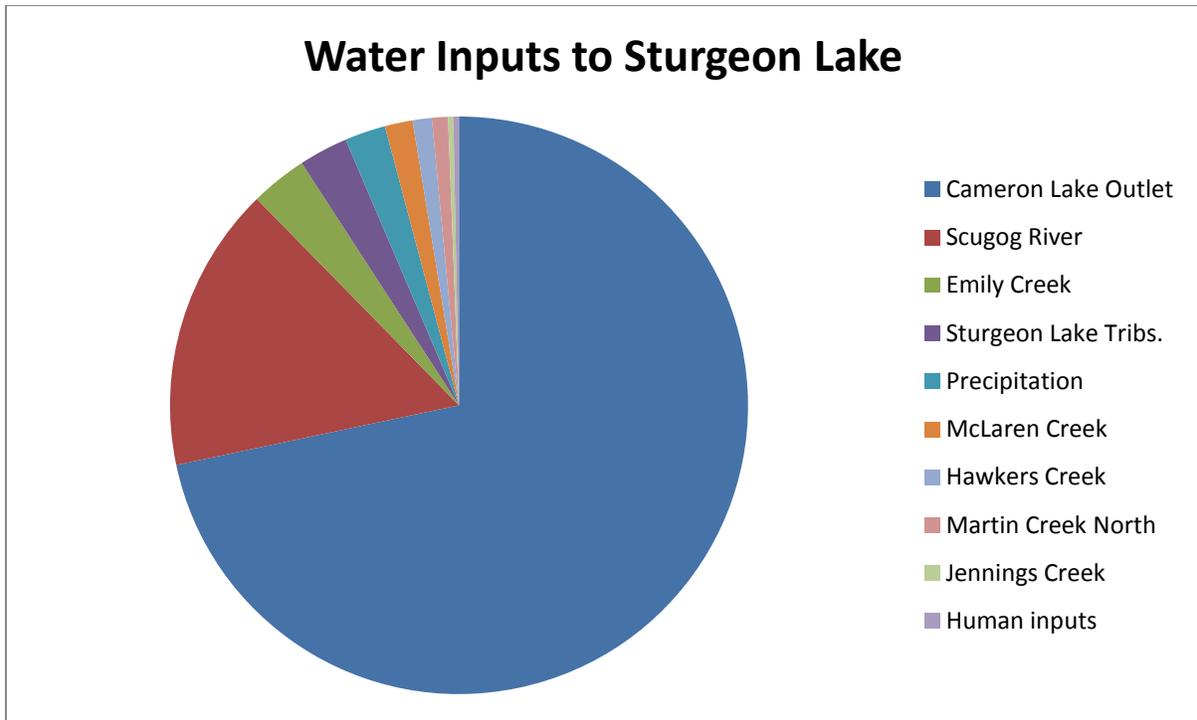


Figure 1.6: Chart showing the major sources of water entering Sturgeon Lake in an average year (2010-2013)

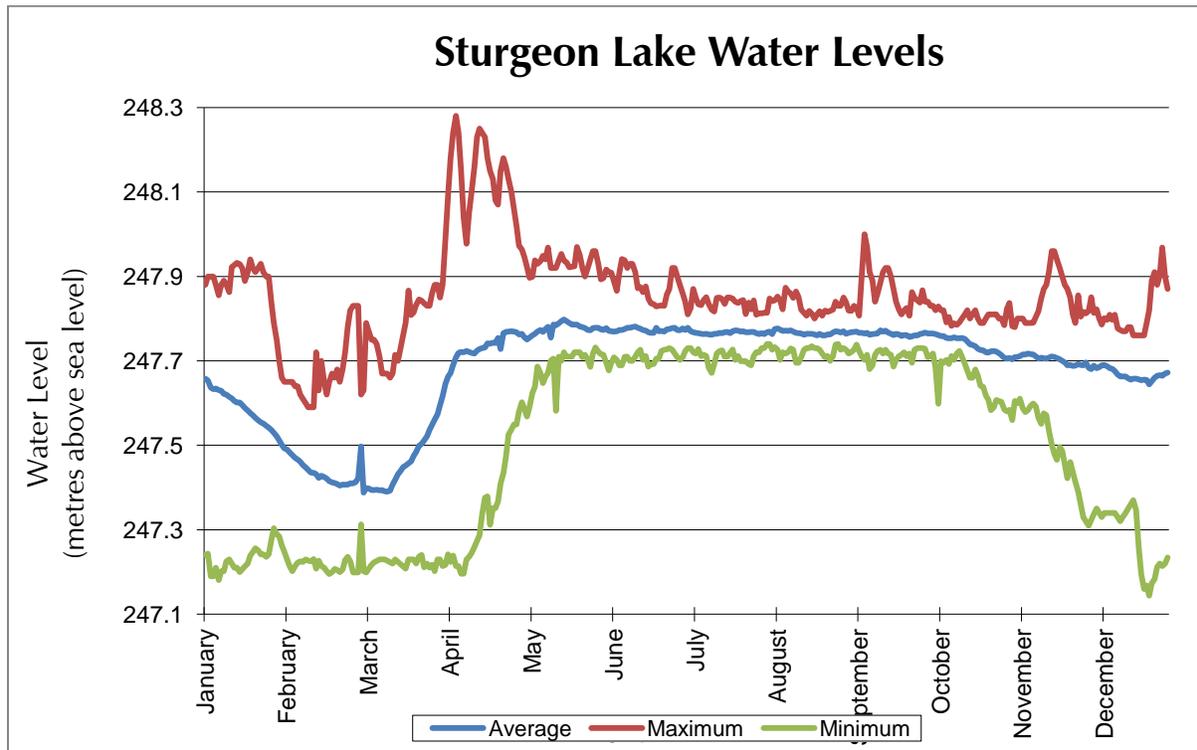
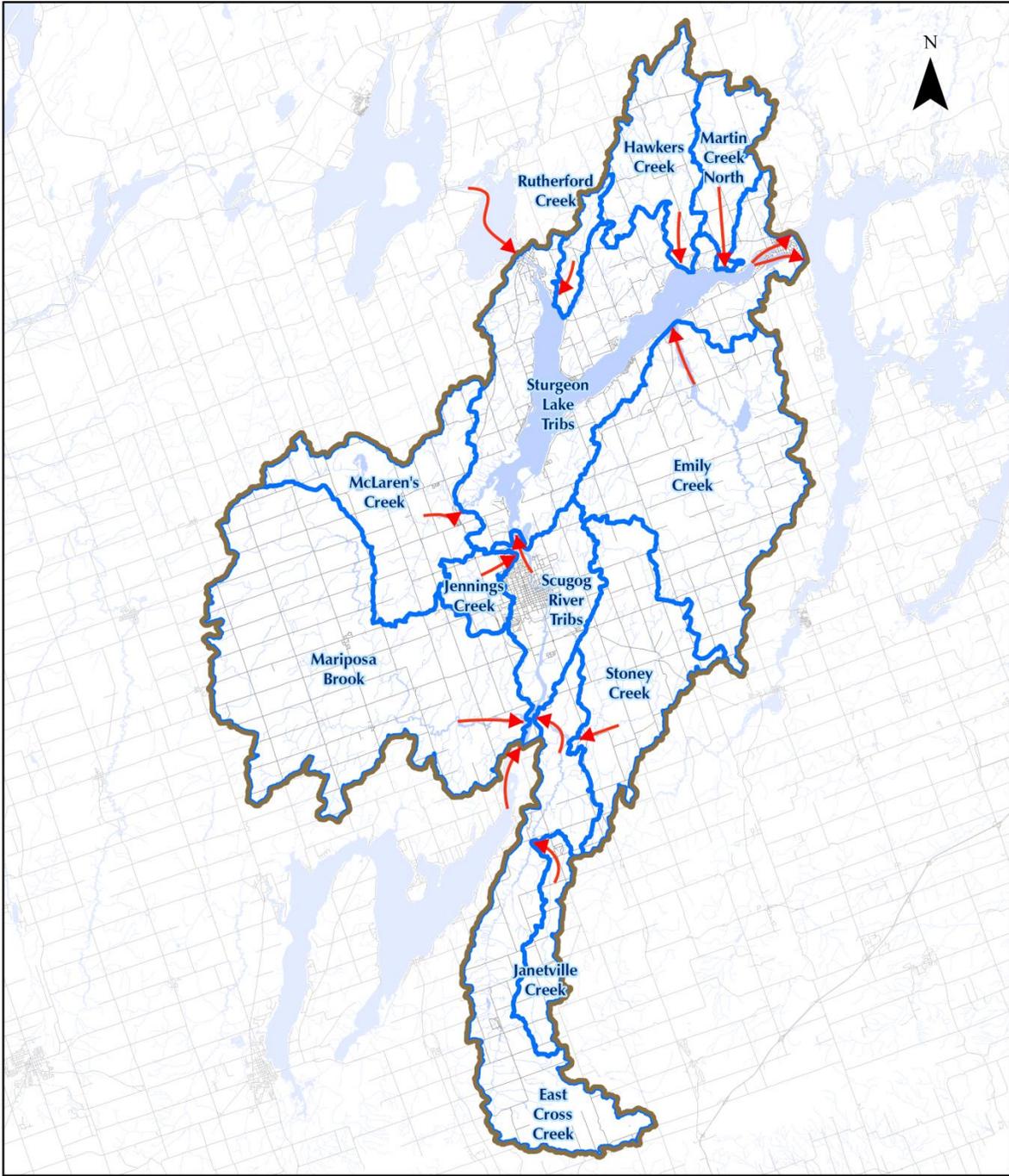


Figure 1.7: Daily average, maximum, and minimum water levels of Sturgeon Lake from 1973-2013



Water Flow Direction

-  Subwatershed Boundary
-  SLMP Planning Area
-  Flow Direction
-  Roads
-  Waterbodies




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 Geospatial Data Exchange.
 Additional Data Sources

Figure 1.8: Map showing major subwatersheds and their flow direction within the Sturgeon Lake Management Planning area

Water Quality

The need to maintain good water quality conditions in Sturgeon Lake is a major trigger for development of the *Sturgeon Lake Management Plan*. Good water quality is important to maintaining the environmental, economic and socio-cultural benefits provided by the lake.

Since at least the mid-1900s, Sturgeon Lake has been considered a polluted lake. This was due in large part to frequently occurring outbreaks of algae blooms, resulting from excessive nutrient inputs (phosphorus in particular) of raw sewage and washing detergents carried into the lake from the Scugog River. In terms of nutrients, it was an extremely productive lake (referred to as eutrophic) and the third most productive of all Kawartha Lakes behind Rice Lake and Lake Scugog. In addition, toxic chemicals from industrial sources were dumped into connecting rivers and settled on the lake bottom, impacting the aquatic food web.

However, in the last 40 years, water quality in Sturgeon Lake has been steadily improving. There has been a shift from a murky open-water dominated lake with frequent algae blooms to a clearer lake with more abundant aquatic plants. Over this time period there has been a marked decrease in nutrient concentrations in Sturgeon Lake, largely as a result of phosphate reduction regulations and wastewater treatment improvements servicing Lindsay and Fenelon Falls. The feeding habits of the exotic zebra mussels, found in the lake since the mid-90s, have further filtered the lake water, thereby increasing water clarity. However, despite better water quality, symptoms of excessive nutrients (e.g., blue-green algae outbreaks) remain evident.

At present, Sturgeon Lake is characterized as a mesotrophic (moderately productive) water body. According to the *Provincial Water Quality Objectives* (Ontario Ministry of Environment, 1994), to avoid nuisance concentrations of algae in lakes, average total phosphorus concentrations for the ice-free period should not exceed 20 micrograms per litre (ug/L). As shown in Figure 1.9, according to recent water chemistry sampling, most sections of the lake meet this criterion with the exception of the Snug Harbour area, which requires a reduction of 12% (2.7 ug/L) in order to conform to 20 ug/L.

Although lake water quality is generally good, existing phosphorus concentrations are elevated in many of its subwatersheds. According to the *Provincial Water Quality Objectives*, excessive plant growth in rivers and streams should not be evident at a total phosphorus concentration below 30 ug/L. As shown in Figure 1.10, according to recent water chemistry sampling, four subwatersheds (East Cross Creek, Jennings Creek, McLaren Creek and Scugog River) have phosphorus concentrations that do not meet this objective.

Another way of summarizing phosphorus information is to convert concentrations to loading amounts. Loading is the amount of phosphorus, by weight, that enters the lake on a yearly basis. The following provides a summary of current phosphorus loadings into the lake by water source, as well as by sector.

Research from 2010 to 2013 indicates that at present, approximately 26,500 kg of phosphorus nutrients enter the lake every year. The majority of nutrients enter the lake during the spring, when elevated runoff caused by snowmelt and precipitation carries large quantities of nutrients into the lake.

Figure 1.11 and Table 1.4 provide a breakdown of current phosphorus inputs into the lake, by water source, on an average year. The categories represent inputs from the catchment areas identified in Figure 1.8.

- Cameron Lake accounts for 46% (12,328 kg) of the total. Flow from Cameron Lake has low average phosphorus concentrations (9 ug/L), but since the volume of flow entering Sturgeon Lake from this source is high (72% of total inflow), it accounts for the majority of nutrient loadings into the lake.

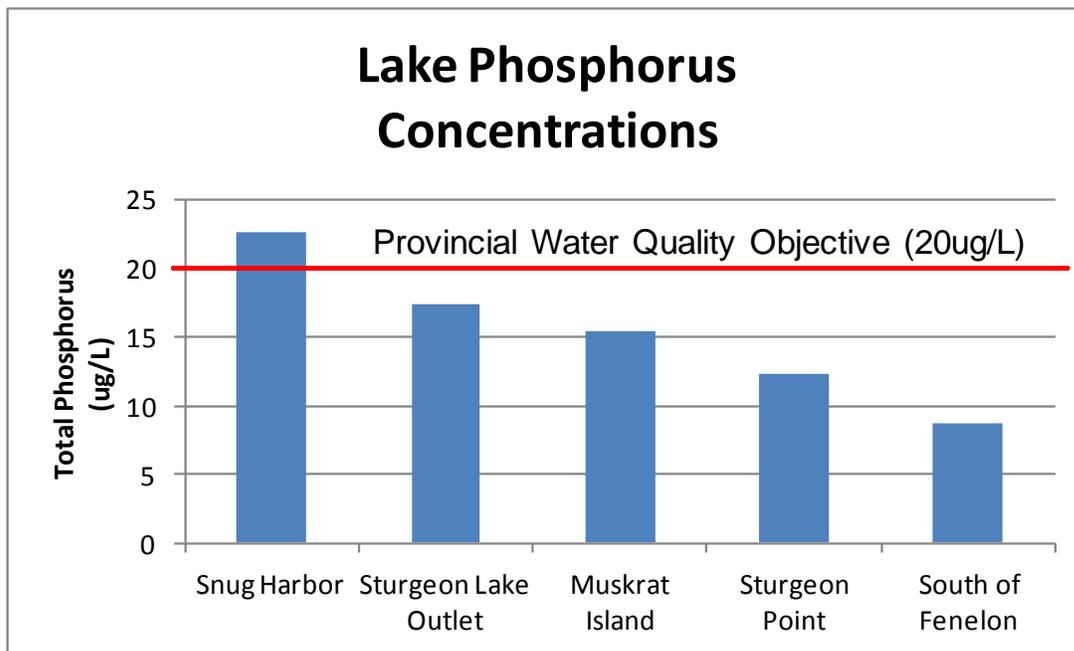


Figure 1.9: Average phosphorus concentrations (2010-2013) in Sturgeon Lake, in relation to provincial water quality objectives

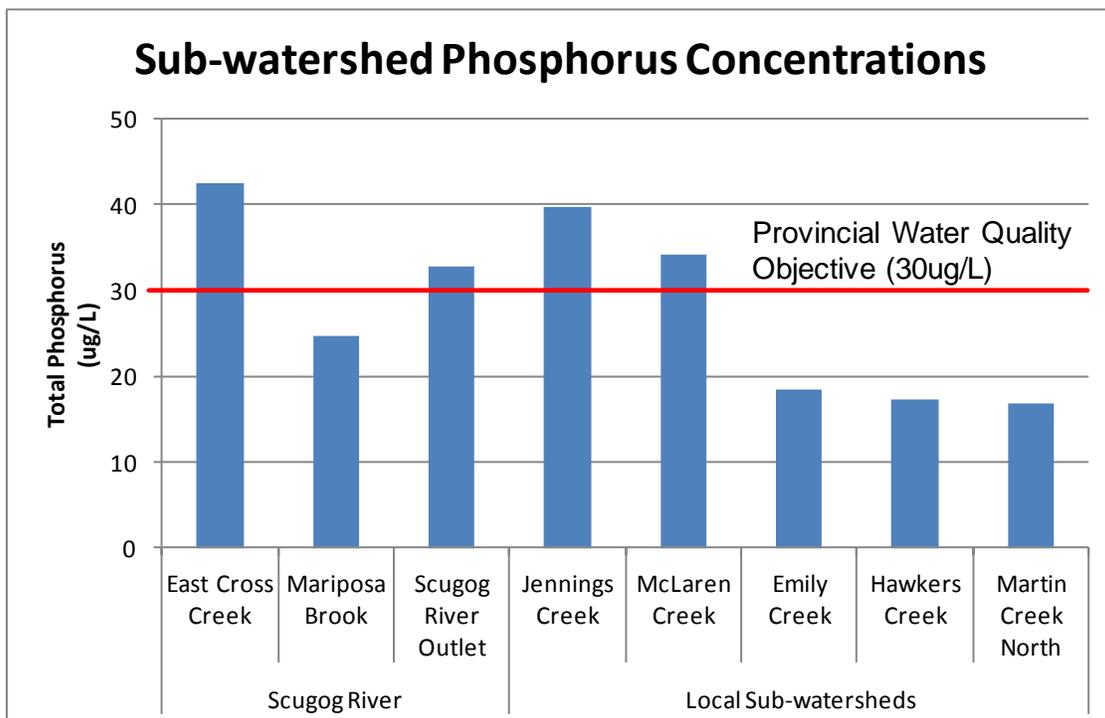


Figure 1.10: Average phosphorus concentrations (2010-2013) in lake subwatersheds, in relation to provincial water quality objectives

Further analyses of specific phosphorus sources that make up this total for Cameron Lake are expected to be published in 2015 as per the Balsam and Cameron Lake Management Plans.

