4.0 HEALEY LAKE

4.1 Physical Features

Surface Area:	762 hectares (1,883 acres)
Maximum Depth:	23 m (75 feet) – Figure 4.2 Bathymetry
Average Depth:	6 m (19 feet) – Figure 4.2 Bathymetry
Lakeshore Perimeter:	55.7 km (Island shoreline additional 19 km)
Littoral Zone:	61%
Water Level:	controlled by outlet dam
Watershed:	short drainage connection to Georgian Bay

4.2 Lakeshore Development

Access:	extensive road access (Figure 4.1)
Crown Land:	approx. 65% of shoreline
Private Development:	2008 – 365 developed lots, 4 vacant, 3 resorts with marinas

4.3 Water Quality

Water Clarity:	3.8 m (2008), 3.8 m (2000), 5.5 (1973)
(Secchi depth)	
Water Colour:	light yellow
Alkalinity:	13.7 mg/L – Level 3 moderate sensitivity (MOE, 1989)
pH:	7.1 (2000), 6.5 (1973)
Total Phosphorus:	13 µg/L (Table 4.1)
	MOE Lake Partner Program – Spring Sampling
	9.4 (2004), 8.5 (2006)
Conductivity:	46 µS/cm (Table 3.1)
Thermal Profile:	Figure 4.3
Dissolved Oxygen:	Figure 4.3
Sonar Transect:	Figure 4.3

Table 4.1 Healey Lake Water Quality, 9 September 2008 (Sampling Stations in Figure 4.1)

Sampling Station	Secchi Depth (m)	Water Conductivity (µS/cm)	Total (µg/L) Phosphorus
1	3.8	46	13
1 (18 m depth)		46	25 and 31
2	3.8	36	12
2 (20 m depth)		37	18 and 20
3	4.2	33	6
4	3.3	37	10
5	1.4	30	15
6	3.3	37	10

4.4 Biological Features

Fish Species:
Largemouth Bass
Smallmouth Bass
Northern Pike
Yellow Perch
Black Crappie
Cisco
White Sucker
Brown Bullhead
Rock Bass
Pumpkinseed
Forage Species (minnows, shiners, darters, etc.)

