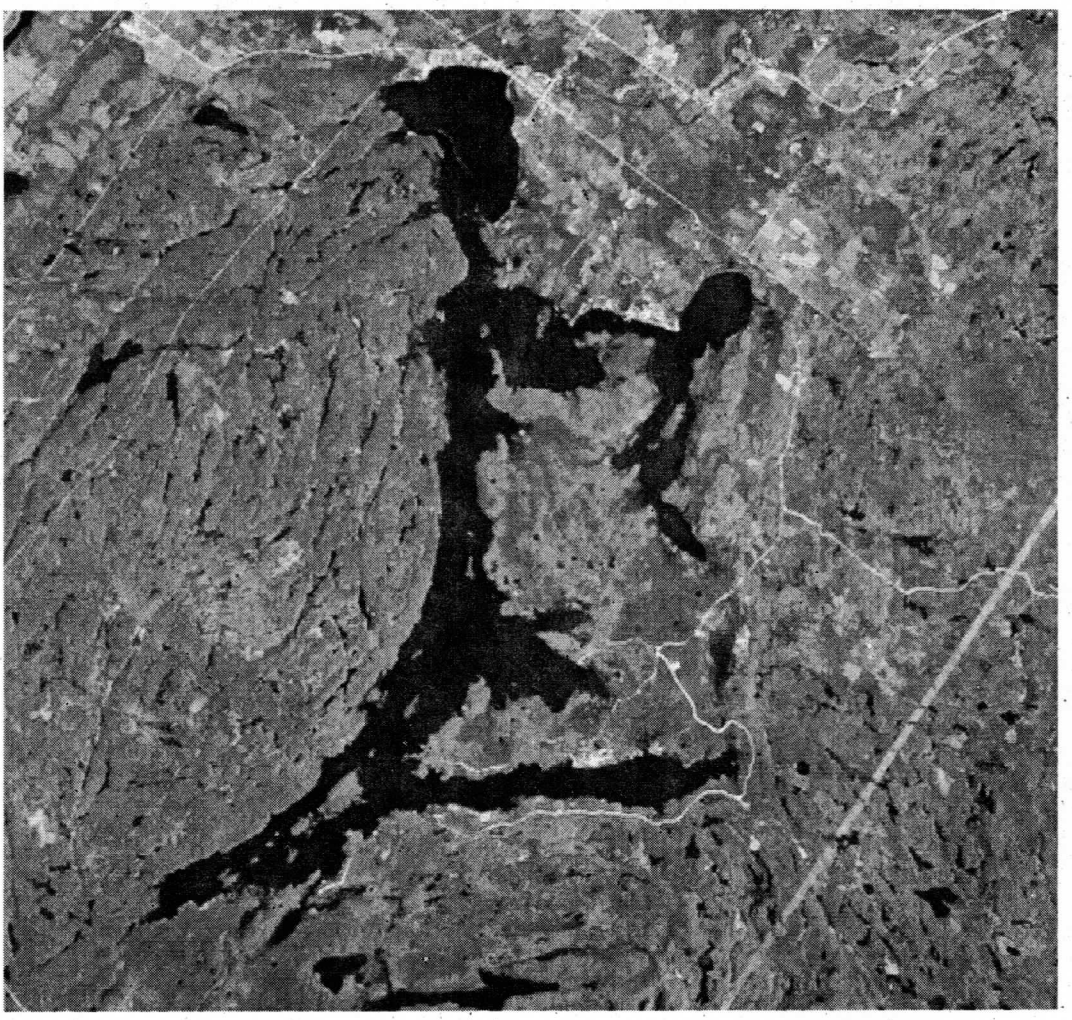
The Fishery of White Lake

Southcentral Sciences Section
Technical Report TR-107



Ontario

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A. Mathers and S. J. Kerr

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Abstract

A. Mathers and S.J. Kerr. 1998. The fishery of White Lake, Technical Report TR-107, Southcentral Sciences Section, Ontario Ministry of Natural Resources, Kemptville, Ontario. 36p. + appendicies.

Historic information on the White Lake (Lanark and Renfrew Counties) fishery is summarized and reviewed. Fisheries management activities have included stocking, creel surveys, fish community assessment using trapnets, aerial boating activity surveys, fish habitat protection and restoration, and enforcement of fisheries regulations. The construction of the dam in 1845 to facilitate log drives at the mouth of Waba Creek has had a dramatic effect on White Lake and its fisheries.

Prior to 1930 White Lake supported a pike fishery. With intensive stocking a walleye fishery developed during the period between 1930 and the mid 1960's. Since that time, bass and pike have been the most sought after game fish with walleye being seen only periodically in the anglers catch. Throughout this time period an intensive angling fishery has occurred.

Water level management, and eutrophication have been the major issues for fisheries management in White Lake. Changes the current slot size regulation for angling walleye to a 41cm (16 inches) total length minimum size limit and promotion of panfish and coarse fish fisheries are recommended.

Introduction

White Lake (45°18' 76°31') is one of the largest lakes in southeastern Ontario (Figure 1). The lake is situated on the border of Lanark and Renfrew Counties. It is in proximity to many urban centers including Ottawa, Arnprior and Pembroke and provides numerous recreational opportunities including angling.

This report is one of several case histories prepared for inland lakes in southeastern Ontario which provide popular fisheries and have a long history of management activity. It represents a synthesis of current knowledge and information on the fisheries and aquatic community of White Lake.

Characteristics of White Lake

Origin of Name

Before European settlement the lake was known as Wa-ba-lac by the local natives. In the Johnston Royal atlas (dated 1860) the lake was shown as Wabak or White Lake. The lake name is believed to be derived from the white marl (deposits of calcuim from biological and sedimentary processes) covering large portions of the lake substrate (Kennedy 1970).

Physical Parameters and History

The lake is located in eastern Ontario on the borders of Lanark and Renfrew Counties and is easily accessible by road from Renfrew, Arnprior, Ottawa, Carleton Place, Perth and Calabogie. The village of White Lake is located at the north end of the lake. The main axis of the lake is situated in a northeast-southwest direction. There are several large bays including Three Mile Bay and Pickerel Bay (Figure 1).

White Lake is part of the Madawaska River watershed and is situated on the southern edge of the Precambrian Shield. Much of the area is underlain by white and light grey and coarse-grained marble and associated rocks. The surrounding topography is basically flat with mixed forest. There is some agricultural activity along the southeast section of the lake. White Lake's shoreline is comprised predominantly rock (40%), mud (57%) and sand (3%).

Fifteen inlets feed White Lake. These include Cranes Creek, Fish Creek, Paris Creek, Broadbrook Creek, Raycroft Creek and Hayes Creek. Several of the inlets are intermittent (Table 1) and most are blocked at some point by beaver dams. The only outlet is Waba Creek (Wabalak River).

Table 1 - Physical characteristics of White Lake, Lanark and Renfrew Counties.

Township/County	Bagot and McNab Twps., Renfrew County; Pakenham and Darling Twps., Lanark County.
Latitude	45° 18'
Longitude	76° 31'
Surface area (ha)	2249.5
Shoreline (km)	97.9
Height above sea level (m)	161.5
Maximum depth (m)	9.1
Mean depth (m)	3.1
Littoral area (%)	90.3
% Crown land	< 20
Lake volume (m^3)	74.74×10^6
Water level fluctuation (m)	0.6
Watershed area (km^2)	211.0
Flushing rate (times per year)	0.89
Number of inlets	11 permanent
Number of outlets	4 intermittent, 1 permanent

White Lake is a relatively shallow lake as reflected by the fact that 90.3% of the lake area is considered as littoral zone. The deepest point in the lake (9.1 m / 30 feet) is situated in Bennett (Pickerel) Bay off the north point of a peninsula. The lake has a very low natural flushing rate (0.89 times per year, Ferris 1985). This rate is likely to have changed with the water management regimes which have be used over time, however, the small volumes of water which flow into lake dictate that the flushing rate is relatively low. A low flushing rate results in accumulation of sediments and other materials.

The bottom substrates in White Lake are predominantly mud. Based on sediment core sampling conducted in 1973 much of the lake bottom was found to have deposits of thick marl (deposits of calcium from biological and sedimentary processes). Substrate sampling in 1975 revealed that, in the Hardwood Island area, there were 3 m of suspended fine organic material overlying 3 m of pure organic substrate (Ferris 1985). There are rocky shoals in the vicinity of several islands.

White Lake was created in 1845 when a dam on Waba Creek was constructed resulting in the water levels increasing in three previously small, interconnected waterbodies. The dam was originally constructed to facilitate the movement of logs to Stewart's sawmill further downstream. When water levels were appropriately high and sufficient logs had accumulated, stop logs in the dam were removed and the logs were flushed downstream to the mill. This activity could result in a summer draw-down of the lake by as much as 1.5 m (5 feet). The dam was rebuilt in 1948.

In addition to being used to transport logs, water stored in White Lake was used to power a local sawmill. In the mid-1950's, the sawmill switched to electric power and log drives no longer occurred. In 1968, the old dam was replaced with a new concrete structure by the Department of Public Works and is currently being operated by MNR (Figure 2).

A highly significant wetlands complex, known as the White Lake fen, extends inland from the northeast shoreline of White Lake. This fen contains at least 26 species of rare and uncommon mosses and vascular plants (Reddoch 1984).

Winter conditions in the White Lake area consist of mean air temperatures of -10°C and an accumulation of 200-220 cm of snowfall. Summer air temperatures average 18°C with approximately 23 cm of rainfall between June and August. On an annual basis White Lake receives an average of 90 cm of precipitation, has an annual average air temperature of 5°C with 117-134 frost free days and a 190 day growing season.

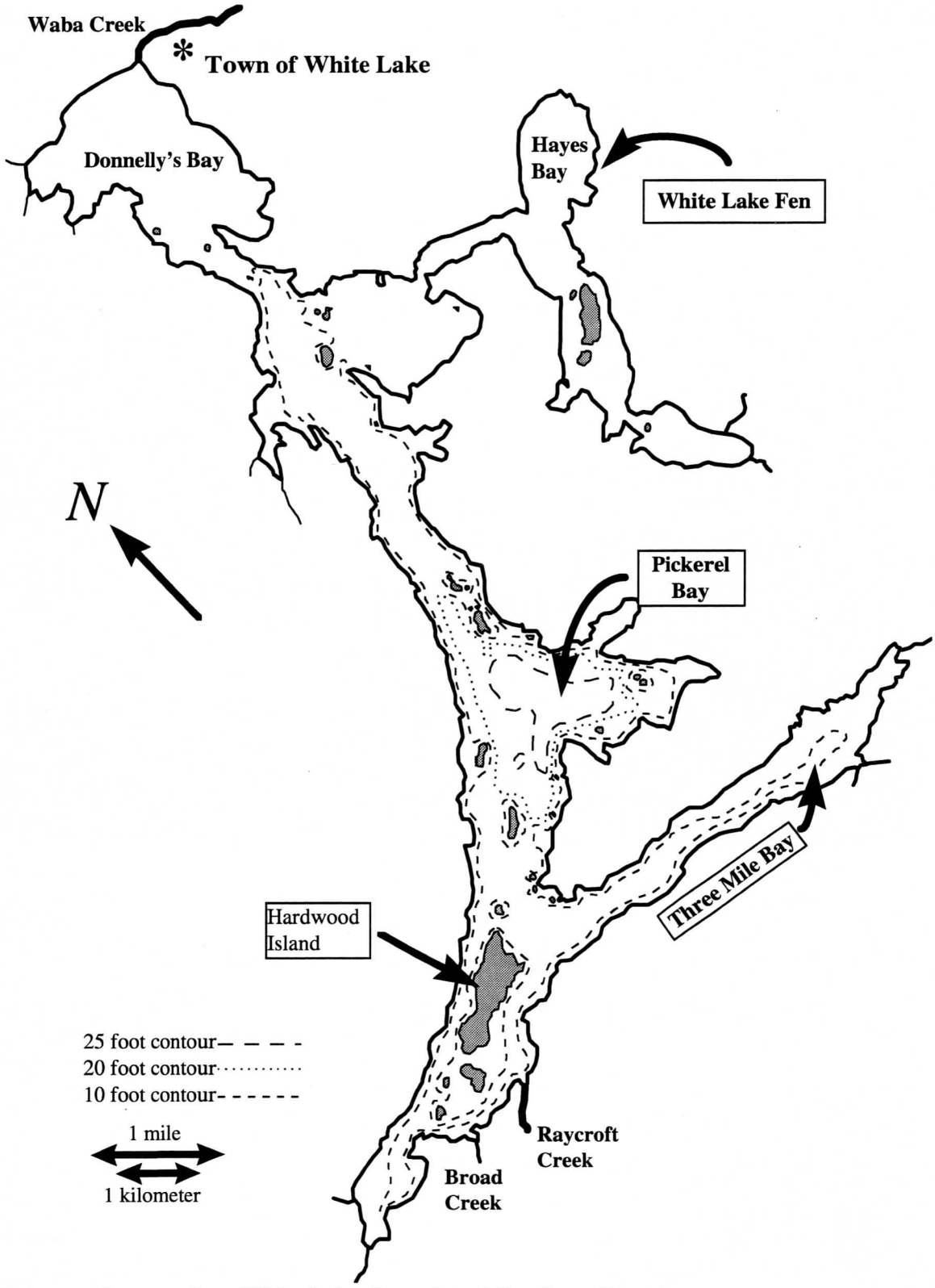

Figure 1 - Bathymetric map of on White Lake, Lanark and Renfrew Counties.

White Lake's appeal to outdoor enthusiasts is evident by the rate of shoreline development (Table 2). Although the first public access road was not constructed by the Ontario Department of Lands and Forests until 1968, there were already several lodges and numerous cottages on the lake. There are currently ten lodges and several hundred cottages on White Lake.

