Inventory Number 69-0768-00

Joe Martin Lake

Joe Martin Lake is located on the east side of the Branden Road, at the end of an unnamed road, south of Hwy 2, in St. Louis County. Joe Martin Lake has a surface area of 71 acres, with 24 littoral acres, 16 feet of water clarity, and predominantly a mucky bottom (Figure 1). Maximum depth is 76 feet, making it one of the deepest and clearest lakes on the Fond du Lac Reservation. Joe Martin Lake is accessible via a primitive boat landing located on the north side of the lake (Figure 1).

This lake strongly stratifies in midsummer, with anoxic conditions below approximately 16 feet from late June through August. Mean filtered color is 14.7 PtCo units, and it is moderately productive or mesotrophic (Carlson's Trophic State Index = 41, calculated with total phosphorus, chlorophyll a, and secchi depth). Joe Martin Lake lies within an area of the Reservation with relatively high topography, and the underlying geology contributes to a high total hardness (mean of 122 mg/l as $CaCO_3$), as compared to other Reservation lakes. The diverse zooplankton community includes large *Daphnia galeata mendotae* (>2.5 mm).

Trap net and gill net locations (Figure 1) were selected based on the 2001 Minnesota Department of Natural Resources (MNDNR) lake survey. Eight trap nets (TN) and one gill net (GN) were set August 4-6. The purpose of this survey was to collect base line data of fish communities, and to use this data for future management decisions. Fish species observed in the 2008 survey included black crappie (BLC), bluegill (BLG), largemouth bass (LMB), northern pike (NOP), pumpkinseed sunfish (PMK), and yellow perch (YEP) (Table 1).

In cooperation with the Fond du Lac Resource Management, all Joe Martin Lake data from previous surveys was forwarded to us by the MNDNR. All other information was gathered from the MNDNR web site: www.dnr.state.mn.us/lakefinder.

The 2008 catch rates are slightly higher in most species than the 2001 survey (Table 1). Lengths of NOP observed in the 2008 survey ranged from 350 mm to 835 mm (Figure 2). NOP catch rates in 2008 were 29.0 / GN compared to 10.0 / GN in 2001 (Table 1). Six of the NOP sampled from the GN were used for mercury analysis (Table 2), and total mercury (wet weight) concentrations for skin-on NOP filets were consistent with values seen in this part of the state, ranging from 0.125 – 0.6 μg/g. These mercury concentrations would prompt a one meal/week (8 oz. portion) consumption advisory for the general population, and a one meal/month for the sensitive population (Appendix 1).

Otoliths were extracted from the NOP sampled from the gill net and used for ageing purposes. All other NOP sampled from TN were measured to the nearest mm and released. Length-at-age observed for NOP was consistent with the area average (Table 3). Northern pike were sampled between ages from

2 to 7 (Table 4). Stock density indices, e.g. PSD (proportional stock density), are used as a quality index for a fish population, and describe fish in terms of specific length categories. The PSD value for this population was 51.5 ± 17.0, suggesting a "balanced" population. The RSD – P value of 9.1 ± 9.8 is also within the objective range for a fish population.

BLG observed in the 2008 survey ranged from 90mm to 230mm (Figure 3). Three BLG collected from the gill net were also used for the mercury analysis (Table 2); wet weight mercury concentrations ranged from 0.132 – 0.189 μg/g, which would be considered safe for unlimited consumption. BLG catch rates were also higher in 2008 (Table 1); 26.0 / GN compared to 0.0 / GN in 2001. Trap net catch rates did not differ as much, with 9.6 BLG / TN in 2008 compared to 8.0 / TN in 2001. The BLG age data shows a wide age distribution, with fish observed up to 9 years old (Table 5). The growth rates show average growth from age 1 to 3 years compared to the MN area average (Table 6). Growth starts to slow at ages 4 and 5, and individuals are one full year behind in mean length by age-6. The PSD value for bluegills in Joe Martin Lake is 37.9 ± 9.4. Ideally, a population will have a PSD between 30 and 60. The RSD – P value for this population is 14.6 ± 6.8, which suggests that there may a higher than desired proportion of "preferred" length fish.

Our data suggests that the bluegill population in Joe Martin may possibly be showing the signs of mild overpopulation. Bluegills were observed in higher numbers than in previous surveys (Table 1). Bluegills were aged up to nine years, suggesting that this population is not overharvested (Table 5). However, because growth rates appear to be lower than reported by the Duluth Area (John Lindgren, MNDNR, personal communication) (Table 6), this would suggest that food resources may be limiting the growth potential of individuals within this population. With only 33.8% of the lake in littoral acres, this may well be limiting the productivity of Joe Martin Lake. Future surveys will monitor this population, and additional data may offer further insight into the bluegill community within Joe Martin Lake.

Black crappies were observed between 62 mm to 228 mm (Figure 4). Gill net catch rates of BLC were higher in 2008 at 7.0 / GN, compared to 0.0 / GN in 2001 (Table 1). 86% of the BLC sampled were between 3 -4 years old (Table 7), and show average growth for this area compared to the MNDNR area average (Table 8).

PMK observed in the 2008 survey ranged from 92mm to 243mm (Figure 5). One 242 mm PMK was collected from our GN and used for mercury analysis (Table 2), and the wet weight concentration was 0.090 μg/g (unlimited consumption). Catch rates of 2.0 / GN in 2008 were higher than the 2001 survey of 0.0 / GN. Trap net catch rates were also higher; 8.3 / TN in 2008 compared to 6.4 / TN in 2001 (Table 1). PMK growth rates are considerably slower in Joe Martin Lake compared to the MNDNR area average (Table 9). The PMK growth data for 2008 shows poor growth, with the lengths of age-3 and age-4 PMK a full year behind the mean lengths for the area reported by the MNDNR. By age-5, mean length

of PMK in Joe Martin is equivalent to the mean length of age-7 PMK from this area of MN. This is even more pronounced by age-6, with these individuals three years behind in length-at-age. One PMK observed was 5.9 inches and aged at 9 years old (Table 10). The length-at-age data for Joe Martin Lake suggests that growth has essentially ceased by age-5. The PSD value for pumpkinseeds in Joe Martin is 35.3 ± 11.4 while. While this value does fall within the range of normal fish populations, it is on the low side.

