Charleston Lake Plan

Produced by
The Charleston Lake Association

2006

In Acknowledgement…

This plan is based on the wealth of information gathered about the water quality, fishery, ecology, traditions of use and recreation, history of cottaging, lake management and all other realms that could be brought to light. It represents hundreds upon hundreds of hours of work by volunteers and specialists alike. It could not have been done, however, without the considerable support of a grant from the **Ontario Trillium Foundation**. The Charleston Lake Association and the Charleston Lake Environmental Association both gratefully acknowledge that support.

The Associations would also like to recognize the extraordinary contributions of the following:

- The Executive of the Charleston Lake Association and the Charleston Lake Environmental Association
- Reg Genge; Ontario Lake Assessments
- Gary Neilsen; Leeds County Stewardship Council
- The Eastern Ontario Model Forest
- The Frontenac Arch Biosphere Reserve

THE ONTARIO TRILLIUM FOUNDATION / LA FONDATION TRILLIUM DE L'ONTARIO

CHARLESTON LAKE ASSOCIATION – PRESERVE AND ENHANCE

LEEDS COUNTY Stewardship Council

ONTARIO LAKE ASSESSMENTS

Frontenac Arch BIOSPHERE RESERVE – Building Sustainable Communities

Charleston Lake Environmental Association

EASTERN ONTARIO MODEL FOREST

ONTARIO PARKS – Charleston Lake Provincial Park

Charleston Lake Plan
…Keeping Charleston Lake Beautiful in Every Way

Table of Contents

List of Figures

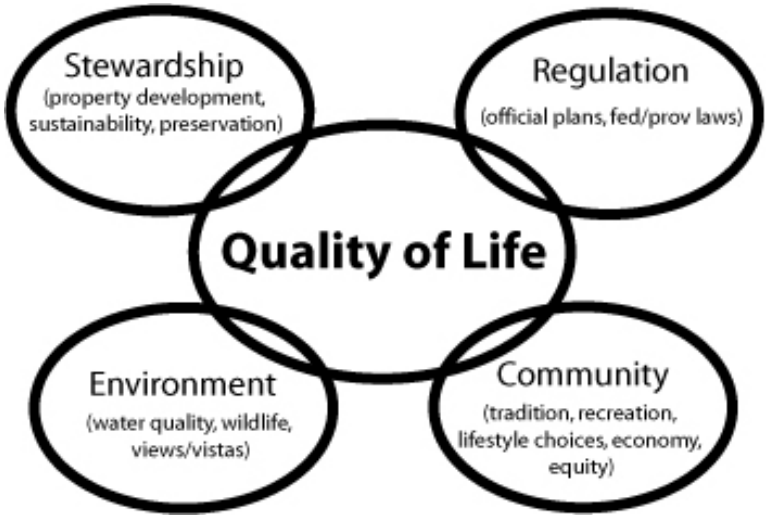
List of Maps

Introduction

The Lake Planning Approach – Why Do It?

Charleston Lake has a long history of community-based volunteer involvement in all aspects of life on the lake. For the past 150 years, concerned citizens and users of the lake have taken part in activities sponsored by the lake association. Volunteers have placed shoal markers for public safety, and have assisted in data collection for monitoring water quality and assessing the state of the fishery. In the 1950s, as the public began to place more value on natural resources, government became involved in conservation programs. However, since that time, there has been a gradual ebbing of programs for fisheries, private land forestry and wildlife management as governments have sought to reduce spending and deficit. During this same time, citizen involvement in conservation has gradually increased, with volunteers taking more and more leadership in matters that affect their environment. In that regard, the lake association has recognized the complexity of issues and the level of sophistication required to deal with them. This has lead to the development of a lake planning process for Charleston Lake.

The process of developing a master plan for the lake is as important as the end result. To be successful, it must engage the entire lake community.



Involving the Lake Community

Landowners, business owners and recreational day-users of the lake have a direct stake in the future health of the lake. Therefore, an important aspect of the creation of this plan was to give ample opportunity for participation and input. In March 2002, a mail-out survey gathered input from 47 individuals and businesses. This was followed with three public workshops tailored to specific sectors of interests on the lake:

Local business owners;	June 2002
Government agencies;	June 2002
Property owners and day-users,	July 2002

Indian Head Rock

Articles in the Charleston Lake Newsletter encouraged input and discussion, and the lake association executive conversed extensively with the membership. Workshop participants and the membership were asked to comment in three subject areas:

Values: What are the most important things about Charleston Lake? Why do you like the lake? Why do you come here?

Issues: What are the major issues facing the lake and the way we use it? Now? In the future?

Guiding Principles: What are the non-negotiable facts we need to be mindful of during the planning process?

It should be noted that while every effort was made to notify and solicit input from everyone interested in Charleston Lake, there were people who were missed. To these folks, we apologize but at the same time make the point that the lake planning is an open-ended and ongoing process, and the Charleston Lake Association is always open to input and participation. The lake plan is a “living” document, to be revised periodically, and contributions are always welcome from those wishing to keep Charleston beautiful in every way.

A Vision for Charleston Lake

The Charleston Lake Association, its partners, lake users and property owners share in the following vision for the future of Charleston Lake:

We are committed to maintaining:

- The highest possible water quality;
- Pristine landscapes and beautiful vistas;
- All of the fish, wildlife, birds and plants that belong here, and the opportunity to see them in nature;
- Tranquility, peace, privacy and an ambiance that enhances the spirit;
- A sense of community, family roots and traditions;
- Commercial and recreational uses that benefit the local economy without hurting the natural integrity of the lake; and
- A safe lake with public accessibility for all to enjoy.

Our Guiding Principle is to guarantee the right of future generations to enjoy the natural heritage of the lake as we have, undiminished in any way.

Does this vision inspire you in any way? Test yourself by asking two questions:

Do I agree with the sentiments being expressed?
Are there things happening on the lake that are contrary to the spirit and intent of this vision?

Values: What are the most important things about Charleston Lake?

Why do you like it? Why do you come here?

[these comments formed the basis for a Vision Statement about how we see the future]

Summary:

- water quality
- tranquility, peace, privacy
- pristine environment
- provincial park
- Blue Mountain ANSI (provincially significant area of natural and scientific interest)
- investment, property value
- fishing especially lake trout and bass
- wildlife, the ability to see birds and animals in nature
- rare species especially black rat snakes and peregrine falcons
- lake recreation is an economic asset to the local economy
- unique ecology in southern Ontario (Tension Zone Ecology)
- biodiversity
- county park
- shoal marking program for safe boating
- hiking trails and picnic sites
- family roots and heritage

Discussion Points:

- local business people recognize the high value of the lake to the local economy
- many, many comments on peace, tranquility, natural environments
- many people seem to be at odds with development trends and increased boat traffic
- fishing tournaments seem to be a potentially divisive issue with support for both pro and con
- most contributors are more inclined to passive recreation (hiking, canoeing, swimming and sailing) than speed boating, water skiing and personal watercraft riding, …(our sample of opinion has an inherent bias)
- very deep and passionate feelings from many folks for a Charleston Lake with a sense of place, family roots, family gatherings and intergenerational traditions

Issues:

What are the major issues facing the lake and the way we use it …now, and in the future?
[these comments will form the basis for future work plans]

Summary:

- Water Quality threatened by
  - over development
  - out dated and leaking septic systems
  - inadequate and expensive pump out options for holding tanks
- increasing boat size and speed
- increased noise pollution
- over fishing
- user apathy
- lack of uniform regulations and bylaws for setbacks and shorelines
- lack of enforcement of current regulation for development
- lack of enforcement of current regulations for fish and game
- urbanization of the lake environment, a curb and sidewalk mentality
  - lights at night, can't see the stars
  - noise
  - boat houses
- inadequate parking at access points
- water levels too low, too high
- agricultural runoff degrading water quality
- eastern rat snakes still persecuted
- tournament fishing needs to be controlled
- live release fishing
- too much signage
- weeds in the lake
- fire fighting plan needed to protect homes with no road access
- illegal garbage dumping
- confusion in permitting between, MNR, CRCA, DFO TLTI
- invasive species zebra mussels, loosestrife
- PWC's seem to be a major concern for many
- septic inspection programs and monitoring seem to have wide support

Discussion:

- water levels did not come up as a major issue
- Provincial park is seen to be a large plus for the lake, some favour continued expansion
- most have adjusted to the lack of communal garbage removal
- very real passion comes through some of the correspondence on the subject of illegal fishing, litter, garbage, and boat wakes and poor boating etiquette
- reaching day users with education efforts seen to be a challenge
- a lot of support (surprising?) for restricting boat size, power and speed
- a lot of support for more control over tournament fishing

Guiding Principles

What are the non-negotiable factors and ideas we need to be mindful of during this planning process? [these comments will become touchstones for guidance as we determine how to go about addressing the issues raised previously]

Summary:

- o need a combination of stewardship, regulation and enforcement in the long run
- o water quality must be kept up to lake trout habitat standards
- o sustainable use: future generations should have the same opportunities to enjoy the lake as we do
- o partnership between landowners, government, conservation groups and business are essential
- o need a consensus on what needs to be done before we proceed
- o education is the key
- o the municipal official plan is the key
- o need some control on development
- o need to understand the capacity of the lake and then devise ways to live within it
- o need consistent rules for the whole lake
- o provincial park is the largest landowner and is important to keep here
- o the lake is finite, it cannot sustain unlimited growth
- o need good information to make good decisions
- o natural beauty and environmental integrity of shorelines must be maintained
- o can't just focus on the lake itself, it exists in a landscape need to work with the whole watershed and all the feeder creeks
- o zero tolerance for septic problems
- o promote an environment first ethic, all economic and recreational activity depend on a healthy lake
- o learn the lessons of Muskoka

Interesting Ideas for the Executive

- seek partnerships with universities for research purposes
- noise pollution laws: learn and enforce them
- a family photo section in the CLA office
- encourage four stroke technology
- create a video of best practices for cottagers
- have a lottery for shore line restoration: the winner gets a free shoreline project
- have lake guardian volunteers do patrols and enforcement
- children's poster contest
- nature is the best landscaper: leave the cultivated look in town, not at the lake
- every boat has a flashlight and a whistle while the real issues go unnoticed
- newcomers accept things as they now are, old timers remark on the incremental changes(mostly bad) that have occurred over the last 50 years
- why are we stocking fish: we are over-fishing the resource, stocking only creates more traffic, big boats , noise and pollution
- special license for trout that reflects the true cost of breeding and stocking them
- erect signs at public access points outlining the do's and don'ts of boating
- a healthy environment is non-negotiable even if it means doing away with fishing,

Location

"Leeds County boasts many inland lakes, but Charleston is Pre-eminently Queen of All".
Thaddeus Leavitt in *The History of Leeds and Grenville*, 1879

Charleston is a mid-size lake, relatively centrally located in the Eastern Ontario United Counties of Leeds and Grenville. While the lake itself straddles two townships—Athens and Leeds and the Thousand Islands—the watershed of the lake reaches well into two more, Front of Yonge and Elizabethtown-Kitley. Charleston Lake sits atop the Frontenac Arch, the ridge of ancient granite connecting the Canadian Shield to the Adirondack Mountains. It is the largest lake of the Frontenac Arch Biosphere Reserve.

Lake planning does not look at the body of water that is the lake alone, but instead at the landscape in which it lies. Frequently, this plan refers to the watershed of Charleston Lake, the "upstream" area where the land drains in runoff, streams, ponds and lakes into Charleston, to the place where the lake's watershed empties to another downstream. While the lake itself has a surface area of 26.2 sq. km., the watershed of the lake is 353.65 sq. km. The watershed has about 41.7 sq. km. of open water, and streams that total some 565 km. in length. Among the other lakes of the watershed are Wiltse, Killenbeck, Temperance, Graham and Eloida. The town of Athens is in the area, and Lansdowne lies just outside. The watershed ends where Wiltse Creek merges with the Gananoque River.

Characteristics of Charleston Lake… Table 1

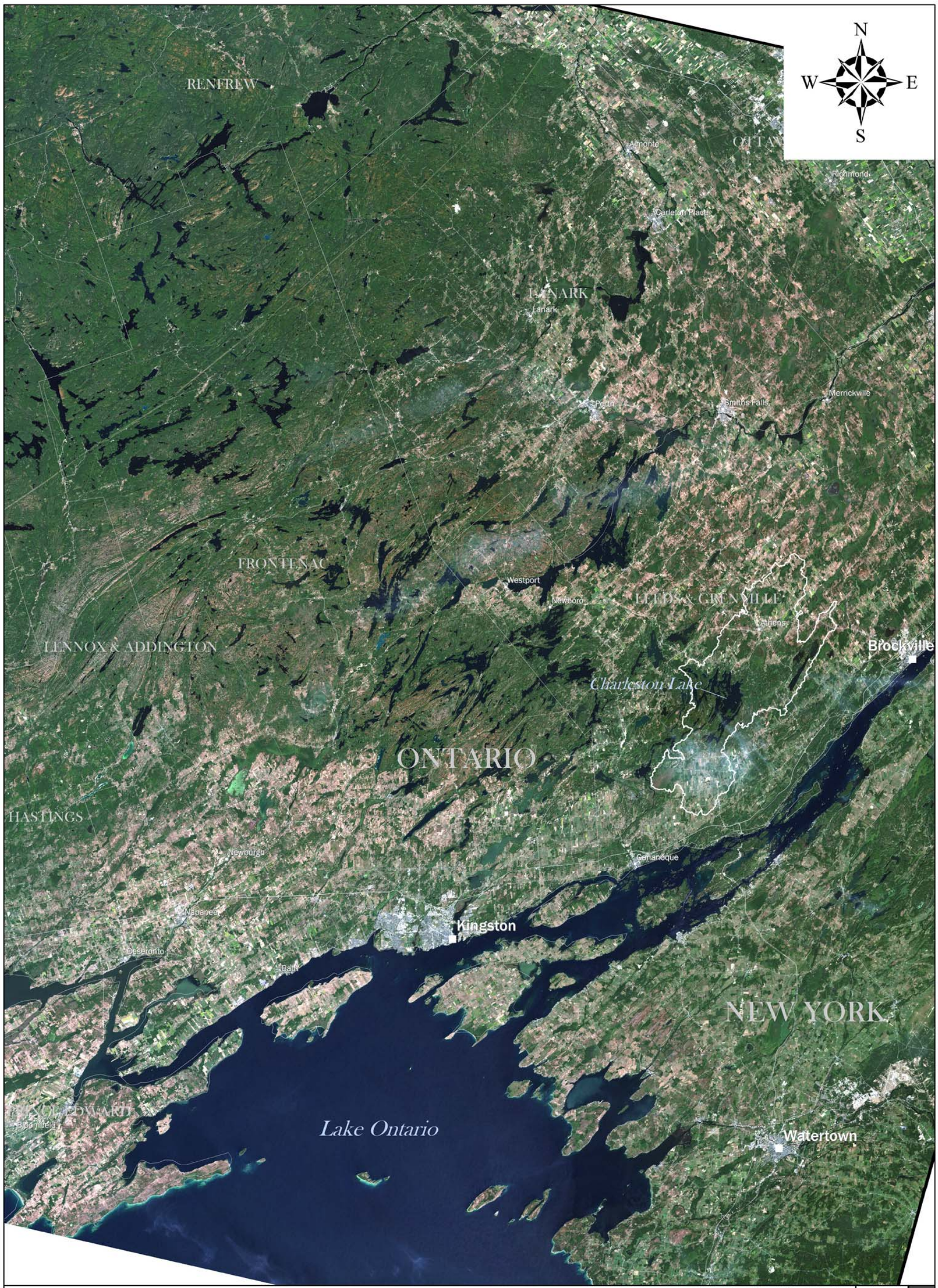
Latitude	44º 32' 10"
Longitude	76º 00' 43"
Lake surface area	26.2 km.^{2}
Wiltse Creek Watershed surface area	353.65 km.^{2}
Charleston Lake Basin Watershed Surface Area	286.6 km.^{2}
Inlets	7
Outlets	1
Lake volume	435.8 x 10^6 m^3
Maximum depth	91.1 m.
Littoral zone % of lake	26%
Mean annual air temperature	6º C.

