Photos – Kan Chhatwal and FPSI

Baptiste Lake
Natural Heritage Inventory

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Comments are Welcome

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Introduction

The purpose of this study is to examine the natural heritage areas and features in the Baptiste Lake watershed and identify potential constraints and opportunities for present and new land development and resource management. Watershed boundaries, water quality, vegetation, streams, wetlands, fish, wildlife, invasive species and Species at Risk are discussed in this inventory.

The Natural Heritage Inventory will answer the following questions

- What is in our watershed?
- What was the effect of the dam on the natural environment?
- What did the lake look like before it was flooded?
- What is the current quality of our water?
- Why is the natural vegetation important to the health of Baptiste Lake?
- What do we know about the streams that flow into Baptiste Lake?
- How are the wetlands important to the lake?
- What fish and wildlife species are found in the Baptiste Lake watershed?
- Was Baptiste Lake always a Lake Trout lake?
- Are there any invasive species in the watershed?
- Are there any species at risk in the watershed lake?

The information provided is intended to assist the community of Baptiste Lake and the Baptiste Lake Association in working with Crown, County and Municipal agencies in establishing appropriate guidelines for the future development of the lake. These recommendations must be reviewed by all community members (rural, village and shoreline residents, business operators), the people who directly or indirectly depend on the lake, including any government or non government body that has a stake in the future health and development of the lake.

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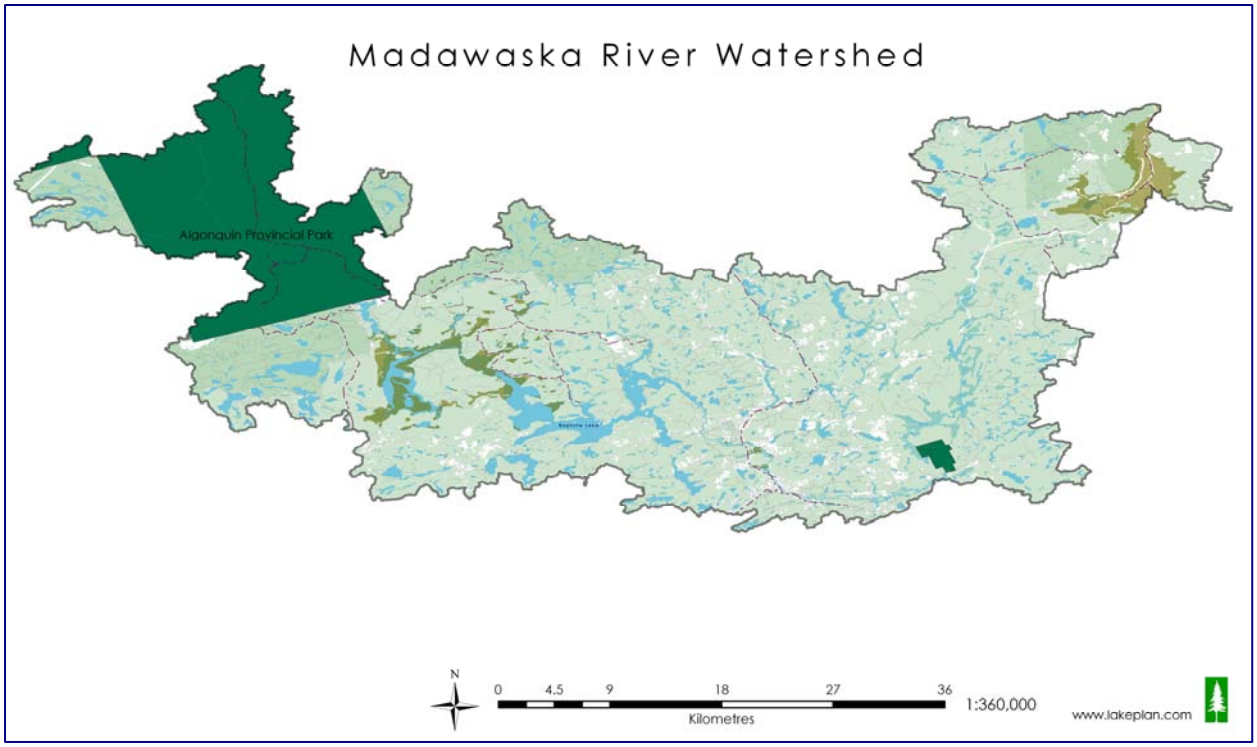
1 General Description of Baptiste Lake Watershed

Baptiste Lake is located in the former Township of Herschel in the Municipality of Hastings Highlands, County of Hastings, approximately 15 kilometres (km) northwest of Bancroft along Highway 62 and Birds Creek County Road.

Baptiste Lake is one of a chain of lakes connecting the York River to the Madawaska River downstream. York River originates in a group of headwater lakes (Source Lake) in the southern extension of Algonquin Park. The York River flows out of Baptiste at High Falls Dam towards Bancroft and continues on through the Conroy Marsh, a 24 km sq provincially significant wetland, and empties into the Madawska River. Baptiste Lake is directly connected to Elephant and Benoir Lakes upstream and it is possible to navigate between the three lakes. The lake supplies water downstream to the Madawaska River, which flows east and empties into the Ottawa River at Arnprior.

Map 1 – Madawaska River Watershed



The lakes within this watershed are managed as headwater reservoir lakes for the Madawaska River system and are, therefore, subjected to water level fluctuations. Reservoir lakes provide water necessary to augment natural flows and to compensate for evaporation losses during seasonal dry periods and to meet a wide range of water-based needs including navigation, flood abatement, recreational uses, hydro-electric generation, municipal water supply, water quality and fish & wildlife conservation.

Baptiste Lake is situated on the Canadian Shield, which is dominated by hard crystalline, igneous and metamorphic rocks (Precambrian granite) with very shallow soils. Glacial till deposits, sediments (sand, gravel and boulders) deposited directly by the glaciers upon their retreat 10,000 years ago, and shallow, acidic soils, due to the historically dense coniferous vegetation, and locally thicker clay, sand and gravel deposits occur where deciduous vegetation-type flourish, are reminiscent of the watershed area. Characteristic features of the lakeshed, as well as eco-district 5E-9, are muddy or rocky lake bottom; drowned land; rocky or eroded shoreline; acidic soil; granite-based rock; and mixed forest with predominantly birch, poplar, maple and pines. The shoreline is rocky, broken occasionally by weedy, stumpy bays and wetlands, and dotted with cottages. The major land uses on these lakes include recreation, recreational fishing, tourism-based fishery, recreational sport, and nature appreciation. The popularity and proximity of these lakes to more southern urban centres make them an ideal recreational destination.

Much of Baptiste and Elephant lakes, and parts of the intervening York River, consist of flooded land created by a Public Works dam, completed in 1932 at the effluence of the York River from Baptiste Lake. The old Public Works dam was preceded by logging dams which elevated the water level to a lesser degree than the present dam, and was replaced by a more stable structure for controlling water release in 1967 (Acres International, 2006). Much of the flooded area was not cut over prior to the elevation of the water, and is, therefore, speckled with drowned and partly eroded trees. Prior to the flooding, the upper limit of the lake (circa 1837 and 1854 surveyor's map) was at Hay Bay. This flooded land has created extreme shallowness of the water, heavy aquatic vegetation growth, and thick layers of organic matter overlying the substratum, which have a negative impact on cold water fish habitat (MNR Lake Files, 2007). In 1988, revised dam operating plans were initiated to slowly withdraw water in the fall, after lake trout spawning to protect eggs, and indirectly protect hibernating reptiles.

Baptiste Lake has an irregular shaped basin (Map 2 on following page), including several distinctly different sections, and is approximately 29 km in length connecting with Elephant and Benoir lakes. The lake's surface area is 2125 ha, mean depth is 5.3 m in the shallower bays and the maximum depth is 31.4 m in the main basin, and a shoreline length of 62 km (MNR, 2004). Many of the bays which appear extensive on maps or aerial photographs are merely drowned land with less than 3 feet of water depth (MNR Lake Files, 2007).

Map 2 – Baptiste Lake

The original deep basin of Baptiste Lake prior to flooding was likely oligotrophic and remains as a modified form today. The main body is relatively deep and moderately productive because of
moderate concentrations of phosphorus and nitrogen, which elevate during late summer and may subject the shallow easterly and westerly bays to eutrophic conditions leading to algal blooms (MNR, 2004). The flooded areas are subjected to eutrophic conditions because of shallow morphometry (MNR Lake Files, 2007).

Eutrophication or nutrient enrichment is a natural process of aging that occurs slowly in all lakes. The enrichment of Baptiste Lake has been accelerated by the flooding effects of the dam on York River. Flooded areas create ideal habitat for warm water fish because vegetative areas are very productive in food and cover for fish. However, flooding also creates a potential of winterkill problems. Bacterial action in the process of organic decomposition, consumes great quantities of available oxygen. In as much as the winter oxygen supply is limited due to ice cover, oxygen depletion and winterkill of fish may result.

Baptiste Lake is managed as a lake trout lake, although historically it was regarded and managed as a warm water fishery because of the 'absence' of lake trout (MNR Lake Files, 2007). Based on oxygen profiles from 2006, there was no optimal lake trout habitat available at the end of summer. The lake, as a result, is considered at capacity west of Lot 16 and 17, and is subjected to seasonal lake trout fishery closures and slot size limits to protect breeding adults (MNR, 2004 and MNR, 1996). Baptiste Lake is considered highly sensitive to the loss of lake trout habitat (MNR, 2004).

The lake is comprised of a complex fish community structure. The native salmonid fish community originally comprised of lake trout, lake whitefish, lake herring (Cisco), brook trout in the tributary streams, and at least one unidentified form of deep-water coregonine (Coregonus (Leucichthys) spp.). Other native fish species found in the lake and the watershed includes burbot, white sucker, brown bullhead, yellow perch, and pumpkinseed. Among the native smaller fish species includes various species of cyprinids (minnows), etheostomines (darters), cottids (sculpins) and at least one species of gasterosteid (stickleback). Since the 1920s, smallmouth bass and walleye were introduced to enhance the sport fishery. Largemouth bass and muskellunge were introduced in 1950s/60s to supplement the predatory fish base and enhance the shallow wetland habitats niches. Rock bass has also appeared among the aquatic fauna, and it is suspected that the rock bass was introduced inadvertently with smallmouth bass plantings (MNR 1966 data, Lake Files, 2007).

Originally a lake trout lake, all its cool and warm water fish species were stocked into the lake as early as the 1920s, and during the 1930s and 1940s Baptiste Lake was famous for its "big" walleye. Unfortunately, since the 1950s, fishing success has declined, and pressure by anglers to the MNR to rid the lake of coarse fish and stock it with game fish has been solicited since the late 1940s (MNR Lake Files, 2007). The low dissolved oxygen in the bottom waters in combination with an increased rate of sedimentation on possible spawning beds and water level fluctuations may have all contributed to the creation of marginal habitat for lake trout, and low production of walleye (MRN Lake Files, 2007).

MNR managed fish stocking programs have ceased, but concerns over degraded walleye spawning habitat and low recruitment success initiated a non-government based Walleye

Stocking program in Baptiste Lake. In 1999, a stocking permit was issued by the MNR to allow local residents to stock walleye fingerlings. The program continues, and the residents have been re-issued a stocking permit for 2007. However, in light of recent concerns regarding an outbreak of Viral Hemorrhagic Septicemia (VHS) in baitfish, muskellunge and smallmouth bass in the Great Lakes drainage area, future stocking permits may be rescinded. VHS is easily spread, is infectious and kills. Future stocking permits and baitfish may be put on hold until further investigation, including VHS testing on introduced fish stocks, are initiated (MNR, 2007).

Historical logging, lakeshore development and progression reshaped Baptiste Lake's watershed. Fisheries stocking, increased boating and angling pressures, dredging and pollution, nutrient runoff, water level manipulation, climate change, and on-going shoreline and infrastructure development have caused continuous changes to the physical landscape as well as impacted the environmental health of the watershed, which may compromise the health of the systems downstream.

2 Water Quality

Baptiste Lake is a MESOTROPHIC lake, bordering on oligotrophic qualities in the main basin, and fluctuating towards eutrophic conditions in shallower bays, based on water quality parameters collected by the MOE and the MNR over the past few decades. Most lakes on the Canadian Shield are ecologically young lakes with low nutrient concentrations and deep, transparent waters. Oligotrophic lakes undergo a natural succession process of aging to become eutrophic lakes. Eutrophication is the process of basin filling and nutrient enrichment usually by nitrates or phosphates found in organic matter, silt and sediments from the surrounding environment and biological activity, i.e., algal blooms, which leads to increased productivity and aging of the lake (Addy and Green 1996). Throughout the eutrophication process the physical, chemical and biological composition of the lake change. This process may be accelerated by human induced land use activities—a cultural eutrophication.

Figure 1 – Definitions of Trophic Status

Eutrophic: a nutrient enriched lake, high in phosphorous and nitrogen, high in algae concentrations, poor in clarity and with poor or no deep water oxygen concentrations.

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

Oligotrophic: lakes which are nutrient poor, deep, clear, cold, oxygen enriched, low in algae concentrations, low in phosphorous and nitrogen concentrations

Baptiste Lake was historically a small, cold water, most likely oligotrophic, but once flooded by dams, the surface area of the lake increased, creating large basins with shallow water. Drowned vegetation and a warmer surface water, as well as land use changes, have artificially aged the lake towards mesotrohic and eutrophic conditions that are seen today.

Trophic status is a limnological lake classification system – the trophic status describes lake conditions as they proceed through the eutrophication or aging process and therefore, encourage appropriate lake management efforts (Addy and Green, 1996). At one end of the spectrum are Shield Lakes. These lakes are generally clear and deep with low nutrient concentrations and, consequently, low biotic productivity. They maintain high dissolved oxygen concentrations throughout the water column and throughout the summer. They are dominated by cold-water species such as lake trout and are lined with granite substrate and surrounded by peat soils. This lake type is called OLIGOTROPHIC. Other terms synonymous with oligotrophic include non-productive, non-enriched, nutrient poor and young.

At the opposite end of the spectrum are productive, nutrient enriched, old EUTROPHIC lakes. These lakes tend to be warm and shallow, and are dominated by bass, perch, pike and carp, devoid of cold-water species. Bottom sediments are commonly organic muck, and the deep waters become depleted of dissolved oxygen during the summer. These lake types are typical of some of the Kawartha Lakes and others bordering on or south of the shield. Mestrophic Lakes are somewhere in between.

Indications of eutrophication or a change in water quality include loss of native species, accelerated proliferation of organisms (algal blooms caused by excess of phosphorus or nitrogen compounds in the water), nutrient leaching from sediments and low dissolved oxygen levels in bottom waters (i.e., iron-coloured water) from a change in chemical properties (such as acidification due to acid rain or anoxic conditions from a warming climate), or the presence of organisms that indicate unsanitary conditions (Coliform bacteria).

Measurements of various physical, chemical and biological parameters can be used to indicate changes in the lake's water quality. A water quality report was generously provided by the Ministry of the Environment (MOE), which concentrated on results from recent water quality data collections conducted in 2000 and 2006. Sampling was conducted to monitor general water quality parameters as well as to specifically monitor the status of oxygen habitat as it relates to lake trout population health. The main basin and Lavalley Bay has been extensively studied by the MOE since the 1970s, and MNR since the late 1950s-early 1960s, including a thorough inventory to comply with the enhanced lake monitoring program in 1997. The water quality results were cross referenced with historical data collected by MNR during lake survey inventories and by lake residents as part of the MOE Self-Help Monitoring Program, as well as information collected in the 1997 and 2004 lake trout lake monitoring programs.

The Water Quality report is quite extensive and includes essential background information to provide context to the water quality parameters collected. The analysis of the survey results suggest that Baptiste Lake is a mesotrophic lake in the main basin, bordering on oligotrophic conditions, with eutrophic conditions in the shallow bays. All parameters, except for dissolved oxygen, did not exceed the Provincial Water Quality Objectives' standards, and were typical results for lakes in the Algonquin-Haliburton region. The lake's water quality has not changed substantially between 1997 and 2006, or from historical measurements dating back to the 1960s; however, there appears to be a slight decrease in water clarity (as measured by Secchi depth) over the period of record (MOE, 2006).

Lakes vary greatly in their response to nutrient inputs. The response depends both on the rate of supply of nutrients and the morphometry. The morphometric features act together with water quality to determine the amount of dissolved oxygen habitat available (MNR, 2004). In general, lakes with greater mean depths have higher oxygen concentrations in the bottom waters. Exceptions include lakes with many bays, islands, multiple basins or small surface areas relative to maximum depth.

Lakes are dynamic systems, responding to both natural events (fluctuations) and artificial stimulus. All surface waters are subject to nutrient, sediment and toxic contamination, some of these come from the lake's own substrate or runoff from the landscape. In general, there is no single measure that constitutes "good" or "poor" water quality because qualifying water quality depends on its use (i.e., drinking water vs. navigational water vs. recreational use), and some water quality problems are treatable. Therefore, water quality is defined through the analysis of its chemical (nutrients, alkalinity, conductivity, total dissolved solids (TDS) and pH), physical (turbidity, colour and odour) and biological (chlorophyll a and fecal

coliform concentrations) content. Figure 2 lists all the important water quality parameters and their analytical relationship pertaining to the health of Baptiste Lake.

Nutrient Levels and Water Clarity

Water clarity is slightly below the mean Secchi depth of lakes in this area (MNR, 2004); the lake is quite clear.

Phosphorus and nitrogen levels in Baptiste Lake are at moderate concentrations which could allow for the formation of some nuisance algal populations, which would be limited to the shallow bays. There is a significant increase in phosphorus concentrations for the August and September sampling period (development, use or rainfall).

Water samples were a brownish yellow colour, which may be attributed to tannins from wetland vegetation, but the dissolved organic carbon concentration was low indicating low organic inputs from wetlands in the Baptiste Lake watershed. Anoxic or oxygen depleted conditions in bottom waters, accelerates the 'internal phosphorus loading' process; phosphorous that was bound by other elements in the bottom sediments are released through chemical processes when low oxygen conditions prevail. Iron that bound phosphorus is released at this time and contributes to the discolouration of water; this water can stain porcelain. If the lake water colour changes, it could be an indication of anoxic conditions (Horne and Goldman, 1994).

Dissolved Oxygen and Temperature

Lakes have a finite capacity to accommodate most types of development. One of the primary constraints on shoreline development is water quality (MNR/MOE 2004-LT Hastings). Land use changes around a lake can have a detrimental effect on water quality. The primary linkage between water quality and shoreline development is nutrient input to the lake. Development increases the supply and availability of "fertilizing" plant nutrients such as phosphorus and nitrogen. These nutrients promote the growth of algae and other aquatic plants. Algae and other organic matter eventually settle to the bottom of the lake where they decompose through bacterial action. This decomposition process utilizes oxygen. In the dark bottom waters the oxygen that is used up cannot be replenished by photosynthesis or diffusion from the surface, which occurs in the shallow waters. This results in reduced levels of oxygen in the deeper bottom waters. Low dissolved oxygen results in poor fish habitat, high sediment nutrient releases, and increased treatment for drinking water supplies (Horne and Goldman, 1994). Development can, therefore, be especially detrimental to lake trout lakes. High levels of phosphorus can set off a sequence of events that can have serious impacts on the quality of recreational waters and their fisheries (MNR, 2004).

