

**Date:** January 28, 2004 (Finalized 11/08/05)

**File Ref:** 3600

**To:** Bureau of Fisheries and Habitat Protection

**From:** Thomas (Skip) Sommerfeldt  
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**Subject: 2002 Lake Survey Summary - Boulder Lake, Oconto County  
(T31N, R15E, sec. 21,28; WBIC - 491800)  
Upper Green Bay GMU**

This report is submitted with the approval of Upper Green Bay Fisheries Team Supervisor, Mike Donofrio; and Regional Fisheries Specialist, Lee Meyers. The report was written and work supervised by Thomas (Skip) Sommerfeldt, Fisheries Biologist - Senior under the Chequamegon and Nicolet National Forest contract fisheries program.

NOTED: \_\_\_\_\_ Date  
Upper Chippewa Fisheries Team Supervisor, Dave Neuswanger

APPROVED BY:

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Upper GB Fisheries Team Supervisor, Mike Donofrio Date

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Regional Fisheries Specialist, Lee Meyers Date

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Bureau of Fisheries and Habitat Protection Date

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**Executive Summary: 2002 Lake Survey Report -- Boulder Lake, Oconto County, WI**

Date of Report: January 28, 2004 (Finalized 11/08/05)

Investigator/Author: Thomas (Skip) Sommerfeldt, Fisheries Biologist - Senior  
Chequamegon/Nicolet National Forest Contract Fisheries Program

**Executive Summary:**

The survey objective was to inventory the fishery, identify management problems and provide future management direction for Boulder Lake. The 2002 survey found a fairly well-balanced fishery. Largemouth bass were the primary gamefish, with a lesser abundance of smallmouth bass, and remnant numbers of northern pike and walleye. The largemouth bass were sustaining a moderate to high density population, with a fair to good-quality size structure. The smallmouth population was self-sustaining but low density, with slow growth rates and a poor size structure. Only 4 walleye were collected, all were yearlings and likely from the 2001 plant of fingerlings. Two northern pike were sampled and had lengths of 32.8 inches and 34.2 inches. The panfishery was predominantly bluegill (86%), with a lower abundance of rock bass (12%), and very low numbers of pumpkinseed (1%), yellow perch (<1%), and black crappie (<1%). The bluegill population had a good size structure and fish achieved above average growth rates.

Major changes that were noted in the fishery since the 1985 and 1978 surveys included a dramatic increase in the abundance of largemouth bass and bluegill, the continued decline of the walleye population, and a drop in the abundance of yellow perch. Walleye have been a past management priority in Boulder Lake, but the author concluded that the species was not ideally suited for the lake and further active management for the species should be discontinued. It was recommended that Boulder Lake be managed primarily as a largemouth bass and panfish fishery, with secondary emphasis on smallmouth bass. The suggested management goal for Boulder Lake is to maintain a balanced predator-prey relationship, with largemouth bass as the primary predator. Shoreline and littoral habitat were poor in many areas of the lake and the installation of shoreline tree drops and half-log cover structures are recommended. A spring electrofishing run every 3 years would be conducted to monitor the status of the fishery.

Title: **2002 Lake Survey Summary Report -- Boulder Lake, Oconto County, WI**

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Lake Characteristics: 362 acres, with a maximum depth of 11 feet. Shallow, drained lake on northwest edge of Oconto County. Clear water with moderate to high fertility. Approximately 80% of the shoreline is privately owned, with extensive development along the east, southwest, and north shores. The remaining 20% of shoreline is owned by the US Forest Service, and they maintain a campground, swimming beach, and boat ramp on the south shore. The lake receives heavy recreational use during the summer months.

Background Info: Remarks on the Boulder Lake Management Record from August 1953 indicated that fishing was mostly for perch and bass, but trout had been caught in previous years. Fish management activities on Boulder Lake have included the stocking of largemouth bass in the early 1950's, the stocking of walleye in 1953, brook trout in 1954, and walleye again in 1973 (fingerlings), 1985 (fry), and 1986 (fry). Fishery surveys were conducted in 1978 and 1984 to assess the walleye spawning populations. Results of these surveys indicated a low adult population and that walleye recruitment was limited, even with the installation of a small walleye spawning reef in 1980.

An electrofishing run in September 1985 (fall walleye recruitment evaluation) found no fingerling or adult walleye. The survey did collect 73 largemouth bass, 13 smallmouth bass, 31 bluegill, 18 yellow perch, 8 rock bass, and 1 black bullhead. It was concluded that the walleye population remained at a low level, with poor recruitment from natural reproduction and/or the 1985 plant of walleye fry. Because of the walleye reef construction, a second attempt at walleye fry stocking was recommended (1986 plant). Follow-up surveys were to be conducted to assess fry survival and recruitment. It appeared that increased walleye recruitment was a major goal, as the declining adult walleye population was jeopardizing the success of the habitat management project (spawning reef).

An electrofishing run in September 1993 (walleye recruitment survey) again found no fingerling or adult walleye. The lake received an additional plant of 15,000 walleye fingerlings in 2001.

Survey Objective: Inventory the fishery, identify management problems and provide future management direction.