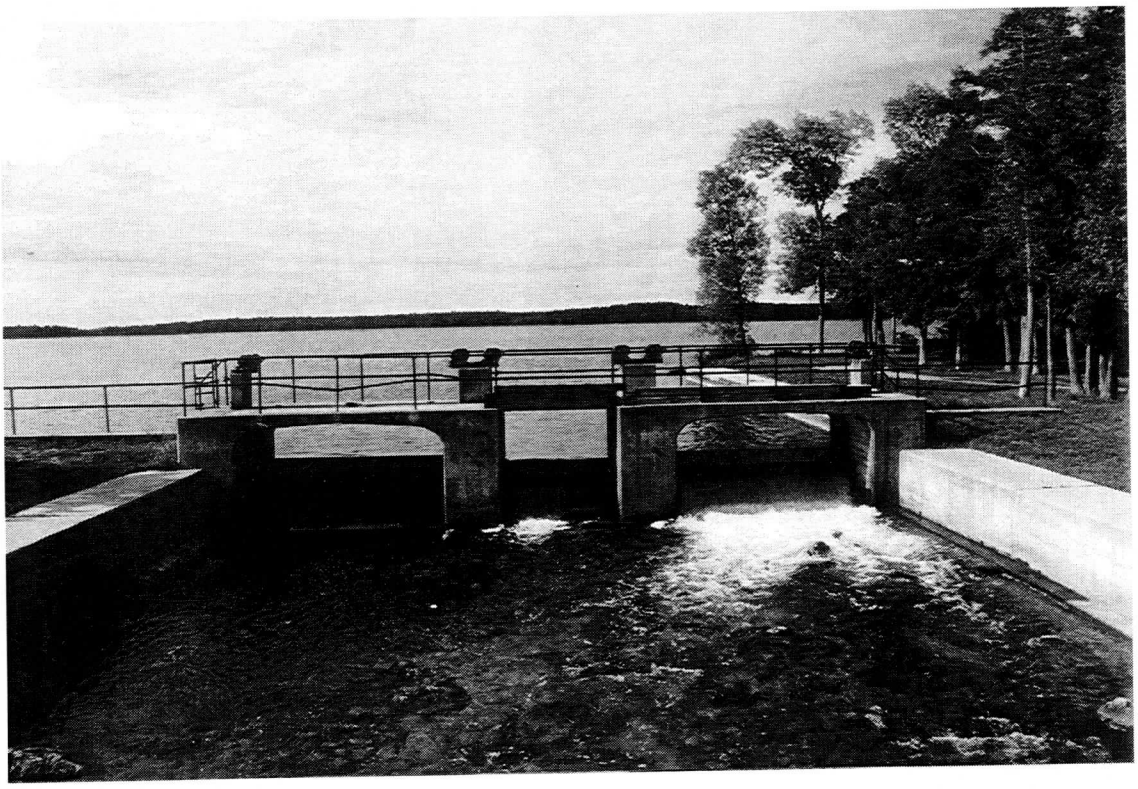

Figure 2 - White Lake dam on Waba Creek.

Table 2 - Shoreline development on White Lake, Lanark and Renfrew Counties.

Year	No. Resorts (Capacity)	No. Campgrounds (Sites)	No. Cottages (Seasonal residences)	No. Homes (Permanent Residences)
1950	- (12)	- (12)	30	-
1959	7 (-)	- (-)	65	-
1969	5 (49)	- (-)	315	-
1972	5 (-)	- (-)	-	-
1974	5 (-)	- (-)	449	-
1975	- (-)	- (-)	462	-
1978	6 (-)	- (500)	-	6 farms
1980	- (-)	2 (500)	-	-
1981	6 (-)	2 (500)	496	-
1995	10 (508)	- (-)	449	5

Chemical Characteristics

Water chemistry information collected from White Lake is summarized in Table 3. Due to the relatively shallow lake basin and heavy wind action, thermal stratification does not usually occur. Summer water temperatures are usually in the 24-26°C range. Alkalinity and pH values suggest that White Lake is well buffered and not particularly sensitive to acidic precipitation.

In terms of trophic status, White Lake was considered as mildly eutrophic as early as 1969 (Ellah 1969). Eutrophic lakes are rich, biologically productive and have secchi disk readings of less than 3 metres and chlorophyll *a* values of greater than 6 ugl^{-1}. Chlorophyll *a* values are indicative of high algal crops and algal blooms often occur during the summer. The diary of Peter's Point Fishing Club (see 'The Fishery') suggests that algae blooms occured at least as early as 1940.

White Lake's shallow, "dish-shaped" basin and its low flushing rate make this system very productive from a biological basis. The nutrients and sediments which fuels the rich biological productivity in White Lake are thought to come from land runoff (45%), the atmosphere (42%), and shoreline development (13%)(Ferris 1985). The secchi disc measurements taken over time in White Lake show no clear trend (Figure 3). Chlorophyll 'a' values have fluctuated widely over time, but appear to have declined over the past 25 years.

The amount of dissolved oxygen in the water column is a critical factor in determining the survival of many fish species. White Lake has sufficient dissolved oxygen to support warm-water fisheries. However, some surveys have shown that at water depths greater than 6 metres oxygen levels can fall below 5 ppm, a critical level for many fish (Ferris, 1985).

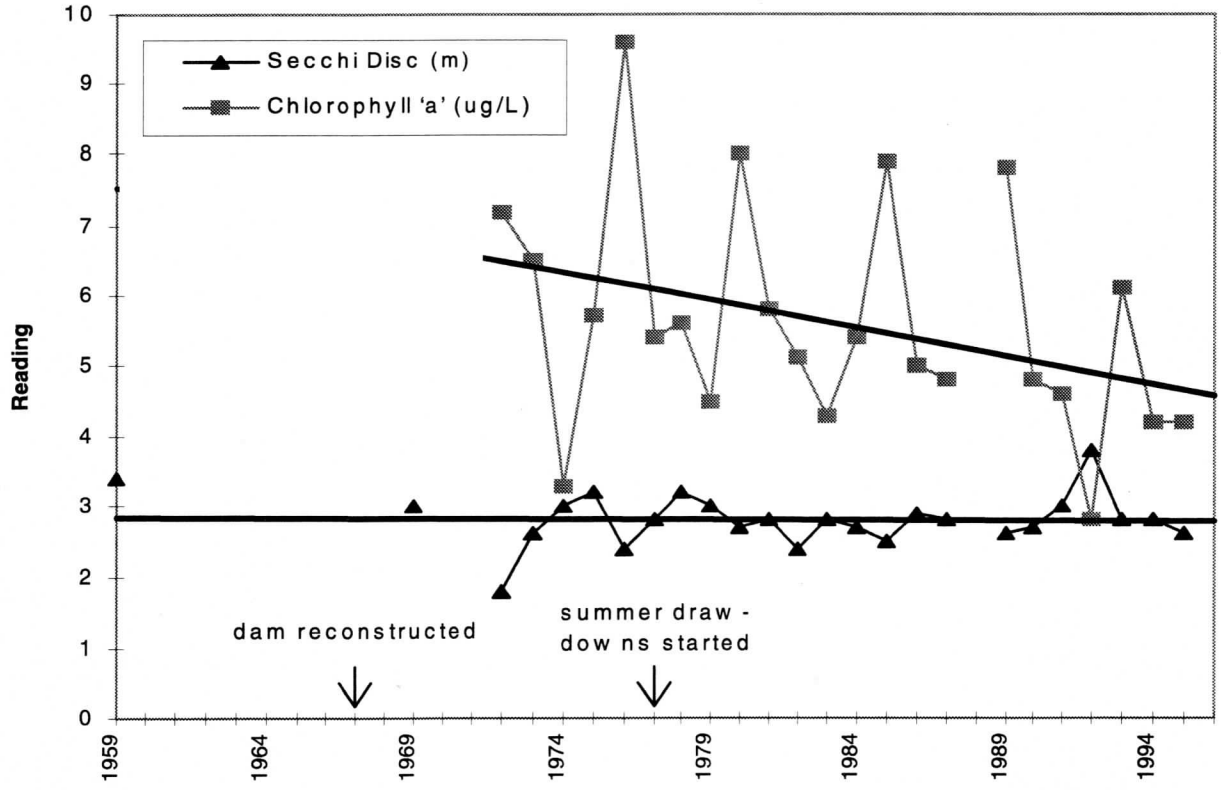

Figure 3 - Trends in secchi disc readings and chlorophyll 'a' measurements from White Lake.

Table 3 - Selected water chemical parameters for White Lake, Lanark and Renfrew Counties.

Year	Sampling Dates	pH	Alkalinity ($mg\ l^{-1}$)	T.D.S. ($mg\ l^{-1}$)	Dissolved Oxygen ($mg\ l^{-1}$)	Turbidity (JTU)	Secchi Disc (m)	Water Temp. (°C)	Water Colour	Chlorophyll 'a' ($ug\ l^{-1}$)	Phosphorus ($ug\ L^{-1}$)	Nitrate ($ug\ L^{-1}$)
1959	-	-	-	-	-	-	3.4	-	-	-	-	-
1969	July 21-Aug. 6	7.6	110	130	0.8-8.0	5	3.0	21.1-25.6	Light green	-	0.03 PO_4	7.0 NO_3
1972	July-September	-	-	-	-	-	1.8	-	-	7.2	-	-
1973	May-October	-	-	-	-	-	2.6	-	-	6.5	-	-
1974	April-October	-	-	-	-	-	3.0	-	-	3.3	-	-
1975	June-September	7.5-8.5	104-114	114-150	-	-	3.2	-	-	5.7	8-38 (total P)	220-1000 (total N)
1976	Summer	-	-	-	-	-	2.4	-	-	9.6	-	-
1977	Summer	-	-	-	-	-	2.8	-	-	5.4	-	-
1978	Summer	-	-	-	-	-	3.2	-	-	5.6	-	-
1979	June - August	7.0-8.5	-	116-159	5.0-10.0	-	3.0	13.0-25.0	-	4.5	-	-
1980	Summer	-	-	-	-	-	2.7	-	-	8.0	-	-
1981	Summer	-	-	-	-	-	2.8	-	-	5.8	-	-
1982	Summer	-	-	-	-	-	2.4	-	-	5.1	-	-
1983	Summer	-	-	-	-	-	2.8	-	-	4.3	-	-
1984	Summer	-	-	-	-	-	2.7	-	-	5.4	-	-
1985	May-October	-	-	-	-	-	2.5	-	-	7.9	-	-
1986	April-October	-	-	-	-	-	2.9	-	-	5.0	-	-
1987	-	-	-	-	-	-	2.8	-	-	4.8	-	-
1989	-	-	-	-	-	-	2.6	-	-	7.8	-	-
1990	-	-	-	-	-	-	2.7	-	-	4.8	-	-
1991	-	-	-	-	-	-	3.0	-	-	4.6	-	-
1992	-	-	-	-	-	-	3.8	-	-	2.8	-	-
1993	-	-	-	-	-	-	2.8	-	-	6.1	-	-
1994	Summer	-	-	-	-	-	2.8	-	-	4.2	-	-
1995	Summer	-	-	-	-	-	2.6	-	-	4.2	-	-

Biota

White Lake supports a wide variety of aquatic flora and fauna (Appendix 1) including at least twenty species of freshwater fish. Probably the most detailed study of aquatic organisms was that conducted by Bond (1977). The original fish which likely inhabited the lake prior to the water level being raised by the construction of the dam likely included baitfish, northern pike, panfish and bullheads. Musky, walleye, smallmouth and largemouth bass have all been introduced to the lake in attempt to create a sport fishery (see 'Fish Stocking'). Additional surveys are required to inventory other biota including benthic fauna (i.e. snails, clams, aquatic insects, snakes, and small fishes). It is interesting to note that Kirkland (undated) reported several sightings of 'large black snakes' in the wood pile and in the kitchen of the Peter's Point Fishing Club in the mid-1940's. These were likely black rat snakes (*Elaphe obsoleta obsoleta*) which have never been documented to occur in southeastern Ontario, north of Highway 7.

Fish Habitat

White Lake provides habitat for a number of fish species. In 1959, local residents reported walleye spawning activity on rocky shorelines and around many of the islands. More recently, Ferris (1985) identified several known and potential walleye spawning sites. These included:

- Raycroft (Long Lake) Creek
- Broad (Broadbrook) Creek
- Fish Creek
- Culvert on east shore near Bayview Lodge
- Shoreline southeast of Bayview Lodge
- Waba Creek
- North tip of Birch Island
- Northeast shoreline of Stanley and Waba Islands
- Fishers Point at the narrows
- Point off Eggshape Bay
- Ryans Point in the north basin.

Overall, walleye spawning habitat is limited on White Lake. Tributary streams are small and often blocked by beaver dams. In addition, lake shoals have become silted and unsuitable. The lack of large accessible tributary streams also limits the spawning habitat for suckers.

Northern pike spawning habitat is relatively extensive although they are susceptible to water level fluctuations. Pike are known to spawn in most of the shallow, vegetated bays around the lake.

Smallmouth bass spawn off many of the gravel points on the lake, along the south shore of Three Mile Bay, as well as around most of the islands. Silt accumulation on littoral areas has also proven to be detrimental for smallmouth bass. Conversely, there are large areas of good habitat for largemouth bass spawning and lake conditions generally seem more suited to this species.

Problems and Issues

Several fisheries management issues have been identified on White Lake over the years. These include:

Water Levels - Controversy over the management of water levels has undoubtedly been the most prevalent issue on White Lake. Ministry of Natural Resources files include letters expressing concern about water level management dated in the early 1960's. Boaters and shoreline property owners prefer stable water levels during the summer and early fall. However, summer water level stabilization further reduces the natural flushing rate of the lake resulting in stagnant waters where silt and algae cover spawning shoals, resulting in water quality and fisheries concerns.

Accelerated eutrophication - White Lake has been considered to be moderately eutrophic for several years. Due to the shallow nature of this impoundment, its low flushing rate and the addition of nutrients from heavy shoreline development this process has been accelerated (Ferris 1985). Hamilton (1981) concluded that if nutrient loading was not significantly reduced, there would be the decline and loss of several species including walleye and possibly smallmouth bass.