See following maps:

Map 1: Satellite Image of Charleston Lake in the Wiltse Creek Watershed of the Gananoque River

Map 2: Charleston Lake Watershed

Map 3: Charleston Lake Bathymetry and Tributaries



Orthorectified Landsat ETM+ Bands 3,2,1
Path 016 / Row 029
2001/08/25

Produced by EarthSat, distributed by the Global Land Cover Facility,
Institute for Advanced Computer Studies, University of Maryland,

0 12.5 25 50 75 Kilometres

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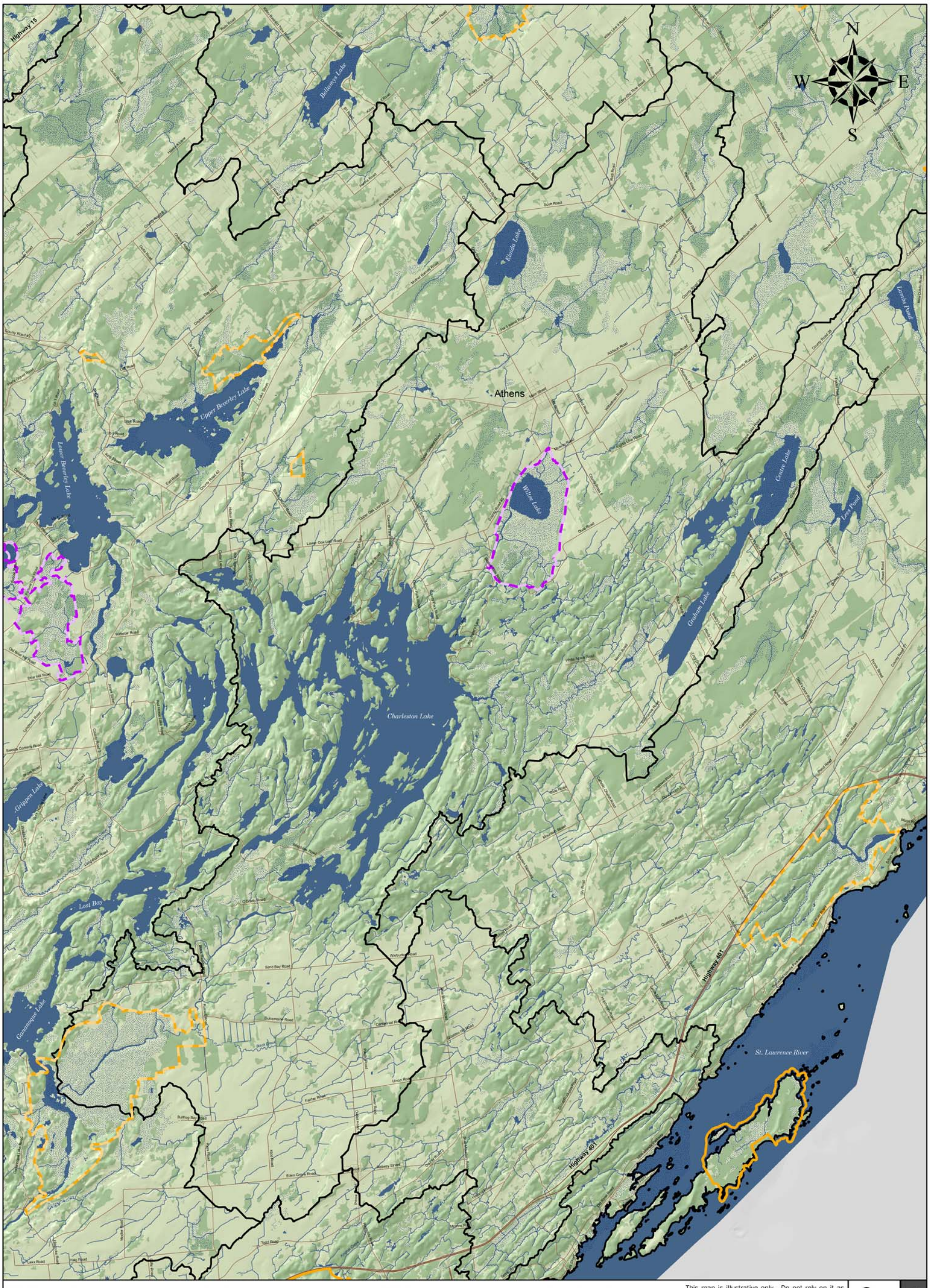
Map 1
General Location

Charleston Lake, Ontario



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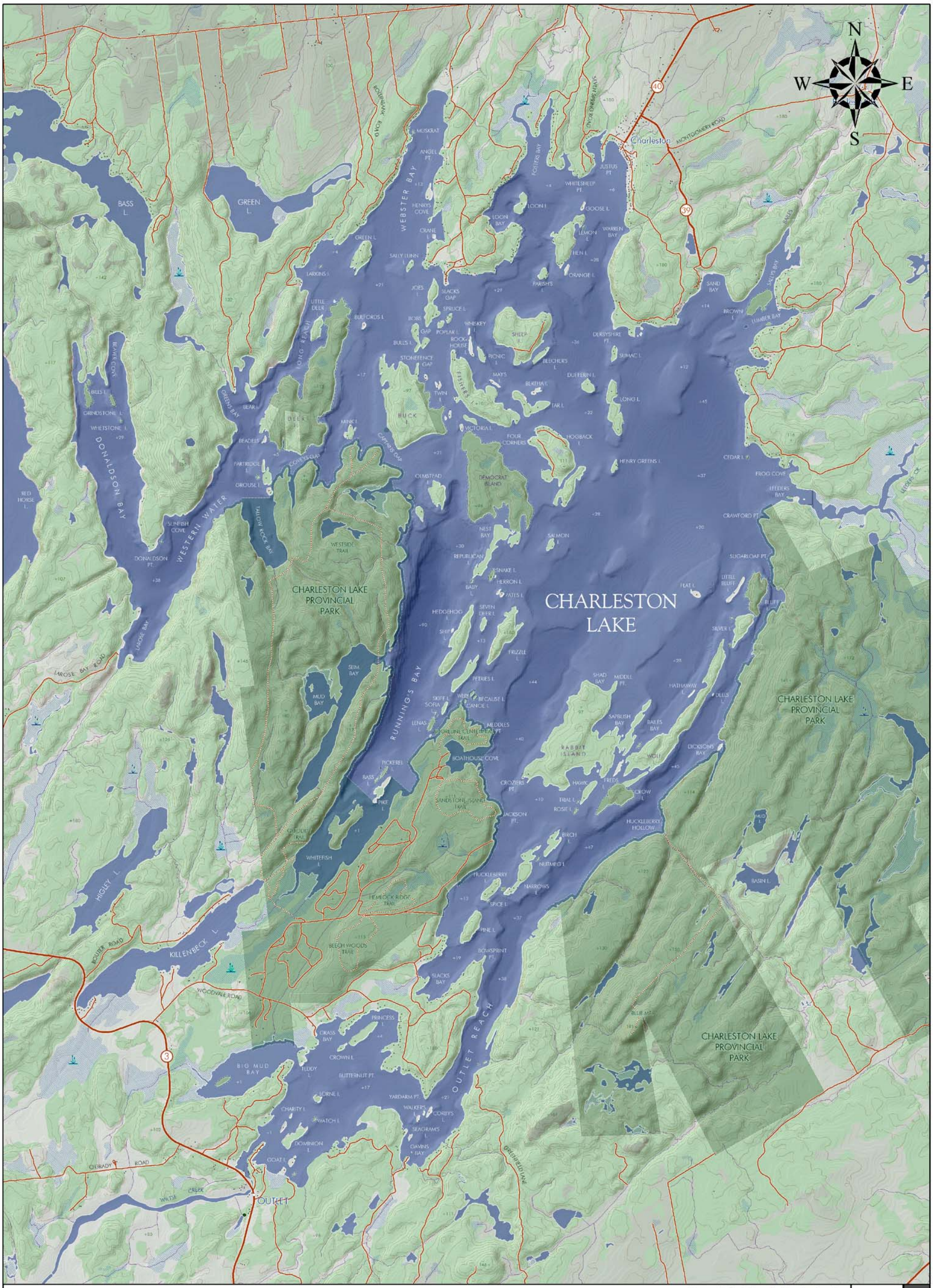
Map 2
Charleston Lake Watershed

Charleston Lake, Ontario



Wooded area
Lake/river
Wetland
County/regional road
Local road
Trail
Stream
10-m contour line
+85 Spot height/depth (m)
Building

0 2.5 5 Kilometres

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Map 3
Lake Bathymetry and Tributaries

Charleston Lake, Ontario

Physical Character

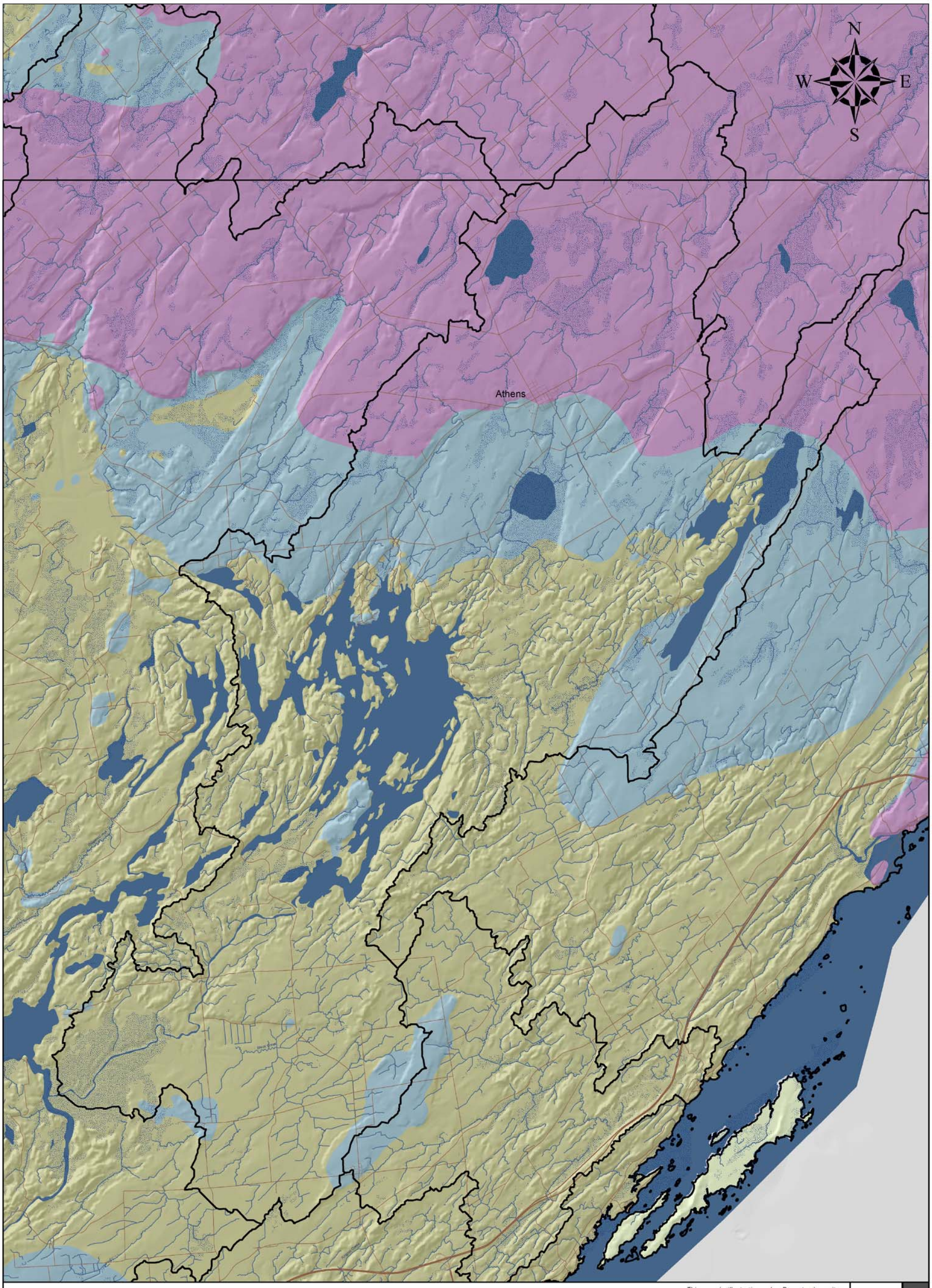
Charleston Lake has an interesting distinction of being cradled in two distinct bedrock types: granite and sandstone. This feature has not only determined the physical shape and characteristics of the lake and its ecology, but has shaped the course of its history and land use as well. For the most part, the southwest end of the watershed is on igneous bedrock and the northeast portion is on sedimentary rock. As a watershed, the region is nearly equally split between the two bedrock types.

Charleston Lake, towards the southwest, sprawls through the valleys of the ancient metamorphic bedrock of the youngest plate of the Precambrian Canadian Shield, known as the Grenville Province. This granite and gneiss and schist bedrock dates to nearly a billion years ago, when shifting plates of the earth's crust collided and pushed an enormous range of mountains into existence. Over hundreds of millions of years, the softer rock of the mountain peaks weathered away, leaving only the "roots" of the mountains; the durable rock cradling the lake today. The northeast-southwest trend of the ridges and valleys belies the orientation of the long-eroded mountains. The shape of the lake is molded by the pattern of the slopes and valleys of the old mountain roots. While glaciers gouged and rounded and deepened and broadened the old valleys over millennia, the topography today is not unlike that of hundreds of millions of years ago.

The softer, layered bedrock found in most of the northeastern watershed are sedimentary forms, or those that formed originally as weathered particles in shallow seas which flooded vast regions long ago. These sandstones consist mostly of weathered particles carried to the seas, but as well some fossilized bodies of the very primitive life-forms of the times. Dating to something approaching 500 million years ago, this softer rock has not endured so resolutely as the harder granites, and the vulgarities of climate and numerous glaciations have worn much away. Even so, there are patches of sandstone around and in Charleston Lake.

Map 4: Charleston Lake – Bedrock Geology

The characteristics and chemistry of the two bedrock types are quite different, and so their presence together significantly lends to the diversity of ecology, and history too. Plants and wildlife are adapted to live best on one type or the other, but when the two bedrock types border each other, there is additional diversity along the border. Land use patterns as we recognize them are quite different on the contrasting bedrocks. On the shield type rock, roads, like waterways, meander in valleys among the hills. Settlements arose strategically at falls of water and transportation routes on the shield, but were less confined on the flatter lands of the sedimentary plains. Shield farms were patterned on that of clay basins in the granite outcrops, where on the flat plains, farm properties could be sectioned and fenced into neat rectangles. In this watershed, much of the Charleston Lake area itself is in granite bedrock, and substantial development in large measure passed it by. Upstream in the watershed, on the more level sedimentary plains, considerably more land was cleared in



Bedrock Geology

- Nepean Formation (sandstone)
- March Formation (dolostone and sandstone)
- Precambrian (igneous and metamorphic)
- Wetlands
- Streams
- Quaternary watersheds

Roads

- Expressway / highway
- Collector
- Local / street

0 2.5 5 10 15 Kilometres

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Map 4
Bedrock Geology

Charleston Lake, Ontario

forestry and in great measure remained cleared for agriculture and community. The geology somewhat divides the watershed into pristine and pastoral; ecological and economic; and beautiful and bucolic categories.