Field Work:	Spring Electrofishing run (1.5 hours, 0.3 for panfish)	May 22, 2002
	Panfish Fyke-Net Survey (5 nets, 15 net-days)	June 10-13, 2002
	Water Chem Measurements and Habitat Observations	August 22, 2002
	Fall Electrofishing run (1.6 hours, 0.2 for panfish)	September 26, 2002

### Findings:

The 2002 survey on Boulder Lake found a fairly well-balanced fishery. Largemouth bass were the primary gamefish, with a lesser abundance of smallmouth bass, and remnant numbers of northern pike and walleye. The panfishery was predominantly bluegill, with a lower abundance of rock bass, and very low numbers of pumpkinseed, yellow perch, and black crappie. A list of all the fish species that were sampled can be found in Table 1.

The largemouth bass were sustaining a moderate to high density population, with good natural reproduction and recruitment. The largemouth had below average growth rates, but the fish did show a steady length increase throughout their life span (Figure 1). The population had a fair to good-quality size structure (Figure 2) and trophy size fish were produced (> 18 inches). The smallmouth population was low density, but self-sustaining. The size structure was poor and few fish greater than 12 inches were sampled (Figure 3). Growth rates were very slow, as fish achieved a mean length of only 10.4 inches after 6 summers of growth (Figure 4). Only 4 walleye and 2 northern pike were sampled and the status of their populations was uncertain. The 2 northern pike were trophy-size fish with lengths of 32.8 inches and 34.2 inches. The 4 walleye ranged from 8.6 to 9.1 inches in length, all aged as 1 year-olds (yearlings), and were likely from the 2001 plant of fingerlings.

The panfishery consisted primarily of bluegill, which represented 86% of the total panfish catch in 2002. Bluegill were considered moderate to high in density and the size structure was good. The June fyke-net effort produced a CPE of 175 bluegill per net-day, with a PSD<sub>6</sub> of 62% (Figure 5). Growth rates were above average for Wisconsin (Figure 6), with fish reaching a mean length of 7.4 inches after 5 summers of growth. Bluegill up to 8.9 inches long were sampled.

Rock bass comprised about 12% of the panfish catch and were maintaining a medium-quality population in the lake. The rock bass had a good size distribution of fish, with 39% measuring greater than 7 inches in length in the June fyke-net effort. No age and growth information was collected from the rock bass, but fish up to 11.1 inches in length were sampled. Yellow perch represented 0.7% of the panfish catch and ranged in length from 2.2 to 10.5 inches. Growth rates were below average for Wisconsin (Figure 7). Pumpkinseed made up about 1% of the panfish catch and ranged in length from 1.9 to 7.3 inches. Only 5 black crappie were sampled and they measured from 2.9 to 12.3 inches long. Four brook trout and 1 brown trout were also sampled and were likely migrants in from the outlet stream.

Major changes that were noted in the fishery since the 1985 and 1978 surveys included a dramatic increase in the abundance of largemouth bass and bluegill (Table 2), the continued decline of the walleye population, and a drop in the abundance of yellow perch. In addition, growth rates of the largemouth bass, smallmouth bass, yellow perch and bluegill all showed significant declines from 1978. This was likely caused by the increased populations of largemouth and bluegill, which resulted in greater competition for the available food and habitat. While largemouth bass, bluegill, and perch still achieved a quality size in Boulder Lake, the decline in growth rates does warrant some concern and should be monitored in future surveys.

Walleye have been a past management priority in Boulder Lake, but it was apparent that the lake does not supply the appropriate habitat and/or forage for the species to thrive. Walleye do best in waters with large expanses of deep water and a strong perch forage base, and Boulder Lake offers virtually no deep-water habitat and a limited number of perch. Despite a number of stocking attempts of fry and small fingerlings, walleye have struggled to maintain a population in the lake. In summary, walleye were not

ideally suited for Boulder Lake and further stocking of the species by the State is not recommended at this time (however, walleye can be effective predators on bluegill and periodic stocking may be considered in the future to maintain greater control over the panfish populations). Smallmouth bass have also struggled to maintain a quality population, as evidenced by the low density, poor size structure and very slow growth rates. While natural reproduction was sustaining the species, the population was limited by the lack of deep-water habitat and a low abundance of its primary forage (crayfish).

It is recommended that Boulder Lake be managed primarily as a largemouth bass and panfish fishery, with secondary emphasis on smallmouth bass. The management goal for Boulder Lake should be to maintain a balanced predator-prey relationship - which would incorporate a high predator density that would keep the panfish populations in check. Currently, the predator portion of the equation is supplied by the moderate to high density largemouth population, which is exerting the necessary predation to maintain the quality panfish population. Largemouth bass have capitalized on the available habitat in Boulder Lake and the species has established a good quality population.

Shoreline and littoral habitat were poor in many areas in the lake. A lack of shallow and mid-depth woody cover was noted along the east shore, southeast shore and portions of the west shore. The installation of shoreline tree drops and half-log cover structures would be beneficial in these areas and lakeshore property owners should be encouraged to utilize these habitat improvements. In addition, proper riparian management should be practiced to ensure future natural tree-falls into the lake.