Siltation of spawning shoals - Observations during 1959 and 1969 netting projects did not reveal any problems with siltation of shoals used by spawning walleye and smallmouth bass. In fact, Littkemann (1959) identified the presence of "numerous stony-rocky shores and shoals in different dimensions which provided good spawning grounds for walleye." The problem was first documented by Thomas (1975) and Bond (1977) concluded that encrustation of calcareous blue-green algae reduced the quality of walleye spawning shoals.

Impaired water quality - Ferris (1985) identified some water quality problems which included dissolved oxygen deficits in deeper (>6m) waters as well as some bacteriological contamination. The re-suspension of sediments from the lake-bottom by wind and wave action or by motor boat propellers has also been identified as an issue.

Shoreline development - Hamilton (1981) reviewed the dramatic increase in shoreline development from 1959-1980 and concluded this was a major cause in the accelerated rate of eutrophication. He believed that White Lake was an example of how unregulated cottage and shoreline development on a lake could have serious consequences on the fishery. Shoreline development was also identified as a problem by Ferris (1985) and vonRosen and McLeod (1985). Ferris recommended that backshore development be developed as an alternative to further lakeshore development in the future. There had also been previous recommendations to delay further lakeshore development until water quality and fisheries habitat issues had been resolved.

Shifts in fish community structure - Alteration of fish habitat and changes in lake trophic status have resulted in a shift in the resident fish community from species such as walleye and smallmouth bass which prefer mesotrophic conditions to those such as northern pike, panfish and largemouth bass which are more suited to eutrophic conditions. Walleye historically were the most highly sought species and were the mainstay of the local tourist industry at one time.

Conflicting resources uses - There are several conflicting resource uses on White Lake. These include anglers, boaters, shoreline property owners, the local tourist industry and hydro considerations. Ferris (1985) reported that 32% of lake use was from boaters while 68% was from anglers. Nowhere is the conflict more evident than with water level regulation and fish habitat protection.

Overexploitation - Overexploitation of highly sought sport fish stocks, particularly walleye, has been identified as a concern by vonRosen and McLeod (1985), vonRosen (1989) and Ferris (1985)

Excessive algae and aquatic vegetation - Excessive mats of algae and aquatic vegetation have been identified as a summer problem by lake residents on several occasions.

Historic Fisheries Management Activities

Lake Inventory

A summary of all historic fisheries management activities on White Lake is included in Appendix 2. The first detailed biological survey of White Lake was conducted in the summer of 1959 (Littkemann 1959). A lake inventory completed to provincial standards was done in 1969. A detailed ecological study was conducted by Bond in 1977.

Fish Stocking

Fish stocking activities played an important role in the development of the White Lake fishery. A summary of fish stocking activity is presented in Table 4 and a detailed record is included in Appendix 3.

Walleye, smallmouth bass and largemouth bass were all established as a result of introductions. Walleye were first stocked in 1921 when the majority of walleye stocking programs consisted of the use of eyed eggs (Table 5). Eggs for these early stocking projects came from either the Great Lakes or from the Talbot River at Lake Simcoe. From the 1920's to 1960 the lake had a reputable walleye fishery and an important tourist industry developed in the area. Poor walleye fishing and public requests lead to walleye stocking being maintained through the 1970's. During this time the Arnprior Fish and Game Club raised walleye for release into White Lake under MNR's Community Fisheries Involvement Program (CFIP). The eggs for these projects came from the Napanee River walleye stock. Results from the CFIP program varied widely between years (between 0 and 9,500 finglerings per year) and totaled 13,000 fingerlings over the years. However, walleye stocking was discontinued in 1982, after it was determined that there was no detectable impact on year class strength. In 1998, walleye fingerlings were stocked on an experimental basis into to White Lake.

Smallmouth bass (adult fish) were released in White Lake between 1903 and 1920. Largemouth bass were introduced to White Lake in 1957. Attempts to introduce muskellunge in an effort to control large panfish populations were unsuccessful. Muskellunge fry were stocked for four different years between 1968 and 1972. Brown trout were planted in Waba Creek in 1953, 1954, 1955, 1958 and 1959.

Table 4 - A summary of fish stocking activities in White Lake, Lanark and Renfrew Counties from 1959 to present.

Fish Species	Life Stage/Size	No. Fish Stocked
Largemouth bass	Unknown	5,000
Smallmouth bass	Fry	10,000
	Fingerlings	13,758
	Yearlings	11,000
	Adults	440
Walleye	Eyed Eggs	30,525,000
	Fry	300,000
	Fingerlings	81,218
Muskellunge	Fry	145,000

Aerial Activity Surveys

Aerial activity surveys were utilized in the 1970s and early 1980s as a means of acquiring estimates of angling and boating activity on a set of various inland lakes in Lanark County. These aerial surveys included White Lake on at least six occasions (Table 5). The 1977 aerial survey revealed the following water related activities: angling (73%), boating (23%), sailing (2%), water-skiing (1%) and other (2%).

Table 5 - Aerial surveys of angling activity conducted on White Lake, Lanark and Renfrew Counties.

Year	Survey Dates	No. Flights	Reference
1977	May-August	23	Mulholland & Kehoe (1977)
1978	January-March	11	Hamilton (1979)
	Summer	41	Gopsill & Mulholland (1978)
	September-October	9	Gopsill (1978)
1981	June-September	30	Macey (1982)
1983	February-March	9	File data

Creel Census Programs

The White Lake recreational fishery has been monitored on several occasions through creel surveys (Table 6). Creels surveys collect information including: angler origin, fish species being targeted, estimates of angling pressure and harvest, angling success, and biological characteristics of the catch.

Table 6 - Creel census programs conducted on White Lake, Lanark and Renfrew Counties.

Year (Season)	Survey Dates	Survey Type	No. Survey Days	No. Anglers Contacted
1964 (S)	-	Casual	-	-
1968 (W)	-	Casual	-	-
1969 (W)	-	Casual	-	-
(S)	-	Intensive	30	1079
1970 (W)	-	Casual	-	-
(S)	-	Casual	10	439
1971 (W)	February-March	Casual	7	24
(S)	-	Casual	-	-
1972 (W)	December-March	Casual	18	181
(Sp)	May-July	Casual	5	242
(S)	June-August	Intensive	-	506
1974 (S)	June-August	Intensive	25	1283
1977 (W)	January-March	Intensive	15	92
(S)	May-August	Intensive	45	893
1978 (W)	January-March	Intensive	19	151
1985 (S)	May-September	Intensive	76	1693
1989 (S)	May-September	Intensive	27	231

Three types of creel surveys have been conducted on White Lake. Casual surveys have involved the collection of creel information by conservation officers on an opportunistic basis during the course of their enforcement duties. More intensive surveys involve the random but stratified designation of time periods and days for which angling pressure counts are conducted and angler interview information are recorded. Statistically valid estimates of angling pressure and harvest

can be derived from this type of survey. A volunteer angler program was attempted in 1995. This involved the distribution of diaries to anglers who were to keep records of their fishing activities over the course of the season and then return the completed diary to the Ministry of Natural Resources for data tabulation. There were extremely poor returns from this experimental project and it was discontinued.

Trap Net Surveys

Index netting projects were initiated on White Lake in 1959 and have been carried out at regular intervals (every 5-6 years) since that time (Table 7). These netting projects are designed to monitor changes in the fish community structure.

The same netting sites are used from year to year. With the exception of the 1969 program, the gear has been a set of 2.4 m trap nets (1.8 m trap nets were utilized in 1969). Netting was conducted in the late summer-early fall in 1959 and 1969, but has been changed to the early summer (i.e., late May-June) since that time. Nets are lifted and checked on every second. All fish are weighed (to 0.1 kg), measured (to 0.1 cm), examined for sex and state of maturity, and marked for future recognition before being released. Incidentally killed fish usually are retained and submitted for contaminant analysis.

On White Lake, it is necessary to clean nets on a regular basis. A fire hose is often used for this purpose. Algae is a particular problem, particularly in the latter stages of the netting project, and catches may be reduced for that reason.

Table 7 - Trap net surveys conducted on White Lake, Lanark and Renfrew Counties.

Year	Survey Dates	No. Nets Used (No. Locations)	Netting Effort (Net Days)
1959	August 27-September 4	4 (4)	32
1969	September 17-26	4 (11)	42
1974	May 22-June 28	5 (13)	169
1980	May 23-June 26	4 (10)	138
1985	May 22-June 13	4 (10)	88
1989	May 23-June 13	4 (12)	84
1995	May 23-June 1	4 (10)	36

Sport fish species, including walleye, northern pike, largemouth bass and smallmouth bass, were tagged with Atkins streamer tags in the 1969 and 1974 programs. By monitoring tag recoveries, movements of marked fish could be determined and population estimates could be generated.

Coarse Fish Removal

Removal coarse fish from White Lake in an attempt to allow walleye populations to increase was discussed during the early 1970's. It was purposed that commercial fishermen would set hoopnets in the lake and remove coarse fish, however, it appears that this projects was never conducted because it was not economically feasible for the commercial fishermen.

Fisheries Regulations and Compliance

White Lake is situated in Division 10 for the purpose of the Ontario Fisheries Regulations. A summary of current fisheries regulations is presented in Table 8. The most recent change to the fisheries regulations was the implementation of a protected slot size limit for walleye which was instituted in 1990.

Table 8 - Current (1998) fisheries regulations on White Lake.

Regulatory Activity	Details
Open Seasons	· Walleye: January 1-February 28 (last day); May 9 (2nd Saturday)-December 31. · Northern pike: January 1-February 28 (last day); May 9 (2nd Saturday)-December 31. · Largemouth and smallmouth bass: June 27 (last Saturday)-October 15. · Other species: Open year round
Daily Catch and Possession Limits	· Walleye: six (6) in one day · Northern pike: six (6) in one day · Bass (any combination): six (6) in one day · Other species: no limit
Size Limits	· Bass: minimum size limit of 30 cm (11.8 inches) · Walleye: legal size under 35 cm (13.8 inches) and over 50 cm (19.7 inches) · Other species: no size limit.

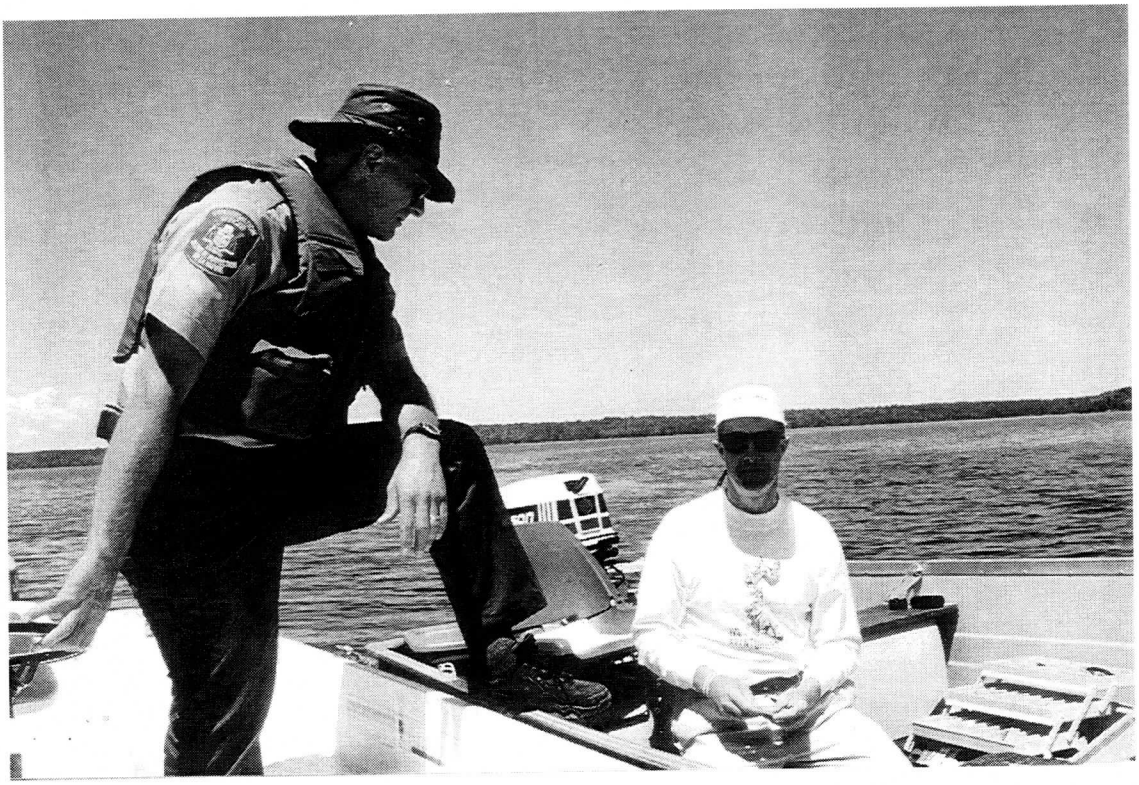

Figure 4 - Conservation Officer Wayne McCormick checking the licence of an angler on White Lake.

Water Quality Assessment

Water quality monitoring with respect to trophic status was initiated in 1972 by the White Lake Water Quality Committee and is presently continuing under the Ministry of the Environment's "Self Help" program. This program involves a local volunteer to measure water clarity (Secchi disc reading) and chlorophyll 'a' through the summer and early fall period. Water clarity is measured with a weighed metal disc (Secchi disc) 20 cm (8 inch) diameter with alternate black and white quadrants. This instrument is lowered into the lake and the depth at which the disc disappears and the depth which it reappears is measured. The average of these numbers is take as the measure of water clarity.

The Ministry of Natural Resources monitors water quality from a fish habitat perspective only. Testing involves the determination of values including dissolved oxygen, pH, alkalinity, turbidity, and water temperature profiles (see Table 3). Detailed bacteriological sampling at several sites in White Lake was conducted during June and July 1983.