Pickerel Island

The Ecological Setting

In broad terms, the forest region is part of the Great Lakes – St. Lawrence Lowlands Forest Region. A closer view, though, shows an ecology that is extremely complex. Almost all of the forest regions of eastern North America intersect in the Biosphere Reserve, at a unique crossroads of landforms. Here, the ancient Canadian Shield reaches deeply south to the Adirondack Mountains in an hourglass-shaped formation called the Frontenac Arch, flanked by the far younger plains of layered sedimentary rocks. Slashing across the Arch is the St. Lawrence River, connecting the Great Lakes to the Atlantic ocean. The Arch and river landforms became corridors for the short and long-term migration of plants and animals. Plants and animals of the boreal northland, the Atlantic coast, the continental heartland, the Appalachian mountains and the Carolinian south migrate those landform corridors, and interact and intermingle here. As a result, the diversity of our biology, our ecology, is astounding. Not only are the simple numbers of species large here, in the top three in Canada, but the diversity in terms of the geographical ranges of these species is extraordinary.

A climate modified by the Great Lakes, a broad range of soil and rock types and chemistries, a diverse topography of hills, cliffs and valleys, and a range of land uses create a hugely complex physical landscape. This allows a tremendous

number of habitats and niches to exist here, and in turn there are opportunities and the conditions for the multitude of plants and animals that have populated the area from so many other parts of eastern North America.

The highlight of this biodiversity is that a goodly number of the plants and animals here are at or near their natural range limits. For example, almost all of the three-needled Pitch Pine, common on the New Jersey Pine Barrens, is found only in this region of Canada. The same is said of our largest snake, the eastern rat snake (formerly called the black rat snake). Red spruce and wire birch are typical trees in Atlantic coast forests, and reach inland just this far west. Balsam fir, sweet gale and barren grounds strawberry are boreal forest plants that have southern range extensions into our area. There are numerous additional examples of both animals and plants that add to the complexity here.

It is not surprising that because so many species are intermixed and near the ends of their extended ranges, the region hosts a high proportion of species that are designated rare, threatened and endangered. While we hear every day about dire situations for numerous plants and animals around the globe, we need look no further than our own forests and wetlands for species that are equally precarious. At present, there are 32 Species at Risk in the region; a number that while one of the highest in Canada shows the richness of the landscape. These sometimes rely on very precise conditions for their habitat, and as habitats are compromised, species may be lost from that location, and from the region itself. Our stewardship of habitats, however small, can make a considerable difference in the continued diversity of this world-recognized ecology.

Our forests began developing the character we see today about 3,000 years ago. Prior to that time, the forests were evolving through successions of forest types as the continent adjusted to the climate changes following the last ice age. Sugar maple, beech, paper birch, hemlock, red oak and white pine are most numerous, with basswood, red maple, white ash, shagbark hickory, white oak, red pine and ironwood being quite abundant as well.

West-facing points of land and exposed granite ridge tops host species that tolerate the dry and windy conditions. Ground covers of blueberries, sedges and tufts of moss grow on the thin, coarse soil, with pitch pine, June berry and red oak overhead. Broader valleys between the ridges often cradle deeper pockets of clay, left from the old post-glacial lake bottoms. Here, deep-rooted trees such as sugar maple, American beech, Canadian yew and shagbark hickory cast deep shade over carpets of trilliums, dogtooth violets, gooseberry and myriads of other shrubs and wildflowers. Steeper north-facing slopes are cool and damp, favouring stands of hemlock, striped maple, elderberry and polypody ferns. Broad ridges with shallower soil, and often with rock outcrops, host savannahs of white oak, white pine, ironwood, coarse sedges and grasses and many fern species. There are several other community types as well. Alvars—characterized by shallow soils on sedimentary bedrock, with extremes of temperature and wet and dry conditions—are a globally rare habitat found only around the Baltic Sea and Great Lakes, but are nearly 8% of the watershed's habitat types and are found on the lake's islands and shorelines. The waterways, all with their own complex variations of depth, bottom type, currents and slope

lend to the vast array of wetland and aquatic habitats. Therefore, the lake too has surprising diversity. The fish community, for example, has a variety of coldwater, coolwater and warmwater fish species.

At the time this region was first settled by immigrants, the array of habitats was very similar to those of today. The size of trees in those ancient forests, though, were often immense. When the land was cleared, new elements of habitat, such as fields and then old, abandoned fields, made opportunities to new species of both plants and animals. At the same time, though, habitat for some species was substantially reduced. Animal life was perhaps most affected. Timber wolves, moose, woodland elk, eastern cougar, black bear, lynx and martin were among those that could not survive the more limited and fragmented habitats. On the other hand, eastern cottontail rabbits and coyotes expanded their ranges to the region, and whitetail deer and raccoons thrived. Interestingly, as some of the forests age and abandoned fields reforest themselves, there are again occasional sightings of some of the former wilderness residents. There is much to be learned about animal species here, as some of the smaller animals, including reptiles and amphibians, have not been surveyed or studied sufficiently to understand their presence and populations, as well, there are landscape connections and potential for reconnections that may actually see wildlife become more successful in living here.

Land Use

Charleston Lake has been visited and enjoyed, particularly by summer people, for thousands of years. Archaeological finds at rock shelters and portage routes provide glimpses of the lake's early life and times. Settlement of the lake area began slowly in the late 1700s when United Empire Loyalists took up land granted to that immigrant wave from the emerging United States, and then picked up pace in the mid 1800s with emigration from the British Isles. Land was cleared in timber harvest and as farms grew and in those years prospered. The network of roads began to lace the countryside, linking communities and the industrious sites around water-powered mills. But it was in the latter decades of the 1800s when a greater focus came to the lake itself. As North America industrialized, the successful built wealth and began to realize their leisure time. They came out of the cities to revel in the fresh and healthy air, to fish, relax and enjoy a social solitude. Cottaging, tourist hotels, guiding and a building boom came to the lake.

From satellite information, it's now possible to relatively accurately quantify the patterns of land use, development and vegetation cover. A table from the Eastern Ontario Model Forest (EOMF) *Resource Inventory for the Charleston Lake Watershed*, 2003, summarizes that data. Forest cover, including as well alvar and scrub, comprise about half of the watershed area. The other half is about 20% in agriculture, 10% water, 10% wetland, and the remaining 10% is built-up areas, open grasslands such as golf courses and unclassified lands.

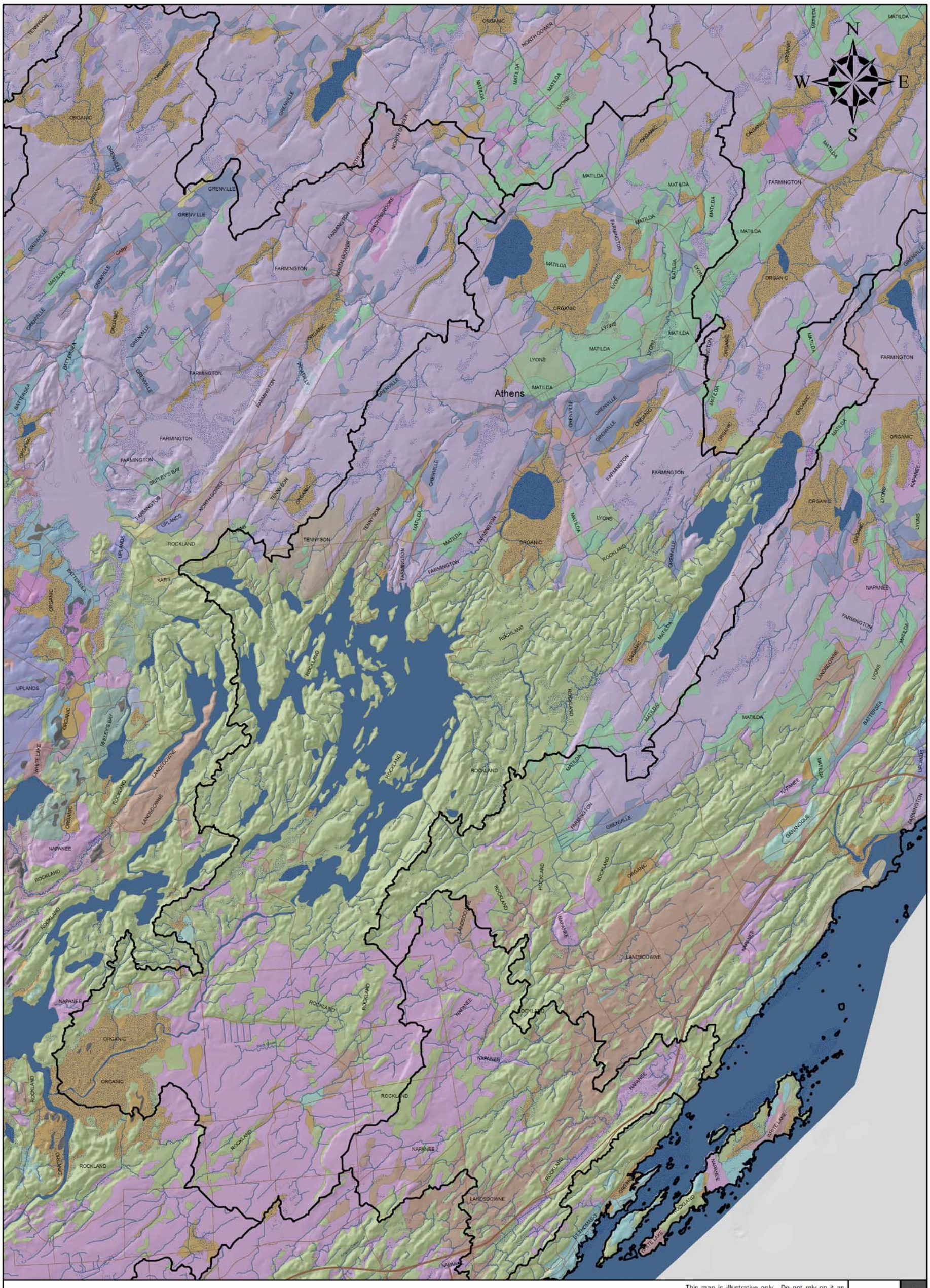
Table 2: Land use in the Charleston Lake Watershed

Land Use	Area (ha)	Area (%)
Built-up	887	3
Water	3432	10
Wetland	3610	10
Grass/golf courses	215	1
Agriculture/pasture	7677	21
Scrub (eg, abandoned farmland)	2047	6
Alvar	2608	8
Deciduous forest	5063	14
Mixed forest	2349	7
Coniferous forest	5859	15
Unclassified	1616	5

Data sources: Parks Canada, MNR Watershed Science Centre

Again from the EOMF source, and noting that the information is about five years old and that some detail may possibly be overlooked, there is data about buildings and other infrastructure that helps in understanding the land use of the lake and watershed, and therefore lake planning:

Map 5: Charleston Lake – Soil Landscapes



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Map 5
Soils

Charleston Lake, Ontario

- There are approximately 4,000 buildings in the watershed. Of these, there are clusters around the village of Athens, along roads, and along the north and south shores of Charleston Lake. In relating all of these to the lake, and excluding boathouses, about 260 buildings were within 15 metres of the shore, about 335 were within 15 to 30 metres, some 80 were 30 to 45 metres from shore, and the remaining 3300+ were 45 metres or more from the lake shore. Knowing these setback distances is useful in understanding issues about buffering, or the "ribbon of life" around the shore.

Map 6: Charleston Lake – Land Cover

- There are some 225 km of paved road, 123 km of secondary roads and 95 km of tertiary roads in the watershed. In figuring road density at metres of length of road per square kilometer of area, the mean road density for the watershed is about 980 m/sq km. As the map of roads and road density shows, highest areas of road density are clustered around the north and south shores of the lake. These roads cross streams 348 times in the watershed; a point of interest again in understanding impacts of development at the lake and area.

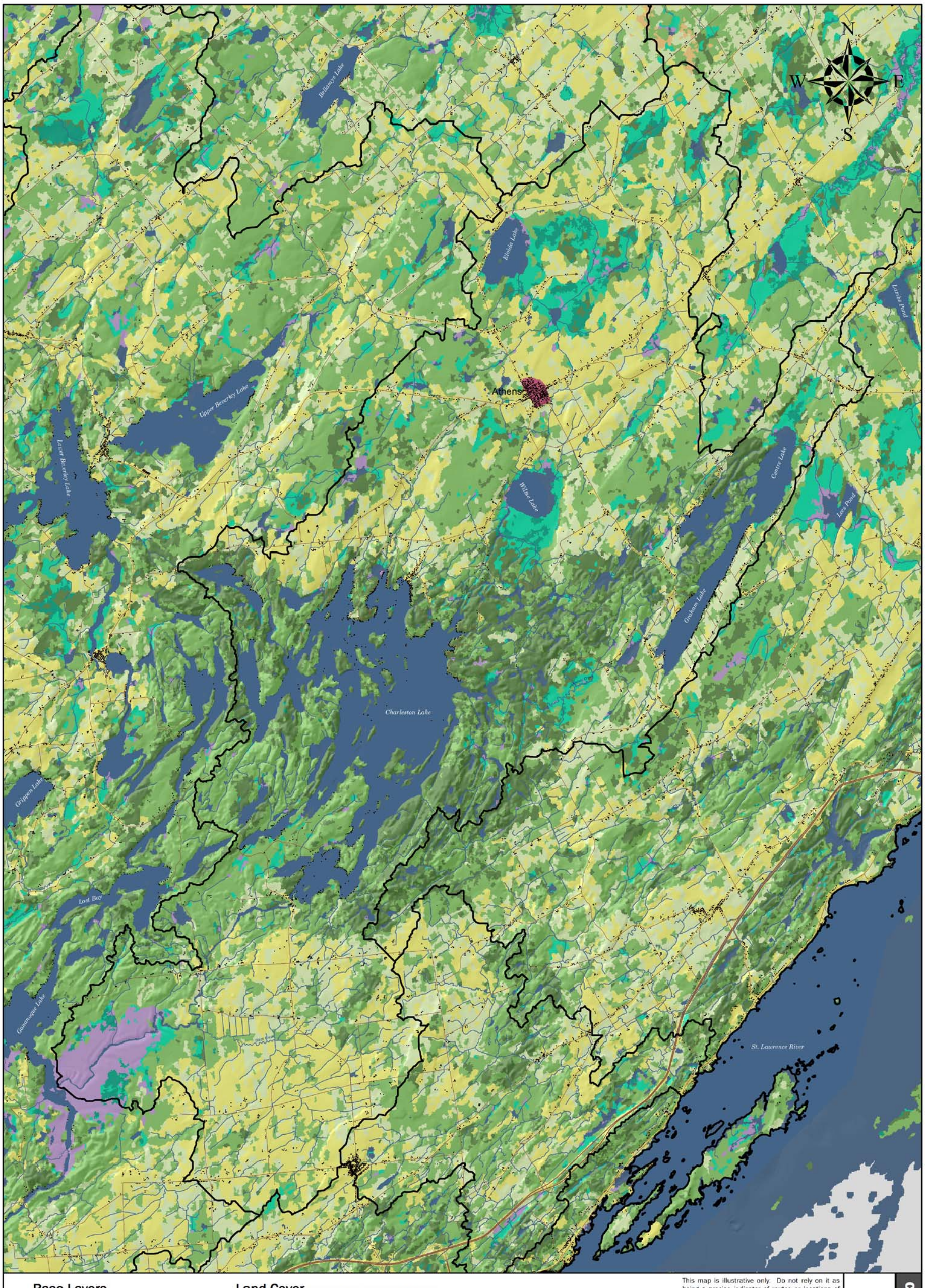
- There is only one waste disposal site in the watershed, and it is located away from the lake north of Athens.

- There are 16 designated pits, piles and quarries in the watershed, with a total area of about .25 sq km.

