



# PRESTON LAKE

Management Plan

2004

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# PRESTON LAKE MANAGEMENT PLAN

## EXECUTIVE SUMMARY

The future of Preston Lake is in the good hands of its residents. For decades, the people living around the best kept secret on the Oak Ridges Moraine have been true stewards of the land, the lake, and the fish and wildlife that share it with them. Homeowners everywhere can benefit from their story.

The Preston Lake community consists of approximately 195 homes surrounding a kettle lake that is completely in private ownership. It contains four privately managed swimming beaches and boasts a significant sport fish population. The ecological health of the lake is critical, as the residents in the community draw all their water needs from adjacent wells. These same residents had the foresight to recognize the self-contained sensitivities of a glacial kettle lake and successfully campaigned in 1971 for a by-law to restrict the use of gasoline-powered motorboats and jet skis.

For a number of years, residents of Preston Lake have been actively involved in restoration activities and monitoring of the water quality and aquatic and terrestrial habitats in their community. In 1997, residents formalized this commitment to their community and its environment by forming Pride and Preston Lake Inc. (PPL), a not-for-profit corporation to represent the local residents.

Volunteers from PPL partnered with other like-minded organizations to create and distribute educational products such as the *Preston Lake Homeowner's Guide*, a 52-page 'how to' reference on living in harmony with the lake and established their own Web site at [www.prestonlake.org](http://www.prestonlake.org). PPL also continues to monitor the lake environment with water quality testing at the swimming areas.

Historically, the 'footprint' of urban growth has not been clearly visible on the Preston Lake area, and the lake itself has illustrated characteristics of high water quality. However, changes in land use and nutrient input from sources such as septic beds, Canada goose droppings and surface runoff have resulted in beach closures, increased phosphorus concentrations, and reduced habitat and shoreline vegetation (Ontario Ministry of Natural Resources [OMNR], 2000).

Through their commitment to environmental monitoring, PPL recognized the signs and symptoms of degraded water quality and approached Toronto and Region Conservation (TRCA) for their assistance in developing and implementing a comprehensive lake management plan. Community and agency partnerships quickly formed to collectively secure the funds to deliver the product. Unlike other planning studies, this management plan had to be different—not a land use plan, but a lake plan that would be prescriptive in nature, identify best management practices, specific priority areas for implementation and call-to-action opportunities for the community.

Many partners, including the Region of York, Town of Whitchurch-Stouffville, York Environmental Stewardship Council, Oak Ridges Moraine Foundation, Human Resources Development Canada, Rouge Park, TD Friends of the Environment Foundation and TRCA, joined with PPL to provide funds and in-kind support and expertise to move this initiative forward.

TRCA provided administrative support and materials required for the project coordinator to develop and implement the plan. With over 45 years experience in protecting and restoring

environmental health, TRCA has defined a new vision for its work, entitled the *The Living City*. This forward-thinking vision has four objectives: healthy rivers and shorelines, regional biodiversity, sustainable communities and business excellence. The Preston Lake Management Plan achieves all four objectives of The Living City vision.

It was agreed that this management plan should provide the recommended actions to ensure the continued health and sustainability of Preston Lake and its surrounding lands. The purpose was to develop an approach to lake management that considered natural features, ensured long-term natural resource health, identified urban and rural environmental impacts and facilitated the continued interaction of the lake residents.

During the research and writing of the plan, a number of in-the-ground objectives were implemented. In 2003, the following stewardship demonstration projects and monitoring initiatives were undertaken:

- Water quality analysis
- Installation of habitat features, including wood duck boxes and an osprey platform
- Expansion of fish habitat through the construction of fish cribs
- Earth Day native tree and shrub plantings for shoreline restoration and naturalization
- Breeding bird survey
- Benthic invertebrate survey conducted by the Ontario Stewardship Rangers
- Fish community analysis
- Creation and distribution of the *Preston Lake Homeowner's Guide*
- Two conservation seminars for the Preston Lake community

Based on identified goals and objectives, the Preston Lake Management Plan suggests best management practices and priorities to protect, enhance and rehabilitate the natural kettle lake ecosystem within the Oak Ridges Moraine.

A watershed strategy exercise is currently underway for the Rouge River watershed. In an effort to compile baseline data for this work, TRCA updated the hydrologic watershed boundary to run water management modelling. Doing so left the Preston Lake area excluded from the former Rouge River watershed boundary. Strategic direction for Preston Lake will be provided in this management plan and referenced in the final Rouge River Watershed Strategy.

Throughout the management planning process, a number of recommendations were prioritized. These recommendations are detailed in the last chapter of the management plan and the means to address them are found in the plan's companion document entitled *Next Steps: A Resource Guide for the Residents of Preston Lake*. The recommendations can be summarized under the following headings:

Water Quality: It is recommended that water quality be sampled twice a month from April to November each year.

Water Quantity: In order to understand fluctuations in lake levels, it is recommended that priority be given to funding the purchase and installation of a staff gauge to allow residents to monitor lake levels.

- Natural Cover: Naturalizing shorelines and reducing mowing will improve the function of the riparian zone, while enhancing the habitat available to flora and fauna native to the area, and will create a less inviting habitat for geese.
- Natural Linkages: Preston Lake should be connected to the White Rose Wetland Complex, located to the northwest, by a combination of hedgerows and natural succession along North Road.
- Limit Access: Bell Hill Road is heavily rutted and unusable by local residents. Steep grades and large ruts have become a source of erosion. Bell Road should be closed and re-naturalized.
- Monitoring: Every two years, the marsh monitoring program and the breeding bird surveys should be conducted. The bird box program should be expanded to include owls, American kestrels and wildlife including bats.
- Goose Management: The egg-oiling programs, combined with habitat modification and scare tactics, should continue to reduce nuisance goose populations. Goose feces should be physically removed from all public beaches.
- Stormwater Management: The current inlet to the West Shore Retention Pond should be blocked and two new inlets should be created at corners of the roadside berm. Excavating the remaining turf grass expansion areas of the pond would increase the volume of stormwater being held.
- Lawn Care: Education and awareness programs should continue to encourage residents to monitor the amount and type of fertilizer and pesticides being applied to their lawns. Lawn care protocol should also be implemented at the parks surrounding the lake.
- Septic Systems: A policy should be adopted for regular septic system inspections by a professional to ensure their function and integrity.

The Preston Lake Management Plan is a blueprint for action. It outlines current conditions and identifies the issues and opportunities available to address them. It provides a set of effective implementation mechanisms and guidance for implementation. *Next Steps: A Resource Guide for the Residents of Preston Lake* will provide residents and community volunteers with the tools to continue to build their capacity as stewards of Preston Lake.

Thanks to its residents and the partners who have come together to fulfill this goal, Preston Lake continues to be in good hands—it is a role model for all kettle lake communities on the Oak Ridges Moraine.

# CHAPTER 1 BACKGROUND

## 1.1 Where is Preston Lake?

Preston Lake, one of many kettle lakes on the Oak Ridges Moraine, is located on the northeast side of Woodbine Avenue and Bloomington Road in the Town of Whitchurch-Stouffville and the Regional Municipality of York ([Map 1](#)).

With a surface area of 22.7 hectares and a maximum depth of nine metres, this kettle lake is characteristic of the ‘kame and kettle’ topography found on the moraine. The Ontario Ministry of Natural Resources (OMNR) has estimated the catchment area (the total area draining into the lake) is approximately 284.7 hectares ([Map 2](#)). Surface water that enters the lake originates from a small wetland to the northeast of the lake. From there, the surface water collects from roadside ditches, travels through a small stream running along Warner Road and empties into a retention pond on the west shore. Preston Lake has several associated kettle wetlands (features also exclusive to moraines). Nearly 30 per cent of the wetland component of the complex is lacustrine (pertaining to a lake) and is directly associated with Preston Lake.

## 1.2 Human Heritage

One of the first groups of people to settle near Preston Lake were native Seneca (Iroquois) from 1500–1650 AD. The lake served as a perfect location within which to prosper because the area’s natural features and high elevation made it ideal for defending against intruders.

In the 1800s, the Van Nostrand family were the first European settlers to arrive in the area. Their property is situated just above Vandorf Road. Preston Lake was originally called Reesor Lake, after Peter Reesor, who bought the land from an ex-officer of the British Army in 1802 for a horse, saddle and bridle. Peter and his wife raised their family at Preston Lake. At the turn of the century, the Reesors sold their land to the Middleton family, who renamed the lake Middleton Lake. In 1920, the Middletons then sold their land to George and Annie Preston.

The Prestons developed their lakeside property as a summer tourist resort in the early 1920s. Their farmhouse still stands just north of North Road. On August 29, 1930, Plan 232 was approved by Whitchurch Township. The plan envisioned a number of small cottages to be used for summer vacationers. Original access to the cottages was given through an informal right-of-way across the Van Nostrand farm.

The Prestons then built a public and private beach, installed a wharf and diving facility, and stocked the lake with largemouth bass. Several dance halls were built during that time, the last of which burnt down in the late 1950s. During the mid-1960s, a family on the north shore won the right to live on Preston Lake all year round and soon other families followed. The south shore community began forming with cottages in the 1950s and today has a wonderful blend of both traditional and modern homes. In the 1970s, the west shore became a trailer park and public beach. In the mid-1980s, Landford Development purchased the property on the west shore with the intention of removing the trailer park and building homes. (Historical text extracted from *Preston Lake Homeowner’s Guide*.)

### **1.3 Why a Management Plan?**

For a number of years, residents of Preston Lake have been actively involved in restoration activities and monitoring of the water quality and aquatic and terrestrial habitats in their community. Several years ago, residents formalized their commitment to the environment by forming Pride and Preston Lake Inc. (PPL). Volunteers from this not-for-profit corporation partnered with other like-minded organizations to create educational products such as the *Preston Lake Homeowner's Guide* (a 52-page 'how to' reference on how to live in harmony with the lake) and established their own Web site at [www.prestonlake.org](http://www.prestonlake.org). PPL also continues to monitor the lake environment, including water quality testing at the three private swimming areas.

Historically, Preston Lake has illustrated characteristics of high water quality, however, changes in land use and nutrient input from sources, such as septic beds, Canada goose droppings and runoff from farms and lawns, have resulted in beach closures, increased phosphorus concentrations, and reduced habitat and shoreline vegetation (OMNR, 2000). Through their commitment to environmental monitoring, PPL recognized the signs and symptoms of degraded water quality and requested community and agency help in the preparation of a comprehensive management plan for the lake and its surrounding lands.

### **1.4 Community Stewardship**

The residents of Preston Lake are leaders in community stewardship. In forming PPL they set out to meet the following five, clearly defined objectives:

- Ensure the well-being and protection of the environment of Preston Lake
- Provide a unified body representing all the property owners of the Preston Lake community in order to serve the best interests of the community as a whole
- Communicate and defend the best interests of the community by informing residents of issues related to the environment and the community as a whole, and by representing the residents of Preston Lake in discussions or negotiations with any third party or government body
- Educate residents to a fuller realization of the environmental responsibilities as residents of Preston Lake
- To promote the unity and community spirit of Preston Lake

For their efforts in protecting and enhancing Preston Lake, PPL received a Rouge River Keeper Award in 2002 and the Ontario Heritage Foundation Achievement Award in 2003.

#### **1.4.1 Subcommittees**

In order to divide the work load and meet their objectives, PPL developed subcommittees to identify problems and solutions for some of the issues facing the lake. Each of the following subcommittees has taken on the responsibility to inform, educate and act on each identified problem associated with the impacts to water quality.

### **1.4.2 Septic Monitoring and Education Subcommittee**

To ensure that all residents of Preston Lake understand the importance of maintaining a healthy septic system, this subcommittee is responsible for ensuring that the health of the lake is preserved by developing educational materials, researching regulations, understanding the repercussions of faulty septic systems and exploring various programs to assist homeowners in replacement and day-to-day use.

### **1.4.3 Fertilizer/Pesticide Reduction Subcommittee**

Lawn fertilizers are the main inputs of nitrogen and phosphorus into Preston Lake. Pesticide runoff, from both insecticides and herbicides, contributes to chemical contamination of the lake, which can be dangerous to species that interact with the lake. This subcommittee is responsible for developing a plan to educate and encourage residents about the use of natural lawn care methods, the use of phosphate-free detergents and the appropriate use of fertilizers and chemicals.

### **1.4.4 Preston Lake Trail Subcommittee**

This subcommittee is responsible for the proposed organization and maintenance of a walking trail around the lake. They are also investigating whether this trail could be connected to the proposed Oak Ridges Moraine Trail.

### **1.4.5 West Shore Retention Pond Subcommittee**

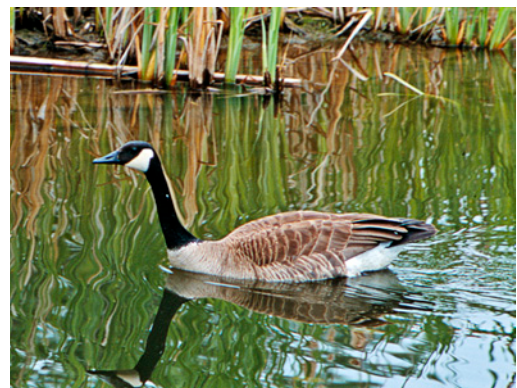
The West Shore Retention Pond was designed as an open water body, but to increase its efficiency, it was converted into a cattail marsh. The subcommittee dedicated to the management and maintenance of the retention pond monitors its health and function.

### **1.4.6 Preston Lake Homeowner Guide Subcommittee**

Volunteers of PPL created a homeowner guide for the residents of Preston Lake. It was developed in an effort to increase awareness of environmental pressures faced by the lake and to illustrate how landowners can help in reducing those pressures. Topics covered by the guide include alternatives to lawn care, septic system maintenance, water reductions, contact information, Canada geese deterrents, wildlife information and other relevant community issues. An electronic version of this guide is maintained on the PPL Web site at [www.prestonlake.org](http://www.prestonlake.org) and contains the latest updates.

### **1.4.7 Goose Management Subcommittee**

The lack of riparian vegetation and presence of lush green lawns has contributed to an increase in both residential and migratory Canada goose populations. As a result, the number of resident Canada geese (*Branta canadensis*) at Preston Lake exceeds the lake's capacity. Goose droppings contain nitrogen, and heavy concentrations of nitrogen can contribute to nutrient loading, excessive algal growth and eutrophication of the lake. Canada goose feces



*Canada goose (Branta canadensis)*

can also lead to higher amounts of *E. coli* levels in the near-shore areas, thus restricting use of the lake for swimming. In an effort to reduce the population of resident geese living on Preston Lake, PPL volunteers, under permit from the Canadian Wildlife Service, have conducted an egg-addling program. Addling, a process in which egg maturation is prevented through shaking, takes place from mid-April to mid-May. Table 1 is a summary of the Preston Lake egg-addling program since 1999.

**Table 1 – Preston Lake Canada Goose Egg-addling Program**

Year	Number of Nests	Number of Eggs
1999	18	98
2000	u/k	u/k
2001	20	93
2002	26	136
2003	23	105

### 1.5 Preston Lake Management Plan Questionnaire

A landowner survey was designed for Preston Lake residents to gain information on their concerns regarding the lake, their lawn care efforts, the condition and maintenance of their septic systems and wells and, for those living along the lake, the condition of their shorelines. Preston Lake residents were surveyed in spring of 2003, and 58 of the 195 homes responded. Residents were surveyed through door-to-door canvassing, and results were posted on the PPL Web site. A copy of the survey and the results can be found in [Appendix A](#).

### 1.6 TRCA Conservation Seminars

As a part of the educational component of the management plan, TRCA staff organized two seminars for the residents of Preston Lake. The first seminar was a presentation of the West Nile virus outlining the importance of wetland habitat and personal safety. The presentation identified the virus-carrying mosquitoes, their breeding habitat and how landowners can be proactive in preventing breeding conditions on their property. The second seminar was a well and septic workshop to inform landowners about groundwater basics and well construction, maintenance, health and testing. It also covered well and septic protection and the legal responsibilities of landowners.

## CHAPTER 2 PLANNING FRAMEWORK

In the province of Ontario, the federal, provincial and municipal governments are all involved in land use planning. As the highest level of government in Canada, federal legislation supersedes all other levels of government. At the federal level, land ownership and control of transportation and telecommunications often has implications on municipal land use planning decisions. In the Preston Lake community, the most direct example of federal jurisdiction would be any development proposals that affect fish habitat must satisfy the regulations under the federal *Fisheries Act*.

The provincial role in land use planning is governed indirectly through various pieces of provincial legislation, and directly through the *Planning Act*. The *Planning Act* sets out the policies by which a municipality must implement land use planning decisions. The Provincial Policy Statement (PPS) provides policy direction for land use planning and development on matters of provincial interest. A healthy economy and managed growth of communities, wise use and protection of resources and the long-term health and safety of Ontario's population are the key components of the PPS. Numerous other pieces of provincial legislation are applicable to land use planning decisions including the *Environmental Assessment Act*, *Lakes and Rivers Improvement Act*, *Conservation Authorities Act*, *Drainage Act* and *Environmental Protection Act*.

*The Oak Ridges Moraine Conservation Act* (2001) outlines policies for land use specific to the Oak Ridges Moraine planning area, which the *Planning Act* shall conform to. The Oak Ridges Moraine Conservation Plan establishes regulations in support of the *Oak Ridges Moraine Conservation Act*. The plan divides the moraine into four types of areas, outlining all permitted uses for each category. Preston Lake is identified as Natural Linkage Area within the plan and is, therefore, under restricted land use in order to protect critical natural and open space linkages between the Natural Core Linkage Areas and along rivers and streams.

The provincial government established regional municipalities as upper-tier municipal corporations. Regional municipalities generally set out a regional level of strategic land use policies in their Official Plans to guide economic, environmental and community building decisions of a larger context. This allows for the implementation of planning and servicing initiatives at a regional scale based on directions given in the PPS.

Preston Lake falls within York Region. In 1994, the Province of Ontario approved the Regional Municipality of York's first-ever Official Plan. This plan was revised in 1999, and a Regional Greenlands System was identified as a part of the plan. This greenlands system was accompanied by a set of policies intended to protect and restore the various elements within it.

Local or lower-tier municipalities have official plans that contain policies for a specified area related to land use planning and development control. The local Official Plan examines growth management within the municipality, while having regard to the larger, regional context. Preston Lake is located in the municipality of Whitchurch-Stouffville. In 2000, the Town of Whitchurch-Stouffville completed the Natural Features and Greenlands Study, which evaluates all natural features within the municipality, examines linkages and functions, and develops strategies and policy directions for their protection and maintenance. Preston Lake is listed in this study as an Environmental Policy Area that should be enhanced, conserved and protected in order to maintain the environmental health of the town.

Many municipal Official Plans include secondary plans or neighbourhood plans, which are detailed policy documents governing specific areas within a municipality. On a local level, the planning process for the Preston Lake community is regulated by the Vandorf-Preston Lake Secondary Plan, developed to incorporate detailed policies and designations to the Official Plan for the Town of Whitchurch-Stouffville. This secondary plan establishes the general policies, as well as specific strategies, with respect to community structure, community enhancement, services, land use and transportation to guide the planning of these two communities and adjacent lands.

Comprehensive zoning by-laws identify and set restrictions for specific land uses. They are used to implement municipal Official Plan policies and to establish land use permissions, restrictions and development standards. Examples of municipal by-laws include tree preservation by-laws, fill by-laws and pesticide use by-laws.

In its 1989 Greenspace Strategy, TRCA made the commitment to guide the preparation of a watershed management strategy for each of the nine watersheds in its jurisdiction. A watershed strategy exercise is currently underway for the Rouge River watershed. Strategic direction for Preston Lake will be provided in this management plan which in turn will be referenced in the final Rouge River Watershed Strategy.

## CHAPTER 3 EXISTING CONDITIONS

### 3.1 Geologic setting

The Oak Ridges Moraine is one of the most important landscape features in the TRCA jurisdiction in regards to its geological, topographical, hydrological and historical significance.

The Oak Ridges Moraine Complex was formed when the meltwaters of the retreating Wisconsin glacier deposited till material (silt, sand, clay, gravel and boulders) between two lobes of the glacier. This resulted in the formation of an interlobate moraine.

Kettle lakes are the result of the burial of glacial ice. This occurs when a large piece of ice is left behind during glacial retreat or when a detached block of ice is swept downstream during a flood. In both cases, the ice is buried by outwash materials like sand, silt and gravel. Slow thaw of the ice undermines the material above causing it to cave in and gather water, thus forming a kettle lake (Ham, 1994).

In the area surrounding Preston Lake, granular deposits of the Oak Ridges Moraine were overridden by glacier ice. In the area between Vandorf Side Road and Bethesda Side Road, moraine deposits were buried under glacial ice that advanced from the Lake Ontario glacial basin about 13,000 years ago. This actively created the Halton Till, a dense sandy-to-clay silt material. The till is of variable thickness and extends northward to the east branch of the Holland River (Gartner Lee Ltd., 2000).

The lake's impermeable clay bottom helps keep the water in its place. Due to the hummocky topography, Preston Lake has an internal closed drainage system. This feature, combined with a small watershed area-to-lake surface ratio, renders the water residence time in Preston Lake in the order of two to three years. Residence time is defined as the length of time water remains within an aquifer, lake or other water body before continuing through the hydrological cycle. As a result, small amounts of pollutants, such as pesticides and fertilizers, can have lasting effects. This, in turn, impacts aquatic habitat and wildlife species, affects human health and the use of the lake for recreational activities.

### 3.2 Groundwater

An understanding of the groundwater flow system is vital to watershed management, ranging from the delineation of the sustainable yield for water supply purposes to programs which maintain the flow of groundwater discharge into surface water streams.

Well records were obtained for Preston Lake from the Ministry of the Environment. The main aquifer under the Preston Lake area is located at approximately 275 metres above sea level (ASL). This stratum is three metres thick and consists of fine sands overlain by approximately 10 metres of thick clay and sand-clay mixtures. The clay layer protects the aquifer from surface contamination. A secondary aquifer is located at approximately 300 metres ASL. All residents in the Preston Lake community rely upon groundwater for use in their homes through individual wells.

### 3.3 Surface Water

The quality and quantity of water in the Preston Lake area are important elements to consider in properly determining an appropriate strategy for long-term management. An alteration in either the quality or quantity of lake water can affect aquatic habitats by altering the abundance and diversity of plant, animal and aquatic species.

#### 3.3.1 Surface Water Quality

The Ministry of Environment (MOE) provided historical water chemistry data for Preston Lake. This data, collected in 1995 and 1996 by the MOE, was compared with water chemistry data collected in 1996 and 1997 for the *Report on Water Quality and Algal Community—Preston Lake* (Olding, 1999) and data collected in 2003 by TRCA staff.