- Local subwatersheds account for 21% (5,645 kg) of the total. It includes all phosphorus entering the lake from its small to medium-sized tributaries, from shoreline septic systems, as well as from Lindsay and Fenelon Falls wastewater treatment plants within the core Sturgeon Lake Planning area. Sturgeon Lake Tributaries (Trib.) account for the majority of phosphorus within this category, which includes several unnamed subwatersheds as well as most of the shoreline septic systems. The remaining subwatersheds, from most to least inputs are: McLaren Creek, Emily Creek, Hawkers Creek, Martin Creek North and Jennings Creek.
- Scugog River accounts for 21% (5,456 kg) of the total. Within this category, phosphorus inputs are split in thirds from: the Scugog River Tribs. (includes most of the Lindsay urban area), East Cross Creek (includes Stony Creek and Janetville Creek), and Mariposa Brook.
- Lake Scugog accounts for 10% (2,531 kg) of the total. For a detailed breakdown of phosphorus inputs entering Lake Scugog, please refer to the *Lake Scugog Environmental Management Plan* (Kawartha Conservation, 2010).
- Atmospheric deposition accounts for 2% (520 kg) of the total. This category includes inputs from "wet" deposition such as rain, snow and dew, as well as from "dry" deposition from dust. Due to the large watershed area of Sturgeon Lake compared with its lake area, the per cent contribution from atmospheric deposition is relatively low compared to other lakes in southern Ontario. For example, atmospheric deposition accounts for approximately 27% of phosphorus entering Lake Simcoe, and 20% for Lake Scugog. These two lakes differ from Sturgeon Lake in that they have relatively small upstream catchment areas relative to their lake surface areas.

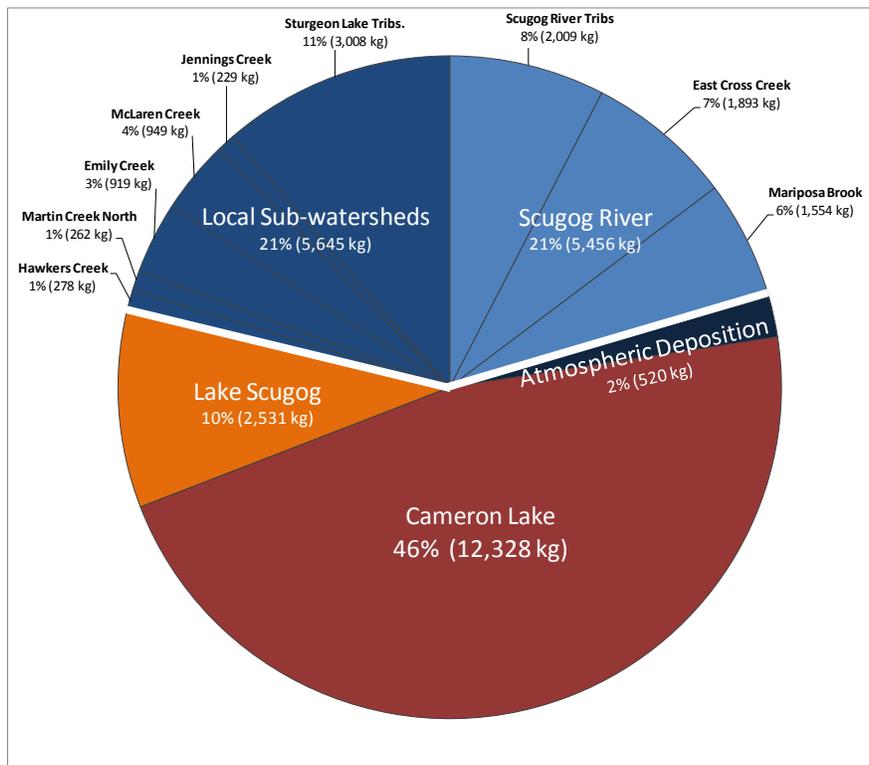


Figure 1.11: Chart showing annual phosphorus amounts entering Sturgeon Lake, by major water source

Table 1.4: Table showing average yearly phosphorus loadings (2010-2013) into Sturgeon Lake, by per cent and amount, from major inputs

Input Source	Phosphorus (kg)	Phosphorus (% of total)
Cameron Lake	12,328	46
Sturgeon Lake Tribs. (Local Subwatersheds)	3,008	11
Lake Scugog	2,531	10
Scugog River Tribs. (Scugog River)	2,009	8
East Cross Creek (Scugog River)	1,893	7
Mariposa Brook (Scugog River)	1,554	6
McLaren Creek (Local Subwatersheds)	949	4
Emily Creek (Local Subwatersheds)	919	3
Atmospheric Deposition	520	2
Hawkers Creek (Local Subwatersheds)	278	1
Martin Creek North (Local Subwatersheds)	262	1
Jennings Creek (Local Subwatersheds)	229	1
Total Entering the lake:	26,480	100%
Total Leaving the lake:	21,052	80%
Net remaining in the lake:	5,428	20%

Figure 1.12 provides a breakdown of current phosphorus inputs into the lake from the Scugog River and local subwatersheds (i.e., the blue "pie-slices" of Figure 1.11, representing 42% of total phosphorus entering the lake). These two categories are expanded to provide additional examination of sector-based sources of phosphorus to develop water quality targets for the core Sturgeon Lake Management Planning area.

- Natural sources account for 38% (4,242 kg) of the subtotal or 16% of the total. This source represents phosphorus that is deemed to enter the lake naturally (that is, without human origin) through stream and river flow within the core planning area. Examples of these inputs include wetlands and forests.
- Agricultural runoff accounts for 30% (3,281 kg) of the subtotal or 12% of the total. This represents the farm-generated phosphorus estimated to come from crop lands and pasture fields that enters the lake through stream and river flow within the core planning area. Examples of these inputs include fertilizer applications, field erosion and livestock manure. McLaren's Creek, East Cross Creek, and Jennings's Creek subwatersheds have relatively high phosphorus contributions from agricultural sources compared to other subwatersheds within the core planning area.

- Urban runoff accounts for 20% (2,229 kg) of the subtotal or 8% of the total. This represents the phosphorus generated from towns and other developed areas that enters the lake through stream and river flow within the core planning area. The Lindsay urban area (which is located mainly in the Scugog Tribs. subwatershed) accounts for over half of this subtotal. Shoreline urban areas represent one quarter of the subtotal, whereas all other urban areas represent the smallest amount. Examples of phosphorus inputs from urban areas include lawn fertilizers, pet wastes and elevated concentrations during heavy rain events.
- Shoreline septic systems account for an estimated 10% (1,080 kg) of the subtotal or 4% of the total. This value includes estimated inputs from systems in close proximity to the Sturgeon Lake shoreline. There are approximately 1,800 residences with private septic systems within 75 m of the lake. To calculate phosphorus loading from septic systems, we estimated that 50% of the phosphorus leaving each septic tank eventually reaches the lake. The phosphorus entering the lake from septic systems is of particular concern because it is ortho-phosphate, a form of phosphorus that is readily available for instantaneous algae growth.
- Wastewater treatment plants account for on average 2% (269 kg) of the subtotal or 1% of the total. This includes loadings from Fenelon Falls Water Pollution Control Plant (servicing approximately 1,800 people) and Lindsay Water Pollution Control Plant (servicing approximately 19,000 people). Due to technical upgrades, the contributions of this source to the total loading have been declining over the last 40 years. The current loadings represent a reduction of over 97% from amounts in the early 1970s and a reduction of over 90% from amounts in the late 1980s.

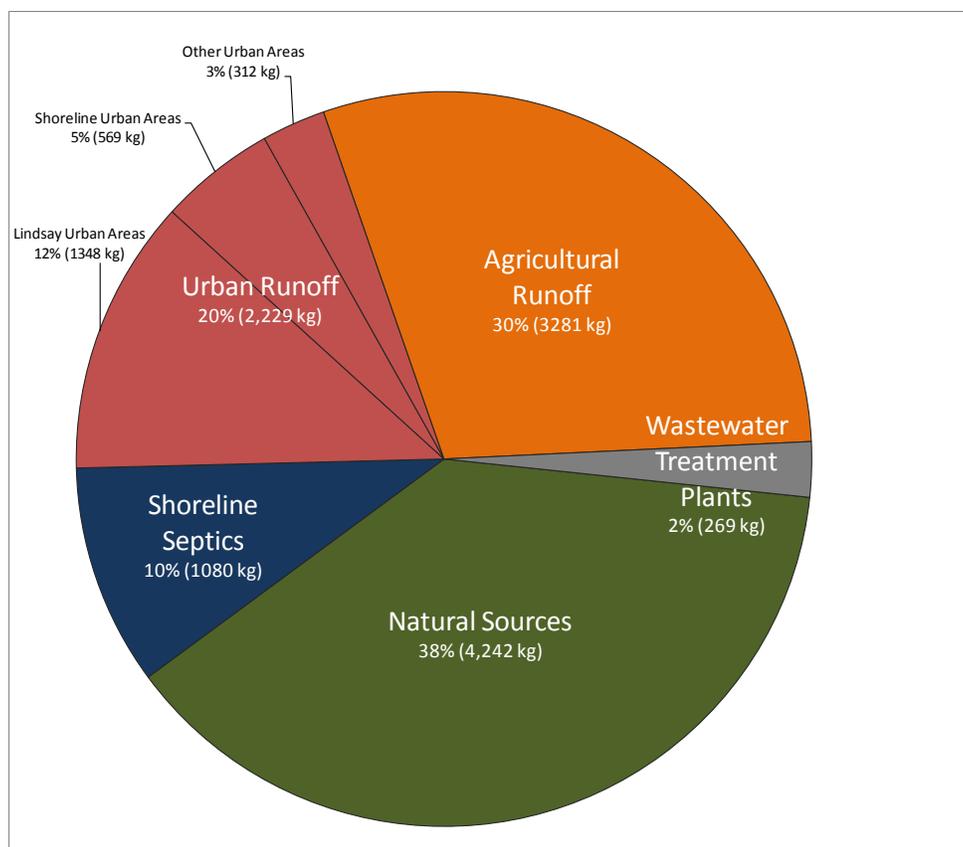


Figure 1.12: Chart showing annual phosphorus amounts entering Sturgeon Lake from local subwatersheds and Scugog River only, by major sector

As previously mentioned, many subwatersheds have phosphorus concentrations that do not meet Provincial Water Quality Objectives. The following outlines how much of a loading reduction (also known as *benchmarks*) is required to consistently meet objectives for inputs within the core Sturgeon Lake Management Planning area.

Table 1.5 provides a breakdown of the benchmarks on a *water-source basis*, whereas Table 1.6 provides a breakdown of benchmarks on a *sector basis*. To obtain the benchmarks, we estimated how much of an annual phosphorus loading is required in order to consistently meet the 30 ug/L phosphorus objective for all subwatersheds within the Local Subwatersheds and Scugog River categories. We then determined how much phosphorus reduction each sector can contribute towards achieving the benchmark.

As previously shown in Figure 1.11, there are five major water sources that load phosphorus into Sturgeon Lake: Cameron Lake, Local Subwatersheds, Scugog River, Lake Scugog and Atmospheric Deposition. The water source benchmark only applies to those sources of phosphorus that are considered manageable and that are within the scope of the core Sturgeon Lake planning area, which are the Scugog River and Local Subwatersheds categories. Benchmarks for Cameron Lake will be developed in 2015 with the completion of the Balsam and Cameron Lake Management Plans, whereas those for Scugog Lake have already been developed in the *Lake Scugog Environmental Management Plan*. Atmospheric Deposition is considered an unmanageable source, therefore it has been excluded.

- From this, we have determined that the overall phosphorus benchmark is the achievement of a maximum loading rate of approximately 8,500 kg per year, which equates to a reduction of existing average annual phosphorous loadings by 2,500 kg or 2.5 tonnes (minus 25% of current loading) from the core planning area. This will require a reduction in average annual loadings of:
 - 1,600 kg/year (minus 30% of current loading) from Scugog River Subwatersheds
 - 900 kg/year (minus 16% of current loading) from Local Subwatersheds

As previously shown in Figure 1.12, the Scugog River and Local Subwatershed categories have been further broken down into five sector-specific phosphorus contributions: Natural Sources, Agricultural Runoff, Urban Runoff, Shoreline Septic Systems and Wastewater Treatment Plants. The sector-based benchmarks only apply to Agricultural Runoff, Urban Runoff and Shoreline Septic Systems categories. These three sources are considered manageable, whereas Natural Sources are not. Benchmarks for shoreline septic systems were developed by estimating that approximately 5% of existing systems are "failing" (i.e., not functioning properly), which in the worse case equates to direct pollution into the lake), thus the benchmark equates to how much of a reduction is needed to offset the "failing" loadings. Benchmarks have already been developed for Wastewater Treatment Plants through a separate process by the Ontario Ministry of the Environment, known as a Certificate of Approval.

- The following represents sector-specific phosphorus reduction benchmarks:
 - 1,254 kg/year (minus 56% of current loading) from Urban Runoff
 - 1,158 kg/year (minus 35% of current loading) from Agricultural Runoff
 - 140 kg/year (minus 13% of current loading) from Shoreline Septic Systems

Table 1.5: Phosphorus benchmarks on a subwatershed basis

	Major Input Source	Existing Phosphorus Inputs (kg/year)	Benchmark Water Quality Objectives (kg/year)	Overall Reduction Needed (kg/year (%))
Scugog River	Scugog River Tribs.	2,009	1,071	938 (47%)
	East Cross Creek	1,893	1,399	494 (26%)
	Mariposa Brook	1,554	1,374	180 (12%)
Local Sub-watersheds	Sturgeon Lake Tribs.	3,008	2,375	633 (21%)
	McLaren Creek	949	766	183 (19%)
	Jennings Creek	229	150	79 (35%)
	Martin Creek North	262	240	22 (8%)
	Emily Creek	919	906	13 (1%)
	Hawkers Creek	278	268	10 (4%)
Sub-Total: Scugog River		5,456	3,844	1,612 (30%)
Sub-Total: Local Sub-watersheds		5,645	4,765	880 (16%)
Total: All Water Sources		11,101	8,549	2,552 (23%)

Table 1.6: Phosphorus benchmarks on a sector basis

Major Input Source	Existing Phosphorus Inputs (kg/year)	Benchmark Water Quality Objectives (kg/year)	Overall Reduction Needed (kg/year)
Urban Runoff	2,229	975	1,254 (56%)
Agricultural Runoff	3,281	2,123	1,158 (35%)
Shoreline Septic Systems*	1,080	940*	140 (13%)*
Sub-Total:	6,590	4,038	2,552 (39%)
Wastewater Treatment Plants**	269	**	**
Natural Sources***	4,242	***	***
Total: All Sectors	11,101		

* Benchmarks for shoreline septic systems currently do not exist. It is estimated that approximately 5% of existing shoreline septic systems are considered "failing", which equates to approximately 140 kg per year of phosphorus. Therefore a 13% reduction from existing loading values is needed to make up this difference.

** Benchmarks for Lindsay and Fenelon Falls wastewater treatment plants are mandated through a Certificate of Approval from the Ontario Ministry of the Environment. Presently, effluent quality is considerably better than the limits and objects set by the Certificate of Approval, therefore is it recommended that existing phosphorus effluent quality be maintained.

*** Benchmarks for natural sources are not applicable, thus are not included in overall reduction needed values.

Aquatic Ecosystems

Aquatic ecosystems refers to the various water-related components that support life in and around Sturgeon Lake. Healthy aquatic life provides significant benefits such as economic revenue (e.g., a high quality fishery that attracts anglers to the area), social significance (e.g., a picturesque cottage-country setting with abundant wildlife) and ecological integrity (e.g., a self-perpetuating food web). As our lake-based communities continue to grow, so too do the pressures placed on its ecosystem. The cumulative effects of pressures such as incremental habitat loss, pollution and introductions of non-native species can cause dramatic shifts in the lake food web. Responsible management is therefore needed not just at a property level, but also in recognizing that life in Sturgeon Lake is dependent upon multiple components that are connected at a broader ecosystem level.

Due to the interconnectedness of lakes in the chain known as the Kawartha Lakes, most aquatic life found in Sturgeon Lake and its tributaries is found in the other Kawartha Lakes as well. However, there are many unique characteristics worth noting, particularly in fish communities and aquatic habitat conditions.

Both the aquatic habitat conditions and fish community structure within the Kawartha Lakes have changed with time. Over the last 30 years, aquatic ecosystems have shifted from a relatively murky, nutrient-enriched environment towards a relatively clear-water, aquatic plant-dominated system. This is a result of reductions in nutrient loadings, the invasion of zebra mussels, and increasing water temperatures, along with other factors. Consequently, the fish community structure in the lake has also changed, not only from the Kawartha Lakes-wide ecosystem shift, but from other factors such as invasive species proliferation.

Sturgeon Lake supports a recreational fishery that is typical of warmwater, shallow Kawartha Lakes. It is one of a few Kawartha Lakes where rare and sensitive coldwater fishes can still be found, such as lake herring in its deep-water areas of the northeastern arm and brook trout in small sections of Martin Creek North and Emily Creek. At least 39 different fish species have been found within the lake or in streams that feed directly into the lake (Table 1.7). Included in this total are many important large-bodied sport fishes such as walleye, muskellunge, largemouth bass, smallmouth bass and common carp, as well as numerous small-bodied sport and bait fishes including yellow perch, black crappie and sunfish.

Areas that are particularly important for maintaining healthy ecosystems in Sturgeon Lake are in the nearshore and shoreline of the lake, and in the streams and rivers that drain into the lake.

Nearshore areas are the shallow areas of the lake (usually less than 3 m) next to shorelines. These are lake ecosystem "hotspots" and tend to be dominated by wetlands or aquatic plants. In particular, they provide important habitat for fishes, and are used by most for spawning and feeding. Compared to other Kawartha Lakes, Sturgeon Lake has a relatively small nearshore area, comprising approximately 37% of the lake surface area. Cumulative development along shorelines is a significant threat to the productivity of nearshore areas.

Streams and rivers that drain directly into Sturgeon Lake are part of the lake ecosystem as well, providing important ecological pathways to and from the lake. Not only do they provide most of the water flow into the lake, but they also provide spawning habitat for popular lake-dwelling species such as walleye and muskellunge. There are dozens of individual creek systems that drain into the lake. Some of the larger watercourses, such as Emily Creek, McLarens Creek, Hawkers Creek and the Scugog River (below the Lindsay dam), provide significant spawning habitat for lake-resident aquatic species.