- The largest single land owner of the region is the province: Charleston Lake Provincial Park; 23.33 sq km.

In summary, development here is largely rural residential, agricultural and seasonal residential. For lake planning, issues and considerations are matters for the community of the watershed, and not heavily impacted by major industry or other external sources.

Map 7: Charleston Lake – Human Infrastructure
Map 8: Charleston Lake – Parcel Boundaries


N
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Bolanova Lake
Eldridge Lake
Lamothe Pond
Athens
Upper Beverley Lake
Lower Beverley Lake
Willet Lake
Centre Lake
Lora Pond
Graham Lake
Charleston Lake
Grippen Lake
Lost Bay
Gananoque Lake
St. Lawrence River
Base Layers
Buildings
Quaternary watersheds
Roads
Streams
Land Cover (Ontario Land Cover Data Base, OMNR c.1992)
Water
Settlement
Mine tailings
Alvar
Forest, coniferous
Forest, deciduous
Pasture
Cropland
Conifer swamp
Deciduous swamp
Treed bog, fen
Open bog, fen
Recent cutovers
0
2.5
5
10
15
Kilometres
This map is illustrative only. Do not rely on it as being a precise indicator of routes or locations of features, nor as a guide to navigation. It has not been designed or certified for planning or surveying purposes, and may contain errors or omissions.
Universal Transverse Mercator
Zone 18 North
North American Datum 1983
This map was designed and developed by the Mapping and Information Group, Eastern Ontario Model Forest. The EOMF is one of eleven model forests in the Canadian Model Forest Network.
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Map 6
Land Cover
Charleston Lake, Ontario

Legend

- Buildings
- Quaternary watersheds
- Roads
- Streams
- Utility lines
- Railway

0 2.5 5 10 15 Kilometres

This map is illustrative only. Do not rely on it as being a precise indicator of routes or locations of features, nor as a guide to navigation. It has not been designed or certified for planning or surveying purposes, and may contain errors or omissions.

Universal Transverse Mercator
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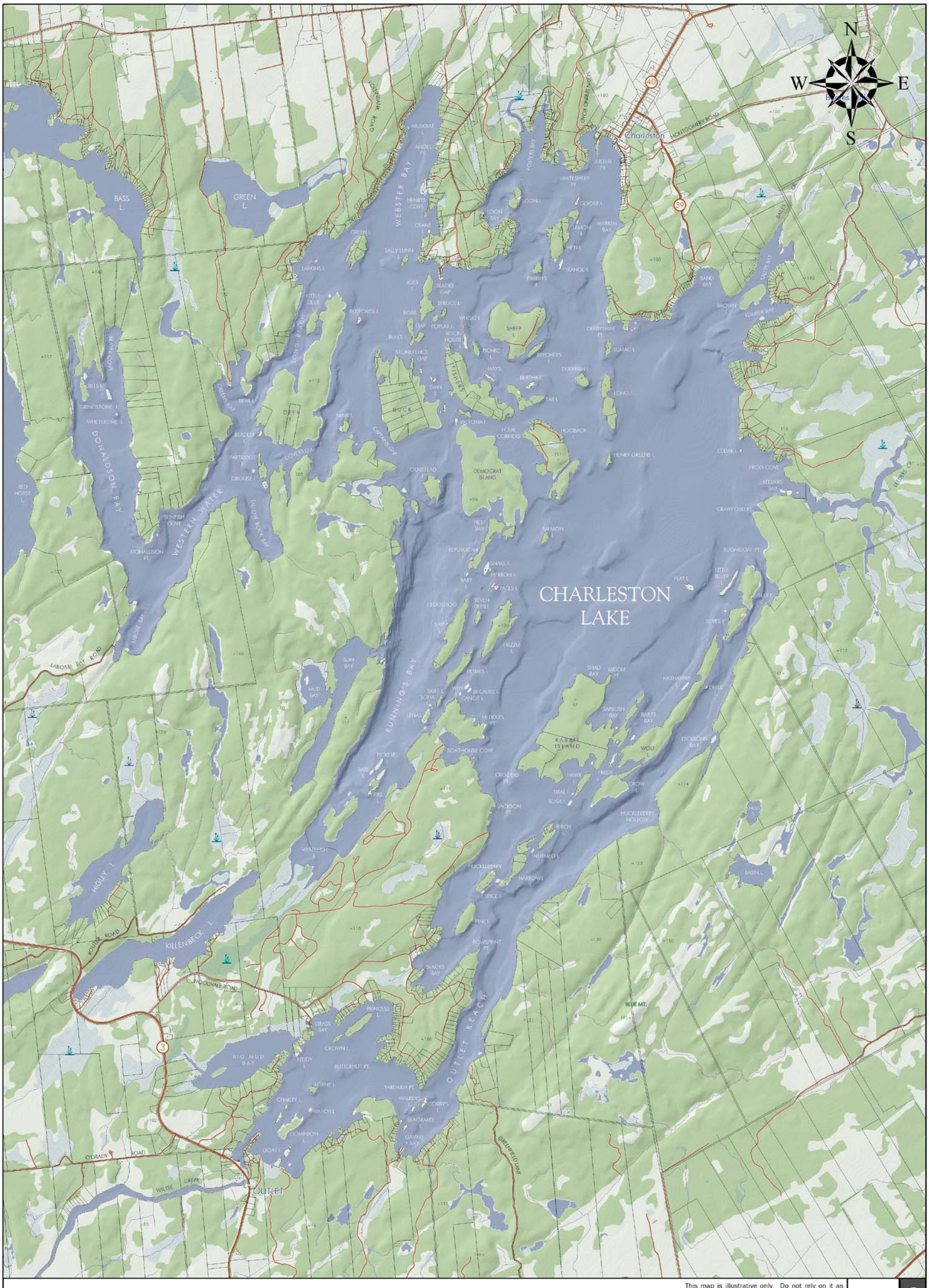
Map 7
Human Infrastructure

Charleston Lake, Ontario



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Universal Transverse Mercator
Zone 18 North
North American Datum 1983

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Map 8
Parcel Boundaries

Charleston Lake, Ontario

Charleston Lake Provincial Park

Charleston Lake Provincial Park is located at the southern end of Charleston Lake, as well as including several islands around the lake. The park is the largest landowner on Charleston Lake. It was officially opened in 1975, as a Natural Environment Class Park. The park now comprises more than 2400 hectares, including unique provincially and nationally significant geological, cultural, and biological features and resources.

Over the past 30 years, more than two million visitors have experienced the charm of Charleston Lake, whether it be camping in one of the three campgrounds or at an interior, backcountry campsite, or a leisurely day visit. Now, more than 100, 000 people visit the park every year. There are three organized campgrounds which contain 238 campsites, and 10 more remote interior campsites, accessible by boat or foot. There are two small beaches, several picnics areas, and a boat launch. The park is a great place for hiking, having 7 hiking trails which comprise more than 25 km. Some of the trails are self-guided interpretive trails with an accompanying interpretive brochure explaining significant natural and historical sites and features. During the summer the park offers interpretive and education programs, as well as a Visitor Centre with informative displays and exhibits.

Photo courtesy of Friends of Charleston Lake

Charleston Lake Provincial is home to and protects a rich diversity of flora and fauna, including a number of rare or at risk plants and animals like the eastern (black) rat snake, Blanding's turtle, stinkpot (turtle), cerulean warbler (songbird), and pitch pine. The park is one of the most geologically diverse provincial parks in Ontario. Historically significant rockshelters can also be found here.

Charleston Lake Provincial Park is committed to the protection of Charleston Lake through the principles and guidelines stated within the current Park Management Plan. The main focus of this Management Plan is protection, including the protection of all park land, park shoreline, and water resources within the park. The park is significant for the recreational and educational experiences it offers, as well as the protection of its many biological, geological, and historical resources.

Photo courtesy of Friends of Charleston Lake

THE ISSUES:

The list of ISSUES listed near the beginning of this plan were raised by the stakeholders – the year ‘round and summer residents, businesses, tourist operators, municipalities, organizations in the region and government agencies. The ISSUES were to form the concerns to be addressed in the plan process, and gave direction and guidance to the planners to come up with solutions, strategies and tasks.

Before those objectives for action plans can be listed, and before strategies and tasks can be presented, some background and in some cases clarification and perspective are needed, Therefore, this next section is a brief synopsis of information from research and study which was used to formulate the plan’s Objectives, Strategies and Tasks. Following this section, the section “Strategic Directions” will present candidate Objectives, Strategies and Tasks. A glossary of technical terms came be found on page 64.

1. Protecting Water Quality

Water quality is identified as the primary concern of shoreline owners and lake users at Charleston Lake. Good water quality is an integral component of ensuring a good quality of life and ecosystem stability. It is influenced by many factors including, excessive nutrient supply, poor agricultural practices in the watershed, poor septic system maintenance, erosion, deforestation, shoreline and buffer strip alteration, urbanization of nearshore areas and over-development.

The CLA and CLEA commissioned a report in 2004 that presents a detailed evaluation of water quality. The report *A Summary and Critical Review of the Water Quality of Charleston Lake, Ontario 1968 to 2003 (Part 1, Volume 1)* contains statistical and graphic presentations of the findings for the trophic state indicators. The sources of the data for this report are the Ministry of Environment, Ministry of Natural Resources, the Cataraqui Region Conservation Authority and the Charleston Lake Association. Of primary interest, related to human impacts on water quality, are the lake trophic status parameters. These include water clarity (Secchi disc depths), chlorophyll a, total phosphorus and oxygen concentrations in the hypolimnion as it relates to lake trout habitat.

Algae or phytoplankton densities are used as an indicator of lake trophic status. Since algae are microscopic plants that contain chlorophyll, a surrogate measurement of the algal density is a measure of the chlorophyll concentration. Chlorophyll is the green pigment in living plants. There is a strong relationship between water clarity, phosphorus concentration and chlorophyll a concentrations: as phosphorus concentrations increase, chlorophyll a concentrations increase and water clarity decreases. If phosphorus concentrations continue to increase, periodic blooms of blue-green algae will occur which can cause toxicity, taste and odour problems. Blue-green algae blooms have been documented on several occasions in Charleston Harbour in recent years. High concentrations of algae and aquatic plants lead to excessive oxygen depletion in the deeper bottom water portions of the lake during the summer stratification period. An average phosphorus concentration in excess of 20 ug/L will lead to high chlorophyll a concentrations and nuisance concentrations of algae.

The findings indicate a moderate decline in phosphorus concentrations over the period of record, with the exception of Deep Water, where there is no apparent trend. It should be noted that changes in analytical procedure may account for some of this decline. Analysis indicates the relationship over the recording is generally very weak.

Study indicated a moderate decline in chlorophyll a over the period of record, with the exception of Deep Water where there is no trend. The regression analysis indicates the relationship is generally weak for every basin.

With respect to water clarity (Secchi disc depths), the trend indicates a moderate improvement in water clarity over the period of record, 1969 to 2003. The regression analysis indicates, however, that the relationship over time is generally very weak. Since the recent arrival of zebra mussels in Charleston Lake, water clarity has improved markedly; this is a result of the zebra mussels filtering the particulates out of the water column, including algae.

There has been considerable effort by various government agencies, including MNR, MOE, the CRCA as well as the Charleston Lake Association to document surface to bottom oxygen and temperature values. Oxygen and temperature data are available for many years over the period 1969 to 2002. The importance of this cannot be understated with respect to the management of water quality for lake trout. Lake trout have optimal oxygen and temperature preferences of $\leq$ 10ºC and $\geq$ 6.0 mg/L of oxygen. Detailed findings are in the above-mentioned report.

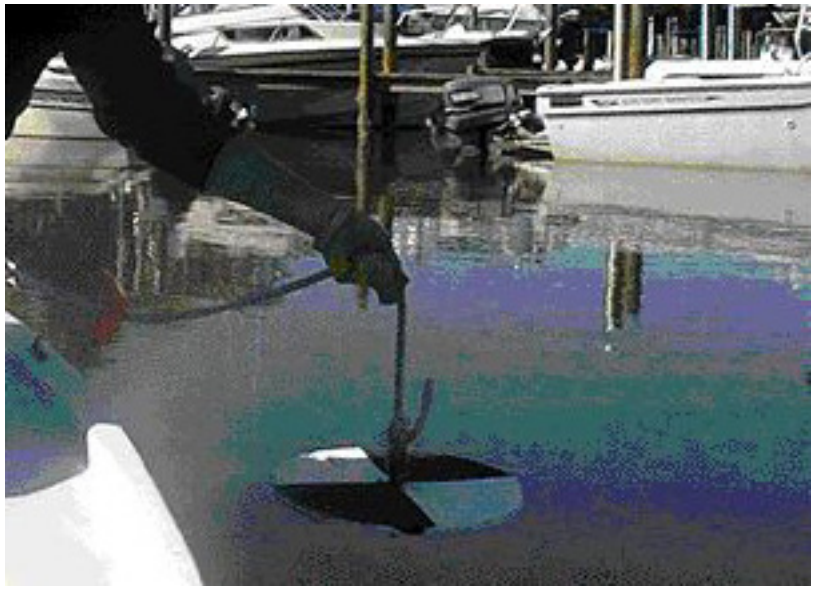
Using Big Water as an example, the water column depth that meets the criteria for optimal lake trout habitat was determined for 53 profiles collected over the period 1975 to 2002. The 6.0 mg/L isopleth remains very deep in the hypolimnion through to the middle of July for most years. There are some years that by late July, optimal habitat is completely gone. By late August for most years, depletion of oxygen has moved the 6.0 mg/L isopleth up to the depth range of 8-12 metres and optimal habitat conditions are completely gone until fall mixing. There is a period lasting greater than two months each year in this basin during which optimal conditions do not exist. As such the lake trout population in Big Water is under less than ideal conditions and some physiological stress from mid August through to the fall mixing period. Deep Water is the only basin that maintains optimal conditions throughout the year.

Based on new research, the Ministry of Natural Resources now proposes an even more rigorous oxygen criteria for lake trout lakes. This requires a volume-weighted late summer mean hypolimnetic oxygen value of 7.0 mg/L. Runnings Bay (Deep Water) is the only individual basin in Charleston Lake that presently meets this objective.

Water Quality Summary

Analysis of the data shows that there has not been much change in water quality over the 34- year period of record-keeping. Conditions of total phosphorous, chlorophyll a, and water clarity have not worsened, and may in fact have improved very slightly over the period of record. The mean values for each of these parameters for the period indicate that Charleston Lake would be classified as mesotrophic. Nonetheless, phosphorus values are high relative to most lakes managed as lake trout waters.