In 2003, water quality readings were taken from three stations in Preston Lake, as noted on [Map 3](#). A water quality profile was taken at the deepest point of the lake (station M). This was done to examine changes in water chemistry according to depth. Station A is located at the mouth of the wetland, adjacent to the agricultural land on the northeast shore of the lake. Station W is located at the mouth of the culvert, which drains the West Shore Retention Pond into the lake.

#### 3.3.2 Thermal Characteristics

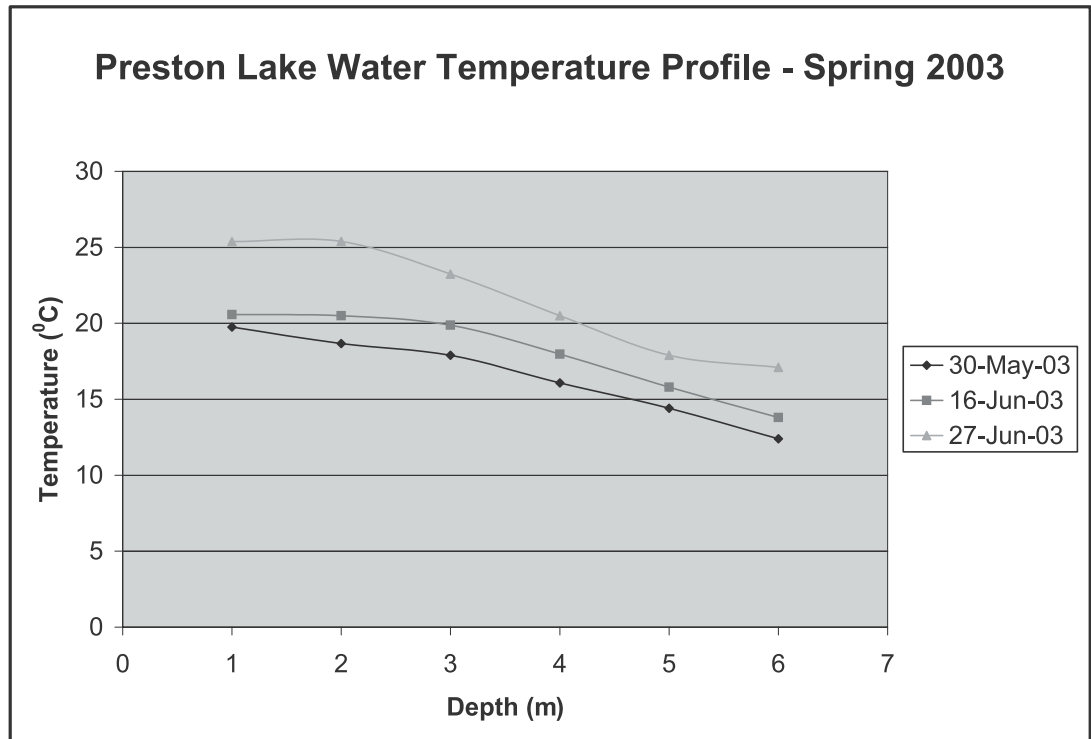
Preston Lake is a dimictic lake in that the lake turns over in the spring and again in the fall, and is covered by ice during the winter. Full mixing takes place briefly in the spring after the ice breaks up and prior to the onset of thermal stratification, and again in the fall, after the collapse of thermal stratification and before the formation of ice cover. The period of thermal stratification extends from late May/early June to mid-September. During autumn and spring, the lake circulates freely.

In aquatic ecosystems, heat establishes thermal stratification, or the layering of water based on temperatures in water bodies, and regulates the rates of both chemical reactions and biological processes. Thermal stratification is the most important physical event in a lake's annual cycle and dominates most aspects of its structure (Horne and Goldman, 1994). As water temperature increases, the water loses density. Sunlight heats the near surface water creating a layer of lighter warm water above a cooler dense layer. These layers are dynamic and their depths can change through the course of the summer. As with most kettle lakes in the region, Preston Lake is deep enough for summer stratification to occur. The warm lighter upper layer (epilimnion) and cool denser lower layer (hypolimnion) of water maintain different temperatures, separated by a transitional zone (metalimnion).

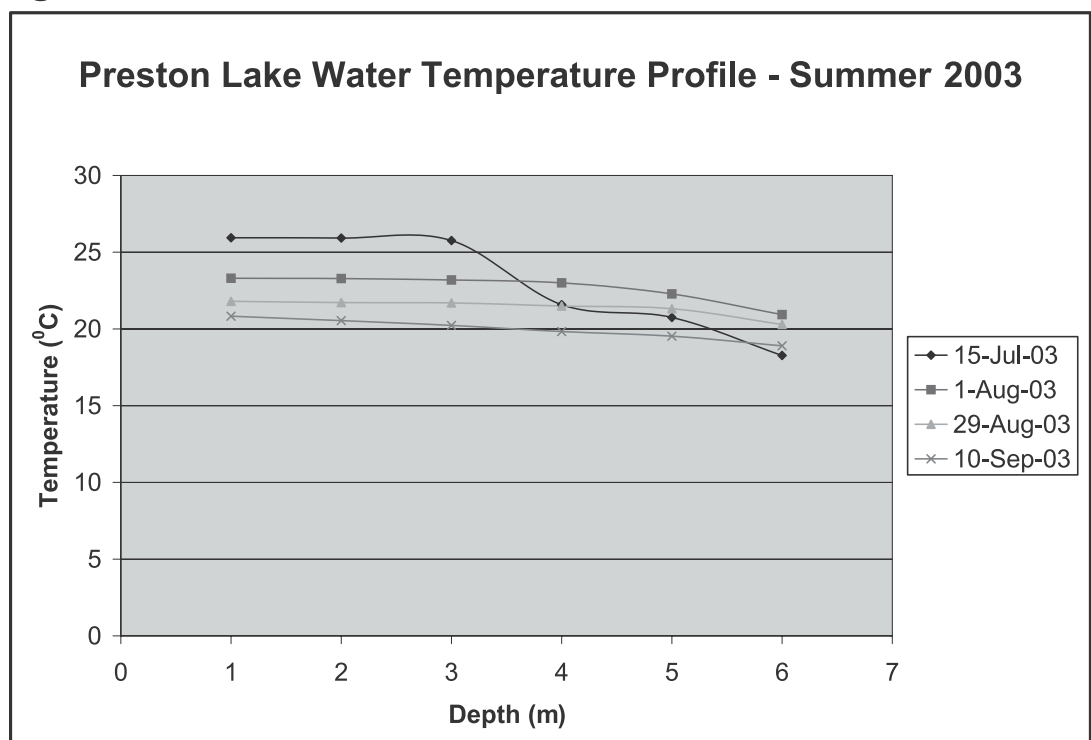
During the summer, Preston Lake's epilimnion extends to a depth of three to four metres. Maximum average summer temperatures (June–September) in the epilimnion were 22.5°C. The bottom water layer (hypolimnion) was found below at a depth of six metres and had a maximum summer average temperature of 17.38°C. Figures 1 through 3 show the temperature profile data recorded at station M in 2003. [Figure 1](#) illustrates the temperature profiles moving from a smooth curve recorded in late May to a more defined 'S' curve in late June. This demonstrates the development of thermal stratification and the creation of three distinct temperature zones. [Figure 2](#) shows the temperature profiles moving from a defined 'S' curve in July to a flatter curve in mid-September. This is the result of the breakdown in thermal stratification in the water column in late summer. [Figure 3](#) indicates that water temperature

is uniform at all depths and that the lake has moved to a fully mixed state. Data detailing the stratification process for 1995, 1996 and 1997 can be found in [Appendix B](#).

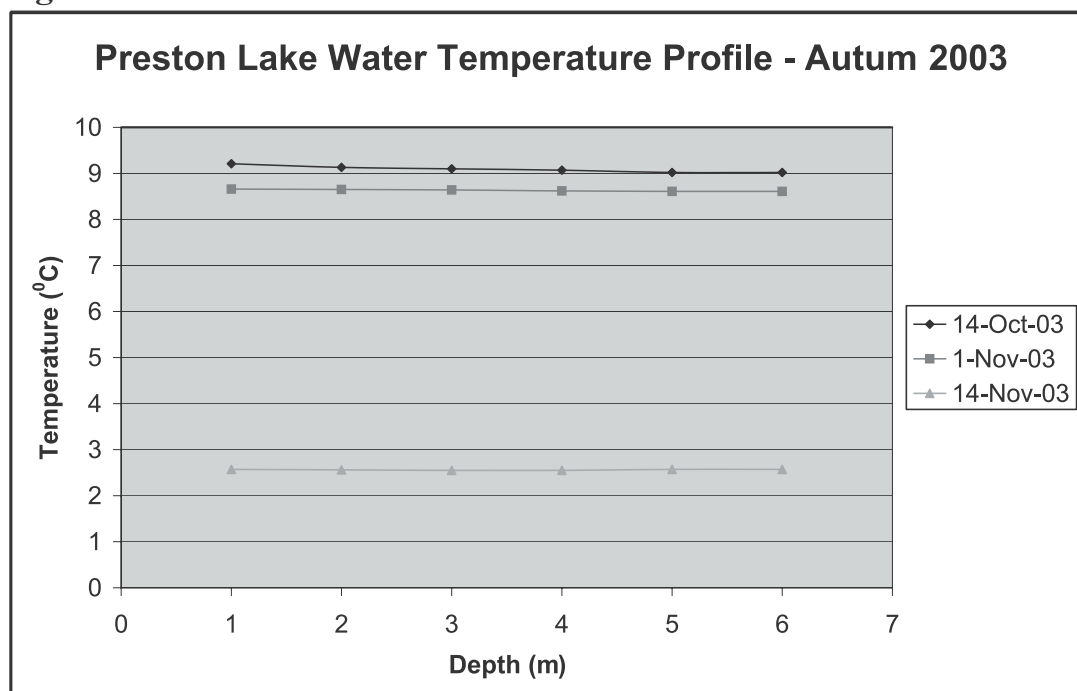
**Figure 1**



**Figure 2**



**Figure 3**



### 3.3.3 Dissolved Oxygen

Preston Lake experiences oxygen depletion in the hypolimnion layer in the summer months, becoming anoxic (low oxygen) below a depth of six metres by mid-summer. The decomposition of organic material at the sediment-water interface reduces the amount of dissolved oxygen at this level. This is a common occurrence with lakes of this depth in the region (including non-developed kettle lakes). Dissolved oxygen concentrations should not be less than the values specified in [Table 2](#) for warm water biota (e.g., centrarchid fish communities) (MOE, 1994). In some hypolimnetic waters, dissolved oxygen is naturally lower than the concentrations specified in the Provincial Water Quality Objectives (PWQO). Such a condition should not be altered by adding oxygen-demanding materials, which would thus cause a depletion of oxygen (MOE, 1994). Tables in [Appendix C](#) show the dissolved oxygen and per cent dissolved oxygen levels found in Preston Lake from 1995 through 1997.

In 2003, Preston Lake exceeded the dissolved oxygen concentration PWQO for warm water biota. When the dissolved oxygen profiles from 2003 ([Figures 4, 5 and 6](#)) are compared with those from 1995 through 1997, no significant change can be detected.

**Table 2 – Dissolved Oxygen Concentrations for Warm Water Biota Based on PWQO**

Temperature (°C)	% Saturation	mg/L
0	47	7
5	47	6
10	47	5
15	47	5
20	47	4
25	48	4

<sup>1</sup> Adapted from Policies Guidelines Provincial Water Quality Objectives of the Ministry of Environment and Energy (1994)

Figure 4

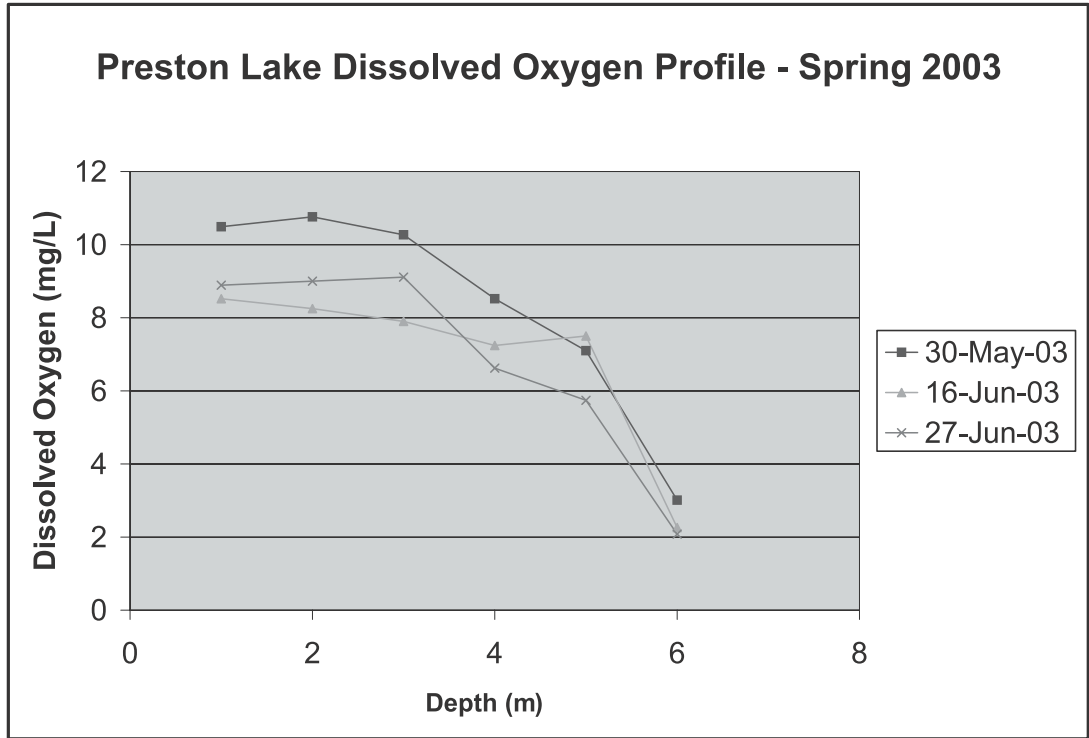
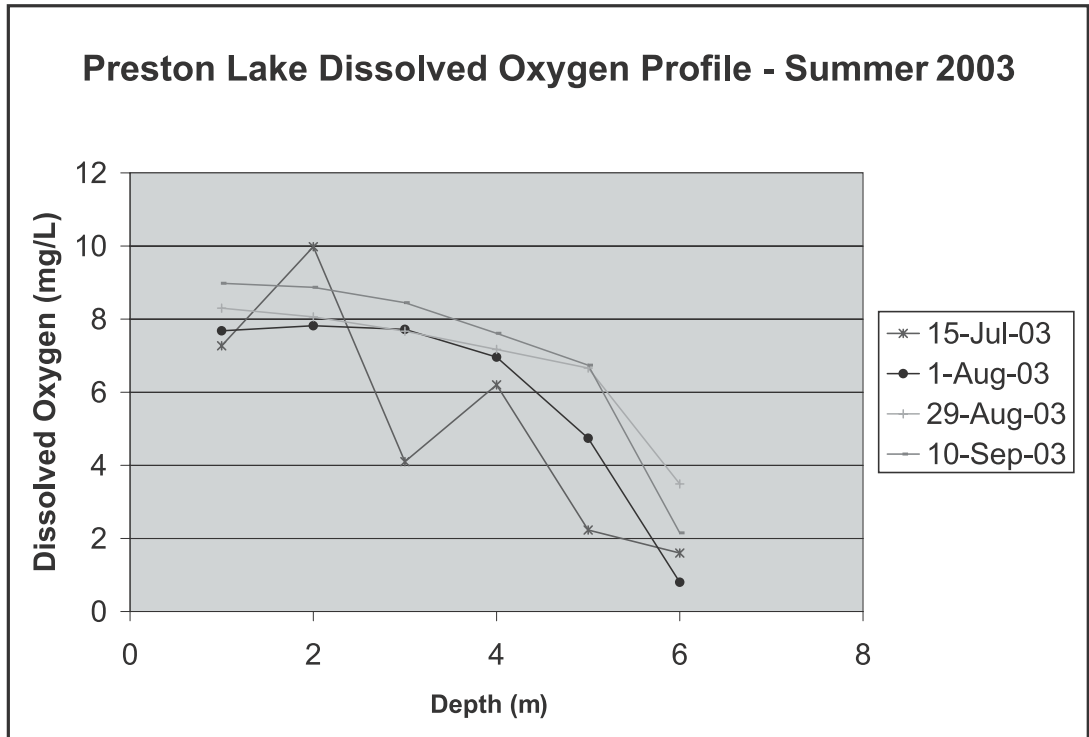
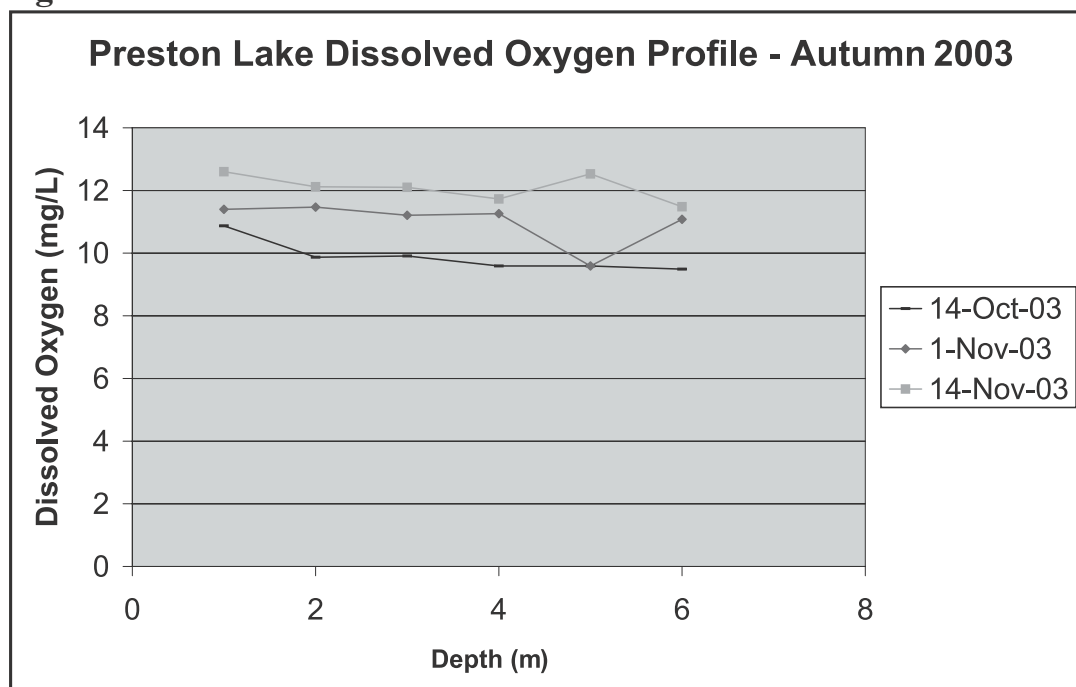


Figure 5



**Figure 6**



### 3.3.4 Nutrients

Fertilizers, raw sewage and animal feces elevate nitrogen and phosphorus levels as they are dissolved in water. Total phosphorous is the measure of all forms of phosphorus in a water sample and is the primary factor affecting total phytoplankton algal growth in urban lakes and ponds. Excessive levels of phosphorus can cause aquatic plant overgrowth, and the resulting decomposition of these plants can lead to oxygen depletion. High levels of phosphorus can lead to algal blooms and, in some cases, affect the habitat of cold-water fish. The total concentration of summer phytoplankton generally reflects the level of phosphorus in the water column.

Since 1995, residents of Preston Lake have participated in the Ontario Lake Partner Program (OLPP) (MOE, 2003), which involves taking phosphorus and Secchi readings.

**Table 3 – Preston Lake Phosphorus (ug/mL) Readings**

Year	Phosphorus (ug/mL)	
	Mean	Median
1995	0.023	0.026
1996	0.023	0.021
1997	0.0176	0.015
1998	0.014	0.014
1999	0.008*	0.008*
2000	0.019	0.018
2001	0.016*	0.016*

\* Only one reading taken that year.

Table 3 shows the yearly average total phosphorus readings. The average amount of total phosphorus recorded between June 1995 and July 2001 is 0.018 ug/mL, which meets the PWQO of 0.020 ug/mL. Based on the OLPP, Preston Lake is conventionally classed as mesotrophic, being moderately enriched and having some nutrients. The yearly average total phosphorus levels have been slowly declining since 1995 (Appendix D). This could be attributed to the increase in resident participation with phosphorus-reducing initiatives, such as low phosphorus detergents, and reducing the amount of fertilizer being used on lawns and gardens.

The west shore residential area is drained by roadside ditches, which empty into the lake at two separate locations: a straight drain, emptying directly into the wetland in the southwest corner of the lake and a retention pond adjacent to the west shore beach. The retention pond is an important feature because when functioning properly, it fixes nitrogen and phosphorus from lawn fertilizers, making them available for uptake by nearby terrestrial vegetation and reduces the amount of nutrients reaching the lake. This in turn lowers the amount of algal growth, thus improving overall water quality and clarity. The retention pond was tested at the intake, deepest point and outflow in October 2001 and again in August 2003.

In 2001, water samples were taken by residents and brought to PSC Analytical Services to be analyzed. At that time, the phosphorus levels in the water exiting the retention pond and entering the lake were measured at 0.034 ug/mL. This is slightly higher than the recommended 0.02 ug/mL of the PWQO for good water quality.

In 2003, water samples were collected the day after a rainfall event, properly fixed and analyzed by Entech Lab. At that time, the phosphorus levels in water exiting the retention pond and entering the lake measured at 0.15 ug/mL. This is significantly higher than the PWQO and could indicate that runoff after a rain event is not being retained long enough in the retention pond, allowing high levels of phosphorous to directly enter the lake.

**Table 4 – West Shore Retention Pond Phosphorus (ug/mL) Readings in 2001 and 2003**

Location	2001	2003
Abbotsford Road ditch	0.194	0.19
In the retention pond	0.119	NA
Lake side exiting the retention pond	0.034	0.15

### 3.3.5 Water Transparency

Water transparency or clarity is an indirect measure of how much phytoplankton (algae) is in the water. Water transparency is determined using the Secchi depth method, which can detect changes in water clarity, indicating changes in the algal biomass of the lake. Water clarity observations are not indicative of algal amounts in lakes that are coloured or ‘tea stained’.