Habitat Protection and Enhancement

There have been several efforts to improve the fish habitat in White Lake. Stream habitat improvement was undertaken on Darling Long Creek and Fish Creek in 1972. This involved the addition of cobble-rubble and removal of beaver dams to enhance the area as a walleye spawning site.

An artificial shoal was constructed in 1974. In 1985 the Arnprior Fish and Game Club removed beaver dams on Raycroft Creek to facilitate upstream movement of walleye in this spawning stream. The same organization was also responsible for cleaning and enhancing a walleye spawning shoal situated southeast of Bayview Lodge.

Water Level Management

White Lake is an artificial lake that has always been subject to annual and seasonal draw-downs (see 'Physical Parameters and History'). Five different water level management regimes have been utilized over the past fifty years (Table 9). From 1860 to 1960 a dam was operated by Stewart's sawmill on Waba Creek with the floodgates opened regularly to allow for the floating of timber downstream. The frequent water fluctuations (up to 1.5 m) maintained a good flushing rate and kept the water clear, rocky shoals clean, and maintained a good walleye fishery. In 1968, a new concrete dam was constructed and water levels were kept high followed by a winter draw-down during the period of 1968 to 1976. Summer water levels were stabilized for the benefit of boaters and shoreline property owners. This stable water level regime resulted in accelerated eutrophication with rapid growth of aquatic plants, reduced water clarity and subsequent failure of the walleye fishery. By 1972, anglers reported that spawning beds had silted over, an absence of small fishes, and by 1976/1977, walleye had all but disappeared from the lake (von Rosen, pers. comm.).

In 1977, the water level management regime was altered to allow gradual summer draw-downs (0.76 m/yr) to clean spawning shoals and reduce midsummer algal blooms. Fall and winter water levels were stabilized by mid-late September each year. This resulted in increased walleye spawning activity on traditional spawning sites. Since 1982, summer water draw-downs were modified in response to adverse public reaction to the previous water level management regime.

In the fall of 1991, a mail survey of shoreline residents and lake users was conducted by MNR to identify the most desired water level management regime. Three options (moderate summer draw-down, severe summer draw-down, and total summer stabilization) were presented. The majority of respondents favoured the moderate summer draw-down option which essentially confirmed the water level management regime which had been in place. This option seemed to represent the best compromise for boating, fisheries management and other interests. Under this scenario, it was recognized that walleye stocks would probably continue to decline and the lake would shift predominantly to a northern pike-largemouth bass sport fishery.

Table 9- Summary of water level management on White Lake.

Date	Water level Control	Management Objective	Water Quality
1850 to 1950	frequent, draw-downs of 4.5 feet	facilitate sawmill operations	clear waters
1950 to 1968	gradual loss (4 feet) of water throughout summer	sawmill using electric power, dam deteriorating	clear waters
1967 to 1977	summer water level stabilized	dam reconstructed at request of cottage owners	increasing algae blooms, sediment accumulation, aquatic plant growth. Loss of spawning beds, some fish species
1977 to 1982	gradual summer draw-down of 3 feet	walleye rehabilitation	gradual clearing of lake, return of fish species, spawning beds rehabilitated
1983 to present	reduced summer drawdown	compromise between shoreline property owners and fisheries concerns	deterioration of walleye and smallmouth spawning beds. Shift towards largemouth/pike fishery.

Fisheries Management Objectives

Resource management activities on White Lake have been based on strategies outlined in the White Lake Integrated Resource Management Plan (Ferris 1985) and, more recently, the Carleton Place District Fisheries Management Plan (OMNR 1988).

The most recent management strategies developed for White Lake include:

- management White Lake for a walleye, bass, and pike sport fishery with increasingly more emphasis on bass and pike.
- remove beaver dams blocking access to walleye spawning sites on tributary streams including Fish Creek.
- encourage the enhancement of walleye spawning habitat on Raycroft Creek and Fish Creek by CFIP proponents.
- manage water levels to optimize fish production and other uses. This includes the stabilization of fall and winter water levels by mid-late September each year.
- implement and evaluate experimental slot size limits for walleye.
- protect fish habitat from destruction and/or harmful alteration.
- review current open seasons and catch/possession limits.
- promote the utilization of coarse fish and panfish species.
- increase public awareness and support for fisheries management issues.

- actively enforce existing fisheries regulations.
- monitor the recreational fishery by conducting intensive creel surveys on a regular basis.
- monitor the fish community by regular (i.e., five year intervals) index trap netting programs.
- consider the use of restricted commercial fisheries (using live capture gear) to reduce panfish and coarse fish stocks..

Status of the Fish Community

Relative Abundance of Species

The fish community of White Lake has exhibited some dramatic shifts over the past thirty-five years. Walleye is perhaps one of the best examples of a species which has declined in abundance (Tables 10 and 11, Figure 5). Walleye were first stocked in 1921 (Appendix 3) and from the 1920's to 1960 the lake had a reputable walleye fishery and an important tourist industry developed in the area. Littkemann (1959) reported that "even pike cannot favourable compete with the large walleye population, thus heavier fishing would tend to keep the walleye under control and bring about a healthy balance among the various existing species." Summer water level stabilization between 1967 and 1977 is thought to have lead to silt and algae covering spawning shoals resulting in the decline of the walleye fishery (Bond 1977; vonRosen 1989). Walleye recruitment failure became evident by 1969 and the fishery had declined notably by the early 1970s. Only remnant walleye stocks currently exist in White Lake.

Smallmouth bass and pumpkinseed are other species which have declined from historic levels. Smallmouth bass are still present but as a much smaller component of the White Lake fish community. Pumpkinseed, once the most abundant species in White Lake, have steadily declined in numbers and appear to have stabilized at approximately one tenth the historical abundance.

Other fish species have increased in abundance since early surveys (Tables 11 and 12, Figures 6 and 7). Largemouth bass, introduced in 1957, now comprise a significant proportion of the catch and provide the basis for a popular recreational fishery. Northern pike have also stabilized at a higher level of abundance are also represent a highly sought species in the fishery. Yellow perch stocks appear to have increased in abundance coincident with the decline of the walleye population. This may be due to decreased predation by walleye. Brown bullhead and rock bass have also increased in abundance in recent years.

Attempts to introduce muskellunge were unsuccessful. Muskellunge have never been captured in any index netting program on White Lake. One brook trout was captured in the 1980 netting program. This fish was believed to be an immigrant from Broad Creek where it was stocked.

Table 10 - Catch rates of various fish species captured in index netting programs on White Lake. Catch rates are expressed in terms of the number of fish caught per trapnet day of fishing effort.

Fish Species	1959	1969	1974	1980	1985	1989	1995
American eel	0.00	0.05	0.00	0.04	0.02	0.00	0.03
Bluegill	0.34	0.00	0.00	0.00	0.00	0.00	0.00
Brown bullhead	11.34	8.48	5.52	4.62	20.67	10.51	39.69
Channel catfish	0.03	0.00	0.00	0.70	0.00	0.00	0.00
Golden shiner	0.00	0.00	0.04	1.45	0.00	0.07	0.00
Largemouth bass	0.03	1.38	2.16	1.99	4.02	1.62	7.58
Northern pike	3.25	2.76	2.64	0.98	6.09	4.57	5.72
Muskellunge	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pumpkinseed	177.75	64.76	36.65	18.90	27.70	12.95	14.69
Rock bass	0.00	2.29	2.98	1.65	3.93	3.42	5.25
Smallmouth bass	2.81	0.19	0.51	0.22	0.67	0.26	0.69
Walleye	7.41	2.93	0.37	0.12	1.73	0.95	0.50
White sucker	1.34	0.40	0.27	0.17	0.89	0.55	2.61
Yellow perch	13.03	34.52	12.90	8.19	18.02	62.08	27.31
All species	217.34	117.76	64.07	36.89	83.75	96.99	104.08

Table 11 - Composition of trapnet catches from White Lake. Values are expressed as a percent of the total catch. Bracketed values represent the actual number of fish caught.

Fish Species	1959	1969	1974	1980	1985	1989	1995
American eel	0.0 (0)	0.04 (2)	0.05 (5)	0.1 (5)	0.03 (2)	0.0 (0)	0.03 (1)
Bluegill	0.2 (11)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
Brown bullhead	5.2 (363)	7.2 (356)	8.6 (933)	12.5 (637)	24.7 (1819)	10.8 (883)	38.1 (1429)
Channel catfish	0.01 (1)	0.0 (0)	0.0 (0)	0.02 (1)	0.0 (0)	0.0 (0)	0.0 (0)
Golden shiner	0.0 (0)	0.0 (0)	0.06 (6)	0.04 (2)	0.0 (0)	0.07 (6)	0.0 (0)
Largemouth bass	0.01 (1)	1.2 (58)	3.4 (365)	5.4 (275)	4.8 (354)	1.7 (136)	7.3 (273)
Northern pike	1.5 (104)	2.3 (116)	4.1 (446)	2.7 (135)	7.3 (536)	4.7 (384)	5.5 (206)
Muskellunge	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
Pumpkinseed	81.8 (5688)	55.0 (2720)	57.2 (6194)	51.2 (2608)	33.1 (2438)	13.4 (1088)	14.1 (529)
Rock bass	0.0 (0)	1.9 (96)	4.6 (503)	4.5 (228)	4.7 (346)	3.5 (287)	5.0 (189)
Smallmouth bass	1.3 (90)	0.2 (8)	0.8 (87)	0.6 (30)	0.8 (59)	0.3 (22)	0.7 (25)
Walleye	3.4 (237)	2.5 (123)	0.6 (62)	0.3 (17)	2.1 (152)	1.0 (80)	0.5 (18)
White sucker	0.6 (43)	0.3 (17)	0.5 (23)	0.5 (23)	1.1 (78)	0.6 (46)	2.5 (94)
Yellow perch	6.0 (417)	29.3 (1450)	20.1 (2180)	22.2 (1130)	21.5 (1586)	64.0 (5215)	26.2 (983)
All species	100.0 (6955)	99.9 (4946)	99.9 (10827)	100.0 (5091)	100.1 (7370)	100.1 (8147)	99.9 (3747)

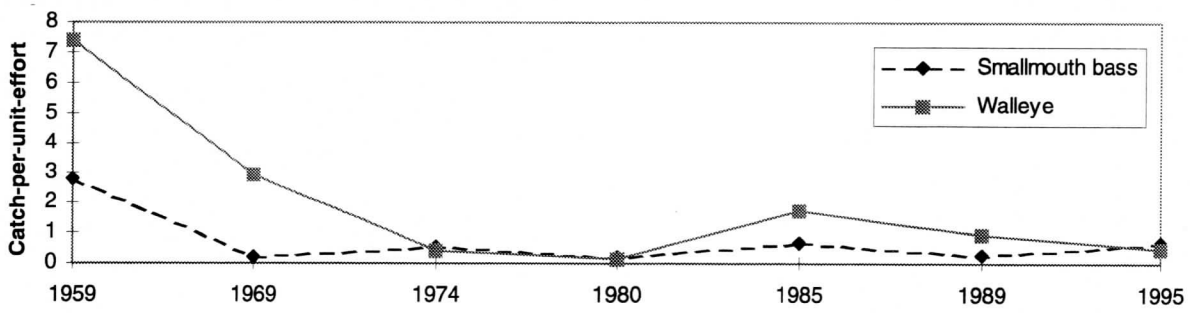

Figure 5 - Trends in catch rates of smallmouth bass, and walleye in trapnets set in White Lake.

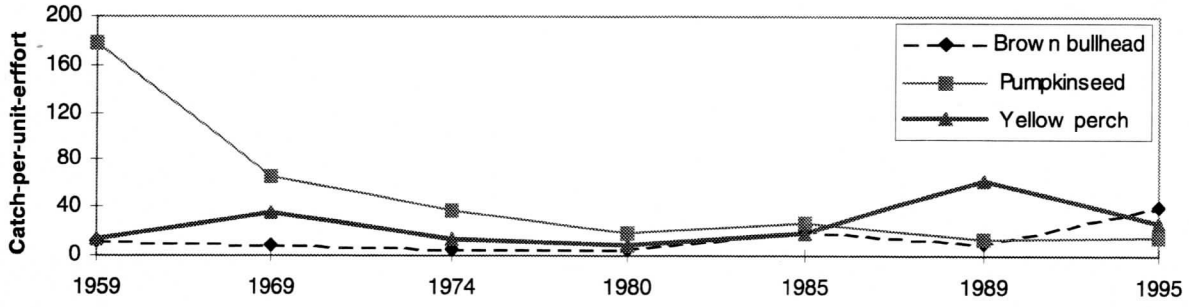

Figure 6 - Trends in catch rates of yellow perch, brown bullhead, and pumpkinseed sunfish in trapnets set in White Lake.