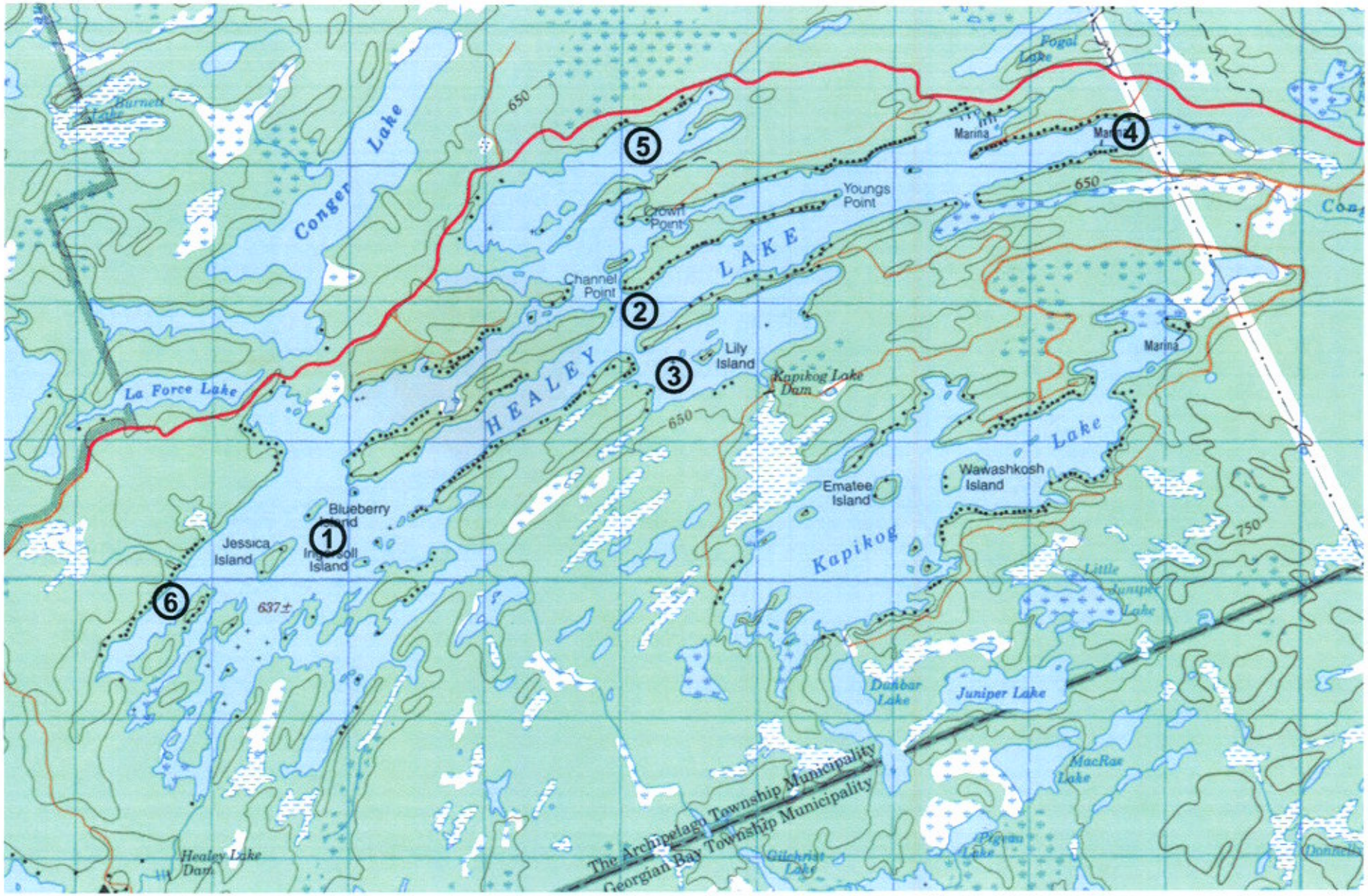
Information on fish population and management programs for Healey Lake are found in the following reports:

Paus, R.M. 1983. 1983 Inland lake fishery assessment program: Healey Lake. 49 p.

MNR. 1973. Raw Creel Data (Winter, 1973).

MNR. 1973, 1974, 1977. Intensive Creel Survey (Summer).