#### Management Recommendations:

1. Manage Boulder Lake primarily for largemouth bass and panfish, with secondary emphasis on smallmouth bass. The self-sustaining, moderate to high-density largemouth bass population was helping to maintain a fairly well-balanced fishery. As such, no active species management was needed at the present time. Specific management objectives are as follows:
  - a. Largemouth bass - maintain a spring electrofishing CPE greater than 80 bass per hour (>6") and a PSD<sub>12</sub> near 40% (a spring CPE of 80 bass per hour equates to a population of about 16 per acre, which should provide an angler catch rate near 2 fish per hour).
  - b. Smallmouth bass - Maintain a spring electrofishing CPE near 20 fish per hour, with a PSD near 20% (with the limited habitat and forage, a high quality population would be an unrealistic objective).
  - c. Walleye - for the present time, discontinue active management for the species (meaning no special regulations or stocking by the State). Private stocking of walleye is currently discouraged due to the potential negative impact to the largemouth bass population. However, should bluegill become overabundant and stunted, walleye stocking may be re-initiated to exert additional predatory pressure on the panfish (the walleye fingerlings should be greater than 6 inches to maximize survival and predatory impact on the bluegill).
  - d. Panfish (bluegill, black crappie, yellow perch, and rock bass) - maintain the combined spring electrofishing CPE of less than 400 fish per hour and the PSD<sub>x</sub> values near 40%.
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 (ideally, a bag limit of 2 or 3 fish would be more appropriate for bass in these high-use recreational lakes). The current 25 bag limit regulation for panfish was adequate, although a 10-bag limit would be more appropriate as well.

3. Increase the amount of shallow and mid-depth woody cover, especially along the southeast, east and portions of the west shore. Both shoreline tree drops and half-log cover structures are recommended and lakeshore property owners should be encouraged to utilize these habitat improvements. A DNR or US Forest Service fisheries biologist should be consulted prior to the design and placement of these structures.
4. Conduct periodic monitoring of the fishery to assess its status and adherence to the above objectives (1.a - d). A spring electrofishing run every 3 years should be adequate to monitor conditions in the lake. The USFS/WDNR fish program will incorporate this monitoring into their work program.
5. Maintain the wild nature of the remaining undeveloped shoreline by discouraging further 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). Proper riparian management should ensure future natural tree falls into the lake.

Table 1. Fish Species Composition - Boulder Lake, Oconto Co.

		Survey:				
Gamefish	Scientific Name	1967	1972	1977	1978	2002
Walleye	<u>Sander vitreum</u>	X	X	X	X	X
Largemouth bass	<u>Microcopterus salmoides</u>	X	X	X	X	X
Smallmouth bass	<u>Micropterus dolomieu</u>	X		X	X	X
Northern pike	<u>Esox lucius</u>					X
Brook trout	<u>Salvelinus fontinalis</u>				X	X
Brown trout	<u>Salmo trutta</u>				X	X
<b>Panfish</b>						
Bluegill	<u>Lepomis macrochirus</u>	X	X	X	X	X
Rock bass	<u>Ambloplites rupestris</u>			X	X	X
Yellow perch	<u>Perca flavescens</u>	X	X	X	X	X
Pumpkinseed	<u>Lepomis gibbosus</u>	X	X	X	X	X
Black crappie	<u>Pomoxis nigromaculatus</u>					X
Green sunfish	<u>Lepomis cyanellus</u>				X	
Black bullhead	<u>Ameiurus melas</u>				X	
<b>Forage fish</b>						
Blacknose shiner	<u>Notropis heterolepis</u>	X			X	X
Common shiner	<u>Luxilus cornutus</u>				X	
Bluntnose minnow	<u>Pimephales notatus</u>	X			X	X
Fathead minnow	<u>Pimephales promelas</u>					X
White sucker	<u>Catostomus commersoni</u>	X	X		X	
Johnny darter	<u>Etheostoma nigrum</u>	X			X	X
Iowa darter	<u>Etheostoma exile</u>	X				X
Crayfish	<u>Orconectes spp.</u>					X

(not rusty)

Survey Pictures from Boulder Lake, Oconto County - 2002.



Boat landing on south end of lake.



Recreational use and information on Boulder Lake.



Fyke net on southwest end of lake.



Bluegill and small bass from netting.



20-inch largemouth from spring shocking.

Boulder Lake, Oconto Co.  
2002

Somm/Rublee/Risch

Fish Survey Totals

Species	Spring Netting	Spring BS May 22, 2002 (1.5 hrs., 0.3 panf.)	Summer Netting June 10 - 13, 2002 (5 nets, 15 lifts)	Fall BS Sept. 26, 2002 (1.6 hrs., 0.2 panf.)	Totals	
Largemouth Bass Mode; Length range		202 5.2, 9.2; 2.6 - 21.4	196 6.2; 5.5 - 20.6	184 2.8; 2.2 - 19.0	<b>582</b>	
Northern Pike Mode; Length range		1 32.8	1 34.2		<b>2</b>	
Walleye Length range		4 8.6 - 9.1			<b>4</b>	
Smallmouth Bass Length range		39 6.2; 5.4 - 11.8	24 6.0 - 13.2	32 3.1 - 12.1	<b>95</b>	
Trout Length range		1 Brookie 6.4	3 Brookies 9.7 - 11.3	1 Brown 5.4		Comp.:
Bluegill Mode; Length range		80 1.5 - 8.3	2620 6.0; 3.7 - 8.9	44 1.7; 1.5 - 8.0	<b>2744</b>	86.2%
Black Crappie Mode; Length range		2 11.9 - 12.3	2 6.6	1 2.9	<b>5</b>	0.2%
Pumpkinseed Mode; Length range			26 3.6 - 7.3	9 1.9 - 5.0	<b>35</b>	1.1%
Yellow Perch Mode; Length range		8 3.5 - 10.5	9 6.0 - 8.1	6 2.2 - 7.8	<b>23</b>	0.7%
Rock Bass Length range		62 4.7; 2.4 - 11.1	306 6.9; 3.7 - 9.6	10 2.7 - 8.4	<b>378</b>	11.9%
Fathead minnow		P				
Bluntnose minnow		C		C		
Blacknose shiner		P				
Johnny darter		P		Iowa - P		
Painted turtle			P			
Snapping turtle			P			
Crayfish (Native)			P	P		