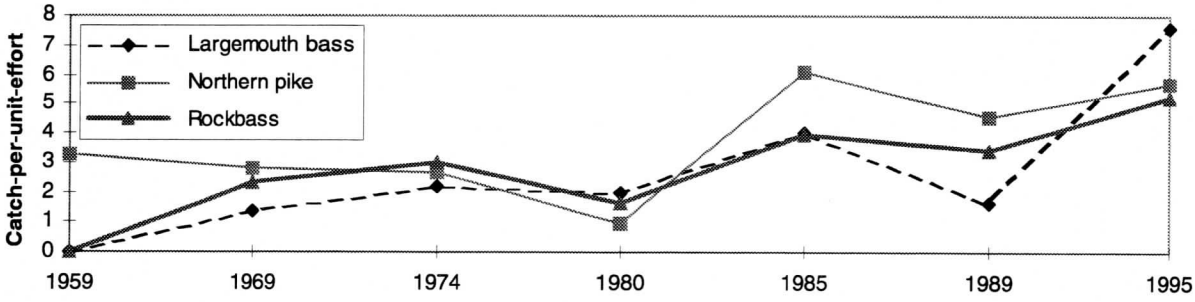

Figure 7 - Trends in catch rates of northern pike, largemouth bass, and rock bass in trapnets set in White Lake

Age and Growth of Sport Fishes

The growth rates of sport fishes caught in MNR programs are shown in Figures 8, 9, 10 and 11. Generally, growth rates of all the species examined in this lake (Appendices 4 , 5 and 6) appear much higher than have been reported for other lakes in eastern Ontario (Hoyle 1990). Caution should be exercised in interpreting these data since they were collected at a variety of times of year and the age interpretation was conducted by a variety of technicians over the years. A detailed study of the growth of fishes in White Lake should be conducted. However, it is interesting to note that there appears to have been an increase in the growth of walleye as their abundance has declined (Figure 11) while northern pike growth appears to have decreased as their abundance has increased (Figure 9). Growth rates for smallmouth and largemouth bass

appear to have been relatively consistent over the recent years. It is also worth noting that sizes of the walleye caught during the trapnet programs has been increasing over time (Appendix 7) - suggesting that spawning success of walleye has been poor in recent years.

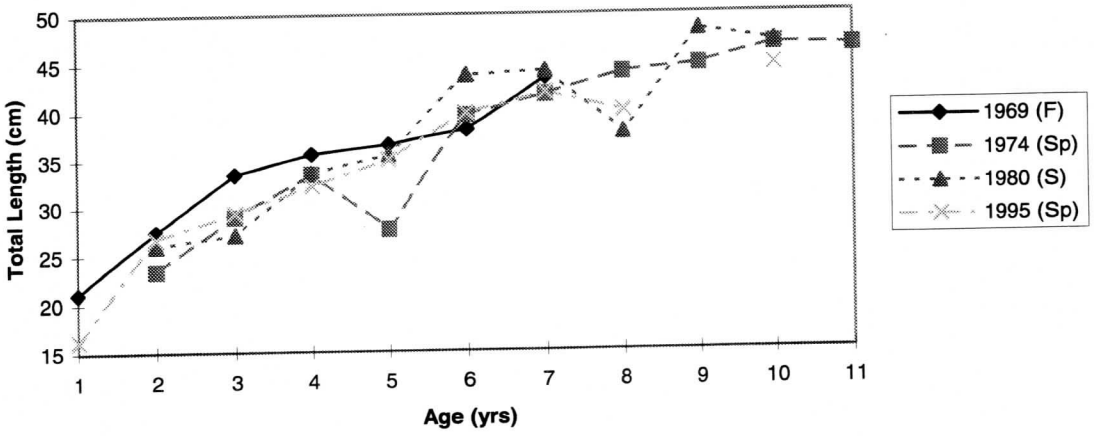

Figure 8- Growth rates for largemouth bass captured during various programs on White Lake. Data presented are the mean total length (cm) of fish captured for each age group.

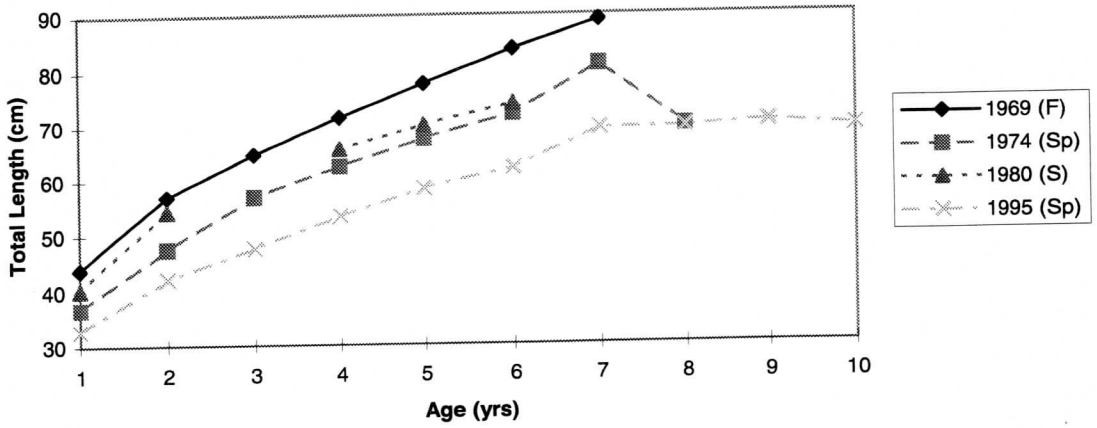

Figure 9- Growth rates for northern pike captured during various programs on White Lake. Data presented are the mean total length (cm) of fish captured for each age group.

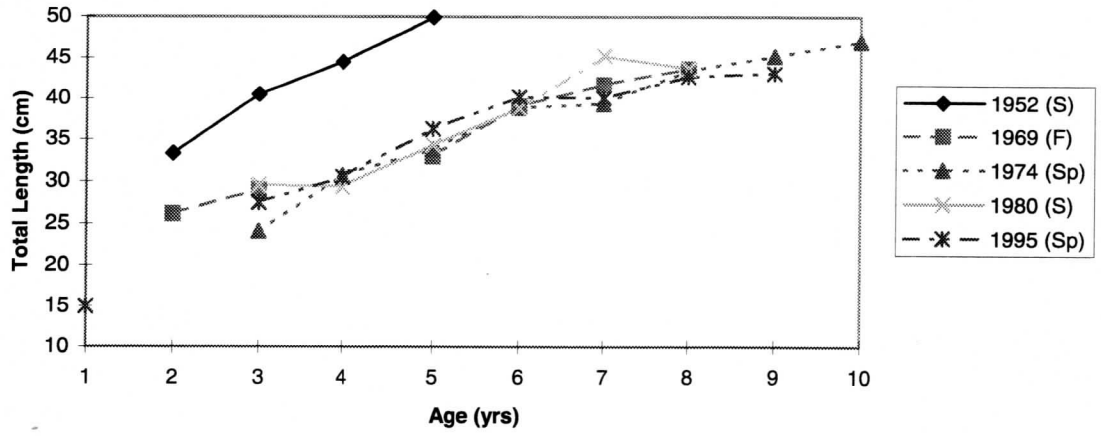

Figure 10 - Growth rates for smallmouth bass captured during various programs on White Lake. Data presented are the mean total length (cm) of fish captured for each age group.

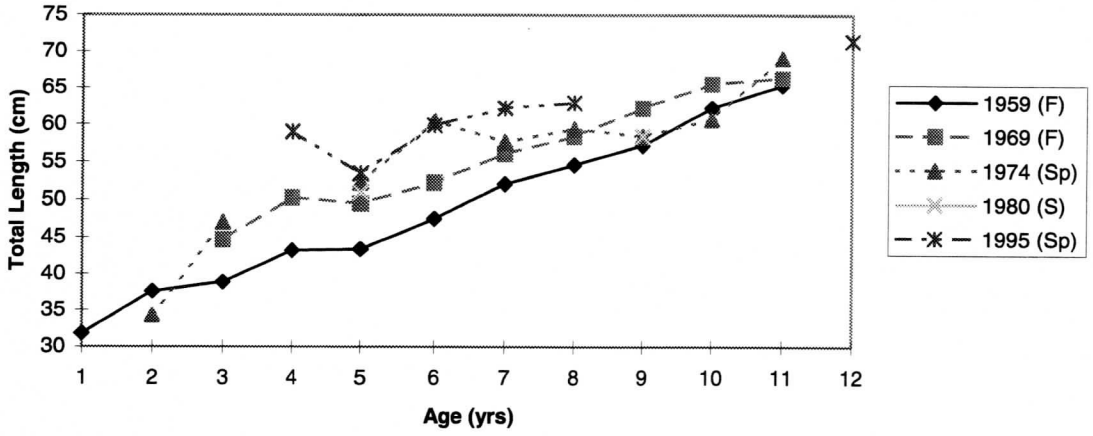

Figure 11- Growth rates for walleye captured during various programs on White Lake. Data presented are the mean total length (cm) of fish captured for each age group.

Contaminants in Fish

The first fish sampled for contaminants were collected in 1969. Two walleye were analyzed for DDT by the Ontario Water Resources Commission. More recently, fish have been collected and analyzed for contaminants in a joint program by the Ontario Ministries of the Environment and Natural Resources (OMOE 1997). Five fish species (northern pike, smallmouth bass, yellow perch, brown bullhead, and largemouth bass) have been evaluated. Consumption restrictions are currently advised for largemouth bass exceeding 35 cm in length and smallmouth bass greater than 35 cm in length. Fish samples should be collected to update the consumption advisories, in particular walleye should be added.

Table 12 - Number of meals per week recommended for fish of a variety of lengths (total length in cm) caught in White Lake, Renfrew and Lanark Counties. Information is based on OMOE 1997 Guide to Eating Ontario Sportfish.

Fish Species	15 - 20cm	20 - 25cm	25 - 30cm	30 - 35cm	35 - 45cm	45 - 55cm	55 - 65cm
Smallmouth Bass	8	8	8	8	4	NCA	-
Brown Bullhead	-	-	8	8	-	-	-
Northern Pike	-	-	-	-	8	8	8
Largemouth Bass	-	-	8	8	4	-	-
Yellow Perch	-	8	8	-	-	-	-

Notes:
8 = advised consumption of 8 meals per month.
4 = advised consumption of 4 meals per month.
NCA = no consumption advised.
It is strongly recommended that women of childbearing age and children of under 15 only not eat fish from the NCA category. A meal is considered to be 227 grams (8 ounces).

The Fishery

Angling reports date back near the turn of the century. Some of the earliest information on the sport fishery is from the records of the Peter's Point Fishing Club (Kirkland undated). This club was established in 1917 on a point of land at the entrance to the Three Mile Bay (Darling Twp.). Some of the records include:

- Annual meeting 1918 - special meeting to secure walleye for stocking in lake. At time "few walleye".
- July 1/1920 - 3 walleye (1-3 ½ lb) angled
- July 2/1920 - 3 walleye, 3 bass. We fished in many parts of the lake and never came in with an empty basket. The troll and worms were used with equal success; minnows appeared not to be wanted.
- Aug 1/1920 - 3 lb walleye, several pickerel caught casting off camp
- June 1940 - algae bloom noted - doesn't necessarily happen every year. 2 ½ lb black bass caught
- June 1940 - 2 walleye, 1 northern pike, 4 perch, 12 sunfish angled
- winter 1943 - 3" ice Dec 5-6, 1 pike 7 walleye angled

- June 30 - July 8/1944 - 40 fish caught (21 walleye, 17 pike, 2 black bass)
- 1945 - several snakes in camp at kitchen, big black snakes common
- 1946 - Aug 3 - 4 snakes in wood-pile, several small ones in attic and one huge one with eluded capture for 4 days.
- 1948 - cottagers now numerous on White Lake. Several early stockings of walleye fry by club members in previous years. Lake become "alive" with boats fishing.
- 1949 - thousands of snail shells washed up on shore - never seen before. May 27 - one wet evening caught 17 walleye and one pike.
- 1951 - "While Lenny, Jack and I were piling the birch we ran into 4 nests of snakes under the wood. There were 4 young ones under one stick. As Jackie was lifting a stick, one about 3 feet long crawled over it. Mr. Lambert came over and saw one about four feet long."
- June 28-29/1951 - 18 pike and walleye caught (largest pike 7 lb., largest walleye 7 ½ lb.)
- summer 1951 - 19" long 3 ½ lb. smallmouth bass angled
- Aug 15/1953 - 3 pike 1 walleye caught off McLachlin's Is.
- Jan 24/1957 - caught 15 perch, 12" ice
- 1961- 3 lb. walleye angled

Based on MNR records and anecdotal information the following chronology of White Lake's fisheries was developed. Prior to 1930 there was an excellent fishery for pike. From 1930 to the mid-1960's walleye fishery developed as a result of introductions carried out in the early 1920's. Walleye stocks collapsed between 1965 and 1970, coincident with the improvement of the largemouth bass fishery. In 1972, Ontario Ministry of Natural Resources changed its management approach to place less emphasis on walleye fisheries and more focus on the bass fishery. This created an immediate negative reaction from local residents and the tourism industry who regarded walleye as the basis of the recreational fishery.

White Lake still provides an important fishery in both social and economic terms. Angling is the activity which has been documented to account for 62% of summer use and 90% of winter use on the lake.

Angler Origin

Angler origin has been recorded during numerous creel surveys conducted on White Lake. Non residents comprise a large proportion (43.9-55.6%) of anglers utilizing the open water fishery (Table 13). As expected, the winter fishery is comprised almost exclusively by local Ontario residents.

Table 13 - Origin of anglers utilizing the White Lake fishery, expressed as the number of anglers (% of total).

Year(Season)	Local*	Ontario	Canadian	American	Other	Total
1969 (S)	Resident -	511 (47.4%)		Non Resident -	568 (52.6%)	1079 (100.0%)
1970 (S)	Resident -	246 (56.0%)		Non Resident -	193 (44.0%)	439 (100.0%)
1971 (W)	Resident -	24 (100.0%)		Non Resident -	0 (0.0%)	24 (100.0%)
1972 (W)	Resident -	176 (97.2%)		Non Resident -	5 (2.8%)	181 (100.0%)
(Sp)	Resident -	88 (36.4%)		Non Resident -	154 (63.6%)	242 (100.0%)
(S)	Resident -	260 (51.4%)		Non Resident -	246 (48.6%)	506 (100.0%)
1974 (S)	Resident -	638 (49.7%)		Non Resident -	645 (50.3%)	1283 (100.0%)
1977 (W)	48 (52.2%)	44 (47.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	92 (100.0%)
(S)	13 (1.5%)	396 (44.3%)	9 (1.0%)	475 (53.2%)	0 (0.0%)	893 (100.0%)
1978 (W)	31 (20.5%)	120 (79.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	151 (100.0%)
1980 (S)	108 (13.4%)	232 (28.8%)	18 (2.2%)	447 (55.6%)	0 (0.0%)	805 (100.0%)
1985 (S)	141 (8.6%)	766 (46.6%)	15 (0.9%)	721 (43.9%)	0 (0.0%)	1643 (100.0%)
1989 (S)	5 (2.2%)	107 (46.3%)	13 (5.6%)	106 (45.9%)	0 (0.0%)	231 (100.0%)

'*' - Local means people who are residing in either Renfrew or Lanark County.