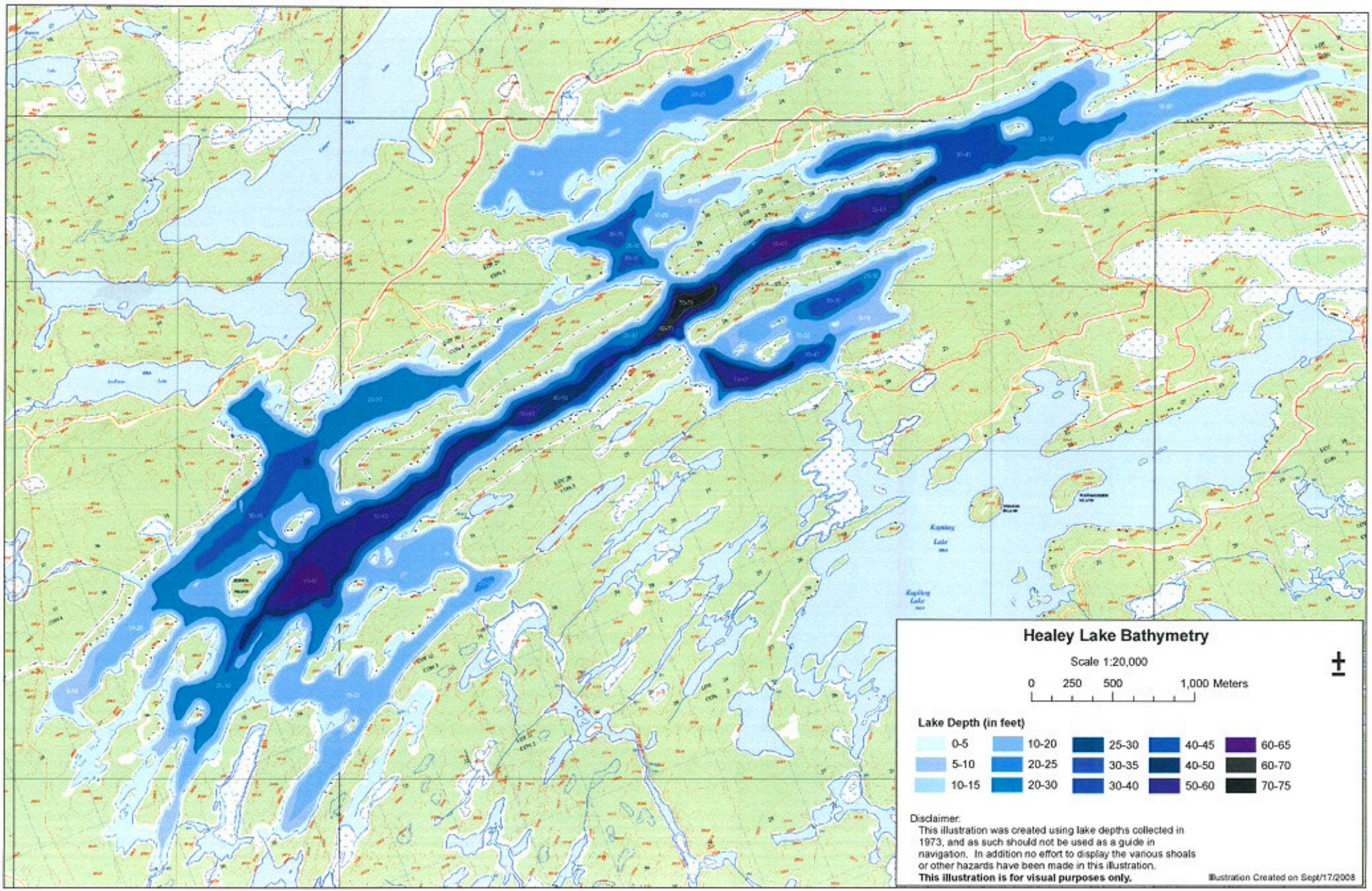
Lee, T. 1973. Interpretation of Limnological Data collected on Healey, LaForce and Conger Lake.