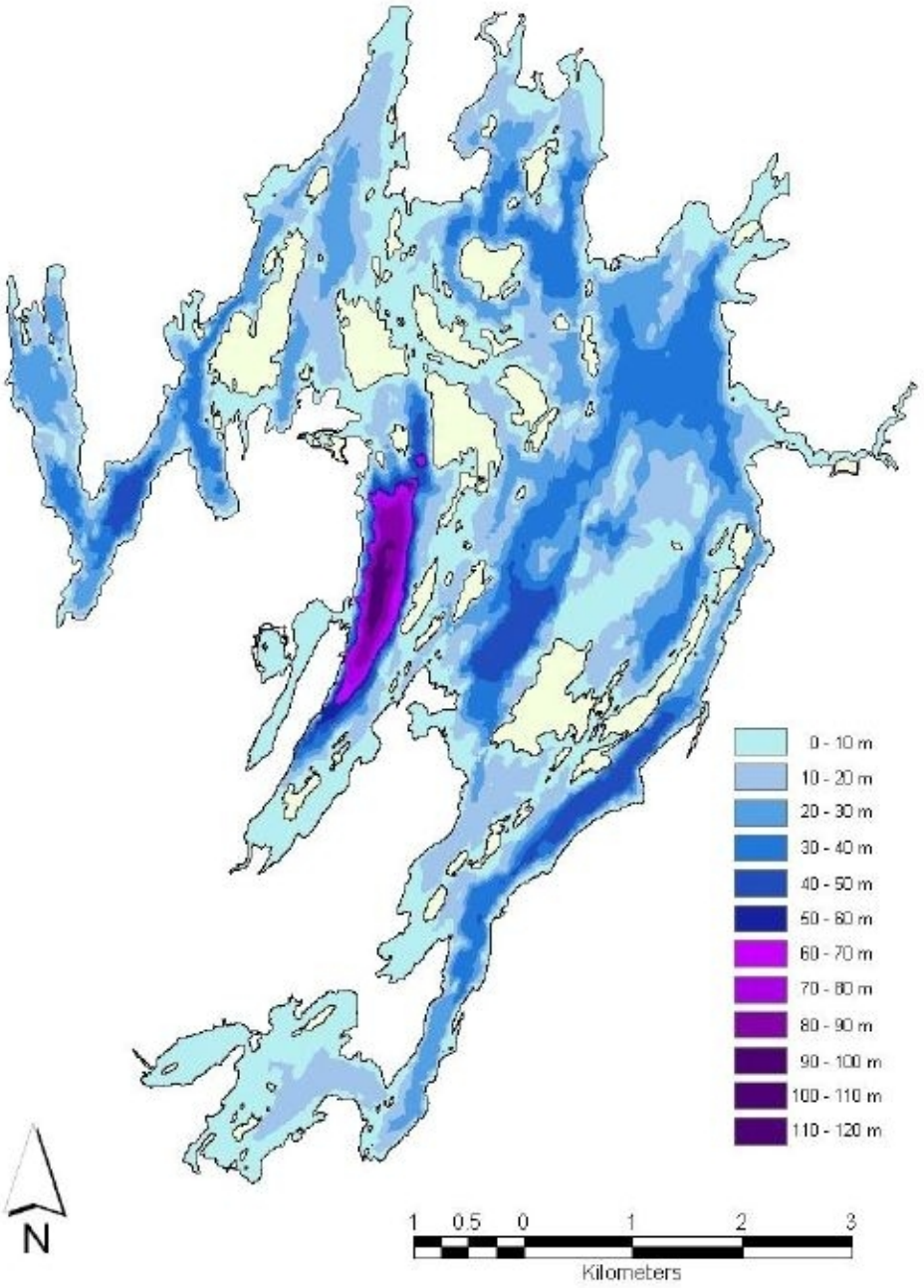
The most critical to water quality for Charleston Lake is oxygen concentrations in the hypolimnion of each of the basins. The oxygen and temperature data set is substantial and covers the entire period from 1969 to 2002. Examination of this data reveals that Runnings Bay (Deep Water) is the only basin in Charleston Lake that maintains optimal conditions for the existence of lake trout. Each of the other basins demonstrates that on an annual basis optimal conditions are depleted to zero by the middle to the end of August. Lake trout populations in these basins are considered to be under physiological stress for a period of up to two months until the fall mixing period restores oxygen conditions.



Secci Disk

Charleston Lake Bathymetry

Water depth in metres



2.0 Maintaining Healthy Fisheries

Protecting, maintaining and enhancing the fishery was identified as of primary importance to property owners. Fishing ranks as one of the important recreational activities while at the lake. It is as well an important economic resource for local businesses. In this, Canada's most southerly lake trout lake, lake trout are strongly identified as a key species, and related to water quality.

Over the decades, management of the fishery has been extensive. The efforts can be categorized under four headings: creel surveys, stocking efforts and spawning assessment, netting surveys, and fisheries management strategies. A comprehensive historical review of fisheries management efforts was undertaken by the Charleston Lake Association. It is presented in the report *A Summary And Evaluation Of The History Of Efforts To Document And Manage The Fishery Of Charleston Lake, Ontario May 2004 (Part 2 , Volumes 4 and 5) available at the Charleston Lake Association Office.*

Stocking efforts have been underway since 1893 and continue to the present. There have been innovative efforts to re-stock with Charleston Lake native strain lake trout since 1987. Creel surveys began in the early 1950s, with the most intensive efforts in the 1980s. Creel surveys have identified overexploitation as a major concern. Netting surveys to evaluate population health and status have been underway since the mid-1960s, and continue at present with standardized spring littoral index netting (SLIN).

Fisheries management has included reducing the harvest of lake trout through fishing tackle restrictions, reduced catches and shortened or closed seasons. Management strategies have also included efforts to protect habitat threatened as a result of water level drawdown, and through controls on shoreline development practices. From the mid-1970s, the agencies (MNR/MOE/CRCA), the Charleston Lake Association and the Biosphere Reserve have worked with the municipalities to encourage measures in Official Plans to protect against nutrient loading and loss of fish habitat through shoreline alteration.

<u>Stocking Programs</u>

The stocking of non-native trout stocks has proven to be disruptive to native stocks. Non-native stock can dilute the gene pool of the native population, reducing their adaptability to a changing environment. Introduced yearlings forage on the fry of native fish. And, this stocking has increased the incidental angling pressure on native fish. The evidence on Charleston Lake is that the Lake Manitou strain lake trout used in stocking programs do not appear on the spawning shoals in any numbers, and therefore pose a low risk to dilution of the native gene pool. However, the Manitou yearlings are still able to forage on native fry. An innovative stocking program using Charleston Lake native strain lake trout was begun on an experimental basis for rehabilitation purposes in 1987. This effort hoped to increase the contribution of native stocked fish to the spawning population, as well as maintaining the recreational fishery. At first, this appeared to be very successful.

However, continued monitoring has shown a decline in the lake-native population and an increase in stocked hatchery-raised lake trout on the spawning shoals as well as in the netting program and angler surveys. There are concerns regarding the continued decline of the natural, lake-raised lake trout stock.

An unfortunate side effect of supplemental stocking is an increased angling pressure which results inadvertently in overexploitation of native stocks. A second but equally serious problem is that stocking can potentially increase the top predator population to numbers beyond the sustainable yield of the food supply, resulting in the overgrazing of the forage base. In Charleston Lake, excessive stocking maintains a harvest level that is ecologically non-sustainable. If the forage base collapses, then the lake trout population will collapse as well.

New studies show that lakes with native reproducing populations produce angler catches 2-3 fold higher within 6 years of curtailment of stocking. Natural native populations rebound quickly when stocking ceases. It takes 5 -7 years for introduced hatchery stocks to disappear. Now, MNR management direction is to curtail supplemental and rehabilitation stocking of wild stocks. While stocking formerly lead to unsustainable excessive harvest expectations, current management strategies promote sustainable yields of native reproducing populations. Recommendations at this time would phase out all stocking, including hatchery-reared native strains, by 2007. To monitor the results of discontinued stocking, Charleston Lake needs additional spring littoral index netting (SLIN) surveys and more creel surveys to confirm the projected increase in native stocks.

Habitat Loss

The MNR, MOE, CRCA and CLA continue to have input into the Municipal planning process to have sound planning principles to address the problem of urbanization of lakeshores. With urbanization comes increased nutrient loading to the lake and potential loss of critical fish habitat along shorelines. Increased nutrient loading is indirectly responsible for increased oxygen depletion and loss of lake trout habitat as a result.

Bass Fishery

Early season angling continues to be problematic, with respect to removal of adult bass from nests. This results in the subsequent loss of young to predation, when other fish are free to raid the unguarded nests.

3.0 Controlling and Planning for Future Development

Controls on present and future development protects not only the natural ecosystem, but also prevents urbanization of the shorefront. Development needs to be sensitive to the ideals of living with nature in a sustainable way, while at the same time maintaining the natural beauty of the lake.

The intensity of development and land use along the shoreline and in the watershed as a whole has a direct impact and role in determining the health of the ecosystem. In addition, the type and density of development plays a direct role in determining the economic value and owner equity of shorefront property. In areas where the natural ecosystem along shorelines has been “urbanized”, both water quality and the value of properties will decline.

There was a time when summer residences were few in number, and for the most part quaint in character. Considerable effort was required to reach Charleston Lake, but with the advent of automobiles and improving roads, and an increasingly affluent society, cottaging at the shoreline has become evermore common. Long-time residents state that enjoyment of the lake is tied to remembrances of their youth at the lake, the quiet solitude and clear natural starlit night skies. They identify with good fishing, clear waters, and wildlife sightings as important aspects of the lake experience.

The adoration of the lake and a desire to share this experience with family and friends has itself ultimately lead to more development. As well, the demand for recreational properties continues to soar, with no sign of slowing, as city people—many first-time cottagers—look to urban escapes. A study of building permits issued in the last decade, as documented in the Township of Leeds and the Thousand Islands Official Plan, reveals that the majority were for redevelopment of properties, particularly on waterfronts. Existing properties are seeing an increase in the level of development. Along with this comes, in many cases, loss of habitat especially between the cottages/ houses and the water’s edge. New lawns, landscaping, decks and patios, lighting, larger docks, driveways, auxiliary structures—all add to what is becoming an increasingly suburban development.

Quite possibly, the scale of and trends in development may come in part from a lack of knowledge of the critical nature and sensitivity of the ecosystem as it relates to the quality of water, presence of wildlife, scenic natural vistas, and other values as expressed in surveys. Municipalities have viewed seasonal residences as a source of tax dollars, while having to provide a minimum in services. Coupled with this thinking too was a lack of understanding by government agencies of the impact of uncontrolled development on the lake ecosystem, including of course water quality and fisheries. By the early 1970s, it had become obvious that life at lakes was changing. Increased boat traffic, over-fishing, removal of shoreline vegetation, damage to littoral zone fish habitat, increased nutrient supply from lawns, inadequate and failing

septic systems, high-phosphorus detergents, and development beyond the sustainable capacity of lakes were all problems facing society not only here, but broadly nationwide.

To address some of these problems, government agencies carried out septic system inspection programs, conducted water quality surveys, developed lake models like the Ontario Lakeshore Capacity Study Model. They addressed fishing pressure through netting surveys, stocking, reduced seasons and increased regulations. Many lake associations, including the Charleston Lake Association, have assisted the agencies through water quality sampling programs and with fisheries management projects.

Modeling of Charleston Lake using the Lakeshore Capacity Model was carried out by the MOE and presented in the report, *Charleston Lake - Application of the Lakeshore Capacity Model and an Assessment of Mean Volume Weighted Hypolimnetic Dissolved Oxygen Levels (2005)*. As a result of the predictions of the model, recommendations are to take all practical measures to reduce further nutrient loadings to the system, and to designate Charleston Lake as an "at-capacity" lake trout lake. The planning implications prevent new lots, through either the consent process or by plan of subdivision, from being approved within 300 metres of Charleston Lake. As well, no development will be permitted except on existing lots of record and under strict conditions where a proponent must show that there will be no adverse impacts on lake water quality. The Ministry of Environment position for these requirements has been conveyed to the Municipalities, to be included in their Official Plans.

Other Factors

The workshops and surveys in 2002 identified that the ability to view and enjoy the night sky as important. Excessive artificial lighting detracts from, and even prevents seeing stars and the natural skyline horizon across the lake. Problem lighting includes spot and floodlights directed at docks and over the water, boathouse lights, high-wattage and unshielded yard lights, excessively bright pathway lights, and lighting left on from dusk until dawn.

Of equal importance was excessive noise from boats, including personal watercraft; and from activities of many types from neighbours and others on the lake.

4.0 Restoring and Protecting the Littoral Zone

The littoral zone in a lake is often referred to as the "Ribbon of Life". It is the space from the water's edge, outwards to the depth of light penetration, surrounding the entire lake. The littoral zone is the most biologically diverse area of the lake. It contains various bottom types, and provides spawning and nursery habitat for many fish, amphibian, reptile and crustacean species, as well as insects and zooplankton. It provides a niche for both the microscopic and larger aquatic plants which collect sunlight in the presence of nutrients, and which produce forage for insects and zooplankton.

Protecting the littoral zone, along with the riparian (land area above the water's edge) buffer zone, is one of the most critically important steps to maintaining a healthy lake ecosystem.

Anglers know the place to catch the most fish is over rocky shoals, weed-beds, and fallen trees of the littoral zone. The fish are there because the habitat is there, providing both food and shelter. Unfortunately, shoreline development often brings serious disturbance and damage to the littoral zone, and subsequent loss of habitat.

Many people—quite likely uniformed, and not ill-meaning—feel that they can "improve" or clean up the littoral zone by removing a weed-bed, filling the shore with sand, removing rocks for use in a crib dock or breakwall, removing sunken logs or fallen trees, or simply filling low-lying shorelines to gain more property. While any of these at one site will not bring about a collapse of the ecosystem, cumulatively these activities can have an impact on a local bay or the whole lake ecosystem, if uncontrolled. It often comes as a surprise to them that all of those actions are, without express permission, illegal under the Fisheries Act.

Combined, the littoral zone and the terrestrial riparian area, contain the most biological diversity of any other features on the landscape, unfortunately these same features are often subjected to alterations that destroy them.

The reason people go to the lake is to enjoy the water and the lakeshore: the focus of most human activity at the lake is the near-shore area. The residence, the dock, boat ramps, boat houses and boat ports, the swimming area, shoreline stabilization efforts, breakwalls, lawns, buffer strip tree and groundcover removal all play a role in habitat loss in the littoral zone. The agencies that are mandated to protect water quality, fish and wildlife habitats and pubic health include MOE, MNR, DFO, Conservation Authorities and the Health Units. Each recognizes the importance of protecting this "Ribbon of

Life", and have developed regulations towards their mandate. Likewise, shoreline residents are becoming better educated about their individual impacts and roles in protecting the lake ecosystem.

Charleston Lake residents in particular have taken positive steps to become involved with restoration of their shorelines. Shoreline reviews have been conducted on the majority of properties with a view to identifying good practices and poor practices that have ecosystem effects for each property. The *Charleston Lake Healthy Shoreline Review Handbook* was provided to each property owner. It contains site-specific information for each property, plus additional educational material for future reference.

Water levels are an often discussed matter at the lake, particularly towards the end of summer when they drop, and in spring when they rise to highest levels after the winter thaw. There is a single outlet for the lake at, appropriately enough, the village called Outlet. The lake level has been controlled for about 120 years by a dam at Outlet, which was placed by the Gananoque Light and Power Company, now Fortis Power, in 1886. This was just one of a number of water level control dams placed by the company, to ensure more even and prolonged flows for hydro electric power generation. The damming raised the lake level by 1.2 metres, creating variations in the shoreline, where some points of land became islands, new bays were formed, low-lying land was submerged and some shoals became less hazardous to boaters while others came into being. 120 years, if you are a shoreline, is very little time. Shoreline vegetation communities were altered, as plant and animal communities adjusted to the new edge of the lake. Soil erodes easily into water, and whereas soil around the original levels had long ago been stabilized by the mesh of plant roots, soil today may still be washing out from the younger shoreline plant communities. That erosion is compounded by the wake, abnormal to the natural balance of nature.

Unchecked by controls such as the dam, the lake level of centuries past varied considerably from season to season, and year to year. The variations from spring highs to late fall lows provided something of a flushing effect for the lake, and as well would have kept some shallower bays from filling in with marsh plants, because the shoreline was constantly/annually being flooded and dried out. Today, the variations in the lake level are an annoyance to some, where fixed or solid dock and boathouses are concerned. On balance, however, change to the levels are beneficial, and part of cycles in nature.

5.0 Responsible Boating

With the increased demand for recreational and lake access comes the inevitable increase in watercraft on the lake. There is often opposing opinion between user groups, with sailors, sail-boarders, canoeists and kayak users often at odds with power boaters. Even within power boaters, there are horsepower or big boat – little boat groups who are at odds. Regardless of any point of view, the increased size, speed, numbers, traffic volume and variety of boating types leads to competition for space, the increased probability for accidents, and with some types, engine noise, some pollution and wake damage to some shorelines - particularly wetland areas.