Measurements are taken by lowering a Secchi disk into the water on the shady side of a boat using a measured rope. As the disk is lowered, it will reach a depth at which it is no longer visible. By raising the disk so it is just visible, a reading is taken. This should be done twice and an average of these two readings should be recorded (OLPP, 2002). Dedicated local residents participating in the OLPP have recorded Secchi depths in Preston Lake since 1995 (Appendix D).

**Table 5 – Preston Lake Secchi Depth Readings 1995–2003**

Year	Secchi Depth (m)	
	Mean	Median
1995	4.1	4.4
1996	5.6	5.8
1997	3.3	3.4
1998	4.1	4
1999*	4	4
2000	4.7	4
2001*	3.5	3.5
2002	4.6	4.7
2003	4.4	5

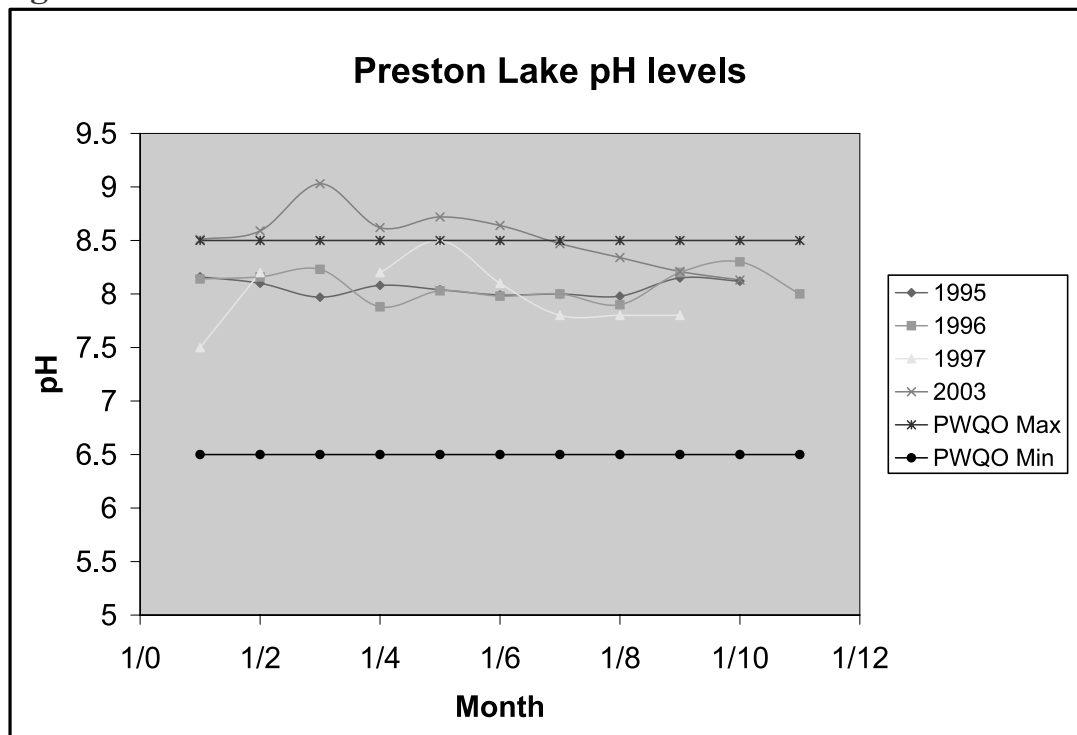
\* Only one reading taken that year.

The average Secchi depth recorded between June 1995 and July 2001 is 4.2 metres. In 2003, the deepest transparency depth was recorded on July 4 at a depth of five metres and the shallowest was recorded on June 3 at a depth of 3.1 metres.

### 3.3.6 pH

pH is defined as the negative log of the hydrogen ion (H<sup>+</sup>) concentration. The hydrogen ion concentration is a controlling factor in the chemical state of many lake nutrients, including carbon dioxide, phosphates and ammonia. Summer surface pH levels in Preston Lake in 2003 ranged from 8.1 to 9.0. Higher pH readings were mainly associated with increased water temperatures.

**Figure 7**



This range is slightly higher than the range found in 1997 (7.8–8.5) in the Report on *Water Quality and Algal Community – Preston Lake* (Olding, 1999). The average summer surface water pH was 8.5, which meets the PWQO field range of 6.5–8.5. Figure 7 shows that Preston Lake pH levels were higher in 2003 than previous years (please refer to Appendix D for details) and exceeded the PWQO from mid-spring until late summer. The higher pH levels could be attributed to phosphorus-rich stormwater runoff.

### 3.3.7 Conductivity

Conductivity is the measurement of the ability of water to conduct an electric current and is reported in terms of microsiemens per centimetre ( $\mu\text{S}/\text{cm}$ ). The greater the content of dissolved metals and other dissolved materials (called ions) in the water, the more current the water can carry. Electrical current flow increases as temperature increases, and conductivity values are automatically corrected to a standard value of 25°C. These corrected values are technically referred to as specific conductivity (Water on the Web, 2003).

Water conductivity levels in urban areas are typically dependent upon road salt loading in the surrounding watershed. Watersheds that experience significant road salt loading will see conductivity levels peak in the spring as the winter salt is washed off impermeable surfaces by spring runoff. Conductivity reading levels tend to decrease as the salt concentrations become diluted.

Since conductivity values can be highly variable, standards are difficult to develop for the protection of aquatic life. However, for reference purposes, conductivity values can be expected to range from 1 to 2000 ( $\mu\text{S}/\text{cm}$ ) in Canadian waters (Canadian Council of Resource and Environment Ministers, 1987).

**Figure 8**

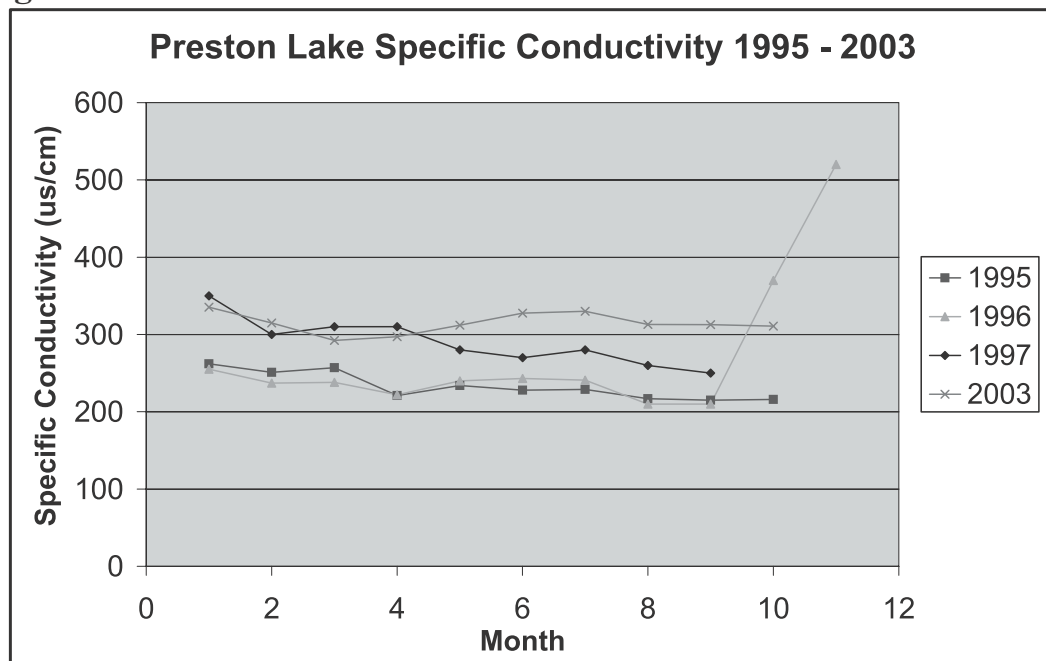


Figure 8 shows that yearly conductivity levels in Preston Lake have risen since 1995 (Appendix D). The large spike at the end of 1996 could be attributed to either an instrument failure or early winter weather resulting in road salt being applied prior to the completion of water testing.

### 3.3.8 Total Dissolved Solids

Total dissolved solids (TDS) refers to the inorganic substances dissolved in water, and are a measure of the amount of alkaline salts dissolved in water or in fine suspension. Road salts and agricultural inputs entering the water can affect TDS levels. Concentrations tend to be higher in March and April, as spring runoff flushes forest litter and soil into water bodies. TDS is an indication of water hardness and its potential buffering capacity, which can affect the buoyancy of fish eggs and other organisms. TDS is comparable to conductivity in that TDS measures the amount of inorganic substances dissolved in water and water conductivity levels are dependent on those concentrations. As no historical TDS data was available, based on conductivity levels it could be inferred that TDS levels are rising.

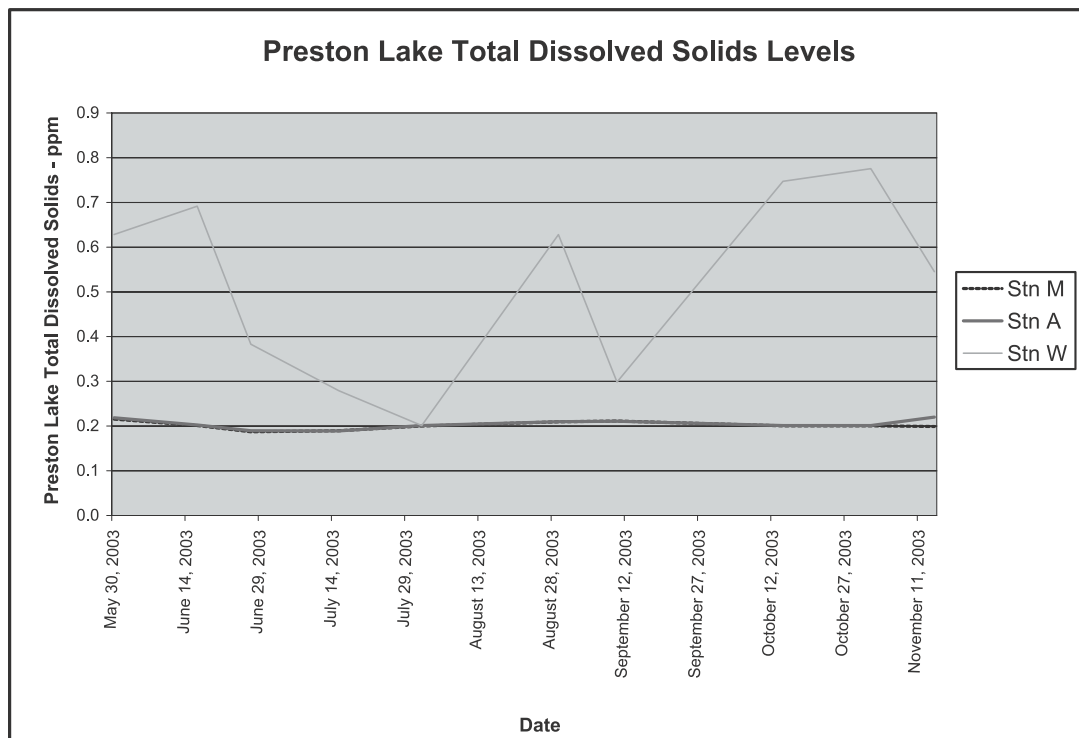
**Table 6 – General References for Total Dissolved Solids**

Environment	TDS (ppm)	Source
Unpolluted rainwater	Close to 0	Basin (2002)
Distilled water	0.5 – 1.5	Green (2003)
Drinking water	500*	MOEE (2003)
Rivers	100-20,000	Green (2003)
Sea water	36,000	Basin (2002)

\*An aesthetic objective (MOEE, 2003)

Standards for TDS in surface water are difficult to find, however there are some general references which are summarized in [Table 6](#). The 2003 TDS values for Preston Lake found in [Figure 9](#) were lower than the general references found in [Table 6](#).

**Figure 9 - Preston Lake Total Dissolved Solids (ppm) Readings from 2003 Sampling Analysis**



### 3.3.9 Beach Testing

PPL volunteers tested the water of the four beaches weekly for *E. coli* bacteria from the first week in July to the end of August. Five samples from each beach were submitted to the York Regional Health Department. Water sample results that were less than 100 parts per million are considered safe for swimming. Typically, beaches are safe for swimming until mid-September. This coincides with the arrival of migratory geese.

**Table 7 – Preston Lake Beach Testing Results**

	South Beach	West Beach	North West Beach	North Beach
Date				
July 10, 2001	11.48	10.71	10.71	
July 17, 2001	14.46	10.71	10.72	10
July 24, 2001	12.59	10	11.96	10.78
July 31, 2001	10.72	12.31	11.96	10.72
August 7, 2001	23.39	n/a	10.72	11.49
August 14, 2001	44.09	81.8	16.63	31.75
August 16, 2001	n/a	287.78	n/a	n/a
August 21, 2001	90.33	341.92*	93.1	144.02*
August 23, 2001	79.69	175.8*	80.1	88.14
August 28, 2001	n/a	174.92*	14.9	71.43
August 30, 2001	21.32	213.66*	11.96	81.91
September 4, 2001	n/a	92.83	15.78	n/a
July 2, 2002	n/a	n/a	n/a	10
July 9, 2002	n/a	17.69	10	11.16
July 16, 2002	20.69	16.81	10.72	11.96
July 23, 2002	45.6	43.97	42.65	61.34
July 30, 2002	77.42	213.21*	301.07*	497.73*
August 1, 2002	n/a	89.9	62.93	317.3
August 6, 2002	72.85	38.44	16.14	36.48
August 13, 2002	23.14	35.5	13.49	16.14
August 20, 2002	12.6	50.17	11.49	23.77
August 27, 2002	13.74	n/a	11.4	21.94
July 15, 2003	17.86	10	11.49	10
July 22, 2003	15.65	n/a	10.72	19.46
July 29, 2003	11.49	10	10	21.76
August 5, 2003	10	10	15.57	n/a
August 19, 2003	118.7*	48.12	10.72	10.72
August 26, 2003	825	n/a	84.7	144.36*
August 28, 2003	711.61*	n/a	1,630.48*	n/a

Geometric mean of samples showing *E. coli* colony counts per 100 mL

\* Indicates high counts and subsequent beach closures

### **3.4 Surface Water Quantity**

Water quantity is the movement of surface water through the drainage basin under various dry weather, rainfall and snowmelt conditions. Many complex factors determine the amount of precipitation that flows into Preston Lake. These factors include soil types (with varying abilities to hold and transfer water), topography and land use.

Monitoring precipitation and surface and groundwater levels are essential components of water quantity management. Human uses have significant impact on all components of the water cycle, thereby affecting the water budget. Changes in volume and pathways of surface water flowing into the lake can affect dependent fish and wildlife habitats.

#### **3.4.1 Stormwater Management**

Stormwater management has evolved over the past 20 years in response to advances in technology and a better understanding of the benefits of this practice. Prior to the 1980s, stormwater management had one objective—flood control.

Management strategies of the day looked at conveying runoff to local watercourses as quickly and efficiently as possible. As a result, watercourses were modified through armouring or concrete lining to accommodate an increase in flow volume and velocity. These measures were largely reactionary and led to a decline in the health of river ecosystems through a reduction in the function and quality of terrestrial and aquatic habitat, reduction in base flows, reduced water quality levels and increased rates of erosion in downstream watercourses.

Flood control remains a key objective of stormwater management, but management practices today provide a higher level of protection for the environment, property and residents by incorporating provisions for water quality, fish habitat protection, and groundwater and erosion controls.

Factors affecting stormwater control include land use designations, flood vulnerable areas, erosion sites and environmental factors (i.e., baseflow, groundwater resources, terrestrial and aquatic habitat). Stormwater criteria are usually defined through watershed or subwatershed studies and are applicable to all greenfield development and, to the extent possible, redevelopment proposals.

Originally, the West Shore Retention Pond was designed as an open water body, but in order to increase its efficiency as a stormwater treatment facility, it was converted into a cattail marsh. Proper management of stormwater quantity and quality is imperative to maintaining the biological and physical attributes of the lake. The pond contains a significant cattail marsh accounting for 70 per cent of its area with room for expansion. However, in its current capacity, it does not provide sufficient residence time for water before it enters the lake.

The retention pond reduces the amount of nutrients reaching the lake by fixing nitrogen and phosphorus. This, in turn, lowers the amount of algae, improving water quality and clarity. The retention pond also helps to reduce the amount of sediment and road salt entering the lake, which improves clarity and lowers conductivity levels. The subcommittee dedicated to the management and maintenance of the retention pond monitors its health and function by visually observing the water flow.

Surface water from the west shore enters Preston Lake from two points: the west shore retention pond and a drain that empties via a culvert pipe from the Abbotsford Road ditch.

The current inlet for the retention pond is directly in line with the exit drain to the lake. During a precipitation event, water is able to flow the shortest possible distance through the retention pond before exiting into the lake. As a result, a minimal amount of nutrients are removed.

### 3.5 Aquatic Habitat and Species

Preston Lake is home to a warm-water fish population. It was stocked in 1947, 1951 and 1960 with smallmouth bass (*Micropterus dolomieu*). Largemouth bass (*Micropterus salmoides*) were introduced in 1963. Preston Lake currently holds the record for the largest largemouth bass caught in Canada. On August 1, 1976, a largemouth bass weighed in at 4.7 kilograms or 10.48 pounds. Historical records from 1971 indicated that the fish species found in



Pumpkinseed (*Lepomis gibbosus*)

Preston Lake, along with large and smallmouth bass, were pumpkinseed (*Lepomis gibbosus*), white sucker (*Catostomus commersoni*) and brown bullhead (*Ameiurus nebulosus*).

In the summer of 2003, TRCA staff conducted fish sampling with equipment and methods that adhere to the OMNR Electroshocking Guidelines and Procedures Manual. All fish were identified, enumerated, weighed, measured and released. Total lengths were measured to the nearest millimetre. Weights were measured on an electronic field balance to the nearest gram. Specific specimens were collected for the MOE Sport Fish Contaminant Monitoring Program and were transported to their lab at the end of the survey.

The first sampling run started at the northwest shore, moved east along the north shore and ended at the wetland at the northeast corner of the lake. The second sampling run started at the eastern end of the lake, moved west along the south shore and ended at the wetland in the southwest corner of the lake (Map 4). The species found in 2003 included largemouth bass, yellow perch (*Perca flavescens*), pumpkinseed, white sucker and brown bullhead. Tables 8 and 9 and Map 4 detail the results of each run, respectively.

**Table 8 – Electrofishing Sample Results from Preston Lake Survey July 2003 – Run One**

Species	Number Caught	Max/Min Length (mm)	Total Biomass (g)
Yellow Perch	37	243 / 58	2195
White Sucker	1	303	313
Largemouth Bass	19	307 / 50	2691
Pumpkinseed	10	199 / 91	754

**Table 9 – Electrofishing Sample Results from Preston Lake Survey July 2003 – Run Two**

Species	Number Caught	Max/Min Length (mm)	Total Biomass (g)
Yellow Perch	59	245 / 58	3937
Brown Bullhead	1	312	375
Largemouth Bass	19	300 / 58	2874
Pumpkinseed	9	150 / 98	504

Based on the results of the two sampling runs, the yellow perch, largemouth bass and pumpkinseed caught met the average sizes caught in Ontario (Scott and Crossman, 1985).

There is some evidence that larger, older largemouth bass were able to avoid collection. It is possible that they are sensitive to noise created by the outboard engine used for the collection considering the gasoline motor ban on Preston Lake. The absence of smallmouth bass could be due to changes in habitat, overfishing, competition pressures or a combination of these factors. Definite conclusions cannot be drawn based on one sampling effort. To gain an accurate representation of the different fish species populations, successive years of sampling would be required.

Three bass and four perch were removed from the lake and sent to the MOE. These fish were tested according to the Sport Fish Contaminant Monitoring Program. The fish samples were prepared using the Protocol for the Collection of Sport Fish Samples for Inorganic and Organic Contaminant Analysis (MOEE 2002). The stomach contents of each specimen were also examined.

Both the 2003 sampling runs and historical data for Preston Lake demonstrate a lack of minnow species. By examining the stomach contents, feeding habits could be determined. [Table 10](#) denotes the stomach contents of each fish sampled.

**Table 10 – Stomach Contents of Fish Collected During 2003  
Preston Lake Electrofishing Surveys**

Species	Length (mm)	Weight (g)	Stomach Contents
Perch	243	160	Chum, Crayfish
Perch	238	116	Nil
Perch	205	82	Chum, Plant Material, Dragonfly Larva.
Perch	225	124	Plant Material, Dragonfly Larva.
Largemouth Bass	293	280	Chum, Plant Material, Crayfish, Unknown Young of the Year
Largemouth Bass	205	120	Plant Material, Unidentifiable Invertebrate, Perch
Largemouth Bass	307	378	Chum, Plant Material, Unknown Young of the Year

TRCA staff conducted benthic invertebrate sampling in 2003. Kick net samples were taken in the near shore and Eckman dredge samples were taken at greater depths ([Map 5](#)). A number

of species typically associated with good water quality including *Chrironomidae* sp. and Caddisfly *Trichoptera* sp. were found at stations K1 and K2. [Map 5](#) details the sampling sights.

### 3.6 Terrestrial Natural Heritage Strategy

Terrestrial natural heritage includes flora and fauna species, community types, and the patterns and the interactions of habitat patches across the landscape. Across the Greater Toronto Area, natural areas have been reduced to small fragments. Clearly, a new approach—one that maintains biodiversity and ecosystem health—is needed. TRCA has developed the *Terrestrial Natural Heritage Strategy* to address this need.

The *Terrestrial Natural Heritage Strategy* examines the condition of natural cover in the whole watershed and links it to adjoining watersheds. Instead of focusing on natural areas individually (e.g., Environmentally Significant Areas, Areas of Natural and Scientific Interest and Classified Wetlands), the *Terrestrial Natural Heritage Strategy* recognizes the interconnectedness of all parts of the natural system.

Natural heritage system data is collected at three scales (from large to small): landscape, vegetation communities and species. At the landscape scale, terrestrial habitat patches are mapped according to four broad habitat categories: forest, wetland, meadow and beach/bluff. Vegetation communities are mapped according to the province's *Ecological Land Classification System* (ELCS). Species of concern within the TRCA jurisdiction (to prevent rarity) are mapped according to TRCA's field data collection protocols. The terrestrial habitat categories for Preston Lake are found on [Map 6](#).