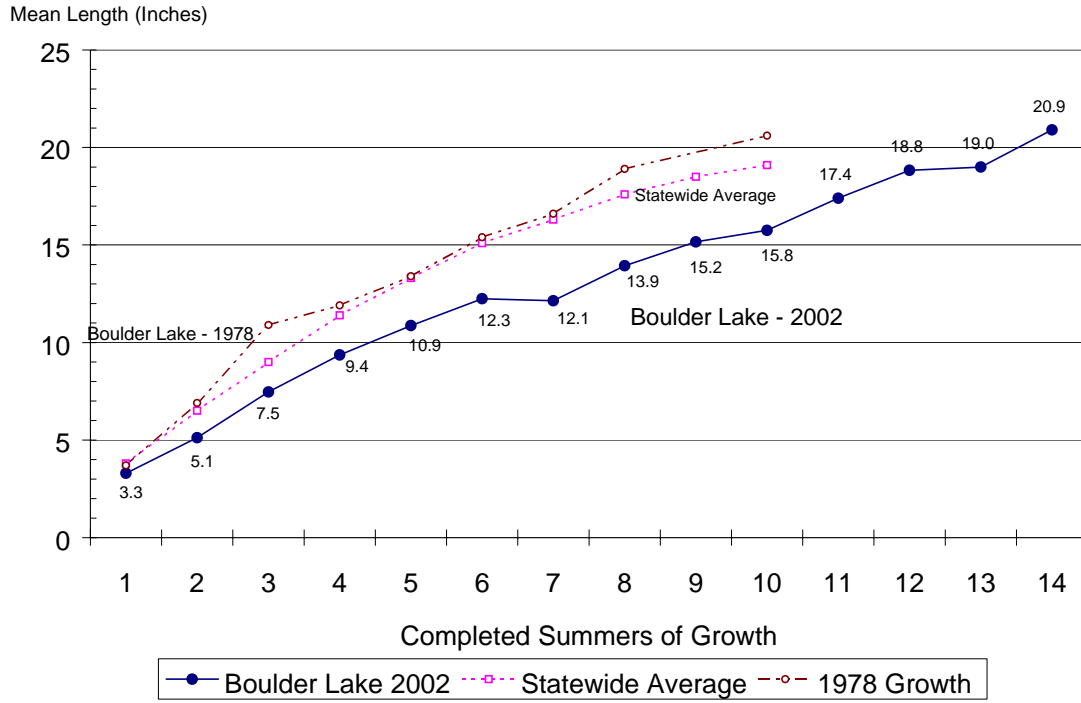
Table 2. Comparison of Spring Electrofishing Catch Statistics  
Boulder Lake, Oconto Co. -- 2002 vs. 1978

	LMB	SMB	Walleye	Bluegill	Y. Perch	Other
<b>2002</b> (May 22) (1.5 hour, 0.3 for panfish)						
<b>CPE</b>	<b>135 /hr</b>	<b>26 /hr</b>	<b>2.7 /hr</b>	<b>267 /hr</b>	<b>27 /hr</b>	1 N Pike 1 Brook trout
<b>Size/PSDx</b>	33 of 133 (>12", also > 6")	0 of 37 (>12", also > 6")	4 fish all 8-9"	<b>29%</b> (>6")	<b>40%</b> (2 of 5 >7")	62 Rock bass 2 Blk crappie
<b>1978</b> (May 24 & 30) (2 runs, 5.1 hours)						
<b>CPE</b>	<b>46 /hr</b>	<b>2 /hr</b>	<b>1.8 /hr</b>	<b>NC</b>	<b>NC</b>	9 Brook trout 1 Brown trout
<b>Size/PSDx</b>	3.5 to 20.9" (n = 234)	6.5 to 19.9" (n = 10)	17.5 to 20.8" (n = 9)	- - (>6")	- - (>7")	