Species Sought

Traditionally, walleye were the most highly sought species in the White Lake fishery (Ellah 1969, Table 14). Ferris (1985) noted that the winter fishery is concentrated primarily on walleye and northern pike. Although many anglers still seek walleye, there is some evidence that the summer fishery may be shifting more to other species, such as bass, perch and pike, as the walleye fishery declines (W. McCormick pers. comm.). Future creel surveys should ensure that species sought by White Lake anglers is recorded.

Table 14 - Fish species sought by anglers contacted on White Lake. Expressed as % of anglers seeking a specific fish species

	1972 (S)	1974 (S)	1977 (W)
No. Anglers Contacted	506	1283	92
Walleye	74.3%	25.0%	46.7%
Northern Pike	14.8%	22.0%	40.2%
Bass (Largemouth and/or Smallmouth Bass)	9.5%	31.0%	-
Panfish	1.4%	3.0%	-
Anything	-	19.0%	13.0%

Angling Pressure

No recent creel surveys or fishing pressure estimates are available for White Lake. Based on estimates of angling pressure which have been generated from creel surveys conducted 1969 to 1989, White Lake probably sustains at least 60-65,000 rod hours (26.7-28.9 rod hours ha^{-1}) of angling effort annually (Table 15). The bulk (80-85%) of this fishing pressure occurs during the summer (late May-Labour day) period. It has been estimated that up to 86,000 rod hours of angling effort occurred in the early 1980's (von Rosen 1982). These angling efforts are considerably greater that the recommended allowable angling pressure which was estimated to be in the order of 54,000 rod hours (OMNR file data). The last creel survey which could be used to generate estimates of angling pressure was conducted in 1989. It is recommended that another intensive creel survey be conducted within the next 2-3 years in order to document angling pressure during this decade.

Table 15 - Seasonal angling pressure estimates for White Lake.

Year	Survey Period	Estimated Angling Pressure (rod hours ha^{-1})	Reference
1969 (S)	May-September	55,892 (24.8)	Ellah (1969)
1972 (S)	June-August	51,213 (22.8)	Pratt (1972)
1974 (S)	June-August	55,218 (24.5)	Thomas (1975)
1977 (W)	January-March	11,820 (5.3)	Kehoe & Strachan (1977)
(S)	May-August	56,589 (25.2)	Mulholland & Clayton (1977)
1978 (W)	January-March	12,458 (5.5)	Hamilton (1979)
(S)	June-August	30,067 (13.4)	Gopsill & Mulholland (1978)
(F)	September-October	252 (0.1)	Gopsill (1978)
1980 (S)	May-August	45,653 (20.3)	Hamilton (1981)
1985 (S)	May-September	52,177 (23.2)	File data
1989 (S)	May-September	25,554 (11.4)	File data

Angling Quality

Angling quality is usually expressed in terms of the catch-per-unit-of-effort. Catch rates for the major sport fish species (walleye, northern pike, smallmouth bass, and largemouth bass) have all been lower than observed for some eastern Ontario Lakes (Hoyle 1990) (Table 16). Walleye catch rates have been poor throughout the period surveyed while largemouth bass catch rates have increased substantially.

Table 16 - Angling success (CUE) recorded for the White Lake fishery. Values are based on effort and catches by all anglers.

Year (Season)	Walleye	N. Pike	S. Bass	L. Bass	Y. Perch	Panfish	Coarse Fish	Total
1969 (S)	0.016	0.114	All Bass -	0.054	-	-	-	0.184
1970 (S)	0.009	0.092	All Bass -	0.092	-	0.109	-	0.303
1971 (W)	0.000	0.153	0.000	0.000	-	0.356	-	0.508
1972 (W)	0.278	0.204	0.000	0.000	0.037	-	-	0.269
(Sp)	0.009	0.130	0.021	0.032	0.081	0.303	-	0.273
(S)	0.008	0.113	All Bass -	0.043	-	-	-	0.466
1974 (S)	0.005	0.085	All Bass -	0.086	-	0.816	-	0.991
1977 (W)	0.001	0.104	0.000	0.000	-	0.257	-	0.368
(S)	0.007	0.133	0.094	0.123	-	-	-	0.351
1978 (W)	0.020	0.087	0.000	0.000	0.325	-	-	0.432
1980 (S)	0.001	0.110	All Bass -	0.130		Other Species -	0.550	0.794
1985 (S)	0.010	0.162	0.054	0.147	0.216	0.438	-	0.989
1989 (S)	0.023	0.145	0.091	0.165	0.188	0.670	-	1.283

Species Composition in the Catch

The relative composition of species in the anglers creel is summarized in Table 17. These values also indicate the decline of the walleye population which now comprises only a very small proportion (e.g., 1%) of the catch. Northern pike and bass now form the majority of the sport fish caught in White Lake.

Estimated Catches and Harvests

Estimated catches and harvests from the White Lake fishery are presented in Table 18. Anecdotal information suggests that small numbers of young walleye are starting to show up in the fishery (Wayne McCormick, personal communication 1998).

Table 17 - Proportion of fish species in the angler's creel from White Lake. (% of total observed catch).

Year (Season)	Sample Size (No. Fish)	Walleye	N. Pike	L. Bass	S. Bass	Y. Perch	Panfish	Coarse Fish	Total
1969 (S)	473	8.7%	61.9%	23.9%	5.5%	-	-	-	100.0%
1970 (S)	296	3.0%	30.4%	All Bass -	30.4%	-	36.1%	-	99.9%
1972 (W)	116	10.3%	75.9%	13.8%	-	-	-	-	100.0%
(Sp)	145	3.4%	47.6%	11.7%	7.6%	29.7%	-	-	100.0%
(S)	484	1.7%	24.2%	All Bass -	9.3%	-	64.9%	-	100.1%
1974 (S)	2058	0.5%	8.6%	All Bass -	8.7%	-	82.3%	-	100.1%
1977 (W)	163	1.8%	28.2%	-	-	-	69.9%	-	99.9%
(S)	529	0.4%	38.0%	26.7%	35.0%	-	-	-	100.0%
1978 (W)	339	4.7%	20.1%	-	-	75.2	-	-	100.0%
1980 (S)	1600	0.2%	13.8%	All Bass -	16.6%	-	Other Species -	69.5%	100.1%
1985 (S)	3647	1.0%	16.5%	11.8%	4.3%	22.0%	44.3%	-	99.9%
1989 (S)	716	1.8%	11.3%	12.8%	7.1%	14.7%	52.2%	-	99.9%

Table 18 - Estimated catches and harvests of various species from the White Lake fishery. Values are based on effort and catches by all anglers. Both numbers of fish and weight (kg in brackets) of fish caught and harvested are shown.

Year	Survey Period		Walleye	N. Pike	L. Bass	S. Bass	Y. Perch	Panfish	Coarse Fish	Total
1972	June-	Catch	212 (-)	2821 (-)	All Bass -	1080 (-)	- (-)	9159 (-)	- (-)	13272 (-)
	August	Harvest	212 (-)	2099 (-)	All Bass -	504 (-)	- (-)	2427 (-)	- (-)	5242 (-)
1974	June-	Catch	90 (-)	2252 (-)	All Bass -	2774 (-)	- (-)	19801 (-)	- (-)	24917 (-)
	August	Harvest	81 (-)	1419 (-)	All Bass -	2053 (-)	- (-)	3168 (-)	- (-)	6721 (-)
1977	January-	Catch	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)
	March	Harvest	90 (-)	1278 (-)	- (-)	- (-)	- (-)	3006 (-)	- (-)	4374 (-)
	May-	Catch	- (-)	- (-)	- (-)	- (-)	- (-)	All Other	- (-)	- (-)
	August	Harvest	- (-)	4255 (-)	2967 (-)	1054 (-)	- (-)	Species -	11882 (-)	20158 (-)
								All Other Species -		
1978	January-	Catch	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)
	March	Harvest	249 (-)	1121 (-)	- (-)	- (-)	3987 (-)	- (-)	- (-)	5357 (-)
1980	May-	Catch	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)
	August	Harvest	46 (-)	2283 (-)	All Bass -	2063 (-)	- (-)	All Other Species -	6848 (-)	11240 (-)
1985	May-	Catch	399 (-)	8423 (-)	6452 (-)	2703 (-)	12770 (-)	21885 (-)	- (-)	52632 (-)
	September	Harvest	134 (-)	2846 (-)	2569 (-)	504 (-)	1905 (-)	2525 (-)	- (-)	10483 (-)
1989	May-	Catch	812 (-)	3925 (-)	4931 (-)	1674 (-)	5291 (-)	20216 (-)	- (-)	36849 (-)
	September	Harvest	44 (-)	909 (-)	1321 (-)	227 (-)	167 (-)	2562 (-)	- (-)	5230 (-)

Characteristics of the Catch

Size of Fish

Size of sport fish angled from White Lake are summarized in Table 19. Unfortunately, there is not a wealth of biological information on catches from the White Lake fishery. This should be more of a priority in future creel surveys. Lodges could collection additional information and biological data from their clientele.

Table 19 - Size (total length) of sport fish species angled from White Lake. The mean and range (range in brackets) of total Length (cm) are shown.

Year (Season)	Walleye	N. Pike	L. Bass	S. Bass
1972 (S)	63.5 (-)	61.0 (-)	- (-)	- (-)
1974 (S)	54.6 (38.1-66.0)	55.1 (40.6-87.4)	37.3 (17.8-46.5)	34.5 (16.8-44.7)
1980 (S)	53.5 (-)	59.1 (-)	35.8 (-)	36.1 (-)

Age Distribution

Age characteristics of the catch are summarized in Table 20.

Table 20 - Mean age (and range in brackets) of sport fishes sampled from the White Lake angling fishery.

Year (Season)	Walleye	N. Pike	L. Bass	S. Bass
1980 (S)	6.3 (5-9)	3.0 (1-6)	5.0 (2-10)	5.4 (3-8)

Yields

The potential yield is a value used to estimate the theoretical amount of fish which can be harvested annually on a sustained basis. Potential yield is estimated by the formula _ (kg yr^{-1}) = [1.4 $(MEI)^{0.45}$] [lake surface area in ha] where MEI (morphoedaphic index) = total dissolved solids (mg L^{-1}) / mean depth (m). The morphoedaphic index (metric) for White Lake has been calculated to be 41.94 which results in an annual estimated production of 16,920 kg of fish $year^{-1}$.

This estimate of annual production must next be partitioned among the different fish species in the White Lake fish community. For White Lake, the total yield has been apportioned as follows: walleye (2%), northern pike (15%), largemouth bass (17%), smallmouth bass (5%), yellow perch (6%), panfish (35%), and coarse fish (20%). The yield of sport fish observed in creel surveys falls well below these calculations suggested by the MEI.

Table 21 - A comparison of estimated yields with harvests from the White Lake fishery. Yields are based on estimated harvests and mean weights. Individual species yields have been partitioned based on an approximation of the fish species composition in White Lake.

	Estimated Yield by Species[1]							
	Walleye	N. Pike	L. Bass	S. Bass	Y. Perch	Panfish	Other[2.]	Total
Predicted Annual Yield (kg)	338 (2%)	2538 (15%)	2877 (17%)	846 (5%)	1015 (6%)	5922 (35%)	3384 (20%)	16920 (100%)
Harvests by Year (Season)								
1972 (S)	318	1259	All Bass -	265	-	728	-	2570
1974 (S)	122	851	All Bass -	1078	-	950	-	3001
1977 (W)	135	766	-	-	-	902	-	1803
(S)	-	2553	1780	474	-	All Other Species	4456	9263
1978 (W)	374	673	-	-	997	-	-	2044
1980 (S)	69	1370	All Bass -	1083	-	All Other Species	2568	5090
1985 (S)	201	1708	1541	227	476	758	-	5222
1989 (S)	66	545	793	102	42	769	-	2317

1. Yield based on a mean size of 1500 gm for walleye; 450 gm for smallmouth bass; 600 gm for largemouth bass and northern pike; 250 gm for yellow perch; 300 gm for panfish and 450 gm for coarse fish/cyprinids.
2. Includes coarse fish and minnow species.

Summary and Recommendations

Having reviewed information which has been collected on the White Lake fishery since 1959, a number of recommendations are offered for future assessment programs and management of this important fishery:

1. **Standardize Index Netting Effort** - Index trapnetting has been conducted on White Lake on a relatively regular basis for the past thirty-five years. It is highly recommended that this program be continued to monitor the status of this valuable recreational fishery. From the seven netting projects in the past, netting effort has ranged from 32-169 net days. It is recommended that the netting program be continued in late May and early June with an average netting effort of 80 net days.

2. **Investigate fish growth** - Fish captured in trapnetting studies in White Lake appear to be much younger than expected compared to fish captured in nearby lakes. A fish aging study with material from several lakes in the area as well as known age reference material should be conducted.

3. **Implement More Detailed Creel Surveys** - Intensive creel surveys were last carried out on White Lake in 1989. It is highly recommended that a survey be conducted in order to obtain information on the fishery during the 1990s. Ideally, the survey would encompass a period extending from the opening weekend of the fishing season in late May until after the Labour day weekend in September. Future creel surveys should ensure that information missing from earlier surveys is collected. This would include fish species sought by anglers, angler opinions of experimental size limits, and increased sampling of the biological attributes of the harvest.

4. **Update Water Quality Information** - Although detailed water quality information with respect to trophic status is available for White Lake, there needs to be an update of routine water quality information used for fisheries management purposes. Water quality sampling should be conducted during the mid-late summer (e.g., August) and late winter (e.g., March). Water quality parameters to record include dissolved oxygen, total dissolved solids, pH, alkalinity, turbidity and water clarity.