Table 1.7: Fish species present or recorded historically in Sturgeon Lake and in streams within the core planning area

Fish by Common Names		
black bullhead	common carp*	northern redbelly dace
black crappie*	common shiner	pearl dace
blacknose dace	creek chub	pumpkinseed
bluegill*	fathead minnow	rock bass
bluntnose minnow	finescale dace	smallmouth bass
brassy minnow	golden shiner	spoonhead sculpin
brook stickleback	iowa darter	spottail shiner
brook trout	Johnny darter	striped shiner
brown bullhead	largemouth bass*	trout-perch
burbot	logperch	walleye*
central mudminnow	longnose dace	white sucker
central stoneroller	mottled sculpin	yellow bullhead
cisco (lake herring)	muskellunge	yellow perch

* denotes species that are non-native to the Kawartha Lakes region.

Bold indicates important species to the recreational fishery.

Terrestrial Natural Heritage

Sturgeon Lake is located in an area referred to as the "Land Between," a transitional zone between two distinct ecological units: the Canadian Shield and the St. Lawrence Lowlands. This overlap in area is significant on a provincial scale as it provides a unique concentration and diversity of natural heritage features that occur within both of these distinct land-form types.

Natural cover on the landscape (that is, forests, wetlands, meadows, and vegetative corridors along water courses and shorelines) is essential to maintaining a healthy Sturgeon Lake. The services provided by these natural features include the following:

- Filter and utilize nutrients, absorbing sediments and other pollutants from surface water runoff.
- Improve air quality through filtration and oxygen release.
- Provide natural aesthetic vistas.

- Provide wildlife habitat, including for those species we are just starting to understand (e.g., a wide range of pollinators).
- Provide the first line of defense in flood attenuation by absorbing high water levels.
- Provide recreational opportunities (e.g., hunting, fishing, hiking, canoeing, wildlife watching).
- Reduce shoreline erosion.
- Sequester carbon to reduce atmospheric carbon dioxide levels, thus contributing to the mitigation of the effects of climate change.
- Moderate summer temperature extremes through shade and transpiration.

Within the core Sturgeon Lake planning area, natural cover provides habitat for locally and provincially rare wildlife species, including 11 that are at risk of disappearing from the area. These include: five birds (Henslow's sparrow, black tern, least bittern, loggerhead shrike, and red-headed woodpecker), five reptiles (Blanding's turtle, milksnake, common five-lined skink, eastern musk turtle, eastern ribbonsnake) and one tree species (butternut).

Agricultural and urban development typically results in the loss and fragmentation of natural cover. At present, the core Sturgeon Lake planning area contains approximately 365 km² of natural cover, representing 38% of the total land cover (Figure 1.13). Forest cover accounts for 25%, wetlands (including forested swamps) account for 16%, whereas meadows account for 6%. The largest natural community types are coniferous forests (5%), coniferous swamps (5%) and mixed forests (4%). Areas of natural cover are generally more extensive in the northern part of the Sturgeon Lake watershed than in the south. In the north, there is less urban development and less intensive agriculture.

Approximately 48% of the shoreline area around Sturgeon Lake is considered natural land cover. The majority of this is wetland, but some small remnant forested areas exist as well. Most of the existing wetland areas (approximately 85%) have been identified as significant in value on a provincial scale.

According to a research document titled *How Much Habitat is Enough?* (Environment Canada, 2013), a certain minimum amount of natural cover types are needed on the landscape to maintain healthy ecosystems. These *benchmarks* exist for forest, wetland and streamside vegetation amounts. We can compare existing natural cover values within the core planning area against these benchmarks to provide insight into the state of health of our terrestrial natural heritage. Table 1.8 provides a summary of these benchmarks for each subwatershed, showing existing amounts of vegetation cover. Where the existing level is below the benchmark, we have summarized how much additional cover is required to meet the respective benchmark for each of the three natural cover types.

The forest cover benchmark is 30%. In other words, at least 30% of any subwatershed or planning area should be forested to maintain ecological benefits. Existing forest cover within the core Sturgeon Lake planning area is 24%, which does not meet this benchmark. This equates to a forest cover deficit of 6% (61 km²). Forest cover is lacking in six of the subwatersheds, including the Scugog River Tributaries (Tlibs.), Jennings Creek, McLaren Creek, Mariposa Brook, Sturgeon Lake Tribs. and Emily Creek (Figure 1.14).

The wetland cover benchmark is 10%. At least 10% of any subwatershed or planning area should be in a wetland state to maintain ecological benefits. Existing wetland cover within the core Sturgeon Lake planning area is 16%, which meets this benchmark. However, the Scugog River Tribs. and Jennings Creek have very little wetland cover and do not meet the benchmark.

The streamside vegetation benchmark is 75%. At least 75% of the total stream and/or river length in any subwatershed or planning area should have natural vegetation along both banks. Existing streamside cover in the core Sturgeon Lake planning area is 64%, which does not meet this benchmark. This equates to a natural cover deficit of 11% (8.7 km²). Streamside vegetation is lacking in seven of the subwatersheds, including Jennings Creek, Scugog River Tribs., Sturgeon Lake Tribs., McLaren Creek, Emily Creek, East Cross Creek and Mariposa Brook (Figure 1.15).

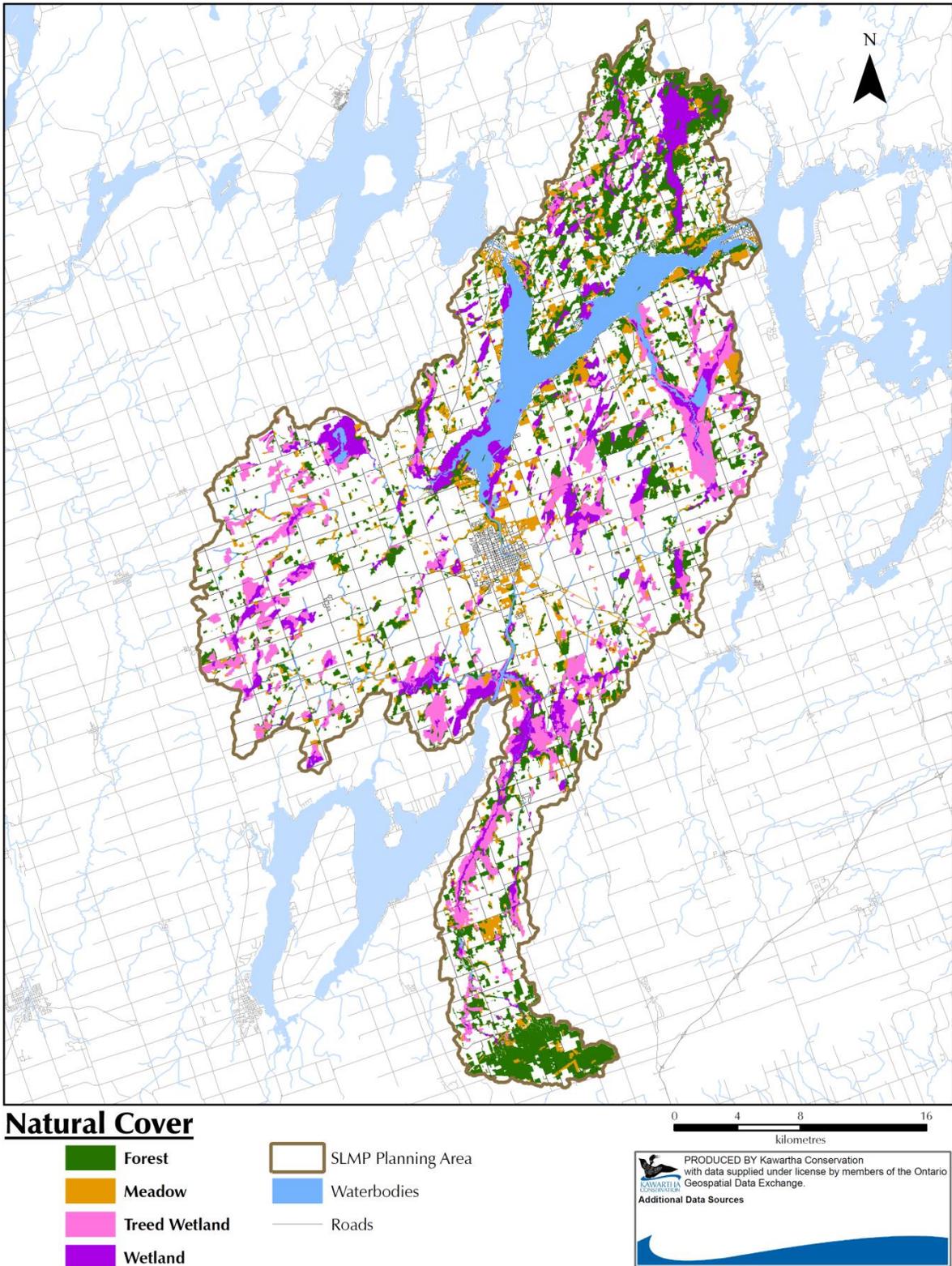


Figure 1.13: Map showing natural cover types within the Sturgeon Lake Management Planning area

Table 1.8: Table summarizing existing forest, wetland and streamside vegetation cover within the core Sturgeon Lake Management Planning area, in relation to ecosystem health benchmarks

Subwatershed	Forests Benchmark = 30%		Wetlands Benchmark = 10%		Streamside Vegetation Benchmark = 75%	
	Existing %	Needed % (km ²)	Existing %	Needed % (km ²)	Existing %	Needed % (km ²)
Scugog Lake Tribs.	3%	27%(13.6)	2%	8%(3.7)	56%	19%(0.7)
Jennings Creek	6%	24%(3.8)	8%	2%(0.3)	49%	26%(0.3)
McLarens Creek	14%	16%(12.6)	15%	-	59%	16%(0.8)
Sturgeon Lake Tribs.	24%	6%(8.6)	10%	-	59%	16%(2.4)
East Cross Creek (incl. Janetville and Stoney)	30%	-	19%	-	73%	2%(0.3)
Mariposa Brook	18%	12%(28.1)	17%	-	62%	13%(2.1)
Emily Creek	28%	2%(3.5)	22%	-	60%	15%(1.9)
Rutherford Creek	38%	-	16%	-	79%	-
Martin Creek North	35%	-	29%	-	90%	-
Hawkers Creek	44%	-	11%	-	76%	-
Sturgeon Lake core management plan area	24%	6%(61.0)	16%	-	64%	11%(8.7)

Red text: existing amount does not meet benchmark.

Green text: existing amount meets benchmark.

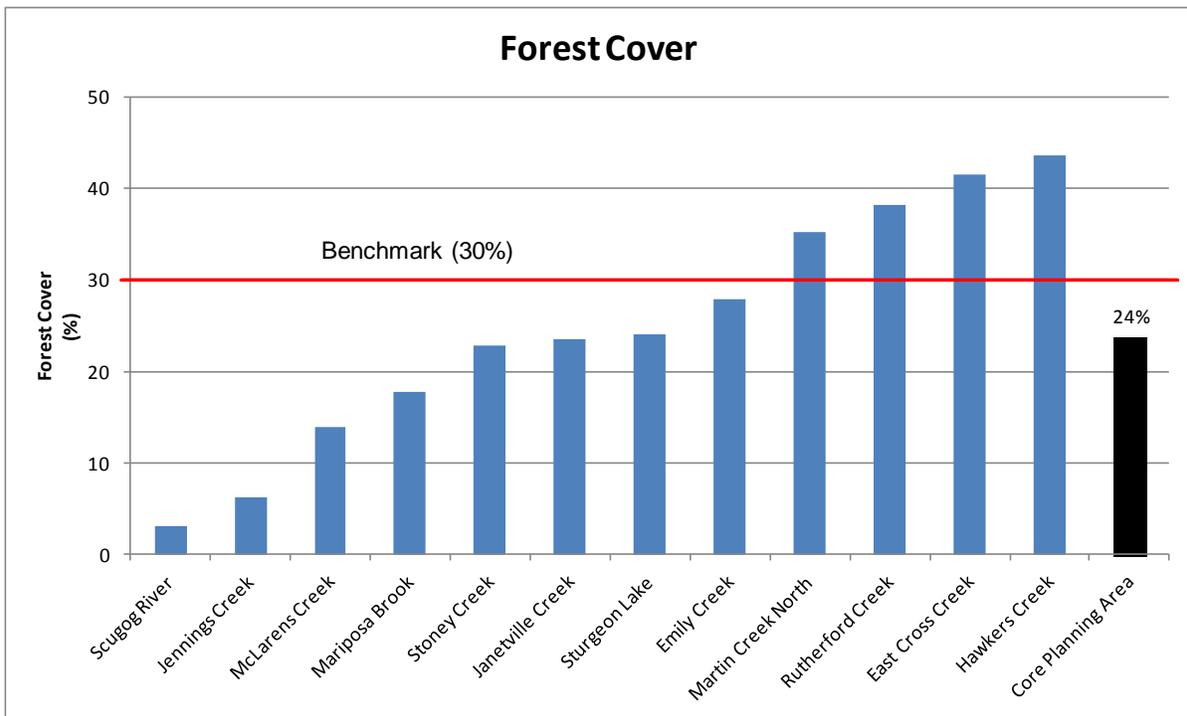


Figure 1.14: Graph showing percentage of forest cover by lake subwatershed and lake plan area, in relation to the 30% minimum value needed to maintain healthy ecosystems

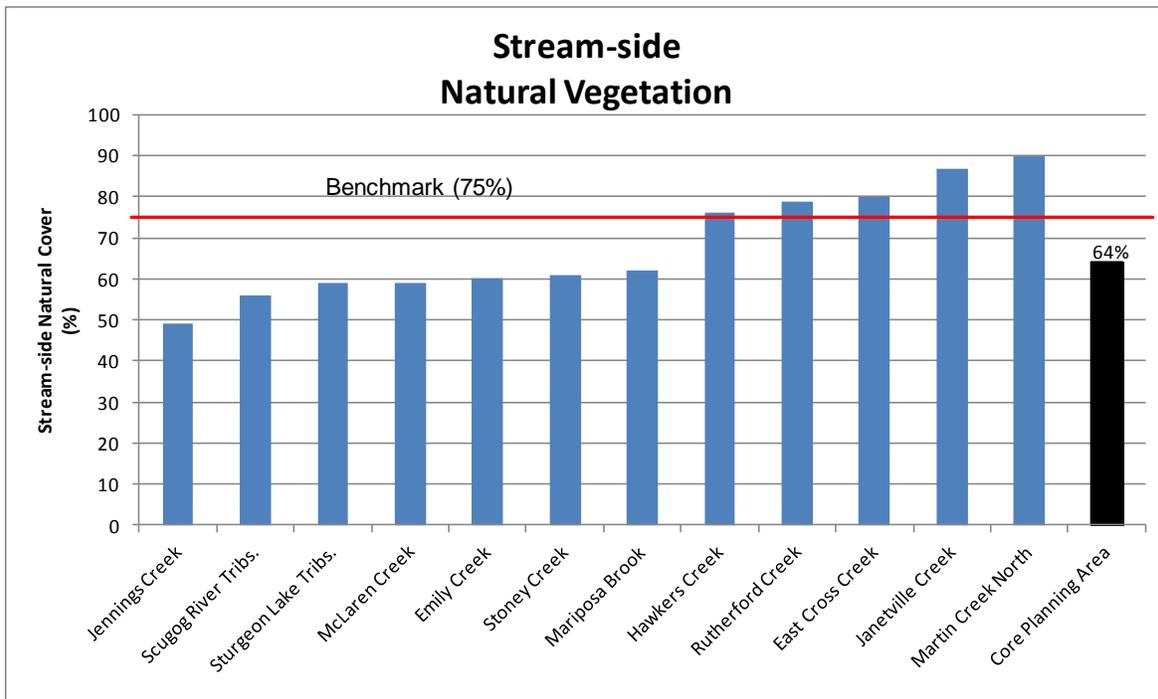


Figure 1.15: Graph showing percentage of natural cover along tributaries by lake subwatershed and lake plan area, in relation to the 75% minimum value needed to maintain healthy ecosystems

2.0 Management Objectives



*Community Advisory Panel meeting
(Bobcaygeon Service Centre, August 2012)*

2.1 Introduction

This chapter provides a summary of the management objectives of the Sturgeon Lake Plan. Objectives are "*what we want to achieve*" through a coordinated approach to managing the lake. The objectives form the basis of the Implementation Strategies and were developed through community consultation. Each management objective is organized into the following: Background, Issues and Implementation Approach. There are eight objectives in total.

Background provides a summary of the objective, including its origin and why it's important. Key points are highlighted, such as valued components, current state and apparent trends that are relevant in implementing the *Sturgeon Lake Management Plan*. Wherever possible, pictures help illustrate key points.

Issues are barriers that prevent us from realizing the objective. Issues have been identified by two means: (1) technical studies, science-based research, and anticipated relevance and (2) concerns expressed through the lake-stakeholder consultation process.

Implementation Approach is a summary of how we intend to address issues and fully realize our objectives. Actions are presented under each strategy in Chapter 3: Implementation Strategies. For specific details related to each action, please refer to Implementation Strategies.

Strategies

- **Stewardship:** Actions that are tailored to rural landowners, urban and shoreline residents, and lake users to deliver best management practices on their properties for the benefit of all and the future health of the lake
- **Strategic Planning:** Actions that focus on strengthening the land use planning and policy framework, with an emphasis on updating the municipal Official Plan
- **Urban and Rural Infrastructure:** Actions that focus on maintaining sustainable operations in government infrastructure and construction works, including the stormwater and wastewater network, shoreline public-access areas, roads, municipal drains, and construction sites
- **Research and Monitoring:** Actions that are focused on research to better understand the lake's response to emerging pressures, as well as tracking environmental health and plan effectiveness through time
- **Communications and Outreach:** Actions that encourage dialogue and information-sharing among all stakeholders and promote sustainable practices to maintain a healthy lake environment. In this chapter, there are no specific Communications and Outreach actions identified because effective communication is crucial to implementing all aspects of the management plan. Please refer to the Communications and Outreach Strategy in Chapter 3 for action details.

