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To: Bureau of Fisheries and Habitat Protection

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Subject: **2000 Lake Survey Summary - Ludington Lake, Forest County**
(T35N, R14E, sec. 32; WBIC - 191900)
Headwaters GMU

This report is submitted with the approval of Headwaters Fisheries Team Supervisor, Mike Vogelsang Jr.; and Regional Fisheries Specialist, Steve AveLallemant. The report was written and work supervised by Thomas (Skip) Sommerfeldt, Senior Fisheries Biologist under the Chequamegon and Nicolet National Forest contract fisheries program.

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Upper Chippewa Fisheries Team Supervisor, Dave Neuswanger Date

APPROVED BY:

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Bureau of Fisheries and Habitat Protection Date

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BACKGROUND INFORMATION

Ludington Lake is a 30-acre, softwater seepage lake in south central Forest County. The lake has a maximum depth of 31 feet and a shoreline length of 0.88 miles, of which the U.S. Forest Service owns 0.66 miles (75%). Water in the lake is clear, soft (total alkalinity of 0.4 ueq/l), and acidic (pH of 5.56). Shoreline vegetation was mainly upland hardwoods and conifers, with swamp conifers and bog/shrub marsh being predominant along the west shore. Littoral bottom types consisted of muck (60%), sand (30%), gravel (4%), rubble (3%), and boulders (3%). Aquatic vegetation (mainly yellow water lily) was common throughout the littoral area. Public access is provided by a gravel boat ramp on the north shore, where a 3-unit campground is also maintained by the USFS. One private dwelling is located on the northeast side of the lake.

Past fisheries management activities have included the periodic stocking of largemouth bass from 1937 through 1952, and fishery surveys in 1940, 1979, and 1983. The 1940 survey revealed a fish population consisting of black crappie, pumpkinseed, bluegill, rock bass, yellow perch, and smallmouth bass. Growth of all species was reported as 'good'. The 1979 survey found the primary fish species were largemouth bass, bluegill, black crappie, yellow perch, and pumpkinseed. Growth and condition of all species was considered good. The species composition had changed since the 1940 survey - bluegill had become the dominant panfish instead of sunfish, and largemouth bass had replaced smallmouth bass as the main predator. The lake was a popular fishery and appeared to receive considerable fishing pressure. The 1979 report concluded that Ludington Lake supported a diverse and abundant fish population with an acceptable predator/prey balance. No management recommendations were offered from the 1979 survey.

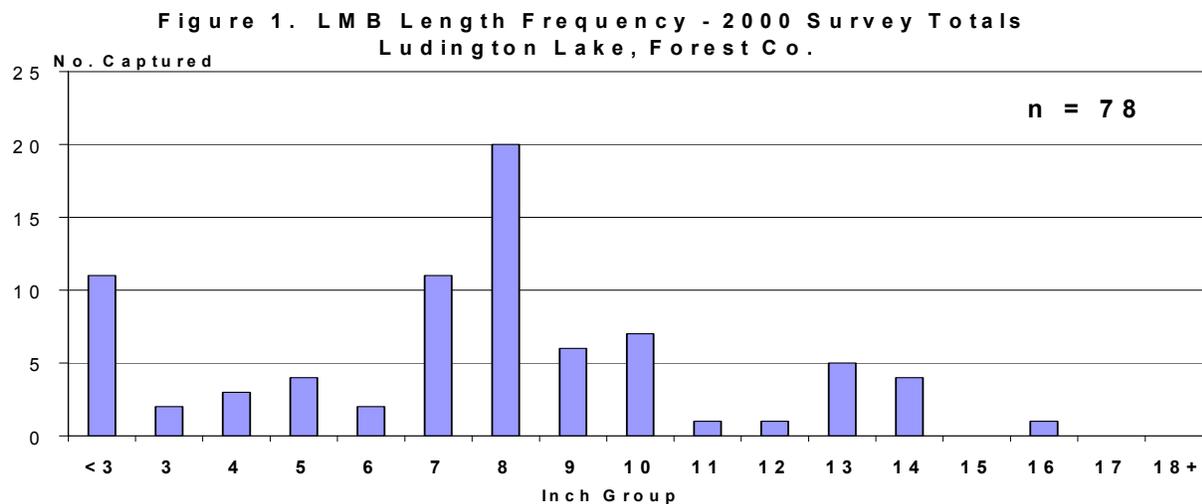
The objective of the 1983 survey was to study the utilization of log structures by fish and anglers in Ludington Lake. It was one of 6 bass/panfish seepage lakes involved in an underwater structure study in the Nicolet National Forest in 1982-83. The lake received 6 log structures in the winter of 1981-82. Subsequent investigations included SCUBA observations during 1982 and 1983, electrofishing runs on May 25 and June 7 1983, and a volunteer creel survey from May to October, 1983. The report concluded that Ludington Lake was a very popular and productive fishery. It had the highest angling pressure of the 6 study lakes and still produced one of the highest sampling catch per effort of largemouth bass. The panfish population was also good, consisting of bluegill, black crappie, and yellow perch. Size range, age, growth, and condition of the fish population was good to excellent, and a satisfactory predator-prey balance was present. The report surmised that the log structures had increased survival rates of the bluegill and largemouth bass, and provided higher numbers available to the angler. Ludington had an excellent catch rate per hour with almost half of the fish caught over structure. Other recommended activities were the installation of tree drops in 1983 and the addition of new brush to the log structures after 5 years (1989) to maintain the effectiveness of the structures. It was unknown if these activities were completed. Six additional log cribs shelters were installed in April 1999 by the US Forest Service (see lake map).