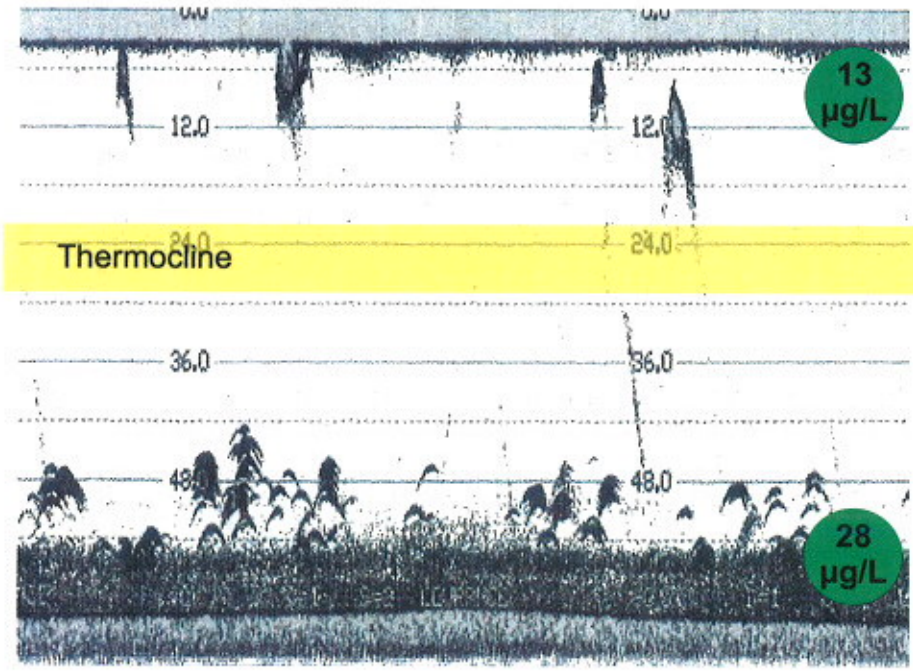
① Water quality sampling stations

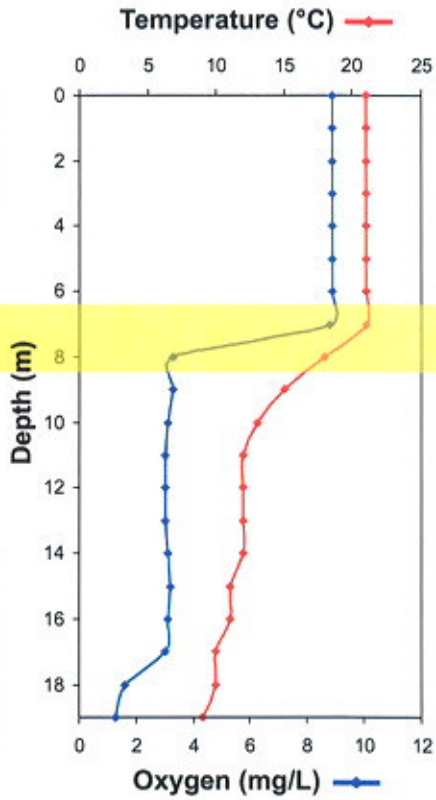
Healey Lake

Figure 4.1	December 2008

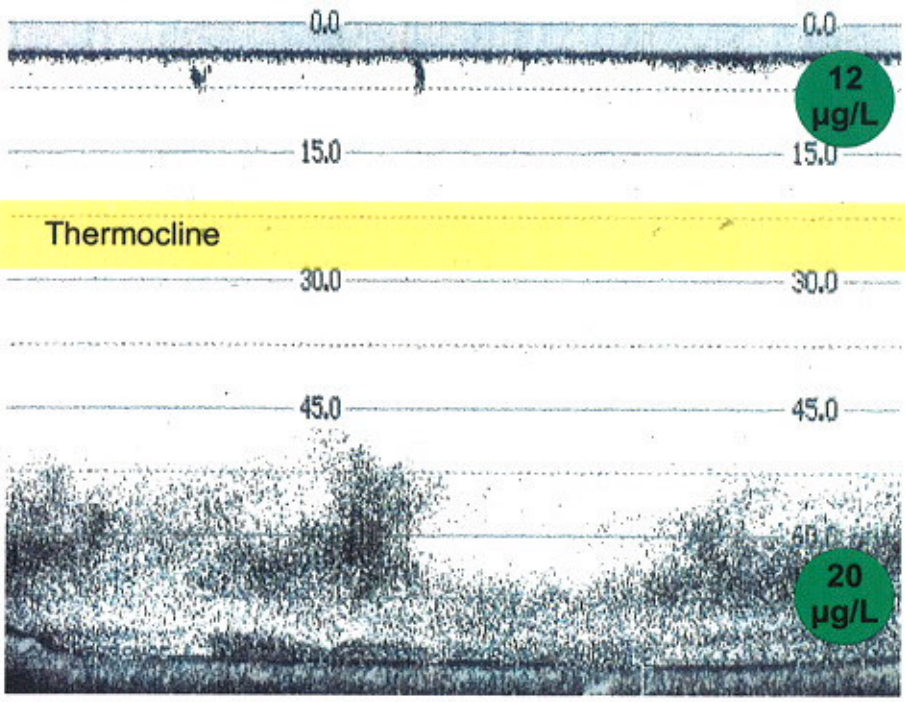

Healey Lake Bathymetry
Scale 1:20,000
0 250 500 1,000 Meters
Lake Depth (in feet)
0-5
5-10
10-15
10-20
20-25
20-30
25-30
30-35
30-40
40-45
40-50
50-60
60-65
60-70
70-75
Disclaimer:
This illustration was created using lake depths collected in 1973, and as such should not be used as a guide in navigation. In addition no effort to display the various shoals or other hazards have been made in this illustration.
This illustration is for visual purposes only.
Illustration Created on Sept/17/2008