"Baptiste Lake has a negative heterograde curve (oxygen measured against temperature and depth) which develops by the decomposition of settling organic material that accumulates near the thermacline as a result of a thermally induced water density gradient. The dissolved oxygen concentrations then increase in the bottom waters to a depth of 26 metres where there is a rapid depletion of dissolved oxygen" (MNR, 2004). By

late summer critical period the dissolved oxygen was 5.24 mg/L, which is less then the new MNR standard (MVWHDO, see Fish Section) of 7 mg/L. This new standard differs and is slightly more stringent then the MOE requirement of 6 mg/L as shown in Figure 2. Under these conditions the lake trout population in this lake is highly stressed. The lake trout were found to be restricted to the southwest basin of the lake until the fall overturn occurred.

MNR data collected during the mid-1960s at the flooded north-east end, the deep central basin, and the flooded north end, sampled the lake from spring overturn to fall overturn for temperature and dissolved oxygen profiles. The hypoliminion in the deep basin of Baptiste Lake showed oxygen deficit/depletion by late summer. The shallow flooded areas of Baptiste Lake were well oxygenated showing near saturation levels during most of the sampling season. The accompanying bottom water oxygen deficiency in the deep basin of Baptiste Lake probably restricts the lake trout population to rather narrow limits of habitat. Winter oxygen deficiencies are known to occur in the shallow flooded areas of Baptiste Lake and have resulted in fish mortalities. This occurrence has been investigated in Redmond Bay by MNR and is probably more widespread than commonly believed. The dense aquatic vegetation in water less than 3.5 metres deep which occurs in more than half the area of Baptiste Lake, plus heavy ice and snow cover probably results in extremely low dissolved oxygen concentrations by March (MNR Lake Files, 2007).

Based on the 2000 dissolved oxygen profiles, Baptiste Lake is considered highly sensitive to the loss of lake trout habitat and is therefore at capacity with regard to shoreline development. New or additional development that would result in a net increase in phosphorus loading should not be permitted.

Major Water Quality Concerns for Property Owners

The following figure (Figure 2) summarizes the key environmental parameters that were measured by the MOE and MNR to qualify water quality on Baptiste Lake. For more information on each parameter and individual datum collected, please consult the Baptiste Lake Water Quality Report provided by MOE (2006).

The following provides information on some of the key factors that impact water quality.

Turbidity (Siltation) - Reduction of the sun's ability to penetrate water is the result of the suspension of fine particles, such as clay, in surface water. This affects the entire food chain by inhibiting the growth of phytoplankton (small floating plant life); creating lower oxygen levels, which interferes with fish and benthic macro-invertebrate (small animals living on the bottom of a lake) respiration; impairing the visual range of fish, which impacts their ability to feed; and degrading fish spawning beds.

Factors that influence and increase lake water turbidity include:

1. Landscape activities—(artificial manipulation of water levels) large and small scale development activities, including unprotected placement of fill or disturbance of soil at or near the shoreline, creates the opportunity for fine soils to enter the lake water, particularly during spring run-off and rain storms;

Figure 2 – Water Quality Parameters of Baptiste Lake for the Sampling Period of 1965 to 2006

Provincial Water Quality Objectives	Pre-1990	1997/2000/2006
Clarity Secchi Depth (m) > 5 oligotrophic 3 – 5 mesotrophic < 3 eutrophic ▪ Affected by suspended particles and natural colour ▪ Subjective measurement	**Range from 3.2 to 4.9** ▪ Moderately, bordering on low nutrient enriched ▪ Cool water ▪ Water is very transparent or clear	**2000/2006 Range from 3.4 to 3.65 m** **1992/1997 Range from 4.0 to 5.5** ▪ Mesotrophic – moderately enriched ▪ Water is transparent ▪ Moving towards eutrophic in shallow waters ▪ Possibly aging affects more pronounced because of shallower depth
Chlorophyll a (µg/L) < 3.5	**Range from 0.4 to 3.0** ▪ Un-enriched to moderately low in nutrients	**Mean of 1.6** ▪ Moderately un-enriched ▪ Moving towards mesotrophic
Total Phosphorus (µg/L) < 10 aesthetic < 20 nuisance algae	**Mean of 10** ▪ Moderately low nutrients ▪ Low concentration of algae & aquatic plants ▪ High transparency	**Mean = <10 in main and <20 in Lavalley Bay** ▪ Border –moderately low nutrients in main basin ▪ Nutrient enriched in shallow bays ▪ Low concentration of algae and aquatic plants in main, but algal blooms or vegetation growth could persist in shallows ▪ Moderate transparency
Dissolved Oxygen (mg/L) Summer > 6 excellent > 4 good/fair < 3 poor Critical parameter for cold water species habitat and management Note – the > 6 mg/l is a MOE standard. MNR know requires 7 mg/l for lake trout habitat	**Lavalley Bay range from 4.1 in June to 1.0 in September; Main Basin range from 5.0 in June to 3.0 in September; and Hay Bay range from 7.2 in June to 8.1 in September.** ▪ End of summer lake trout habitat in main basin and Lavalley Bay is impacted by lower D.O. concentrations due to nutrient enrichment ▪ Shallow areas of Hay Bay are mixed well by wind, which produces large quantities of D.O. throughout shallow water column ▪ May impact fish reproduction and change ecological communities	**Range from 4.47 to 5.24 Main; and a mean of 1.14 in Lavalley Bay** ▪ No useable (> 4 mg/L) fish habitat in end of summer in main basin and Lavalley Bay
pH 6.5 – 7.5 excellent 5.5 – 6.5 good/fair 5.0 – 5.5 poor	**Range from 6.8 to 7.4** ▪ Excellent range for development and survival of aquatic life	**Range from 6.42 to 7.53 Main** ▪ Remained consistent since 1960s data
Alkalinity (mg/L) < 10 sensitive	**Range from 11 to 27** ▪ Slightly susceptible to acidification at the surface ▪ Local pockets of crystalline limestone rock may contribute to buffering qualities	**Range from 12 to 16.8 consistent between the Main basin and Lavalley Bay** ▪ Measurements slightly higher in the euphotic zone indicating some susceptibility to acidification
Organic Carbon (mg/L) 1.0 to 30.0 TOC < 3.0 TOC represents oligotrophic conditions	No measurements	**Range from 6.6 to 8.9 in Main Basin and from 8.2 to 9.3 in Lavalley Bay** ▪ Mesotrophic conditions
Ammonia/Nitrogen (mg/L) < 1.0 nitrogen (ammonia/non-TKN), < 0.02 ammonia (CCME), < 3.0 nitrate (proposed) <0.005 nitrite (<0.06 mg/L CCME) TN:TP	No measurements	**Ammonia <0.05; nitrate 0.01 to 0.021 in surface waters and 0.25 to 0.27 in bottom waters; nitrite <0.005; TKN ranged from 0.26 to 0.50** **TN:TP ranged from 33:1 to 81:1 in Main Basin and 60:1 and 112:1 in Lavalley Bay** **1997 – 30:1 and 83:1 in Main** ▪ No negative impact

Source – MOE Water Quality Report, Baptiste Lake 2006

2. Riparian disturbance—erosion created by the alteration or removal of natural shoreline structures causes fine soil particles to be washed into the lake rather than being filtered or captured by the vegetation;
3. Increased impervious surfaces—non-vegetated or developed surfaces such as fields and site-specific storm water management systems (larger developments and roads) create greater opportunity for fine soil particles and storm water run-off to be washed into a lake; and
4. Recreational activities—increased and inappropriate boating practices create shoreline erosion through excessive wake action and disturbance of the clay and silt on the lake bottom—scouring, and bathing in lakes with soap.

Nutrient Enrichment - The trophic status and biotic productivity of a waterbody is the result of four important factors:

1. Edaphic Factors—the nutrients available to a waterbody via weathering soils within the drainage basin, which determines if a lake is productive or sterile.
2. Morphological Factors—dimensions of the basin (surface area, mean depth, volume).
3. Climatic Factors—range of climates favourable for growth and production. Temperature and precipitation influence the rate of weathering and the amount of erosion.
4. Human Actions—land use such as land clearing, agriculture, damming and shoreline development will influence and change the productivity of a lake.

An increase in nutrient loading, particularly in phosphorus levels, may accelerate the eutrophication (gradual nutrient enrichment) process and increase the growth of algae and aquatic plants in a lake. Both phosphorus and nitrogen are essential nutrients for plant and animal growth. There are many natural and human sources of phosphorus and nitrogen including phosphate and nitrate found in soils and rocks, wastewater treatment plants, leaking septic systems, and runoff from fertilized land and manure storage areas. Increased levels of phosphate and nitrate encourage the growth of aquatic plants and algal blooms that in turn elevate temperature and alter other important water body characteristics such as concentrations of available dissolved oxygen. Several factors help to create or increase nutrient enrichment of lakes including:

1. *Nutrients* – in particular phosphorus from terrestrial/landscape runoff. Phosphorus occurs naturally in nature, but it is also generated from human-made sources (laundry detergent and fertilizers). These nutrients enter lakes through the streams that flow into the lake and the natural flow that occurs during the spring run-off;
2. *Fertilizers* – used on lawns and gardens that border the lake introduce nutrients through run-off or groundwater;
3. *Septic systems* – that may be poorly designed, out of date, not operating properly, or not pumped out regularly contribute to the nutrient loading of lakes;
4. *Low attenuation of the soil* – due to the underlying granite bedrock, increases the contamination of ground and surface water; and
5. *Drainage from roads and lots* – also contributes to erosion and the concentration of suspended sediments near shore, increase aquatic chloride and sodium concentrations.

Bacterial Contamination - Fecal bacteria (*Escherichia coli*) measurements indicate the possible presence of disease causing bacteria, viruses and other microorganisms, which can cause other impacts such as cloudy water and unpleasant odours. Sources of fecal contamination of surface waters include wastewater treatment, septic tanks, and domestic and wild animal feces. The PWQOs, which are numerical, should not go above 100 counts per 100 ml for fecal coliform and 1000 counts per 100 ml for total coliforms in recreational waters.

The 'rainfall effect' is when heavy precipitation flushes the land area around the lake and the subsequent runoff will carry available contaminants, including sewage organisms, and natural soil bacteria with it into the lake. In the Precambrian areas where there is inadequate soil cover and in fractured limestone areas where fissures in the rocks provide access to the lake, this phenomenon is particularly evident. Melting snow provides the same transportation function for bacteria, especially in an agricultural area where manure spreading is carried out in the winter on top of the snow.

For more information regarding Ontario's Provincial Water Quality Objectives (PWQO), please visit the web site at http://www.pscanalytical.com/ce/guidelines/pwqo.htm

Future Monitoring Needs - Collection of data, over time, will provide the necessary information to identify trends in water quality and to identify which water quality parameters need to be addressed. The BLA have been collecting this type of information over a 30 year period and continued and expanded monitoring programs and activities aimed at maintaining water quality and protecting aquatic habitat and sensitive aquatic species are important so that we can continue to analyze and extrapolate trends and protect the lake.

Continued participation in the MOE Lake Partner Program and creation of a water quality database will enable the collection of data and the establishment of long term trends in water quality. As well, creating a standardized database could also help in identifying key parameters, which are affecting water quality and, in turn, be used to focus remedial action on those activities that are deemed to be the source of the elevated or lowered parameters. This database could also be used by resource related agencies to assist in monitoring lake trout habitat, water levels, fish management programs, and the effects of land use changes as well as other environmental factors that may influence Baptiste Lake's water quality health.

DID YOU KNOW?

That to date none of the streams flowing into Baptiste Lake have been assessed.

Inventorying and monitoring the water quality of tributary streams, particularly those that are implicated as sources of lake water quality impacts, would also assist in determining the origin of water quality impacts.

Future actions such as the identification of shoreline activities and land uses, which pose a risk to water quality, and the identification and protection of riparian zones and sensitive natural areas (wetland, fish spawning areas), will also aide in improving water quality and in increasing the health of the aquatic ecosystem.

Observations – Water Quality

- Baptiste Lake is a mesotrophic, bordering on oligotrophic lake in its main basin, with an eutrophic component in the shallower bays.
- Low dissolved oxygen concentrations in the deep waters during late summerl did not meet MNR standards of 7 mg/L, indicating poor lake trout habitat and stressed lake trout populations.
- Other water quality parameters were typical of the region and all fell below the Provincial Water Quality Objectives for each.

Recommendations – Water Quality

1. *The Association should continue to collect water quality information, including a thorough inventory of the benthic and plankton communities, through the MOE's "Lake Partner Program". A consistent monitoring program, which collects routine samples from various locations across the lake, produces and contributes, over time, to a database that would be useful to cottagers, resource managers and researchers to establish trends in water quality and standardized monitoring protocols.*
2. *An annual report of water quality testing results should be sent to all property owners on the lake that reports on the "State of the Water Resource".*
3. *Continue planting along the shoreline, including aquatic plants, to enhance both the buffering and uptake of seasonal nutrients and fish habitat. Decrease the amount of impervious landscapes along the shoreline by reducing the demand for manicured lawns and the construction of paved driveways...keep it natural! Note—by maintaining a buffer strip along your shoreline, you will also detract Canada Geese from your property.*
4. *In cooperation with the local MNR staff, inventory and monitor the water quality of the tributary streams.*
5. *Encourage educational and volunteering efforts including weekend workshops and training and the preparation of new information products, such as newsletter articles and web site links, which promote both the protection of water quality.*

3 Natural Areas

The Great Lakes region of south-central Ontario, including Baptiste Lake's sub-watershed, was historically covered by great mountain ranges. After several glacial periods, thick sheets of moving ice scraped, eroded and collected debris along their path removing all surface material and reducing mountains to their bedrock roots – the Precambrian layer (Canadian Shield). During the last ice age period (the Wisconsin) over 10,000 years ago, retreating glaciers impacted the landscape by depositing glacial till (a mix of unconsolidated clay, silts, sand, gravel, rocks and boulders) throughout the watershed, carving out lakes and rock ridges, and exposing barren rock (Chapman and Putnam, 1984).

Figure 3 - Human Impacts

- Intensive logging during the 18th and 19th centuries and forest fires
- The expansion of urbanized development and life-styles from city centres
- Increasing populations with increasing demands on the natural resources
- Recreational pressures due to the watershed's close proximity to large city centres
- Water level manipulations
- Climate change

Baptiste Lake is within ecological site-district 5E-9 and the Madawaska River Drainage System (watershed #2KD-02). The sub-watershed lies within the physiographic region of the Algonquin Dome (Highlands), which is characterized by a rolling topography. The sub-watershed (lakeshed) is defined by its protruding igneous and metamorphic (Precambrian) rock and granite bedrock, shallow glacial till cover and bare rocky outcrops and ridges of varying elevations. Many of the lowland areas (wetlands, ponds and streams) are floored with outwash sand flats and gravel hills, and the soils are generally stony, sandy, acidic and shallow (Chapman and Putnam, 1984). Unique and rare, rock-cored drumlins also occur locally in the northern portion of the lakeshed (Henson and Brodribb, 2005).

The lakeshed has extensive forest cover, dominated by tolerant hardwood woodlands and upland mixed woods, permanent and intermittent wetlands and streams encompassing the perimeter of the lakes' shorelines and uplands, and other large and small neighbouring freshwater lakes and ponds. There are also a few islands with relatively undisturbed and distinctly unique woodland habitats, including Blueberry and Herschel Islands, and upland grassland communities. Unfortunately, historical and current human activities and their associated impacts are altering natural habitats and the ecological integrity of this landscape on a daily basis.

Vegetation

Importance of Vegetation - The naturally occurring vegetation along the shorelines of Baptiste Lake, the York River, and the tributary creeks feeding the lake and its sub-watershed, as well as the ecological communities within the wetlands and upland woodland areas provide a variety of important ecological functions and features including bank stabilization, nutrient uptake, provision of riparian habitat, and overall health of the lakes' ecosystems, which enhance the quality of life of all residents. The species diversity and the various vertical and horizontal structural form of plants, and their distribution

patterns across the landscape, create a variety of core and corridor habitats that are particularly valuable to migrant songbirds for nesting and foraging, to fish for spawning and feeding, to reptiles and amphibians and many insects for successful life-cycles, to mammals for hunting, traveling and protection, and to humans for recreation, peace, health and vitality.

Natural shorelines contain three distinct vegetative zones: littoral, riparian and upland, (Figure 4) and each has its own characteristic communities of organisms. Together, these three area comprise the Ribbon of Life (Figure 5). Although each of these zones contributes separate functions to the health of the lake, it should be noted that the shoreline is a natural progression of each zone, seamlessly transitioning into the next. Therefore, alteration of any zone affects the entire shoreline by diminishing the shore's ability to support life on the lake.

Figure 4 - Shoreline Areas

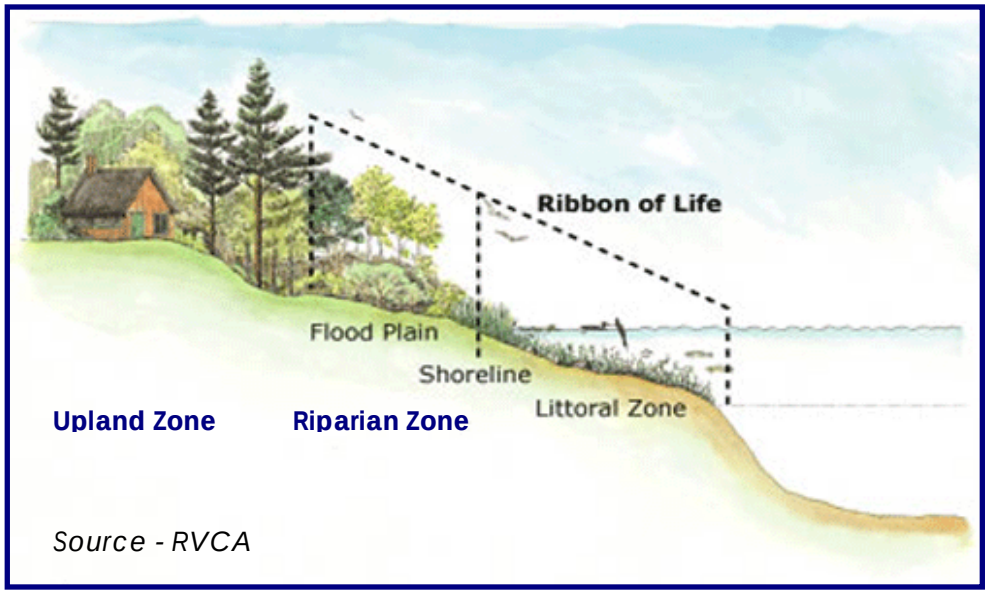
Littoral Zone – the water's edge out towards the deep water where sunlight is able to penetrate down to the lakebed (bottom)

Riparian Zone (floodplain) – begins at the water's edge and ends, approximately, 30 metres inland

Upland Zone – the area of land beyond the riparian zone

The riparian zone is a transitional zone between the other two, creating a variety of 'edge' habitats along the succession from terrestrial to aquatic vegetation and habitats. It is a valuable component to a forested landscape because of its habitat diversity, which supports a large diversity of plants and animals, some of which are found nowhere else, and is, therefore, ecologically quite productive (Hunter, 1990). The interweaving deep roots of trees and shrubs provide stability to the shoreline. The dense foliage of the canopy buffers the shore from winds and cools the area, as well as boosts the humidity around the lake and provides shelter for wildlife and a variety of birds. The shoreline vegetation provides shade to the littoral zone to maintain cool summer temperatures and blocks the harmful affects of ultraviolet rays, and filters an estimated 90% of run-off from winter snow and rains before it enters the lake; this filtering is important to ensure that silt and sediments from shoreline development do not reach the lake.

