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To: Bureau of Fisheries and Habitat Protection

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Subject: 2000 Lake Survey Summary - Imogene Lake, Vilas County
(T41N, R12E, sec. 31,32; WBIC - 586800)
Headwaters (Upper Wisconsin) GMU

BACKGROUND INFORMATION

Imogene Lake is a 66-acre, softwater seepage lake in eastern Vilas County. It is within the Eagle River/Florence District of the Chequamegon/Nicolet National Forest and is located about 12 miles northeast of the city of Eagle River. The lake has a maximum depth of 41 feet and a shoreline length of 1.4 miles, of which the US Forest Service owns 0.5 mile (36%). Public access is provided by a walk-in trail on the southwest side of the lake, off of Forest Road 2492. The shoreline is predominantly upland (95%) and consists of mixed hardwood and conifers (there were small sections of marsh/shrubs located on the southeast and west ends of the lake). Littoral bottom types are mainly sand (50%), gravel (20%), silt/muck (10%), rubble (10%), and boulder (10%). Submergent aquatic vegetation was sparse and shoreline emergent vegetation was moderate, with sedges, cattail, and burreed being most common. Water in the lake was clear, with a pH of 5.8, a total alkalinity of 21.6 mg/L, and a secchi reading of 10 feet (August 2000).

Past fisheries management activities have included the stocking of walleye and largemouth bass from 1934 to 1957, and fishery investigations in 1980 and 1998. The fishery survey in 1980 was conducted in mid-May and consisted of 18 fyke-net lifts. The main fish species found were largemouth bass, walleye, yellow perch, and pumpkinseed. Smallmouth bass and bluegill were not captured but were "known to be present". The management report concluded that "growth and condition was good for all species". "Natural reproduction appeared to be sustaining the population although predators may be dominating the panfish species." It was recommended that the lake be managed for largemouth bass, smallmouth bass, and panfish. No stocking was suggested, but the possibility of a two-story fishery was mentioned. Additional cover in the form of 10 tree drops and 10 log crib shelters was also proposed. The development of a carry-in access was recommended, followed by additional investigation of the water quality and fishery to formulate a management scheme for the lake. No management was to be considered until the access was developed. It was not known if any of these recommendations were pursued or completed.

The 1998 fishery survey occurred over a 2-day period in mid-July and utilized small-mesh fyke nets and shoreline electrofishing with a backpack shocker unit. The field data indicated that the

main fish species were yellow perch, pumpkinseed, largemouth bass, smallmouth bass, and mudminnow.

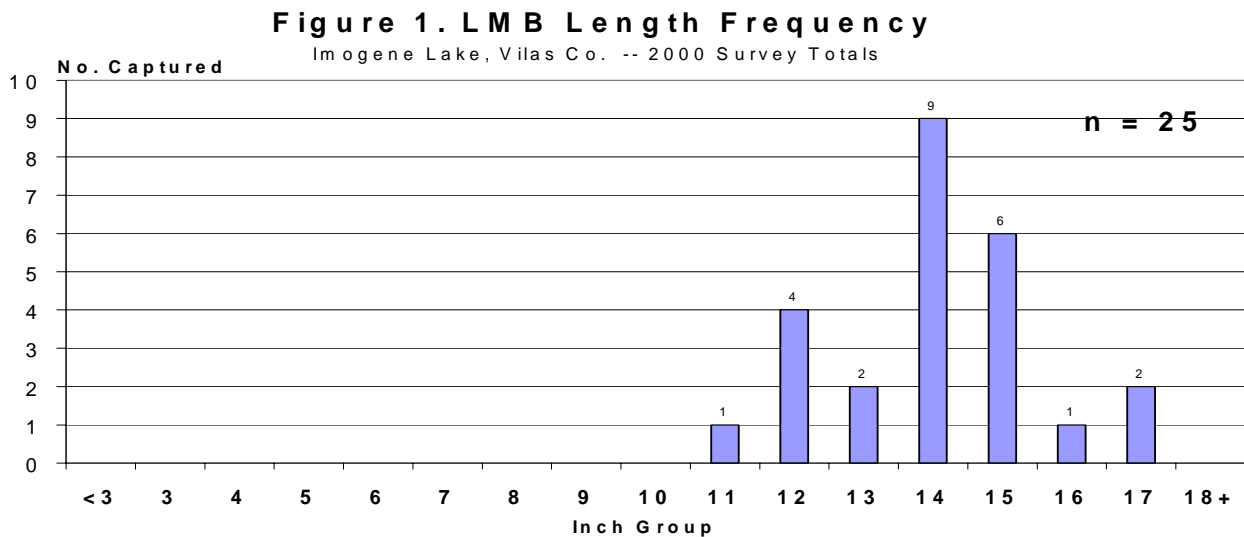
No management recommendations resulted from this survey.