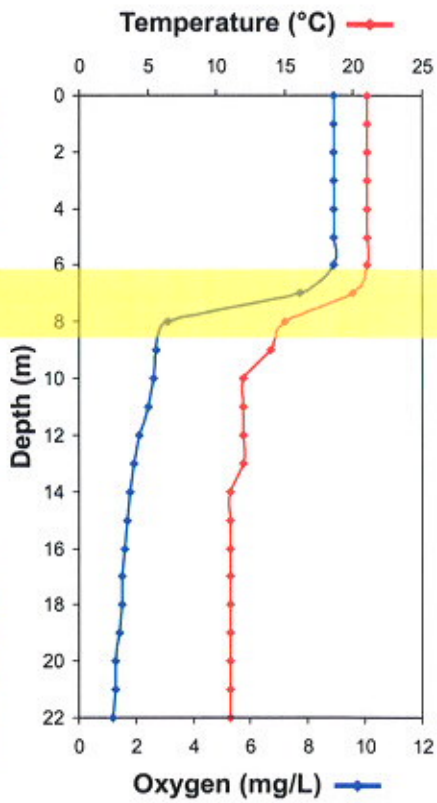
Healey Lake Station 1 - 09 Sep 2008





Healey Lake Station 2 - 09 Sep 2008

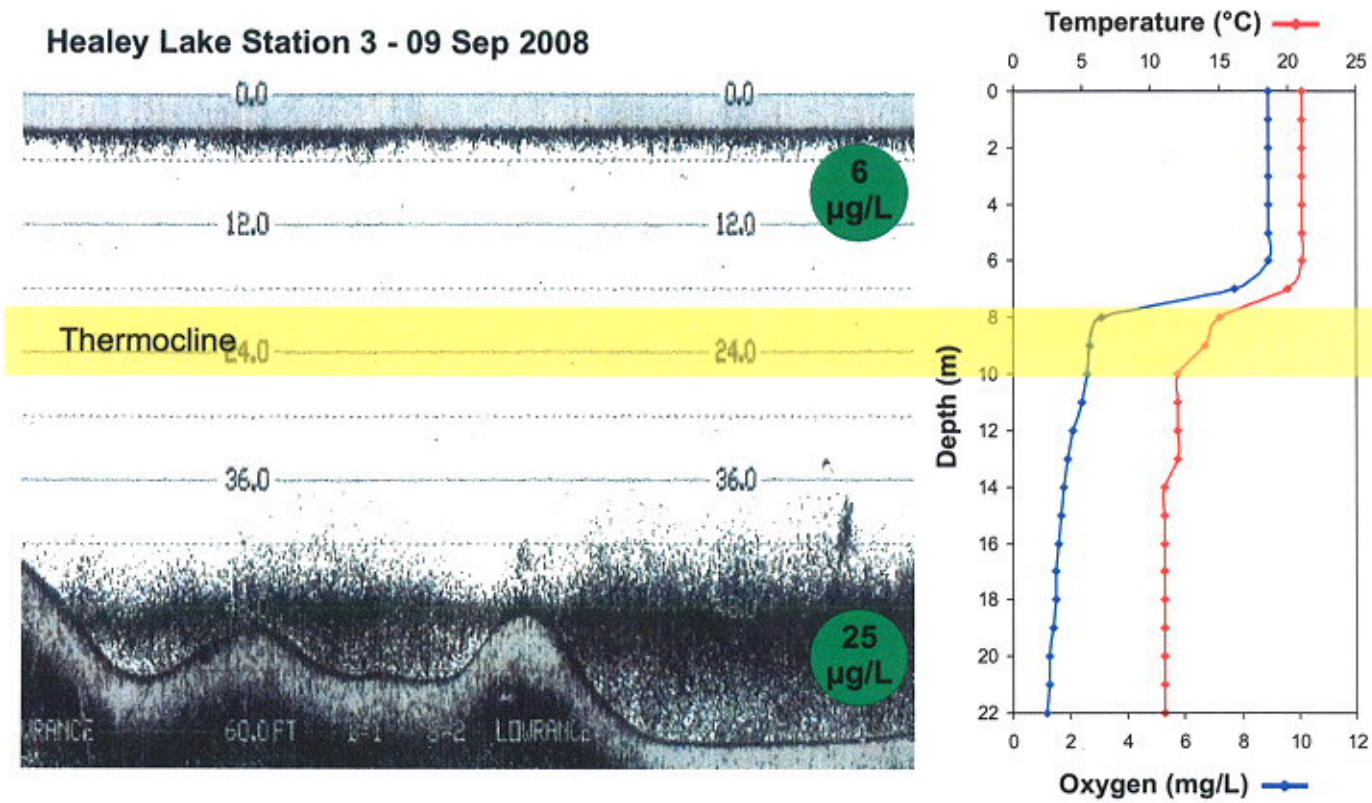




Sonar Transects and Temperature-Dissolved Oxygen Profiles

Figure 4.3	December 2008

Total Phosphorus



Sonar Transects and Temperature-Dissolved Oxygen Profiles

Figure 4.3	December 2008

Total Phosphorus

4.5 Water Quality and Ecological Overview

Healey Lake is a moderate-size, moderately-deep **headwater lake** with several small localized tributary inflows. This includes the drainage from Kapikog Lake into Healey Lake. Figures 1.1, 4.1 and 4.2 illustrate many of the topographic features of Healey Lake.

Healey Lake is **moderately-deep** with an average depth of 6 m and a maximum depth of 23 m. The lake has a relatively low water volume to shoreline perimeter ratio and low water surface area to shoreline perimeter ratio. This is largely due to its irregular, elongated shape with numerous islands and bays.

The low total dissolved solids levels, low to moderate total phosphorus levels, and fair to good water clarity would suggest that Healey Lake is **oligotrophic** (low levels of biological productivity), but tending to mesotrophic. The fact that there is a high degree of oxygen depletion below the thermocline by late summer suggests sufficient nutrient loading to cause this effect (Figure 4.3). This may be a result of the high level of shoreline development on the lake over the past four decades (43 cottages