Figure 5 – Ribbon of Life



Source - RVCA

Destructive activities that negatively impact the natural landscape include: the removal of shoreline and aquatic vegetation; adding sand, rocks and retaining walls or creating

artificial shoreline beaches; planting non-native or ornamental plant species; artificially regulating of water levels, which creates an abnormal "false shoreline" along the lakeshore; and climate change. When shorelines are de-vegetated, ecological communities change because habitat quality and quantity change creating conditions favourable for the introduction of invasive species and the loss of native and possibly rare ones.

The Algonquin Highlands is covered by the Great Lakes-St. Lawrence Forest Region; a transitional zone between the southern deciduous forest and the northern coniferous boreal forest of Ontario. This overlap of tree species creates a complex mosaic of communities, defined by local climate and soil conditions, across the landscape (Kershaw, 2001). The Great Lakes—St. Lawrence Forest Region that sits on the Canadian Shield is dominated by sugar maple and white pine, but many other hardwood tree species are found in close association. Figure 6 lists all the tree species common to the Baptiste Lake – Madawaska River watershed.

Figure 6 – Common Riparian, Wetland and Upland Tree Species in the Baptiste Lake – Madawaska River Watershed

Common Name	Scientific Name	Habitat Type
Balsam Fir	*Abies balsamea*	Moist lowlands and slopes
White Spruce	*Picea glauca*	Wide range; prefers rich, moist soils
Black Spruce	*Picea mariana*	Wetland – bog
Tamarack	*Larix laricina*	Wetland – bog
Eastern Hemlock	*Thuja canadensis*	Cool, moist, shady protected sites
Eastern White Pine	*Pinus strobes*	Dry, rocky ridges to sphagnum bogs
Red Pine	*Pinus resinosa*	Sandy, rocky, dry sites
Scotch (Scots) Pine	*Pinus sylvestris*	Woodlands and plantations
Eastern White Cedar	*Thuja occidentalis*	Swampy sites to limestone outcrops
Bur Oak	*Quercus macrocarpa*	Bottomlands and rocky uplands
Red Oak	*Quercus rubra*	Prefers dry, sunny sites
Yellow Birch	*Betula alleghaniensis*	Moist and shady sites
Paper (white) Birch	*Betula papyrifera*	Forest edges and disturbed sites
Speckled Alder	*Alnus incana*	Wetland – swamp
Balsam Poplar	*Populus balsamifera*	Lowland sites and ravines
Willow species	*Salix spp.*	Floodplains, shorelines and wetlands
Chokecherry	*Prunus virginiana*	Exposed areas and open woodlands
Pin Cherry	*Prunus pensylvanica*	Open woodlands and disturbed sites
American Mountain-ash	*Sorbus Americana*	Swamps, thickets and coniferous forests
Showy Mountain-ash	*Sorbus decora*	Rocky shores of lakes and streams
Fireberry Hawthorn	*Crataegus chrysocarpa*	Rocky shores and near wetlands
Staghorn Sumac	*Rhus typhina*	Disturbed sites and rocky, sandy soils
American Basswood	*Tilia americana*	Cool, moist woods, near water
American Beech	*Fagus grandifolia*	Moist, well-drained slopes and bottomlands
Red maple (soft)	*Acer rubrum*	Cool, moist sites in lowland areas; and dryer upland sites
Sugar maple (hard)	*Acer saccharum*	Deep, rich soils in upland woods; young prefer moist soils
Mountain Maple	*Acer spicatum*	Moist woods, swamps and rocky ravines
Striped Maple	*Acer pensylvanicum*	Cool, moist, shady woodlands
White Ash	*Fraxinus americana*	Upland sites
Red Ash	*Fraxinus pennsylvanica*	Open floodplains and wetlands
Black Ash	*Fraxinus nigra*	Wetland – swamp

Source: ROM , 2007; Henson and Brodribb, 2005; and Kershaw, 2001

The Great Lakes-St. Lawrence forested region is a tolerant hardwood region, containing a number of boreal influences. Its landscape is speckled with tree and shrub species tolerant to extreme conditions such as fluctuating moisture regimes, shade or acidic soils. Characteristic tree species of tolerant hardwood-mixed forests in lowland and shoreline areas include red maple, eastern hemlock, balsam poplar, black and white spruce, yellow birch, large-toothed aspen, red oak, American beech, and speckled alder. In the upland forests and rocky ridges of Baptiste Lake many intolerant tree species, including white and red pine, white birch, maple sugar and basswood, strive in these dryer, well-drained soil conditions (Figure 6).

Shorelines and Uplands of Baptiste Lake - The shorelines of Baptiste Lake are both private and public lands. The shoreland landscape is a mixture of undisturbed, naturally vegetated areas with pockets of rocky and sandy-soiled shores, wetlands, permanent and intermittent streams, and steep rock ridges, as well as areas of urbanized grassy lawns and cleared landscapes with hardened shorelines.

A large proportion of shoreline and upland areas abutting Hamilton, Grassy and Dog bays remain Crown land, as well as the eastern shoreline and uplands of Lavelley Bay and the upland/backland of West Bay's southern shoreline (MNR 2006 land ownership data). The undisturbed, naturally vegetated Crown land along the shoreline and in the upland areas provides intact vegetative areas for recreation and wildlife, which affords species and their habitats indirect protection.

The 'shoreland' that is privately owned around the lake has a disproportionate amount of altered shorelines that have been cleared of native shrubs, herbs and trees to accommodate non-native, ornamental grassy lawns, and/or hardened surfaces with concrete and wood to prevent erosion. When native vegetation is removed, so is the shoreline's capability to trap nutrient runoff and prevent soil erosion. Voluntary rehabilitation of these properties would improve water quality and enhance biological diversity.

The Vegetative Community - The shorelines and uplands of Baptiste Lake are dominated by a patchwork of mixed and deciduous dominated treed woodlands, interspersed with pockets of tolerant hardwood or mixed wetland forests, coniferous forests and pine plantations, intolerant hardwood upland forests, grasslands, and lawns, beach, floating or submerged marshy-wetlands, and/or rocky shorelines. The largest influence in the area abutting the lake is tolerant, mid-tolerant and intolerant hardwood woodlands in the upland areas and shorelines of the main basin and the bays in the north-western portion of the lake proper, including Hay, Rangers and Grassy Bay. This area also has pockets of mixed woodlands along the shorelines, which equally dominates the uplands on the northern slopes of the main basin and Grassy Bay. Cleared land and lawns influence the shorelines of the main basin and West and Rangers bays.

Blueberry Island and the northern mainland abutting Herschel Island in the main basin are dominated by White Birch woodlands (Terrestrial Conservation Blueprint digital data, 2005); historically, logged area back in the 1930s (BLA, 2006). The smaller islands north at the outflow of McGarry Creek and large portions of the wetland abutting Grassy Bay are dominated by Aspen species. These mixed hardwood woodlands, in particular the species

that are intolerant to shade and moist conditions (i.e., sugar maple, beech, red oak) provide important breeding habitat for many southern ranging bird species and rare mammals (e.g., southern flying squirrels).

Shallow waters and drowned trees, rocky shorelines, and mixed forests with a coniferous (spruce, cedar, pine, balsam fir) influence dominate Hay Bay. Wetland habitats and wetland tolerant tree species govern the viewscape of the eastern shoreline, Grassy Bay and Hamilton Bay. Rock ridges, bare rock, woodlands define the western shoreline from Hay Bay to Hamilton Bay.

Moving from the main basin east through the narrows towards Lavalley Bay, the dominance shifts from deciduous woodlands to mixed forest cover along the shoreline and upland areas. However, patches of deciduous woodlands and lawns continue to appear along the shoreline, as well as wetland and lowland areas in the shallower portions of the bay. A large patch of mixed woodlands in the main basin along the northern shoreline at the mouth of the narrows had evidence of deer winter browsing on the Eastern White Cedar that laced the shorelines. Lavelley Bay has the largest proportion of Crown land shorelines, and is influenced by exposed bedrock shorelines, coniferous dominated mixed forest, and steep rock ridges, including exposed rock faces with porous metamorphic rock, ideal for bird nesting. The porous holes are probably a consequence of crystalline limestone, gneiss, marble and granite bedrock, and the erosive powers of water.

Figure 7 - Common Riparian, Shoreline and Wetland Shrubs and Herbs in Baptiste Lake's watershed

- Dwarf Raspberry
- Leatherleaf
- Labrador tea
- Bog saurel
- Woodsorrel
- Sweet gale
- Sundew and Pitcher Plant
- Mountain Holly
- Large and small cranberry
- Jewelweed (Touch-me-not)
- Sensitive, Royal , Wood and Lady ferns
- Elderberry
- Pipewort
- Wild mint
- Bog Rosemary
- Marsh St. John's wort
- Rushes, sedges and grasses

Source: Wetland Evaluation

Throughout the basin there are small pockets of wetland dominated species near outflows of streams, and small patches of coniferous woodlands dominated by Black Spruce, White Pine, Eastern White Cedar, Hemlock and Balsam Fir near streams or wetlands along the shoreline, or on islands, with a particularly large area found at the outflow of McGarry Flats, in Redmond Bay, and south of the High Falls dam within the riparian zone of the York River. Pockets of treed bogs, muskegs and aspen dominated lowland forests and wetlands are found north of Grassy Bay in the provincially significant wetland and near the inflow from Elephant Lake. Small communities of oak and pine dominated woodlands just south of the High Falls dam, and a small remnant patch of a Jack Pine forests in upland area south of Baptise Village, also provide important habitat, which increases local biodiversity.

Observations – Vegetation

- *Recommendations under land use planning are made to protect sensitive natural heritage features such as wetlands, ANSI's and fish habitat. These areas should be identified and protected in official planning documents and appropriate zoning by-laws.*

- *Baptiste Lake is on the Canadian Shield, and in the eco-district 5E-9, which is characterized by woodlands, rock ridges, shallow soils and wetlands.*
- *Baptiste Lake's sub-watershed is a matrices of mixed and coniferous forests, open woodlands and deciduous forests, grassland, rockland, rock cliffs, treed and aquatic wetlands, beaches and lawns, and hardened shorelines. The lake is predominantly shallow and defined by a riverine system, except for deeper water in the lacustrine zone of West and Lavelley Bays and the main basin.*
- *Historically, the watershed was covered with old-growth Eastern White Pine, Eastern Hemlock and Yellow Birch tree species. Intensive logging in the late 1800s and early 1900s removed these stands, replacing them with younger, mixed forests, dominated by white pine, yellow birch, red and sugar maple, poplar and balsam fir tree species.*
- *The Terrestrial Conservation Blueprint project recognizes important wetland and upland core habitat areas in the western and north-eastern areas around the lake.*
- *Shoreline and aquatic vegetation is important for maintaining water quality and the protection of fish and wildlife habitat as well as the aesthetics of the landscape.*

Recommendations – Vegetation

6. *Stakeholders should participate in the maintenance, protection and improvement of watershed natural habitats to support fish, plant and animal populations.*

7. *The Association should provide educational opportunities for watershed users to identify ways to contribute to maintaining a healthy watershed (information gathering and data exchange workshop to promote communication and motivation among all stakeholders about the importance of maintaining a healthy watershed environment), and to cultivate partnerships to promote an integrated and consistent approach to the management of the sub-watershed.*

8. *Protecting the sub-watershed's forest production and old growth stands contribute to the maintenance of regional biodiversity by diversifying the structure of the forest and therefore diversifying habitat type and species communities. Assessment of woodland areas, with regards to their significance, should be undertaken.*

9. *Lakefront owners that have > 25% disturbance of shorelines should be encouraged to restore the shoreline areas back to a natural state by protecting and retaining the existing native vegetation and planting only native species (grasses, sedges, shrubs and trees) wherever possible. Ideally, a minimum of 75% of the shoreline lot should remain in a natural state with the exception of marinas.*

10. *The Association should encourage the municipalities to ensure that new development protects the integrity of the shorelines by minimizing the loss of native vegetation and substrates, and prevents runoff, during construction, into the lake.*

11. *Identify degraded areas and encourage restoration activities:*
    a. *In the Littoral Zone consider in-water rehabilitation with the assistance of MNR (need in-water permits) by adding downed native logs and other woody debris, as well as carefully placed rocks, near the shoreline to create micro-habitats for aquatic species and to protect the natural substrate;*
    b. *In the Riparian Zone create a buffer of native plants, shrubs and trees between the water line and lawn, to discourage erosion and prevent sediment runoff;*

c. *In the Upland Zone replant native trees, in areas that do not block the view from the residence, to buffer strong winds, maintain cool water temperatures, protect slope gradient and erosion, and provide habitats for native species; and*

d. *Municipal planning documents should require the mandatory protection of shoreline buffer areas. There should be a mandatory 30 metres of vegetative, "non-disturbance" buffer along the shoreline of new lots created; a 15 metre buffer may be considered for existing developed lots.*

12. *Programs should be developed to educate, assist and encourage landowner stewardship to "naturalize" degraded shorelines. Two excellent restoration guides include: The Shore Primer – A Cottager's Guide to a Healthy Waterfront, by Fisheries and Oceans Canada (2001), and Restoring Natural Habitats: A Manual for Habitat Restoration in the Greater Toronto Bioregion (it is non-area specific), prepared by Hough Woodland Naylor Dance Ltd. and Gore & Storrie Ltd., for the Waterfront Regeneration Trust (1995). Both of these documents describe the principles of basic shoreline protection, including terrestrial and aquatic habitats in the riparian zone, and various rehabilitation procedures and techniques.*

13. *The planting of native vascular plant, shrub and tree species should be encouraged because non-native or "exotic" species can have serious negative impacts on the environment. Local nurseries and landscaping businesses should be encouraged to stock and promote the use of local plants and trees as well as locate non-profit organizations that will donate native species, tools and free labour.*

14. *The municipality should develop Official Plan policy and a "Tree Cutting" or "Tree Preservation" forestry by-law to ensure that lots retain a percentage of their natural vegetation, including shoreline plants and trees, to prevent an increase of storm water runoff from impervious surfaces, landscape alteration, and from resource activities such as clear-cuts.*

Streams

Importance of Streams - Streams or creeks are an important feature of any landscape and define the boundary of all watersheds by transporting water from atmospheric and ground sources towards lowland areas, filling in lakes and wetlands. Streams interact with the valley in which they flow, connecting riparian areas, flood plains and other lakes, providing important water storage and release functions, and nutrient and sediment transport (Horne and Goldman, 1994).

Water quality in head-water streams and lakes is incredibly important for the maintenance of downstream lakes that rely on inflow from these sources. Baptiste Lake is part of a chain of lakes connecting water from headwater lakes in Algonquin Park via the York River to lakes downstream. Historically, Baptiste Lake was a small, natural lake, relying on the York River inflow from Elephant Lake and several

ground-water fed streams as a water source. However, once the river's outflow was dammed for specific water needs, the river flooded the land turning Baptiste Lake into a reservoir lake defined by a river (riverine) system.

Downstream water quality is also a concern and any changes to Baptiste's Lake water quality and quantity conditions could affect the entire Madawaska River Watershed.

Baptiste Lake Streams - Baptiste Lake has, based upon the MNR's Ontario Base Map digital data, 27 permanent streams and 16 intermittent streams, for a total of 43 streams and 2 rivers, including one river inflow and one river outflow via the York River. Often, new intermittent streams are created during spring runoff from shoreline floodplains, wetlands or rock crevices which have accumulated snow and rain. Disturbances that remove vegetation and increase the number of impermeable surfaces in the watershed contribute to nutrient and pollutant runoff, erosion, sedimentation, infilling and changes to water flow in streams, which negatively impacts fish habitat and fish (Horne and Goldman, 1994).

Stream assessments, which investigate substrate type (i.e., porous gravel vs. sand or muck), temperature, flow, habitat conditions and species composition, is incredibly important to identify and protect streams. Cold water streams are typically sources of ground water seepage from acquifers, and are important for temperature regulation, spawning fish and overall water quality health of lake or lacustrine systems. Classifying a stream based upon certain criteria enables the identification of important ground water sources and spawning habitat of resident fish species, such as walleye, brook trout

The streams are scattered throughout Baptiste Lake, and flow through private and Crown land. There are 13 inflowing tributary streams in Lavalley Bay, including the larger McGarry Creek and along the outflow; 6 in Redmond Bay; 3 in Dog Bay; 8 in the main basin, including West Bay and the creek connecting Baptiste Lake to Diamond Lake; 2 in Hay and Rangers bays; and 11 throughout Grassy and Hamilton Bay, which includes passage through a provincially significant wetland. The largest inflow is the York River connection to Elephant Lake, and the one outflow via the York River, which drains water south-east towards Bancroft, and then north into the Madawaska-Ottawa rivers downstream. The connectivity of lakes via rivers and their tributaries contributes to the importance and benefits to all downstream waters of protecting Baptiste Lake's ecological health.

Streams are either permanent or temporary features in the landscape, but all are an important part of the fish and wildlife habitat of Baptiste Lake. These streams have not been researched (neither identified by name nor inventoried extensively), and there may be more streams unidentifiable from maps or aerial photography that flow into Baptiste Lake. The Ministry of Natural Resources is, however, supportive about implementing a potential research or volunteer effort for the collection of water quality information and species inventories in these streams and others in the Madawaska River Watershed.

Observations – Streams

- *There are forty-three (43) streams and one inflow and outflow, respectively, which connect the Benoir-Elephant-Baptiste lakes chain to the Madawaska River downstream.*
- *There may be more tributaries linked to these lakes, but are currently unidentifiable.*

- *The streams occur both on patented/private and Crown land.*
- *There is a lack of data, including fish inventories and environmental parameters, and a need for site-specific information to be able to properly classify the streams that flow into Baptiste Lake. Currently, the classification of these streams is unknown, but assumed to be a mix of warm, cool or coldwater due to the lakes' fish community (brook trout, walleye, muskellunge, bass) and thermal regime (mixture of warm, cool and cold water fish habitat).*
- *MNR is supportive about potential research or volunteer efforts for the collection of water quality information and species inventories in these streams.*

Recommendations – Streams

15. *A detailed study of the streams should be implemented for the collection of long-term data, including a benthic community study to determine thermal regime and water quality, and a fish spawning suitable habitat inventory, and conservation.*
16. *Official Plans and Zoning by-laws should recognize the location of all permanent and intermittent streams including policy to control and protect them against development impacts, especially cold water streams which are significant to protection of lake water quality and fish habitat.*
17. *Through landowner contact and information brochures, property owners that own property adjacent to streams should be encouraged to help protect the water quality and natural features of these streams, such as maintaining a 20 m vegetated buffer(at a minimum) along the stream's shoreline.*
18. *The streams that flow into Baptiste Lake need to be "officially" named prior to inventories. Perhaps encourage the "young" cottagers to participate in a "name that stream" contest.*

Wetlands

Importance of Wetlands - Wetlands are land types (swamps, marshes, fens, bogs) that occur across the landscape along waterbodies (lakes, rivers and streams), or in lowland areas with shallow ground water tables which are subjected to periodic flooding during spring, including vernal pools which are popular with breeding frogs and salamanders. Wetland ecosystems contribute considerable ecological, social and economical value to any lake/watershed via water filtration, including pollution control (Horne and Goldman, 1994), and attenuation or detention of rain and runoff to prevent flooding, as well as supply necessary habitat for a variety of flora and fauna species. Many rare and unique species reside in wetlands, and when wetlands are drained or cleared for development, habitats, ecosystem functionality, and the local biodiversity are altered or eliminated...forever. The wetland types common to Baptiste Lake's sub-watershed are listed below in Figure 8.