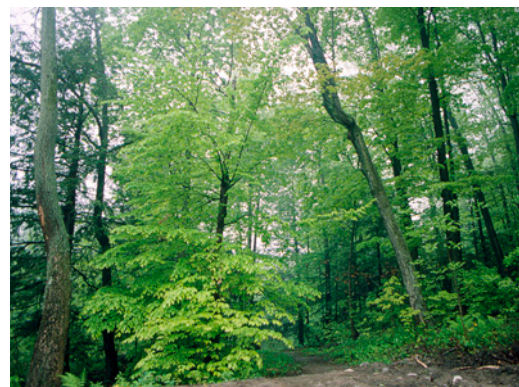
Using these data, six indicators and 20 measures were examined to determine the health of the natural system as a functioning unit. Landscape, vegetation community and species data were summarized under each of the six indicators. These indicators are quantity, distribution, size and shape, matrix influence, connectivity and biodiversity.

In its terrestrial natural heritage program, TRCA has become more proactive in ensuring that the losses of species and habitats do not continue. The shift away from focusing on rare species and habitats, and instead looking at a preventative approach (taking into account the ecological needs and sensitivities, as well as the distribution and abundance of species and habitats), is fundamental to TRCA's *Terrestrial Natural Heritage Strategy*.

### 3.7 Quantity and Distribution of Natural Cover

The *Terrestrial Natural Heritage Strategy* has a natural cover target of 30 per cent. Currently, forest cover accounts for approximately 25 per cent of the area in Whitchurch-Stouffville. Forest cover is important because it:

- provides wildlife habitat;
- helps to control soil erosion and flooding;
- mitigates stormwater runoff and overland flow;
- promotes infiltration and groundwater recharge;



*Mixed woodland*

- filters nutrients and sediments from surface water runoff;
- moderates water temperature by providing shade through riparian cover;
- enhances air quality; and
- reduces local temperatures by lowering albedo.

Forest cover also has social, economic, educational and aesthetic values.

### 3.7.1 Mixed Woodlands

Preston Lake is surrounded by mixed woodland consisting of sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), American basswood (*Tilia americana*), white birch (*Betula papyrifera*), trembling aspen (*Populus tremuloides*), white cedar (*Thuja occidentalis*), eastern hemlock (*Thuja canadensis*) and balsam fir (*Abies balsamea*). A conifer plantation exists to the east of Preston Lake made up of red pine (*Pinus resinosa*), white pine (*Pinus strobus*), jack pine (*Pinus banksiana*), white spruce (*Picea glauca*), Scots (Scotch) pine (*Pinus sylvestris*) and European larch (*Larch decidua*).

Woodland frogs, such as northern spring peepers (*Pseudanctris crucifer*), wood frogs (*Rana sylvatica*) and eastern gray treefrog (*Hyla versicolor*), depend on the native forests and the small plantation around Preston Lake for hibernating and foraging. It is critical for woodland frog survival that broad corridors be maintained between their forests and breeding ponds. Forest bird species also depend on these wooded areas adjacent to water. Wood ducks (*Aix sponsa*) and ospreys (*Pandion haliaetus*) nest in wooded areas and forage in open water areas. Maintaining woodland areas around Preston Lake and its associated wetlands is critical for the survival of these species.

### 3.7.2 Riparian Vegetation

Riparian vegetation is defined as a woody or herbaceous plant abutting a watercourse. It provides shade over a watercourse, slowing the increase in temperature caused by the sun. Debris from shrubs and trees provides cover for aquatic organisms, while their roots help to maintain bank stability by filtering and trapping sediments and preventing erosion. Riparian vegetation also provides habitat for insects that live in the overhanging vegetation. These insects then fall into the lake and provide food for fish and other aquatic species.

Preston Lake has excellent stretches of natural riparian vegetation, creating shady pools within the body of the lake. However, many of the properties that back onto the lake have degrading shorelines consisting of rock walls or gabion basket-style shoreline protection that is in various stages of disrepair and in need of replacement.

### 3.7.3 Wetlands

Wetlands are uncommon on the Oak Ridges Moraine, accounting for only two per cent of land cover, and consist mostly of small isolated kettle wetlands or headwater wetlands. Preston Lake has several associated kettle wetlands (features exclusive to moraines) and is part of a larger system known as the White Rose/Preston Lake Complex, which incorporates four wetlands: the White Rose Wetlands, Bloomington Wetlands, Simeon Forest Wetlands and Preston Lake Wetlands. These wetlands were inventoried individually in the mid-1980s and re-evaluated in 2000. It was at this time that the four wetlands were combined into one wetland complex. Wetlands of less than two hectares were included in the complex.

This complex of wetlands can be defined by the following characteristics:

- They support wetland types not well represented on the moraine
- They are home to significant species
- They are breeding sites for amphibians
- They are migratory waterfowl stopovers
- They are headwater sources or contribute to base flows
- They are hydrologically connected to larger wetlands
- They provide wetland habitat between larger wetlands
- They are kettle wetlands
- They occur along wildlife corridors



*Cat tails*

The high diversity of wetland types and species at the White Rose/Preston Lake Complex is the result of its large number and variety of interconnected wetlands and adjacent upland habitats. Wildlife corridors are vital for maintaining diversity and resiliency in an ecosystem (Riley and Mohr, 1994). Because of the interconnected nature of the complex, it is imperative that the species, habitat types and their links within Preston Lake be maintained or improved. A decline within the Preston Lake system could affect the entire White Rose/Preston Lake Complex.

The White Rose/Preston Lake Complex is made up of 77 wetland types covering 104 hectares. It contains 417 different vascular plant species, 54 bird species, and 10 reptile and amphibian species (OMNR, 2000) and is classified as a Provincially Significant Wetland (PSW). Sixty-one locally significant plant species have been identified in the White Rose/Preston Lake Complex (Appendix E). The White Rose Bog and Simeon Forest have been classified as Areas of Natural Scientific Interest (ANSI) and are regionally significant. The Simeon Lake Forest Complex has also been designated as an Environmentally Significant Area (ESA). Sixty-two per cent of the wetlands in the White Rose/Preston Lake Complex are palustrine (pertaining to a marsh), being situated along the headwater tributaries of Bruce Creek in the Rouge watershed and the east branch of the Holland River (OMNR 2000). Twenty-eight per cent of the wetland component of the complex is lacustrine and directly associated with Preston Lake. The remaining 10 per cent are isolated kettle wetlands (OMNR 2000). The small spring flooded wetlands are important amphibian breeding areas, providing spring flows to headwater tributaries and serving as recharge areas for Oak Ridges Moraine aquifers. The larger wetlands are the main discharge zones for headwater tributaries.

### 3.8 Natural Cover Linkages

The adjacent upland surrounding the White Rose/Preston Lake Complex are important for many wetland species living within the system and vital for the maintenance of wetland function. Waterfowl use the fields surrounding the wetlands for nesting and the open water for brooding and migratory stopovers. Wood frogs use the small ephemeral pools and wetlands for breeding, but forage and hibernate in the upland forests and plantations. Leopard frogs (*Rana pipiens*) forage in fields away from their wetland breeding grounds and hibernate in the bottom of deeper permanent ponds or lakes. Snapping turtles (*Chelydra serpentina*) and eastern painted turtles (*Chrysemys picta*) live year round in Preston Lake, but seek out

upland, south-facing agricultural lands to lay their eggs in June. The mixed conifer swamps found in the White Rose/Preston Lake Complex provide important deer habitat during the winter months.

The agricultural uplands adjacent to Preston Lake provide a nesting and foraging habitat for waterfowl species, which can nest several hundred metres from a wetland (MOE 2001). Leopard frogs also depend on these uplands for foraging. Maintaining these habitats will ensure the lake's species diversity.

### 3.9 Habitat Inventories

#### 3.9.1 Mammals

The *Atlas of the Mammals of Ontario* was used to obtain lists of mammals for the Preston Lake area (Dobbyn, 1994). The creation of the atlas was supervised by Nature Ontario (formerly Federation of Ontario Naturalists) and relied on existing published and unpublished data, supplemented by volunteer records. Appendix F lists the mammals found in the Preston Lake area.

#### 3.9.2 Birds

Bird data was acquired based on field observations made in association with the *Atlas of the Breeding Bird of Ontario* (Cadman and Eagles and Helleiner, 1988) and TRCA staff. TRCA staff added to this data with sightings made while working in the field around Preston Lake. [Appendix G](#) lists the birds found in the Preston Lake area.



*Ruby-crowned kinglet (Regulus calendula)*

#### 3.9.3 Herpetofauna

The Ontario Herpetofauna Summary (Weller and Oldham, 1988) was used to obtain lists of herpetofauna found in the Town of Whitchurch-Stouffville ([Appendix H](#)). The herpetofauna summary was developed from data collected in the 1970s and 1980s and was used to map the distribution throughout the province. The residents of Preston Lake also participate in a marsh monitoring program and have installed frog loggers to record calling species.

## CHAPTER 4 HABITAT CREATION

### 4.1 Osprey Nesting Platform

Osprey have a wing span of 1.6 metres and weigh between 1.5 and two kilograms. They are the only raptor with a reversible outer toe, similar to that of owls. This allows an osprey to grasp its prey with two toes in front and two in the back. Ospreys, also known as the ‘fishing eagle,’ survive on a diet primarily of fish, but occasionally will eat small birds, rodents, snakes and frogs. Ospreys will live in loose colonies or single nests and prefer to build their nests in standing, living, partially dead or dead trees close to or over water. They commonly return to the same nesting site, building it up with sticks and twigs every year. As an alternative to trees, ospreys will use hydro poles, channel markers and other artificial structures for nesting.

During the 1960s and 1970s, pesticides containing organochlorine entered the ecosystem causing a rapid decline in the population of many large raptors, including ospreys. These toxins persist in aquatic food chains, being absorbed in fatty tissue and permanently remaining in the organism. Through a process known as bioaccumulation, the toxins move up the food chain as contaminated individuals are consumed by higher-level species. Top-level predator species, such as ospreys and bald eagles, were the most susceptible to the effects of bioaccumulation of organochlorine.

Canada (in 1969) and the United States (in 1973) banned the use of these pesticides, leading to a recovery in osprey populations. However, human encroachment has limited the osprey’s habitat. In an effort to alleviate these pressures, an artificial habitat structure was constructed and installed in 2003 (refer to [Map 7](#) for location).

A large pine tree was selected on the north shore of Preston Lake to house the nesting structure. The structure was designed and installed in accordance with Environment Canada’s *Artificial Nest Structures for Ospreys—A Construction Manual* (Ewins, 1994). Currently there is a natural osprey nest in use located in the communications tower on Bloomington Road, just south of Highway 404. Based on available space and food supplies, Preston Lake has the potential for an additional platform. Nest construction specifications can be found in [Appendix I](#).

### 4.2 Bird Boxes

As urban areas expand and our natural areas become more influenced by human activity, quality bird nesting habitats are being reduced. Cavity nesters (listed in [Table 11](#)) commonly use woodpecker holes or natural hollows in rotting trees as nesting sites. However, dead standing trees are often removed from wooded areas, thus removing prime nesting habitat. Providing artificial nesting structures, such as nesting boxes, is an important way of helping cavity nesters to survive.



*Building bird boxes*

**Table 11 – Bird Box Cavity Nesters Found at Preston Lake**

Black-capped chickadee	<i>Peocile atricapilla</i>
Eastern bluebird	<i>Sialia sialis</i>
Great crested flycatcher	<i>Myiarchus crinitus</i>
Hooded merganser	<i>Lophodytes cucullatus</i>
House wren	<i>Troglodytes aedon</i>
Red-breasted nuthatch	<i>Sitta canadensis</i>
Tree swallow	<i>Tachycineta bicolour</i>
White-breasted nuthatch	<i>Sitta carolinensis</i>
Wood duck	<i>Aix sponsa</i>
Easter screech-owls	<i>Genus otus</i>
American kestrel	<i>Falco sparverius</i>
Northern flicker	<i>Colaptes auratus</i>
Hairy woodpecker	<i>Picoides villosus</i>
Downy woodpecker	<i>Picoides pubescens</i>
Yellow-bellied sapsucker	<i>Sphyrapicus varius</i>

Two large boxes suitable for wood ducks or hooded mergansers were installed on posts, one in the wetland channel that runs north from Preston Lake, and the other in the swamp east of Morgan Road (Map 7). Ten to 13 centimetres of wood chips were placed into each box. Wood ducks do not gather nest materials and will not use the structure if the wood chips are absent. These two sites were ideal because they are in wooded swamps and have abundant woody vegetation adjacent to the water. Loafing sites are available in the form of logs and stumps. Ten smaller boxes suitable for songbirds were installed in the public areas and distributed to residents for backyard use. Box constructions specifications can be found in Appendix I.

### 4.3 Fish Log Cribs

As development occurred around the shoreline of the lake, valuable fish habitat has been lost. Manicured backyards reduced the amount of woody debris and deadfalls that fall into the lake. Hardened shoreline structures like block and gabion basket walls have resulted in sterilized sections of shoreline habitat.

In an effort to provide substrate relief to an artificially uniform lake bottom, log cribs were installed. The log cribs will provide habitat for fish and other aquatic species. Placed adjacent to naturally occurring aquatic plant beds, these structures will expand the aquatic habitat present in the lake. They will provide a place for fish to hide and ambush predators to hunt. The cribs are located off the north shore and in the southwest corner of Preston Lake (Map 7). They were installed under permit from the Department of Fisheries and Oceans. Construction specifications can be found in Appendix I.

### 4.4 Native Tree and Shrub Plantings

In an effort to address both Canada goose control issues and shoreline restoration, planting projects were undertaken at each of the four beaches on Preston Lake. The projects were designed in concert with the beach associations and implemented by the residents of Preston Lake. Naturalization projects like these are important to provide a sense of ownership and to

build the capacity of local community residents to respect and care for these important areas. Species lists for each project can be found in [Appendix J](#).

#### **4.4.1 West Shore Plantings**

In the spring of 2003, 19 silver maples (*Acer saccharinum*) were planted along the edge of the West Shore Retention Pond in an effort to create shade and help remove nutrients from the retention pond. Field clump cedars were planted around the Preston Lake Beach Club shed and between the treeline and waterline to the south of the west beach. Shrubs were planted in front between the cedars and the waterline to the south of the west beach. A line of shrubs was planted along the north section of the west beach, in an effort to prevent Canada geese from walking directly from the shoreline to the grassed area adjacent to the beach. The PPL Goose Management Committee installed a fence to further inhibit goose movement along the beach.

#### **4.4.2 South Shore Plantings**

A native plant butterfly garden was planted in the south shore park. It was designed to act as a visible barrier to prevent Canada goose movement from the beach area to the park lawn. From the water, a goose would be unable to see the park lawn that lies behind the garden. The taller vegetation inhibits their ability to become airborne and detect predators. Geese will be less inclined to move from the water onto the parklands, which should reduce the amount of feces deposited onto the parklands and help to reduce lake nutrient levels and *E. coli* counts in the near-shore zone. Baltic rush (*Juncus balticus*) and wood rush (*Luzula sylvatica*) were used to line the lakeside edge of the garden. These plant species have high silica content and are unpalatable to geese. A temporary fence was installed in 2003 surrounding the garden to prevent goose movement and grazing.

#### **4.4.3 North Shore Plantings**

Various species of native ferns and shrubs were planted in a terraced right-of-way to reduce the flow of water moving from Parkhill Road to South Road and into the lake. Trees were planted around the north and northwest beaches to increase riparian habitat and control runoff. A native plant garden was created along the south road above the beach to absorb and contain runoff.

## CHAPTER 5 RECOMMENDATIONS

During the process of preparing a management plan for Preston Lake, a number of recommendations have been developed. The means to address a number of these recommendations are being compiled and will be included in the plan's companion document entitled *Next Steps: A Resource Guide for the Residents of Preston Lake*.

### 5.1 Healthy Water Quality and Quantity

The characteristics of a clay-lined kettle lake, including the residence time and relatively small drainage area, create a situation where even minor changes in nutrient inputs to the lake could have dramatic effects on water quality. In order to be proactive, it is recommended that water quality be sampled twice a month from April to November each year. In addition to the Secchi depths and water samples measuring phosphorus taken as part of the OLPP, nitrogen, pH and temperature readings should be collected at the mouth of the West Shore Retention Pond, the middle of the lake and at the edge of the northeastern wetland adjacent to the agricultural land in order to monitor water quality over space and time.

In addition, temperature readings should be taken at metre intervals at Station M twice a month to monitor the thermal stratification of the lake. Funding should be acquired to purchase a unit similar to the LaMotte Fresh Water Test Kit (Model AQ-2) so that the residents of Preston Lake can monitor lake water quality themselves. Water quality results could be jointly reviewed and analyzed by TRCA staff and community volunteers.

These same characteristics dictate that discharge and recharge functions of the lake are in a delicate balance and, therefore, the water quality, quantity and duration in the wetlands must be maintained. In order to understand fluctuations in lake levels, it is recommended that priority be given to funding the purchase and installation of a staff gauge to allow residents to monitor lake levels.

The current design of the West Shore Retention Pond does not provide sufficient residence time for stormwater before it enters the lake. To improve the function of the retention pond, the current inlet should be blocked and two new inlets should be created at corners of the roadside berm. In addition to altering the inlets, excavating the remaining turf grass expansion areas of the pond would increase the volume of stormwater retention. This would increase the time and distance required for water to enter and exit the retention pond, thus improving retention time and increasing the amount of nutrients removed from the water. By lowering the phosphorus levels entering the lake water, algal populations and aquatic vegetation growth would be reduced, resulting in improved water quality.

In addition, it would be beneficial to install infiltration basins upstream (drainage swales in the ditches at the front of properties) at several key areas on the south and west shores of Preston Lake. This would reduce the amount of runoff reaching the lake via the straight drain on the lake's southwest corner and the south beach.

The residents of Preston Lake collectively should adopt a policy of annual septic system inspections by a professional to ensure their function and integrity. It is also suggested that a PPL subcommittee be created for well monitoring, testing and education to ensure all Preston Lake residents are testing their wells a minimum of three times a year, as recommended by the Ontario Ministry of Health.



*Beach shoreline, Preston Lake*

## **5.2 Shoreline Enhancements**

Preston Lake has excellent stretches of natural riparian vegetation creating shady pools within the body of the lake. However, many of the properties that back onto the lake have altered shorelines consisting of rock walls or gabion basket walls that are in various stages of degradation and in need of replacement. Many of these structures are connected to each other, making it possible to naturalize several connected backyards using current standards for shoreline stabilization. Naturalizing these shorelines will improve the function of the riparian zone, while enhancing the habitat available to flora and fauna native to the area. Reducing mowing practices, enhancing grass shorelines with native trees and shrubs and creating naturalized buffer strips along the lake shoreline will help to reduce nutrient inputs and create a less inviting habitat for Canada geese.

## **5.3 Landform Conservation**

Any future development in the Preston Lake area should adhere to the guidelines set out in the Natural Linkage Areas section of the Oak Ridges Conservation Plan (chapter two). It is recommended that Preston Lake be connected to the White Rose Wetland Complex by a combination of hedgerows and natural succession along North Road.

Bell Hill Road connects South Road and Park Hill Crescent on the north side of Preston Lake. Currently Bell Hill Road is heavily rutted and unusable by local residents. Because of its steep grade and large ruts, it has become a source of erosion. This erosion process has been accelerated by all-terrain vehicle traffic. It is recommended that the option should be explored to close and renaturalize Bell Hill Road.

## **5.4 Habitat Expansion**

In order to properly assess the avian species present in the Preston Lake area, it is recommended that projects such as the marsh monitoring program continue and bird checklists for community volunteers be developed. The bird box program currently being run at Preston Lake should be expanded to include owls, American kestrels and bats.

## **5.5 Canada Goose Management**

An intergraded approach to goose management, incorporating turf management, natural buffers, egg oiling and scare tactics should be considered. It is recommended that the egg-adding program utilize oiling, which is easier, faster and more effective at lowering the number of new resident geese. Goose feces should be physically removed from all public beaches to help improve near-shore water quality and reduce the number of days that beaches are closed.

## **5.6 Lawn Care and Maintenance**

The Preston Lake Management Plan questionnaire indicated that a community natural lawn care protocol would be beneficial to aid residents in the appropriate application of fertilizers and pesticides. A variety of lawn care workshops could be organized to outline best management practices including lawn care, equipment care and maintenance. As a result of the workshops, lawn care protocol could be implemented at the parks surrounding the lake. Specifically, grass length should be increased to eight centimetres (3.5 inches) to help reduce overland flow and make the parks less attractive to Canada geese.

Residential fertilization is a major contributor of phosphorus entering the lake. By monitoring (soil sampling) the amount and type of fertilizer being applied, residents can tailor the application according to the needs of the lawn. As with fertilization, pesticide application must be done in a site-specific manor native wetland/shrub garden should be created at the top of the South Shore Park to aid in the removal of runoff and nutrients.

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# APPENDIX A

## Preston Lake Management Plan Questionnaire Results

### Lake Concerns

1. How concerned are you with lake water quality?
  - a. Very Concerned 71%
  - b. Concerned 22%
  - c. No Opinion 2%
  - d. Not Very Concerned 3%
  - e. No Concern at all 0%
2. How concerned are you with quality of fishing?
  - a. Very Concerned 35%
  - b. Concerned 38%
  - c. No Opinion 14%
  - d. Not Very Concerned 11%
  - e. No Concern at all 3%
3. How important is local wildlife to you?
  - a. Very Important 55%
  - b. Important 38%
  - c. No Opinion 3%
  - d. Not Very Important 2%
  - e. Not Important at all 2%
4. How important is lake recreation to you?
  - a. Very Important 47%
  - b. Important 41%
  - c. No Opinion 9%
  - d. Not Very Important 3%
  - e. Not Important at all 0%

### Lawn Care

5. Do you fertilize your lawn?
 

Yes	55%
No	43%
Unknown	2%
6. If yes, who applies the fertilizer?
 

a. Household Member	59%
b. Professional	41%
7. How often do you fertilize your lawn?
 

a. Once a year	6%
b. Between two and four times a year	63%
c. More than five times a year	28%
d. Unknown	3%
8. What is the chemical composition of your fertilizer (e.g. 28-3-10)?
 

27-7-7	6%
21-3-12	3%
28-3-10	6%
Unknown	85%
9. Do you use herbicides/pesticides on your lawn?
 

Yes	40%
No	60%

10. If yes, who applies the fertilizer?
 

a. Household Member	52%
b. Professional	48%
11. Which products are used?
 

a. Diazanone	0%
b. Dursban	0%
c. 2,4-D	4%
d. Other	26%
e. Unknown	70%
12. Would you consider using an organic pest control method if the cost and effort was equal?
 