The 2000 fishery survey on Imogene Lake was conducted through the Chequamegon/Nicolet National Forest contract fisheries program. A full survey incorporating spring and fall shocker runs and a June fyke-net effort was planned, with access being gained through private land on the east side of the lake. However, the June netting and fall shocker run had to be canceled due to the difficult access through this private land (we buried the truck in mud up to its axles after the spring shocker run). As such, data gathering was limited to the spring shocker run in May, 3 angler-hours of effort in June, and visual/habitat observations in August of 2000. In addition, dissolved oxygen (DO) levels and other water quality parameters were measured in August 2000 and March of 2001.

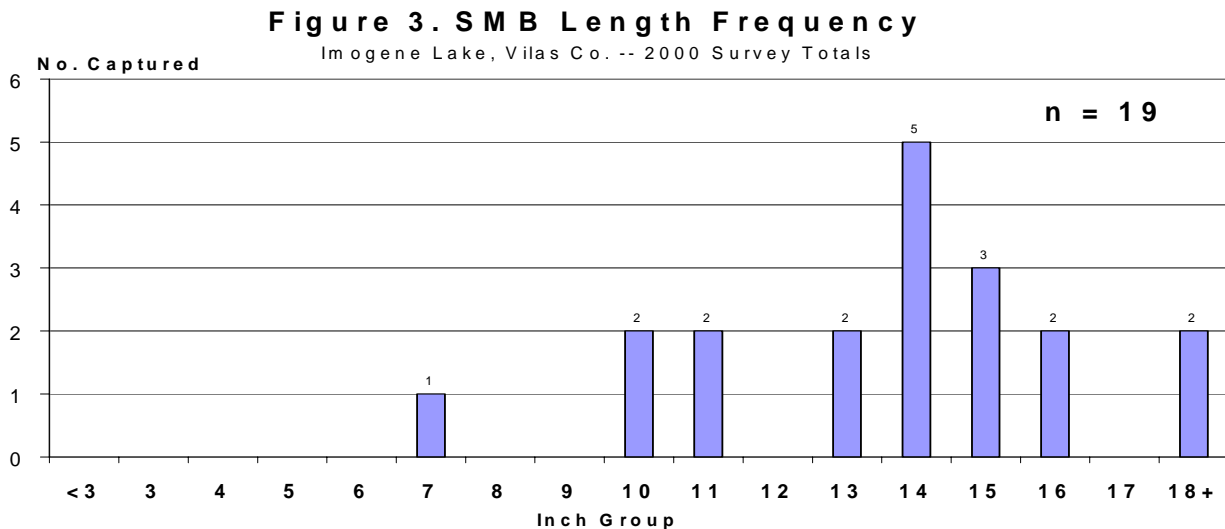
RESULTS

Only 4 fish species were found during the 2000 survey on Imogene Lake and included largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), yellow perch (*Perca flavescens*), and pumpkinseed (*Lepomis gibbosus*).

Largemouth bass were the most numerous gamefish found with a total of 25 bass collected during the 2000 survey. They ranged in length from 11.9 inches to 17.8 inches, with most in the 12 to 15 inch size (Figure 1). Age and growth analysis indicated near average growth for Wisconsin (Figure 2), with largemouth reaching a mean length of 14.6 inches after 6 summers of growth. Natural reproduction and recruitment were low for the past 3 years as no fish less than 11 inches or 4 years of age were sampled. Young-of-the-year largemouth were observed along shore during August of 2000, but survival and recruitment to larger sizes was unknown.



Smallmouth bass were the other major predator species and a total of 19 fish were measured during the 2000 survey. The smallmouth ranged from 7.5 to 18.7 inches in length, with most in the 13 to 16 inch size (Figure 3). Growth rates were above average for the first 5 years of life and slowed to average growth thereafter (Figure 4). Smallmouth reached a mean length of 10.6 inches after 3 summers of growth and increased to 15.1 inches after 6 summers. The largest fish was 18.8 inches long and was age 9. Current year natural reproduction was not documented and recruitment to larger size classes was erratic for the last 5 years.