Figure 8 – Wetland Types Common to the Baptiste Lake Sub-watershed	
Wetland Type	**Habitat Characteristics**
Marsh	▪ Wet areas of standing or flowing water ▪ Along shores or rivers, and bordered by peripheral band of trees and shrubs (swamps) ▪ Common species – emergents (grasses, sedges, rushes, cattails and reeds), low shrubs (sweetgale, red osier, leatherleaf, winterberry), submergents (water milfoil, waterweed, pondweeds), or floating plants (water lilies, water plantain, pickerel weed and arrowhead) ▪ Nesting and foraging habitat for colonial birds, waterfowl, turtles and amphibians
Swamp	▪ Treed wetlands (25% tree cover) formed during snowmelt or flooding ▪ Isolated or found along rivers, streams and lakes, or areas with saturated soil ▪ Common species – black spruce, tamarack, black ash, silver maple, and speckled alder ▪ Swamps may dry up completely during summer months
Fen	▪ Located in low-lying areas and develop at ground water seepage areas (cold water areas) ▪ Develop in areas of restricted drainage, with peat deposits ▪ Receive nutrients from ground water ▪ Fens may dry up completely (like swamps) during summer months ▪ Common species – sedges, grasses, reeds, buckbean (indicator species), bog rosemary, bog willow, shrubs and stunted trees (cedar, black spruce and tamarack)
Bog	▪ Hummocky (hills and depressions) wetlands with peat filled depressions and a high water table ▪ Isolated from mineral soil and relies solely on atmospheric deposition for nutrients and water ▪ Bogs isolation creates low biodiversity (<12 different plant species) ▪ Commonly found in northern parts of the province ▪ Common species – sphagnum moss, shrubs (bog laurel, swamp blueberry), cotton grasses and sedges, and treed (<25% cover) or treeless (black spruce or tamarack dominate) ▪ Extremely rare in southern Ontario
Source: MNR, 1994	

Baptiste Lake Wetlands - Baptiste Lake is underlain with Precambrian, impervious bedrock, and an interconnected network of palustrine (absent, intermittent or permanent flow), riverine (channel or river) and lacustrine (beside lakes) wetlands, including swamps, marshes, bogs and fens, and streams are scattered across the landscape.

These wetlands are typical of eastern Ontario with emergent borders of cattails and floating aquatic plants (water-lilies, pondweeds, pickerel weeds and duck weeds) and low shrubs (water willow or sweetgale), bordered by tall, water-loving shrubs (willows, alders and/or dogwoods) and trees (silver and red maple, black ash, cedar and spruce) which stretch to the forest's edge. Some rare flora associated with rare fen and bog communities, including (rattlesnake) manna grass, wire sedge, beaked sedge, buckbean, pitcher plants and sundews, bog rosemary, Labrador tea and low-bush cranberry. These "special features" result in substantial social and economic benefits and opportunities for the local residents

including fishing, boating, other recreational activities, wildlife viewing, and an overall appreciation for nature.

Wetlands provide important habitats to a variety of species, act as sponges holding large quantities of water (releasing water slowly to prevent erosion and to allow time for water purification), and act like giant filters. Threats to wetlands include development; draining, dredging and filling to create fertile land; peat harvesting; invasive species; climate change; air and water pollution; and water level manipulations. Climate change and water level manipulations can be misleading however, because some of the side effects (warmer and dryer conditions, or shallow vs. flooded conditions) can be beneficial to some species or communities of a wetland ecosystem.

In general, any ecosystem that contains more habitats will inevitably contain more variety of plants that will attract a variety of animals. The benefits of biodiversity both to humans and to the ecological health of an area (and the larger region) are of great importance because of the link between greater diversity of habitats and the greater numbers of abundance of plants and animals. As well, the variety of living things working together maintains the ecological processes of the planet (MNR, 1993). In the wetland evaluation system a wetlands biodiversity is scored based upon the number wetland types (proximity to water and groundwater, and connectivity to inflow and outflow areas), vegetation communities, diversity of surrounding habitat, proximity to other wetlands, presence and number of edges (highest diversity along transitional zones (e.g., riparian zones), and open water types. The more diverse a wetland is the higher the score, which brings the wetland one point closer to 'provincial significance'.

Figure 9 - Wetland Plants Common to Baptiste Lake's Marshes, Swamps, Fens and Bogs

- ferns
- duckweed
- arrowhead
- water-milfoil (northern, eastern and, possibly, alternate (resembles the invasive Eurasian water-milfoil)
- yellow pond lily and fragrant white water-lily (moose food)
- pondweeds
- water shield
- bladderworts
- burreeds
- horsetails
- grasses
- sedges
- black spruce* (bog)
- balsam fir
- tamarack
- eastern white cedar
- willows (small pussy, peach leaf and slender)
- speckled alder
- leatherleaf
- white and dwarf or swamp* birch (fen)
- mountain holly* (bog)
- bog laurel* (bog)
- bog rosemary* (fen)
- sweetgale
- narrow-leaved meadowsweet
- bulrushes
- pitcher plant (bogs and fens)
- sundew (bogs and fens

**Wetland type indicator species*
Source: Wetland Evaluations

Provincially Significant Wetlands - Baptiste Lake's watershed has one large 'provincially significant' wetland (PSW), which encompasses several wetlands abutting the lake at the inflow from Elephant Lake, the 'Baptiste-Elephant Wetland Complex'. It is comprised of 59 individual wetlands, which range in size from 0.5 to 362.0 ha. The wetland complex is underlain with sandy soil, which is derived from a glacial spillway deposited when the glaciers retreated over 10,000 years ago. Sixty-six percent of the wetland complex area is classified as swamp and 29 % as marsh, and only 2 % is bog and 3 % is fen, which makes this complex quite biologically diverse (Biota Environmental Contractors, 1994). The latter wetland types are rare in central Ontario and extremely sensitive to disturbance.

This wetland is designated 'provincially significant' because of significant natural heritage features including a large number of vegetative community types which create a variety of

fish and wildlife habitats, as well as its economical and ecological valuable wood products and lowbush cranberry, commercial fish production (bait and/or coarse fish), recreational enjoyment (nature appreciation, fishing and hunting), and the presence of breeding or migratory species at risk.

The interesting feature of this wetland is its connectivity to Elephant Lake and its significant contribution of habitat for birds, reptiles, amphibians, fish, wildlife, insects and other aquatic species.

Major human influence to the area may be the deleterious effects of the annual water level drawdown in the fall, road construction, tree clearing, and activities related to hunting and fishing, such as poaching, shoreline clearing, and sight and sound impacts. However, the wetland is quite large and these impacts may be minor to overall wetland function.

According to the new Provincial Policy Statement (2005), development and site alteration shall not be permitted in significant wetlands in Ecoregions 5E, 6E and 7E. Baptiste Lake's sub-watershed is within Ecoregion 5E (Site District 5E-9). Development and site alteration that would negatively impact the form and function of a significant natural heritage are not permitted in significant woodlands and valleylands south and east of the Canadian Shield, and significant wildlife and areas of natural and scientific interest.

There are several smaller patches of wetlands distributed across the lake's shorelines, including a large wetland in Lavalley Bay and several smaller ones in McGarry Creek and Redmond Bay (MNR wetland digital data, 2006). The evaluation system recognizes the critical role of wetlands in maintaining healthy ecosystem (MNR, 1994). These wetlands and others adjacent to the lake's shorelines have not been evaluated for provincial significance, but should be regarded as locally significant natural heritage features because of their contribution to water quality and biodiversity.

Most of the wetlands in Baptiste Lake and its watershed are of a type that can become established in a relatively short time frame (i.e., tens of years), and since the lake is on a river system, is shallow, flooded land, and its fluctuation regime has been in place for over 100 years (dams), it is assumed that these wetlands represent an adapted system. The main threat to the viability of these wetlands may be from increased shoreline development, or impending impacts from unprecedented climate changes.

The diversity of the surrounding habitat include recent prescribed burns and cutovers or clearcuts (< 5 years), deciduous and coniferous forests, treed and aquatic wetlands, abandoned pits or quarries, row crop, and deep river and open lake habitats (Biota Environmental Contractors, 1994). This regional context of a lake's watershed is incredibly important to recognize important natural heritage features that contribute significant ecological functions to the overall health of the Algonquin Highlands region. There are a lot of wetlands in Baptiste Lake, and their role of purifying water quality is incredibly important, especially in shallow, riverine systems. Fish production, flood attenuation and protection against shoreline erosion are also an important feature of wetland vegetation. Therefore, protection and conservation of these wetland and lowland areas should be made a priority.

Observations – Wetlands

- *There is one large Provincially Significant Wetland Complex, comprised of 59 individual wetlands within Grassy and Hamilton Bays and the inflow from Elephant Lake. This large wetland complex connects Baptiste Lake with Elephant Lake via water flow and floristic communities.*
- *There are all four wetland type communities represented in Baptiste Lake's lakeshed, including the rare floristic communities of bogs and fens.*
- *There are many other wetlands within the quiet shores of Lavelley and Redmond Bays, and smaller pockets adjacent to shorelines of streams, outflows and backlot lakes that have not been evaluated or properly recognized by local official plan zoning map(s).*
- *Conservation of Baptiste Lake's wetlands are important to the water quality and overall regional health of Madawska River watershed downstream.*

Recommendations – Wetlands

19. *In cooperation with the local MNR, a wetland evaluation should be initiated to inventory the wetlands abutting Lavelley and Redmond Bay, and other wetland areas found within the sub-watersheds (immediate surrounding area), in order to qualify and quantify*

vegetation and animal inventories and to determine whether or not they are "provincially significant" wetlands.

20. *An education program promoting the sensitivity and the need to protect wetlands should be prepared that includes the significance of wetland habitats for "species at risk" conservation in Ontario.*
21. *Local official plans and zoning by-laws must identify the location and size of wetlands, and provide appropriate policy to ensure their protection, including the enforcement of environmental/lake impact assessments for new development proposals in provincially significant wetlands as well as the associated adjacent lands.*
22. *The ongoing protection of these areas depends, in part, upon the commitment of municipal governments to zone wetlands as "natural areas where no development can occur".*
23. *Encourage collaboration and dialogue among Lake Associations and/or residents on Benoir and Elephant Lake*

4 Fish and Fish Habitat

Introduction

Baptiste Lake has a complex fish community which is comprised of cold, cool and warm water fish species. Prior to the dam construction and subsequent flooding of land in 1931/32, Baptiste Lake maintained a coldwater fishery of wild, self-sustaining lake trout despite earlier assumptions that lake trout were absent from the lake. A current population of naturally-reproducing lake trout, along with other native cold water species including lake whitefish, cisco and burbot populations, are present due to pockets of deepwater habitats within the main basin of the lake. The lake also supports a cool and warm water fishery composed of several introduced and historically stocked fish species including walleye, muskellunge, smallmouth and largemouth bass, rock bass and northern pike, and a native fish community comprised of yellow perch, white sucker, brown bullhead, pumpkin seed and several species of minnows and darters (MNR Lake Files, 2007 and ROM, 2007).

All fish species occurring in Baptiste Lake, as well as other fishes whose geographical ranges extend into the Baptise Lake sub-watershed, are listed in Figure 10.

Figure 10 – Fish Species in Baptiste Lake

Common Name	Scientific Name	Fish Family
Lake Whitefish	*Coregonus clupeaformis*	Trouts, Salmons, Char and Whitefishes
Lake Herring (Cisco)	*Coregonus artedi*	Trouts, Salmons, Char and Whitefishes
Lake Trout	*Salvelinus namaycush*	Trouts, Salmons, Char and Whitefishes
Brook Trout*	*Salvelinus fontinalis*	Trouts, Salmons, Char and Whitefishes
Northern Pike	*Esox lucius*	Pikes
Muskellunge	*Esox masquinongy*	Pikes
White Sucker	*Catostomus commersoni*	Suckers
Golden Shiner	*Notemigonus crysoleucas*	Minnows
Blacknose Shiner	*Notropis heterolepis*	Minnows
Brown Bullhead	*Ameiurus nebulosus*	Bullhead Catfishes
Burbot	*Lota lota (cod)*	Cod
Rock Bass	*Ambloplites rupestris*	Sunfishes and Bass
Black Crappie**	*Pomoxis nigromaculatus*	Sunfishes and Bass
Largemouth Bass	*Micropterus salmoides*	Sunfishes and Bass
Smallmouth Bass	*Micropterus dolomieu*	Sunfishes and Bass
Pumpkinseed	*Lepomis gibbosus*	Sunfishes and Bass
Walleye	*Sander vitreus*	Darters, Perches, Walleye and Sauger
Yellow Perch	*Perca flavescens*	Darters, Perches, Walleye and Sauger

* Rivers and Streams
Source: MNR Lake Files, 2007 and BLA, 2007

**Fish species native to Hastings County that were not identified in the MNR species list, but have been recognized as a probable resident by MNR. Several darter species are native to Hastings County including: Fantail darter, (*Etheostoma flabellare);* Johnny darter, (*Etheostoma nigrum);* Least darter, (*Etheostoma microperca); and* Tessellated darter, (*Etheostoma olmstedi).*

Recently northern pike has become an established member of the fish community; most likely an introduction from movement upstream from the Madawaka River or from past stocking efforts. Black Crappie and Bluegill are two other fish species that have been

expanding their geographical ranges northward due to the accessibility of inland lakes via the canal systems. According to the MNR, black crappie may already be a resident of Baptiste Lake due to its hospitable and plentiful weedy, warm water shoreline habitats, but has yet to be confirmed through sightings. Bluegill, on the other hand, is a resident of lakes in the northeastern areas of Lennox and Addington County abutting northern areas of County of Hastings and connected via the Ottawa-Madawaska-York Rivers and the Rideau Canal waterway.

Today, because of naturally-reproducing lake trout populations, the lake is managed as a cold water lake, which includes development restrictions on portions of the lake due to lake trout carrying capacity objectives (MNR Lake Files, 2007 and MNR, 2004).

DID YOU KNOW?

The various species of fish which live in these lakes are affected differently by characteristics of habitat, such as:

- depth of lake area
- water temperatures
- dissolved oxygen levels
- presence of in-water structures for refuge, such as plants, rocks, or woody debris
- spawning schedules and habitats (i.e. muck vs. rubble)
- prey and predators, including humans

Historical Changes to Baptiste Lake's Fishery

Baptiste Lake was historically managed, since the 1940s, as a warm water lake because residents and the managing agency presumed that the lake trout population was rare or absent due to low to nil catches of lake trout and the dramatic changes to the lake's fish habitat and community. Prior to natural resource extraction, logging dams and settlement of the lake area, Baptiste Lake was a small, cold water, oligotrophic (low nutrient) lake with resident populations of lake trout and other native cold water species. Loss of fish habitat has occurred in the entire Baptiste chain due to heavily cottaged use and low water levels which occurs during hot/dry summers, causing oxygen depletion (MNR Lake Files, 2007). Changes to the fish community began when the existing dam at the outlet on the York River was upgraded and rebuilt in 1931/32.

The dam built in the 1930s on the York River flooded the un-cleared land causing a significant increase in lake levels, increasing the lake's basin by nearly twice its original size. Two-thirds of the flooded land around the original basin of Baptiste Lake and the York River created a large volume of shallow, weedy bays and shorelines, with lots of submerged terrestrial plants, trees and logs; all ideal habitats for warm water fishes, but not ideal for cold water fishes. Flooding of land creates a rapid, influx of nutrients into the water column because of the rotting and decomposing plant and woody debris, which negatively impacts cold water fish habitat through the reduction of dissolved oxygen concentrations in the deeper waters. The larger surface area of shallow (<10 m depth), weedy water also increases temperatures which increases metabolic rates of aquatic organisms and other biogeochemical processes and minimizes optimal and useable cold water habitat (Horne and Goldman, 1994). The dissolved oxygen and temperature levels in Baptiste Lake are extremely restrictive for Lake Trout (MNR 1987, 1991 and 2004). Introduction of other fish species can also have significant impacts on the resident, native fish community.

Baptiste Lake has been periodically stocked with native and introduced fish species to supplement existing populations and to enhance sport angling opportunities on the lake. The native cool and warm water fish species' populations were undoubtedly increased due to the large volume of shallow water. The introduction of walleye and smallmouth bass during the 1920s and 1930s, and in the 1950s the introduction of two more predators, the muskellunge and largemouth bass, have changed the predatory-prey dynamics within the native fish community. Introductions create more complex interactions among fish and their habitat, such as increased competition for resources and predation at various life stages. Rock bass and northern pike have also appeared among the aquatic fauna, and it is suspected that the rock bass was introduced inadvertently during smallmouth bass plantings (MNR Lake Files, 2007).

Post-stocking surveys of lake trout populations have determined that the ecological change brought about by raising the Baptiste Lake water level in 1932, the successful introduction of competitive and predatory fish (e.g., walleye and rock bass), land use changes, and climate change have had some bearing on the "disappearance", or poor recruitment success, of lake trout in this lake and changes in the overall quality of the fishery. Degradation of spawning habitat through siltation or 'burying' of spawning shoals, fluctuating water levels, pollution, increased angling pressure, and stresses associated with a complex fish community (e.g., egg and fry predation) have negatively impacted the other fish populations (walleye, muskellunge and smallmouth bass).

Fish Management and Stocking History

The Ministry of Natural Resources' (MNR) Bancroft District manages Baptiste Lake's fisheries, including the monitoring and protection of fish habitat. Fisheries management practices, include fish stocking, population surveys, spawning habitat remediation, protection of critical fish habitat (littoral zone), and the accumulation of baseline date to develop appropriate management strategies. The management of Baptiste Lake began concurrently with the development boom in the early 1920s.

Fisheries Management Strategies

Since the 1950s, fishing success has declined, and pressure by anglers to the MNR to rid the lake of coarse fish and stock it with game fish has been solicited since the late 1940s (MNR Lake Files, 2007). The low dissolved oxygen in the bottom waters, documented since the 1960s, in combination with an increased rate of sedimentation on possible spawning beds and water level fluctuations, may have all contributed to the creation of marginal habitat for lake trout, and low production of walleye over the years (MNR Lake Files, 2007). Since the 1960s, the proposed MNR management strategy to promote recruitment has been to initiate rehabilitative stocking of walleye via a Jar Hatchery (eggs planted from Jack and Kasshabog lakes) in the 1980s, continued monitoring of spawning success (i.e., observation of adults and eggs), and rehabilitative work on spawning beds by thickening the substrate with the introduction of rock rubble to protect eggs from siltation and predation (Bellamy, 1983).

The Ministry of Natural Resources managed fish stocking programs have ceased, but concerns over degraded walleye spawning habitat, low recruitment success, and poor angling success (the catch per unit effort (CUE) for all game species was below allowable yields) initiated a community-based Walleye Stocking program in Baptiste Lake. In 1999, a stocking permit was issued by the MNR to allow local residents to stock walleye fingerlings. The program continues, and the residents have been re-issued a stocking permit for 2007. However, in light of recent concerns regarding an outbreak of Viral Hemorrhagic Septicemia (VHS) in baitfish, muskellunge and smallmouth bass in the Great Lakes drainage area, future stocking permits may be rescinded. VHS is easily spread among fish, is infectious and kills; it is not harmful to humans. Future stocking permits and baitfish may be put on hold until further investigation, including VHS testing on introduced fish stocks, are initiated (MNR, 2007).