Boating is widely pursued as a recreational activity. As a result, boating results in or contributes to a number of problems including, noise, pollution and safety issues. At Charleston, as all across “cottage country”, the overall number of boats and now PWCs, in addition to their speed and size has increased over the past few decades. With this increase the need for boating safety and training has become a necessity, and has lead to the Boating Certification Program. The new boat operator licensing provides an opportunity to educate boat operators about safe handling as well as potential hazardous areas.

There is much discussion about the pros and cons of two-stroke outboard engines verses four-stroke engines. The Environment Canada Environmental Technology Centre reports that a two-stroke engine will produce twelve (12) times as much toluene, xzylene, ethylbenzene, benzene, and will release five times as much oil and grease as does a four-stroke outboard. Two-stroke outboards also produce 50% more carbon monoxide and fifteen times more unburned hydrocarbons than the 4-stroke engine. There is, however, a new technology in two-stroke engines with significant improvements over their ancestors. There is no information about the impact of boat emissions specific to Charleston Lake. The standard of emissions for outboard motors is established by the U.S. Environmental Protection Agency, with all new motors to meet tougher standards by 2006.

Wake impacts can be significant in terms of erosion of shorelines, damage to wetlands and injury to wildlife, as with swamping loon nests at water level. Much of the shoreline on Charleston is bare granite rock or granite boulders, and therefore wake damage to such shorelines is minimal overall. It may be significant in other cases, where there are gentler gravel-covered slopes and where maturing forest cover has allowed soil to be created and accumulate. In these latter cases, the normal network of tree and shrub roots would bind the soil and let healthy vegetation grow to the water’s edge. Where shoreline development has cleared the vegetation, and/or where boat traffic is heavy, erosion occurs. Narrow access channels from one major basin to another act to focus boat traffic at these sites. Sediment and nutrient aid and

accelerate the growth of algae and aquatic plants, reducing clarity, abrade the delicate gills of fish, and smother the eggs of fish and small aquatic organisms that are basic to the food chain. Wake damage to docks and shorelines in some locations may be problematic.

Photo courtesy of Charleston Lake Provincial Park

6.0 Keeping Ecosystems Healthy

Healthy ecosystems are of course the cornerstone to healthy socio-economic conditions. History has proven that ecosystems collapse where deforestation, overfishing, over grazing and uncontrolled development has taken place. Socio-economic decline is directly linked to unstable ecosystems.

Lakes are the receivers of everything that happens upslope and upstream in their catchment area, or watershed. As lakes become overdeveloped and shorelines become urbanized, there are impacts such as decreased wildlife populations, lowered water quality, littoral zone alteration, deforestation of shorelines, excessive angling pressure, introduction of exotic species etc.

Even on undeveloped lakes, there are outside effects that can alter their state of health. Atmospheric-borne contaminants such as acid rain, mercury and phosphate, airborne chemicals such as DDT still used in parts of South America; and factors such as global warming can alter the conditions of environment and ecology. While we might expect that lake ecosystems would still overall be healthier at undeveloped lakes in undeveloped watersheds, we know that ecosystems begin to change as soon as humans begin to arrive. Not all human impacts need be described as negative: we have the knowledge and capability to become less obtrusive in the ecosystem, if we choose to inhabit it in a sustainable manner.

Volunteers, peregrine falcon recovery project

Unfortunately, some human impacts are accidental and unwitting. The introduction of foreign species such as the zebra mussel and Eurasian milfoil, the over-stocking of fish not native to the lake and non-native strains of sport species, excessive nutrient loading, incremental alteration to and loss of spawning and nursery habitat in nearshore areas—all bring stress to an ecosystem. The good news is that all of these stressors can be prevented and often times reversed. It may be through regulation, but the most successful can be through dedication and good stewardship.

All ecosystems are incrementally weakened as they are diminished in size. Here, size not only matters—it's critical. Bigger is always better. A bigger patch of forest has the ability to host greater numbers of species, and greater numbers of any of the species individually. A bigger patch may have enough interior size to host species that are deep forest, non edge-dwelling species. For example, scarlet tanagers only live in deciduous forests well away from the shrubby exterior

perimeters of a woods. The same principles apply to lake habitat, as where large healthy basins in the lake can hold more lake trout than can the small basins. And, the more of the basins that remain healthy or which are restored to better health, the more likely it is that the native population will continue and thrive. If the lake trout is the so-called “canary in the coal mine”, then their health means a more healthy environment overall.

Around the shoreline, increased development and increased density of development means that the woodlands and their patch size becomes smaller and more fragmented. Lanes, lawns, driveways—all reduce the effectiveness of the woodland to function as a continuous unit. A question that is often asked is “how much habitat is enough”, as if there might be a number or percentage where development can be targeted to reach, but to avoid exceeding. The question might better be phrased, in considering the health of ecosystems, as “how much development is enough”, where the integrity of the ecosystem is the goal. Development is not a bad thing, but if the values of the cottage life are high qualities of water, wildlife, tranquility and all others listed in the Value section at the beginning of the Plan, then the qualities of the development should dovetail with values of the lake and experience itself.

Invasive Species

Invasive species are those which are introduced from other eco-regions, and which become established in other ecosystems. In many instances, invasive species can disrupt the ecosystem into which they are introduced, sometimes displacing a native species to the point where it is lost as a contributing member of the community. This is one of the most serious threats today facing ecologies throughout the world.

Zebra Mussel

At Charleston, most are aware of a number of prominent invasive species. The native American elm has all but been lost to woodlands because of the fungus carried by Dutch elm beetles. The broad shady canopy that elms once spread over the mature forest has not been replaced, and has allowed more sunlight to reach forest floors, altering groundcover. Purple loosestrife out competes native marsh plants, such as mint species, and reduces the number of native and accustomed forage plants. Zebra mussels are making the water more clear, but to the potential loss of native clams to the food chain, let alone to their impact on swimming areas and water systems.

These species, and pigeons, English sparrows, starlings, carp—all have moved in, and will not likely be moved out. Some of the invasive species that may yet arrive here could be kept from disrupting the lake ecology, if they were kept out. Live bait handling, boats trailered from other regions, “imported” firewood—all have potential of bringing in invasive species. Watchfulness against such practices is key, as is education of prevention measures.

Climate Change

Global warming is an established fact. Studies of pollen in bore samples taken worldwide show that while before the last ice age the climate was rather unsteady over time, climate has been remarkably stable in the ten thousand years since the last glaciation. Measurements of climate trends since the industrial revolution in the mid 1800s, though, has showed a clear and gradual rise in global mean temperatures. Weather patterns aside, the climate change at the region ecological level means that populations of some of the species we currently know are going to change.

Predictive models show that southern species of plants and animals will move northward, and northerly-tending species will not survive or compete as well with the advancing southerners, and “retreat”. As example, over the next several decades, shagbark hickory, near its northern limits here now, will likely extend into the present-day boreal well north of Algonquin Park. Southern flying squirrels, once a rare southerner here, have already settled in to the Temagami area.

A concern at Charleston Lake is the overall warming of the lake. Lake trout have an ideal summer temperature range of 9 – 13º C, compared to northern pike with an optimum range of 17 – 21º C and pumpkin-seed sunfish at 22 – 30º C. While warming of the lake favours warm water species, it makes for conditions less tolerable for cold water species, such as lake trout. Compounding the situation is that warmer water encourages growth of aquatic plants and algae, which, when they die, consume oxygen—again, additional stress to the lake trout.

Climate cannot of course be changed at so very small an area as the lake, but there are contributions to counter change that everyone can make. At the lake and in everyday life, using less energy of all sorts is a positive step. As well, reducing the warm water entering the lake is another contribution. Eaves trough added to the structures and run into a catch basin of stone and plants, or into rain barrels for use in dry spells, would allow the runoff to cool before entering the lake. Planting native shade trees and ground cover along shorelines also cools runoff, in addition to absorbing sediments and nutrients that compound climate effects.

7.0 The Role of Charleston Lake in the Surrounding Landscape

Charleston Lake is an important feature on the landscape of eastern Ontario. It lies centrally on the Frontenac Arch which connects the Canadian Shield to the north, to the Adirondack Mountains south of the St. Lawrence River. The lake lies at the great natural crossroads of Eastern North America, where the Frontenac Arch and St. Lawrence River valley intersect. The migration routes at this crossroads, the two bedrock geologies, the lake-moderated climate, and the rugged topography together create the foundation for a biological diversity that is one of the richest in Canada, and a fundamental reason the region was designated as a UNESCO Biosphere Reserve.

Charleston is part of the headwaters of the Gananoque River System and its watershed empties ultimately into the St. Lawrence River.

While Charleston may be a green oasis in the minds of many, it is not an isolated feature of the Eastern Ontario landscape. The health of Charleston Lake, in every respect, is dependent not only on what happens around the shores, but what is happening throughout the remainder of the watershed, and beyond. And equally so, the health of the environment and community beyond the lake is interdependent with that of Charleston.

The Lake Associations have been both progressive and proactive in their involvement with the community and community of interests of the region. This has resulted in influence to affecting planning and policy, and in increased capacity and knowledge to the benefit of the lake and to the partners that the associations have cultivated.

The landscape in which Charleston Lake is cradled is proving to be remarkably and significantly rich and diverse in plant and animal species. A very basic fundamental of species diversity is that “size matters”. The larger the area and core size of woodlands and wetlands, the more successful and plentiful plants and animals are likely to be. Diversity will go up as these woodlands and wetlands overlap, as the majority of animal species in particular need both terrestrial and aquatic environments at various stages of their life cycles. In the area of Charleston Lake, there is, in comparison with most of southern Ontario, considerable quantities of woodlands and wetlands intact. And, as studies are revealing, the Charleston natural areas are very much linked in great natural corridors with even greater areas of woodlands and wetlands in eastern Ontario. Charleston Lake is part of the ecological landscape of a very vast and significant area, from “Algonquin to Adirondack”; from the Canadian Shield to the Appalachian Mountains.

The role of Charleston in the surrounding landscape, then, is compounded. It has an ecological role, where its health is both dependent upon and contributes to the health of that landscape. It also has a role as part of the community, in social, economic, stewardship and cultural terms. The lake associations have taken important steps in integrating the several roles into the community of the region, and as such have become very important to, for example, the Biosphere Network of the Frontenac Arch Biosphere Reserve. The expression “sometimes a leader; always a partner” is very apt.

Perhaps nowhere in the relationships is there one more relevant than with Charleston Lake Provincial Park. Had that park not been created, for the most part protecting approximately half of the shoreline and surrounding lands at the lake from development, discussions of water quality and environmental health would have taken a very different direction. There is no reason to assume that had the shoreline remained privately owned, the subdivision of property throughout would not parallel the average state of development of the remainder of the lake. The lake trout population may not have survived the probably doubled development.

At the same time, parks are not islands of ecological integrity. The health of the ecosystem within depends on the health of the ecosystem without. Integrated in the community, the lake associations would be increasingly involved in the state and affairs of the park, and the Friends organization of the park.

8.0 The Role of Charleston Lake Property Owners and Lake Users in the Surrounding Community

The community of lake residents is not isolated, but rather is very much a part of the economy and society of the community of the region. And, in the same way, if the ecosystem health of Charleston Lake declines, so too does the health of the community at large.

The CLA must continue to partnership with the community at large, and the agencies and groups that are part of that community, for mutual benefit.

While the lake is an oasis of peace and tranquility, the lake community is not isolated from the surrounding community. There is an interdependence of local businesses for supplies, building materials, marinas, campgrounds, food and medical services. Additionally, social services like churches, community parks and halls, ball diamonds, recreation centers, boat ramps, golf courses and restaurants are all part of the landscape and are used by lake dwellers. In short, both economic and social relationships with the community are mutually beneficial.

The CLA has also worked in partnerships with government agencies like OMNR, OMOE, Charleston Lake Provincial Park, the Leeds and Grenville Health Unit, the Municipalities, and the Cataraqui Region Conservation Authority. Working with these agencies not only achieves the best use of hard earned tax dollars, but also optimizes the use of monetary donations to the Charleston Lake Environmental Association.

The CLA has also benefited from partnerships with non-government groups such as Athens District Secondary School, the Frontenac Arch Biosphere Reserve, the Olsena Fishing Club, the Renegade Bass Tournament Organization, the CHEO Lake Trout Tournament and the Rideau Valley Birdwatchers Association.

The Charleston Lake Association leads where necessary, partners in mutually beneficial endeavours and is always non-confrontational. To maintain a healthy watershed ecosystem, the CLA needs to continue fund raising, continue networking, continue dialogue with the municipalities and continue to partnership with the government agencies.

9.0 Supporting Your Lake Associations

Lake associations were often formed to resolve road maintenance and garbage pickup issues on private roads. In recent decades, other more ubiquitous issues arose—boating pressures, over-development, declines in water quality and fisheries, other sweeping changes—sometimes brought lake road associations, angling clubs and perhaps business associations to combine forces.

Today's lake associations deal with planning issues input and by-laws, do their own water quality surveys, conduct social programs for the community at large, conduct boating safety courses, distribute educational material and communicate more openly and broadly with their membership.

Lake associations' executives are typically volunteers who as well often head up committees to address issues or concerns identified by the general membership. Examples of committee activities are:

- water quality
- social events
- youth programs
- planning
- fish and wildlife
- fire awareness and response
- swimming and boating safety / courses
- preparing a lake plan
- …and, in fact, many of the issues listed at the beginning of this plan

The Charleston Lake Association has evolved into a successful non-confrontational organization. The list of successes is impressive:

- ❖ Conducting water quality surveys annually
- ❖ Completed a review and trend analysis of all the historical water quality
- ❖ Completed a review of all the historical fisheries management efforts to date
- ❖ Completed a lake Carrying Capacity Assessment in cooperation with MOE
- ❖ Assisted with the peregrine falcon introduction

- Completed Healthy Shoreline Reviews of all properties on the lake
- Assisted MNR in stocking of native-strain lake trout
- Prepared a successful application for Trillium Funding
- Built a Resource Centre
- Reviewed and commented on the Official Plan for the Township of Leeds and the Thousand Islands
- Introduced a Neighborhood Watch program
- Introduced a Group Insurance Program
- Provided members with information on property assessment and tax issues
- …and many more ……

The achievements of the Charleston Lake Association cannot continue without the dedication of a large number of volunteers. The efforts of many make projects enjoyable, rewarding, and more successful. Unfortunately, when only a few volunteer, the work can become a burden and efforts and success drops off. Not everyone can donate all of their free time, but many can donate some time and especially expertise to lake association activities, so when sharing the load, projects are successful and the rewards are great.

At no time in the history of Charleston Lake has there been a greater need for volunteers to the Association. With increasing population growth and improved transportation, the demand for lake front properties in eastern Ontario is increasing—and Charleston Lake is a prime destination. This Lake Plan identifies nine key ISSUE CATEGORIES. Each of the categories has one or more Action Plans. Volunteers and committees will be needed to carry out each of these Action Plans, if progress is to be made.

It will require the time, expertise and experience of retired seniors—their connections and contacts, the roll-up-your-sleeves efforts of middle generation, and the energy and exuberance of the young generation to make Charleston live up to the Vision its community has seen for it. There are projects, strategies and tasks for all.

Consider for a moment the project plan for the YOUTH SUMMER PROGRAM FOR NON-POWERED CRAFT. To effectively run this 3-day program one would need a committee of two or three persons. The committee would be responsible for advertising the program in the CLA Newsletter and perhaps the local paper. The committee would also be responsible for contacting the OPP, the Canadian Power Squadron, Scouts Canada, Frontenac Outfitters or other canoe rental / training services in order to get information and ideas. The committee would also solicit from the CLA membership, volunteers to be on-hand and assist for the 3-day course. In addition, the committee would solicit loans of canoes or kayaks for children who do not have them.