2.2 Management Objective #1:

Minimize pollution entering the lake from human sources

BACKGROUND:

- Life around the lake needs clean water. Sturgeon Lake and the Scugog River are sources of drinking water for several communities, including the Town of Lindsay, Southview Estates and Bobcaygeon. Aquatic ecosystems also need clean water to thrive. Excessive inputs of raw sewage, nutrients, sediments, toxic chemicals and other elements negatively impact the quality of the lake water for human use and ecosystem needs.
- Sturgeon Lake has a long history of pollution from human sources. Significant gains have been made in the last 50 years towards reducing lake contamination, especially in reducing point-source inputs of raw sewage from urban areas. At present, the majority of lake water pollution comes from various non-point sources such as in surface water runoff directly from urban areas, and in streams that drain upland urban and agricultural areas.

ISSUES:

- High concentration of pollution in surface water runoff from urban areas. Urban areas contain significant amounts of hardened surfaces, on which pollutants (such as pet feces, oil, fertilizers, salt, etc.) accumulate. After a rain these harmful substances are washed into the lake instead of being purified by gradually filtering through vegetation into the ground. Certain agricultural practices, such as excessive fertilizer applications, and tile draining and ditching along streams, can have a similar effect.
- Eutrophication of the lake through excessive nutrient and sediment inputs. Eutrophication is the term used to describe the accelerated aging process of lakes from consistently high nutrient inputs, in particular phosphorus and nitrogen. Symptoms of eutrophication include frequent blue-green algae blooms, high algae growth and oxygen depletion in lake water. A large harmful blue-green algae bloom occurred in the summer of 2011, requiring authorities to issue water use restriction advisories for the eastern arm of the lake from Sturgeon Point to Bobcaygeon. Current water quality data show that nutrient concentration in certain parts of the lake (Goose Bay) and in certain tributaries (the Scugog River, McLarens Creek, Jennings Creek, East Cross Creek) do not meet guidelines for good water quality.
- Contamination from other sources. Contaminant spills from power boats, grey-water discharge from houseboats, oil spills from shoreline properties, and leachate from active and abandoned landfills are all potential areas of concern regarding pollution inputs into the lake.

IMPLEMENTATION ACTIONS:

Stewardship:

- Implement measures such as vegetated buffer strips along streams, conservation tillage, and other practices that reduce nutrient and soil loss from farms, with assistance from local cost-share programs [Action A1 - page 54].
- Implement lot-level measures such as reducing fertilizer use, increasing infiltration, capturing stormwater runoff, and other practices that conserve water and reduce pollution in targeted urban areas and waterfront communities [Action A3 - page 56].
- Implement a septic inspection program to identify and repair, upgrade, or replace faulty septic systems in heavily developed shoreline areas [Action A7 - page 60].
- Implement programs to educate lake recreationalists about the need for preventative boat maintenance and proper disposal of grey water to reduce the risk of pollution [Action A8 - page 61].

Strategic Planning:

- Amend and strengthen the *City of Kawartha Lakes Official Plan* and Secondary Plan policy to require protection of the natural environment through specific measures, such as development setbacks within 30 metres of shorelines or streams [Action B1 - page 64].
- Implement the Trent Source Protection Plan to address threats to municipal drinking water systems [Action B2 - page 65].

Urban and Rural Infrastructure:

- Implement effective sediment and erosion control measures and other practices to prevent contaminants from reaching local watercourses during agricultural drain, road, and other construction projects. [Action C2 - page 71].
- Through stormwater management planning, improve the quality and control of stormwater in urban settlement areas of Bobcaygeon, Lindsay and Fenelon Falls. [Action C3 - page 72].
- Operate sewage treatment plants and landfills at maximum efficiency in terms of pollutant removal and capacity [Action C4 - page 73].

Research and Monitoring:

- Undertake pilot projects to test the effectiveness of various innovative approaches in identified priority areas that have nuisance aquatic plants and poor water quality [Action D4 - page 78].

2.3 Management Objective #2:

Enhance swimming opportunities at public beaches

BACKGROUND:

- There are five public beaches on Sturgeon Lake. Active beaches include: Beach Park (Bobcaygeon, south shore of Big Bob Channel), Riverview Beach (southeast arm of Little Bob Channel), Centennial Beach (County Rd. 24 at Emily Creek), Verulam Recreational Beach (Crane Bay Road), and Sturgeon Point Beach (Sturgeon Point). These beaches are relatively popular during the summer months, providing an opportunity for public enjoyment along the shoreline. There are three former (non-maintained) beaches: Ken Reid Conservation Area, Hickory Beach and Thurstonia.
- All public beaches are routinely tested to determine if safe for swimming. The local Health Unit tests beaches in June, July, and August to verify whether or not the beach is safe for swimming at that particular time. If the beach is found to contain high *E. coli* levels, it is considered potentially hazardous to human health and posted as "unsafe for swimming."

ISSUES:

- High *E. coli* at certain beaches, leading to beach postings. Within the last five years, three of the five beaches (Beach Park, Riverview and Centennial) have been posted as unsafe for swimming at least 20% of the time. Beach Park in Bobcaygeon is a priority concern, as it is highly used, in a most desirable location, and the most often posted among all beaches. High *E. coli* concentrations are likely the result of a combination of factors including: excessive feces from birds, particularly Canada Geese, combined with urban runoff and pet feces following storm events, and/or shallow, warm waters with limited water circulation.

IMPLEMENTATION ACTIONS:

Urban and Rural Infrastructure:

- Increase community opportunities for enjoyment of public beaches and waterfront spaces [Action C1 - page 70].
- Through stormwater management planning, improve the quality and control of stormwater in urban settlement areas of Bobcaygeon, Lindsay and Fenelon Falls. [Action C3 - page 72].

Research and Monitoring:

- Undertake pilot projects to test the effectiveness of various innovative approaches in identified priority areas that have nuisance aquatic plants and poor water quality [Action D4 - page 78].

2.4 Management Objective #3:

Maintain the biodiversity of the lake ecosystem

BACKGROUND:

- Biodiversity is what sustains healthy aquatic and terrestrial ecosystems. It includes all varieties of life and all habitats of the lake and its watershed. Biodiversity helps sustain the goods and services provided by the lake ecosystem, such as provisioning services (e.g., food, fuel and freshwater), regulating services (e.g., air quality regulation, erosion regulation and pollination), and cultural services (e.g., educational values, inspiration and sense of place). Native biodiversity, or life that is naturally occurring in an area, provides greater benefits to the lake ecosystem than non-native biodiversity.

ISSUES:

- Proliferation of exotic, invasive species. The Trent-Severn system, due to its interconnectedness and heavy human use, is particularly prone to the proliferation of non-native species. Sturgeon Lake has long been home to a variety of exotic species including common carp, zebra mussels, Eurasian water-milfoil, curly-leaved pondweed, purple loosestrife and more recently, yellow iris, rusty crayfish, phragmites, and spiny water-flea.
- Loss and fragmentation of natural habitats. Large expansive natural areas and natural linkage corridors between them are needed to sustain healthy landscape conditions. Natural cover loss is due to land clearing for agriculture and urban purposes. A total forest cover of 25% of the study area does not meet the benchmark guideline of 30% for maintaining healthy ecosystems. Similarly, existing vegetative cover along watercourses, at 64%, also does not meet the benchmark guideline of 75%.
- Wildlife at risk of disappearance. Within the planning area, there are 11 documented wildlife species that are at risk. The species that particularly rely on Sturgeon Lake for persistence include the black tern, least bittern, Blanding's turtle and eastern musk turtle. Loss of habitat, the draining of wetlands for agricultural purposes, and increased disturbance, such as roads and urban encroachment, are major threats to the above-mentioned species.

IMPLEMENTATION ACTIONS:

Stewardship:

- Develop a reforestation program to re-establish and manage natural cover on marginal rural lands, particularly in subwatersheds that do not meet our 30% forest cover target [Action A2 - page 55].
- Implement a natural landscaping approach along shoreline properties, with particular focus on decommissioning hardened shorelines and addressing severely eroded or ice-damaged sections [Action A5 - page 58].
- Implement measures such as boat and equipment sanitization to reduce the risk of transfer of invasive species between water bodies [Action A9 - page 62].

Strategic Planning:

- Amend and strengthen the *City of Kawartha Lakes Official Plan* and *Secondary Plan* policy to require protection of the natural environment through specific measures, such as development setbacks within 30 metres of shorelines or streams [Action B1 - page 64].
- Implement the *Kawarthas, Naturally Connected Natural Heritage Strategy* and the *City of Kawartha Lakes Integrated Community Sustainability Plan* [Action B2 - page 65].
- Develop a site plan control by-law that requires new development along shorelines to comply with measures, such as maintaining natural vegetation and building setbacks, to protect water quality and sensitive ecological areas [Action B4 - page 67].
- Develop a tree conservation by-law that requires the retention of existing forested areas, particularly on undeveloped areas along shorelines and streams [Action B5 - page 68].

2.5 Management Objective #4:

Maintain recreational access along populated waterfront areas

BACKGROUND:

- The shoreline is heavily developed with dense areas of waterfront properties. The majority of people living in the Sturgeon Lake planning area reside within the settlements of Lindsay, Fenelon Falls, and Bobcaygeon, which are in close proximity to the shoreline of the lake. As well, there are numerous small settlement areas directly along the shoreline. Maintaining access to the lake for boating, swimming or other activities from these shoreline properties is an important value to waterfront residents. There are at least seven man-made residential canals along the shoreline of Sturgeon Lake (Figure 2.1).

ISSUES:

- Proliferation of aquatic plants and algae in shallow bays and canals. Shallow areas of lakes, combined with low-energy waters (that is, sheltered from high winds, waves and currents) and soft substrates are particularly prone to aquatic plant growth. Sturgeon Lake is similar to all of the Kawartha Lakes as it is a relatively shallow lake with weedy areas along the shorelines. Aquatic plants are beneficial to the lake ecosystem as they provide cover and food for fishes and wildlife, stabilize sediments, uptake nutrients and provide other benefits. However, excessive aquatic plants can often interfere with boating access (particularly in shallow, nearshore bays where mooring facilities and dwellings are located) and swimming opportunities (see Figure 2.1).



Dense aquatic plants along the nearshore (Snug Harbour area, summer 2012)

There is general agreement among lake stakeholders that aquatic plants have increased in proliferation in recent years. This is likely due to a combination of factors including increases in water clarity (due to reductions in nutrient inputs and the filter-feeding habits of the exotic zebra mussels), the presence of aggressively growing plants such as native wild rice and exotic Eurasian water-milfoil, a reduction in winter ice cover, nutrient rich substrates, sediment loading, and increases in water temperatures (during the growing season) resulting from climate change. Canals and shallow bays in particular are prone to increased algae build-up, accelerated siltation and aquatic plant growth, due to the often limited water circulation and frequently stagnant waters. Often, routine dredging is conducted to maintain canal accessibility.

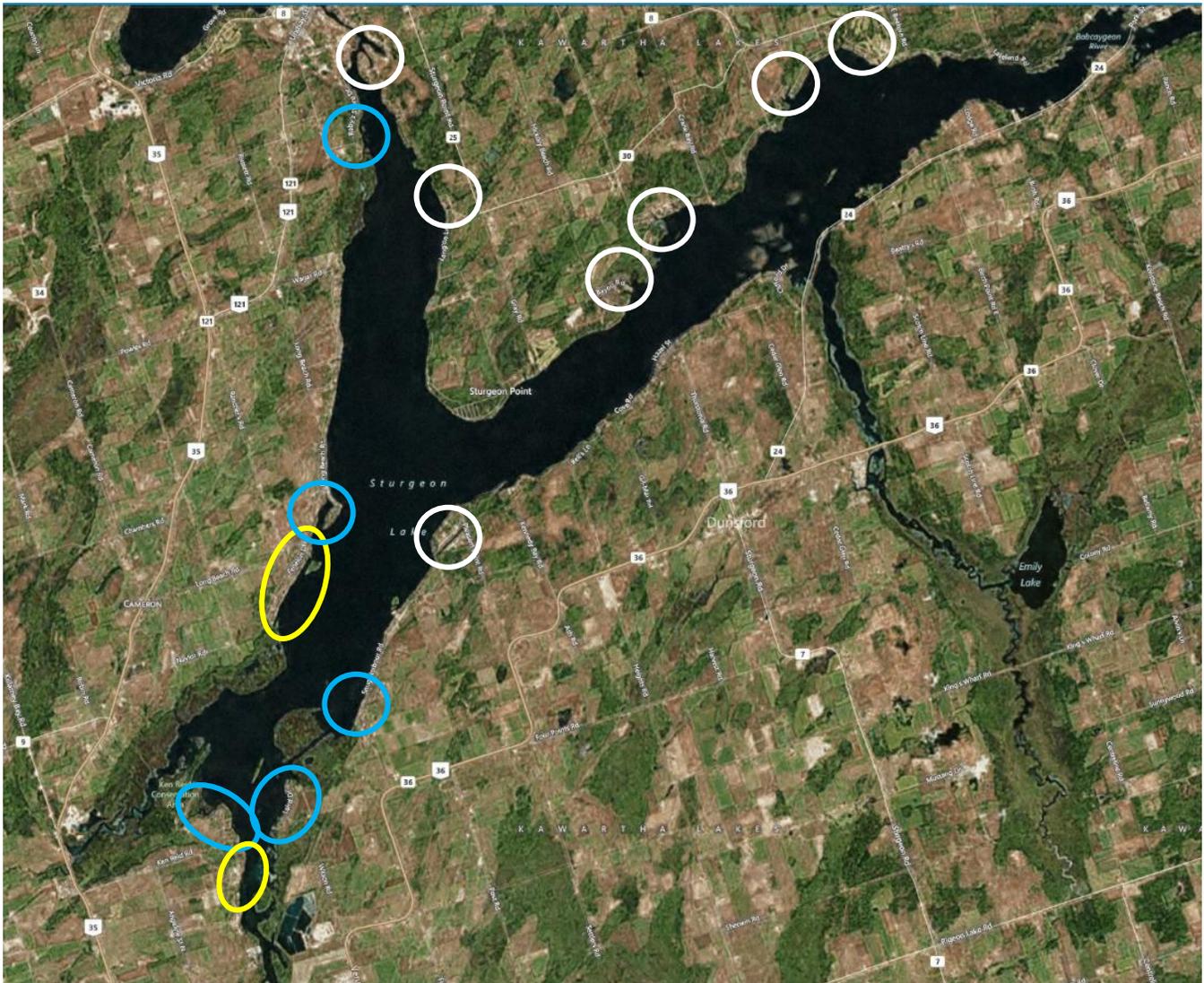


Figure 2.1: Map showing locations of priority areas with problems of excessive vegetation (blue), ice damage and shoreline erosion (yellow), and residential canals (white)

IMPLEMENTATION ACTIONS:

Stewardship:

- Undertake with local communities the control of nuisance aquatic plants using recognized and approved methods along problem nearshore areas identified within the plan [*Action A6 - page 59*].

Urban and Rural Infrastructure:

- Increase community opportunities for enjoyment of public beaches and waterfront spaces [*Action C1 - page 70*].

Research and Monitoring:

- Undertake pilot projects to test the effectiveness of various innovative approaches in identified priority areas that have nuisance aquatic plants and poor water quality [*Action D4 - page 78*].

2.6 Management Objective #5:

Enhance and maintain the natural integrity of the shoreline

BACKGROUND:

- The zone between land and water is often referred to as the Ribbon of Life. Shoreline areas are extremely rich in biodiversity and provide multiple benefits to the lake ecosystem including filtering contaminants, preventing erosion, and providing fish and wildlife habitat. The shoreline around Sturgeon Lake is over 100 km long.
- The lake shoreline is a dynamic system. Natural forces such as currents, wave action and ice movement can be a source of shoreline accumulation (that is, gaining land) or shoreline erosion (that is, losing land). A natural shoreline provides a stable waterfront in most instances, due to its ability to stabilize soil, absorb wave energy and slow lot-level surface water runoff. Shoreline degradation is accelerated by waterfront modifications such as removal of natural cover, hardening, infilling and dredging.

ISSUES:

- Dense urban development along the lake shoreline. The Sturgeon Lake shoreline is one of the most heavily developed of all the Kawartha Lakes. Artificial shorelines can cause reduced aquatic habitat potential, less water quality buffering capacity, greater wave action, land/water isolation and other negative implications for the lake.
- Loss of shoreline soil and property frontage. A particularly problematic shoreline section is the western shore of Sturgeon Lake, immediately south of the Long Beach area. This area of the lake is prone to waterfront damage due to dense urban development near the water's edge and movement of lake ice back and forth on the shoreline.

IMPLEMENTATION ACTIONS:

Stewardship:

- Implement a natural landscaping approach along shoreline properties, with particular focus on decommissioning hardened shorelines and addressing severely eroded or ice-damaged sections [Action A5 - page 58].

Strategic Planning:

- Amend and strengthen the *City of Kawartha Lakes Official Plan* and Secondary Plan policy to require protection of the natural environment through specific measures, such as development setbacks within 30 metres of shorelines or streams [Action B1 - page 64].
- Initiate a trial one-window permit application process for shoreline works between Parks Canada and Kawartha Conservation [Action B3 - page 66].
- Develop a site plan control by-law that requires new development along shorelines to comply with measures, such as maintaining natural vegetation and building setbacks, to protect water quality and sensitive ecological areas [Action B4 - page 67].
- Develop a tree conservation by-law that requires the retention of existing forested areas, particularly on undeveloped areas along shorelines and streams [Action B5 - page 68].

2.7 Management Objective #6:

Maintain healthy and productive sport fish populations

BACKGROUND:

- Recreational fishing is a big industry in the Kawartha Lakes. The Kawartha Lakes, including the Trent River system, is one of the top fishing destinations in Ontario in terms of angler fishing hours. Fishing for warmwater species on these lakes has traditionally been excellent due to the high productivity of the lake waters. Sturgeon Lake is a competitively fished lake, with multiple tournaments per year. The season for Yellow Perch, Black Crappie and Sunfish became open all year in Sturgeon Lake in 2010, which expanded angling opportunities.
- In Sturgeon Lake, the most sought-after fish species have traditionally been walleye (also known as pickerel), muskellunge and yellow perch. To a lesser degree, largemouth bass, smallmouth bass, and more recently black crappie, are targeted by anglers as well. Shallow areas along the shoreline are particularly important habitats for these fishes, as they use them for spawning and nursery areas. Many of the areas immediately below dams are known to be important areas for fish spawning, particularly for walleye.