The 2000 fishery survey on Ludington Lake was conducted through the Chequamegon/Nicolet National Forest contract fisheries program. It was designed to inventory the fish population and identify any management problems. To gather information on the fishery, the survey utilized electrofishing runs in May and September and an early summer fyke-net effort in June 2000. In addition, dissolved oxygen (DO) levels and other water quality parameters were measured in August 2000 and March 2001 (ice cover).

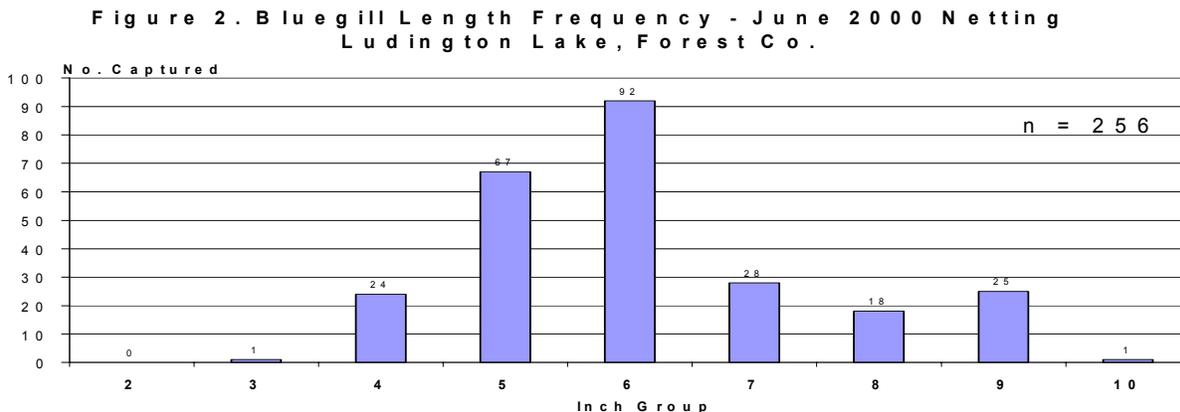
RESULTS

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

A total of 78 largemouth bass were sampled during the 2000 survey. They ranged in length from 1.9 to 16.9 inches, with the majority of fish in the 7 to 10 inch size (Figure 1). Age and growth analysis indicated near average growth for Wisconsin (Figure 3). Bass had a mean length of 9.1 inches after 3 summers of growth and improved to 13.9 inches after 6 summers. Natural reproduction was considered good and recruitment to the 14-inch size was fair. There did appear to be a size truncation near the 14-inch legal length limit, as only 1 bass greater than 15 inches was sampled.



The panfishery in Ludington Lake was comprised of bluegill, yellow perch and pumpkinseed. Bluegill were the most numerous species sampled with 302 fish being measured. They ranged from 1.0 to 10.3 inches in length, with a good distribution of fish within that size range. The June fyke-net effort produced the best sample of bluegill (Figure 2), yielding a catch-per-effort (CPE) of 28 fish per lift and a PSD₆ of 64%. Age and growth analysis indicated above average growth for Wisconsin (Figure 4), with bluegill reaching a mean length of 7.9 inches after 4 summers of growth.



Yellow perch were maintaining a significant population in the lake as the spring and fall electrofishing runs produced CPEs ranging from 300 to 400 fish per hour. A total of 119 perch were sampled during the survey, ranging from 1.9 to 8.2 inches in length. However, most of the perch that were collected were in the 2 to 3 inch size. Age and growth analysis indicated below average growth for Wisconsin (Figure 5), with perch achieving a mean length of just 6.3 inches after 6 summers of growth.