5. **Survey walleye spawning -** a survey to evaluate the walleye spawning grounds on shoals and in tributary streams should be conducted. Limited spawning is known to occur and consideration should be given to options to increase natural reproduction such as removing beaver dams blocking access to walleye spawning sites on tributary streams including Fish Creek and encouraging the enhancement of walleye spawning habitat on Raycroft Creek and Fish Creek by CFIP proponents.

6. **Evaluate Experimental Size Limit Regulations** - As part of an experimental program on a set of Lanark County lakes, a protected slot size limit (35-50 cm) was implemented for walleye in White Lake in 1990. This regulation was instituted to protect mature walleye from over-harvest while not restricting angling opportunities. Anecdotal information suggests that small numbers of young walleye are starting to show up in the fishery (Wayne McCormick, personal communication 1998). In addition, the stocking of summer fingerling walleye during 1998 should increase the numbers of small walleye in the population. The current angling regulations do not provide protection for these small fish and given the limited natural reproduction which has occurred in this lake the slot size regulations do not seem appropriate. Based on this information, it is recommended that the slot limit regulation for walleye be removed from this lake and a 41 cm (16 inch) total length minimum size limit be established on White Lake. The public should be consulted about this recommendation and others prior to changing angling regulations. Additional assessment information, including creel surveys and index netting programs, would be of great value evaluating the experimental size limits.

7. **Promote Utilization of Panfish and Coarse Fish Species** - An estimated 55% of the annual fish production from White Lake is comprised either of panfish or coarse fish species. Efforts should be directed to increasing the harvest of these species and result in a better balance among fish species. Options to accomplish this including the use of a restricted commercial fishery and the promotion of panfish and coarse fish among lake anglers.

8. **Consider Fisheries in Water Level Management** - There has been a long history of controversy in the management of water levels in White Lake. An agreement reached in 1991 would seem to represent the best compromise among all interests. White Lake's fisheries are clearly influenced by whatever water level management regime is utilized and the health of resident fish stocks should be a major consideration in future water level manipulations.

9. **Transfer Fisheries Information and Management Objectives to Lake Residents and User Groups** - Support for management programs depends upon good communication among managers, lake residents, and various user groups. Managers should ensure that information from various fisheries management programs be disseminated in a timely fashion and issues are openly discussed at public meetings.

10. **Encourage user groups to form one lake-wide association.**

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Zooplankton samples were examined and identified by Dr. W. T. Geiling in 1977.

Scale samples have been aged by Gary Raine (1969), Marion Thompson (1974 and 1980) and Arnold Gibson (1995).

References

Anonymous. 1972. 1971-72 winter fishing report for the Kemptville District. File Report, Ontario Ministry of Natural Resources, Kemptville District.

Bond, L. J. 1977. Ecological study of White Lake, Renfrew and Lanark Counties. File Report, Ontario Ministry of Natural Resources, Lanark District. 42 p. + appendices.

Doyle, R.W. 1975. Cottage pollution survey of the Three Mile Bay and Pickerel (Bennett) Bay on White Lake, Renfrew and Lanark Counties. Ontario Ministry of Environment, Kingston Ontario 43 p.

Ellah, R. T. 1969. 1969 White Lake trap net study and creel census. File Report, Ontario Department of Lands and Forests. Kemptville District. 45 p.

Ferris, J. P. 1985. White Lake integrated resource management plan. Ontario Ministry of Natural Resources, Carleton Place District.

Gopsill, B. 1978. 1978 fall aerial boating activity survey. File Report, Ontario Ministry of Natural Resources, Lanark District. 12 p.

Gopsill, B. and H. C. Mulholland. 1978. 1978 aerial boating activity program. File Report, Ontario Ministry of Natural Resources, Lanark District. 14 p.

Hamilton, J. G. 1979. 1977-78 winter creel census and aerial survey on Black, Christie, Clayton, Pike, Taylor, and White lakes. File Report, Ontario Ministry of Natural Resources, Lanark District.

Hamilton, J. G. 1981a. 1980 White Lake trap net report. File Report, Ontario Ministry of Natural Resources, Lanark District. 29 p.

Hamilton, J. G. 1981b. 1980 creel census on Clyde, Dalhousie, Farren, Flower, Joe, Patterson, White, and Widow lakes. Ontario Ministry of Natural Resources, Lanark District. 66 p.

Hoyle, J. 1990. Northern pike - smallmouth bass - largemouth bass communities and sport fisheries in Ontario inland lakes. Rideau Lakes Fisheries Assessment Unit Report No. 19. RR#2 Sharbot Lake Ontario K0H 2P0.

Kehoe, D. and J. Strachan. 1977. 1977 creel census report for Bennett, White, and Fagan lakes. File Report, Ontario Ministry of Natural Resources, Lanark District. 84 p.

Kennedy, C. C. 1970. The upper Ottawa Valley, Renfrew County Council. Pembroke, Ontario.

Kirkland, H.B. undated. The story of Peter's Point: A history of the Peter's Point Fishing Club. Mimeo. 49 p.

Littkemann, P. 1959. Biological report on White Lake in McNab, Bagot, Darling, and Pakenham Townships. File Report, Ontario Department of Lands and Forests, Kemptville, Ontario. 27 p.

Macey, A. 1982. Aerial boat activity and fishing pressure assessment, June-September 1981. File Report, Ontario Ministry of Natural Resources, Lanark District. 32 p.

Michalski, M. F. P. 1972. The enrichment status of White Lake, Renfrew and Lanark Counties. Ontario Ministry of the Environment, Kingston, Ontario. 16 p.

Mulholland, H. C. and T. Clayton. 1977. 1976-77 winter creel census on Bennett, Christie, Dalhousid, and White lakes. File Report, Ontario Ministry of Natural Resources, Lanark District. 28 p.

Mulholland, H. C. and D. Kehoe. 1977. 1977 aerial boating activity survey. File Report, Ontario Ministry of Natural Resources, Lanark District. 14 p.

Ontario Ministry of the Environment. 1985. Cottagers self help program: Enrichment status of lakes in the southeastern region of Ontario. Water Resources Branch, Kingston, Ontario. 34 p. + appendices.

Ontario Ministry of the Environment. 1986. Cottagers self help program: Enrichment status of lakes in the southeastern region of Ontario, 1986. Water Resources Assessment Unit, Kingston, Ontario. 28 p. + appendices.

Ontario Ministries of the Environment and Natural Resources. 1997. 1997-98 guide to eating Ontario sport fish. Queen's Printer for Ontario, Toronto, Ontario. 173 p.

Ontario Ministry of Natural Resources. 1980. Lanark district land use strategy: Background information. Lanark District. 98 p.

Ontario Ministry of Natural Resources. 1988. Carleton Place District Fisheries Management Plan, 1987-2000. Carleton Place, Ontario. 57 p. + appendices.

Pratt, L. C., 1972. 1972 summer creel census report for Bennett, Fagan, Mississippi and White lakes. Ontario Ministry of Natural Resources, Kemptville District. 69 p.

Reddoch, J. M. 1984. The White Lake fen. Trail and Landscape 18(37105-160) : 134-141.

Robinson, G. W. 1974. Enrichment status of fourteen lakes in the southwestern region of Ontario. Water Resources Branch, Ontario Ministry of the Environment, Kingston, Ontario. 36 p.

Thomas, E. R. 1975a. 1974 White Lake trap net study. File Report, Ontario Ministry of Natural Resources, Lanark District. 54 p.

Thomas, E. R. 1975b. 1974 creel census on White Lake. File Report, Ontario Ministry of Natural Resources, Lanark District. 24 p.

Tupling, G. M. 1972. Supplementary report to the 1969 White Lake trap net study. File Report, Ontario Ministry of Natural Resources, Kemptville District. 4 p.

vonRosen, H. K. 1977. White Lake management plan. File Report, Ontario Ministry of Natural Resources, Lanark District. 15 p.

vonRosen, H. K. 1982. White Lake fisheries options. File Report, Ontario Ministry of Natural Resources, Carleton Place District. 6 p.

vonRosen, H. K. 1989. 1989 White Lake fisheries assessment. File Report, Ontario Ministry of Natural Resources, Carleton Place District. 15 p. + appendices.

vonRosen, H. K. and H. McLeod. 1985. 1985 White Lake fisheries assessment with a pickerel stocking analysis. File Report, Ontario Ministry of Natural Resources, Carleton Place District. 12 p. + appendices.

Personal Communications

Aunger, Peter. Ontario Ministry of Natural Resources, 10 Findlay Avenue, Carleton Place, Ontario. K7C 3Z6

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vonRosen, Hans. Pinegrove Biotechnical, R. R. #1, Lanark, Ontario. KOG 1KO.

APPENDIX 1. Aquatic flora and fauna recorded in White Lake, Lanark and Renfrew Counties.

Fish	American eel	Anguilla rostrata
	Banded killifish	Fundulus diaphanus
	Blacknose shiner	Notropis heterolepis
	Bluegill	Lepomis macrochirus
	Bluntnose minnow	Pimephales notatus
	Brook stickleback	Culaea inconstans
	Brown bullhead	Ictalurs nebulosis
	Common shiner	Notropis cornutus
	Creek chub	Semotilus atromaculatus
	Fathead minnow	Pimephales promelas
	Golden shiner	Notemigonus crysoleucas
	Largemouth bass	Micropterus salmoides
	Northern pike	Esox lucius
	Northern redbelly dace	Phoxinus eos
	Pumpkinseed	Lepomis gibbosus
	Rock bass	Ambloplites rupestris
	Smallmouth bass	Micropterus dolomieu
	Walleye	Stizostedion vitreum vitreum
	White sucker	Catostomus commersoni
	Yellow perch	Perca flavescens
Reptiles and Amphibians	Bullfrog	Rana catesbiana
	Green frog	Rana clamitans
	Leopard frog	Rana pipiens
	Mink frog	Rana septentrionalis
	Spring peeper	Hyla crucifer
	Wood turtle	Clemmys insculpta
	Painted turtle	Chrysemys picta
	Snapping turtle	Chelydra spentina serpentina
Invertebrates	Zooplankton	Bosmina longirostris
		Calanoid copepodids
		Calanoid nauplii
		Ceriodaphnia lacustris
		Chaoborus sp.
		Chydorus sphaericus
		Cyclopoid copepodids
		Cyclopoid nauplii
		Cyclops vernalis
		Daphnia galatea mendotae
		Daphnie retrocurva
		Diaphanosoma leuchtenbergianum
		Diaptomus minutus
		Diaphomus orogonensis
		Holopedium gibberum
		Leptodora kindtii
		Mesocyclops edax
		Polyphemus pediculus
		Tropochclops minutus

Invertebrates (continued)		Tropocyclops prasinus mexicanus
	Amphipods	Hyalella azteca
	Gastropods	Vivparidae spp.
	Isopods	Ascellus sp.
	Aquatic Insects	Haliplus sp.
		Chironomidae spp.
		Trichoptera sp
Algae		Oscillatoria sp.
		Calothrix sp.
		Nostoc sp.
		Phormidium sp.
		Mougeotia sp.
		Cladaphora sp.
Aquatic Vegetation	Arrowhead	Sagittaria graminea
	Bladderwort	Utricularia sp.
	Bulrush	Scirpus heterochaetus
	Burreed	Sparganium sp.
	Bushy pondweed	Typha angustifolia
	Canada waterweed	Anachais canadensis
	Cattail	Typha latifolia
	Coontail	Ceratophyllum demersum
	Floating pondweed	Potamogeton natans
	Horned pondweed	Potamogeton zannichellia
	Muskgrass	Chara aspera
	Reedgrass	Phragmites maximus
	Pickerel weed	Heteranthera dubia
	Richardsons pondweed	Potamogeton richardson
	Sago pondweed	Potamogeton pectinatus
	Soft reed	Juncus effusus
	Spike rush	Eleocharis sp.
	Star duckweed	Lemna trisulca
	Swamp potato	Sagittaria latifolia
	Sweetgale	Myrica gale
	Tapegrass	Vallisneria americana
	White waterlily	Nymphaea odorata
	Wild rice	Zizania aquatica
	Yellow waterlily	Nuphar variagatum

APPENDIX 2. Fisheries management activities (excluding stocking) on White Lake.

Year	Project/Activity	Source(s)
1959	· biological survey including trap netting.	Littkemann (1959)
1964	· summer creel survey by Conservation Officers.	File data
1965	· summer creel survey by Conservation Officers.	File data
1967	· winter creel survey.	File data
1968	· winter creel survey.	File data
	· summer water levels stabilized.	File data
1969	· winter creel survey.	File data
	· lake inventory completed to provincial standards.	File data
	· summer creel survey.	Ellah (1969)
	· index trap netting project.	Ellah (1969); Tupling (1972)
1970	· winter and summer creel survey.	File data
1971	· winter creel survey.	File data
	· summer creel survey.	File data
1972	· winter, spring and summer creel surveys.	File data; Pratt (1972)
	· Secchi disc and chlorophyll 'a' measurements.	File data
	· stream enhancement of Darling Long Creek.	File data
	. course fish removal	File data
1973	· sediment core sampling of lake bottom.	File data
1974	· index trap netting project.	Thomas (1975a)
	· summer creel survey.	Thomas (1975b)
	· artificial shoal construction.	File data
1975	· cottage pollution survey.	File data
	. lake study by MOE	File data
1976	· ecological study.	Bond (1977)
1977	· winter creel survey.	Mulholland & Clayton (1977)
	· winter dissolved oxygen testing.	File data
	· summer draw-down water level management regime. · summer creel survey.	File data File data
	· aerial creel survey.	Mulholland & Kehoe (1977)
	· water management program initiated.	File data
1978	· winter aerial survey.	Hamilton (1979)
	· summer aerial survey.	Gopsill & Mulholland (1978)
	· fall aerial survey.	Gopsill (1978)
	. summer water chemistry analysis	File data
1980	· index trap netting project.	Hamilton (1981a)
	· summer creel survey.	Hamilton (1981b)
1981	· aerial creel survey.	Macey (1982)
1982	· modification of summer water level draw-downs.	File data

Year	Project/Activity	Source(s)
1983	· winter aerial creel survey.	File data
1985	· index trap netting project.	vonRosen & McLeod (1985)
	· summer creel survey.	File data
	· beaver dam removal on Raycroft Creek.	File data
1989	· index trap netting project.	vonRosen (1985)
	· summer creel survey.	vonRosen (1985)
1991	· public water level questionnaire.	File data
1995	· index trap netting program.	File data
	· volunteer angler diary project.	File data

APPENDIX 3. White Lake stocking history.