Yes	85%
No	3%
Unknown	12%

### Septic System

1. Average septic system age 14.5
 

Unknown	14%
Holding tanks	3%
2. How often do you empty your septic tank?
 

a. Every year	6%
b. Every other year	19%
c. Every three to five years	61%
d. Every six or more	6%
e. Unknown	8%
3. When did you empty it last?
 

a. This year	20%
b. Last year	20%
c. Two years ago	30%
d. Three or more years ago	20%
e. Unknown	10%

4. Do you put the following through your septic system?
 

a. Septic tank enhancers	14%
b. Oil base paints	0%
c. Household cleaners	21%
d. Solvents	0%

### Wells

1. How often do you test your well?
 

a. Monthly	2%
b. Every other month	2%
c. Every four months	8%
d. Every six months	29%
e. Once a year	21%
f. Once in the last two to five years	9%
g. Once in the last five to 10 years	2%
h. Cistern/Lake pump	6%
i. Do not test	21%

2. Does it test poorly?
 

Yes	5%
No	95%
  
3. If yes at what time of the year does it test poorly?
 

Summer
  
4. What causes it to test poorly?
  - a. E-coli
  - b. Total coliforms
  - c. Fecal Streptococci
  - d. Pseudomonas Aeruginosa
  - e. Other
  
5. Does your well ever run dry?
 

Yes	2%
No	96%
Unknown	2%

6. If yes, when?

#### Property Features

1. Does your property include shoreline?
 

Yes	7 (12%)
No	
  
2. If yes, is it
 

Beachfront	1
Shoreline protection	5
Swamp	1
  
3. If you have shoreline protection what type is it?
  - a. Gabion Stone/Baskets
  - b. Armour Stone
  - c. Naturalized
  - d. Other (please describe)

	5
--	---
  
4. What condition is your shoreline protection in?
  - a. Very Good
  - b. Good
  - c. Average
  - d. Poor
  - e. Very Poor

	3
	1
	1
  
5. Does your mowed lawn extend to the edge of the shoreline protection area?
 

Yes	1
No	5

#### Docks

1. Do you have a dock?
 

Yes	7
No	
  
2. If yes what type of dock is it?
  - a. Floating
  - b. Pipe
  - c. Permanent
  - d. Specialty (Cantilever, Suspension or lift)

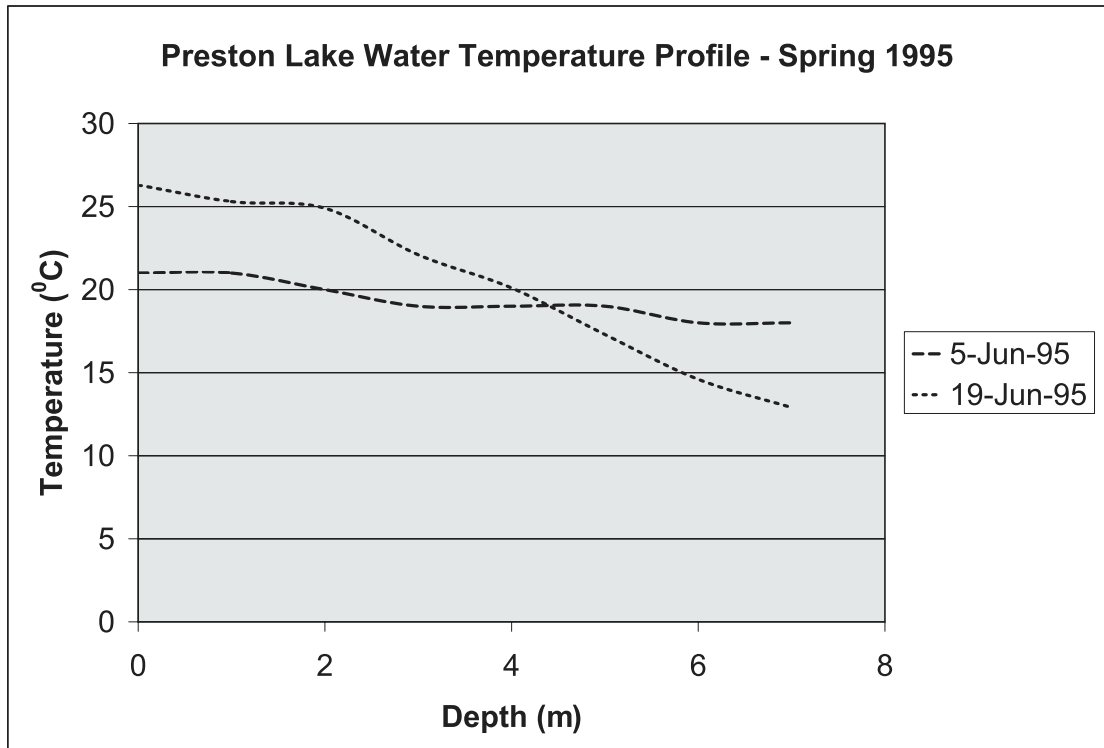
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# APPENDIX B

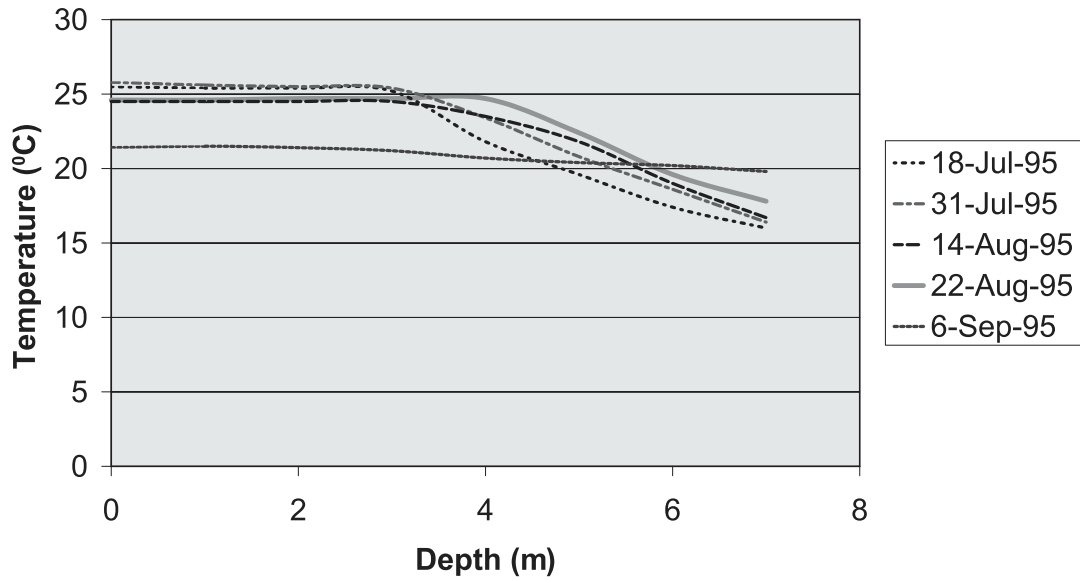
## Preston Lake Temperature Profiles 1995–1997

### Preston Lake Water Temperature Readings - 1995

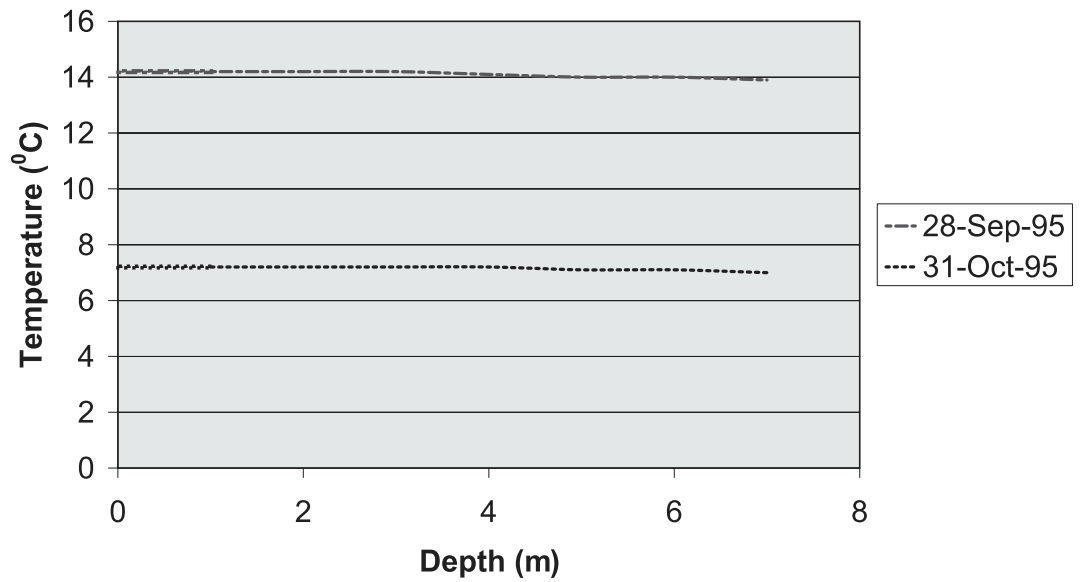
Temp								
Depth (m)	0	1	2	3	4	5	6	7
Date								
5-Jun-95	21	21	20	19	19	19	18	18
19-Jun-95	26.3	25.3	24.9	22.1	20.1	17.3	14.6	12.9
18-Jul-95	25.5	25.4	25.4	25.2	21.8	19.6	17.4	16
31-Jul-95	25.8	25.6	25.5	25.4	23.4	20.8	18.6	16.4
14-Aug-95	24.5	24.5	24.5	24.5	23.5	21.8	19	16.7
22-Aug-95	24.6	24.6	24.7	24.7	24.7	22.4	19.6	17.8
6-Sep-95	21.4	21.5	21.4	21.2	20.7	20.4	20.2	19.8
28-Sep-95	14.2	14.2	14.2	14.2	14.1	14	14	13.9
31-Oct-95	7.2	7.2	7.2	7.2	7.2	7.1	7.1	7
Avg. Temp	21.17	21.03	20.87	20.39	19.39	18.04	16.50	15.39



### Preston Lake Water Temperature Profile - Summer 1995

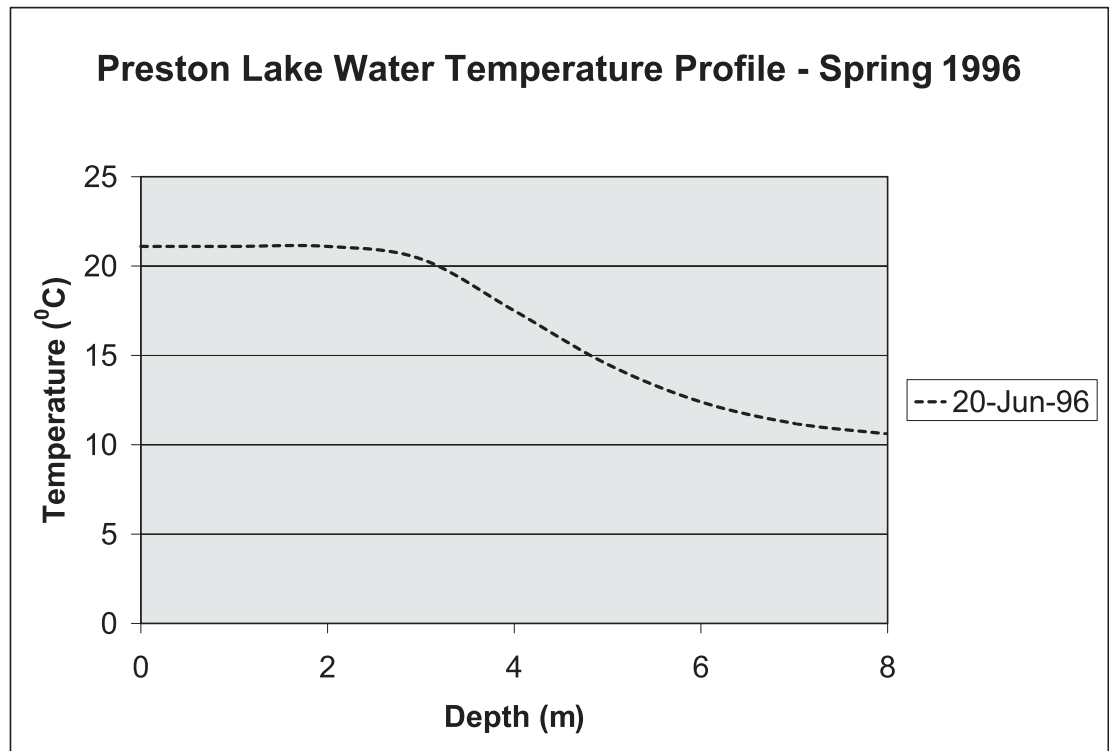


### Preston Lake Water Temperature Profile - Autumn 1995

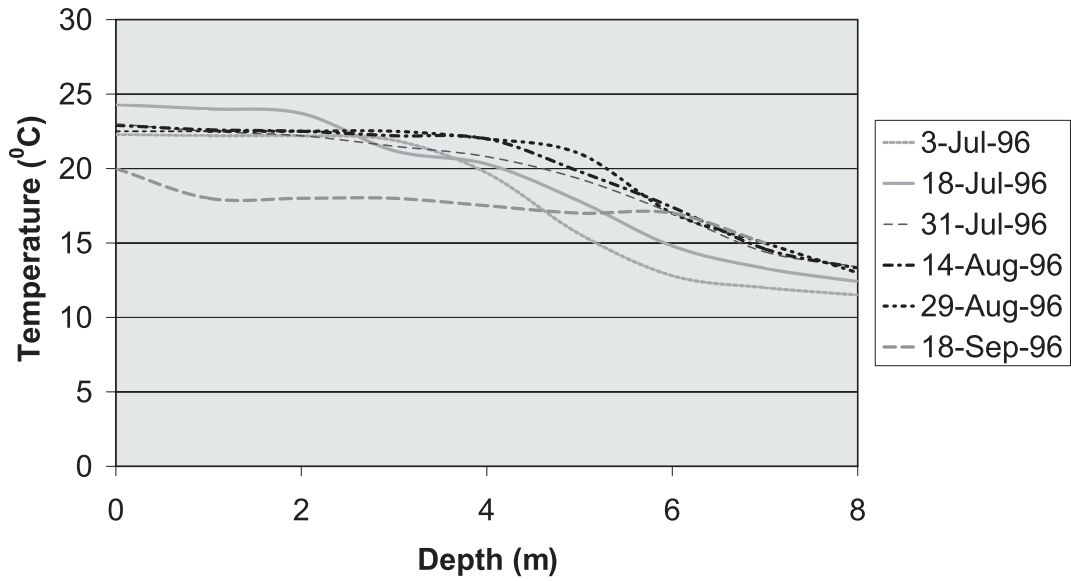


### Preston Lake Water Temperature Readings – 1996

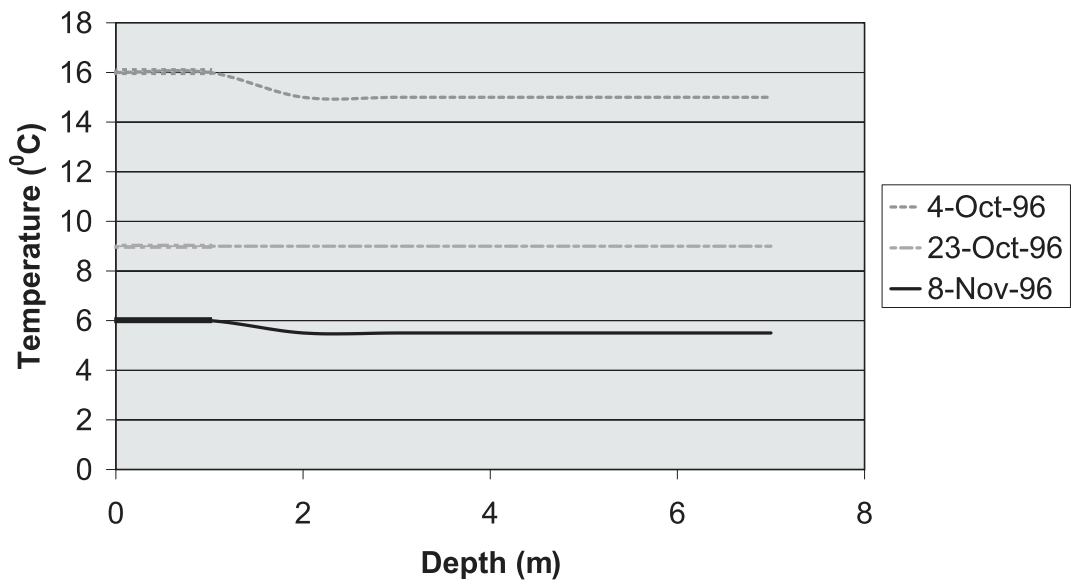
Temp									
Depth (m)	0	1	2	3	4	5	6	7	8
Date									
20-Jun-96	21.1	21.1	21.1	20.4	17.5	14.5	12.4	11.2	10.6
3-Jul-96	22.3	22.2	22.2	21.9	19.7	15.6	12.8	12	11.5
18-Jul-96	24.3	24	23.7	21.2	20.3	17.8	14.8	13.3	12.4
31-Jul-96	23	22.5	22.2	21.5	20.8	19.3	17	14.4	13.4
14-Aug-96	22.9	22.6	22.5	22.2	22	19.8	17.4	14.6	13.3
29-Aug-96	22.5	22.5	22.5	22.5	22	21	17	15	13
18-Sep-96	20	18	18	18	17.5	17	17	15	
4-Oct-96	16	16	15	15	15	15	15	15	
23-Oct-96	9	9	9	9	9	9	9	9	
8-Nov-96	6	6	5.5	5.5	5.5	5.5	5.5	5.5	
Avg. Temp	18.71	18.39	18.17	17.72	16.93	15.45	13.79	12.50	12.37



### Preston Lake Water Temperature Profile - Summer 1996

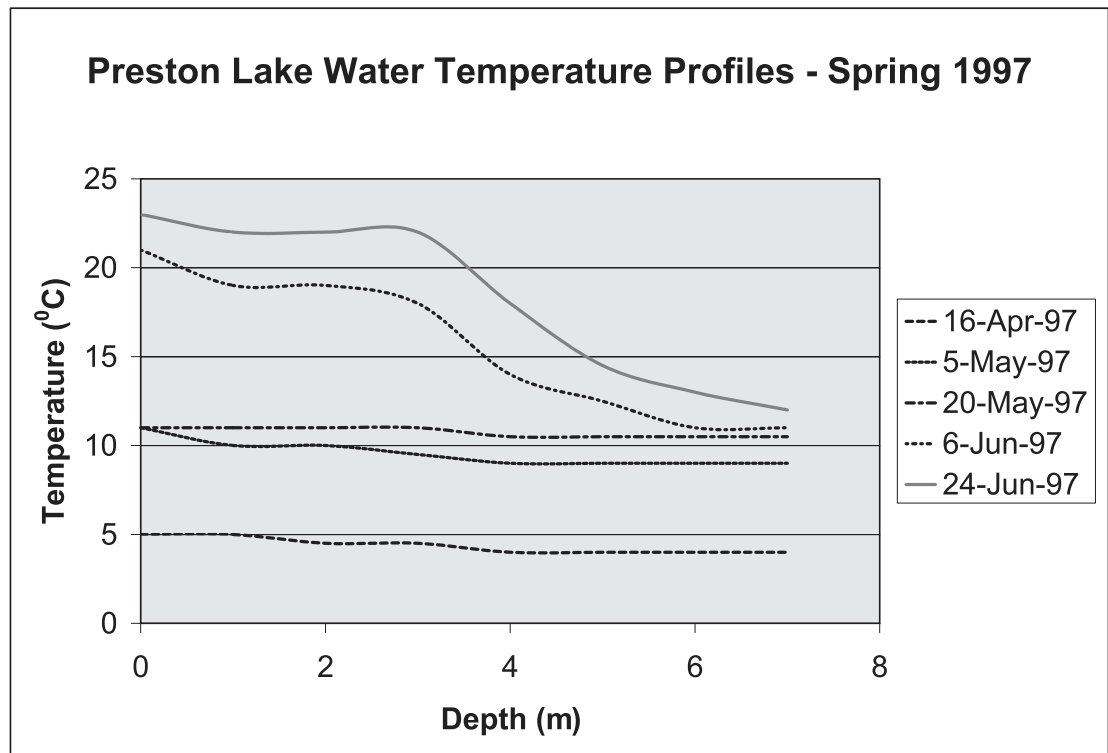


### Preston Lake Water Temperature Profile - Autumn 1996

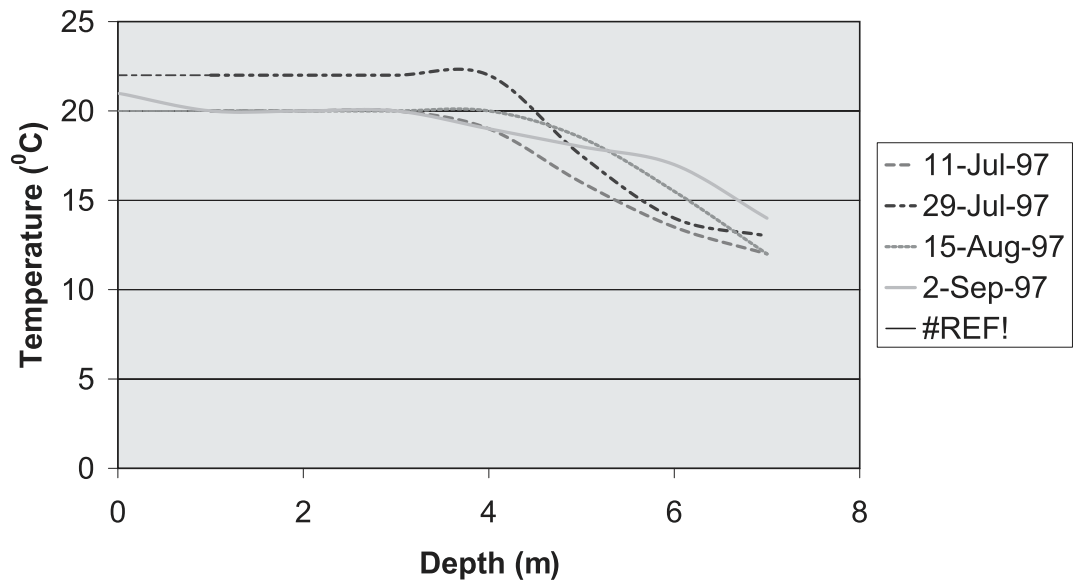


### Preston Lake Water Temperature Readings – 1997

Temp								
Depth (m)	0	1	2	3	4	5	6	7
Date								
16-Apr-97	5	5	4.5	4.5	4	4	4	4
5-May-97	11	10	10	9.5	9	9	9	9
20-May-97	11	11	11	11	10.5	10.5	10.5	10.5
6-Jun-97	21	19	19	18	14	12.5	11	11
24-Jun-97	23	22	22	22	18	14.5	13	12
11-Jul-97	20	20	20	20	19	16	13.5	12
29-Jul-97	22	22	22	22	22	17.5	14	13
15-Aug-97	20	20	20	20	20	18.5	15.5	12
2-Sep-97	21	20	20	20	19	18	17	14
Avg. temp	17.1	16.6	16.5	16.3	15.1	13.4	11.9	10.8