in 1955, 324 cottages and 3 marinas by 1973, 365 cottages by 2008). Earlier temperature and oxygen data (prior to 2000) are not available. However, the presence of a population of cisco (lake herring), a coldwater species, suggests that coldwater fish habitat with higher dissolved oxygen levels may have occurred in the past. These fish are now confined to the deeper basin at Station 1 where dissolved oxygen conditions are marginal at 3 mg/l (ppm) below the thermocline. These fish are absent from the deep basins at Stations 2 and 3 because of low oxygen levels (Figure 4.3).

Water quality is good with a near neutral pH (7.1), low but likely adequate alkalinity, very low total dissolved solids, and good water clarity (3.8 m transparency). Water conductivity measurements indicate a lower degree of water mixing between the various bays and arms of Healey lake, as might be expected given the complex nature of this lake basin (Figure 4.1) and its lack of a major tributary system flowing through it. The northern bay of Healey Lake is most isolated from the remainder of the lake (Station 5) and appears to have some different water chemistry features. At 30 µS/cm water conductivity (Table 4.1), this is the softest water in the lake. It is also much more stained in colour (dark brown), has a reduced water clarity (1.4 m), and a higher phosphorus level (15). These all suggest a strong influence from local acid bog drainage to this bay and reduced mixing with the rest of Healey Lake.