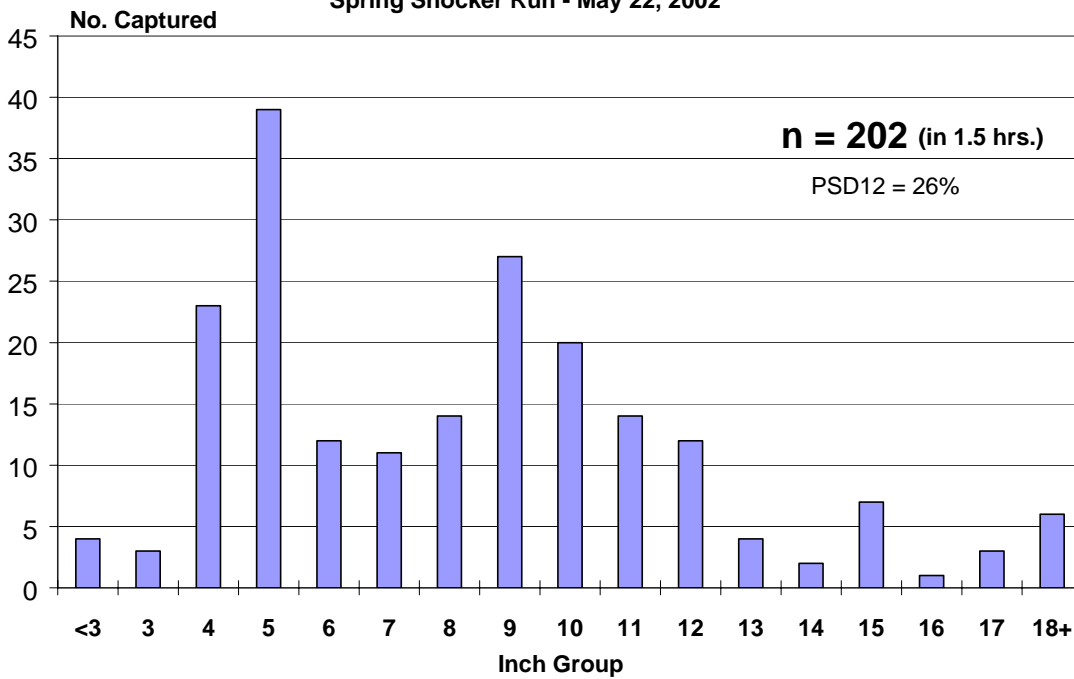
Table 3. Comparison of Fall Electrofishing Catch Statistics  
Boulder Lake, Oconto Co. -- 2002 vs. 1985 vs. 1978

	LMB	SMB	Walleye	Bluegill	Y. Perch	Rock Bass
<b>2002</b> (Sept. 26) (1.6 hours, 0.2 for panfish)						
<b>CPE</b>	<b>115 /hr</b>	<b>20 /hr</b>	<b>0 /hr</b>	<b>220 /hr</b>	<b>12 /hr</b> (collected for 0.5 hr.)	1 Brown trout 9 Pumpkinseed
<b>Size/PSDx</b>	12 of 43 (>12", also > 6") 117 YOY	3 of 21 (>12", also > 6") 2 YOY	- -	<b>50%</b> (>6")	<b>17%</b> (1 of 6 >7")	10 Rock bass 1 Blk crappie
<b>1985</b> (Sept. 18) (2.0 hours)						
<b>CPE</b>	<b>37 /hr</b>	<b>7 /hr</b>	<b>0 /hr</b>	<b>16 /hr</b>	<b>9 /hr</b>	8 Rock bass 1 Blk bullhead
<b>Size/PSDx</b>	11 of 67 (>12", also > 6") 3 YOY	2 of 10 (>12", also > 6") 2 YOY	- -	<b>93%</b> (>6")	<b>50%</b> (>7")	
<b>1978</b> (Sept. 27, 28) (6.0 hours, 2 runs)						
<b>CPE</b>	<b>20 /hr</b>	<b>2 /hr</b>	<b>2.2 /hr</b>	<b>27 /hr</b>	<b>21 /hr</b>	2 Brown trout 72 Rock bass
<b>Size/PSDx</b>	3.0 to 19.9" (n = 121)	10.0 to 12.9" (n = 11)	16.5 to 22.9" (n = 13)	2.6 to 10.3"	3.2 to 10.3"	3 Pumpkinseed

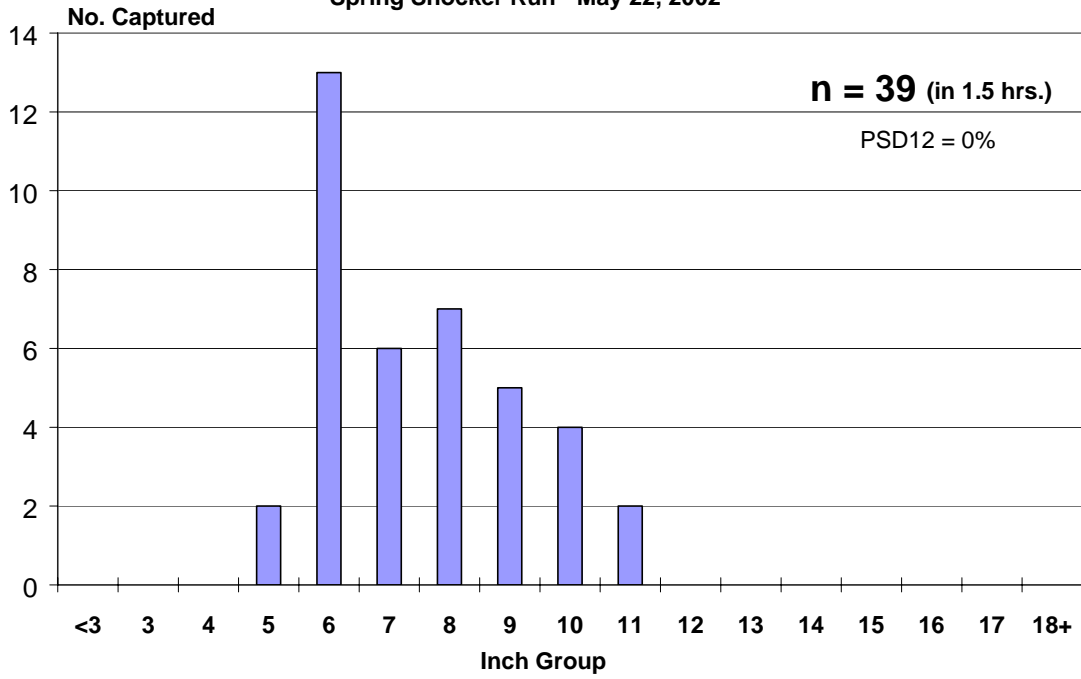
**Figure 1. Largemouth Bass Growth Rates - Boulder Lake, Oconto Co.**