The panfishery in Imogene Lake in 2000 consisted primarily of yellow perch, with a smaller population of pumpkinseed also present. Spring electrofishing yielded 67 perch, with a length range of 2.1 to 8.1 inches. The majority of the fish were in the 2 to 3 inch size range, with just 1 perch measuring greater than 7 inches. Age and growth analysis indicated very slow growth for Wisconsin (Figure 5), with perch reaching a mean length of just 5.1 inches after 4 summers of growth

A total of 16 pumpkinseed were sampled during the spring shocker run in May 2000. They had a length range of 3.0 to 7.7 inches and a PSD₆ of 31%. Growth rates were near average for the first 3 years of life and above average thereafter (Figure 6). Pumpkinseed achieved a mean length of 4.6 inches after 3 summers of growth and improved to 7.1 inches after 5 summers. Natural reproduction was erratic and several year classes were missing or lightly represented in the age and growth data.

Winter DO monitoring indicated adequate oxygen (> 2 mg/l) to a depth of 10 feet during the late-winter period of 2001 (Figure 7). The summer oxygen/temperature profile showed that the lake did stratify, with the thermocline occurring at the 10 to 14 foot depth (Figure 8). Conditions were anaerobic (no oxygen) below the 14 foot depth in early August 2000.

SUMMARY/DISCUSSION

The 2000 survey on Imogene Lake found a medium-quality fishery of largemouth bass, smallmouth bass, yellow perch and pumpkinseed. The largemouth and smallmouth bass exhibited decent growth rates and a good proportion exceeded the 12-inch 'quality' size. However, natural reproduction and recruitment were erratic for both species, as few bass less than 10 inches in length were found.

Yellow perch were the predominant panfish and the population was considered abundant and slow-growing, with few fish reaching a quality size (> 7 inches). Pumpkinseed were low to moderate density, but fish achieved good growth rates and good numbers of quality size fish (> 6 inches) were available. A lack of shallow-water woody cover was evident.

The low natural reproduction and recruitment for both bass species was cause for concern. This may be the result of several related factors, which may include the low amount of shallow-water cover and the abundant, slow-growing perch population. With limited nursery and hiding cover for small bass, their vulnerability to predation was undoubtedly high. The perch likely capitalized on this vulnerability and utilized small bass as a food source. Add in some heavy competition for the available food, and this would explain the low recruitment of bass to larger sizes. Then, with limited numbers of medium-size bass (8 to 12 inches in length), return predation on the small perch was insufficient to keep the population under control. If correct, this produced a virtual stalemate - an abundant, slow-growing perch population that was basically caused and limited by itself.

There are two main options for rectifying this situation. The direct approach would involve the stocking of large-size bass fingerling to increase recruitment. The other option is more indirect but gets at the root of the problem - the lack of shallow-water woody structure. By increasing the amount of nursery/hiding cover, natural reproduction and recruitment of bass should improve and result in more medium-size fish. This would increase predation on the abundant perch and work toward establishing a well-balanced fishery. The later approach is recommended and the installation of woody cover structures should be pursued. The cover structures should include shoreline tree drops, half-log cover structures, and traditional log-crib shelters.