ISSUES:

- Decline in walleye populations. Overall, measures of walleye populations reveal a decline since 1998, however recent monitoring indicates a potential variation in the recruitment trend relative to previous years. Physical changes to Sturgeon Lake have made aquatic habitat less suitable for walleye and more suitable for other fish species. This is in large part due to increased water clarity from a gradual reduction in nutrient loadings into the lake and the "water-clearing" feeding habits of zebra mussels. Below dams, increased velocity during periods of high water discharge may pose a risk to walleye spawning due to disruption of physical spawning, scouring of eggs or damage to emerging young.
- Potential future decline in muskellunge due to northern pike range expansion. Northern pike have been recently confirmed in Balsam and Cameron Lakes. This fish is not naturally occurring in the Kawartha Lakes; due to its aggressive growth and preference for similar habitats, it can cause population declines in the native muskellunge.
- Contamination advisories for consumption of certain sport fishes caught in Goose Bay. Contamination in Scugog River outlet sediments – from historical Polychlorinated biphenyls (PCBs), Polycyclic aromatic hydrocarbons (PAHs) and heavy metals – has likely impacted top predator sport fish. Compared to sport fishes in the rest of Sturgeon Lake, eating high numbers of certain fishes (e.g., smallmouth bass and common carp) in Goose Bay is considered more hazardous to human health, particularly to those considered sensitive such as children and pregnant women.

IMPLEMENTATION ACTIONS:

Stewardship:

- Implement a natural landscaping approach along shoreline properties, with particular focus on decommissioning hardened shorelines and addressing severely eroded or ice-damaged sections [Action A5 - page 58].
- Implement measures such as boat and equipment sanitization to reduce the risk of transferring invasive species between water bodies [Action A9 - page 62].

Strategic Planning:

- Amend and strengthen the *City of Kawartha Lakes Official Plan* and Secondary Plan policy to require protection of the natural environment through specific measures, such as development setbacks within 30 metres of shorelines or streams [Action B1 - page 64].
- Implement the *Fisheries Plan for Zone 17* [Action B2 - page 65].
- Develop a site plan control by-law that requires new development along shorelines to comply with measures, such as maintaining natural vegetation and building setbacks, to protect water quality and sensitive ecological areas [Action B4 - page 67].
- Develop a tree conservation by-law that requires the retention of existing forested areas, particularly on undeveloped areas along shorelines and streams [Action B5 - page 68].

Urban and Rural Infrastructure:

- Implement effective sediment and erosion control measures and other practices to prevent contaminants from reaching local watercourses during agricultural drain, road, and other construction projects. [Action C2 - page 71].

2.8 Management Objective #7:

Ensure permit application process for works projects is transparent and efficient

BACKGROUND:

- Work projects in Sturgeon Lake or along the shoreline typically need approvals from local planning authorities. Examples of works include shoreline grading, aquatic plant removal, boathouse construction, retaining wall creation and other projects that occur close to the water's edge. Permits are required from Parks Canada, Kawartha Conservation, and/or the City of Kawartha Lakes. As a general rule, works occurring above the high water mark require approval from the conservation authority; works below high water mark require approval from Parks Canada, and works that occur in both areas require approval from both organizations. Building permits for shoreline structures are typically required from the City of Kawartha Lakes. Approvals are required to ensure human safety and maintain the integrity of the lake environment.

ISSUES:

- Confusion and frustration from shoreline owners and contractors. Due to the multi-jurisdictional nature of the lake and shoreline, there is often confusion as to what types of projects require approvals, who to send information for approval, and how long the wait times are for approvals.

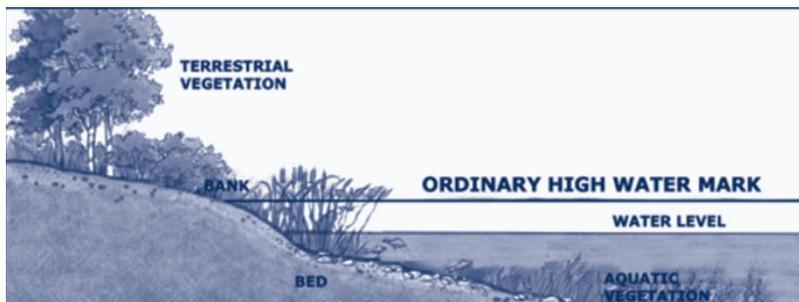


Diagram showing approximate location of ordinary high water mark in relation to water levels in lakes. In Sturgeon Lake, through water-level regulation, these levels are equal during summer operating water levels.

IMPLEMENTATION ACTIONS:

Strategic Planning:

- Initiate a trial one-window permit application process for shoreline works between Parks Canada and Kawartha Conservation [Action B3 - page 66].

2.9 Management Objective #8:

Improve our understanding of how the lake will respond to emerging pressures

BACKGROUND:

- Solid scientific understanding of lake-based pressures and how the lake ecosystem will respond to them are key elements in directing management decisions. Some of the important emerging pressures include:
 - Climate change. It is generally agreed that climate change is predicted to increase water temperatures and alter natural hydrological processes (e.g., more extreme weather events and changes to rainfall patterns). This will likely have impacts on multiple facets of the lake ecosystem, including water quality, aquatic ecosystems, and water levels and flows.
 - Cumulative development. It is unknown at what point development in the watershed/shoreline can cause serious negative implications for the lake aquatic ecosystem. Shoreline areas, in particular, are at risk of increasing development and urbanization. Cumulative draining of farmlands (e.g., through tile systems) also may warrant further investigation. There is a need to improve scientific understanding about the interactions of these stressors with the lake in order to better manage the resource.
 - Non-point sources of pollution. These are diffuse sources of pollution that are not easily measured because there is no single "outlet." A particular area of focus should be quantifying nutrient inputs into the nearshore areas of the lake (e.g., from septic systems), because values are not well understood at this time.
 - Invasive species. Species introductions into areas outside their naturally occurring range can have profound impacts on lake dynamics. Zebra mussel proliferation in the Kawartha Lakes, resulting in increasing water clarity and leading to the proliferation of aquatic plants, is an example of the ecosystem-level impact of invasive species.
 - Emerging contaminants. There is a need to know the potential environmental impact of introducing non-traditional chemical compounds into the lake environment, such as nano-silvers, pharmaceuticals, hormones, antibiotics and pesticides.

ISSUES:

- Lack of coordination of research and monitoring initiatives, and information management. Many different organizations and agencies are actively collecting data on various aspects of the lake ecosystem (e.g., Kawartha Lake Stewards, Trent University, City of Kawartha Lakes, Kawartha Conservation, Ontario Ministry of Natural Resources, etc.). At this time, there is no coordinated approach to these efforts, and there is no collective information management system in place.

IMPLEMENTATION ACTIONS:

Research and Monitoring:

- Implement a coordinated lake monitoring program that regularly tracks key indicators of lake watershed health, including nutrients, forest cover, fish communities and oxygen levels [Action D1 - page 75].
- Conduct research to more accurately identify shoreline sources of nutrients (such as septic systems) and potential impacts to nearshore areas of the lake [Action D2 - page 76].
- Conduct research to identify how the lake ecosystem responds to emerging pressures such as cumulative development, climate change and invasive species [Action D3 - page 77].

3.0 Implementation Strategies



Launch of Blue Canoe stewardship program in Sturgeon Lake
(Ken Reid Conservation Area, Spring 2012)

3.1 Introduction

The following Implementation Strategies provide a framework for a coordinated approach to maintaining a healthy Sturgeon Lake. Integrated efforts are fundamental to improving the environment in and around the lake. Everyone in the watershed shares a responsibility for the current state of the lake, so everyone is needed to participate in management efforts. A broad spectrum of partners, businesses and residents is required in the implementation process in the watershed. Working simultaneously, they can accomplish tasks in different areas. The more actions and strategies accomplished, the more likely that objectives for a healthy lake environment will be met.

Implementation Strategies provide a suite of actions to help achieve the management objectives outlined in Chapter 2. For greater on-the-ground applicability, actions are presented under the following strategies:

- Stewardship Strategy
- Strategic Planning Strategy
- Urban and Rural Infrastructure Strategy
- Research and Monitoring Strategy
- Communications and Outreach Strategy

Within each strategy, an introductory context is provided for approaches to implementation along with detailed actions. The format for each management action is as follows:

Action: A brief description of the management approach.

Urgency: The level of urgency for undertaking the particular action. Urgency is based on three primary criteria: level of necessity, level of impact, and practicality of action.

Rationale: A description of why the action is important and how it supports the level of urgency.

Priority Areas: A description of where the action is needed the most. It is most often geography based (e.g., specific subwatersheds or areas of development), but it also is based on other contexts (e.g., specific industry or threats). Some priorities are to-be-determined at a later stage.

Lead and (Partner) Implementers: Organizations, groups or individuals who are either leading or partnering in the implementation of actions. Partners are in brackets.

Deliverables: A description of specific details and/or project measurables leading to successful implementation of an action. In some cases, a specific numeric target is identified.

3.2 Stewardship Strategy

We must all understand our collective impact on the lakes and be informed as to *what we can do* to help sustain a healthy lake and its watershed. This strategy is comprised of core actions focused on farms and rural lands, towns and urban lands, shoreline areas, and lake users. The primary focus of this strategy is to develop an understanding of individual responsibility for effective land and soil stewardship practices at the property level. A second major focus of this strategy is to provide technical assistance and/or resources that result in positive stewardship actions.

Where necessary, financial incentives should be considered for projects with extraordinary cost or complexity (e.g., a large erosion remediation project across several properties). The Scugog WATER Fund, a successful incentive program currently offered to help protect Lake Scugog in the Durham Region, could be a model for this initiative. The stewardship strategy works in conjunction with the Communications and Outreach Strategy and incorporates other program areas, such as the Environmental Farm Plan.



A plume of silt entering the Scugog River from a roadside ditch, during a rain event.

Action A1: Nutrient and soil loss from farms

Implement measures such as vegetated buffer strips along streams, conservation tillage, and other practices that reduce nutrient and soil loss from farms, with assistance from local cost-share programs.

Urgency:

- High

Rationale:

- At 51% of the total land use, the majority of the landscape draining into Sturgeon Lake is agriculture-based. The proper management of farmlands is essential in maintaining the environmental health of the watershed and in decreasing phosphorus and nitrogen loads, and sediment loss into the lake via drainage ditches and other small tributaries. Over the past 20 years, farmers have made significant gains in applying enhanced water quality protection measures through the Environmental Farm Plan. In terms of phosphorus loadings, it is estimated that local rural areas contribute approximately 12% from all sources, or 3,821 kilograms per year. A 35% reduction in agricultural phosphorus loading is needed to achieve the water quality benchmark. A key element of this action is not to impede the application of nutrients required for crop production, but rather to encourage the management practices that retain nutrients (and soils) onsite for crop utilization.

Priority areas:

- Subwatersheds of McLarens Creek, Jennings Creek, and East Cross Creek; other localized high risk sites.

Lead and (partner) implementers:

- Ontario Soil and Crop Improvement Association: delivery agent for the Environmental Farm Plan; (Ontario Ministry of Agriculture and Food; Ontario Ministry of Rural Affairs; Kawartha Conservation; City of Kawartha Lakes; agri-businesses)

Deliverables:

- Develop a local program to provide additional financial and project management incentives to landowners in the Sturgeon Lake planning area to *top up* Environmental Farm Plan incentives, focusing on surface water and soil management improvements in high priority areas.
 - Establish a Review Committee comprised of municipal, provincial and conservation authority staff, and agricultural representatives. It will provide program direction, collaborate on applications for external funding, and review project applications on a confidential basis.
 - Every year, conduct 10-20 agricultural improvement projects in priority subwatersheds such as:
 - Grassy waterways on erodible crop land sites.
 - Vegetated buffer strips adjacent to watercourses.
 - Grazing land management: fencing, crossings, alternative watering systems.
 - Improved manure storage.
 - Livestock yards/feedlot operation runoff management; diversion of upslope water.
 - Conservation tillage; cover crops that stabilize soils and reduce erosion.
 - Nutrient management planning: modern technologies such as GPS units and improved application techniques for more accurate application of nutrients.
 - Wetland restoration and protection.
- Over the long term, achieve a 35% reduction in existing phosphorus loading from local agricultural sources to achieve a loading target of approximately 2,000 kg per year.

Action A2: Reforestation program

Develop a reforestation program to re-establish and manage natural cover on marginal rural lands, particularly in subwatersheds that do not meet the 30% forest cover benchmark.

Urgency:

- Medium

Rationale:

- The total forest cover in the Sturgeon Lake planning area is 232.9 km², representing 23.7% of the total land area. This is below the 30% benchmark that is widely applied to planning areas in southern Ontario, and it indicates a landscape deficit for the Sturgeon Lake core management area of 6.3% (61.5 km² or 15,197 acres). It is not feasible to fully address the above deficit. The reforestation program should emphasize strategic tree planting of highest priority sites, with natural succession attending to the reforestation and natural cover establishment of other areas.

Priority areas:

- Subwatersheds of Emily Creek, McLarens Creek, Jennings Creek, Stoney Creek, unnamed Sturgeon Lake Tributaries, Scugog River, Janetville Creek, Mariposa Brook; other areas identified in the Natural Heritage Strategy.
- Lands with marginal agricultural values.
- Streamsides.
- Areas that can be effectively reforested through natural regeneration at no cost or by small-scale, strategic tree planting at lower densities.

Lead and (partner) implementers:

- Trees Ontario; Kawartha Conservation; Cottager's Associations; (Kawartha Chapter of the Ontario Woodlot Association; private landowners)

Deliverables:

- Finalize the Kawarthas, Naturally Connected Natural Heritage Strategy within the Sturgeon Lake basin.
 - Utilize this strategy to identify priority sites that will be effectively reforested through natural regeneration at no cost; field or open area sites for large-scale tree planting or small-scale, strategic tree planting at lower densities.
- Develop a reforestation program to undertake large-scale reforestation projects, focusing on the priority areas in the above watersheds. The program would provide assistance to participants in developing property-specific planting plans, obtaining trees at competitive prices and planting trees, among other resources.
 - Expand the existing bulk sales program for private landowners who pick up their own trees and do the planting on their own properties.
 - Engage youth by organizing tree planting opportunities for Scouts and other youth groups.
 - Within a 5-year period, achieve a target of increasing forest cover in the core Sturgeon Lake planning area by 1% (150 acres) of the current deficit per year by planting (50%) and natural regeneration (50%). This equates to planting approximately 45,000-50,000 trees and shrubs annually.
 - Within a 5-year period, achieve a target of increasing streamside vegetation in the core Sturgeon Lake planning area by 1% (21 acres) of the current deficit per year by planting (50%) and natural regeneration (50%). This equates to planting approximately 5,000-10,000 trees and shrubs annually along stream corridors.
- Develop an effective partnership with Trees Ontario to fully utilize provincial funding in support of the Fifty Million Tree program.

Action A3: Urban and waterfront lot-level measures

Implement lot-level measures such as reducing fertilizer use, increasing infiltration, capturing stormwater runoff, and other practices that conserve water and reduce pollution in targeted urban areas and waterfront communities.

Urgency:

- High

Rationale:

- Urban areas account for approximately 8% of the Sturgeon Lake planning area, yet contribute disproportionately high amounts of sediments, nutrients and other contaminants typically through increased surface water runoff over fertilized lawns, parks and hardened surfaces running into the lake. In phosphorus loadings, it is estimated that local urban areas contribute 8% from all sources or 2,229 kg per year. A 56% reduction in urban phosphorus loading is needed to achieve the water quality benchmark.

Priority areas:

- Town of Lindsay, Fenelon Falls, Bobcaygeon, small communities (e.g., Thurstonia, Sturgeon Point).

Lead and (partner) implementers:

- Urban residents; businesses; property managers; (City of Kawartha Lakes Public Works; City of Kawartha Lakes Environmental Advisory Committee; Kawartha Conservation)

Deliverables:

- Develop a program that provides educational and project management assistance, and financial assistance where possible, to urban residents to support the uptake of property-level measures for water stewardship action.
 - Within a 5-year period, achieve a target of 50% of urban residential, commercial, and public properties, implementing lot-level measures such as:
 - Maintain a buffer strip of natural vegetation along urban waterfronts and stream banks to filter runoff, prevent erosion and provide wildlife habitat.
 - Capture and store storm runoff via rain barrels, grassed swales, vegetated depressions, rain gardens, splash pads or “roll up” attachments to down spouts, and private stormwater management ponds as applicable.
 - Maintain trees and other landscape plants that help slow surface water runoff and reduce soil erosion; replace at risk, dying or storm-damaged trees with trees and shrubs of appropriate species.
 - Mow lawns to no less than three inches in height to encourage healthier root development to help absorb more moisture.
 - Work toward a low or no phosphorus fertilizer and gradual reduction, then eliminate chemical fertilizer use on lawns; leave mulched clippings to decompose and use yard compost for soil amendments.
 - Conduct soil testing to determine actual nutrient deficiencies.
 - Maintain permeable surfaces, such as porous asphalt or vegetated swales, as alternatives to hardened driveways, walkways and parking lots.
 - Maintain septic systems with regular pump-outs.
 - Take advantage of hazardous waste and recycling programs.
 - Dispose of pet wastes in the garbage and discourage feeding of waterfowl.
- Over the long term, achieve a 56% reduction in existing phosphorus loading from local urban sources to achieve a loading target of approximately 1,000 kg per year.

Action A4: Youth

Engage school youth in environmental programming and volunteer opportunities.

Urgency:

- Medium

Rationale:

- Youth will play a significant role in managing our water resources in the coming years. Early engagement is needed to help prepare youth for the management challenges ahead, especially regarding the sustainability of local waters and solutions needed. Recent research suggests that *nature deficit disorder* is a wide-spread occurrence among urban youth, therefore more regular opportunities for appreciating the outdoors are needed. By taking advantage of internship and volunteer positions, youth will gain practical experience in the field of resource management while fulfilling required community-based volunteer hours.

Priority areas:

- Primary and secondary schools.