**Figure 2. LMB Length Frequency - Boulder Lake, Oconto Co.  
Spring Shocker Run - May 22, 2002**

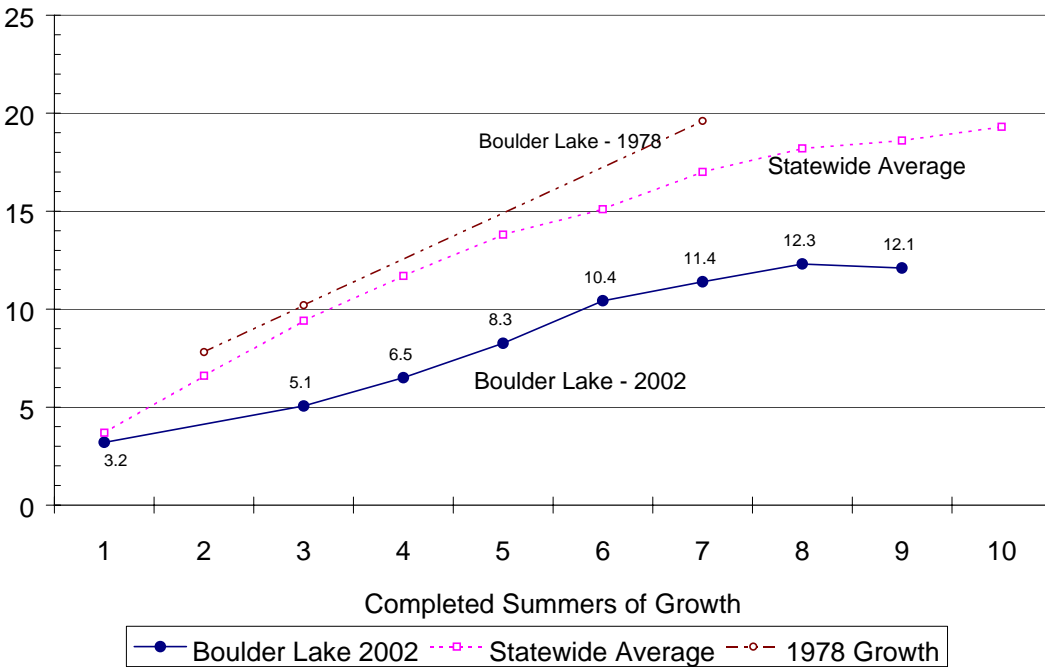


**Figure 3. SMB Length Frequency - Boulder Lake, Oconto Co.  
Spring Shocker Run - May 22, 2002**

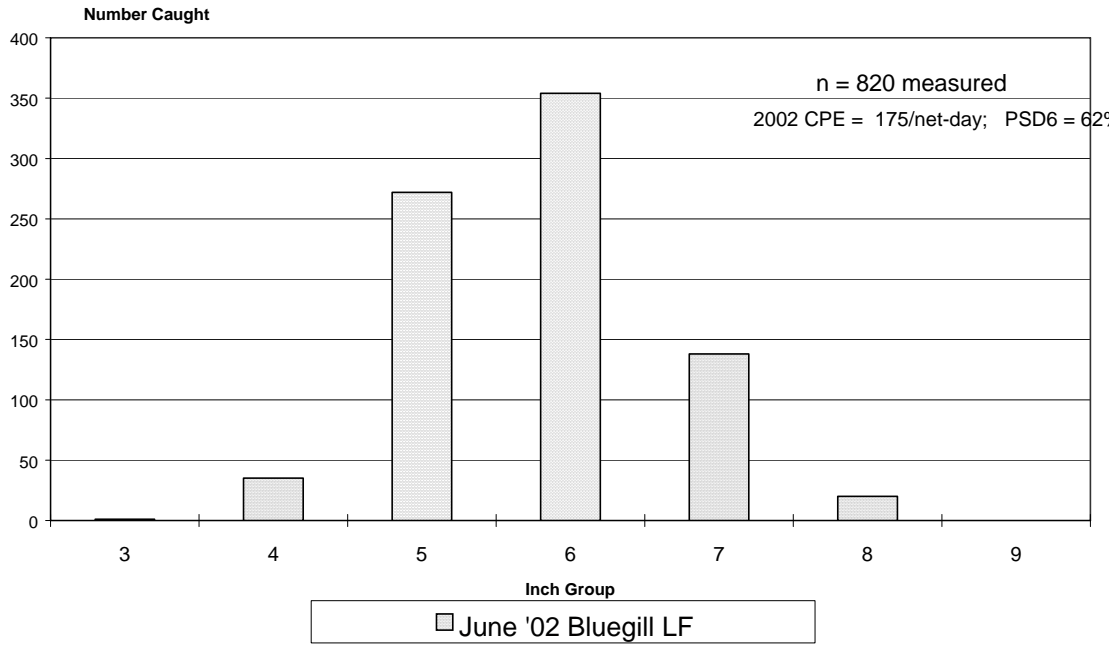