Despite concentrated habitat protection efforts, habitat rehabilitation, and extensive fish stocking efforts there are still concerns regarding the health of complex fisheries, especially lake trout populations in the Minden-Haliburton area. Creel survey results indicate poor angler success, as anglers continue to report poor catches, and a preponderance of small fish. Requests for increases in stocking rates persist despite evidence that stocking of hatchery fish over native populations can have serious negative consequences on the community. Furthermore, a reluctance to accept harvest controls leaves few options (MNR, 1995).

Stocking History

Stocking fish into Baptiste Lake began in the 1920s with lake trout and smallmouth bass; walleye was later introduced in the late 1920s (1920s and 1930s), at which time rock bass may have accidentally been introduced during smallmouth bass stocking. Figure 11 lists the stocking history of Baptiste Lake.

Figure 11 - Stocking History in Baptiste Lake

Year	Fish	Quantity
1923 to 1952	*Lake Trout (81)*	First stocking.
1926 to 1954	*Walleye*	An average of 300,000 to 1,000,000 fry stocked 16 times over a 28 year period.
1927 to 1952	*Brook Trout (80)*	First stocking in 1927, and again in 1935 with periodic stockings of 1,000 to 1,000,000 fry, fingerlings, eggs or adults every 1-3 years until 1952.
1931 to 1935	*Cisco*	Introduced supplemental stocks of 500,000 per year.
1932 to 1956	*Smallmouth Bass*	Introduced.
1952 to 1957	*Largemouth Bass*	Introduction to lake.
1958 to 1986	*Muskellunge*	An average of 50,000 fry stocked 25 times over a 28 year period.

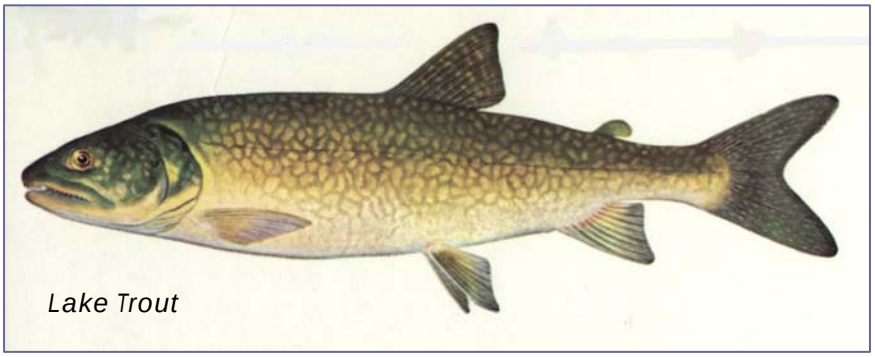
Source: MNR Lake Files, 2007

Due to the larger area of shallow, flooded land and the absence of northern pike in the lake, muskellunge and largemouth bass were introduced to fill this unoccupied niche.

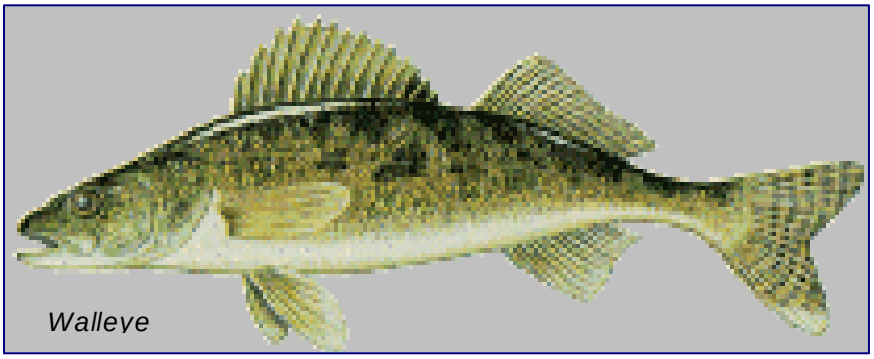
Annual plantings of largemouth bass were made for a period of five years from 1952 to 1956, and in 1956 muskellunge plantings began after the arrival of some Elephant Lake individuals into Baptiste Lake. Stocking for most species, however, except for muskellunge, was ceased by the ministry in the late 1950s.

At the request of residents and local anglers, MNR began stocking Baptiste Lake with muskellunge fingerlings (juvenile life stage) from the local Deer Lake Hatchery at Cordova Mines to increase the predatory base of the lake and help curtail the expanding bass and sunfishes community, in particular the exploding rock bass population. The local residents also promoted derbies to remove unwanted bass and sunfishes, which they believed were negatively impacting the young of other fish, including walleye and smallmouth bass (MNR Lake Files, 2007). Since muskellunge had been successfully introduced to Elephant Lake, and some individuals had made their way into Baptiste, it seemed only natural to introduce this species rather than pike into the lake. Unfortunately, the musky population never became plentiful enough in any lake to control the number of coarse fish, especially rock bass and sunfishes, and natural recruitment success in Baptiste Lake is poor to moderate (MNR Lake Files, 2007).

It was common practice from the 1920s to the 1960s to stock fish in waters that appeared to be suitable in order to provide angling opportunities, or to remove fish (i.e., bass populations) to prevent overcrowding (MNR Lake Files, 2007). Many lakes that had been isolated from natural corridors may have been first introduced to lake trout, bass and walleye at this time. By the 1950s and 60s, MNR (Department of Lands and Forests during this time) began creel, netting and spawning surveys, and rehabilitative work including restoring spawning habitat with clean substrate and/or seeding spawning sites with fish eggs, to obtain standardized scientific data and improve fish recruitment, which forms the basis of current fisheries management (MNR Lake Files, 2007). Creel surveys established by the MNR monitor angler catches and fish sizes to establish the current quality of the fishery. Current management activities include: creel surveys, spawning shoal surveys, fall and spring netting surveys, and habitat rehabilitation projects, with concentrations on specific management strategies such as stocking or shoal rehabilitation.



Lake Trout



Walleye

Stocking of lake trout and walleye have ceased in most lakes, especially where naturally reproducing population has been established, and it is MNR's policy not to stock reared populations on top of naturally producing populations. Artificially increasing a fish population cause added stress to the native population, either through competition, genetic hybridization, and/or increased angling pressure. When "natural lakes" are stocked, the fish that are stocked are substituting fish for other fish rather than actually adding fish to the lake. Stocking of lake trout or walleye is a suitable management technique where lake trout rarely or never reproduce. Since Baptiste Lake's lake trout and walleye population are supported via natural reproduction, MNR will not supplement, through stocking.

Fishing pressure has increased substantially over the past decades because of increased access to these lakes, which means that the average angler is catching fewer and smaller fish. Over harvest problems cannot be addressed by simply stocking more fish. Stocking cannot increase the natural carrying capacity of a waterbody. Overexploitation is best controlled by limiting fishing opportunities, limiting harvest, or by restricting access to the resource. Fishing regulations on lake trout and walleye lakes now limit anglers to seasonal and slot size limits to protect spawning stock and promote variable year classes.

Monitoring Water Quality and Quantity

Dissolved oxygen and temperature profiles are monitored to determine the amount of useable and suitable lake trout habitat. Oxygen depletion forces cold water species into oxygenated but shallow and warm water (MNR, 2004). Under these conditions these fish become stressed and more exposed to predation, especially juvenile lake trout (cannibalism). Each species has its own requirements, but habitat requirements for lake trout are more demanding than those of other fish species (MNR, 2004). Lake trout require clear, deep lakes with well-oxygenated bottom waters. In a significant number of Ontario lakes, lake trout populations have been lost or are severely impaired. Unless properly managed, these fisheries and their benefits will be lost forever (MNR, 2004).

The 2006 temperature and oxygen profile data indicates that the bottom waters in the main basin was found to contain both optimum and useable lake trout habitat during the July survey, but only useable habitat during the September survey. The bottom waters found to contain, on average, no optimal lake trout habitat, but with some usable habitat during July, which disappeared by September (MOE, 2006). Due to the fact that lake trout have stringent water quality requirements, the present standard of water quality in Baptiste is limited.

In the late 1950s and 1960s numerous letters to the MNR referred to fish kills of rock bass, walleye and other species of sunfishes in the shallow areas (e.g., Redmond Bay) and streams (e.g., McGarry Creek) of Baptiste Lake. At the time low dissolved oxygen and concentrations of roadside pollutants (e.g., calcium chloride toxicity from road salts) and winter drawdowns seem to be the cause of the problem. After the traditional winter drawdown of three feet, the shallow bays have only two feet of water under the ice, and in combination of oxygen-deleting vegetation decomposition, low dissolved oxygen makes the shallows inhospitable to fish. In response to the community's concerns, the dam control agency tested a drawdown regime of 12.5 feet versus the traditional 12 feet to protect fish

in the shallow areas to see if the regime was negatively impacting the fish community. Today, the dam is managed to protect spawning lake trout. The drawdown is brought to its pre-spring-freshet level in the fall before lake trout spawn to prevent the exposure of eggs to the dry, cold winter air. This drawdown indirectly protects hibernating reptiles as well.

Spawning Surveys and Tagging Programs

Due to the presence of degraded lake trout habitat and low recruitment, spawning and habitat assessment surveys were initiated by the MNR. The lake trout fishery is degraded because of small useable habitat and low recruitment. During a 1975 lake survey, six (6) suitable spawning sites were mapped (Map 3) and four (4) were active. It was suggested at this time not to re-establish lake trout because of only marginal habitat. In 1990, the lake trout population was surveyed post-1952 stocking to determine population status. Another spawning survey re-examined the six suitable spawning sites, but this time found no activity. Hot and dry summers and low water levels have reduced suitable lake trout habitat in the water column indicating a stressed population. No rehabilitation has been implemented for this species.

Map 3 – Baptiste Lake – Potential and Active Lake Trout Spawning Sites

Based on oxygen profiles from 2006, there was no optimal lake trout habitat available at the end of summer. The lake, as a result, is considered at capacity west of Lot 16 and 17, and is subjected to seasonal lake trout fishery closures and slot size limits to protect breeding adults (MNR, 2004 and MNR, 1996). Baptiste Lake is considered highly sensitive to the loss of lake trout habitat (MNR, 2004).

During the 1930s and 1950s, Baptiste Lake was established as a premier walleye and bass lake. After the 1950s, anglers started to complain about poor catches, degraded habitat, and a changing fish community. In response, MNR began tagging walleye to determine their distribution throughout the lake and their behaviour to establish possible causes for their low numbers observed since the 1960s. The results from 1960s and 1970s tagging programs demonstrated well-established populations of walleye in the lake and satisfactory spawning beds. The lake carries a fairly high population of walleye; however, angling in the summer months was not good. It seems that the walleye in this lake, like a few other lakes, did not respond to angling readily. The tagging program suggested that walleye in Baptiste Lake do not range widely throughout the lake. There was also evidence that some of the walleye returned to the same "summer areas" in subsequent years.

In the 1980s, creel surveys also revealed poor catch success for walleye and bass, which indicates a possible gradual depletion of these populations. Trap net programs, spawning site surveys, and stocking (Jar Hatchery) to augment fish population were initiated. In 1985, spawning site inventories mapped thirteen (13) suitable sites (Map 4) for walleye, and observed three (3) active sites; in 1986 three more sites were added, but no activity was observed.

Source – MNR Lake Files, 2007

One of the key objectives of the Bancroft District Fisheries Management plan is to provide opportunities for recreation and economic benefits consistent with the maintenance of healthy fish communities by sustaining naturally reproducing populations and protecting critical fish habitat. Those spawning sites that were degraded by siltation, in particular Redmond Bay, McGarry Creek, and the inflow from Elephant Lake, sites 5, 7 and 1, respectively, continue to be rehabilitated to promote recruitment, as well as protection of other potential spawning sites along shorelines or in streams with gravely, rocky bottoms. Stocking of walleye fry by residents since 1999 may also benefit the population; future assessments will determine the success of this program's initiative to increase walleye populations and angler success.

Lake Trout Lakes

Lake trout was first stocked into Baptiste Lake in 1923 and last stocked in 1952. The reason for the discontinuation of lake trout stocking was never clear, but was probably related to the fact that due to flooding and eutrophic conditions the lake was no longer viewed as a lake trout lake (MNR lake files). The first lake wide fishery survey was conducted in 1956 and updated in 1975. Up until 1975, Baptiste Lake was considered a warm water lake with a rare or absent lake trout population. It was only in 1980, when a 37 pound lake trout was caught from Baptiste Lake, and subsequent reports from numerous anglers during 1982-1990, and in 1982 a total of 16 lake trout adults were observed on spawning shoals during a MNR survey, that Baptiste lake re-established its cold water status.

DID YOU KNOW?

Lake Trout

- Lake trout are present in only 1% of Ontario's lakes and these lakes make up 25% of the world's lake trout resource.
- Lake trout lakes are therefore important part of our natural heritage and provide high quality angling and recreational experiences.
- Baptiste Lake is a cold water, lake trout lake. However, since the 1920s there have been numerous physical changes to the lake's basin and water quality, and biological changes to the fish community through stocking that have contributed to the decline of this cold water native.

In the spring of 1990, the Algonquin Region introduced a new policy governing shoreline development on lake trout lakes. During this time, the Baptiste lake dam revised its operating plan to recognize measures to protect spawning lake trout and their eggs in the fall and over winter. In 1990, MNR conducted a lake trout assessment study on the status of the lake's population to determine whether this new policy applied to Baptiste Lake. This study determined the presence of naturally reproducing lake trout in Baptiste Lake because none of the captured lake trout had clipped fins, which is a consistent physical feature of stocked fish. Diamond Lake is the only other lake trout lake in Herschel Township. The presence of other coldwater fish such as burbot and lake whitefish also indicates the presence of suitable cold water habitat in the lake. Since there is a naturally reproducing population of lake trout, Baptiste Lake must be managed as a lake trout lake (MNR Lake Files, 2007).

Lake Trout Ecology - During the summer months lake trout live in or below the thermocline and in the bottom waters, where temperatures are traditionally cooler than surface waters. The bottom waters are isolated from the upper waters during periods of stratification by the thermocline; the bottom waters are therefore not replenished with new supplies of oxygen from the atmosphere or through photosynthesis. An increase in heat during the summer turns the metabolic wheels at a faster rate; therefore, the rate of recycling energy and growth increase during summer months, reducing dissolved oxygen near the bottom. The thermocline is not fixed in depth, but rather descends gradually during the summer until the lake turns over in the fall (Horne and Golman, 1994 (Limonolgy)). Warm surface temperatures and reduced dissolved oxygen in the bottom waters confines lake trout to a small area of useable habitat which diminishes over the summer months as the thermocline descends. It is during this critical time period that lake trout are stressed because of limited habitat.

Lake trout at various life stages occupy different niches of a lake. They are traditionally pelagic species, inhabiting the deep, cold waters of the open lake. During the spawning season and larval stages, lake trout occupy shoreline habitats near rocky shoals. During these life stages, lake trout are subjected to competition for resources and predation on young. At their juvenile stage, young lake trout occupy the pelagic zone too, but are often found at deeper waters than their adult counterparts due to their dissolved oxygen requirements (>7 mg/L); adult lake trout can survive quite well with dissolved oxygen concentrations between 4 and 6 mg/L, the latter being optimal habitat. When bottom waters become anoxic or devoid of oxygen, the juvenile lake trout are pushed up the water column to more optimal habitat, which is also occupied by adult lake trout. Lake trout, like many other species, are cannibalistic, especially when stressed for food resources because of limited habitat. It is during this life stage that lake trout are probably impacted the most; the loss of juvenile fish to cannibalism means a loss of recruitment or adult fish that can reproduce in the future. This is a common situation in many stressed habitats of lake trout lakes, and the late maturation, modest egg production, and low recruitment make these fish vulnerable to these external factors that promote anoxic lake conditions (MNR, 2005).

Carrying Capacity - All natural ecosystems have a maximum carrying capacity by which populations can be sustained by the areas resources; the same is true of development and recreation. In the 1970s, MOE began recreational lake carrying capacities to determine the amount of 'use' a lake could withstand before water quality and natural areas became impaired by human activities. Carrying capacity studies today involve the study of habitat requirements by aquatic species to determine the maximum amount of 'use' a lake can withstand.

Lake trout have stringent water quality requirements. The MNR has determined that a volume-weighted mean dissolved oxygen concentration of 7 mg/L of dissolved oxygen is required to meet the needs of juvenile lake trout and to ensure that natural recruitment in a lake continues. The late summer critical period indicates that Baptiste Lake experiences dissolved oxygen concentrations of less than 7 mg/l during the critical late summer period, including less than 2 mg/L in Lavalley Bay. The data also indicates that optimal lake trout

habitat becomes substantially reduced during the late summer period and that lake trout habitat is limited to usable habitat only, which also decrease substantially over the critical summer period (MOE, 2007).

Based on the 2006 data, there was no optimal lake trout habitat available at the time of the July sampling period and there was no lake trout habitat (optimal and usable) available during the late summer critical period in Lavalley Bay. As a result, Baptiste Lake west of Lots 16 and 17, (former) Herschel Township is considered to be at capacity and any new development should be reviewed by the Ministry. The present standard of water quality in Baptiste is restrictive to the needs of lake trout. Future shoreline development could cause a further deterioration of water quality and therefore a loss of lake trout habitat (MNR Lake Files, 2007, 1990/91 data).

Observations – Fish Community

- *Baptiste Lake supports a cold water fishery, which are dominated by lake trout, with a warm water component comprised of walleye, smallmouth bass, largemouth bass, muskellunge, northern pike, yellow perch, rock bass.*
- *Rock bass and northern pike have been introduced inadvertently into Baptiste Lakes, and most likely introductions via stocking and the Rideau Canal Waterway.*
- *Critical fish spawning shoal sites for lake trout, walleye, bass and muskellunge have been mapped and verified in Baptiste Lake.*
- *Community-based walleye stocking may be put on hold for VHS assessment.*
- *Walleye and Lake trout populations are stressed.*

Recommendations – Fish Community

24. The Association should provide volunteers to the MNR in order to assist with the annual active bass nest and lake trout spawning surveys—a netting index per species to collect the data necessary for lake assessment and management strategy improvements.

25. In some areas, lakefront residents that have significantly altered or disturbed the shoreline habitat should be encouraged to return a significant portion of their property to as natural a state as possible, including in-water rehabilitation efforts.

26. Encourage 30 m vegetated shoreline setbacks, especially new setbacks, and the requirement for shoreline vegetation buffers for development adjacent to critical fish habitat.

27. Discourage sport fish tournaments due to impacts on fish communities. Restrict Rock Bass derbies to July and August—after bass spawning season.

28. Known fish spawning sites should be identified in the Official Plan and zoning by-law.

5 Wildlife and Wildlife Habitat

The various habitat-types available within the Baptiste Lake sub-watershed have been identified as significant and suitable wetland, upland and shoreline habitat for migratory stopover, feeding, breeding, staging and molting areas for waterfowl, colonial water birds, passerines (perching songbirds), shorebirds and raptors, in particular the Great Blue Heron, American Black Duck, the Bald Eagle, Golden Eagle, Osprey and Red-shouldered Hawk. Local occurrences of bald eagles, red-shouldered hawks, osprey, herons, loons and black ducks were observed by local residents and during the boat tour, as well as the documentation of suitable wintering and breeding habitat along the shoreline and upland areas during the 2006 boat tour.