MANAGEMENT RECOMMENDATIONS

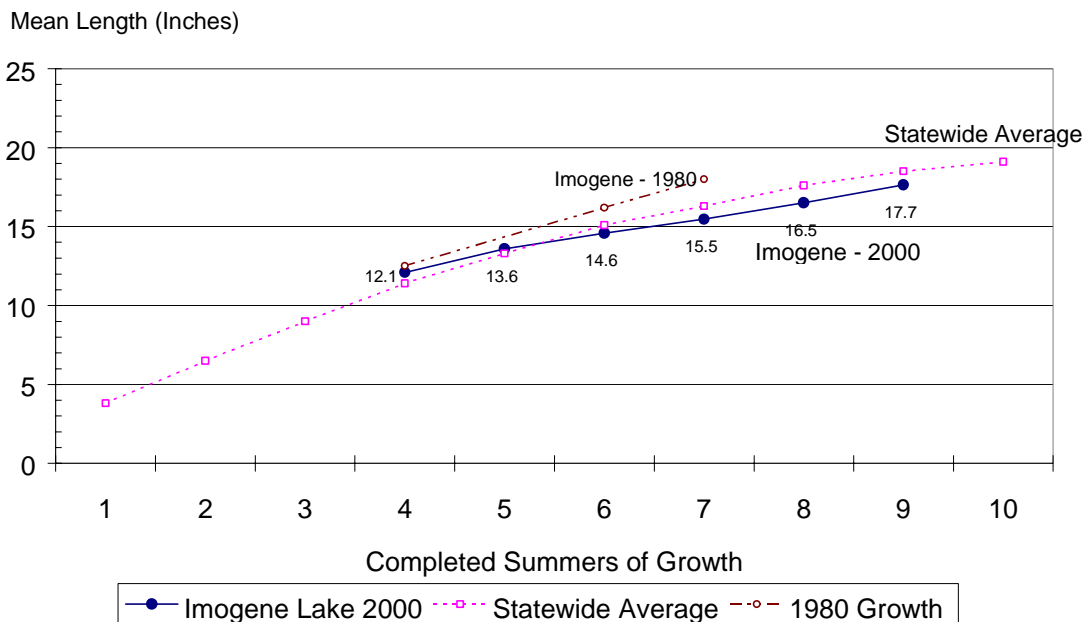
1. Manage Imogene Lake as a largemouth bass, smallmouth bass, and panfish fishery. No supplemental stocking of any species is suggested at the present time. For this carry-in lake, the current harvest regulation for bass of a 14-inch minimum and 5 daily bag should be adequate to maintain and enhance the bass population, provided that woody cover structures are installed (see #3 below). Ideally, a reduced daily bag limit to 2 fish would seem more appropriate for bass in these small, softwater lakes. (However, any change should be delayed until the current harvest regulations are evaluated. The 14-inch minimum has only been in effect since June 1998 and fisheries are still responding to this change).
2. The panfish regulation of a 25 bag and no size limit was appropriate as well (although a 10 daily bag would be preferable on these small, softwater lakes).
3. Enhance shallow-water woody cover through the installation of shoreline tree drops and half-log structures. An initial goal of 40 tree drops and 30 half logs is suggested. The Forest or WDNR fish biologist should be consulted prior to selection and placement of these structures. In addition, log crib shelters in the deeper water areas would be beneficial to the fishery as well.
4. Maintain the wild nature of the lake by limiting any further shoreline development and by following the guidelines for riparian management zones as described in "Wisconsin's Forestry Best Management Practices for Water Quality" (PUB-FR-093 95).
5. The carry-in access was considered adequate for this small, lightly developed lake.

- Assess the status of the fishery on a periodic basis. A spring shocker run every 3 years would be ideal, but the difficult access may preclude this type of monitoring. An alternative would be an angling and observation trip every two years, with a focus on the presence/abundance of small bass (early to mid-August would be the optimum time). The USFS/WDNR contract fish program will incorporate this monitoring into their work plans.

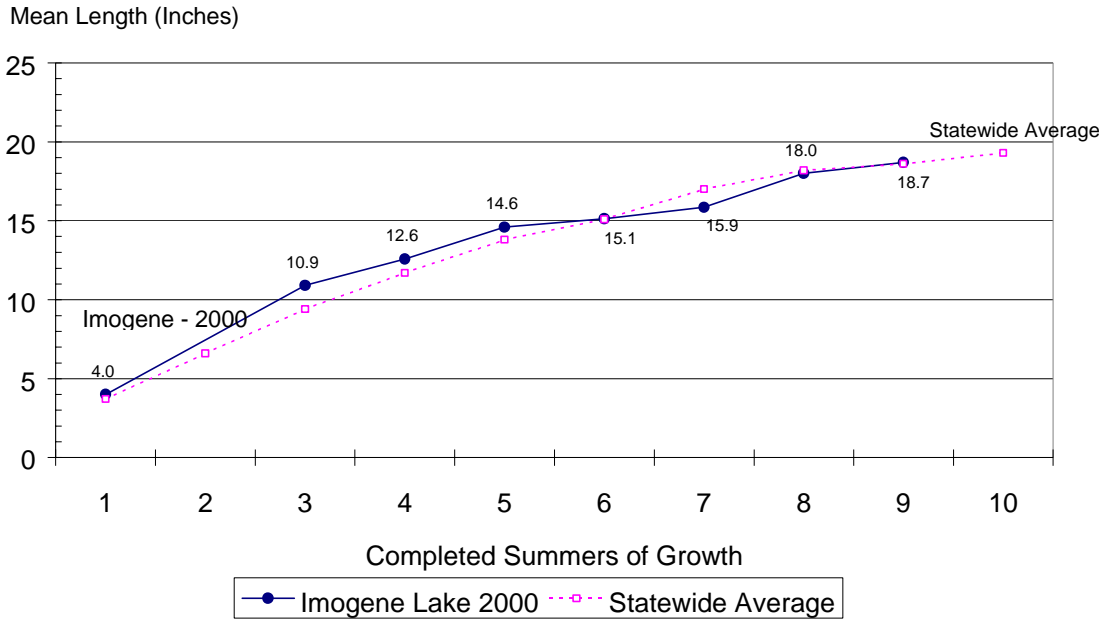
Imogene Lake, Vilas Co. 2000 Fish Survey Totals