Lead and (partner) implementers:

- Trillium Lakelands District School Board; Kawartha Conservation; (Kawartha Field Naturalists; Boys and Girls Club of Kawartha Lakes)

Deliverables:

- Develop formalized educational programs that integrate lake-based, environmental communications, stewardship and research into 10-15 Ontario primary and secondary schools, through curriculum-based lessons, activities and teaching tools.
- Make available youth internship, co-op, and/or volunteer opportunities at local businesses, organizations and clubs involved in water resource management.
- Promote greater youth involvement in lake-stewardship volunteer opportunities including:
 - Shoreline and public park restoration projects, such as tree and garden plantings.
 - Urban projects, such as implementation of *Yellow Fish Road* program to draw attention to storm sewers draining directly into the lake.

Action A5: Natural landscaping along shorelines

Implement a natural landscaping approach along shoreline properties, with particular focus on decommissioning hardened shorelines and addressing severely eroded/ice-damaged sections.

Urgency:

- High

Rationale:

- Shoreline areas are often referred to as the Ribbon of Life around our lakes and are particularly sensitive to development. The Sturgeon Lake shoreline is one of the most heavily developed of the Kawartha Lakes; over 50% of the shoreline (within 30 metres of the lake) is in a developed state. In addition, much of the shore-water interface has been altered (approximately 25%), which reduces the vegetative buffering benefits provided by natural shorelines. Pressures along the shoreline are expected to grow, as waterfront lots are popular retirement destinations for an aging population and as lake water quality continues to improve.

Priority areas:

- Densely populated waterfront communities, back lot developments adjacent to waterfronts.

Lead and (partner) implementers:

- Kawartha Conservation; Parks Canada: Trent-Severn Waterway; shoreline property owners and managers; (Federation of Ontario Cottagers' Associations; local shoreline associations; City of Kawartha Lakes; local volunteer lake stewards; local nurseries)

Deliverables:

- Develop a program to engage residents, providing technical assistance and know-how, supporting community volunteers, and encouraging business and industry to implement practices that protect the integrity of the shoreline.
 - Within a 5-year period, achieve a target of 50% of residences with greater than 25% of their shoreline naturalized to a minimum of 3 metres (10 feet) from the water's edge.
 - Within a 5-year period, achieve a target of 50% of shoreline properties practising lot-level measures such as:
 - Maintain a buffer strip of natural vegetation along the shoreline, the wider the better; establish a "no-mow" zone along the shoreline.
 - Minimize waterfront development of structures (excluding erosion protection) to 25% or less of total frontage.
 - Select dock or boathouse sites where little or no vegetation currently exists.
 - Re-vegetate disturbed soil areas as soon as possible to stabilize loose soils.
 - Retain fallen trees and large rocks in the nearshore zone, unless they are a hazard to boats or swimmers.
- Develop a shoreline-focused incentive program that provides financial and/or project management assistance to encourage property owners with extraordinary issues to decommission hardened shorelines (e.g., vertical retaining walls, etc.) or repair severely eroded/ice or wave-damaged sections and replace with natural materials.
 - Establish a Review Committee comprised of municipal staff, conservation authority staff and cottager's association representatives to provide program direction and review project applications on a confidential basis.
 - Every year, decommission vertical retaining walls or repair severely ice-damaged shorelines on three to five properties.

Action A6: Control of aquatic plants

Undertake with local communities the control of nuisance aquatic plants, using recognized and approved methods, along problem nearshore areas identified in the plan.

Urgency:

- High

Rationale:

- Certain locations on Sturgeon Lake (shallow bays, residential canals) now have significant problems with boating access to open water resulting from excessive aquatic vegetation, build-up of bottom sediments or loss of shoreline area. Other areas are prone to ice damage and resulting shoreline loss. These issues affect the enjoyment of a property as well as long term property values.

Priority areas:

- Problem areas identified in Figure 2.1; other areas as reported and/or anticipated.

Lead and (partner) implementers:

- Local shoreline community leads; (Parks Canada – Trent-Severn Waterway; Kawartha Conservation)

Deliverables:

- Develop and distribute communication materials that clarify appropriate aquatic plant control methods, within regulatory and practical standards.
- Organize community-specific aquatic plant control plans that address problem areas and allow greater access to waterfront mooring areas.
- Identify priority lake sites with the greatest potential, over the next decade, to be restricted in waterfront access due to aquatic plants.

Action A7: Septic inspection program

Implement a septic inspection program to identify and repair, upgrade or replace faulty septic systems in heavily developed shoreline areas.

Urgency:

- High

Rationale:

- Septic systems at shoreline residences and community properties on the strip of land around the lake are estimated to contribute almost 4% (1,080 kg per year) of the total phosphorus load to the lake. A 13% reduction in septic system loading is needed to achieve the water quality benchmark. Ongoing studies may yet illustrate that this source of phosphorus has a potentially significant influence on nearshore algae blooms, because it is readily available for uptake (orthophosphate). In addition, bacteria from sewage is often ineffectively treated or contained by faulty septic systems. Human health should be a major consideration when faulty systems are in the vicinity of residential wells and beaches. Individual and communal waterfront septic systems must be properly installed and maintained.

Priority areas:

- Densely populated shoreline areas; older septic systems.

Lead and (partner) implementers:

- City of Kawartha Lakes; Haliburton, Kawartha, Pine Ridge District Health Unit; Kawartha Conservation; (septic system businesses)

Deliverables:

- Over the long term, achieve a 13% reduction in existing phosphorus loading from shoreline septic systems, to achieve a loading target of approximately 940 kg per year.
 - Implement the recently approved City of Kawartha Lakes "loan-incentive" septic system initiative. This allows owners to enter into a longer-term payback agreement to access funds for improving their system.
 - Develop regulatory means for legislating the upgrade of outdated or faulty septic systems (e.g., a municipal by-law requiring a certificate of approval prior to a property sale).
 - Conduct periodic "dock talk" extension services and local workshops with a focus on helping homeowners understand, inspect and manage septic systems.
 - Create a comprehensive municipal or regional inventory of all septic systems in the Sturgeon Lake watershed, detailing type, location and year of construction.
 - Continue investigating official complaints of malfunctioning systems to address potential health hazards and determine corrective actions as required.

Action A8: Boat management programs

Implement programs to educate lake users about preventative boat maintenance and proper disposal of grey water to reduce the risk of pollution.

Urgency:

- Medium

Rationale:

- Sturgeon Lake is a heavily used lake for recreational purposes, particularly for pleasure craft. Due to the potential for lake contamination by chemicals (e.g., gas, oil, etc.) and grey water (e.g., holding tanks) on board most of these vessels, there may be a need to educate people about properly maintaining equipment and disposing of wastes.

Priority areas:

- Older boats, large boats (e.g., yachts and houseboats).

Lead and (partner) implementers:

- Kawartha Protect Our Water; (Kawartha Lake Stewards Association; recreational lake users; associated industry)

Deliverables:

- Communicate a proactive approach to reducing risk of water contamination such as:
 - Practise preventative maintenance, including regular engine and equipment inspection and servicing.
 - Keep oil absorbent pads and containment pans or trays under the engine when not in water.
 - Know fuel capacity prior to filling tanks; when possible, fill away from water over a spill containment system.
 - Store petroleum products to reduce risk of spillage.
 - Minimize the use of harsh cleaners by rinsing boats regularly, or if needing to clean boat beyond soft cleaning, first remove boat from the water.
 - Dispose of grey water wastes on land in appropriate facilities.
 - Use low-impact recreational practices (e.g., canoeing, kayaking, sailing, etc.) and technologies (e.g., 4-stroke motors).
- Minimize disturbance to sensitive ecological features with measures such as:
 - Reduce your wake and ensure the boat is an appropriate distance from shore; this minimizes the turbidity (soil and sediment disturbance) and damage to nearshore areas.
 - Adhere to recreational fishing regulations for Zone 17.
 - Avoid disturbing lake-bottom sediments in areas that are known to contain PCBs and other heavy metals, such as in nearshore areas at the outlet of Scugog River.

Action A9: Reduce Invasive Species

Implement measures such as boat and equipment sanitization to reduce the risk of transfer of invasive species between water bodies.

Urgency:

- High

Rationale:

- The spread of exotic and invasive species, throughout the aquatic and terrestrial environment, is generating profound implications for ecosystem health throughout North America. Invasive species have significantly altered the Sturgeon Lake ecosystem already, usually to the detriment of biodiversity and lake-based values. With its connection to the other Kawartha Lakes, the spread of exotic species is most easily facilitated by travel and recreational boating and fishing.

Priority areas:

- Vessels and equipment that travel back and forth between lakes.
- Construction sites, and recreation corridors.

Lead and (partner) implementers:

- Invading Species Awareness Program - Ontario Ministry of Natural Resources and Ontario Federation of Anglers and Hunters; recreational boaters and fishermen; (Ontario Invasive Plant Council; Kawartha Conservation; Kawartha Lake Stewards Association; construction industry)

Deliverables:

- Reduce the risk of transferring and spreading invasive species:
 - Inspect boats, trailers, boating equipment, fishing tackle and nets, and remove any visible plants or animals before leaving any water body.
 - Drain water from motor, live well, bilge and transom wells while on land before leaving the water body.
 - Empty bait buckets on land before leaving the water body. Never release live bait into a water body, or move them from one water body into another.
 - Wash and dry fishing tackle, nets, boat and equipment to kill harmful species that may not be visible to the eye.
 - Install, and utilize wash stations adjacent to public boat launch facilities.
- Report invasive species sightings through the Invading Species Hotline: 1-800-563-7711.
- Facilitate public education, for example:
 - Learn how to prevent the spread of invasive species.
 - Learn how to identify invasive species, that is, existing invasive species and potential species that could threaten lake health.
 - Access information of organizations such as the Invading Species Awareness Program and the Invasive Plant Council, to gain access and disseminate information to lake stakeholders.
 - Use best-bet control and management approaches.

3.3 Strategic Planning Strategy

The primary focus of this strategy is to integrate proactive approaches for lake health and environmental protection measures into operational planning policies within a framework of existing planning tools and legislation. One area of focus is reviewing and strengthening the water protection and natural heritage policies in the *City of Kawartha Lakes Official Plan*. Any remedial implementation plans and actions must be supported by the official policies, plans and relevant legislation. If necessary, these should be updated or newly developed.

It is important to enhance collaboration among municipal planning staff, federal and provincial regulating authorities, and Kawartha Conservation staff related to shoreline regulations and permitting procedures. This will streamline processes and improve transparency for the general public.

The implementation of the *Sturgeon Lake Management Plan* will be linked with existing strategic planning initiatives that further leverage efforts to improve the health of the lake and watershed.



Entrance to Pleasant Point canal.

Action B1: Official Plan

Amend and strengthen the *City of Kawartha Lakes Official Plan* and Secondary Plan policy to require protection of the natural environment through specific measures, such as development setbacks within 30 metres of shorelines or streams.

Urgency:

- High

Rationale:

- Municipal Official Plans and Secondary Plans provide the structure for planning and development in the core Sturgeon Lake planning area. The current *City of Kawartha Lakes Official Plan* requires stronger wording and specific policy to protect the lake environment. Important natural areas (e.g., wetlands, woodlands, fish spawning areas, etc.) must be identified on maps and have appropriate policy to preserve and protect them.

Priority areas:

- Areas to be determined, as defined by a natural heritage strategy (e.g., Kawarthas, Naturally Connected Natural Heritage Strategy)

Lead and (partner) implementers:

- City of Kawartha Lakes; (Kawartha Conservation; Ontario Ministry of Natural Resources; consultants)

Deliverables:

- Amend *City of Kawartha Lakes Official Plan* and proposed Secondary Plans to include strong natural heritage policy (and corresponding maps) to protect the ecological function of important natural areas and improve water quality in the lake.
 - Strengthen shoreline protection provisions to ensure that the natural features and functions associated with shorelines and nearshore areas are maintained.
 - Review and integrate where applicable the shoreline-based policy recommendations in the document *Shoreline Environmental Studies in Support of Official Plan Policies for the City of Kawartha Lakes* (Gartner Lee and French Planning, 2002).
 - Consider requiring new multi-lot residential, commercial and/or industrial developments to achieve a "no-net-increase" in phosphorus inputs entering the lake from pre-development compared to post-development footprint.
 - Consider requiring natural treatments (e.g., native plantings, natural rock, etc.) to be integrated wherever feasible for shoreline alteration works.
 - Work with partners to identify natural heritage areas to be protected and ensure corresponding policy is in effect.
 - Strengthen wording (e.g., "shall" instead of "should," and "require" instead of "encourage") for policies that apply to water quality and natural heritage protection measures.
 - Apply enhanced lake protection provisions used in the Lake Simcoe watershed (as per the *Lake Simcoe Protection Plan*) to the Sturgeon Lake planning area.
 - Integrate goals and objectives developed in the Integrated Community Sustainability Plan Initiative into the Official Plan strategic directions.
 - Provide for greater water quality protection measures for developments in back-lots.
 - Enable Site Plan Control (see Action B4) and Tree Conservation By-laws (see Action B5) to be adopted.
- Conduct effective enforcement of policies.

Action B2: Implement plans

Implement the following plans: Trent Source Protection Plan, *Fisheries Plan for Zone 17*, Kawarthas Naturally Connected Natural Heritage Strategy, and City of Kawartha Lakes Integrated Community Sustainability Plan.

Urgency:

- High

Rationale:

- Various resource planning initiatives (government, community or industry-led plans) directly or indirectly support the enhancement of the lake environment. In most instances, successful implementation of these initiatives will assist in the long-term sustainability of Sturgeon Lake.

Priority areas:

- Protect fish and fish habitat
- Reduce drinking water threats to the municipal water systems of Lindsay, Bobcaygeon and Southview Estates

Lead and (partner) implementers:

- As per lead and partners identified in respective plans.

Deliverables:

- Finalize and implement the Kawarthas, Naturally Connected Natural Heritage Strategy.
 - Focus on identification of priority areas in core *Sturgeon Lake Management Plan* area for reforestation or areas of critical ecological significance that must be protected from incompatible development.
- Implement the Trent Source Protection Plan.
 - Focus on addressing drinking water threats to the municipal intake systems of Lindsay, Bobcaygeon and Southview Estates.
- Implement the City of Kawartha Lakes Integrated Community Sustainability Plan.
 - Focus on integrating water-based objectives and targets into municipal planning and policy.
- Implement the *Fisheries Management Plan for Zone 17*.
 - Focus on implementing actions identified in the Walleye Management Strategy, Muskellunge and Northern Pike Strategy, and Invasive Species Strategy.

Action B3: Shoreline works

Initiate a trial one-window permit application process for shoreline works between Parks Canada and Kawartha Conservation.

Urgency:

- Medium

Rationale:

- The purpose of the coordinated approach is to arrange for implementing and evaluating a shoreline Permit Protocol for Sturgeon Lake for permits issued by Parks Canada and Kawartha Conservation. This coordinated shoreline permitting and approval project builds on the recommendations in the 2008 report of the Panel on the Future of the Trent-Severn Waterway. It will greatly simplify the shoreline permitting process and support the restoration of the shoreline. Also, the pilot project takes advantage of the newly updated Kawartha Conservation policies concerning shoreline development activities.

Priority areas:

- Shoreline areas

Lead and (partner) implementers:

- Kawartha Conservation, when the majority of works is along shoreline; Parks Canada, when the majority of works is in-water

Deliverables:

- Implement the pilot project on Sturgeon Lake for development activities originating on properties between the dams (Little Bob and Big Bob, Fenelon Falls, Lindsay) at each end of Sturgeon Lake.
 - Implement for a period of one year from the date the Partnership Agreement comes into effect.
 - Make the approval process simpler, faster and less confusing for the public:
 - Support a more consistent application of shoreline policies.
 - Clarify jurisdictional scope of permitting activities.
 - Improve public awareness about the use of the permitting processes.
- Conduct an evaluation of the pilot project following one year of implementation.

Action B4: Site plan control for shorelines

Develop a site plan control by-law for shoreline areas to protect natural vegetation and significant habitat, establish buffer zones, and improve water quality.

Urgency:

- High

Rationale:

- Site plan control is a very useful planning tool to enhance shoreline protection measures. Implementation of this by-law would require applications to include plans of the existing development and site alteration proposal. As a condition of granting approval, the municipality would require measures that enhance lake health, such as preservation of mature vegetation, natural shoreline landscaping, and appropriate treatment of driveways (e.g., requiring gravel or a porous material). This control would apply to development activities (e.g., building construction, site grading, etc.). The authority to use this tool must first be set out in the municipal Official Plan.

Priority areas:

- To-be-determined based on consultations; consider application to shorelines and areas of back-lot development adjacent to shorelines

Lead and (partner) implementers:

- City of Kawartha Lakes

Deliverables:

- Amend *City of Kawartha Lakes Official Plan* and Secondary Plans to enable site plan control by-law.
- Develop a site plan control by-law.
 - The scope and criteria of the by-law (e.g., to what projects it applies) would be determined through municipal process, which should emphasize public consultation.
 - Incorporate the following: preservation of natural vegetation, enhanced stormwater management measures, development setbacks from key natural heritage features (e.g., wetlands), provision for natural shoreline structures, etc.
- Conduct effective enforcement of the by-law.

Action B5: Tree conservation by-law

Develop a tree conservation by-law that requires the retention of large existing forested areas along shorelines.

Urgency:

- High

Rationale:

- Forested areas along the lake shoreline maintain the integrity of the lake ecosystem by stabilizing soils, moderating temperature, providing fish and wildlife habitat, reducing surface water runoff and utilizing nutrients. The intent of this action is to prevent the clear-cutting of large tracts of forested areas along shoreline prior to a development application. The act of "cutting down" or "injuring" a tree is not typically considered development, therefore this practice would not fall under the proposed site plan control by-law action. An additional level of protection is necessary. The authority to use this tool must first be set out in the municipal Official Plan.

Priority areas:

- To-be-determined based on consultations; consider application to large (e.g., greater than one hectare) forested areas along the Sturgeon Lake shoreline

Lead and (partner) implementers:

- City of Kawartha Lakes

Deliverables:

- Amend *City of Kawartha Lakes Official Plan* and Secondary Plans to enable tree conservation by-law.
- Develop a tree conservation by-law.
 - The scope and criteria of the by-law (e.g., to what projects it applies) would be determined through municipal process, which should emphasize public consultation.
 - Require a permit from shoreline property owners to cut or injure trees considered to be within the scope of the by-law.
- Conduct effective enforcement of the by-law.

3.4 Urban and Rural Infrastructure Strategy

A significant focus of this strategy is to reduce impacts to the lake resulting from urban and rural infrastructure maintenance. This is mainly a municipal responsibility, with emphasis on enhanced control of stormwater water quality and quantity, soil erosion and maintenance of public spaces. However, other stakeholders involved in the construction industry are similarly responsible for ensuring that their activities are not detrimental to the health of the lake.