### Preston Lake Water Temperature Profile - Summer 1997

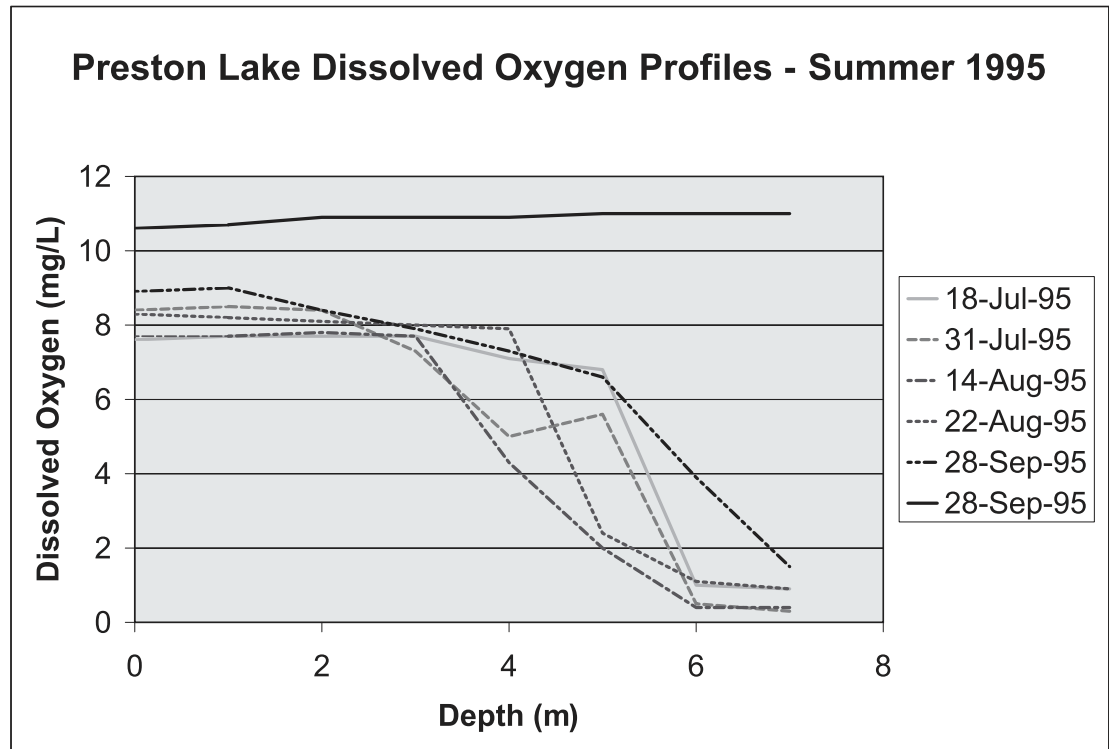


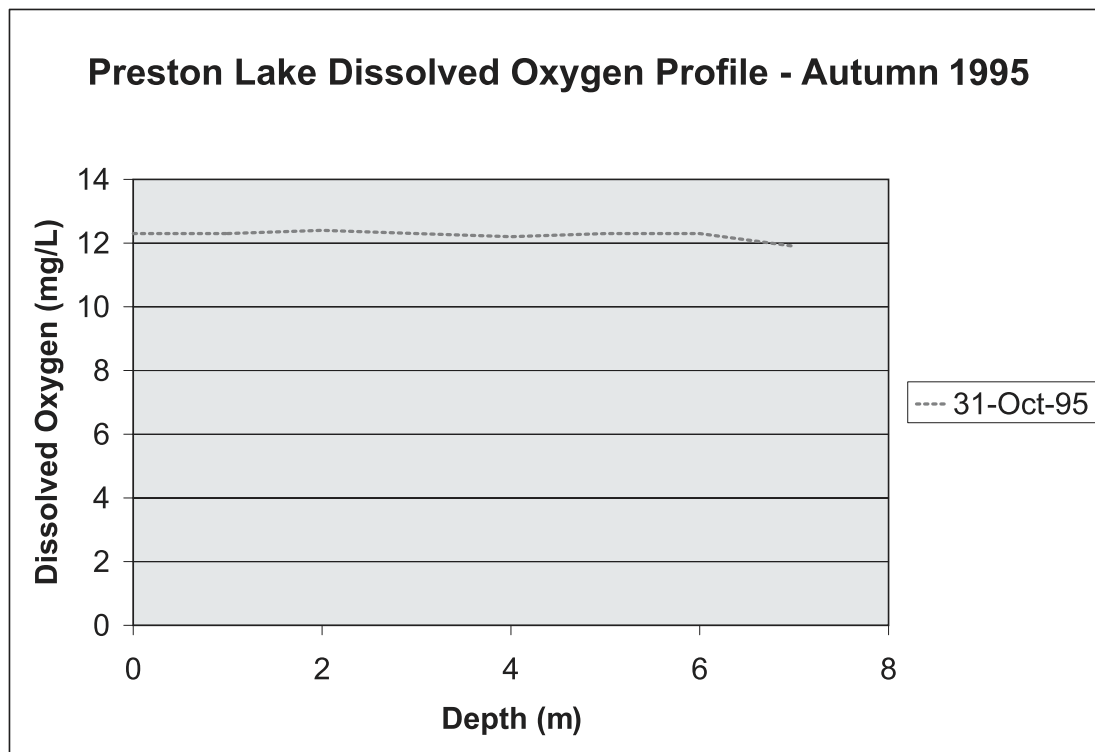
# APPENDIX C

## Preston Lake Dissolved Oxygen Profiles 1995–1997

### Preston Lake Dissolved Oxygen Readings – 1995

DO								
Depth (m)	0	1	2	3	4	5	6	7
5-Jun-95	10.7	10.8	11.2	6.2	6.2	6	5.4	5.1
19-Jun-95	8.6	8.8	9	7.6	7	6.2	1.4	0.3
18-Jul-95	7.6	7.7	7.7	7.7	7.1	6.8	1	0.9
31-Jul-95	8.4	8.5	8.4	7.3	5	5.6	0.5	0.3
14-Aug-95	7.7	7.7	7.8	7.7	4.3	2	0.4	0.4
22-Aug-95	8.3	8.2	8.1	8	7.9	2.4	1.1	0.9
6-Sep-95	8.9	9	8.4	7.9	7.3	6.6	3.9	1.5
28-Sep-95	10.6	10.7	10.9	10.9	10.9	11	11	11
31-Oct-95	12.3	12.3	12.4	12.3	12.2	12.3	12.3	11.9
Avg. Temp	9.23	9.30	9.32	8.40	7.54	6.54	4.11	3.59

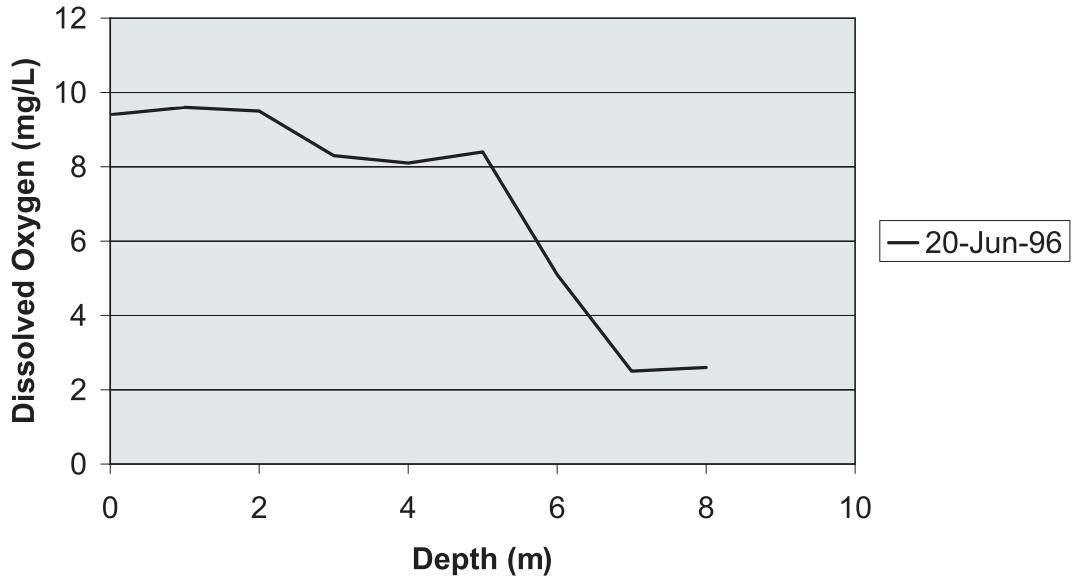




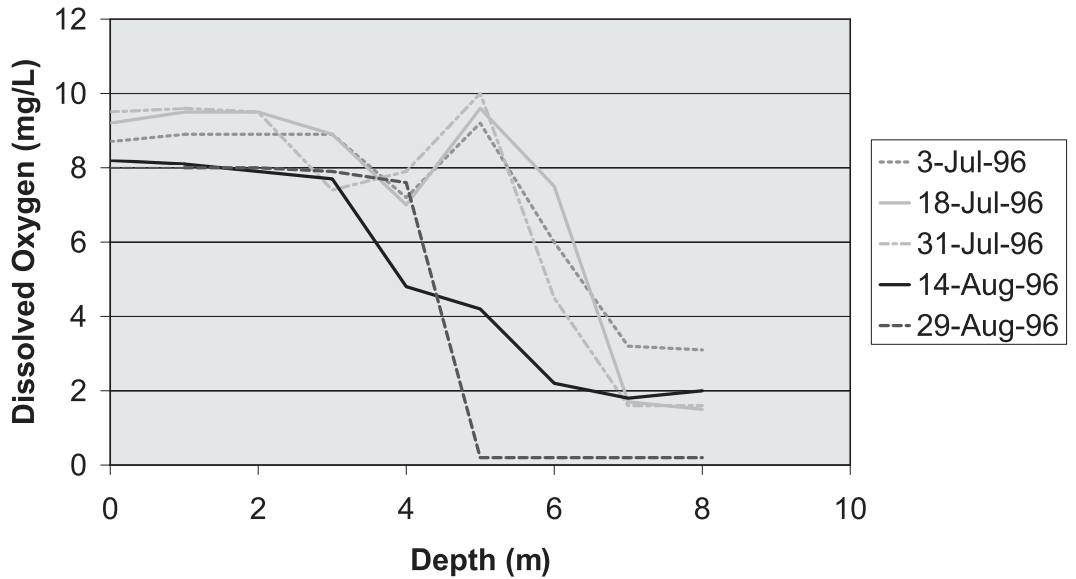
### Preston Lake Dissolved Oxygen Readings – 1996

DO									
Depth (m)	0	1	2	3	4	5	6	7	8
Date									
20-Jun-96	9.4	9.6	9.5	8.3	8.1	8.4	5.1	2.5	2.6
3-Jul-96	8.7	8.9	8.9	8.9	7.2	9.2	6	3.2	3.1
18-Jul-96	9.2	9.5	9.5	8.9	7	9.6	7.5	1.7	1.5
31-Jul-96	9.5	9.6	9.5	7.4	7.9	10	4.5	1.6	1.6
14-Aug-96	8.2	8.1	7.9	7.7	4.8	4.2	2.2	1.8	2
29-Aug-96	8	8	8	7.9	7.6	0.2	0.2	0.2	0.2
Avg. Temp	8.83	8.95	8.88	8.18	7.10	6.93	4.25	1.83	1.83

**Preston Lake Dissolved Oxygen Profile - Spring 1996**

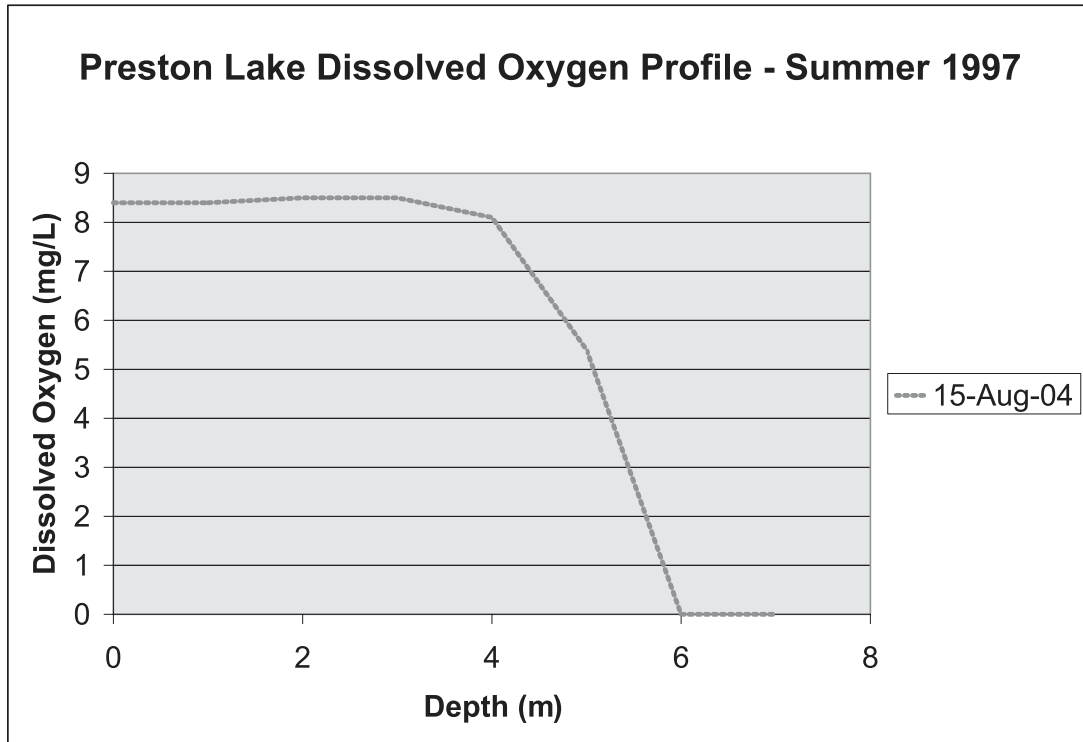


**Preston Lake Dissolved Oxygen Profile - Summer 1996**



### Preston Lake Dissolved Oxygen Readings – 1997

DO								
Depth (m)	0	1	2	3	4	5	6	7
Date								
15-Aug-04	8.4	8.4	8.5	8.5	8.1	5.4	0	0



## APPENDIX D

Preston Lake Total Phosphorus, Secchi Depths, pH Readings and Specific Conductivity 1995–2003

### Ministry of the Environment Lake Partner Program Total Phosphorus Measurements for Preston Lake 1995-2003

STN	Site ID	Date	TP(ug/L)
7006	2	5-Jun-95	26.0
7006	2	19-Jun-95	30.0
7006	2	4-Jul-95	38.0
7006	2	9-Jul-95	28.0
7006	2	18-Jul-95	26.0
7006	2	31-Jul-95	26.0
7006	2	8-Aug-95	10.0
7006	2	14-Aug-95	20.0
7006	2	22-Aug-95	34.0
7006	2	27-Aug-95	24.0
7006	2	6-Sep-95	18.0
7006	2	28-Sep-95	12.0
7006	2	31-Oct-95	12.0
7006	2	2-Jun-96	22.0
7006	2	16-Jun-96	20.0
7006	2	20-Jun-96	20.0
7006	2	3-Jul-96	20.0
7006	2	7-Jul-96	16.0
7006	2	18-Jul-96	24.0
7006	2	28-Jul-96	20.0
7006	2	31-Jul-96	30.0
7006	2	11-Aug-96	16.0
7006	2	14-Aug-96	32.0
7006	2	29-Aug-96	28.0
7006	2	10-Sep-96	24.0
7006	2	7-Jul-97	18.0
7006	2	16-Jul-97	20.0
7006	2	22-Jul-97	16.0
7006	2	6-Aug-97	14.0
7006	2	13-Aug-97	14.0
7006	2	20-Aug-97	14.0
7006	2	27-Aug-97	22.0
7006	2	3-Sep-97	14.0
7006	2	14-May-98	6.0
7006	2	9-Jun-98	16.0
7006	2	5-Aug-98	22.0
7006	2	8-Aug-98	14.0
7006	2	20-Aug-98	14.0
7006	2	28-Jun-99	8.0
7006	2	23-May-00	18.0
7006	2	16-Jun-00	18.0
7006	2	22-Jul-00	22.0
7006	2	8-Aug-00	20.0
7006	2	24-Aug-00	16.0
7006	2	5-Jul-01	16.0

**Ministry of the Environment Lake Partner Program Secchi Depth  
Measurements for Preston Lake 1995-2003**

STN	Site ID	Date	Secchi(m)
7006	2	5-Jun-95	1.2
7006	2	19-Jun-95	4.5
7006	2	9-Jul-95	4.3
7006	2	18-Jul-95	3.5
7006	2	31-Jul-95	5.0
7006	2	8-Aug-95	5.0
7006	2	14-Aug-95	5.0
7006	2	22-Aug-95	3.5
7006	2	27-Aug-95	4.6
7006	2	6-Sep-95	4.0
7006	2	28-Sep-95	4.9
7006	2	31-Oct-95	4.0
7006	2	2-Jun-96	5.8
7006	2	16-Jun-96	6.2
7006	2	7-Jul-96	6.1
7006	2	28-Jul-96	5.2
7006	2	11-Aug-96	4.5
7006	2	7-Jul-97	3.3
7006	2	16-Jul-97	4.0
7006	2	22-Jul-97	3.1
7006	2	6-Aug-97	3.4
7006	2	13-Aug-97	2.6
7006	2	20-Aug-97	3.5
7006	2	27-Aug-97	3.5
7006	2	3-Sep-97	3.0
7006	2	14-May-98	4.5
7006	2	5-Aug-98	4.0
7006	2	8-Aug-98	3.7
7006	2	20-Aug-98	4.0
7006	2	28-Jun-99	4.0
7006	2	23-May-00	7.0
7006	2	16-Jun-00	5.0
7006	2	22-Jul-00	3.5
7006	2	8-Aug-00	4.0
7006	2	24-Aug-00	4.0
7006	2	5-Jul-01	3.5
7006	2	23-May-02	5.0
7006	2	6-Jul-02	4.5
7006	2	29-Jul-02	4.8
7006	2	10-Aug-02	4.2
7006	2	3-Jun-03	3.1
7006	2	15-Jun-03	5.0
7006	2	4-Jul-03	5.0

### Preston Lake pH Reading 1995 – 2003

1995	<b>Date</b>	5-Jun	19-Jun	4-Jul	18-Jul	31-Jul	14-Aug	22-Aug	6-Sep	28-Sep	31-Oct	
	<b>pH</b>	8.2	8.1	8.0	8.1	8.0	8.0	8.0	8.0	8.2	8.1	
1996	<b>Date</b>	20-Jun	3-Jul	18-Jul	31-Jul	14-Aug	29-Aug	10-Sep	18-Sep	4-Oct	23-Oct	8-Nov
	<b>pH</b>	8.14	8.16	8.23	7.88	8.03	7.98	8	7.9	8.2	8.3	8
1997	<b>Date</b>	16-Apr	5-May	20-May	6-Jun	24-Jun	11-Jul	29-Jul	15-Aug	2-Sep		
	<b>pH</b>	7.5	8.2		8.2	8.5	8.1	7.8	7.8	7.8		
2003	<b>Date</b>	30-May	16-Jun	27-Jun	15-Jul	1-Aug	29-Aug	10-Sep	14-Oct	1-Nov	14-Nov	
	<b>pH</b>	8.51	8.59	9.03	8.62	8.72	8.64	8.47	8.34	8.21	8.13	

### Preston Lake Specific Conductivity (uS/cm) 1995 – 2003

1995	<b>Date</b>	5-Jun	19-Jun	4-Jul	18-Jul	31-Jul	14-Aug	22-Aug	6-Sep	28-Sep	31-Oct	
	<b>Conductivity</b>	262.0	251.0	257.0	221.0	234.0	228.0	229.0	217.0	215.0	216.0	
1996	<b>Date</b>	20-Jun	3-Jul	18-Jul	31-Jul	14-Aug	29-Aug	10-Sep	18-Sep	4-Oct	23-Oct	8-Nov
	<b>Conductivity</b>	255	237	238	222	240	243	241	210	210	370	520
1997	<b>Date</b>	16-Apr	5-May	20-May	6-Jun	24-Jun	11-Jul	29-Jul	15-Aug	2-Sep		
	<b>Conductivity</b>	350	300	310	310	280	270	280	260	250		
2003	<b>Date</b>	30-May	16-Jun	27-Jun	15-Jul	1-Aug	29-Aug	10-Sep	14-Oct	1-Nov	14-Nov	
	<b>Conductivity</b>	335.2	314.8	292.4	297.1	312.1	327.7	330.1	312.9	312.8	310.8	