Species	Spring BS	Summer Angling	August Obs.	Totals
Largemouth Bass Mode; Length range	24 11.5 - 17.9	1 13.2	yoy present	25
Smallmouth Bass Length range	13 10.0 - 18.7	6 11.0 - 16.4	1 7.5	20
Bluegill Mode; Length range				
Pumpkinseed Mode; Length range	16 3.0- 7.7			16
Yellow Perch Mode; Length range	67 3.2; 2.1 - 8.1		yoy present	67

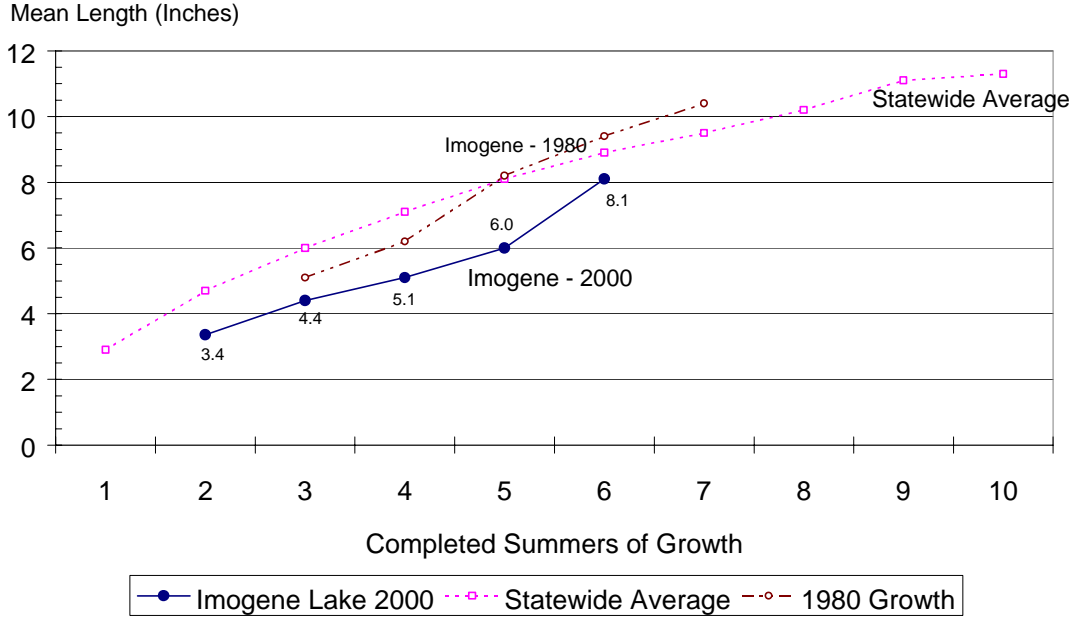
**Figure 2. Largemouth Bass Growth Rates
Imogene Lake, Vilas Co.**