Year	Fish Species	No. Fish Stocked
1903	Smallmouth bass (Adults)	100
1904	Smallmouth bass (Adults)	100
1921	Walleye (Eyed eggs)	100,000
1922	Walleye (Eyed eggs)	100,000
1924	Walleye (Eyed eggs)	200,000
	Smallmouth bass (Fry)	10,000
1929	Smallmouth bass (Yearlings)	5,000
1931	Walleye (Eyed eggs)	100,000
	Smallmouth bass (Yearlings)	6,000
1932	Walleye (Eyed eggs)	200,000
	Smallmouth bass (Adults)	100
1935	Walleye (Eyed eggs)	500,000
1938	Walleye (Eyed eggs)	550,000
1939	Walleye (Eyed eggs)	500,000
1940	Walleye (Eyed eggs)	950,000
1941	Walleye (Eyed eggs)	1,200,000
	Smallmouth bass (Fingerlings)	1,000
1942	Walleye (Eyed eggs)	500,000
1943	Walleye (Eyed eggs)	500,000
1944	Walleye (Eyed eggs)	1,000,000
1945	Walleye (Eyed eggs)	500,000
1946	Walleye (Eyed eggs)	200,000
1947	Walleye (Eyed eggs)	475,000
	Smallmouth bass (Fingerlings)	300
1948	Walleye (Eyed eggs)	275,000
1949	Walleye (Eyed eggs)	350,000
	Smallmouth bass (Fingerlings)	1,000
1950	Walleye (Eyed eggs)	100,000
	Smallmouth bass (Fingerlings)	1,000
1951	Walleye (Eyed eggs)	5,000,000
	Smallmouth bass (Fingerlings)	4,400
1952	Walleye (Eyed eggs)	2,000,000
	Smallmouth bass (Fingerlings)	500

Year	Fish Species	No. Fish Stocked
1953	Walleye (Eyed eggs)	4,200,000
	Smallmouth bass (Fingerlings)	2,000
1954	Walleye (Eyed eggs)	3,000,000
	Smallmouth bass (Fingerlings)	1,000
1955	Smallmouth bass (Fingerlings)	2,558
1956	Smallmouth bass (Adults)	140
1957	Largemouth bass (Fingerlings)	5,000
1963	Walleye (Eyed eggs)	500,000
1964	Walleye (Eyed eggs)	1,000,000
1965	Walleye (Eyed eggs)	1,000,000
1966	Walleye (Eyed eggs)	1,000,000
1967	Walleye (Eyed eggs)	1,000,000
1968	Muskellunge (Fry)	15,000
1969	Muskellunge (Fry)	40,000
1970	Muskellunge (Fry)	30,000
1971	Walleye (Fingerlings)	218
	Muskellunge (Fry)	30,000
1972	Muskellunge (Fry)	60,000
1973	Walleye (Eyed eggs)	1,000,000
1974	Walleye (Eyed eggs)	1,000,000
1975	Walleye (Eyed eggs)	1,000,000
1976	Walleye (Eyed eggs)	1,000,000
1977	Walleye (Fry)	100,000
	Walleye (Fingerlings)	9,500
1979	Walleye (Fry)	200,000
	Walleye (Fingerlings)	3,000
1980	Walleye (Eyed eggs)	200,000
1981	Walleye (Fingerlings)	25,000
1982	Walleye (Fingerlings)	17,000
1998	Walleye (Fingerlings)	39,000

APPENDIX 4. Growth rates for eight fish species from White Lake.

WALLEYE

		Total Length (cm) @ Age Class													
Year (Season)	Data Source	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
1959 (F)	Trapnet	31.8	37.6	38.9	43.2	43.4	47.5	52.1	54.6	57.2	62.2	65.3	-	-	-
1969 (F)	Trapnet	-	-	44.7	50.3	49.5	52.3	56.1	58.4	62.2	65.5	66.3	-	-	-
1974 (Sp)	Trapnet	-	34.3	47.0	-	52.3	60.5	57.7	59.4	58.4	60.7	69.1	-	-	-
1980 (S)	Creel	-	-	-	-	51.0	-	-	-	58.4	-	-	-	-	-
1995 (Sp)	Trapnet	-	-	-	59.0	53.5	59.9	62.2	62.9	-	-	-	71.4	-	-

NORTHERN PIKE

		Total Length (cm) @ Age Class													
Year (Season)	Data Source	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
1969 (F)	Trapnet	43.9	56.9	64.8	71.6	77.7	83.8	88.9	-	-	-	-	-	-	-
1974 (Sp)	Trapnet	36.8	47.5	56.9	62.5	67.6	72.1	81.0	69.9	-	-	-	-	-	-
1980 (S)	Creel	40.3	54.3	-	65.8	70.1	74.0	-	-	-	-	-	-	-	-
1995 (Sp)	Trapnet	32.9	42.1	47.6	53.3	58.3	62.0	69.3	69.5	70.4	69.4	-	-	-	-

LARGEMOUTH BASS

		Total Length (cm) @ Age Class													
Year (Season)	Data Source	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
1969 (F)	Trapnet	21.1	27.4	33.5	35.6	36.6	38.1	43.4	-	-	-	-	-	-	-
1974 (Sp)	Trapnet	-	23.4	29.0	33.5	27.6	39.6	41.7	43.9	44.7	46.7	46.5	-	-	-
1980 (S)	Creel	-	26.0	27.1	33.6	35.5	43.7	44.1	37.7	48.3	47.0	-	-	-	-
1995 (Sp)	Trapnet	16.2	26.7	29.4	32.2	35.0	39.8	41.9	39.9	-	44.6	-	-	-	-

SMALLMOUTH BASS

Total Length (cm) @ Age Class

Year (Season)	Data Source	I	II	III	IV	V	VI	VII	VIII	IX	X
1952 (S)	Angling				33.3	40.5	44.5	49.9			
1969 (F)	Trapnet	-	26.2	29.0	-	33.0	39.1	41.7	43.7	-	-
1974 (Sp)	Trapnet	-	-	24.1	30.7	33.8	38.9	39.4	43.4	45.2	47.0
1980 (S)	Creel	-	-	29.5	29.4	34.3	38.8	45.0	43.7	-	-
1995 (Sp)	Trapnet	15.0	-	27.5	30.5	36.3	40.2	40.1	42.7	43.1	-

YELLOW PERCH

Total Length (cm) @ Age Class

Year (Season)	Data Source	I	II	III	IV	V	VI	VII	VIII	IX	X
1974 (Sp)	Trapnet	-	-	-	15.5	17.0	18.8	20.3	22.1	23.1	23.1

PUMPKINSEED

Total Length (cm) @ Age Class

Year (Season)	Data Source	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
1974(Sp)	Trapnet	-	-	11.4	16.0	17.8	18.3	19.1	19.6	19.8	21.3	-	-	-	-

WHITE SUCKER

Total Length (cm) @ Age Class

Year (Season)	Data Source	I	II	III	IV	V	VI	VII	VIII	IX	X	...XI	XII	XIII	XIV
1974(Sp)	Trapnet	-	34.3	45.2	48.8	51.3	51.6	-	-	-	-	-	-	-	-

ROCK BASS

Total Length (cm) @ Age Class

Year (Season)	Data Source	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
1974(Sp)	Trapnet	-	-	-	15.5	17.0	18.8	20.3	22.1	23.1	23.1	-	-	-	-

Appendix 5. - Mean age of fish caught during White Lake index netting programs, 1959-1995.

Fish Species	Year	Mean Age of Catch (Sample Size)	Number of Age Classes (Range in Ages)
Largemouth bass	1969	3.9 (58)	7 (1-7)
	1974	5.5 (347)	10 (2-11)
	1980	5.5 (274)	-
	1985	5.8 (350)	13 (2-14)
	1989	6.5 (134)	12 (2-14)
	1995	4.8 (264)	9 (1-10)
Northern pike	1969	2.5 (110)	7 (1-7)
	1974	3.3 (353)	8 (1-8)
	1980	3.2 (148)	-
	1985	3.5 (534)	8 (1-8)
	1989	3.7 (383)	9 (1-9)
	1995	3.8 (182)	10 (1-10)
Pumpkinseed	1974	7.3 (99)	8 (3-10)
Rock bass	1974	6.4 (99)	7 (4-10)
Smallmouth bass	1969	5.9 (10)	6 (2-8)
	1974	6.3 (83)	8 (3-10)
	1980	5.3 (-)	-
	1985	6.7 (58)	9 (2-11)
	1989	6.5 (22)	9 (2-10)
	1995	5.7 (23)	8 (1-9)
Walleye	1959	6.3 (39)	11 (1-11)
	1969	7.1 (104)	9 (3-11)
	1974	7.4 (62)	9 (2-11)
	1980	6.5 (17)	-
	1985	5.4 (116)	10 (3-13)
	1989	7.3 (80)	9 (3-12)
	1995	6.8 (16)	6 (4-12)
White sucker	1974	4.1 (41)	5 (2-6)
Yellow perch	1974	5.2 (100)	7 (3-10)

Appendix 6. Age distribution of selected sport fishes from White Lake. Bracketed values represent the number of fish caught during index netting surveys.

Fish Species	Year (N)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
L. Bass	1969 (58)	5.2	29.3	8.6	6.9	27.6	17.2	5.2	-	-	-	-	-	-
	1974 (347)	-	0.9	23.1	17.6	8.9	19.3	10.4	11.0	5.2	2.6	1.2	-	-
	1985 (349)	-	5.4	9.5	11.5	20.1	29.5	8.6	3.2	3.7	5.4	1.4	1.1	0.6
	1989 (134)	-	9.0	2.2	5.2	10.5	37.3	8.2	8.2	6.7	5.2	3.7	2.2	XIV-1.5
	1995 (264)	0.4	2.7	10.6	27.3	28.0	22.3	8.0	0.4	-	0.4	-	-	-
N. Pike	1969 (110)	8.2	55.5	20.9	10.0	3.6	0.9	0.9	-	-	-	-	-	-
	1974 (353)	0.6	25.5	46.2	13.0	9.3	3.7	1.4	0.3	-	-	-	-	-
	1985 (534)	4.5	20.8	27.7	29.2	9.9	5.4	1.5	0.9	-	-	-	-	-
	1995 (182)	6.6	15.4	26.4	18.7	19.8	9.3	1.1	0.5	1.6	0.5	-	-	-
Pumpkinseed	1974 (99)	-	-	1.0	6.1	10.1	20.2	15.2	18.2	18.2	11.1	-	-	-
Rock Bass	1974 (99)	-	-	-	8.1	29.3	23.2	15.2	9.1	8.1	7.1	-	-	-
S. Bass	1969 (10)	-	10.0	10.0	-	10.0	20.0	30.0	20.0	-	-	-	-	-
	1974 (83)	-	-	8.4	16.9	16.9	7.2	26.5	13.3	8.4	2.4	-	-	-
	1985 (58)	-	1.7	-	8.6	20.7	31.0	8.6	12.1	12.1	1.7	3.4	-	-
	1995 (23)	4.3	-	4.3	17.4	13.0	26.1	26.1	4.3	4.3	-	-	-	-
Walleye	1959 (39)	2.6	7.7	5.1	5.1	17.9	20.5	20.5	7.7	2.6	2.6	5.1	-	-
	1969 (108)	-	-	4.8	1.9	5.8	20.2	24.0	26.0	12.5	2.9	1.9	-	-
	1974 (62)	-	1.6	1.6	-	21.0	6.5	21.0	14.5	21.0	8.1	4.8	-	-
	1985 (116)	-	-	5.2	55.2	9.5	12.9	-	4.3	1.7	2.6	3.4	2.6	2.6
	1989 (80)	-	-	5.0	2.5	-	2.5	32.5	42.5	10.0	2.5	1.3	1.3	-
	1995 (16)	-	-	-	6.3	18.8	25.0	18.8	25.0	-	-	-	6.3	-
W. Sucker	1974 (41)	-	4.9	22.0	41.5	22.0	9.8	-	-	-	-	-	-	-
Y. Perch	1974 (99)	-	-	-	8.1	29.3	41.5	22.0	9.8	-	-	-	-	-

Appendix 7. Mean size of fish captured during index trap netting programs on White Lake, 1959-1974.

Fish Species	Year	Mean Size of Catch (Total Length in cm)	Largest Fish Caught (Total Length in cm)
Brown bullhead	1974	31.0	-
Largemouth bass	1969	33.4	-
	1974	37.1	-
	1995	35.1	46.0
Northern pike	1959	56.0	-
	1969	60.3	88.9
	1974	56.9	-
	1995	51.8	74.6
Pumpkinseed	1974	18.8	-
Rock bass	1974	20.3	-
Smallmouth bass	1959	38.7	-
	1969	37.9	-
	1974	36.8	-
	1995	36.6	43.1
Walleye	1959	48.5	64.8
	1969	56.1	-
	1974	57.4	-
	1995	60.5	71.4
White sucker	1974	44.2	-
Yellow perch	1974	18.8	-

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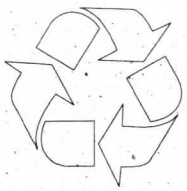

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