The recommended urban stormwater management strategy will provide an integrated, comprehensive stormwater management plan in all urban catchment areas. Implementation of this strategy can help reduce contaminants from urban runoff by using water quality and quantity treatment and by reducing or eliminating the sources of pollutants. The use of innovative 21st-century approaches should ensure that urban development is sustainable and minimizes impact to the lake.



Lagoons at the Lindsay Water Pollution Control Plant

Action C1: Improvement of public waterfront

Increase community enjoyment of public beaches and waterfronts by deterring geese, conducting regular maintenance and increasing public access.

Urgency:

- High

Rationale:

- Public access to Sturgeon Lake provides a primary connection to the lake. Many of the public beaches are often posted as unsafe for swimming due to elevated bacteria concentrations. It is anticipated that active management of these spaces will increase public enjoyment opportunities at our beaches and other waterfront parks.

Priority areas:

- Bobcaygeon Beach Park and other beaches as necessary.

Lead and (partner) implementers:

- City of Kawartha Lakes; Kawartha Land Trust; beach stewards; (school students; volunteer organizations)

Deliverables:

- Within a 5-year period, achieve a target of 80% (approximately 39 days) reduction in the amount of time that public beaches are posted as "unsafe for swimming".
 - Conduct routine maintenance at public spaces, including beaches, such as regular garbage pick-up, clean-up of pet and bird feces, and provide adequate feces disposal facilities.
 - Conduct pilot project(s) to increase the circulation of beach waters at problem beaches (see Action D4).
 - Investigate the potential to implement higher levels of urban storm runoff management within beach areas.
 - Investigate the feasibility of having beach stewards or volunteers (e.g., 40-hour commitments) doing clean-ups weekly during the summer months.
 - Investigate means to deter waterfowl such as creating and maintaining tall vegetation or wider buffers, dog presence, bangers, falconry, oiling eggs, or consider expanding/providing waterfowl hunting opportunities.
- Develop a strategic plan for acquisition of additional properties and work with partners (e.g., Kawartha Land Trust) to secure additional properties that provide increased access to waterfront areas.

Action C2: Infrastructure maintenance and construction practices

Implement effective sediment and erosion control measures and other practices to prevent contaminants from reaching local watercourses during agricultural drain, road, and other construction projects.

Urgency:

- Medium

Rationale:

- Routine maintenance of agricultural municipal drains and drainage ditches along rural road networks is often needed to remove build-up of silt and sediments. In the case of drains, the accumulation of sediments over time may impede the ability of the channel (and adjacent cropland) to drain water efficiently at crucial times of the year. This is similar to roads, where it is also necessary to maintain unimpeded water conveyance through proper functioning ditches. These practices can potentially involve dredging or altering the channel for increased through-flow, and this can damage the aquatic ecosystem, including the harmful alteration of in-stream habitat, destabilization of banks, introduction of excessive sediments into our lakes, etc. A number of cost-effective options incorporate the natural environment (e.g., vegetation and its root systems), which will help minimize maintenance costs while protecting the environment. In the case of road-side ditches and construction sites, the focus should be on reducing sediment loading into nearby (down-slope) watercourses.

Priority areas:

- All construction and drainage worksites.
- Municipal agricultural drains.

Lead and (partner) implementers:

- City of Kawartha Lakes; (Ontario Ministry of Agriculture and Food; Kawartha Conservation; construction industry)

Deliverables:

- Avoid conducting construction projects during sensitive periods for fish and wildlife, where this is appropriate.
- Identify and install effective measures to prevent disturbed soils and sediments from migrating into the watercourses. Utilize standards outlined in the document *Erosion and Sediment Control Guideline for Urban Construction* (TRCA, 2006). For example:
 - Focus on "site-level" containment of sediments, recognizing that advanced controls are often required to protect sensitive natural heritage features.
 - Plant disturbed areas with soil-stabilizing vegetation (preferably native species).
 - Use sediment blankets or matting for disturbed banks.
 - Work under low-flow periods; develop a "back-up" plan in case of heavy rains/melt.
- Host periodic workshops for contractors, consultants, project managers and developers to ensure effective communications and knowledge of the most up-to-date measures for controlling the movement of sediments off-site.

Action C3: Stormwater management

Through stormwater management planning, improve the quality and control of stormwater in urban settlement areas of Bobcaygeon, Lindsay and Fenelon Falls.

Urgency:

- High

Rationale:

- Lindsay, Fenelon Falls and Bobcaygeon are the largest urban centres on Sturgeon Lake. Urban areas, although representing a relatively small part of the Sturgeon Lake planning area, are significant contributors of sediments and contaminants, including nutrients and bacteria. This is mainly due to increased seasonal and stormwater runoff from hardened surfaces, typical of highly developed areas. Efforts should be focused on improving stormwater quality in priority areas based on calculated flow and nutrient loading - including type of stormwater control, size, location and cost estimate. Recent advances in the application of low impact development (LID) standards in Greater Toronto Area settings have proven to be extremely cost-effective in achieving enhanced stormwater quality and quantity control.

Priority areas:

- Defined sewer-sheds (to be determined) within major urban settlement areas.

Lead and (partner) implementers:

- City of Kawartha Lakes; (Centre for Alternative Wastewater Treatment; Water Research and Innovation Network; Kawartha Conservation)

Deliverables:

- Undertake an urban stormwater management initiative that provides an integrated approach to master drainage planning, including water quality and quantity treatment, for all urban catchment areas.
 - Create an inventory of all urban storm drainage systems (including delineation of sewer-sheds), conduct regular inspections and establish a maintenance schedule.
 - Identify those sewer-sheds that contribute the highest inputs of nutrients and sediments.
 - Identify opportunities to retrofit existing units or create new stormwater infrastructure to improve water treatment, in terms of quality and quantity where appropriate, with an emphasis on applying low impact development (LID) and other innovative technologies.

Action C4: Sewage treatment and landfill

Operate sewage treatment plants and landfills at maximum efficiency in terms of pollutant removal and capacity.

Urgency:

- Medium

Rationale:

- Two municipal wastewater treatment plants, servicing the urban communities of Lindsay and Fenelon Falls, empty treated water directly into Sturgeon Lake. Over the years, these plants have improved treatment efficiency and reduced phosphorus input to the lake dramatically. For example, average annual phosphorus loadings into the lake in the early 70s were 10,800 kg; in the late 80s they were 3,700 kg; and at present they are under 300 kg. It is important to maintain this momentum. However, excessive water flow amounts entering the treatment plants (from heavy rainfall events) continue to overload plant capacity on occasion. This has led to partial by-pass events when some untreated wastewater enters the lake. It is important to ensure that the treatment plants are able to process large flow events.

Priority areas:

- Fenelon Falls and Lindsay Water Pollution Control Plants; Lindsay Ops Landfill.

Lead and (partner) implementers:

- City of Kawartha Lakes; (Centre for Alternative Wastewater Treatment; urban residents)

Deliverables:

- Identify opportunities to reduce amount of stormwater entering wastewater treatment conveyance system (e.g., disconnecting downspouts, etc.); also, identify storm vs. combined storm/sewage infrastructure and investigate options to mitigate.
- Ensure effluent quality from both municipal water pollution control plants consistently meets average annual phosphorus loading in recent years (which is consistently under 300 kg).
- Reduce partial bypass events from treatment plants when overloaded with stormwater.
- Ensure that pumping stations have back-up power supplies and/or other features to prevent spillage to waterways.
- Prevent soils from leaching contaminants into waterways from active and inactive landfills.

3.5 Research and Monitoring Strategy

All management decisions, as well as remedial and restorative actions, depend on sound scientific data and knowledge. Further lake-based research will shed light on the many information gaps identified through this planning process, including emerging 21st century pressures. Further monitoring is crucial for determining the effectiveness of current lake-based programming and for identifying new opportunities to engage stakeholders. This adaptive management approach will ensure that priorities remain relevant as new information becomes available.

A key component of this strategy is collaboration among groups and institutions already active on the lakes. There is great value in using the expertise of local community members, volunteers and citizen scientists. We will promote the sharing of local knowledge and expertise that, in some cases, spans generations. This will help build plan interest and lead to the “buy-in” of the local people. As project partners create the momentum, the community will come on board.



Kawartha Conservation staff measuring flow volumes for developing a lake water-budget.

Action D1: Lake monitoring

Implement a coordinated lake monitoring program that regularly tracks key indicators of lake watershed health, including nutrients, forest cover, fish communities and oxygen levels.

Urgency:

- Medium

Rationale:

- Routine collection of lake and watershed data provides critical information about the ongoing state of Sturgeon Lake and its watershed. It also helps to monitor progress on achieving the planning targets, while allowing early detection of hot-spots. Various agencies and groups are actively monitoring Sturgeon Lake and its watershed; coordination is key to reducing duplication and increasing efficiency. We need to support and take advantage of locally based monitoring, drawing on contributions from volunteers, community organizations and local academia.

Priority areas:

- Sturgeon Lake and its watershed.

Lead and (partner) implementers:

- Kawartha Conservation; (Kawartha Lake Stewards Association; Fleming College; Trent University; provincial ministries; Parks Canada – Trent-Severn Waterway; citizen scientists)

Deliverables:

- Develop a list of science-based lake and watershed health indicators that are practical enough to be understood by the general public. Example indicators include:
 - Water quality (nutrient status, contaminant inputs, temperature, oxygen, etc.).
 - Water quantity (lake water levels, flow inputs, etc.).
 - Aquatic ecosystems (biodiversity, primary production, fishes, aquatic plants, etc.).
 - Terrestrial natural heritage (forest cover, natural shorelines, etc.).
- Conduct routine monitoring of Sturgeon Lake and its watershed using appropriate lake and watershed health indicators.
 - Coordinate monitoring activities between academia and active groups.
 - Utilize a "pressure-state-response" feedback loop for monitoring, so that efforts are directed at: recognizing relevant pressures/threats to lake health, determining to what degree these have impacted the state of lake health, and determining the effectiveness of management response.
 - Integrate monitoring efforts into secondary and post-secondary institutions, where practical.
 - Increase data collection opportunities by volunteers, citizen-scientists and local stakeholders.

Action D2: Sources of nutrients

Conduct research to more accurately identify shoreline sources of nutrients, such as septic systems, and potential impacts to nearshore areas of the lake.

Urgency:

- Medium

Rationale:

- The action aims to better determine how shoreline dwellings affect nearshore ecosystems in lakes through the release of nutrients. This requires the investigation of nutrient chemistry and ecological processes of the nearshore ecosystems of Sturgeon Lake. Such studies will provide better insight into actual contributions from shoreline septic systems, since loading amounts have only been estimated at this time. The main objective of such research is to study the presence and quantity of nutrients in nearshore areas adjacent to shorelines (that vary in the amount and type of residential development), with a particular emphasis on better quantifying septic system impacts.

Priority areas:

- Shoreline and nearshore areas.

Lead and (partner) implementers:

- Trent University; (Kawartha Lakes Stewards Association; Kawartha Conservation)

Deliverables:

- Conduct nearshore zone sampling for source detection and assessment of ecosystem services.
- Quantify shoreline nutrient input from septic systems and other sources.
- Stimulate and support additional studies of advanced research that will produce more precise knowledge of septic system input of nutrients.

Action D3: Response to emerging pressures

Conduct research to identify how the lake ecosystem responds to emerging pressures such as cumulative development, climate change and invasive species.

Urgency:

- Medium

Rationale:

- The key driver for the proposed research is the anticipated increase of development intensification along the shoreline of Sturgeon Lake and in surrounding urban areas, and the consequent pressures on the lake ecosystem. There is an urgent need to improve scientific understanding about these interactions – particularly for climate change and invasive species in the lake basin – so that appropriate management responses may be developed.

Priority areas:

- Cumulative development along shorelines.
- Climate change.
- Invasive species in aquatic ecosystems.

Lead and (partner) implementers:

- (Kawartha Conservation; colleges and universities; Kawartha Lake Stewards Association; provincial ministries)

Deliverables:

- Conduct research on the feasible extent of lake ecosystem changes resulting from climate change, invasive species and cumulative development.
- Conduct research into how further reductions in phosphorus will impact the lake ecosystem, with a focus on impacts to fisheries.
- Conduct research to identify lake and watershed health thresholds and carrying capacity.
- Investigate options for predictive modeling tools and decision-support systems to help guide management efforts to mitigate any negative impacts of emerging pressures.

Action D4: Innovative water quality management

Undertake pilot projects to test the effectiveness of innovative approaches in identified priority areas with nuisance aquatic plants and poor water quality.

Urgency:

- Medium

Rationale:

- The purpose of this action is to test, at relatively local scales, the effectiveness of a suite of projects that could (if proven effective) be applied to a broader scale. These pilot projects will address numerous information gaps in innovative water management approaches and technology. Numerous small projects of a collaborative nature, given high profile, are likely to garner solid support for implementation efforts. It is essential that these projects contain a monitoring component to determine their effectiveness.

Priority areas:

- Various, depending on scope of pilot project.

Lead and (partner) implementers:

- (Water Research and Innovation Network - WRAIN; academia; industry; government agencies; and others depending on project scope and location)

Deliverables:

- Within the next 2-3 years, facilitate pilot projects or other study initiatives on the following:
 - Effective approaches for the control of nuisance vegetation along the nearshore areas of the lake to enhance/maintain vessel access to mooring areas. For example:
 - Stock milfoil weevils to control Eurasian water-milfoil in heavily infested areas.
 - Test localized plant reduction techniques that provide effective control yet maintain ecosystem health.
 - Effective approaches for enhancing water quality in residential canals of concern (e.g., North Bayou Canal). For example:
 - Increase water circulation to reduce stagnancy by installing aerators, fountains and/or culverts.
 - Innovative approaches for enhancing the quality of urban stormwater before it enters the lake. For example:
 - Test constructed wetlands (e.g., floating islands).
 - Construct low-impact development techniques to control runoff, such as bioswales, infiltration trenches and permeable pavement.
 - Innovative approaches for enhancing the quality of rural stormwater and/or drainage runoff. For example:
 - Use controlled tile drainage.
 - Use other farm beneficial management practices.

Action D5: Socio-economic value

Determine the socio-economic value of Sturgeon Lake, with emphasis on the value of goods and services provided by natural resources.

Urgency:

- Low

Rationale:

- At present the socio-economic value of Sturgeon Lake, regarding direct and indirect monetary value to the municipality and local communities is unknown. A specific information gap is the significance of the lake's ecosystem services (e.g., providing clean water, fishing opportunities, recreational values, natural spaces, clean air, etc.) to the broader community. Recognition of the value of ecosystem services and the impact of human development on them is becoming more widespread through recent research (e.g., *Lake Simcoe Basin's Natural Capital* and the *Economic Value of Toronto's Greenbelt* reports). However, public knowledge of the vital role of these services in human quality of life is limited, so it is important that communities have access to information on the value of natural areas.

Priority areas:

- To be determined.

Lead and (partner) implementers:

- Chamber of Commerce; City of Kawartha Lakes; (universities; Fleming College; David Suzuki Foundation)

Deliverables:

- Identify key ecosystem goods and services provided to humans (Sturgeon Lake users and stakeholders in particular) from Sturgeon Lake resources.
- Identify environmental, social and economic value of ecosystem goods and services.
- Produce a summary report.

3.6 Communications and Outreach Strategy

Communication and outreach help set the *Sturgeon Lake Management Plan* in motion and provide the mechanisms for plan updates and adjustments to meet changing community needs and environmental conditions. This involves communicating information about the lake and watershed; the actions needed to sustain a healthy environment, community and economy; receiving feedback from stakeholders about implementation of the plan (and plan updates and adjustments); and facilitating collaboration on the plan and related projects.

The Communication and Outreach Strategy supports the other strategies with actions based on these four objectives:

1. Enable informed decision making and actions that contribute to the goal of the plan.
2. Motivate actions that protect Sturgeon Lake.
3. Create the cultural conditions for long-term sustainability of the lake.
4. Provide transparency and accountability for the plan and its implementation.

Many people have a stake in the implementation of the *Sturgeon Lake Management Plan*. They are grouped into target audiences by the different forms of communication and outreach required for implementing the plan. Audience groups include shoreline property owners, agricultural and rural landowners, urban residents, businesses, tourists and other visitors, municipal councillors and staff, lake associations, agencies and related organizations, developers, funders and Kawartha Conservation staff.

Barriers to implementation (which will be illuminated by the research in this strategy) include:

- Poor understanding of watershed connections (e.g., impact of urban residents on the lake), why specific actions are needed, and the corresponding benefits of those actions
- Upfront costs and lack of agreement on who is responsible for watershed protection (e.g., landowners may see agencies as responsible, and agencies may see greater need for landowners to take responsibility)
- Lack of knowledge of what to do and how to do it
- Long period of time before results from stewardship actions are evident
- Challenges of keeping the brand and awareness of the plan at the forefront.

Opportunities to support the implementation of this strategy include:

- Strong involvement and input from community leaders and representatives with the committees for lake management planning
- Research and stewardship activities by groups in the watershed such as the Kawartha Lake Stewards Association, Kawartha Protect Our Water, Fleming College, Federation of Ontario Cottagers' Associations and Trent University
- Three years of outreach in the Blue Canoe Program, which provided information about lake management planning and collection of information through surveys
- Increasing concern about excessive aquatic plant growth, blue-green algae and other symptoms of lake enrichment, as well as invasive species, climate change and other issues identified in surveys
- Science to back up the strategies
- Emphasis in the community on the need for stewardship actions by individual property owners
- Release of a new booklet and other communication materials
- Establishment of a web page for the program and other communication mediums
- In-house skills, such as online media, writing and presentation
- Media coverage surrounding lake management planning, the *2013 Kawartha Watershed Report Card*, open houses, and other Kawartha Conservation and partner activities.

The following actions address the barriers and leverage the opportunities to meet the communication and outreach objectives.

Action E1: Keeping the community informed

Communicate the science, issues, solutions, targets, and outcomes of plan implementation.

Urgency:

- High

Rationale:

- A large amount of information and analysis have been generated through plan development, providing a baseline for setting environmental targets. It enables informed decision making and actions that contribute to the goal of the plan. Through ongoing monitoring, it will be possible to track any improvement or decline in conditions, measure the effectiveness of actions, and respond to emerging issues in a changing environment. Transparency and accountability to stakeholders are necessary for ongoing funding and support for plan implementation.