## APPENDIX E

### Partial List of Plants Found in the White Rose/Preston Lake Complex

<i>Abied balsamea</i>	Baslsam Fir	<i>Drosera rotundifolium</i>	Round-leaved Sundew*
<i>Acer rubrum</i>	Red Maple	<i>Dulichium verticillatus</i>	Three-way Sedge*
<i>Acer saccharinum</i>	Silver Maple	<i>Epilobium strictum</i>	Soft Willow-herb*
<i>Almus rugosa</i>	Speckled Alder	<i>Eriophorum vaginatum</i>	Sheathed Cotton-grass*
<i>Andromeda glaucophylla</i>	Bog Rosemary*	<i>Eriophorum virginicum</i>	Tawny Cotton-grass*
<i>Arceuthobium pusillum</i>	Dwarf Mistletoe*	<i>Fagus grandifolia</i>	American Beech
<i>Arctium minus</i>	Wild Rhubarb	<i>Fraxinus americana</i>	White Ash
<i>Arctium minus</i>	Common Burdock	<i>Fraxiun nigra</i>	Black Ash
<i>Arethusa bulbosa</i>	Dragon's Mouth*	<i>Galium asparine</i>	Bedstraw
<i>Aronia melanocarpa</i>	Black Chokeberry*	<i>Galium asprellum</i>	Rough Bedstraw
<i>Asclepias incarnata</i>	Swamp Milkweed	<i>Gaylussacia baccata</i>	Black Huckleberry*
<i>Asclepias syriaca</i>	Common Milkweed	<i>Impatines campensis</i>	Jewel Weed
<i>Aster borealis</i>	Rush Aster*	<i>Iris Versicolour</i>	Blue Flag Iris
<i>Betula papyifera</i>	White Birch	<i>Kalmia polifolia</i>	Bog Laurel*
<i>Calla palustris</i>	Water Arum	<i>Larix decidua</i>	European Larch
<i>Calopogon tuberosus</i>	Grass Pink*	<i>Ledum groenlandicum</i>	Labrador-tea*
<i>Carex canescens</i>	Silvery Sedge*	<i>Lemna trisulca</i>	Star Duckweed*
<i>Carex lasiocarpa</i>	Hairy Sedge*	<i>Menyanthes trifoliata</i>	Bog Buckbean*
<i>Carex limosa</i>	Mud Segde*	<i>Muhlenbergia glomerata</i>	Wild Timothy*
<i>Carex nagellanica</i>	Stunted Sedge*	<i>Najas flexilis</i>	Slender Najas*
<i>Carex prairea</i>	Prairie Sedge*	<i>Nemopanthus mucronata</i>	Mountain Holly*
<i>Carex trisperma</i>	Three-fruited Sedge*	<i>Nuphar variegatum</i>	Bullhead Pond Lilly*
<i>Carex tuckermanii</i>	Tuckerman's Sedge*	<i>Nymphaea odorata</i>	Fragrant Water-lily*
<i>Ceratophyllum demersum</i>	Common Coontail	<i>Onoclea sensibilis</i>	Sensitive Fern
<i>Chamaedaphne calyculata</i>	Leatherleaf*	<i>Osmunda cinnamonea</i>	Cinnamon Fern
<i>Cornus stolonifera</i>	Red Osier Dogwood	<i>Parthencissus quingfolis</i>	Virginia Creeper
<i>Decodon herticillatus</i>	Swamp Loosestrife	<i>Picea glauca</i>	White Spruce
<i>Decodon verticillatus</i>	Water-willow*	<i>Picea mariana</i>	Black Spruce*

<i>Pinus banksiana</i>	Jack Pine
<i>Pinus resinosa</i>	Red Pine
<i>Pinus strobus</i>	White Pine
<i>Pinus sylvestris</i>	Scots Pine
<i>Plantago major L</i>	Plantain
<i>Pogonia ophioglossoides</i>	Rose Pogonia*
<i>Polygonium amphibium</i>	Smartweed
<i>Populus balsamifera</i>	Balsam Poplar
<i>Populus tremuloides</i>	Trembling Aspen
<i>Potamogeton amplifolius</i>	Large-leaved Pondweed*
<i>Potamogeton foliosus</i>	Leafy Pondweed
<i>Potamogeton praelongus</i>	White-stemmed Pondweed*
<i>Potamogeton zosteriformis</i>	Flat-stemmed Pondweed*
<i>Potentilla palustris</i>	Marsh Cinquefoil*
<i>Prunus serotina</i>	Black Cherry
<i>Pteridium aquilinum</i>	Braken Fern
<i>Quercus rubra</i>	Red Oak
<i>Ramnus cothartica</i>	European Buckthorn
<i>Sagittaria engelmanniana</i>	Narrow-leaved Arrowhead
<i>Sagittaria latifolia</i>	Broad-leaved Arrowhead
<i>Salix candida</i>	Hoary Willow*
<i>Salix pedicellaris</i>	Bog Willow*
<i>Sambucus canadensis</i>	Elderberry
<i>Sarracenia purpurea</i>	Pitcher Plant*

<i>Scirpus subterminalis</i>	Bullrush
<i>Scutellaria galericulata</i>	Skullcap
<i>Sium suave</i>	Water Parsnip
<i>Solanum</i>	Nightshade sp.
<i>Solidago sp</i>	Goldenrod sp.
<i>Sonchus sp.</i>	Thistle sp.
<i>Sparganium eurycarpum</i>	Giant Bur-reed*
<i>Sparganium natans</i>	Small Bur-reed*
<i>Thelypteris palustris</i>	Marsh Fern
<i>Thuja occidentalis</i>	White Cedar
<i>Tilia americana</i>	American Basswood
<i>Tsuga canadensis</i>	Eastern Hemlock
<i>Typha latifolia</i>	Cattail
<i>Ulmus americana</i>	American Elm
<i>Utricularia cornuta</i>	Horned Bladderwort
<i>Utricularia minor</i>	Small Bladderwort*
<i>Utricularia vulgaris</i>	Common Bladderwort*
<i>Utricularia vulgaris</i>	Greater Bladderwort
<i>Vaccinium angustifolium</i>	Lowbush Blueberry*
<i>Vaccinium macrocarpon</i>	Large Cranberry*
<i>Vaccinium myrtilloides</i>	Velvet Blueberry*
<i>Vaccinium oxy-coccos</i>	Small Cranberry*
<i>Viburnum cassinoides</i>	Northern Wild Raisin*

\* Locally Rare Vascular Plant Species

Status: rare in Site District 6-7 based on Varga et al. 1999 Draft. The Vascular Plant Flora of the Greater Toronto Area, Ontario Ministry of Natural Resources, Aurora District

Source: based on sight records and collections of S. Varga 1980, 1984, 1986, 1998-2000

# APPENDIX F

## Mammals Found in Preston Lake

COMMON NAME	Scientific Name	LO	PTn	PTt	HD	AS	MR	STD	+	TS	L-rank
Virginia opossum*	<i>Didelphis virginiana</i>	1	2	2	0	1	1	2	0	9	L5
Common shrew	<i>Sorex cinereus</i>	2	2	2	1	1	2	4	0	14	L4
Smoky shrew	<i>Bianna brevicauda</i>	5	2	2	3	2	3	4	0	21	L2
Hairy-tailed mole	<i>Parascalops brewen</i>	4	2	2	1	1	5	3	1	19	L3
Star-nosed mole	<i>Condylura cristata</i>										
Little brown bat*	<i>Myotis lucifuga</i>	1	2	2	1	1	1	2	0	10	L4
Silver-haired bat	<i>Lasionyctens noctivagans</i>	4	2	2	2	1	1	3	0	15	L3
Big brown bat*	<i>Eptesicus fuscus</i>	1	2	2	1	1	1	1	0	9	L5
Eastern red bat*	<i>Lasiurus borealis</i>	1	2	2	0	1	1	3	0	10	L4
Hoary bat*	<i>Lasiurus cinereus</i>	1	2	2	0	1	1	3	0	10	L4
Eastern cottontail*	<i>Sylvilagus floridanus</i>	1	2	2	0	2	2	4	0	13	L4
European hare	<i>Lepus europaeus</i>										
Snowshoe hare	<i>Lepus americanus</i>	4	2	2	1	3	3	4	0	19	L3
Eastern chipmunk	<i>Tamias striatus</i>	0	2	2	1	2	2	3	0	12	L4
Woodchuck*	<i>Mamota monax</i>	1	2	2	1	2	2	3	0	13	L4
Grey squirrel	<i>Sciurus carolinensis</i>	0	2	2	0	1	2	0	0	7	L5
Red squirrel	<i>Tamiasciurus hudsonicus</i>	2	2	2	0	1	2	2	0	11	L4
Northern flying squirrel	<i>Glaucomys sabrinus</i>	5	2	2	4	3	3	3	0	22	L2
Southern flying squirrel	<i>Glaucomys volans</i>	5	3	3	2	2	3	3	0	21	L2
Beaver	<i>Castor Canadensis</i>	2	2	1	1	2	3	4	0	15	L3
White-footed mouse*	<i>Peromyscus leucopus</i>	1	2	2	0	1	2	1	0	9	L5
Deer mouse*	<i>Peromyscus maniculatus</i>	1	2	2	0	1	2	1	0	9	L5
Meadow vole*	<i>Microtus pennsylvanicus</i>	1	2	2	1	1	2	3	0	12	L4
Muskrat	<i>Ondatra zibethicus</i>	1	2	2	2	1	3	3	0	14	L4
House mouse	<i>Mus musculus</i>										
Meadow jumping mouse	<i>Zapus hudsonius</i>	4	2	2	1	2	3	3	0	17	L3
Woodland jumping mouse	<i>Napaeozapus insignis</i>	4	2	3	3	3	3	3	0	21	L2
Porcupine	<i>Erethizon dorsatum</i>	3	2	3	3	4	2	4	0	21	L2
Coyote*	<i>Canis latrans</i>	1	1	1	0	1	1	1	0	6	L5
Red fox	<i>Vulpes vulpes</i>	0	2	2	0	1	1	1	0	7	L5
Raccoon	<i>Procyon lotor</i>	0	2	1	1	1	1	1	0	7	L5
Short-tailed weasel	<i>Mustela eminea</i>										
Long-tailed weasel*	<i>Mustela frenata</i>	1	2	2	1	2	2	3	0	13	L4
Mink	<i>Mustela vison</i>	3	2	2	1	3	2	4	0	17	L3
Striped skunk	<i>Mustela mephitis</i>	1	2	2	0	2	1	1	0	9	L5
White-tailed deer	<i>Odocoileus virginianus</i>	1	2	2	1	3	1	2	0	12	L4

\*=local occurrence unknown

LO=local occurrence

PTn=population trend, continent-wide

PTt=population trend, TRCA

HD=habitat dependence

AS=area sensitivity

MR=mobility restriction

STD=sensitivity to development

AP=additional points

TS=total score

# APPENDIX G

## Birds Found in Preston Lake

COMMON NAME	Scientific Name	LO	PTn	PTt	HD	AS	MR	STD	AP	TS	L-rank
Acadian flycatcher	<i>Empidonax vireescens</i>	4	1	2	3	3	2	3	0	19	L3
Alder flycatcher	<i>Empidonax alnorum</i>	2	1	2	2	1	2	4	0	14	L4
American bittern	<i>Butorides lentiginosus</i>	5	3	3	4	3	1	4	0	23	L2
American black duck	<i>Anas rubripes</i>	2	3	2	1	1	1	4	0	14	L4
American coot	<i>Fulica americana</i>	5	1	2	2	3	2	4	0	19	L3
American crow	<i>Corvus brachyrhynchos</i>	0	2	1	0	1	1	1	0	6	L5
American goldfinch	<i>Cardeulis tristis</i>	0	2	2	0	1	1	1	0	7	L5
American kestrel	<i>Falco sparverius</i>	0	2	2	2	1	1	0	0	8	L5
American redstart	<i>Setophaga ruticilla</i>	2	3	2	2	2	2	3	0	16	L3
American robin	<i>Turdus migratorius</i>	0	1	2	0	1	1	1	0	6	L5
American woodcock	<i>Scolopax minor</i>	0	2	3	2	3	2	4	0	16	L3
Baltimore oriole	<i>Icterus galbula</i>	0	2	2	0	1	1	1	0	7	L5
Bank swallow	<i>Riparia riparia</i>	3	2	2	2	1	1	2	0	13	L4
Barn swallow	<i>Hirundo cristata</i>	0	2	2	2	1	1	1	0	9	L5
Barred owl	<i>Strix varia</i>	4	2	3	4	5	2	3	1	24	L2
Belted kingfisher	<i>Ceryle alcyon</i>	0	3	2	2	2	2	2	0	13	L4
Black and white warbler	<i>Mniotilta varia</i>	2	1	2	2	5	2	4	1	19	L3
Black tern	<i>Chlidonias niger</i>	5	3	3	3	3	1	3	0	21	L2
Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>	1	3	2	2	3	2	3	0	16	L3
Blackburnian warbler	<i>Dedroica fusca</i>	3	1	2	4	3	2	3	0	18	L3
Black-capped chickadee	<i>Parus atricapillus</i>	0	1	1	1	1	2	0	0	6	L5
Black-crowned night heron	<i>Nycticorax nycticorax</i>	5	1	0	2	3	1	3	0	15	L3
Black-throated blue warbler	<i>Dendroica caerulescens</i>	4	2	3	3	3	2	4	0	21	L2
Black-throated green warbler	<i>Dendroica virens</i>	2	2	2	3	3	2	4	0	18	L3
Blue jay	<i>Cyanocitta cristata</i>	0	4	2	0	1	1	0	0	8	L5
Blue-grey gnatcatcher	<i>Poliopitla caerulea</i>	3	1	0	1	3	2	2	0	12	L4
Blue-headed vireo	<i>Vireo solitarius</i>	3	1	2	1	3	2	3	0	15	L3
Blue-winged teal	<i>Anas discors</i>	4	3	4	2	3	1	4	0	21	L2
Blue-winged warbler	<i>Vermivora pinus</i>	3	2	1	2	3	2	4	0	17	L3
Bobolink	<i>Dolichonyz oryzivorus</i>	0	3	2	2	3	1	4	0	15	L3
Broad-winged hawk	<i>Buteo platypterus</i>	3	2	3	3	5	1	3	1	21	L2
Brown creeper	<i>Certhia americana</i>	1	2	2	2	3	3	3	0	16	L3
Brown thrasher	<i>Toxostoma rufum</i>	1	4	3	1	2	2	4	0	17	L3
Brown-headed cowbird	<i>Molothrus ater</i>	0	2	2	0	1	1	1	0	7	L5
Canada goose	<i>Branta canadensis</i>	0	1	0	1	1	1	0	0	4	L5
Canada warbler	<i>Wilsonia canadensis</i>	3	3	2	3	3	2	4	0	20	L2
Canvasback	<i>Aythya valisineria</i>	5	2	2	2	4	1	4	0	20	L2
Carolina wren	<i>Thryothorus ludovicianus</i>	4	2	2	2	1	3	0	0	14	L4
Caspian tern	<i>Sterna caspia</i>	5	2	2	3	3	1	2	0	18	L3
Cedar waxwing	<i>Bombycilla cedrorum</i>	0	1	2	0	1	1	2	0	7	L5
Cerulean warbler	<i>Dendroica cerulea</i>	5	3	3	3	3	2	3	0	22	L2
Chestnut-sided warbler	<i>Dendroica pensylvanica</i>	3	2	2	2	3	2	4	0	18	L3
Chimney swift	<i>Chaetura pelagica</i>	0	3	3	1	1	1	0	0	9	L5
Chipping sparrow	<i>Spizilla passerina</i>	0	2	2	0	1	1	1	0	7	L5
Clay-coloured sparrow	<i>Spizella pallida</i>	4	3	2	2	2	1	2	0	16	L3
Cliff swallow	<i>Hirundo rustica</i>	0	2	2	2	1	1	1	0	9	L5
Common grackle	<i>Quiscalus quiscula</i>	0	3	2	0	1	1	1	0	8	L5

Common moorhen	<i>Gallinula chloropus</i>	3	2	3	2	3	2	4	0	19	L3
Common nighthawk	<i>Chordeiles minor</i>	2	3	3	2	1	1	2	0	14	L4
Common snipe	<i>Gallinago gallinago</i>	3	2	2	2	2	2	5	1	19	L3
Common tern	<i>Sterna hirundo</i>	4	4	2	3	2	1	2	0	18	L3
Common yellowthroat	<i>Geothlypis trichas</i>	0	2	2	2	1	2	4	0	13	L4
Cooper's hawk	<i>Accipiter cooperi</i>	2	2	2	3	4	1	2	0	16	L3
Double-crested cormorant	<i>Phakacrocorax auritus</i>	5	0	0	3	4	1	4	0	17	L3
Downy woodpecker	<i>Picoides pubescens</i>	0	2	1	1	1	2	1	0	8	L5
Eastern bluebird	<i>Sialia sialis</i>	4	2	1	2	2	1	2	0	14	L4
Eastern kingbird	<i>Tyrannus tyrannus</i>	0	2	2	1	2	1	1	0	9	L5
Eastern meadowlark	<i>Stumella magna</i>	0	3	2	2	3	1	3	0	14	L4
Eastern phoebe	<i>Sayornis phoebe</i>	1	2	2	2	1	2	1	0	11	L4
Eastern screech-owl	<i>Otus asio</i>	1	2	2	3	1	2	3	0	14	L4
Eastern towhee	<i>Pipilo erythrophthalmus</i>	2	3	2	1	2	2	4	0	15	L3
Eastern wood-pewee	<i>Contopus virens</i>	0	4	2	1	2	2	2	0	13	L4
European starling	<i>Stumus vulgaris</i>										L+
Field sparrow	<i>Spizilla pusilla</i>	1	3	3	2	2	1	4	0	16	L3
Gadwall	<i>Anas strepera</i>	5	1	1	1	1	1	4	0	14	L4
Golden-crowned kinglet	<i>Regulus satrapa</i>	3	2	2	2	3	2	3	0	17	L3
Golden-winged warbler	<i>Vermivora chrysotptera</i>	4	3	3	2	3	2	4	0	21	L2
Grasshopper sparrow	<i>Ammodramus savannarum</i>	3	3	3	2	2	3	3	0	19	L3
Great blue heron	<i>Ardea herodias</i>	4	2	2	2	3	1	3	0	17	L3
Great-crested flycatcher	<i>Myiachus crinitus</i>	0	2	3	1	3	2	2	0	13	L4
Great-horned owl	<i>Bubovirginianus</i>	2	2	2	1	2	2	1	0	12	L4
Green heron	<i>Butorides striatus</i>	2	2	2	2	2	2	3	0	15	L3
Green-winged teal	<i>Anas crecca</i>	4	1	2	2	3	1	4	0	17	L3
Grey catbird	<i>Dumetella carolinensis</i>	0	3	1	1	1	2	3	0	11	L4
Hairy woodpecker	<i>Picoides villosus</i>	0	2	1	2	3	2	2	0	12	L4
Henslow's sparrow	<i>Ammodramus henslowii</i>	5	4	3	3	3	3	4	0	25	L1
Hermit thrush	<i>Catharus guttatus</i>	4	1	2	2	3	2	4	0	18	L3
Herring gull	<i>Larus argentatus</i>	5	4	0	1	1	1	1	0	13	L3
Hooded merganser	<i>Lophodytes cucullatus</i>	4	2	3	3	3	1	4	0	20	L2
Hooded warbler	<i>Wilsonia citrina</i>	4	1	2	3	4	2	4	0	20	L2
Horned lark	<i>Eremophila alpestris</i>	0	3	2	2	2	1	3	0	13	L4
House finch	<i>Carpodacus mexicanus</i>	0	2	0	0	1	1	0	0	4	L5
House sparrow	<i>Passer domesticus</i>										L+
House wren	<i>Troglodytes aedon</i>	0	2	1	1	1	2	1	0	8	L5
Indigo bunting	<i>Passerina cyanea</i>	0	2	2	2	1	1	3	0	12	L4
Killdeer	<i>Charadrius vociferus</i>	0	2	2	1	1	1	2	0	9	L5
Least bittern	<i>Ixobrychus exilis</i>	4	3	3	3	4	2	4	0	23	L2
Least flycatcher	<i>Empidonax minimus</i>	2	3	3	1	2	2	3	0	16	L3
Loggerhead shrike	<i>Lanius ludovicianus</i>	5	3	3	2	3	2	3	0	21	L2
Long-eared owl	<i>Asio otus</i>	5	2	2	2	2	2	3	0	18	L3
Magnolia warbler	<i>Dendroica magnolia</i>	4	2	2	2	2	2	3	0	17	L3
Mallard	<i>Anas platyrhynchos</i>	0	1	2	1	1	1	3	0	9	L5
Marsh wren	<i>Cistothorus palustris</i>	4	2	3	2	3	3	4	0	21	L2
Merlin	<i>Falco columbarius</i>										
Mourning dove	<i>Zenaida macroura</i>	0	2	1	0	1	1	0	0	5	L5
Mourning warbler	<i>Oporornis philadelphia</i>	0	2	2	2	2	2	4	0	14	L4
Mute swan	<i>Cygnus olor</i>										L+
Nashville warbler	<i>Vermivora ruficapilla</i>	3	1	2	2	2	2	4	0	16	L3
Northern cardinal	<i>Cardinalis cardinalis</i>	0	2	1	0	1	2	2	0	8	L5
Northern flicker	<i>Colaptes auratus</i>	0	3	2	0	1	2	3	0	11	L4