Qualified trainers may have to be hired or perhaps be available as college or university students who call Charleston home for the summer and volunteer their time. Scouts Canada may have Voyagers who need community service awards and would provide the training.

After two days of training in safety and paddling skills have a local biologist/naturalist/wetland ecologist or bird watcher join the group on the last day for a brief orientation and then take a day canoe exploratory trip into the Leeder Creek Wetland. Additional adult volunteers will be required to attend on the day trip. At the end of the day have a certificate ceremony and marshmallows; with this will begin a whole new generation of low impact lake users.

Strategic Directions and Tasks…

Landowners, lake users, government agencies and all others all desire a healthy lake and ecosystem, and a reasonable combination of stewardship, regulation and control that will result in a high quality of life for this and future generations. That's very clear from the surveys conducted as part of the planning process. The issues raised and values discussed and parameters studied over the four years of the planning period were varied and complex.

It's also very clear, then, that there is no single course of action that will ensure the kind of future for which everyone would wish. Consequently, and with the Guiding Principles front-of-mind, this plan looks at 25 related but yet distinct Action Plans. If these are embraced by the community that in one way or another is Charleston Lake, we are on the road to realizing the Vision for Charleston Lake. As was the case in the planning itself, everyone must play a part.

ACTION PLANS

The following section of the plan is a set of candidate Objectives, Strategies and Tasks for the community of Charleston Lake. They are drawn from the Issues raised by the many individuals, groups and agencies that were canvassed in questionnaires and workshops over the study and planning period. It should be borne in mind that this plan is a grass-roots endeavour: it does not come from an outside authority, although it benefits from outside expertise. This plan comes from the hearts and minds of the lake community, in its broadest and most inclusive sense. Therefore, the Objectives, Strategies and Tasks discussed next are "living things": open to change, addition, modification, inventiveness, adoption—whatever may be the will of those undertaking to make Charleston Lake a better place. The plan is based on sound information, good judgment and best interests. The Action Plans are only as good as those putting their shoulder into the effort.

1.0 PROTECTING WATER QUALITY — *ACTION PLAN* —

1.1 MONITORING WATER QUALITY

DESCRIPTION:

Water quality will be an on-going concern and issue. In order to be aware of the state of the lake and remain knowledgeable about all aspects of its health, the Charleston Lake Association must continue to lead in this regard and work in partnership with the agencies (MOE, MNR, CRCA), resort operators and the business community to continue water quality monitoring programs.

OBJECTIVE:

To ensure that water quality in Charleston Lake is improved, and to monitor changes over time.

STRATEGIES & TASKS:

1. **Continue monitoring phosphorus and water clarity annually under the MOE Lake Partner Program;**
2. **Consider extra water clarity sampling during the ice-free season on all basins by way of lake steward volunteers; this is needed to monitor the impact of the zebra mussel colonization of the lake;**
3. **Complete intensive oxygen and temperature profile sampling at least once every 5 years during the August 15 to September 21 critical time period; coordinate this effort with the agencies so oxygen and temperature surveys may be conducted by the agencies in the intervening years;**
4. **Raise funds annually and earmark accordingly to pay for monitoring;**
5. **Keep the need for public awareness regarding the impact of phosphorus supply to the lake on water quality and lake trout in the forefront.**

1.0 PROTECTING WATER QUALITY — *ACTION PLAN* —

1.2 REDUCING NUTRIENT SUPPLY from the WATERSHED

DESCRIPTION:

Charleston Lake in area is just slightly more than 7% of the watershed. This leaves considerable room for outside influences on the lake. The lake is downstream, at the receiving end, of the majority of activities on the landscape. Fortunately, much of the watershed is forested and has large wetland (filter/buffer) areas. There are, however, external influences to the watershed and lake such as air quality, development pressures from increased building and road densities and so forth which do impact the qualities of the watershed environment. As discussed in the section on land use, about 20% of the watershed of Charleston Lake is involved in agricultural use. There is a varying degree of nutrient runoff on this land, depending on the type of agricultural practice. In some areas, there is a lessened ability of vegetation along stream courses to absorb nutrient, as when cattle are allowed to feed and water up to and into stream courses. The Charleston Lake Association must continue to be active in these matters, and work in partnership with the agencies (OMOE, OMNR, CRCA, OMAF), municipalities and others to reduce nutrient loading and other manageable negative impacts to the lake.

OBJECTIVE:

To reduce excessive nutrient supply to the lake from all sources to prevent further enrichment and loss of oxygen from below the thermocline, and to other negative impacts from the watershed insofar as is possible.

STRATEGIES & TASKS:

1. **Work in partnerships with farm owners and farm organizations, and with conservation partners such as the Leeds County Stewardship Council, the Cataraqui Region Conservation Authority, the Province and Government of Canada towards conservation strategies as in farm management plans, ways to assist property owners to reforest vacant and marginal lands, and in other remediation efforts to control nutrient migration from the land to inlet streams through conservation tillage, fencing livestock out of streams, and stream buffering;**
2. **Continue with education and assistance to shoreline owners to maintain natural buffer strips along the lake and to re-naturalize shorelines where required;**
3. **Continue to interact with municipal councils towards best planning practices for land use in the watershed;**

4. **Support the municipalities in their implementation of progressive planning principles, zoning by-laws and land management practices that protect against increased nutrient loading, hazardous wastes, and soil erosion; and that encourage source and groundwater protection;**
5. **Develop and encourage partnerships of lake property owners and members of the agricultural community, pairing up these groups for "adopt a stream" projects along the particular water courses where both are affected;**

1.0 PROTECTING WATER QUALITY — *ACTION PLAN* —

1.3 SEPTIC SYSTEM INSPECTION AND MAINTENANCE

DESCRIPTION:

The supply of nutrients from septic systems is recognized by MOE to be one of the main anthropogenic sources of phosphorus. The focus of this project is to improve septic systems on Charleston Lake. Approvals for development and redevelopment continues to be on the basis of septic systems. The Charleston Lake Association must continue to encourage the municipality to be proactive in ways to monitor septic system maintenance if this remains the case.

OBJECTIVE:

To ensure that nutrient supplies and bacterial sources from septic systems are minimized as much as possible, and to support the municipalities and Health Unit to the extent possible in undertaking re-inspection programs.

STRATEGIES & TASKS:

1. **Encourage the municipalities to complete their Septic System Re-inspection Program;**
2. **Continue to educate septic system owners on the maintenance and operation procedures to ensure systems are functioning properly (tips would include regular pump-outs, no chemicals down the drain, setbacks for new or replacement systems as far as possible from the shoreline, no driving or parking over the bed etc.), and to undertake to repair or replace failed and failing systems to a point where they meet or exceed standards and regulations;**
3. **To ensure regular pump-outs, encourage an annual municipal surcharge on the municipal tax bill, as example, $50.00 per year for septic pump-out. When a pump-out occurs, the property owner pays the contractor and then takes that receipt to the municipal office for a full refund;**
4. **Encourage municipalities to apply the highest level of standards of zoning by-laws in site plan approvals for new construction and reconstruction especially as applies to installation of septic systems, setbacks at waterfronts and maintaining shoreline vegetation buffer zones.**
5. **Seek mandatory inspections approval of septic systems when properties change hands.**

2.0 MAINTAINING HEALTHY FISHERIES — *ACTION PLAN* —

2.1 REGULATION AND ENFORCEMENT

DESCRIPTION:

Fishing ranks high as one of the important recreational activities while at the lake. It is also recognized as an important economic resource for local businesses. Creel efforts have identified overexploitation as a major concern. Monitoring has shown a decline in the native population and an increase in stocked lake trout on the spawning shoals as well as in the netting program and angler surveys. There are concerns regarding the continued decline of the natural native stock relative to hatchery reared fish.

OBJECTIVE:

To protect, enhance and maintain a sustainable, healthy fishery.

STRATEGIES:

1. **Support MNR's decision to stop all stocking of hatchery-reared native strain lake trout in Charleston as of 2007;**
2. **Assist MNR with the production of educational material on the effects of stocking and unsustainable harvest on native trout populations. This could be done through seminars and/or the production of a CD or pamphlet material that could be offered to anglers at retail outlets;**
3. **Support the MNR Regulation and Enforcement so that the native lake trout strain can recover;**
4. **Identify through signage and pamphlets bays or sections of the lake that are temporary fish sanctuaries each spring until the opening day of bass season;**
5. **Discourage tournament angling for lake trout;**
6. **Continue to educate anglers about the effects of angling for bass over nests.**

2.0 MAINTAINING HEALTHY FISHERIES — *ACTION PLAN* —

2.2 MONITORING THE FISHERY

DESCRIPTION:

Creel efforts have identified overexploitation as a major concern. Monitoring has shown a decline in the native population and an increase in stocked lake trout on the spawning shoals as well as in the netting program and angler surveys. There are concerns regarding the continued decline of the natural native stock relative to hatchery reared.

OBJECTIVE:

To protect, enhance and maintain a sustainable healthy fishery.

STRATEGIES & TASKS:

1. **Support the MNR in their efforts to monitor the fishery using SLIN netting. This could be achieved by providing dollars to hire a contract field technician(s). Costs could be shared between several different lake associations, and volunteers could assist in field work;**
2. **Contribute to and assist with the stocking of other nearby put-grow-take lake trout lakes (Redhorse Lake) with Charleston lake native strain to direct angling pressure away from Charleston Lake;**
3. **Encourage MNR to do near-shore netting directed at monitoring the health of the warm-water species;**
4. **Assist MNR with creel surveys and/or other methods of determining angling pressure such as implementing an angler diary program for Charleston Lake or a boat count protocol conducted by lake volunteers as an index to angler demand.**

3.0 DEVELOPMENT: CONTROL & PLANNING —*ACTION PLAN* —

3.1 OFFICIAL PLANS and ZONING BY-LAWS – LAKE PROTECTIVE POLICIES

DESCRIPTION:

The Charleston Lake Association has participated actively with the municipalities to update their Zoning By-laws, with a view to protecting the lake environment and ecosystem, and to prevent urbanization of the shorefront. Future opportunities for discussion can continue to reach lake planning objectives.

OBJECTIVE:

To ensure that the municipalities update their Official Plans and Zoning By-laws in a manner consistent with this report and any background reports, reflecting the most recent findings and recommendations of the Province; and to continue to participate actively with the municipalities to update Official Plans.

STRATEGIES & TASKS:

1. **Develop a good understanding of OPs and Zoning By-laws, and identify potential development areas or trends. Review planning and background reports relating to the Official Plans and the implementing Zoning By-laws;**
2. **Work with municipalities to ensure that appropriate standards and safeguards are in place for new and redevelopment proposals;**
3. **Work with municipalities, the Township of Athens and the Township of Leeds and the Thousand Islands, in particular, to ensure that both have similar and parallel zoning by-laws regarding regulation of waterfront development;**
4. **Encourage municipalities to adopt consistent and lake-wide standards for building height, shoreline setback distances, sleeping cabins, percentage of lot coverage, boat houses, vegetation buffers within the 30 metre setback distance, etc.;**
5. **Work with conservation partners and the municipalities to identify and update information on wetlands, conservation zones, ANSIs, fish habitat, special habitats for species at risk and others including loon nesting sites etc. on the Official Plan Schedules, and relevant to Zoning By-Law;**
6. **Support the municipalities and push for planning principles that protect the 30 metre buffer strips for riparian wildlife corridors, nutrient sinks and fish habitat protection;**

7. **The CLA must lend support to the agencies (e.g. OMOE) when progressive planning recommendations are forwarded as a result of new findings such as the Lake Capacity Study that recommends that Charleston lake be considered an "at capacity" lake;**
8. **Ensure that OPs have special provisions to prevent the re-development of small lots with oversized residences;**
9. **Work with municipalities to resolve residents concerns such as garbage collection, fire and rescue plans and private road maintenance.**

3.0 DEVELOPMENT: CONTROL & PLANNING — *ACTION PLAN* —

3.2 SITE PLAN CONTROL

DESCRIPTION:

Site Plan Control (SPC) is a means by which the Charleston Lake Association can work with the municipalities to ensure the proper use and enforcement zoning by-laws regarding development at the lake and watershed.

OBJECTIVE:

To ensure that municipalities use site Plan Control to regulate development and to protect shoreline buffer areas.

STRATEGIES & TASKS:

1. **The Association must develop a good understanding of the current use of SPC to encourage the municipalities to develop and apply SPC by-laws SPC to be used for all new proposed and redevelopment proposals;**
2. **Encourage the use of SPC for the entire lake, and especially in areas adjacent to shorelines, natural features and historic sites;**
3. **Ensure there is provision in SPC agreements that address outdoor lighting, as addressed in section 3.5 below; and work with municipalities towards education programs regarding light trespass issues; for example limiting wattage, directing lights inward and down, shrouding and hours for exterior lighting as in some municipalities;**
4. **Ensure adequate and appropriate wordings in provisions of zoning by-laws and in the SPC Agreements to prevent inappropriate removal of buffer strip vegetation;**
5. **Assist municipalities in implement a monitoring system to ensure that site plan agreements are enforced.**

3.0 DEVELOPMENT: CONTROL & PLANNING — *ACTION PLAN* —

3.3 LAKE CARRYING CAPACITY MODELING

DESCRIPTION:

Phosphorus enters fresh water from rain and snow, upstream lakes, streams and overland flow, and groundwater. Concentrations in lakes are determined by local geology, land-use, lake shape and volume (morphometry), the type and depth of soil in the watershed, and human activity. At lakes like Charleston, without urban drainage, agricultural drainage or point sources such as sewage treatment plants, and waste from septic systems may be the most important human-origin sources of phosphorus to lakes on the Canadian Shield.

In 1975, a conceptual model quantified the connections between natural sources of phosphorus, human inputs from shoreline development, water balance, lake morphometry, and the ice-free total phosphorous concentration of a lake. The model is referred to as “Ontario’s Lakeshore Capacity Model”, or (LCM). The coefficients and input parameters of the LCM are modified as new scientific information becomes available.

The most up-to-date data and modeling methodology was used by Ministry of Environment staff for Charleston Lake in 2005. The findings determined Charleston Lake to be “at capacity”.

OBJECTIVE:

To ensure that the most recent and accepted lake capacity modeling methodology is applied to Charleston Lake.

STRATEGIES & TASKS:

1. **The Charleston Lake Association should stay informed about new developments in lake modeling, and should encourage MOE to apply any new scientific findings and accepted methods to the model as it applies to Charleston Lake.**

3.0 DEVELOPMENT: CONTROL & PLANNING — *ACTION PLAN* —

3.4 NOISE AND LIGHT POLLUTION

DESCRIPTION:

Many responding to questionnaires about issues and values identified tranquility and the ability to view the night sky as important values to residents. Unfortunately, with increased development in cottage country often brings suburban tendencies. The light and sound effects of excessive artificial lighting (area, yard, dock, driveway, walkway lights), lawn mowers, high-power boat motors and personal watercraft, loud music and loud parties carry well across water. Such intrusions are an increasing irritant, and all detract from the raison d'etre of escaping to the lake for quiet and tranquility. Many concerns can be resolved as a matter of common sense and courtesy.

OBJECTIVE:

To prepare a voluntary 'Code of Conduct' for all lake users to make everyone aware of the impact of their actions to others.