The upland and shoreline (dense) mixed and coniferous forests also provide significant preferred and optimal wintering habitat for the white-tailed deer, moose, black bear, fisher, northern river otter and other rarer mammals. Figure 12 lists some of the common mammals that have suitable and preferred breeding and wintering habitats with the watershed boundary of Baptiste Lake and Madawaska River watersheds.

Figure 12 – List of Common Mammals in the Baptiste Lake-Madawaska River Watershed

White-tailed Deer	Beaver	Red Fox
Moose	Muskrat	Coyote
Raccoon	Porcupine	Grey and Eastern* Wolf
Black Bear	Striped Skunk	Woodchuck
Lynx*	Bats*	Mice
Mink	Weasel species*	Moles
Bobcat*	Eastern Chipmunk	Shrews
Northern River Otter*	Red and Grey Squirrels	Voles
American Marten*	Northern and Southern* Flying Squirrels	Snowshoe Hare
Fisher		Eastern Cottontail

* Rare, "at risk", or at southern limits of range

Source: ROM, 2007; BLA, 2007; NHIC, 2005; and Eder, 2002

Core and Corridor Habitats

The Terrestrial Conservation Blueprint (Henson and Brodribb, 2005) identifies several large patches of critical core wildlife habitat and important natural cover (woodlands, grasslands, fields) areas that buffer the adjacent lands, as well as important natural corridors for wildlife movement across the lake and between core habitats. Some species need to migrate long distances between critical habitat to fulfill these ecological needs or to avoid overcrowding. Corridors enable movement between habitats. One large deer yard, a large wetland complex, interior upland forests, and several small pockets of shoreline deer yards and wetlands correspond with the Conservation Blueprint data. Wildlife corridors within the riparian zone in summer and between shorelines during winter allow large and small mammals and birds to find food, shelter or protection. Deer browse of eastern white cedar and hemlock was observed along the shorelines along the shoreline in areas of dense mixed or coniferous woodlands during the boat tour, in particular the shorelines of the main basin, Rangers Bay, Lavalley Bay north of Blueberry Island, in the narrows towards

the outflow, and Redmond Bay.

A large proportion of shoreline and upland areas abutting Hamilton, Grassy and Dog bays are still public lands, and the eastern shoreline and uplands of Lavelley Bay and the upland/backland of West Bay's southern shoreline is also public land according to MNR land ownership data, which affords species and their habitats indirect protection. However, 40% of the 'shoreland' that surrounds the Lake is privately owned, and a large majority of these shorelines have been cleared of native shrubs, herbs and trees to accommodate non-native, ornamental grassy lawns and/or hardened with concrete and wood to prevent erosion. Accordingly, the management and conservation of wildlife habitat and corridors along the shoreline becomes substantially dependent on each private landowner's ability, knowledge and desire to manage their property to benefit both nature and their quality of life.

While birds migrate south to more favourable climates, some mammals of the Baptiste Lake area have developed methods to survive the harsh winters of the Algonquin Region. Many mammals, including bats and the black bear, enter into hibernation or torpor (sporadic periods of hibernation) where they sleep for extended periods of time during the winter months. Other mammals, such as the white-tailed deer, weasels, the beaver, voles and the bobcat, remain active year-round, but may adapt their behaviours according to the local climate.

Wildlife

White-tailed deer are at their northern range limit in Ontario because of the harsh winter conditions. Fortunately, deer have adapted themselves to survive these harsh conditions by migrating from summer ranges and herding into deer yards. Important deer yards encompass dense, coniferous (hemlock and cedar) forested habitats, which provide suitable winter cover and food for winter survival, as well as protection against predators. Moose also require wintering areas for protection and food, but are solitary animals and will not herd.

There are several pockets of wintering areas in the watershed including one huge deer yard all along the northern shoreline and uplands of Baptiste Lake connecting large core lakeshed habitat with Algonquin Provincial Park's protected wildlife habitat. Eastern and southern portions of the lakeshed are smaller pockets of wintering habitat in the upland and along the shorelines of Baptiste and Diamond lakes. The deer yards overlap moose wintering and summer habitat planning areas, as well as black bear potential habitat sites and regulated hunting areas.

Moose feed on woody and leafy plant material found in wetlands. During June and July, moose are able to get sodium and minerals from the new growth of aquatic plants, but must rely on natural or artificial mineral licks, including roadside ditches and salt blocks, during the winter. Moose feeding areas are incredibly important to protect because they provide the necessary mineral and dietary intake to sustain the species throughout the summer months, especially during calving season in late May-early June. There are several wetland habitats adorning the shorelines of Hamilton, Hay, Grassy and Rangers bays, including the provincially significant wetland complex of Elephant and Baptiste lakes, and smaller, scattered wetlands in the quiet areas of Dog, Lavalley and Redmond bays and the upland lakes surrounding Baptiste Lake. Beavers and muskrats will also congregate in wetland areas to build their lodges and dens along the shorelines of quieter bays, streams and lowland areas. Digital data collected from the MNR identifies important optimal summer moose feeding areas on Big Lighthouse Lake, north-east of Elephant and Baptiste Lakes, and smaller lakes further north. No mineral licks have been identified for the area.

The bear is primarily solitary except during breeding or feeding at dumps. Nuisance bears have become a major problem in Ontario because of open dumps, or human encroachment on their natural habitats. There has been lots of public pressure over the years to reinstate the spring bear hunt to control local populations, but the global black bear population has been hard hit by poaching so that the ban will not be lifted for some time in Ontario. However, conservation efforts, including old field habitat restoration and protected woodlands, which provides important food (raspberry, aspen, hawthorn) and cover, and milder winters have positively impacted bear populations south of the Shield. In response, bear populations have been increasing and repopulating their historical range (MNR, 2006).

The MNR Bancroft District office, therefore, works with the public to deal with nuisance calls in the summer (relocate and educate), and advising folks about removing attractants and what to do when a bear is encountered (Bear Wise Program). The District also has a bear population

Bear Wise Program Guidelines

- Reduce food attractants
- Use bear resistant garbage containers
- Modify garbage collection schedules
- Install fencing around landfill sites
- Green space vegetation management to modify bear travel corridors
- Implement by-laws to support bear hazard reduction measures

For more information visit http://bears.mnr.gov.on.ca or contact the MNR Bancroft Office.

index program, which is conducted each year, and when public safety becomes an issue the MNR takes action (MNR Lake Files, 2007).

In recent years, the fisher has been expanding beyond its natural range, or humans have been encroaching upon fisher territory because several sightings and loss of pets have been reported in more urbanized settings. Fishers usually prefer intact wilderness for breeding and wetland areas to over-winter, and often disappears shortly after development occurs in its habitat area. Localized populations have generally been impacted from habitat loss, forest clearing, fire and harvesting. They are nocturnal hunters, infamous for hunting porcupine, which it kills by repeated attacks to the head.

For further information on deer, moose, black bear and other mammalian habitat, ecology and management, please contact the Bancroft MNR Distirct office or visit http://www.mnr.gov.on.ca .

Locally Rare Wildlife and their Significant Habitat – Many of the larger, rarer mammals native to south-central and eastern Ontario that need large expanses of undisturbed woodlands for habitat, including the wolf, elk, bobcat and lynx, have been "extirpated" (removed from the wild) from their natural range due to the loss of habitat from encroaching urban centres and conflicting land uses. The geographical ranges of smaller mammals including several bat, mole, vole, weasel and flying squirrel species also extend into the wetland, grassland, woodland and dense forest habitats of Baptiste Lake's sub-watershed. Sightings of these regionally rare mammals occur on occasion and are documented with the MNR; however, current occurrences need to be verified through active inventories, especially for small, nocturnal mammals (Figure 13).

Large, intact core forested habitats and natural area linkages (corridors) within the Bancroft District area, especially the townships abutting the Algonquin Provincial Park boundary, are considered refuge for many of these natural heritage features (Henson and Brodribb, 2005). Many of these mammals are provincially or locally rare species because of their low population numbers or limited dispersal due to human encroachment, intensive trapping for fur, roads and cars, habitat destruction due to development or pollution, and/or direct persecution. It is, therefore, incredibly important to understand the intricate role that each of these species plays in balancing the health of the natural environment, and to help maintain and conserve the local ecosystem's biological diversity. Protection of wildlife habitat in and around Baptiste Lake is vital to the conservation of local biological diversity. However, if habitat fragmentation continues, because of development pressures, to remove large core habitats (woodlands, wetlands and other intact natural areas) and the corridors that connect these areas, loss of valuable wildlife and wild-space resources will be the end result.

Figure 13 – Regionally Rare Mammals associated with Baptiste Lake – Madawaska River Watershed	
1. **Eastern Wolf**	• Algonquin Park and surrounding townships • Impacted from habitat loss, especially large forest tracts, and direct persecution; it is now a listed species at risk in Ontario • A distinct form of the Grey Wolf, and is considered genetically linked to the Red Wolf from Texas • Resembles the coyote, but is slightly larger; it is extremely difficult to properly distinguish between these two species in the wild and its protection indirectly protects the coyote
2. **Southern Flying Squirrel**	• Geographical range extend into Baptiste Lake sub-watershed and surrounding mixed and coniferous woodland areas • Southern flying squirrel is a species at risk, and associated with more deciduous dominated woods • Historical records from the NHIC exist for the County of Hastings and Bancroft District woodland areas • Needs confirmation of recent sighting
3. **Elk**	• The Provincial Elk Restoration Advisory Committee reintroduced Elk from Alberta' Rocky Mountain Elk stock into the Bancroft-North Hastings Area, which is part of its historical range • Over-harvesting and habitat loss are responsible for its extirpation from eastern Ontario • Elk tend to disperse from their release sites and migrate north • Elk are predominantly active at dusk and dawn, but several elk sightings have been reported since the release in 2000 and 2001, including an elk cow and calf in winter 2004 near Bancroft and several more recent adult sightings along the shorelines of Baptiste Lake
4. **Northern Long-eared Bat, Small-footed Bat, and Eastern Pipistrelle**	• All bats are nocturnal and require winter hibernacula and roosting sites in forests, caves and/or urban areas close to feeding habitats along water • Bats undergo periodic torpor or temporary hibernation during winter months, but if temperatures rise above 0'C, adults will emerge to feed • Most bats mate in the fall and winter and the young are born in May/June • Bats use echolocation, or sound waves to locate food
5. **Least Weasel**	• Very small; only 15-22 cm in length, with a short tail • All weasels turn white during winter months • Inhabits open, grassy areas or forest edges • At its southern range limits near Bancroft
Source: BLA, 2007; NHIC, 2005 and Mammals of Ontario, 2002	

Birds

Baptiste Lake has a wide variety of open and forested upland woodlands, pockets of deciduous (hardwood) and conifer riparian forests along the shorelines, swamps, marshes, rocky cliffs, forest edges, thickets and open areas, which create a great variety of bird habitat. Many of these species are migrant songbirds (passerines), which migrate from the South American regions to breed in Ontario during the spring and summer months. Waterfowl, dabbling and diving ducks, owls, hawks and some coniferous songbirds are annual or year-round residents of these lakes and can be seen at various times of the year on or near Baptiste Lake.

Figure 14 provides a list of the bird species that are traditionally common to Baptiste Lake and the Madawaska River Watershed.

Figure 14 – Birds Species Traditionally Common to Baptiste Lake and the Madawaska River Watershed		
Common Loon	**Whip-poor-will**	Brown Thrasher
Pied-Billed Grebe	Chimney Swift	**European Starling**
Horned Grebe	Ruby-throated Hummingbird	**Cedar Waxwing**
American Bittern	Belted Kingfisher	Golden-winged Warbler
Least Bittern	Pileated Woodpecker	Tennessee Warbler
Great Blue Heron	Olive-sided Flycatcher	**Nashville Warbler**
Green Heron	Yellow-bellied Sapsucker	Northern Parula
Turkey Vulture	Downy Woodpecker	**Yellow Warbler**
Canada Goose	Hairy Woodpecker	**Chestnut-sided Warbler**
Wood Duck	**Black-back Woodpecker**	**Magnolia Warbler**
American Black Duck	Northern Flicker	**Black-throated Blue Warbler**
Mallard	Eastern Wood-Pewee	**Yellow-rumped Warbler**
Ring-necked Duck	**Yellow-bellied Flycatcher**	**Black-throated Green Warbler**
Hooded Merganser	Alder Flycatcher	**Blackburnian Warbler**
Common Merganser	**Willow Flycatcher***	**Pine Warbler**
Common Redpoll	Least Flycatcher	Bay-breasted Warbler
Osprey	Eastern Phoebe	**Black-and-white Warbler**
Bald Eagle	Great Crested Flycatcher	**American Redstart**
Northern Harrier	Eastern Kingbird	**Ovenbird**
Sharp-shinned Hawk	**Northern Shrike**	**Northern Waterthrush**
Cooper's Hawk	**Yellow-throated Vireo**	**Mourning Warbler**
Northern Goshawk	Blue-headed Vireo	**Common Yellowthroat**
Red-shouldered Hawk	**Warbling Vireo**	**Canada Warbler**
Broad-winged Hawk	**Philadelphia Vireo**	**Scarlet Tanager**
Red-tailed Hawk	Red-eyed Vireo	Eastern Towhee
Golden Eagle	**Grey Jay**	**Chipping Sparrow**
American Kestrel	Blue Jay	Clay-coloured Sparrow
Merlin	American Crow	Field Sparrow
Peregrine Falcon	Common Raven	Vesper Sparrow
Ruffed Grouse	**Horned Lark***	**Savannah Sparrow**
Virginia Rail	**Purple Martin**	Grasshopper Sparrow
Sora	Tree Swallow	**Song Sparrow**
American Coot	**Northern Rough-winged Swallow**	Lincoln's Sparrow
Killdeer	**Bank Swallow**	**Swamp Sparrow**
Spotted Sandpiper	**Cliff Swallow**	**White-throated Sparrow**
Common Snipe	Barn Swallow	**Dark-eyed Junco**
American Woodcock	Black-capped Chickadee	Northern Cardinal*
Ring-billed Gull	Red-breasted Nuthatch	**Rose-breasted Grosbeak**
Herring Gull	White-breasted Nuthatch	**Indigo Bunting**
Common Tern	Brown Creeper	Bobolink
Black Tern	**House Wren**	**Red-winged Blackbird**
Rock Dove (pigeon)	Winter Wren	Eastern Meadowlark
Mourning Dove	**Sedge Wren**	**Common Grackle**
Black-billed Cuckoo	**Marsh Wren***	**Brown-headed Cowbird**
Yellow-billed Cuckoo	Golden-crowned Kinglet	**Baltimore Oriole**
Eastern Screech Owl*	Ruby-crowned Kinglet	**Purple Finch**
Great Horned Owl	Eastern Bluebird	House Finch
Barred Owl	Veery	Red Crossbill
Great Grey Owl	Swainson's Thrush	White-winged Crossbill
Long-eared Owl	Hermit Thrush	Pine Siskin
Short-eared Owl	Wood Thrush	**American Goldfinch**
Northern Saw-whet Owl	American Robin	
Common Nighthawk	Grey Catbird	
* Regionally Rare Species for Site Region 5 Source: Ontario Breeding Bird Atlas, 2007; ROM, 2007; BLA, 2007; Boat Tour (FPSI), 2006; and MNR, 1994		

The best source for the occurrence of bird species in your lake area is the Ontario Breeding Bird Atlas (OBBA). The OBBA relies on voluntary birders to confirm the occurrence of bird

species during the breeding season and then verifies the observations via historical records, known species distribution ranges, occurrence of suitable breeding and wintering habitats across the province, and the expertise of wildlife management agencies and renowned biologists before publishing the lists. The province of Ontario is split into 10 x 10 km squares, which correspond with topographical coordinates (UTMs). During the breeding season, volunteers record observations of breeding evidence, such as observation of young or nest with eggs, which is a confirmed occurrence of a bird species within a specific square; only breeding events are tracked, not fly-bys during non-breeding season (e.g., bald eagle during winter months). An annual winter bird count records birds that over-winter in Ontario, breed during winter months (e.g., owls), or are year-round residents.

Baptiste Lake straddles three breeding squares: 17QL30 – northern Baptiste Lake; 17QK39 – southern Baptiste Lake; and 18TQ79 – southeast at the dam. It is assumed by biologists that if suitable habitat and conditions (food, shelter, etc.) are available and species occurrence prevails in a breeding square then it is probable that the species may be present locally. Figure 14 lists all the birds species that have confirmed and/or probable breeding for the area covered by these three squares, and whose summer and/or winter distribution ranges extend into the Baptiste Lake watershed. Baptiste Lake is wintering and migratory habitat for the Bald Eagle, migratory territory for Golden Eagle, breeding habitat for Great Blue Heron colonies and several raptor and duck species, including the Northern Harrier, Pie-billed and Horned Grebes, Common Loon and the American Black Duck, and critical summer, winter or migratory habitat for many passerine (song-bird) species.

There are over a hundred and fifty (150) bird species whose geographical ranges extend into the Baptiste Lake sub-watershed, including some locally and regionally rare breeding birds. Those species listed in bold have not been confirmed during the breeding season, but have been observed in their wintering habitat, during migration, or confirmed for abutting watersheds within the MNR Bancroft District area.

Nesting Sites - Great Blue Heron colonies and several raptors nest have been mapped along the shorelines of smaller lakes north of Baptise Lake's main basin and within the Elephant-Baptiste Lake PSW boundary. Under the Crown Sustainable Forestry Act, nesting sites of important wetland and interior forest breeding birds need to be mapped and protected from destruction during wood resource extraction. Raptor nests were mapped in the Baptiste Lake sub-watershed in 2006.

Common Loon nests have been observed by local residents in many quieter bays and islands, but verified nest locations and digital mapping has yet to occur. In 2006, only observation of adult American Black ducks were documented in the wetlands of Dog Bay near Hounds Creek, but no efforts to locate nest sites were initiated. Location of nests and confirmation of breeding is an important process to conserving significant habitat and protecting local biodiversity.

In 2004 a Community Fish and Wildlife Improvement Project was conducted by the North Hastings High School. The students built and monitored duck boxes erected in the wetlands at the inflow from Elephant Lake. These boxes provide habitat for Wood ducks and Hooded Mergansers, but only the latter species was observed nesting (Mrazek and Shannick, 2004).

Habitat preferences vary with each bird species—some prefer the dense upland forest cover while others prefer the shoreline or wetland areas. The variety of birds that exist in the Baptiste Lake area is a product of the variety of natural habitat available in the region. Over the past few decades, degradation of breeding and/or wintering habitat, changes to land use, pollution, competition from invasive bird species, and climate change have caused population declines of many common bird species. Other species, such as nighthawks, the whip-poor-will, Great Grey and Short-eared owls, deciduous-mixed woodland warblers, Tufted Titmouse, and many other southern or northern bird species may have always been uncommon because of their geographical range limits in the Baptiste Lake sub-watershed, and with a variable environment and human encroachment, their local occurrences and distributions may continue to change periodically with changes to their habitats.