**Figure 4. Smallmouth Bass Growth Rates - Boulder Lake, Oconto Co.**

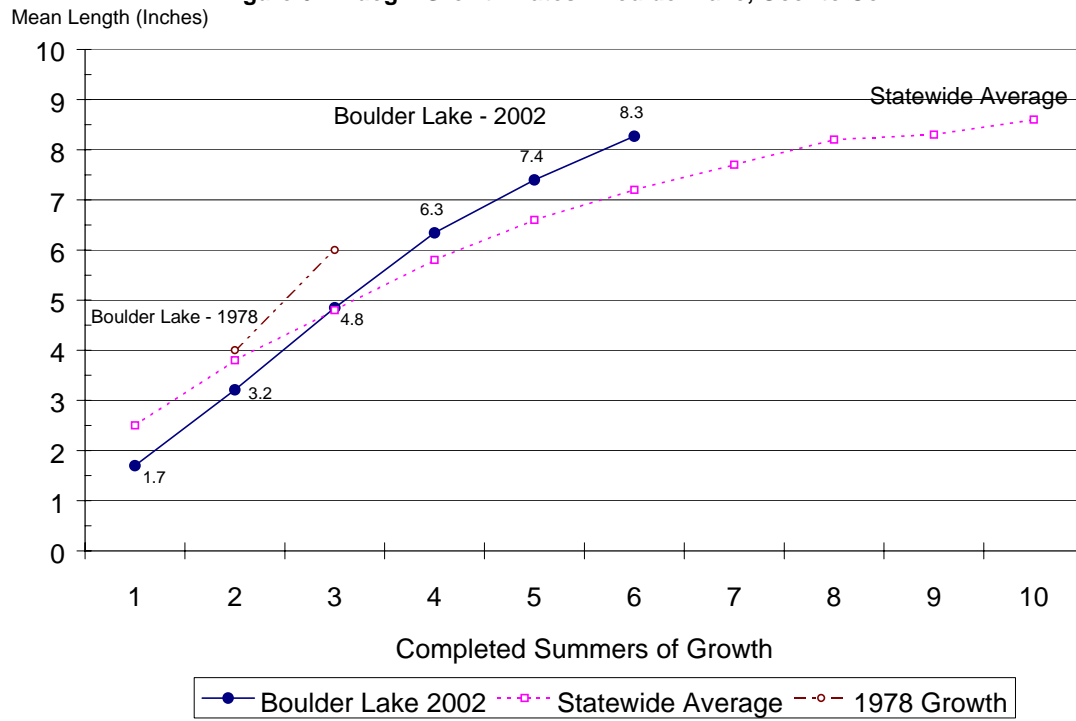
Mean Length (Inches)



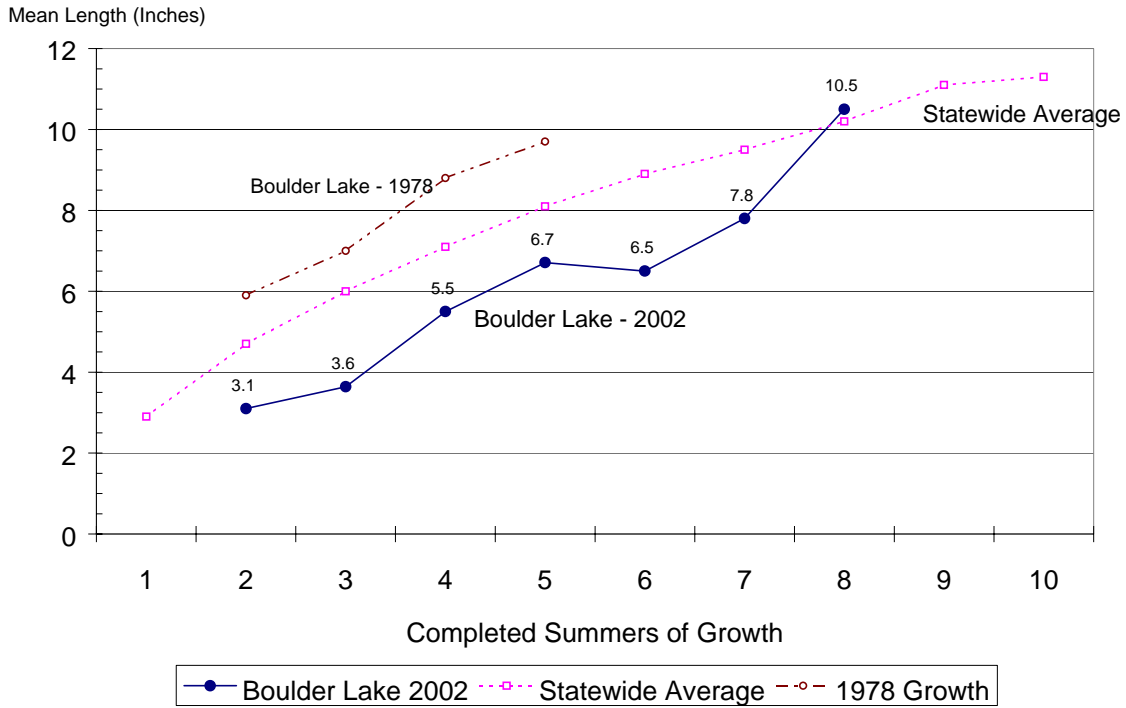
**Figure 5. Bluegill Length Frequency - Boulder Lake, Oconto Co.  
Summer Panfish Netting - June 2002**