Pumpkinseed were the least abundant of the panfish species, with a total of 85 fish measured during the survey. They had a length range of 3.1 to 8.1 inches, with the majority being 5 to 6 inches long. No age and growth data were collected from the pumpkinseed.

Winter DO monitoring indicated adequate oxygen (> 2 mg/l) to a depth of 20 feet during the late-winter period of 2001. The summer oxygen/temperature profile showed that the lake did stratify, with the thermocline occurring at the 14 to 18 foot depth. Conditions were anaerobic (no oxygen) below the 22-foot depth in August 2000.

SUMMARY/DISCUSSION

The 2000 survey on Ludington Lake found a fairly well-balanced fishery in this small, softwater seepage lake. Largemouth bass were the primary gamefish and were maintaining a moderate density population. Natural reproduction and recruitment were fair to good, but the size structure appeared to be truncated just above the 14-inch length limit. Bluegill and yellow perch were the predominant panfish, with a lower abundance of pumpkinseed. Bluegill were maintaining a high-quality population, with above average growth rates and an excellent size structure. Yellow perch were considered moderate to high density, with most fish in the 2 to 4 inch size and experiencing below average growth. Pumpkinseed were low to moderate in density and the population had a good size structure.

The fishery in Ludington Lake had not changed a whole lot in the last 20 years. Species composition remained essentially the same, with the abundance of the various species showing some variation over time (Tables 1 & 2). Largemouth bass had increased in abundance since 1983, with more fish in the 7 to 10 inch size found in 2000. Bluegill abundance and size structure had decreased since 1979, but growth rates had improved and there were still good numbers of quality-size fish available to the angler. Yellow perch density was considered moderate to high in 2000 and abundance was believed to have increased. While catch statistics were not comparable for perch between the surveys, the increase was inferred from the high electrofishing CPE's (especially of 2 to 4 inch fish) and the decreased growth rates. Black crappie were not found in the 2000 survey.

Ludington Lake should be managed primarily as a largemouth bass and panfish fishery. The main management goal should be to maintain a balanced predator-prey relationship, which should ensure continued quality angling opportunities. While the size structure of the bass population appeared truncated near the 14-inch size, a more restrictive length regulation was not warranted at this time. The bass population was sustaining itself, there was an adequate abundance of adults and juvenile fish, and they were providing sufficient predatory control over the panfish populations (and if it aint broke - don't fix it). For the panfish, the current harvest regulation of a 25 daily bag was considered adequate to maintain a quality fishery. The abundant and slow-growing yellow perch did warrant some concern and should be monitored in the future. However, it was believed that the

perch provided an important component in the lakes fishery, serving as a major forage item for the bass and larger panfish and acting as a predatory control on the small bluegill and pumpkinseed.

Shallow water woody structure was lacking and the installation of shoreline tree drops should be pursued. In addition, another 8 to 12 log crib shelters could be installed to provide more deep-water cover. These additional habitat improvements should further enhance the bass population and may eliminate the need for any restrictive regulations in the future. In addition, proper riparian management to ensure future natural tree-falls into the lake should be a management objective.

MANAGEMENT RECOMMENDATIONS

1. Manage Ludington Lake as a largemouth bass and panfish fishery. The fishery was considered fairly well balanced and no supplemental stocking of any species was needed at the present time.
2. 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 additional 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 most fish communities are still responding to this change). The panfish regulation of a 25 bag and no size limit was appropriate as well, though 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. An initial goal of 20 tree drops is suggested. The Forest or WDNR fish biologist should be consulted prior to selection and placement of the tree drops. In addition, another 8 to 12 log-crib shelters in the deeper water area would be beneficial to the bass population 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. Assess the status of the fishery on a periodic basis. A spring or fall shocker run every 3 years should be sufficient to keep abreast of the conditions in the lake. The USFS/WDNR contract fish program will incorporate this monitoring run into their work plans.

Ludington Lake, Forest Co.



Access Site



Nice Bluegill from June Netting



Table 1. Comparison of Spring Electrofishing Catch Statistics
2000 vs. 1983 - Ludington Lake, Forest Co.

	LMB	Bluegill	Y Perch	Pumpkinseed
May 9, 2000				
(0.3/0.3 hr.)				
CPE	70/hr	73/hr	~300/hr	70/hr
Size/PSDx	42%	5%	3%	14%
	(>12")	(>6")	(>7")	(>6")
May 25 & June 7, 1983				
(~1.8 hrs. - 4 circuits)				
CPE	26/hr	Not	Collected	>>>
Size/PSDx	59%			
	(>12")			
Abundance Trend	Inc.+	???	???	???
Size/Growth Trend	Same?	???	???	???