Provincial and national initiatives, in particular the Ontario Breeding Bird Atlas/Bird Studies Canada, Ducks Unlimited and the Canada-United States Waterfowl Management Plan (NAWMP), are some of the many programs designed to protect and enhance wetland and upland habitat to restore breeding-bird habitats, as well as monitor migration patterns and population sizes through bird-banding efforts (CWS, 2007). In order to protect local diversity, it is therefore important for residents to ensure that the current variety of existing habitat is maintained and protected within the lakeshed, and a thorough inventory of bird species confined to the Baptiste Lake sub-watershed needs to be implemented.

Reptiles and Amphibians

The shorelines, riparian zones and wetlands of Baptiste Lake, York River and their tributary streams are home to a variety of reptiles and amphibians, which are listed in Figure 15.

Based upon occurrences confirmed by the MNR and NHIC, and distribution maps provided by the Ontario Herpetological Atlas, there are nine amphibian and four reptile species, including the rare and “at risk” Blanding’s Turtle in the Baptiste Lake sub-watershed or “lakeshed”, and historical sightings of the Stinkpot turtle. The Blanding’s Turtle and the Stinkpot are both threatened “species at risk”, whose geographical ranges includes preferred wetland and upland forested, sandy-soiled habitats in the Baptiste Lake lakeshed.

Within the boundaries of northern County of Hastings and the southern areas of the Madawaska River watershed abutting the Baptiste Lake lakeshed five other amphibian and reptile species, respectively, which also includes two rare and “at risk” snakes. The geographical ranges for the Hog-nosed Snake and the Eastern Milksnake extend into the Madawaska River watershed and the Baptiste Lake lakeshed in areas where preferred and optimal habitat exists for both these snake species.

Figure 15 – Common and Rare Amphibians and Reptiles in the Baptiste Lake – Madawaska River Watershed	
Amphibians	
Lakeshed	
Eastern American toad	*Bufo americanus americanus*
Northern Spring Peeper	*Psuedacris crucifer*
Grey Treefrog	*Hyla versicolor*
Wood frog	*Rana sylvatica*
Northern Leopard frog	*Rana pipiens*
Green frog	*Rana clamitans*
Bull frog	*Rana catesbeiana*
Eastern/Northern Redback salamander	*Plethodon cinereus*
Mink frog	*Rana septentrionalis*
Watershed	
Western chorus frog	*Pseudacris triseriata*
Red-spotted newt	*Notophthalmus viridescens viridescens*
Jefferson/Blue-spotted salamander complex	*Ambystoma jeffersonianum-laterale "complex"*
Yellow Spotted salamander	*Ambystoma maculatum*
Northern Two-lined salamander	*Erycea bislineata*
Reptiles	
Lakeshed	
Common Snapping turtle	*Chelydra serpentina serpentina*
Midland Painted turtle	*Chrysemys picta marginata*
Blanding's turtle	*Emydoidea blandingi*
Stinkpot (Common Musk) turtle*	*Sternotherus odoratus*
Wood turtle**	
Eastern Garter snake	*Thamnophis sirtalis sirtalis*
Watershed	
Northern Redbelly snake	*Storeria occipitomaculata*
Eastern Hog-nosed snake	*Heterodon platirhinos*
Northern Water snake	*Nerodia sipedon sipedon*
Eastern Milk snake	*Lampropeltis triangulum*
Northern ringneck snake	*Diadophis punctatus edwardsi*
* Historical records from pre-1984 **Northern and eastern areas of Madawaska Watershed (eco-district 5E-9) Source: NHIC – Herpetofaunal Atlas, 2000 and ROM, 2006	

Many of amphibian and reptile species', especially turtles, populations are low in numbers because of habitat loss and changes in land use. Annual drawdown regimes on regulated lakes may be contributing to the population declines. Turtles burrow in the sediments of the lake's shallow waters along shorelines and within hummocky soils of wetlands during hibernation; in late fall as the water temperatures begin to drop and as shoreline mud flats freeze, the hibernating turtles could become frozen in the lake's sediment. However, with current drawdown regimes managed to protect spawning lake trout in the Fall on Baptiste Lake the likelihood of water levels negatively impacting turtles is likely uncommon.

Where appropriate wetland, riparian and upland habitat exists in the sub-watershed other reptile species may be found, although recent inventories or occurrence verifications have not been completed for many of them. Most turtle and snake species are shy and wary creatures and will avoid human contact at all costs. However, the mosaic of natural habitats along the shorelines and in the uplands surrounding Baptiste Lake and defining the landscape of the Madawaska River watershed may become less suitable for these animals if there is a continued growth and inadequately managed recreational activity and cottage development along shoreline corridors and in wetland and upland core habitats.

Global Population Declines - The world's amphibian (frogs, salamanders and newts) and reptiles (turtles and snakes) populations have been dramatically reduced over the past few decades due a combination of environmental factors influenced by human activities such as industrialization, habitat destruction for development purposes, and the food trade. The declines, individual deformities, and the loss of biological diversity has been linked to climatic and landscape changes such as acid rain, greenhouse gases, ozone depletion and increasing UV radiation, habitat loss, stream channelization, and effluents leaching into wetlands. The dramatic responses by frogs to environmental influences have enabled researchers to monitor local ecosystems and implement management strategies that may lessen the impacts of ecosystem changes, such as the loss of nesting and hibernating habitat.

During the summer of 2000, MNR initiated a bullfrog inventory to document their occurrences and distribution throughout Baptiste Lake's wetland habitat, and their population sizes to monitor environmental changes occurring in the watershed. Frog populations in general are excellent indicators of ecological changes such as water level, temperature and predator-prey changes, because of their unique life-cycle, morphology and riparian-shoreline-wetland habitat needs (BLA, 2007).

> *Frogs and salamanders are particularly at risk because of their permeable, gelatinous skin and life-cycle requirements. The loss of shoreline and riparian vegetation, fluctuating water levels, ozone-depletion and drought-induced climate change (hot, dry summers) have contributed to increasing water temperatures and ultra-violet light exposure, which are both detrimental to these species' eggs and development. Many toxins and pollutants that are leached into the soils or deposited by rain inhibit normal growth in tadpoles and have contributed to mutated or sterile adults.*
>
> *Turtle and snake population are also declining because of habitat loss due to development encroachment, road traffic, persecution and climate change. Prime turtle nesting and snake hibernacula habitats along shorelines, roadsides and upland areas are easily accessible and predated upon, or destroyed during development excavations or vegetation removal, and the adults are often killed by on-coming traffic prior to or after nesting. A warming climate is also impacting reptile species because sexing of the young is temperature-dependent; high temperatures in the nest produce females and lower temperatures produce male. In the last decade, researchers monitoring emerging Northern Map and Blanding's turtles have observed a disproportionate number of female vs. male hatchlings. A reduction in males inhibits future recruitment. Scientists have hypothesized that the extinction of dinosaurs, the ancestors to present-day reptiles, was due to a warming climate and the lack of males. Turtles are therefore good indicators for monitoring biotic impacts of predicted global climate change (Janzen, 1994; COSEWIC, 2002; Lovich, 2003).*

In general, there is a lack of awareness regarding breeding and nesting reptile habitats. It is therefore important to identify these locations because species at risk habitat is protected under federal law from wilful destruction, which would prevent inappropriate development

from occurring in these areas. In general, most turtle species, except for the common snapping turtle and western and midland painted turtles, and several snake species, are being tracked in Ontario by the Natural Heritage Information Centre and local MNR District offices due to their sensitivity to development, loss of habitat, and low reproductive success due to predation and traffic mortality.

It is incredibly important that we are aware of our actions and their impacts on the natural world. Protecting our planet's biological diversity ensures the earth's sustainability and a healthy and sustainable future for its inhabitants. It is incredibly important that we curtail our consumptive activities and start implementing ideas and actions that implement conservation and preservation values of our lake's most precious feature, biodiversity.

If you find a turtle's nest or an injured turtle on your property or along the roadside, please contact the Kawartha Turtle Trauma Centre at http://www.kawarthaturtle.org/ or the Toronto Zoo at www.torontozoo.com to find out how you can help.

Observations – Wildlife

- *There is a wide variety of suitable core breeding habitats and natural corridors and species' occurrences, including several regionally, locally and provincially rare species, in the Baptiste Lake sub-watershed area.*
- *One large deer yard is located along the northern shoreline and upland areas of Baptiste Lake; several smaller deer yards are scattered along the south-western and eastern shorelines and upland areas.*
- *Great Blue heron colonies and several raptors' nests are present in Baptiste Lake's sub-watershed. The raptors nests were inventoried in 2006 to prevent encroachment during forest extraction, but heronry colony location have not been recently mapped or verified by the MNR. Common Loon adult pairs, young and nest sights have also been observed on many quieter bays and island of Baptiste Laske, but current nest location verification and digital mapping has not occurred.*
- *Riparian vegetation along the shoreline and abutting upland areas is incredibly important to all wildlife in the watershed.*
- *The MNR Bancroft District has a black bear population index program, which is conducted each year, and a public advisory program about nuisance bears.*

Recommendations – Wildlife

29. *A program should be established by the Association to locate the nesting sites of turtles in order to identify important habitat areas, and literature that promotes the protection of wildlife habitat and shorelines should be distributed to property owners.*

30. *Turtle nesting sites should be identified and protected against predation; property owners should be informed about the techniques available to protect turtle nesting sites (Kawartha Turtle Watch and the Toronto Zoo).*

31. *Lakefront owners should be encouraged to return a significant portion of their shoreline to natural vegetation to encourage nesting and create suitable habitats for other species.*

32. *A revised inventory of the animal species, including breeding birds, smaller mammals such as voles, moles and bats, and insects should be prepared. The last Mammal Atlas was published in 1994 and the Baptiste Lake animal inventory, as well as government agencies and province-wide conservation programs relies upon information extracted from this report.*

33. *Participate in Loon Watch (Canadian Lakes Loon Survey) http://www.bsc-eoc.org/cllsmain.html.*

34. *Prepare a safe conduct code for recreational boating to address high boating speeds and wake damage near sensitive habitat areas.*

35. *Planning of shoreline development is required to protect the remaining wildlife habitat of Baptiste Lakes including the following suggestions:*
    a. *Minimum frontage requirements on remaining undeveloped lots should be at least 90 to 120 metres (300 – 400 feet) and increased frontage requirements would be preferred;*
    b. *Wood lot clearing along the shoreline of important conifer and hardwood trees should be restricted; and*
    c. *Greater restrictions regarding alteration of natural shorelines should be imposed including the identification of a maximum shoreline activity area.*

6 Invasive Species

Invasive, alien and exotic species refers to all introduced species occurring in wild spaces across Ontario and the world. The labels 'alien' and 'exotic' often refer to non-native species, and 'invasive' refers to native species from Ontario that have expanded their geographical ranges into new areas. All introduced species, however, whether native or non-native, are invasive, and in the absence of natural predators, competitors, diseases and parasites, are destructive. Populations of invasive species have the ability to out-compete native species for food and habitat, cause unpredictable changes to habitats, and once established they are almost impossible to eliminate.

Introductions of invasive aquatic species have occurred because of a lack of judgement regarding the consequences of human activities and their ecological impacts. A variety of pathways including unregulated ballast water discharge, natural barrier removal, canals, stocking and accidental releases from aquariums, bait harvesters, anglers and the live fish food trade have introduced animals, plants and invertebrates into our lakes, rivers, streams and wetlands. These invasive species are able to migrate unknowingly via these pathways into new habitats if precautions aren't taken to remove or prevent these organisms from traveling to new water bodies. As of 2006/2007 baitfish harvest and movement are regulated by MNR to protect in-land lakes from fish diseases (i.e., VHS – Viral Haemorrhagic Septicaemia), parasites and other unwanted pests; boaters and anglers are making efforts to clean their boat hulls prior to entering a new lake, which includes a government-initiated monitoring program of all navigational boat hulls entering the Great Lakes and waterways.

Invasive Species in Baptiste Lake's Watershed

At present, the only documented 'invasive' species in Baptiste Lake's lakeshed are the historical introductions of non-resident fish species. However, during the 2006 boat tour, populations of a water-milfoil species were observed in the wetlands abutting Hound Creek in Dog Bay, but species verification here and in other locations is advised for summer 2007 because several native species resemble the invasive Eurasian Water-milfoil. The verification of Purple Loosestrife populations is also advised for summer 2007; its probable introduction is based upon OFAH's Invasive Species Program mapping of the widespread distribution of this plant across Ontario.

The Great Lakes and St. Lawrence River basin ecosystem is also home to more than 160 known non-native species of fish, invertebrates, plants, parasites, algae and pathogens, and many other introduced species have likely gone unnoticed. Other invasive species may therefore potentially pose a threat to Baptiste Lake because of its close proximity and connectivity to other recreational lakes via the York, Madawaska and Ottawa Rivers and the Rideau Canal, which have been infested with other invasive species, including the following:

- Zebra Mussel (*Dreissena polymorpha*)
- Quagga Mussel (*Dreissena bugensis*)
- Spiney Water Flea (Bythotrephes cederstroemi)

- Rusty Cray Fish (*Orconectes rusticus*)
- Round Goby (*Neogobius melanostomus*)
- Curly Pondweed (*Potamogeton crispus*) – associated with Eurasian Water-milfoil
- Flowering Rush (*Butomus umbellatus*)
- Canary Reed Grass (*Phalaris arundinacea*)
- European Frogbit (*Hydrocharis morsus-ranae*)
- Eastern Mosquito Fern (*Azolla caroliniana*)
- Fanwort (*Cabomba caroliniana*)
- European Water-chestnut (*Trapa natans*) – discussed by BLA during the 1950s
- Several Aquarium Snails – Mud Bithynia (*Bithinia tentaculata*) and Banded Mystery (*Viviparus georgianus*) and Chinese Mystery (*Cipangopaludina chinensis*) Snails
- Red-eared Slider Turtle (*Trachemys scripta elegans*) – pet release
- Common Carp (*Cyprinus carpio*) – this fish burrows into shoreline mud, uprooting vegetation and usurping other native aquatic species from their habitat

Purple Loosestrife, Zebra Mussel, Spiney Water-flea, Round Goby, Rusty Crayfish and European Frogbit have been identified in Haliburton, Hastings, Lennox and Addington, and Renfrew County lakes and rivers, as well as the Rideau Waterway.

Due to the variety and magnitude of recreational activities, and other opportunities for transport, that take place on the inland lake systems, these species are able to expand their range throughout eastern Ontario. Therefore, actions should be taken to curtail their introduction into Baptiste Lake.

Rock Bass and Other "Introduced" Fish Species

According to MNR lake files, Rock Bass was 'accidentally' introduced into Baptise Lake during smallmouth bass plantings probably as early as the 1930s and 1940s. Local lake residents and anglers have been complaining about the large rock bass populations since the late 1940s and have implemented summer derbies and large-scale fish harvesting with traps and nets to remove the fish from the lake (MNR Lake Files, 2007). These fish species are all native to Ontario, but were not a component of the original fish-community prior to their introduction, and have, therefore, diversified the original fish community as well as impacted the complexity of species and ecosystem interactions.

Fish species such as rock bass and northern pike are "hardy fish", tolerant of stressed aquatic systems and are, therefore, an aggressive competitor for many species, especially for smallmouth bass and lake trout. It is hypothesized that rock bass populations may stress other bass populations by predating (feeding) on their young (larvae) and lake trout through direct competition for resources, altering the predator-prey dynamics in the lake. Northern pike are voracious predators, and the larger adults consume large quantities of forage fish, especially yellow perch, which competes directly with walleye and bass for prey. Competition forces top-predators like lake trout and walleye to feed on less desirable prey, which negatively impacts growth, recruitment and survival, and causes changes to the prey community as well, reducing populations from predation and increasing others by opening up new ecological niches (e.g., bluegill fill econiche gap left behind from dwindling yellow perch populations, but create stunted/smaller bluegill)(MDNR, 2007 and

Vander Zanden et al., 1999 and 2004).

Zebra mussels and Spiney Water-Flea

Water samples collected by volunteers through the Invading Species Watch 2005 found no evidence of zebra mussel veligers (larval stage) or spiney water-flea in Baptiste Lake (OFAH, 2005). Summer 2006 data will be released later in 2007.

The Zebra Mussel and the Spiny Water-flea have been invading the lakes of Ontario since their introduction into the Great Lakes, probably as a result of discharge from the ballast of the ocean going ships. The spiney water flea is a predacious zooplankton species, which competes directly with native zooplankton for food and indirectly with fish larvae (young) by reducing or eliminating their food resources (loss of zooplankton populations). Zebra mussels attach to any hard surface available, including boats, docks and native mollusc and clam species, reducing local biodiversity. Zebra mussels are filter feeders and, therefore, impact water quality by filtering out plankton species, making the water less nutritional for other filter feeders and much clearer. Both species are moved around unsuspectingly by boaters and baitfish (OFAH, 2007).

Figure 16 - Invading Species Watch Program

The Invading Species Watch is a volunteer-based monitoring program with the Ontario Federation of Anglers (OFAH) and Hunters, the Ministry of Natural Resources (MNR), and the Federation of Ontario Cottagers Association (FOCA) for aquatic invasive species. The invading species watch offers shoreline residents and cottage owners a chance to participate in the program. Using a monitoring kit provided by the OFAH, volunteers take water samples using a plankton tow net and send their samples to the OFAH for analysis (2004).

For more information about purple loosestrife or other invasive species, or to participate in a Project Purple event in your community call the OFAH/MNR Invading Species Hotline at 1-800-563-7711, or visit http://www.invasivespecies.com

Zebra mussels seem to have the greatest impact on lakes. Certain aquatic species (walleye, northern pike, frogs and turtles) are sensitive to sunlight and require murky water for protection from UVA/B radiation and predators and to also solicit predation success. Clearer water is not always a good thing, especially in weedy, wetland lakes or basins. More sunlight in the deeper waters encourages unwanted plant growth, which leads to increased nutrients and decreased dissolved oxygen in the bottom waters during decomposition. A clearer lake may lead to loss of deepwater fish habitat.

Zebra Mussels attach to recreational boats that are used on the Great Lakes. If these boats are launched into inland lakes, without the hulls being cleaned, zebra mussels can be introduced into that lake. It is probable that if pH is greater than 7.4 and calcium levels exceed 20 mg/L that zebra mussels can establish colonies (note - mussels require calcium to develop shells). Baptiste Lake currently has a range of pH levels from 6.4 to 7.4.

Purple loosestrife and Eurasian milfoil

The Purple Loosestrife (*Lythrum salicaria*) and the Eurasian Water-milfoil (*Myriophyllum spicatum*) were introduced as ornamental plants in the 1800's from Europe and Asia. These plants have become the two most widely distributed invasive plant species in Ontario

because of their ability to spread and proliferate in a wide range of environmental conditions, especially areas that have been disturbed or contaminated by human activity. Both plant species are aggressive and spread quickly creating monocultures of dense vegetation, which blocks out other native species and reduces local biodiversity. Eurasian milfoil is able to regenerate from stem fragments, and purple loosestrife seed dispersal also thrives on disturbance, which enables invasion into new areas of an infected lakes and wetlands. Boaters unclogging boat motors after exiting weedy inlets or bays, or extraction and transport of plant cuttings, may accidentally introduce these species elsewhere in the lake.