Northern goshawk	<i>Accipier gentilus</i>	4	2	2	3	5	1	3	1	21	L2
Northern harrier	<i>Circus cyaneus</i>	3	2	2	2	4	1	3	0	17	L3
Northern mockingbird	<i>Mimus polyglottos</i>	4	2	0	1	1	2	1	0	12	L4
Northern parula	<i>Parula americana</i>	4	1	2	3	5	2	3	1	21	L2
Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	3	2	3	2	1	1	1	0	13	L4
Northern saw-whet owl	<i>Aegolius colubris</i>	5	2	2	2	4	2	2	0	19	L3
Northern waterthrush	<i>Seiurus noveboracensis</i>	1	1	2	2	3	2	5	1	17	L3
Orchard oriole	<i>Icterus spurius</i>	3	2	1	0	1	1	1	0	9	L5
Osprey	<i>Pandion haliaetus</i>	4	1	2	2	3	1	3	0	16	L3
Ovenbird	<i>Seiurus aurocapillus</i>	0	2	3	3	4	2	4	0	18	L3
Peregrine falcon	<i>Falco peregrinus</i>	5	2	1	3	1	1	0	0	13	L4
Pied-billed grebe	<i>Podilymbus podiceps</i>	3	2	4	3	2	2	3	0	19	L3
Pileated woodpecker	<i>Dryocopus pileatus</i>	1	2	2	3	4	2	3	0	17	L3
Pine Siskin	<i>Cardeulis pinus</i>										
Pine warbler	<i>Dedroica pinus</i>	1	1	2	3	4	2	3	0	16	L3
Prairie warbler	<i>Dendroica discolor</i>										
Purple finch	<i>Carpodacus purpureus</i>	4	4	3	0	1	1	2	0	15	L3
Purple martin	<i>Progne subis</i>	0	2	2	2	1	1	1	0	8	L5
Red-bellied woodpecker	<i>Melanerpes carolinus</i>	5	1	2	1	2	2	2	0	15	L3
Red-breasted nuthatch	<i>Sitta canadensis</i>	1	1	1	3	3	2	2	0	13	L4
Red-eyed vireo	<i>Vireo olivaceus</i>	0	2	2	1	2	2	3	0	12	L4
Redhead	<i>Aythya americana</i>	5	1	2	2	4	1	4	0	19	L3
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	4	3	3	2	2	2	2	0	18	L3
Red-shouldered hawk	<i>Buteo lineatus</i>	3	2	3	3	5	1	3	1	21	L2
Red-tailed hawk	<i>Buteo jamaicensis</i>	0	2	2	1	2	1	1	0	9	L5
Red-winged blackbird	<i>Agelaius phoeniceus</i>	0	2	2	0	1	1	3	0	9	L5
Ring-billed gull	<i>Larus delawarensis</i>	4	1	0	1	1	1	1	0	9	L5
Ring-necked pheasant	<i>Phasianus colchicus</i>										L+
Rock dove	<i>Columba livia</i>										L+
Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	0	2	2	2	3	2	3	0	14	L4
Ruby-crowned kinglet	<i>Regulus calendula</i>	4	3	2	2	3	2	3	0	19	L3
Ruby-throated hummingbird	<i>Archilochus colubris</i>	3	2	2	1	1	1	2	0	12	L4
Ruffed grouse	<i>Bonasa umbellus</i>	1	3	2	1	3	2	5	1	18	L3
Savannah sparrow	<i>Passerculus sandwichensis</i>	0	3	1	2	1	1	3	0	11	L4
Scarlet tanager	<i>Piranga olivacea</i>	1	2	3	3	4	2	3	0	18	L3
Sedge wren	<i>Cistothorus platensis</i>	4	2	3	2	2	3	3	0	19	L3
Sharp-shinned hawk	<i>Accipiter striatus</i>	1	2	2	3	4	1	3	0	16	L3
Short-eared owl	<i>Asio flammeus</i>	4	3	2	2	3	2	2	0	18	L3
Song sparrow	<i>Melospiza melodia</i>	0	2	2	0	1	2	2	0	9	L5
Sora	<i>Porzana carolina</i>	3	2	2	2	2	3	4	0	18	L3
Spotted sandpiper	<i>Actitis macularia</i>	1	2	3	2	1	1	4	0	14	L4
Swamp sparrow	<i>Melospiza georgiana</i>	0	1	2	2	1	2	5	1	14	L4
Tree swallow	<i>Tachycineta Bicolor</i>	0	2	2	2	1	1	3	0	11	L4
Turkey vulture	<i>Cathartes aura</i>	2	1	1	2	1	1	2	0	10	L4
Upland sandpiper	<i>Bartramia longicauda</i>	4	2	3	2	3	1	3	0	18	L3
Veery	<i>Catharus fuscescens</i>	2	3	3	4	3	2	5	1	23	L2
Vesper sparrow	<i>Pooecetes gramineus</i>	3	3	3	2	2	1	4	0	18	L3
Virginia rail	<i>Rallus limicola</i>	1	2	2	2	2	3	4	0	16	L3
Warbling vireo	<i>Vireo gilvus</i>	0	1	2	0	1	2	2	0	8	L5
Western meadowlark	<i>Sturnella neglecta</i>	5	3	2	2	3	1	3	0	19	L3
Whip-poor-will	<i>Caprimulgus vociferus</i>	4	3	3	2	3	2	4	0	21	L2
White-breasted nuthatch	<i>Sitta carolinensis</i>	1	2	1	3	3	2	2	0	14	L4

White-throated sparrow	<i>Zonotrichia alvicollis</i>	2	3	2	1	2	2	4	0	16	L3
Wild turkey	<i>Meleagris gallopavo</i>	3	1	0	4	5	2	4	1	20	L2
Willow flycatcher	<i>Empidonax traillii</i>	0	4	2	1	1	2	3	0	13	L4
Winter wren	<i>Troglodytes troglodytes</i>	2	2	3	2	3	3	3	0	18	L3
Wood duck	<i>Aix sponsa</i>	2	1	1	3	3	1	4	0	15	L3
Wood thrush	<i>Hylocichia mustelina</i>	0	3	3	3	3	2	4	0	18	L3
Worm-eating warbler	<i>Helmitheros vermivorus</i>										
Yellow rail	<i>Coturnicops noveboracensis</i>	5	2	2	3	3	3	4	0	22	L2
Yellow warbler	<i>Dendroica petechia</i>	0	1	1	1	1	2	3	0	9	L5
Yellow-bellied flycatcher	<i>Empidonax flaviventris</i>	5	2	2	3	2	2	5	1	22	L2
Yellow-bellied sapsucker	<i>Sphyrapicus varius</i>	3	2	3	2	2	2	3	0	17	L3
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	3	3	2	2	2	2	3	0	17	L3
Yellow-rumped warbler	<i>Dendroica coronata</i>	3	1	2	2	3	2	3	0	16	L3
Yellow-throated vireo	<i>Vireo flavifrons</i>	4	2	2	1	3	2	3	0	17	L3

\*=local occurrence unknown

LO=local occurrence

PTn=population trend, continent-wide

PTt=population trend, TRCA

HD=habitat dependence

AS=area sensitivity

MR=mobility restriction

STD=sensitivity to development

AP=additional points

TS=total score

# APPENDIX H

## Herpetofaunal Species Found in Preston Lake Area

COMMON NAME	<i>Scientific Name</i>	LO	PTn	PTt	HD	AS	MR	STD	AP	TS	L-rank
Amphibians											
Red-backed salamander*	<i>Plethodon cinereus</i>	1	2	2	3	1	3	5	1	18	L3
American toad	<i>Bufo americanus</i>	0	2	2	1	1	2	4	0	12	L4
Eastern gray treefrog	<i>Hyla versicolor</i>	2	2	3	2	3	3	5	1	21	L2
Striped chorus frog	<i>Pseudanctris triseniata</i>	3	2	3	2	2	5	5	2	24	L2
Northern spring peeper	<i>Pseudanctris crucifer</i>	1	2	3	3	3	2	5	1	20	L2
Wood frog	<i>Rana sylvatica</i>	0	2	3	4	3	2	5	1	20	L2
Northern leopard frog	<i>Rana pipiens</i>	0	3	2	2	1	2	5	1	16	L3
Green frog	<i>Rana clamvitanus</i>	0	2	2	1	1	2	4	0	12	L4
Reptiles											
Common snapping turtle	<i>Chelydra serpentina</i>	1	3	2	2	1	2	4	0	15	L3
Midland painted turtle*	<i>Chrysemys picta</i>	1	2	2	1	1	2	4	0	13	L4
Eastern garter snake	<i>Thamnophis sirtalis</i>	0	2	2	1	1	2	3	0	11	L4
Northern ribbon snake	<i>Thamnophis sauritis</i>	5	3	2	2	2	2	5	1	22	L2

\*=local occurrence unknown

LO=local occurrence

PTn=population trend, continent-wide

PTt=population trend, TRCA

HD=habitat dependence

AS=area sensitivity

MR=mobility restriction

STD=sensitivity to development

AP=additional points

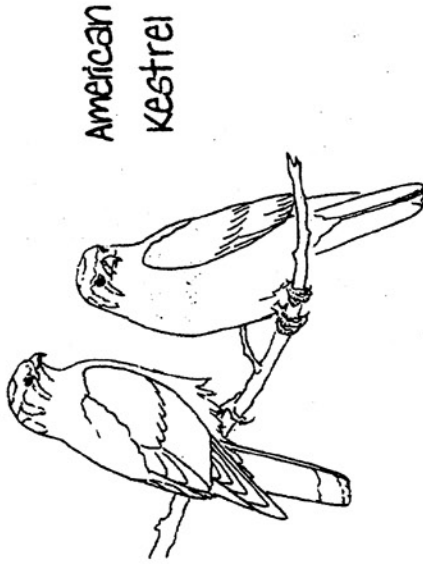
TS=total score

# APPENDIX I

## Habitat Structure Specifications

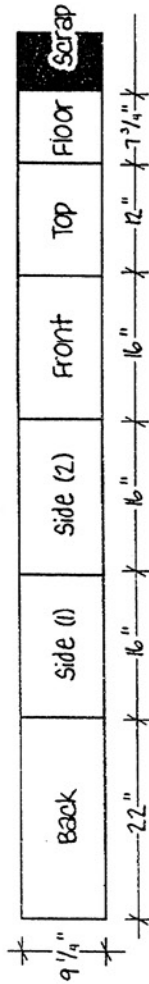
### Nesting Box

American Kestrel • Northern screech Owl  
 Northern Saw-whet Owl • Boreal Owl (?)  
 Southern Flying Squirrel

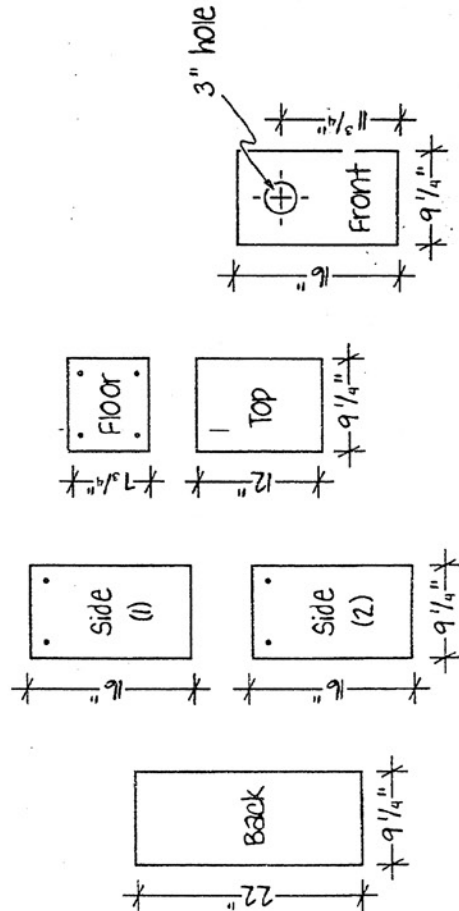


American Kestrel

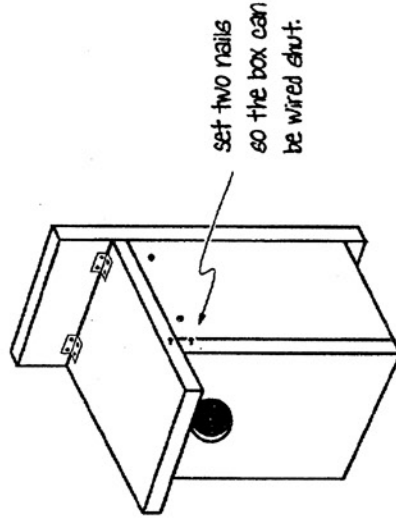
1. Start with one 1" x 10" x 8 foot board and cut as shown below.



2. Drill air holes in the sides and floor. Drill an entry hole in the front.



3. Assemble as shown below:  
 Hinge the roof for cleaning.



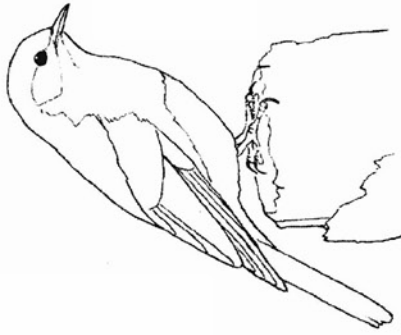
set two nails  
 so the box can  
 be wired shut.

Place 3" of sandust in the  
 bottom of the box.

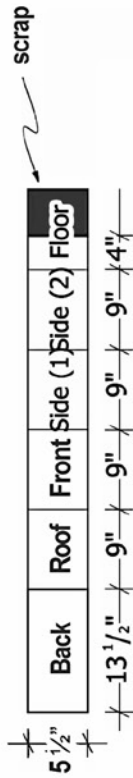
# Nesting Box

Black-capped Chickadee • Eastern Bluebird  
Tree Swallow • Great Crested Flycatcher

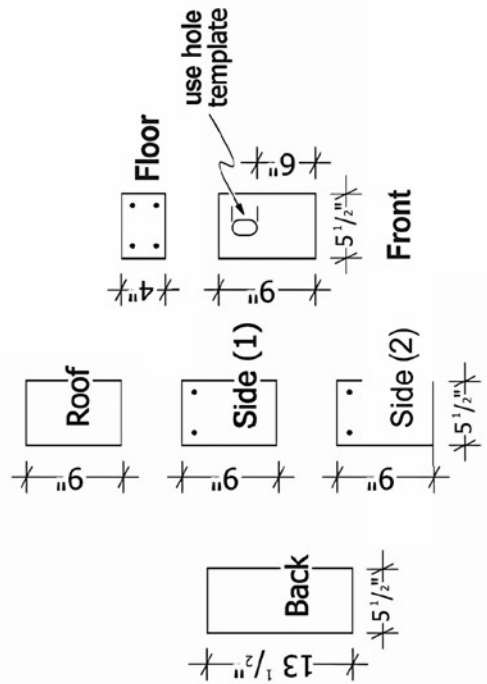
Eastern  
Bluebird



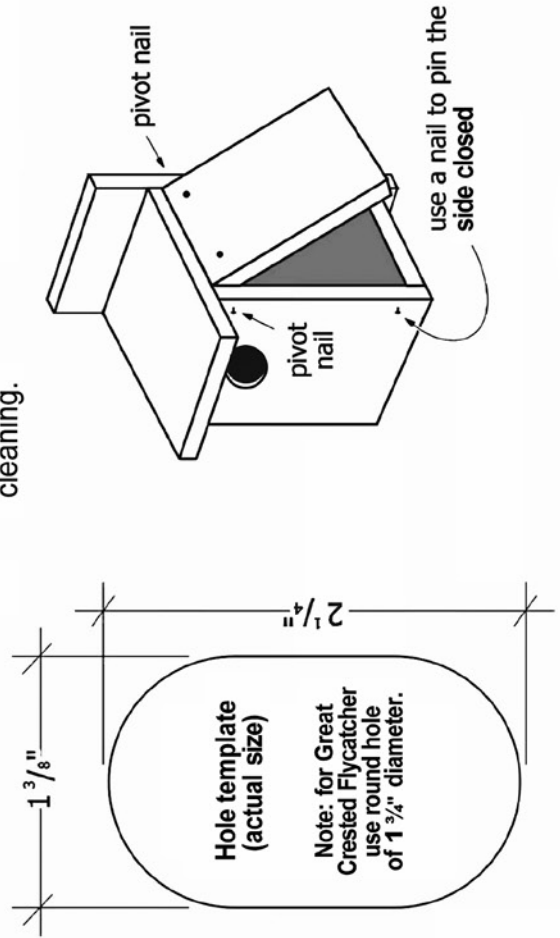
1. Start with one 1" x 6" x 6 foot board and cut as shown below.



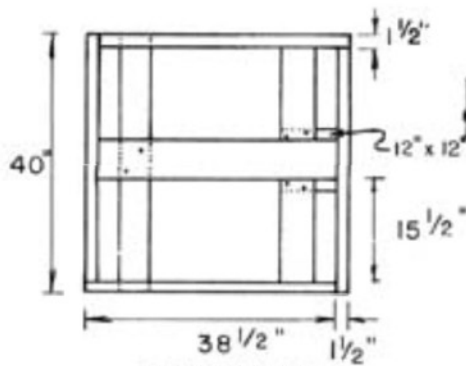
2. Drill air holes in the sides and floor. Cut or drill an entry hole in the front.



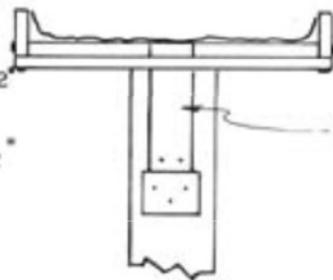
3. Assemble as shown below! Two pivot nails allow the side to swing out for cleaning.



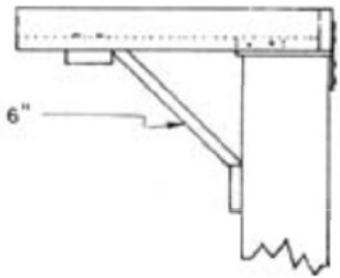
# OSPREY NEST PLATFORM



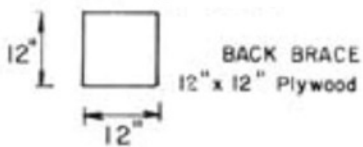
**TOP VIEW**



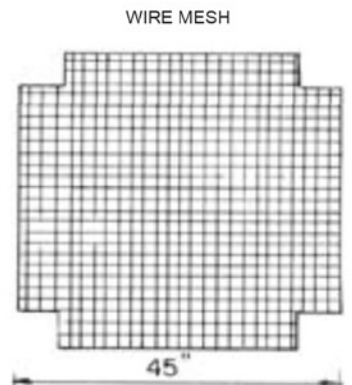
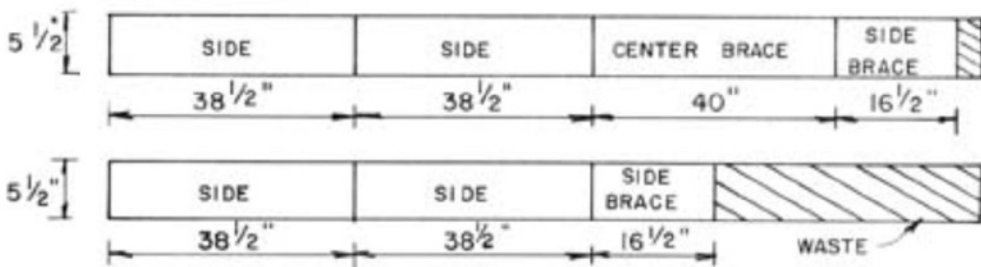
**EXPANDED VIEW**



**SIDE VIEW**



**BACK BRACE**  
12" x 12" Plywood



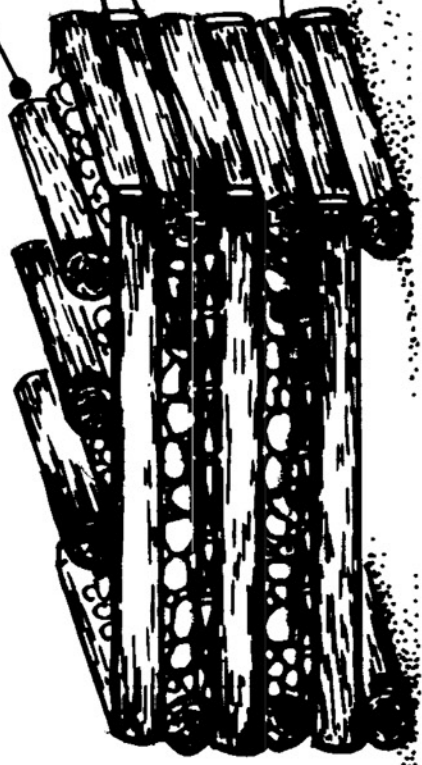
**WIRE MESH**

**WELDED WIRE 2" - 4" MESH**

- LUMBER:**
- One 12" x 12" x 1/2" exterior plywood
  - Two 2" x 6" x 12' cedar board
  - One 20' or 30' cedar support post
  - One 2" x 6" x 40" cedar board

# Log Crib Structure Side Perspective View

2.5 m X 25 cm dia. Unpeeled  
Cedar Posts



Gabion Stone Ballast

50 mm X 203 mm Boards

175 cm

## APPENDIX J

### List of Species Planted in Preston Lake

North Shore		# planted
Wild Bergamont	<i>Monarda fistulosa</i>	18
Foxglove Beardtongue	<i>Penstemon digitalis</i>	18
Black-eyed Susan	<i>Rudbeckia hirta</i>	18
Hoary Vervain	<i>Verbena stricta</i>	18
Hairy Beard-tongue	<i>Penstemon hirsutus</i>	18
Canada Anemone	<i>Anemone canadense</i>	18
Green-headed Coneflower	<i>Rudbeckia laciniata</i>	18
Great Blue Lobelia	<i>Lobelia siphilitica</i>	18
Wild Columbine	<i>Aquilegia canadensis</i>	18
Dense Blazing Star	<i>Liatris spicata</i>	18
Praire Smoke	<i>Geum triflorum</i>	18
Nannyberry	<i>Viburnum lentago</i>	13
Red Osier Dogwood	<i>Cornus stolonifera</i>	13
Alt Leaf Dogwood	<i>Cornus alternifolia</i>	13
Chokecherry	<i>Prunus virginiana</i>	5
Speckled Alder	<i>Alnus rugosa</i>	15
Shrub Willow spp	<i>Salicaceae</i>	20
Green Ash	<i>Fraxinus pennsylvanica</i>	7
Iron Wood	<i>Ostrya virginiana</i>	7
Silver Maple	<i>Acer saccharinum</i>	10
White Pine	<i>Pinus strobus</i>	20
South Shore		# planted
Heath Aster	<i>Aster ericoides</i>	18
Arrow-leaved Aster	<i>Aster urophyllus</i>	18
Wild Bergamont	<i>Monarda fistulosa</i>	18
Foxglove Beardtongue	<i>Penstemon digitalis</i>	18
Grey-headed Conflower	<i>Ratibida pinnata</i>	18
Black-eyed Susan	<i>Rudbeckia hirta</i>	18
Hoary Vervain	<i>Verbena stricta</i>	18
Baltic Rush	<i>Juncus balticus</i>	36
Wood Rush	<i>Luzula multiflora</i>	18
Big Blue Stem	<i>Andropogon gerardii</i>	18
Switch Grass	<i>Panicum virgatum</i>	21
Indian Grass	<i>Sorghastrum nutans</i>	21
Nannyberry	<i>Viburnum lentago</i>	7
Red Osier Dogwood	<i>Cornus stolonifera</i>	7
Alt Leaf Dogwood	<i>Cornus alternifolia</i>	7
Chokecherry	<i>Prunus virginiana</i>	5
Speckled Alder	<i>Alnus rugosa</i>	15
Shrub Willow spp	<i>Salicaceae</i>	20
Green Ash	<i>Fraxinus pennsylvanica</i>	7
Iron Wood	<i>Ostrya virginiana</i>	7
Silver Maple	<i>Acer saccharinum</i>	10
White Pine	<i>Pinus strobus</i>	20

West Shore		# planted
Pussy Willow	<i>Salix discolor</i>	10
Sandbar Willow	<i>Salix exigua</i>	30
Nine Bark	<i>Physocarpus opulifolius</i>	20
Sandcherry	<i>Prunus pumila</i>	30
Shrub Willow spp	<i>Salicaceae</i>	10
Speckled Alder	<i>Alnus rugosa</i>	5
White Cedar	<i>Fraxinus pennsylvanica</i>	50
Green Ash	<i>Ostrya virginiana</i>	3
Iron Wood	<i>Acer saccharinum</i>	3
Silver Maple	<i>Pinus strobus</i>	10

Thanks to our Project Partners:



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