Total phosphorus levels in surface waters averaged around or slightly above 10 in Healey Lake by late summer. This is tending toward the mesotrophic level and is likely higher than would be expected as a natural background condition. Some of this phosphorus appears to be originating from deep basin releases due to the anoxic conditions found here. All three basins (Stations 1, 2 and 3) had low dissolved oxygen and higher phosphorus levels (28, 20 and 25, respectively). This is illustrated in Figure 4.3. All three basins also had hydrogen sulphide (H_2S) gas bubbles in these deeper waters, as is indicated by the black stippling of

the water column near the bottom on the sonar charts in Figure 4.3. See Section 1.2 for assistance in interpreting these results.

Several **tributary inflows** were found to have pH levels of 5.5 to 6.1, with Kapikog Lake outflows at 6.5. This is typical of localized drainage from small lakes, beaver ponds and acidic bogs on the granite bedrock of the Canadian shield. Healey Lake and Kapikog Lake lie within a geological zone called the Moon River synform. If viewed on an aerial photograph or satellite image, the synform shows as a circular swirl just to the north of the Moon River between Georgian Bay and Lake Joseph (see Figure 1.1). The semi-circular shape of Healey Lake is part of the synform structure. The synform consists largely of a type of granite called alaskite. This granite is of volcanic origin, pink in colour because of its high content of quartz and feldspar, and very hard and weather-resistant. Because of this underlying geology, surface waters in this region tend to be very acidic with little natural buffering capacity. Some small lakes to the south of Healey Lake and Kapikog Lake are so acidic that they support little fish life. Fortunately, Healey Lake appears to have adequate natural buffering capacity to at least partially neutralize these acidic inflows. Nevertheless, Healey Lake may be vulnerable to longer-termed acidification stresses.

Healey Lake is deep enough in its three basins to be **thermally stratified** through the summer but exhibits a high degree of oxygen depletion below the thermocline by late summer (Figure 4.3). When measured in early September of 2008, surface waters were 21° C, a moderately-sharp thermocline (zone of rapid temperature change) occurred at 7 to 8 m depth, and water temperatures below 10 m were 10 to 12 °C. Dissolved oxygen levels fell from 8.9 ppm above the thermocline to 3 ppm or lower below it. Oxygen levels below 3 to 4 ppm will not support coldwater fish species such as lake trout, whitefish and cisco.

Healey Lake has a good diversity of **warmwater fish species** but only a small population of cisco representing the coldwater fish community. The warmwater fish community is quite diverse, including populations of smallmouth and largemouth bass, northern pike, white sucker, yellow perch, rock bass, pumpkinseed (sunfish) and brown bullhead (catfish). A remnant population of cisco was found in the deeper basin at Station 1 where dissolved oxygen conditions were marginal at 3 mg/L (see sonar charts in Figure 4.3). The deep basins at Stations 2 and 3 also appear to have suitable coldwater habitat for cisco but have oxygen levels which are too low to support this species (below 2 mg/L). Any further reduction of late summer dissolved oxygen in Basin 1 will likely result in the elimination of this fish species from Healey Lake. As discussed in Section 1.2, the presence and condition of this cold water fish species can be a good biological indicator of overall lake health and water quality.

Although the fish population is quite diverse for a moderate-sized headwater lake, it is important to recognize that natural **biological productivity** in Healey lake is comparatively low, meaning that fish populations must be managed carefully and conservatively to avoid levels of exploitation that exceed the natural biological capacity of the lake. Without this, Healey Lake fish stocks are highly vulnerable to overfishing because of the lake's road accessibility and considerable shoreline development (numbers of anglers resident on the

lake or having ready access to it). The comparative abundance of perch, rock bass, pumpkinseed, white sucker and bullheads suggests that the large predator species (bass and pike) may be excessively depleted, shifting the normal equilibrium which occurs between these species. Early reports on Healey Lake suggest that game fish were very abundant until an access road was built in 1949, after which fishing quality declined as cottage development density increased. Unfortunately, fishery management and catch regulations on Healey Lake were not adjusted to account for this increased fishing pressure. Fishery regulation specific to the needs of Healey Lake should be considered.