Purple loosestrife reproduces at an alarming rate, spreading along roads, canals and drainage ditches, and has seriously impacted marshes and lakeshores, choking out the natural wetland vegetation that occurs around it (OFAH, 2007). There are several plant species that mimic or look similar to the loosestrife, including Fireweed (*Epilobium angustifolium*), Blue Vervain *(Verbena hastate)* and Water-willow or Swamp Loosestrife (*Decoden verticillatus*) but, unlike the purple loosestrife, these plants are native to Ontario. Unfortunately, complete eradication of the purple loosestrife is impossible because there are no native herbivores that have the potential to control its spread. In some areas of Ontario, however, mechanical removal, as well as the release of non-native leaf-feeding Calerucella beetles, has been effective in controlling or slowing down the spread. The non-native beetles are the natural predator of purple loosestrife leaves and flowers; however, they may pose other ecological complications in the future.

Eurasian water-milfoil grows quickly and produces dense "floating" mats of vegetation, which blocks out sunlight to other submerged plants, out-competing these species and reducing local biodiversity. The decomposition of these thick "floating" mats increases nutrient levels (adding phosphorous, nitrogen and carbon to the water column), which degrades water quality by raising the aquatic pH and decreasing dissolved oxygen levels and the amount of quality habitat available for fish, waterfowl and other species. These thick mats may also create stagnant water in wetland areas, which may serve as breeding grounds for mosquitoes. There are several native water-milfoil species that resemble the invasive species, including the Alternate-leaved Water-milfoil (*Myriophyllum alterniflorum*), Farwell's Water-milfoil (*Myriophyllum farwellii*), and Bracted Water-milfoil (*Myriophyllum verticillatum*). The other native water-milfoil, the Northern Water-milfoil (*Myriophyllum sibiricum*) retains its stiffness out of water and has fewer leaf segments per leaf, and the leaf and stem sample extracted from Dog Bay collapsed, which is a typical characteristic of the feathery-leaved, non-native plant.

Prevention is the best way to stop the spread of this invasive species. Other preventative measures include draw downs of water levels to expose the mats to the elements to encourage desiccation (drying); pulling out the plant or dredging the area to dislodge root systems; installing bottom barriers so the plant is unable to take root; and biological control using North American weevils which naturally feed on native Northern Water-milfoil.

Observations – Invasive Species

- *As of 2005/2006, Baptiste Lake is free of Zebra Mussels and Spiney Water-flea.*
- *Purple Loosestrife is a probable resident of wetlands and shoreline areas in Baptiste Lake watershed, but verified observations are necessary (OFAH Invasive Species Program data).*
- *Further investigation of aquatic plant species and other invasive species is necessary in Baptiste Lake due to a suspicious water-milfoil species observed in Dog Bay during the 2006 boat tour.*
- *Invasive species pose a serious threat to the lake's health, as well as the ecological, social and economic stability of the community. Invasive species out-compete local, native species and threaten already stressed rare and species at risk species, which reduces local biodiversity.*

Recommendations – Invasive Species

36. *To prevent introductions of new invasive species into Baptiste Lake and its watershed, the lake association should focus activities primarily on education and awareness for lake residents and visitors, including posting signage at all water access points regarding the harmful effects of invasive species on the lake and the procedures to ensure protection of the lake ecosystem.*

37. *A thorough inventory of aquatic vegetation along shorelines, in wetlands and the quiet bays is necessary for the summer season to verify the presence/absence of invasive species.*

38. *It is very important, if you are a boater, angler, sailor, canoeist or water-skier, to take precautions to prevent the transport of exotic species from one lake, river or stream to another.*

39. *Continue to assist efforts to raise awareness of invading species, prevent their spread, and track their distribution through the distribution of educational fact sheets to all lake residents, schools and visitors, and by participating in local OFAH Invasive Species projects.*

7 Rare Species and Species at Risk

Species are classified as rare or at risk because of small or reduced population sizes and distribution occurrences across the province, Canada and the globe, or due to their specialized function within an ecosystem. The status of their rarity is based on based on the best available science, community and Aboriginal knowledge on the specie's biological and habitat requirements, distribution, population size, threats, management strategies, as well as additional species specific factors. An "at risk" designation (special concern, threatened or endangered) by COSEWIC and/or COSSARO affords species some or complete protection in Ontario and Canada from wilful persecution and/or habitat destruction under various provincial and federal legislation.

Figure 17 - Agencies Involved in Species at Risk in Ontario

Natural Heritage Information Centre (NHIC) - collects, manages and ranks Ontario species population information.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC) – Federal Species at Risk Act (SARA) authority for assessing the conservation status of species that may be at risk of extinction in Canada.

Committee on the Status of Species at Risk in Ontario (COSSARO) - The Ontario Ministry of Natural Resources provincial technical committee responsible for the evaluation of species at risk in Ontario.

Rarity may be caused by the lack of suitable breeding, nesting or over-wintering habitats, predation, over-population, lack of resources, low genetic variation, deformities, disease, persecution, unregulated hunting, disease, pollution, acid rain, climate change, habitat destruction, fire suppression, invasive species, or over-collecting. Rarity may also be due to the fact that a particular population is at its natural distribution range limits. Biodiversity is important to the form and function of an ecosystem; a large variety of species creates a wide variety of habitats and functions within an ecosystem. Therefore, all species, especially rare species, are considered very important and worthy of protection efforts because of their local biological, social and, most often, economical value.

All species are important to the biological diversity of the local area. Lists of locally, regionally and/or provincially significant natural heritage features are used in municipal land-use planning and in evaluations of natural areas, wetlands and environmentally sensitive areas (ESAs). Under the provincial Planning Act, the Provincial Policy Statement provides direction for municipal land use planners on how to make sure that species at risk habitats are protected when lands are developed. The protection of all federal "at risk" schedule 1 species (COSEWIC designation) is federal law (SARA). The provincial and federal governments also administer numerous acts to regulate the protection of provincially and/or federally "at risk" species and spaces.

The NHIC species lists only reflect current and historical verified, collected information on species distribution ranges and local occurrences, but do not reflect a thorough inventory of each lakeshed for every species that have probable occurrences within its boundary. Consulting other provincial and federal species list, local MNR biologists and other experts, and with local knowledge, as well as knowing the habitat requirement for each species, is just as important for inventorying local biodiversity. Just because a species is not found on a list doesn't mean it isn't there, it just means that it hasn't been observed or recorded; if suitable breeding habitat exists, the species is probably there, especially if occurrences are recorded for abutting habitats or watersheds.

It is, therefore, important to monitor all species for evidence of decline and to contribute efforts to slowing or preventing population declines, loss of habitat, and/or the extirpation (no longer found in the wild) of these species from the province all together.

Individuals can be involved in recovery efforts from identifying and reporting species observed on their property, to restoring degraded habitats, or being stewards of small or large portions of their land. Ontario's Land Stewardship program provides opportunities for landowners to help wildlife by providing financial incentives to enhance or maintain critical habitat, protect nesting sites, conduct surveys of species on their property, and provide special population data to the Natural Heritage Information Centre (FON, 2005).

Figure 18 - Ontario, Canadian and Global Legislation to Protect Significant Natural Heritage

Provincial Legislation:

Ontario's Endangered Species Act
Fish and Wildlife Conservation Act
Crown Forest Sustainability Act
Provincial Parks Act
Planning Act (Provincial Policy Statement)
Environmental Assessment Act
Aggregates Act.

Federal Legislation:

Species at Risk Act (SARA)
Fisheries Act
Migratory Bird Convention Act

International Legislation:

Convention on the International Trade in Endangered Species of Wild Flora and Fauna: (CITES)

For more information regarding the laws and regulations in place in Ontario for the protection of fish and wildlife, please contact the MNR Bancroft Area Office or visit the MNR web site at **http://www.mnr.gov.on.ca/MNR/**, and to learn more about Ontario's laws visit **http://www.e-laws.gov.on.ca**.

For more information regarding distribution, ranks and status of Baptiste Lake's species, or if you would like to report a rare species, please contact the NHIC and Ontario Parks in Peterborough.

Baptise Lake Sub-watershed Species at Risk Occurrences

A geographical query was preformed on the NHIC website to determine which rare and "at risk" species were located within the Baptiste Lake drainage area and the abutting habitats along the Baptiste lakeshed's boundary, the York River, and in the Madawaska River watershed and northern areas of County of Hastings. As per the MNR, no new SAR species other than the list verified by the NHIC were identified for the Baptiste lakeshed. The following six species at risk occurrences have been verified for Baptiste Lake sub-watershed and habitats abutting the sub-watersheds of Benoir, Elephant and Diamond lakes.

Figure 19 - Species at Risk Designations

END – Endangered
END-R – Endangered and Regulated under the Ontario Endangered Species Act
uTHR – Threatened
SC – Special Concern
NAR – Not at Risk

1. **Bald Eagle**, *Haliaeetus leucocephalus*
   - Provincially END-R/SC and Nationally NAR
   - Two different geographical SAR designations; north of French and Magnetawan Rivers it is SC and END-R in County of Hastings
   - Non-breeding, wintering habitat in Baptiste Lake and neighbouring sub-watersheds
   - Usually nests in the crown of tall trees or on cliffs near water
   - Impacted by pesticides, illegal shooting, accidental trapping, poisoning and electrocution
   - Protected under the Endangered Species Act and Species at Risk Act


Bald Eagle

2. **Golden Eagle**, *Aquila chrysaetos*
   - Provincially END-R and Nationally NAR
   - Non-breeding, migratory habitat in Baptiste lake and neighbouring sub-watersheds
   - Often confused with an immature, dark-headed Bald Eagle
   - Breeds in the Hudson-James Bay lowlands and mountainous areas, nesting on rock cliff ledges
   - Protected under the Endangered Species Act and Species at Risk Act


Golden Eagle ROM

3. **Peregrine Falcon**, *Falco peregrinus anatum*
   - Provincially and Nationally THR
   - Current geographical range extends into northern County of Hastings range
   - Historical records (NHIC 1940s) in the southern areas of Baptiste Lake sub-watershed
   - Protected under the Planning Act - PPS and the Species at Risk Act


Peregrine Falcon ROM

4. **Blanding's Turtle**, *Emydoidea blandingii* (Great Lakes Population) 1992 York River<4km

- Provincially and Nationally THR
- Last sighting south-east Baptiste Lake in , needs confirmation of recent sightings
- Suitable wetland and upland habitat is present in the sub-watershed, so this turtle may be present
- Migrates upland to lay nest
- High domed, dark green shell, with a distinctive yellow throat and a yellow with black patched underbelly
- Impacted by nest flooding, short summer seasons, road kill and predation
- Protected under the Planning Act – PPS and the Species at Risk Act

5. **Stinkpot Turtle**, *Sternotherus odoratus*

- Provincially and Nationally THR
- Historical sightings within northern County of Hastings areas, abutting the southern boundary of Baptiste Lake sub-watershed
- Rarely leaves the water, even to bask, so it is hard to locate occurrences
- Suitable shallow wetland habitat is present in the sub-watershed, so this turtle may be present
- Emits a musky, skunk-like smell if disturbed or handled
- Impacted by shoreline development, wetland habitat loss, and boat collisions
- Protected under the Planning Act – PPS and the Species at Risk Act

6. **Eastern Hog-nosed Snake**, *Heterodon platirhinos)* (Great Lakes Population)

- Occurrences south of Baptiste Lake near Diamond Lake and within the Benoir-Elephant Lakes sub-watershed
- It is non-venomous
- Long scales on its nose which give it an upturned snout
- Protected under the Planning Act – PPS and the Species at Risk Act

De-listed Species at Risk

Until recently, the Red-shouldered Hawk was listed as a 'special concern' species at risk in Ontario. However, due to stable and increasing populations, ecological awareness and conservation, and improvements to breeding forested habitat, this species was designated

'not at risk' in April 2006 and was formally removed from the SAR list by COSEWIC, COSSARO and the SARA Registry in March 2007. De-listing all species at risk is the primary goal of SAR conservation because it means that ecological improvements to habitats and conservation efforts have positively benefited the species' reproductive success and survival locally and globally.

Red-shouldered Hawk, *Buteo lineatus*

- Neighbouring sub-watersheds
- De-listed from the SAR species list as of March 2007; no longer at risk
- Perch in trees to hunt for frogs, snakes, rodents and small birds
- Nests by a tree trunk, 10-200 feet above ground near water and swamps in undisturbed woodlots or forested areas
- Impacted by loss of forested habitat
- Protected under the Fish and Wildlife Conservation Act, the Crown Forest Sustainability Act, and the Planning Act – PPS for 'significant wildlife habitat'.

Madawaska River Watershed Species at Risk Occurrences

All other "at risk" species recorded in neighbouring sub-watersheds with suitable or preferred habitat conditions need confirmation by the MNR, but according to species-specific Species at Risk Recovery Team Reports, these species geographical ranges do extend into Baptiste Lake sub-watershed, north County of Hastings, Madawaska River watershed, and ecological district 5E-9 (ROM, 2007; NHIC, 2005; and Henson and Brodribb, 2005).

These species are "at risk" because of watershed activities and land use, habitat alteration from wetland drainage, deforestation, invasive species competition, and/or habitat degradation from development and toxic pollutants. These species, and all Species at Risk, within and downstream from the watershed are, therefore, directly impacted by activities upstream in the Benoir-Elephant-Baptiste chain of lakes.

- **Wood Turtle,** *Clemmys insculpta*
- **Least Bittern**, *Ixobrychus exilis*
- **Great Gray Owl,** *Strix nebulosa*
- **Eastern Milksnake,** *Lampropeltis triangulum triangulum*
- **Black Tern**, *Chlidonias niger*
- **Cerulean Warbler**, *Dendroica cerulean*
- **Red-headed Woodpecker**, *Melanerpes erythrocephalus*
- **Eastern Ribbon Snake,** *Thamnophis sauritus septentrionalis*
- **Monarch butterfly**, *Danaus plexippus*
- **West Virginia White***, Pieris virginiensis*
- **Eastern Cougar**, *Puma concolor*
- **Southern Flying Squirrel***, Glaucomys volans*
- **Eastern Wolf**, *Canis lupus lycaon*

Baptiste Lake-Madawaska River Watershed Rare Species Occurrences

Several rare butterfly and moths (Lepidoptera) and dragonfly and damselfly (Odonata) species, as well as birds, bats and vascular plants have been documented to occur in the wetlands, woodlands and rock ridges of Baptiste Lake-Madawaska River watershed and north Hasting Highlands County. The current distributions of these rare species need to be confirmed through field investigations.

- **Ring-necked Duck, Aythya collaris**
- **Eastern Pipistrelle Bat, Pipistrellus subflavus**
- **Small-footed Bat, Myotis leibii**
- **Northern Long-eared Bat, Myotis septentrionalis**
- **Beaverpond Clubtail, Gomphus borealis**
- **Moustached Clubtail, Gomphus adelphus**
- **Least Clubtail, Stylogomphus albistylus**
- **Harpoon Clubtail, Gomphus descriptus**
- **Zebra Clubtail,** *Nannothemis bella*
- **Horned Clubtail**
- **Elfin Skimmer, Nannothemis bella)**
- **Eastern Red Damsel, Amphiagrion saucium**
- **Boreal Snaketail, Ophiogomphus colubrinus**
- **Grass-leaved Water-plantain, Alisma gramineum**
- **Auricled Twayblade, Listera auriculata**
- **Northern Woodsia, Woodsia alpine**
- **Pepper and Salt Skipper, Amblyscirtes hegon**
- **Williamson's Emerald, Somatochlora williamsoni**
- **Ebony Boghaunter, Williamsonia fletcheri**
- **Water awlwort, Subularia aquatica**
- **Prickly Hornwort, Ceratophyllum echinatum**
- **Large Water-starwort, Callitriche heterophylla**
- **Bee-balm, Monarda didyma**
- **Carey's Smartweed, Polygonum careyi**
- **A Lichen, Rhizocarpon oederi**

The observations of all significant and rare species during breeding or blooming season are needed to confirm current occurrences within the sub-watershed of Baptiste Lake and its abutting wetland and upland habitats. Observation of species in their wintering habitat is important, but not as critical as monitoring the breeding or blooming population, because without healthy breeding habitats species will not reproduce, or will abandon traditional breeding grounds for others, if others exist and the species is capable of migration (i.e., sedentary plants). It is, therefore, important to monitor human-activities and protect the integrity of these and neighbouring sub-watershed habitats, since the area's biodiversity is not bounded by our political boundaries, but affected by our personal and community-based decisions regarding habitat conservation.

Observations – Rare and Species at Risk Species

- *There are four species at risk breeding habitat and two species at risk wintering and/or migratory habitat within or abutting the boundary habitats of the Baptiste Lake sub-watershed.*
- *Several other rare and "at risk" species' occurrences and geographical ranges extend into the Baptiste Lake – Madawaska River Watershed, and their occurrences therefore need to be verified so that there habitats may be protected and conserved. Just because a species hasn't been seen, doesn't mean it may not inhabit the area.*
- *The following websites may be consulted for current information on federally and provincially designated Species at Risk:*
    - *Species at Risk Registry* http://www.sararegistry.gc.ca/default_e.cfm
    - *Ontario Parks & SARO List* http://www.mnr.gov.on.ca/mnr/speciesatrisk/
    - *Royal Ontario Museum (ROM) – Ontario's Species at Risk* http://www.rom.on.ca/ontario/risk.php
    - *Natural Heritage Information Centre* http://nhic.mnr.gov.on.ca/nhic_.cfm
    - *COSEWIC – Canada's Species at Risk* http://www.cosewic.gc.ca/
    - *Environment Canada, Canadian Wildlife Service (CWS) – Species at Risk* http://www.speciesatrisk.gc.ca/
    - *Department of Fisheries and Oceans (DFO) – Aquatic Species at Risk* http://www.dfo-mpo.gc.ca/species-especes/home_e.asp
- *If you are undertaking planning application work in locations with SAR species occurrence, including significant habitat, the Natural Heritage Reference Manual states that COSEWIC (schedule 1) species at risk will receive policy protection under the Provincial Policy Statement (protection of significant portions of habitat for endangered and threatened species).*

Recommendations – Rare Species and Species at Risk

40. *Cottagers need to be educated about the provincial and federal legislation regarding species at risk and the incentives that are in place for private stewardship efforts. Prepare write-ups in the BLA newsletters with pictures and ask for help identifying sightings to the MNR,*

41. *Cottagers should be given the necessary information to expand their understanding of habitat and landscape requirements of rare species, and learn how to properly identify those rare species and define their critical habitat (nesting, breeding (or blooming) and feeding areas) being tracked in the Benoir-Elephant-Baptiste lakes' area.*

42. *A thorough inventory to locate and protect key habitats of rare and species at risk needs to be assessed, especially for reptiles (turtles and snakes), invertebrates, fish and birds, which are negatively impacted by shoreline destruction.*

43. *The identification and location of endangered or threatened species should be reported promptly to the MNR Bancroft District, or consult the Natural Heritage Information Centre in Peterborough.*

44. *The location of rare and "species at risk" nesting, basking, hibernating or other habitats should not be publicized since many of these species are rare or "at risk" due to direct persecution.*

45. *Public awareness workshops, newsletter article, or web pages should be posted on the Association's web site for links and information regarding the protection of rare species' habitat and how to naturalize their property to encourage rare species establishment.*

46. *Provincial and/or federal agencies, or Non-government Organizations (NGOs,) may have funding available to include Baptiste Lake into an inventory and monitoring study for rare or "at risk" species. Volunteers could be trained and provided field equipment to assist with the location of specific rare species in the area.*

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