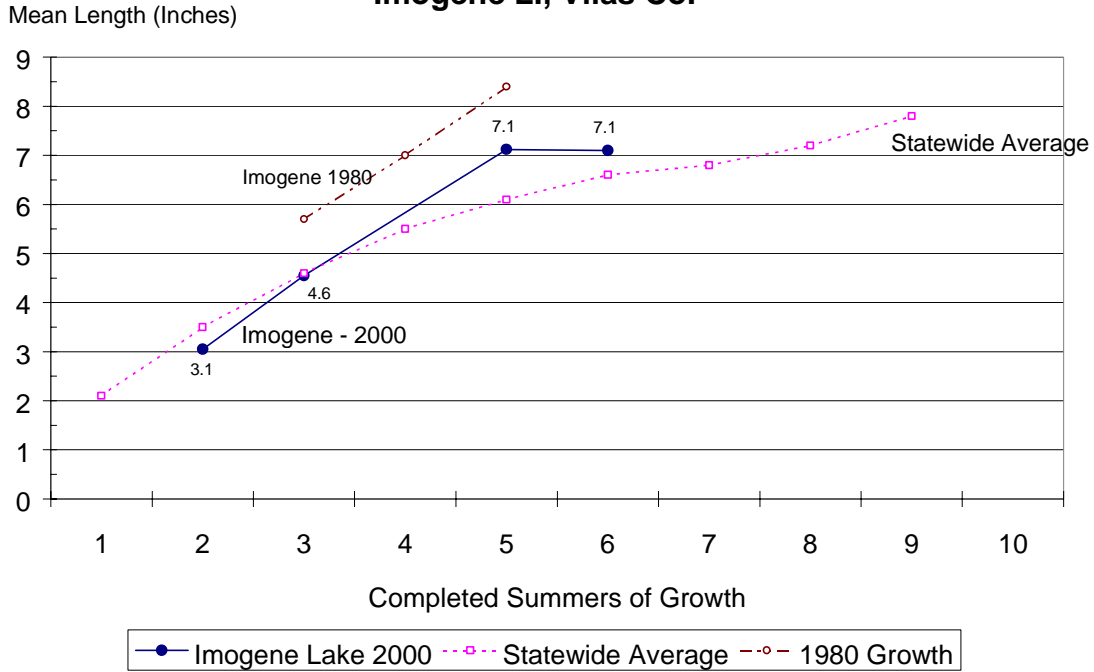
**Figure 4. Smallmouth Bass Growth Rates
Imogene Lake, Vilas Co.**



**Figure 5. Yellow Perch Growth Rates
Imogene Lake, Vilas Co.**



**Figure 6. Pumpkinseed Growth Rates
Imogene L., Vilas Co.**



**Figure 8. Summer DO and Temperature Profile
Imogene Lake, Vilas Co -- August 10, 2000**

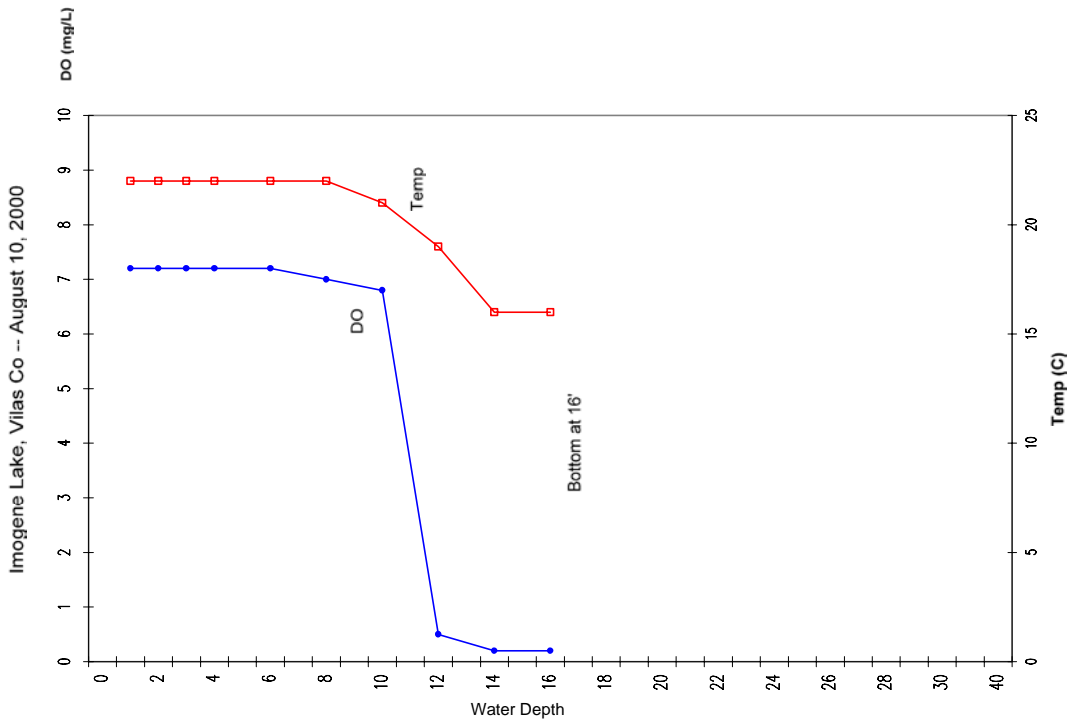


Figure 7. Winter DO and Temperature Profile

Imogene Lake, Vilas Co -- March 26, 2001