The existing level of **lakeshore development** and associated human activity on Healey Lake could be considered high for a moderate-sized, oligotrophic headwater lake on the Precambrian Shield. Environmentally sensitive planning in the past would likely have limited shoreline development well below that which currently exists on Healey Lake. As discussed above, the depletion of dissolved oxygen below the thermocline by late summer may be related to nutrient loadings from shoreline development.

There are over 400 residences on Healey Lake. These residences occur in highest density along the northern, eastern and southern shores of the lake where access roads follow the shoreline. There are only limited areas on the lake which retain a totally natural shoreline landscape without human alteration.

Healey Lake has easy road accessibility from Highway 400 with local access roads now circling much of the eastern, northern and southern sides of the lake. Only the extreme southwestern shore of the lake remains roadless.

4.6 Recommendations

Water Quality: Water quality in Healey Lake should be protected as a priority, both because of its relatively high natural quality for recreational use and because of its potential sensitivity to acidification within the watershed and possible early stage eutrophication effects. Long-term monitoring of nutrients levels, water clarity (Secchi disc depth), dissolved oxygen, pH and bacterial levels should be continued. A water quality survey similar to that carried out in 2008 should be repeated at least every 5 years.

Fishery Resources: As discussed in Section 3.0, natural biological productivity in Healey Lake is low (oligotrophic). This, combined with the easy road accessibility and considerable shoreline development, makes Healey Lake a very good candidate for special fishing regulations to protect fish stocks and enhance fishing quality. This could include reduced catch limits, maximum or slot size limits, the possible use of spawning sanctuaries and open season changes to protect critical brood stock or excessively vulnerable fish populations. These types of special fishing regulations have proven very successful at protecting fish stocks and improving fishing quality in many similar circumstances. In Healey Lake, it should also improve the species population equilibrium, which requires healthy populations of the larger predator species. The population of cisco in this lake could be used as a biological indicator of environmental conditions, since any additional

nutrient loading (eutrophication) would likely further deplete dissolved oxygen levels in deeper portions of the lake and have a negative effect on cisco population levels and ultimate survival in Healey Lake.

Lakeshore Development: It is strongly recommended that no further building lots be created on Healey Lake. As discussed in Section 4.5, this lake is already at or above the optimum shoreline development capacity if a broad spectrum of environmental factors is considered.

Shoreline development capacity should be determined based on a comprehensive long-term vision of the ecosystem, landscape and human environmental features to be protected on the lake. Those residing on the lake should be directly involved in developing this vision through the "lake plan" or "community plan" process now occurring on many lakes.

One of the other factors which should be considered on Healey Lake is the very high ratio of shoreline perimeter to either lake surface area or lake water volume. Lakes such as this are particularly vulnerable to excessive lakeshore development if only shoreline availability is considered rather than lake surface area and water volume. This is because water-based recreational activities such as boating, water-skiing and fishing must all be accommodated on the surface area of the lake, while the water volume in the lake is what is available to assimilate or dilute various discharges and contaminants related to shoreline development. This would include nutrient leaching from septic systems, fertilizer and pesticide runoff from lawns and gardens, gasoline and oil residues from two-cycle outboard motors, etc. A loss in aesthetic values of the lake environment due to excessive boating activity or noise levels is at risk on smaller surface area lakes with long narrow arms and bays, while a deterioration in water quality is likely for lakes with high shoreline development but comparatively small water volume.

As well, the extension of road access to presently inaccessible shorelines on this lake should be restricted to preserve the natural character and ecosystem features in these areas. Circling of the lake with roads inevitably leads to the undesirable linear urbanization of shorelines. In particular, a very high level of protection should be given to the several large wetlands on Healey Lake.

Lake Stewardship: Because of the high density of lakeshore development and sensitive nature of aquatic ecosystems in Healey Lake, all residents on the lake should practice a high level of lake stewardship on their properties, including a well-operating septic system, low water-use practices, maintenance of natural vegetation on the lake shores, restricted use of fertilizers and pesticides, and phasing out of two-cycle outboard motors for the much cleaner four-cycle engines.