Table 2. Comparison of June Fyke-Net Catch Statistics
2000 vs. 1979 - Ludington Lake, Forest Co.

	LMB	Bluegill	Y Perch	Pumpkinseed
June 26 - 29, 2000				
(9 net days)				
CPE	2.7 /lift	28 /lift	0.1 /lift	6 /lift
Size/PSDx	0 of 24	64%	0%	70%
	(>12")	(>6")	(>7")	(>6")
June 26 - 28, 1979				
(12 net days)				
CPE	0.1 /lift	43 /lift	0.5 /lift	1.5 /lift
Size/PSDx	0 of 1	88%	5 of 6	50%
	(>12")	(>6")	(>7")	(>6")
**5 black crappie were also sampled in 1979.				
Abundance Trend	Inc.	Dec.	Same	Inc.
Size/Growth Trend	Same?	Neg.	Neg.	Pos.

**Figure 3. Largemouth Bass Growth Rates
Ludington Lake, Forest Co.**

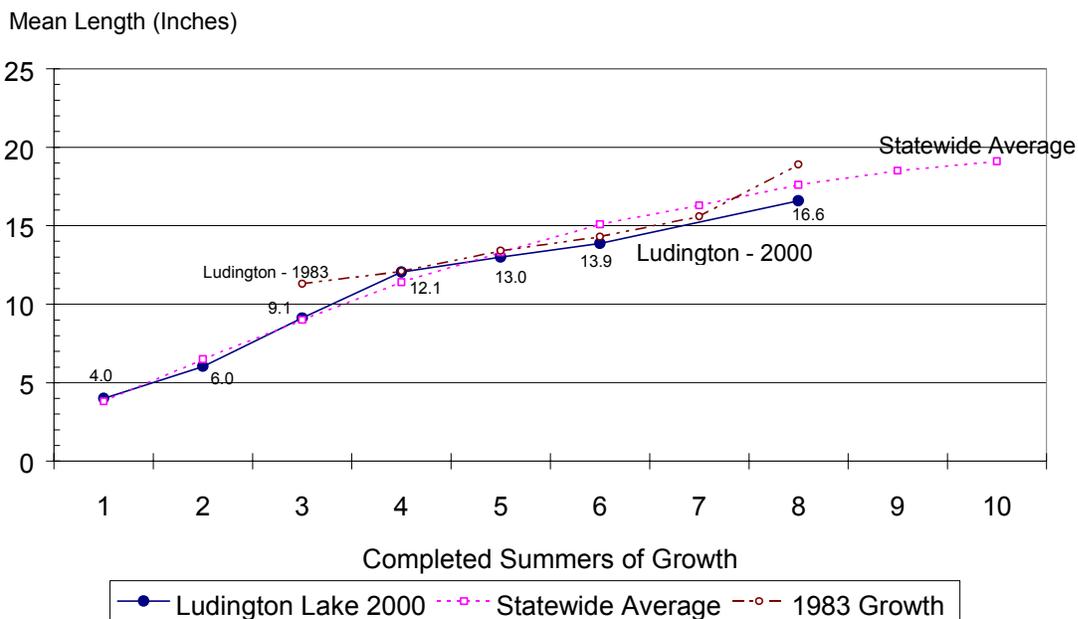
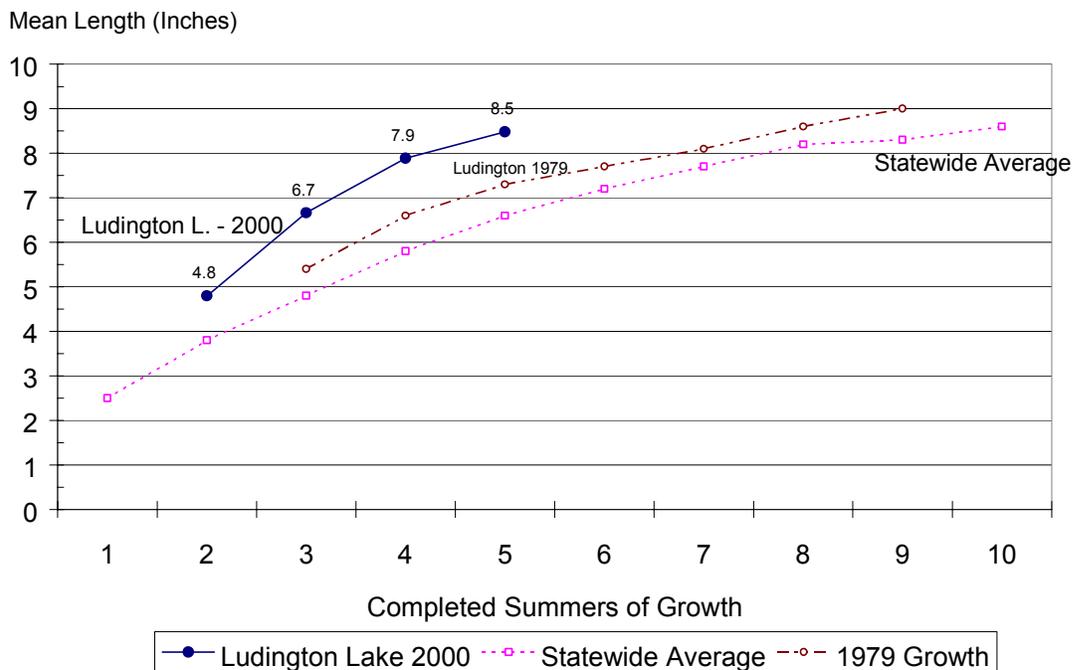
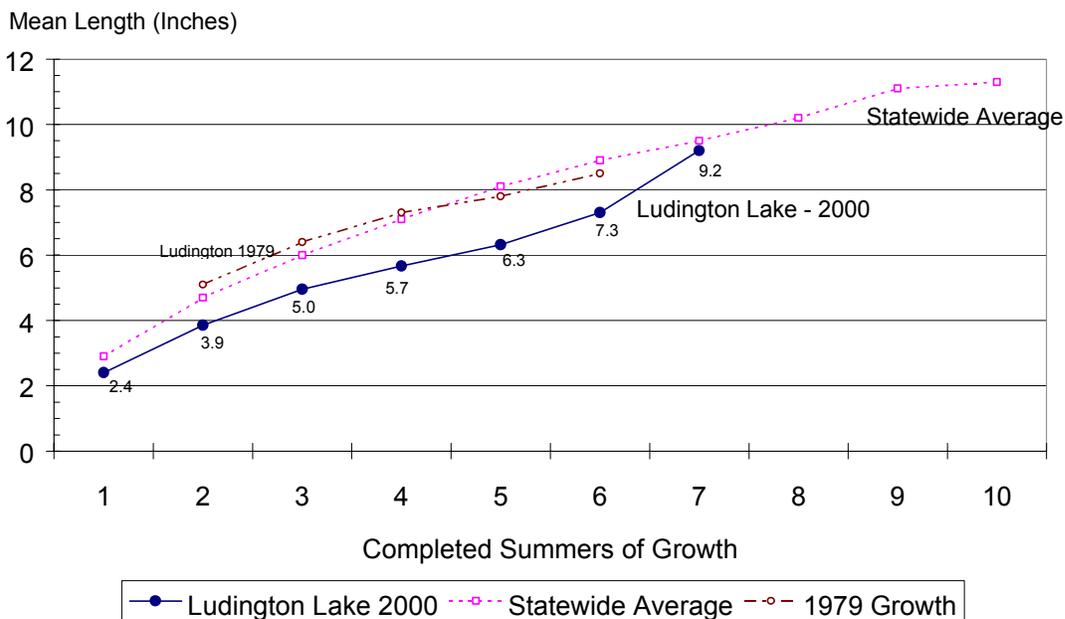


Figure 4. Bluegill Growth - Ludington Lake, Forest Co.



**Figure 5. Yellow Perch Growth Rates
Ludington Lake, Forest Co.**



**Ludington Lake, Forest Co.
2000**

Fish Survey Totals

Species	Spring Netting	Spring BS	Summer Netting	Fall BS	Totals
Largemouth Bass Mode; Length range		21 4.0 - 14.4	24 8.7; 5.0 - 9.9	33 2.3; 1.9 - 16.9	78
Walleye Length range					
Smallmouth Bass Length range					
Sucker Length range					
Bluegill Mode; Length range		22 3.2 - 7.3	256 6.5; 3.9 - 10.3	24 1.0 - 9.4	302
Black Crappie Mode; Length range					
Pumpkinseed Mode; Length range		21 4.5 - 6.3	57 6.2; 4.5 - 8.1	7 3.1 - 6.7	85
Yellow Perch Mode; Length range		60 2.4; 2.2 - 7.3	1 6.1	58 3.3; 1.9 - 8.2	119
Rock Bass Length range					