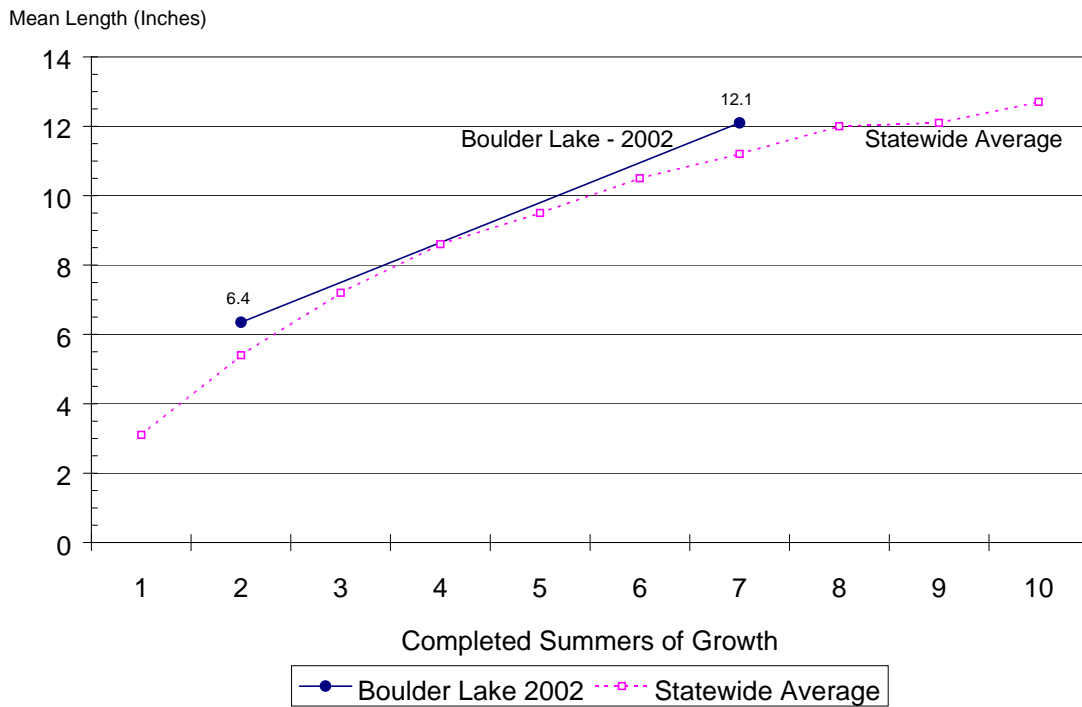
**Figure 6. Bluegill Growth Rates - Boulder Lake, Oconto Co.**



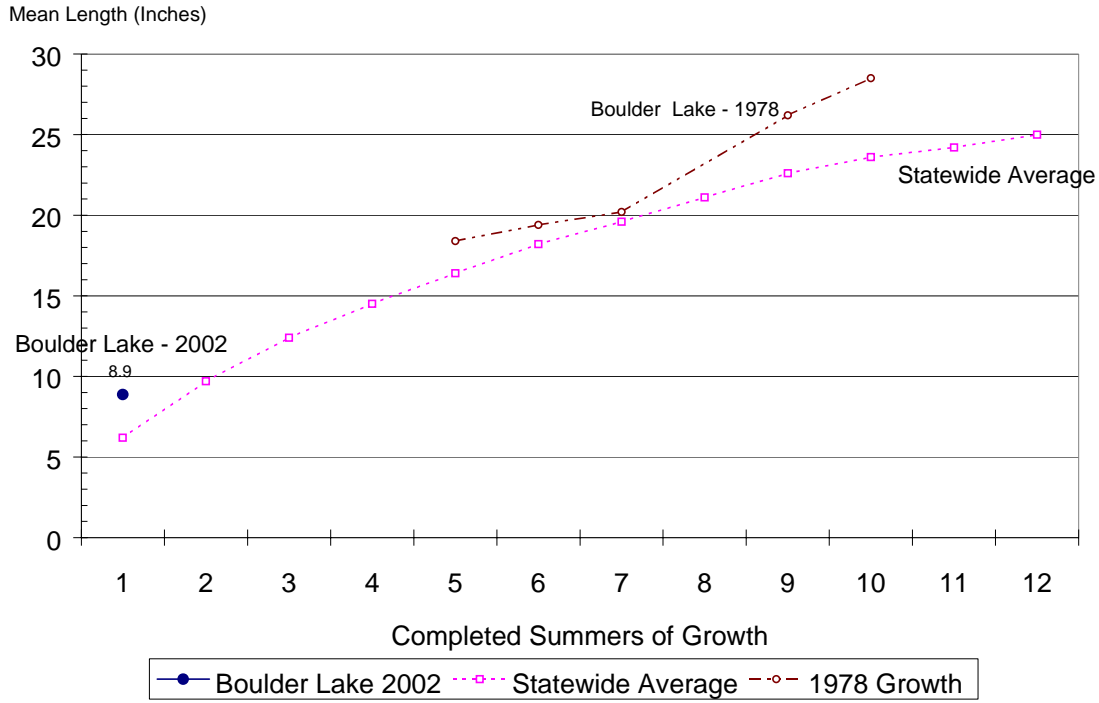
**Figure 7. Yellow Perch Growth Rates - Boulder Lake, Oconto Co.**



**Figure 8. Black Crappie Growth Rates - Boulder Lake, Oconto Co.**



**Figure 9. Walleye Growth Rates - Boulder Lake, Oconto Co.**



**Figure 10. Northern Pike Growth Rates - Boulder Lake, Oconto Co.**