Priority areas:

- Kawartha Lakes wide.

Lead and (partner) implementers:

- Kawartha Conservation; City of Kawartha Lakes; Kawartha Lake Stewards Association; Federation of Ontario Cottagers' Associations; (local agricultural organizations and other community groups)

Deliverables:

- Distribute a report every 2 years on monitoring results, implementation of stewardship actions, impacts of actions, and other changes in the watershed. Main target audience: municipal councillors and staff, lake associations, agricultural organizations, other related organizations and agencies, funders, provincial staff and Kawartha Conservation staff.
- Provide updates via newsletters, social media, newspapers, radio and television. Main target audience: shoreline property owners, agricultural and rural landowners, urban residents, developers and businesses.
- Maintain a web page for lake management planning to host reports, updates and related resources. Main target audience: municipal councillors and staff, lake associations, agencies and related organizations, funders and Kawartha Conservation staff.
- Develop infographics and posters that include facts and findings about Sturgeon Lake, issues and solutions, ecological connections and human-environment relationships. The graphics will be professionally designed and suitable for hanging in cottages, offices and other settings, for posting online, and for distributing through social media. Main target audience: shoreline property owners, agricultural and rural landowners, urban residents, businesses, developers, municipal councillors and staff, and Kawartha Conservation staff.
- Provide presentations by request, to contribute the latest information and updates, and to answer questions and talk directly with people in the community.
- Showcase new technologies, innovations and practices where appropriate.
- Contribute to educational programs.

Action E2: Community Advisory Panel

Maintain the Community Advisory Panel to ensure effective communication, agency support and collaboration among lake stakeholders during plan implementation.

Urgency:

- High

Rationale:

- With the implementation of the *Sturgeon Lake Management Plan*, maintaining a solid connectivity among all project partners is essential for the availability of communications to the watershed community. The Community Advisory Panel will continue to help provide this function. The panel will also evaluate various plan implementation components by assessing whether actions are appropriate and meet targets, and recommend responses.

Priority areas:

- Kawartha Lakes wide.

Lead and (partner) implementers:

- Kawartha Conservation; City of Kawartha Lakes; (Kawartha Lake Stewards Association; Federation of Ontario Cottagers' Associations; agricultural groups; community organizations)

Deliverables:

- Maintain the Community Advisory Panel membership, with an increasing focus on plan implementation.
 - Maintain development of partnerships achieved during the lake study and research period.
 - Receive input on plan implementation, and on changes in the landscape and in communities.
 - Assist with funding proposals and acquisition of resources for program delivery.
 - Stakeholder representatives: municipal councils and staff, industry leaders for farmers and businesses, shoreline and urban communities, and community champions and organizations.

Action E3: Community Input

Create opportunities for input to plan implementation and updates, and regularly assess target audience needs, concerns, barriers and knowledge gaps.

Urgency:

- High

Rationale:

- This action assists with evaluating the implementation of the *Sturgeon Lake Management Plan* and encourages an open forum for updates to the plan. This is important as the landscape changes demographically, climatically, ecologically, culturally and in other ways. An understanding of community needs, values, concerns, interests, barriers and knowledge gaps is critical to effective communication and to program design and implementation.

Priority areas:

- Kawartha Lakes wide.

Lead and (partner) implementers:

- Kawartha Conservation

Deliverables:

- Conduct a representative knowledge, attitudes and behaviours (KAB) survey of the watershed population to create a baseline. Conduct future surveys to measure changes. Main target audience: shoreline property owners, agricultural and rural landowners, urban residents, businesses, developers and others.
- Obtain public and stakeholder feedback on reports (every 2 years) to gauge perceptions of the state of the lake and direction of the plan through a survey. Main target audience: municipal councillors and staff, lake associations, related organizations, other stakeholders and Kawartha Conservation staff.
- Compile and analyse other surveys and audience research undertaken in the priority area.
- Implement customer relations tracking/demographics mapping software to manage information collected through stewardship activities, surveys and other sources, about each target group.

Action E4: Profile Sturgeon Lake

Profile the natural heritage features, social values and economic values associated with Sturgeon Lake, including a long-term vision for the lake and a shared sense of responsibility to protect it.

Urgency:

- High

Rationale:

- Many incredible natural and cultural features make up Sturgeon Lake and the surrounding lands. Encouraging an ecological perspective involves recognizing the connections between people and their actions on the landscape. This perspective highlights how ecological ties are also community and economic ties; how and what one does on the land has ecological implications for the local economy and community. This provides a foundation for stewardship plan activities and promotes Sturgeon Lake as a desirable place to visit and invest.

Priority areas:

- Kawartha Lakes wide, Ontario wide.

Lead and (partner) implementers:

- Kawartha Conservation; City of Kawartha Lakes; Chamber of Commerce; Federation of Ontario Cottagers' Associations

Deliverables:

- Contribute information about the lake and its natural features to tourism-focused and other communication sources that profile the City of Kawartha Lakes and Sturgeon Lake. Main target audience: tourists and other visitors, funders, businesses and shoreline property owners.
- Contribute information about the lake, its natural features and protection ideas to local school curricula and other local environmental education programming. Main target audience: shoreline property owners, urban residents, agricultural and rural landowners.
- Build a strong brand for the plan that signifies shared responsibility; community effort; science-based programming; and ecological, community, and economic ties. Main target audience: shoreline property owners, agricultural and rural landowners, businesses, urban residents, municipal councillors and staff, lake associations, agencies and related organizations, developers, funders and Kawartha Conservation staff.

Action E5: Community Based Social Marketing

Undertake Community Based Social Marketing to motivate lake and watershed friendly lifestyles.

Urgency:

- High

Rationale:

- Community Based Social Marketing (CBSM) techniques are proven to influence behaviour and contribute to new social norms that can be maintained over the long term. Some of these techniques will be used in conjunction with stewardship programming, by adding an additional communication component. Key elements of CBSM are obtaining voluntary commitments from participants to undertake an action; publicizing that commitment to reinforce the action and encourage others to make commitments; following up with the participant within a specified time-frame; providing reminders close to where the action is taken; and publicizing the completed action to further reinforce the behaviour and encourage others to follow suit.

Priority areas:

- Kawartha Lakes wide.

Lead and (partner) implementers:

- Kawartha Conservation; (Federation of Ontario Cottagers' Associations)

Deliverables:

- Publicize commitments (obtained in stewardship programming) on the Kawartha Conservation website and through Kawartha Conservation and partner social media channels. Main target audience: shoreline property owners, agricultural and rural landowners, urban residents and businesses.
- Place signs or stickers that serve as a reminder near a voluntary action location. Main target audience: shoreline property owners, agricultural and rural landowners, urban residents and businesses.
- Publish stories featuring people who take action: online (website, blog, interactive map), in social media and video, in stewardship presentations and through traditional media. Main target audience: shoreline property owners, agricultural and rural landowners, urban residents, businesses, funders, developers, and municipal councillors and staff.

Action E6: Collaboration

Work collaboratively with people and projects that contribute to the objectives of the lake plan.

Urgency:

- Medium

Rationale:

- A large amount of information and analysis has been generated in the development of the *Sturgeon Lake Management Plan* that may contribute to other related initiatives in the watershed. Representatives of a wide range of stakeholders must collaborate on program aspects of the *Sturgeon Lake Management Plan*, including science and research, funding proposals and other project support. They need to seek out unique partnership opportunities for lake management projects.

Priority areas:

- Kawartha Lakes wide.

Lead and (partner) implementers:

- Kawartha Conservation; Kawartha Lakes Stewards Association; (City of Kawartha Lakes; Federation of Ontario Cottagers' Associations; community organizations; local businesses)

Deliverables:

- Participate in working groups and committees, and work with organizations (such as the following) to provide research and information from the plan and support objectives relevant to the plan:
 - Business chambers.
 - City of Kawartha Lakes Economic Development.
 - Cottage, lake and rate payer associations and environmental groups.
 - Curve Lake First Nation.
 - Developers.
 - Educational institutions such as Fleming College, Trent University, Trillium Lakelands District School Board, and Peterborough Victoria Northumberland and Clarington Catholic District School Board.
 - International Centre of Excellence for Water Quality.
 - Mississaugas of Scugog Island First Nation.
 - Regional Tourism Organization 8 (RTO8).
 - Trent-Severn Waterway Water Management Advisory Council.
 - Water Research and Innovation Network (WRAIN).
- Provide assistance with the incorporation of plan research and analysis, and information about the implementation of best management practices to various organizations. Main target audience: municipal councillors and staff, lake associations, agencies and related organizations, developers, funders and Kawartha Conservation staff.

3.7 Moving To Implementation

The *Sturgeon Lake Management Plan* provides a solid framework for a coordinated approach to maintaining a healthy lake and watershed for all uses. However, successful implementation will require ongoing commitments (financial and otherwise) from all identified partners to fully realize and sustain a healthy lake environment.

Creating and maintaining collaborative partnerships is essential to the success of this management plan. The more stakeholders, knowledge and resources applied to each action item, the better the result. Everyone around the lake is accountable for responsible lake management. Early implementation efforts should highlight small successful projects from individuals, groups and agencies to build momentum.

Specific costs of action item deliverables were intentionally omitted from the *Sturgeon Lake Management Plan*. At early stages of implementation, it is essential to develop a solid business plan to attract potential funders, sponsorships and commitments from many sectors. Efforts should also emphasize the assembly of relevant expertise, even if those partners have not yet been identified as lead or partners in plan implementation.

Many of the strategies and actions developed through this plan can be applied to other lakes as well. However, we have tried to focus primarily on the priorities of stakeholders and ecosystem-based issues specific to Sturgeon Lake. Therefore, careful consideration should be used when applying management approaches from this plan to other lakes, as each lake is unique with its own set of issues and community-based values.

To assess progress and remain accountable, the *Sturgeon Lake Management Plan* should be reviewed and updated, if necessary, in a five to ten year time period. Reporting and evaluating the progress of project deliverables should be conducted more periodically, such as on an annual basis. This will allow stakeholders to adjust priorities and assess the targets and deliverables through an adaptive management approach.

References

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Appendix A: Key Stakeholders

Everyone has a role to play in maintaining a healthy Sturgeon Lake. A wide range of communities, organizations and individuals relies on healthy lake conditions to sustain their livelihoods. Successful implementation of the management actions identified in Chapter 3 relies heavily on a cooperative approach among these stakeholders for their support and direction. Table A provides a working list of key lake-based stakeholders.

Table A: Key lake management stakeholders

Federal Government	Parks Canada, Trent-Severn Waterway (now Ontario Waterways); Fisheries and Oceans Canada; Transport Canada
Provincial Government	Ministry of Natural Resources (Peterborough District); Ministry of Environment (Eastern Region); Ministry of Municipal Affairs and Housing; Ministry of Transportation; Ministry of Agriculture and Food; Ministry of Rural Affairs
Municipal Government	City of Kawartha Lakes Council; Departments of Public Works, Planning and Development Services, and Community Services; Haliburton, Kawartha, Pine Ridge District Health Unit
Stewardship Groups	Kawartha Lakes Stewards Association; Ontario Soil and Crop Improvement Association (Environmental Farm Plan); Kawartha Field Naturalists; Kawartha Protect Our Water; Ontario Federation of Anglers and Hunters; Ducks Unlimited; Kawartha Land Trust; Kawartha Conservation; City of Kawartha Lakes Environmental Advisory Committee; Lakeland Alliance; Friends of the Osprey
Agriculture	City of Kawartha Lakes Agriculture and Development Advisory Board; Victoria County Soil and Crop Improvement Association; Victoria-Haliburton Federation of Agriculture; Victoria Cattlemen's Association; and others
Lakeside Communities	Federation of Ontario Cottagers' Associations; Sturgeon Point Association; Beehive Estates; Pleasant Point; Thurstonia; Southview Estates; Snug Harbour; Birch Point; Daytonia Beach; Village of Fenelon Falls; Village of Bobcaygeon; Town of Lindsay; Alpine RV Resort; Kenstone Beach; Ancona Point; Cedar Glen; Pickerel Point; Sandy Point; Verulam Park; and others
Academia	Trillium Lakelands District School Board; Kawartha Pine Ridge District School Board; Peterborough Victoria Northumberland and Clarington Catholic District School Board; Fleming College; Trent University; University of Toronto; and others
Lake-related Businesses and Clubs	Birch Point Marina; Sturgeon Lake Marina; Lunge Haven Marina; McLaren's Marina; Wynch Wood Marina; Southwinds Resort and Marina; Tour Boat Operators (Fenelon Falls); Lindsay Bassmasters; Sturgeon Lake Sailing Club; Real Estate Companies; and others

Appendix B: Existing Planning Initiatives

A number of current management planning initiatives relate directly or indirectly to the *Sturgeon Lake Management Plan* goal of maintaining a healthy and sustainable Sturgeon Lake. To realize this goal, support for these initiatives is crucial. For maximum leverage, efforts should be integrated wherever possible. The following initiatives are particularly relevant:

- City of Kawartha Lakes Integrated Community Sustainability Plan (City of Kawartha Lakes, 2013). This plan, led by the local municipality, provides a framework for sustainable management for 10 key themes: Water, Agriculture, Natural Systems, Resource Consumption, Health and Education, Economy, Culture and Heritage, Active Communities, Accessibility and Financial Filter. The plan recognizes lake management planning as a key step towards achieving a sustainable municipality. As such, they should be integrated when seeking funding for implementation efforts.
- Shoreline Environmental Studies in Support of Official Plan Policies for the City of Kawartha Lakes (Gartner Lee and French Planning, 2002). This initiative resulted in a thorough list of shoreline-based planning advice and approaches, which were recommended for consideration by the City of Kawartha Lakes for integration into their Official Plan. Many of these were considered in the development of the Strategic Planning Strategy outlined in Chapter 3.
- City of Kawartha Lakes Official Plan (City of Kawartha Lakes, 2012). The Official Plan is a policy document containing a statement of Council's commitments to guide development and land use within the municipality. The Official Plan contains a number of policies that address protection of water resources including lakes and water quality. It provides a mechanism to implement a number of planning tools including: Secondary Plans (more detailed plans of a specific area), Zoning and other By-laws, Subdivision Control, Consent Applications (to sever land into a limited number of parcels), and Site Plan Control.
- Secondary Plans for City of Kawartha Lakes Settlements (City of Kawartha Lakes, Draft). The City of Kawartha Lakes is studying the long-term growth and development of five settlement areas: Bobcaygeon, Fenelon Falls, Lindsay, Omemee and Woodville. Secondary plans provide more detailed planning and policy approaches for these urban areas. Three of these urban areas are located on Sturgeon Lake and have the potential to directly influence land use, landscape changes and water quality conditions.
- Naturally Connected, Kawartha Natural Heritage Systems Strategy (Ontario Ministry of Natural Resources, Draft). This strategy identifies significant landscape features and functions within the Kawartha Lakes region that are important for maintaining functioning ecosystems. Using a base-set of ecosystem-based targets (e.g., maintaining 30% forest cover on the landscape), the strategy will determine which landscape-level features are priority areas for protection and/or restoration. Most of the Sturgeon Lake watershed is within the scope of this initiative. Accordingly, the completed Strategy will be a valuable tool to guide the implementation of many of the action items outlined in Chapter 3.
- Water Research and Innovation Network (WRAIN). WRAIN supports the water and wastewater industry to accelerate market adoption of new technologies through collaboration and demonstration sites. The network consists of researchers, municipal service providers and economic development professionals. Sturgeon Lake, under pressure from a variety of land uses (e.g., urban wastewater, agricultural runoff, shoreline development, etc.), has potential as a location to pilot innovative approaches.
- Fisheries Management Plan for Zone 17 (Ontario Ministry of Natural Resources, 2009). This plan provides provincial direction for the management of fisheries resources within the Kawartha Lakes management zone, including recreational use as well as science and monitoring aspects. The plan presents management strategies for the following themes: Walleye, Largemouth and Smallmouth Bass, Panfish, Muskellunge and

Northern Pike, Coldwater Stream Fisheries, Other Fish Species, Invasive Species and Disease Management, Awareness and Education, and Monitoring and Assessment. Successful implementation of this plan will be crucial for achieving objectives identified in Chapter 2.

- Lake Scugog Environmental Management Plan (Kawartha Conservation, 2010). This plan provides recommendations for improving water quality through nutrient reduction and management in the lake and its major tributaries. Lake Scugog is a major headwater lake to Sturgeon Lake, via the Scugog River, and as such is a major source of water that comprises Sturgeon Lake. Successful implementation of this plan is crucial for maintaining good water quality conditions in Sturgeon Lake.
- Oak Ridges Moraine Watershed Plans (Kawartha Conservation, 2012). These plans provide recommendations for improving the hydrological and ecological integrity of four Oak Ridges Moraine tributaries: Nonquon River, Southern Lake Scugog Tributaries, Blackstock Creek and East Cross Creek. All of these systems eventually flow into Sturgeon Lake via the Scugog River. Successful implementation of these plans is crucial for maintaining good water quality conditions in Lake Scugog and downstream to Sturgeon Lake.
- Trent Source Protection Plan (Kawartha-Haliburton Sourcewater Protection Authority, 2013). This plan seeks to protect municipal sources of drinking water both from groundwater wells and surface water intake systems. There are three communities on Sturgeon Lake that obtain drinking water from municipal surface water intakes drawing from the lake and river system: Bobcaygeon, Southview Estates and Lindsay. Stewardship actions identified in the plan and the development of risk management plans to deal with specific threats to municipal drinking water supplies and systems will be crucial for maintaining good water quality conditions in Sturgeon Lake.
- Relevant Provincial and Federal Legislation. Various pieces of legislation provide the foundation for planning, policy and/or plan implementation. Statutes of most relevance include: *Historic Canals Act, Fisheries Act, Navigable Waters Protection Act, Species at Risk Act, Migratory Birds Convention Act, Canadian Environmental Assessment Act, Canadian Environmental Protection Act, Planning Act, Clean Water Act, Conservation Authorities Act, Endangered Species Act, Environmental Assessment Act, Fish and Wildlife Conservation Act, Green Energy Act, Lakes and Rivers Improvement Act, Oak Ridges Moraine Conservation Act, Public Lands Act, Water Resources Act, Nutrient Management Act, Drainage Act, Pesticides Act, Environmental Protection Act.*

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