STRATEGIES:

1. **Design and promote a "Code of Conduct" through posters, newsletters and stickers;**
2. **Educate boaters about excessive noise on the water, and abatement systems available for engines;**
3. **Educate landowners about techniques and technologies for less exterior artificial lighting and issues of light trespass, and hold special night sky events such as star gazing, night hikes and lake legend storytelling at campfire events;**
4. **Work with municipalities with exterior lighting addressed in zoning by-laws, through Site Plan Control.**

4.0 RESTORING, & PROTECTING THE LITTORAL ZONE —*ACTION PLAN*

4.1 SHORELINE REVIEW PROGRAM EVALUATION

DESCRIPTION:

The purpose of the Healthy Shoreline Review Program (2002-2005) was two-fold: to note the types and amounts of natural habitats at present, and to offer suggestions to landowners on ways to improve shoreline habitats. Protecting the littoral zone and the terrestrial riparian buffer is one of the most important steps to maintaining a healthy lake ecosystem. The program educated property owners about their impact on the lake, and at the same time documenting the state of shoreline environments for future reference.

OBJECTIVE*:*

To determine location and degree to which landowners acted on recommendations, to determine a strategy for future shoreline remediation efforts, and to summarize observations for input to Zoning By-laws of Municipal OPs.

STRATEGIES & TASKS:

1. **From recommendations in the Healthy Shoreline Reviews, re-visit priority areas and sites of the lake to determine the degree to which have been acted upon;**
2. **Conduct demonstration remediation workshops, advertised at sites where landowners are willing, to demonstrate ways of meeting typical recommendations as in the shoreline reviews;**
3. **Establish some of the sites where restoration work has been done as open and signed demonstration sites where landowners may visit to see results and learn techniques;**
4. **Monitor the before and after biological community at demonstration sites and other restored shoreline properties. This could be undertaken in partnership with secondary school science classes and lake association members;**
5. **Continue to distribute educational materials through the CLA Resource Centre;**
6. **As properties change ownership, supply the new landowner with a copy of the property's Healthy Shoreline Review and accompanying handbook, and other educational materials;**
7. **Plan at some future point to repeat the HSR program, particularly in more heavily impacted areas of the lake, to determine the state and rate of progress of shoreline restoration.**

4.0 RESTORING & PROTECTING THE LITTORAL ZONE —*ACTION PLAN* —

4.2 LANDOWNER RECOGNITION

DESCRIPTION:

Awards recognize good efforts and help to promote the values of good stewardship. Awards promote pride of achievement and peer pressure to do the same.

OBJECTIVE:

To recognize and reward good stewardship of the land.

STRATEGIES & TASKS:

1. **Work with landowners through art contests and design to create an award to be presented with ceremony at annual gatherings such as the AGM of the CLA, in recognition of property owners who have maintained, or protected the riparian buffer and littoral zone; or have taken effective action to restore such habitats;**
2. **Provide annually Landowner Recognition Awards to inland property owners who have protected a wetland, restored a stream, re-forested abandoned or marginal land or protected or maintained other natural features of the watershed;**
3. **Provide an annual award to a group who has served the lake community; e.g. a nature group, a school group, or an agency;**
4. **Establish an awards committee to:**
   - **initial design and create a high profile for the award and program**
   - **set criteria and categories for the awards**
   - **publish a request for nominations in the Association newsletter, website and media**
   - **present awards at AGM or other community function (Beef Producers or Soil and Crop Improvement Association meetings, the local fairs etc.)**
   - **ensure that awards presentations are highly publicized in local papers and newsletters**
   - **follow up periodically to ensure award winners continue to merit their awards**

5.0 SAFE BOATING & PWC — *ACTION PLAN* —

5.1 BOATING AWARENESS PROGRAM

DESCRIPTION:

Sensitive habitats, fragile shorelines and wildlife are needlessly damaged throughout the boating season, but damage could be largely avoided through boater education, and related education / communication projects to improve boating safety.

OBJECTIVE:

To make boaters more aware of the impact of their activities on others, and to promote safe boating habits.

STRATEGIES & TASKS:

1. **Encourage more frequent patrol of the lake by OPP to enforce boating regulations;**
2. **Working with or adapting from the Canadian Power Squadron, create a code of ethics, etiquette and boating safety program for Charleston Lake;**
3. **Prepare a pamphlet and shoreline binder insert of materials as in 2. above, to be accompanied with a lake map highlighting sensitive shorelines, wetlands, loon nesting sites and so forth, to be distributed at retail outlets , at launch and marina locations, and to association members;**
4. **Sponsor workshops to certify boaters for their operator cards;**
5. **Post signs at narrow channels notifying "No Wake Zone";**
6. **Continue the program to maintain and modernize the shoal markers.**

5.0 SAFE BOATING & PWC — *ACTION PLAN* —

5.2 YOUTH SUMMER PROGRAM FOR NON-POWERED CRAFT

DESCRIPTION:

There is opportunity to increase understanding and influence behaviour of non-intrusive use of the lake environment—values that can be carried forwarded to adulthood—through an education and boating safety program to introduce children and youth to kayaking, canoeing and sailing. This project is an opportunity to explore nature with excursions up an inlet streams and into wetlands. The participants will not only gain an appreciation of safe boating but also an understanding of the lake environment.

OBJECTIVE:

To promote interest among young lake users in non-power, lake friendly recreation. Focus can be on boating fun, safety and environmental education.

STRATEGIES & TASKS:

1. **Develop a curriculum for a weekend and a one-week program, of instruction and handling of canoe, kayak and sailing watercraft;**
2. **Through the CLA Newsletter, solicit interest in contributing equipment and/or time to such a program.**
3. **Solicit information from the Canadian Power Squadron, and the Antique Boat Museum programs at Clayton, NY.**

6.0 KEEPING ECOSYSTEMS HEALTHY — *ACTION PLAN* —

6.1 WILDLIFE HABITAT SUSTAINABILITY

DESCRIPTION:

All ecosystems are incrementally weakened as they are diminished in size. Here, size not only matters—it's critical. Bigger is always better. Healthy habitats in the upland and shorelines of the lake, and throughout the watershed, have multiple beneficial functions, including reducing erosion, trapping and absorbing sediment and nutrients, hosting wildlife, reducing air pollution, moderating climate effects, and providing recreational and economic value. In this region, there is one of Canada's highest biodiversities, because of the great variations of habitat.

OBJECTIVE:

To protect existing large blocks of habitat, both upland and wetland, around the shoreline of the lake and in the watershed.

STRATEGIES & TASKS:

1. **Continue to work with study teams of conservation partners such as MNR and Parks Canada in ecological studies underway in the Frontenac Arch Biosphere Reserve, to learn locations of both representative and critical habitats in the Charleston Lake watershed;**
2. **Partner with conservation groups, agencies and landowners in strategies to conserve and protect significant wildlife habitats, such as spawning areas, breeding habitat for reptiles and amphibians, and other plant and animal species;**
3. **Work with landowners of wetland properties at stream mouths of streams entering Charleston Lake and with conservation partners such as the land trust to conserve and protect these areas which buffer the lake as filters and nutrient absorbers, and are vital wetland habitat**
4. **Work with landowners and groups such as the stewardship council to replant disturbed, formerly landscaped and corridor areas between blocks of habitat with native species appropriate to those areas.**

6.0 KEEPING ECOSYSTEMS HEALTHY — *ACTION PLAN* —

6.2 SPECIES AT RISK RECOVERY PLANS

DESCRIPTION:

Ecosystems worldwide are under considerable pressure from far-ranging effects of development. There is a steadily growing number of species at risk—those plants and animals that are of concern, threatened, and endangered. While this region has one of the highest numbers of species at risk in Canada, there is an element of good news in the statistic. There are still large areas of healthy habitats in the upland and shorelines of the lake, and throughout the watershed, and there are great variations of those habitats. That is why 32 species at risk are found here.

OBJECTIVE:

To protect species at risk in the region, both at the lake and in the watershed.

STRATEGIES & TASKS:

1. **Participate in monitoring and Recovery Plans, as designed by Environment Canada, Ontario Parks and MNR, in the Charleston Lake watershed, for species such as map turtles, eastern (formerly black) rat snake, least bittern and others, through committees of volunteers;**
2. **Partner with conservation groups, agencies and landowners in strategies to conserve and protect significant wildlife habitats, such as spawning areas, breeding habitat for birds, reptiles and amphibians, and other plant and animal species;**
3. **Identify specific habitat locations where species at risk are known, and develop strategies such as conservation plans, isolation from disturbance, habitat improvement, landowner awards and other;**
4. **Communicate information about species at risk, and plans and projects at the lake for their protection, through newsletters to the membership and to other lake users;**
5. **Place awareness signs such “Brake for Snakes” and “Turtle Crossing” at critical locations.**

6.0 KEEPING ECOSYSTEMS HEALTHY — *ACTION PLAN* —

6.3 INVASIVE SPECIES

DESCRIPTION:

"Invasive species" are plants and animals from ecosystems outside of our own, which have successfully established here and which most often damage and disrupt the regional ecosystems and inhabitants. Hundreds of invasive species have established in Ontario over the years, and new species continue to arrive. Common amongst these are dandelion, English sparrows, starlings, zebra mussels, purple loosestrife, Eurasian milfoil. Garlic Mustard for example has been found to retard hardwood tree germination and growth by up to 90%. While many invasive species are here to stay, sometimes eliminating native species, some can be limited in effect, and new threats may be avoided.

OBJECTIVE:

To prevent new invasive species from establishing at the lake and in the watershed, and to diminish the effects of some that are now here.

STRATEGIES & TASKS:

1. **Educate landowners of the importance of using native species of plants in landscaping and maintaining existing native ground cover and forests, to provide shelter and forage for native species while preventing invasive species to establish;**
2. **Educate landowners and lake users about possible new invasive species that may arrive here, and encourage measures to avoid "invasions", such as from live bait, arrivals on boat trailers, introductions from landscaping and soil and unintentional releases;**
3. **Place "Wanted" posters at visible locations and in newsletters, identifying invasive species;**
4. **Hold work sessions to replant formerly landscaped or disturbed areas with native species, to pull garlic mustard and/or build and erect bluebird nest boxes.**

6.0 KEEPING ECOSYSTEMS HEALTHY — *ACTION PLAN* —

6.4 IMPACTS OF CLIMATE CHANGE

DESCRIPTION:

Models for predicting climate change do not give specific timeframes, but they do predict very likely trends. The increasingly warmer climate of eastern North America will have effects here. There will be increasing stresses on the ecosystem, and among these will be a warming of the lake—one concern of which is stress on the lake trout population. There are actions that can be taken at the lake by residents and lake users to help diminish effects of warming.

OBJECTIVE:

To reduce the effects of global warming on the lake ecosystem.

STRATEGIES & TASKS:

1. **Reduce the amounts of nutrient entering the lake, through measures discussed in other Action Plans, to improve the dissolved oxygen content in the lake;**
2. **Reduce the amount of warmed runoff into the lake, by restoring native shade trees and native ground cover along all possible areas of the shoreline and around buildings;**
3. **Collect runoff from residential and boathouse roofs in eaves trough added to the structures and run into catch basins of stone and plants, or into rain barrels for use in dry spells;**
4. **Encourage everyone to participate in reducing the amount of energy consumed, whether electrical or in fuels, both at the lake and elsewhere.**

7.0 CHARLESTON IN THE SURROUNDING LANDSCAPE *—ACTION PLAN*

7.1 FRONTENAC ARCH BIOSPHERE RESERVE

DESCRIPTION:

Charleston Lake is an integral part of the ecological and social landscape that surrounds it. The Charleston Lake Association has long recognized that fact, and has been a valuable contributing member of the Frontenac Arch Biosphere Reserve since its origin. The Association has a history of partnership with the community, and is progressive in that way of thinking.

OBJECTIVE:

To continue to work, partner and lead by example towards the economic, social and ecological health of the Frontenac Arch Biosphere Reserve.

STRATEGIES & TASKS:

1. **Continue to work in partnership towards a healthy, safe, strong and sustainable community in the Frontenac Arch Biosphere Reserve;**

7.0 CHARLESTON IN THE SURROUNDING LANDSCAPE *—ACTION PLAN*

7.2 ALGONQUIN TO ADIRONDACK CORRIDOR

DESCRIPTION:

Charleston Lake is virtually at the centre of the Frontenac Arch landform, which is a great wildlife corridor from the Canadian Shield to the Appalachian Mountains; better known in concept form as the Algonquin to Adirondack corridor. As a large area of forest and wetlands in its own right, Charleston Lake contributes significantly to this continental-scale corridor.

OBJECTIVE:

To continue to work towards a healthy environment, conscious of the surrounding landscape.

STRATEGIES & TASKS:

1. **Continue to work in partnership and by example towards a healthy, safe, strong and sustainable community and ecosystem locally, in the Frontenac Arch Biosphere Reserve and in the broader landscape.**

8.0 THE ROLE IN THE GREATER COMMUNITY — *ACTION PLAN* —

8.1 NETWORKING WITH OTHERS

DESCRIPTION:

The community of lake residents is not isolated, but rather is very much a part of the economy and society of the community of the region. And, in the same way, if the ecosystem health of Charleston Lake declines, so too does the health of the community at large.

The Charleston Lake Association leads where necessary, partners in mutually beneficial endeavours and is always non-confrontational. To maintain a healthy watershed ecosystem, the CLA needs to continue fund raising, continue networking, continue dialogue with the municipalities and continue to partnership with the government agencies.

OBJECTIVE:

To continue to partner with the community at large, and the agencies and groups that are part of that community, to achieve common goals.

STRATEGIES & TASKS:

1. **Continue to network with other lake associations, government and non-government groups in and beyond the Frontenac Arch Biosphere Reserve;**
2. **Continue to partner with government agencies whenever possible;**
3. **Continue to work closely with the municipalities;**
4. **Continue with the Charleston Lake Environmental Association in fundraising to support projects.**

9.0 SUPPORT YOUR LAKE ASSOCIATION — *ACTION PLAN* —

9.1 SERVING ON BOARDS AND COMMITTEES

DESCRIPTION:

Achievements of the Charleston Lake Association cannot continue without the dedication of a large number of people. Combined efforts of many volunteers make projects enjoyable and rewarding, and are of tremendous benefit to every aspect of life at the lake. When many share the load and responsibility, more projects can be undertaken, projects have higher rates of success, the rewards are great, and the work is less a burden. Few can donate all of their free time, but many can donate some time and expertise to lake association activities

OBJECTIVE:

To increase interest of CLA members in becoming active on the executive, and in serving on committees

STRATEGIES & TASKS:

1. **Develop a strategy to attract new thinking and talent to the executive, such as holding workshops on volunteerism and board development;**
2. **Recognize the contribution of volunteers through an awards program;**
3. **Prepare a handbook of background and the work of the executive, as a tool in recruiting volunteers and new board members;**
4. **Develop a Youth CLA or a youth committee, and designate some projects such as recreation programs, monitoring and restoration which it could manage, assist with or complete;**
5. **Hold a social event such as a corn roast and entertainment towards summer's end, to celebrate work completed in projects and to present awards to volunteers and landowners.**

GLOSSARY:

Some of the terms used in this plan may be unfamiliar to the reader. Because such words actually have very specific meanings in the discussions sections, particularly ISSUES, they have been used in the text. Hopefully, the definitions below will explain those unfamiliar words and terms.

Algae - microscopic, light-synthesizing single cell plants, commonly found in water; there are many species, and are often found in colonies in strands, blobs or floating individually

Chlorophyll a - the green photosynthetic pigment found in living plants, including algae

Eutrophic - a nutrient-enriched lake, high in phosphorous and nitrogen; generally with excess growth of algae, poor in clarity and little or no deep-water oxygen

Hypolimnion - the lower, colder layer of water in a lake, largely stagnant and remaining at a constant temperature

Isopleth - a line on a map connecting points with the same value; eg. water depths

Mesotrophic - lakes which are moderately enriched; between eutrophic and oligotrophic

Morphometry - refers to the lake size and outside shape, including are, volume, fetch, mean depth, shoreline length etc.

Oligotrophic - nutrient poor lakes; deep, clear, cold, oxygen-enriched, low algae concentrations

Phytoplankton - free-floating microscopic plants

Trophic status - refers to the level of nutrient supply