As was observed in the bluegill population, this data suggests that the pumpkinseed population has also increased between 2001 and 2008 (Table 1). Pumpkinseeds were aged up to nine years, suggesting that this population is not overharvested (Table 10). However, because growth rates definitely appear to be lower than reported by the Duluth Area (John Lindgren, MNDNR, personal communication) (Table 9), this would suggest that food resources may be limiting the growth potential of individuals within this population. With only 33.8% of the lake in littoral acres, this may well be limiting the productivity of Joe Martin Lake. Future surveys will monitor this population, and additional data may offer further insight into the pumpkinseed community within Joe Martin Lake. Initial evaluation of this population is that it may be over-populated.

Six YEP were sampled and sizes ranged from 154 mm to 249 mm (Figure 6). Growth rates are equivalent to the MNDNR area average (Table 11).

Sampled LMB ranged in length from 155 mm to 420 mm (Figure 7). Growth rates were slightly slower than the MNDNR area average (Table 12). Age distribution was evenly represented through age-7 (Table 13). The PSD value of 52.9 ± 23.7 is within the normal range for populations balanced by both small and large individuals, though care should be taken when interpreting PSD values calculated from only 19 individuals.

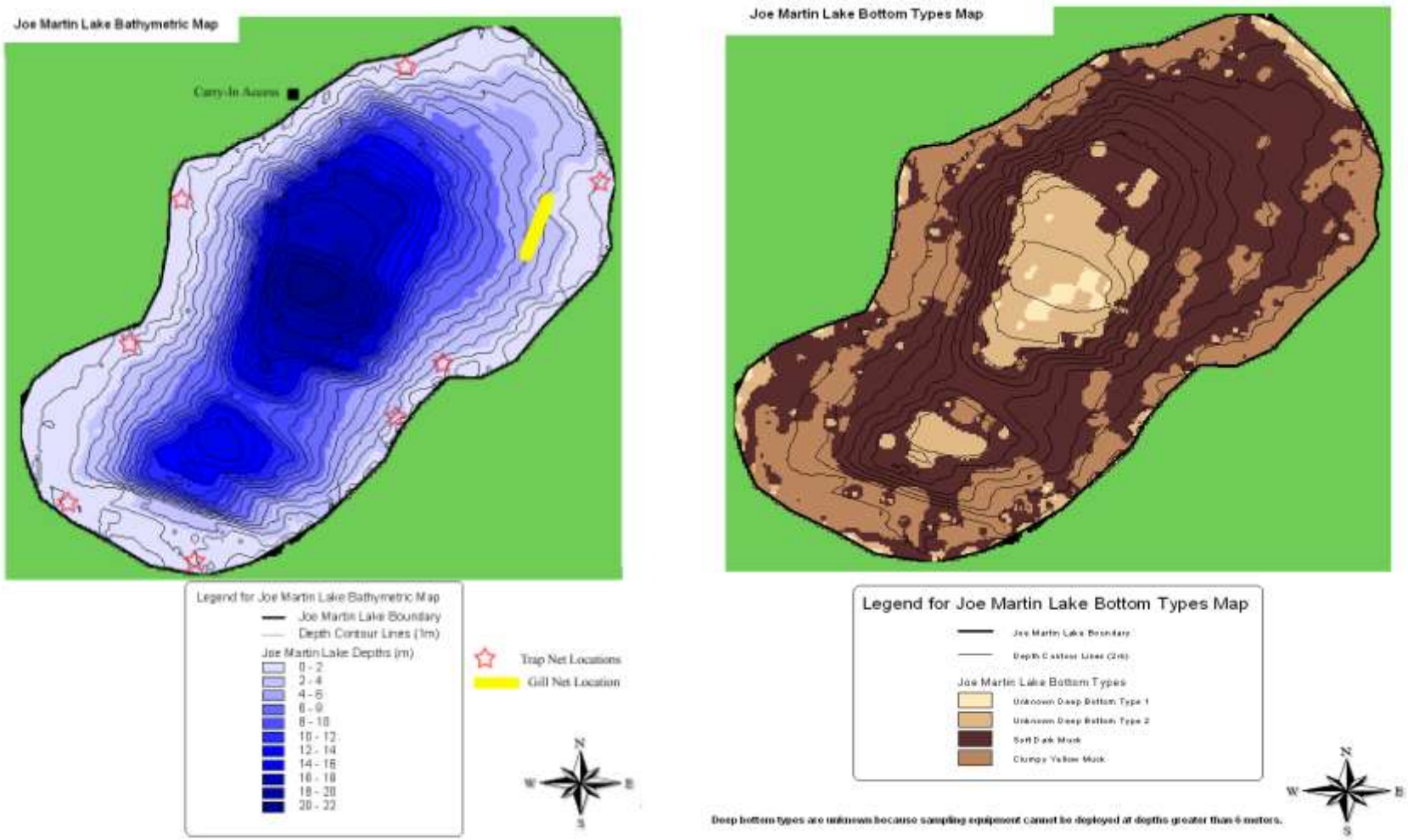

Figure 1. Joe Martin Lake, St. Louis County. Left panel presents depth data along with locations of trap nets and gill nets set in 2008. Right panel presents bottom substrate data.

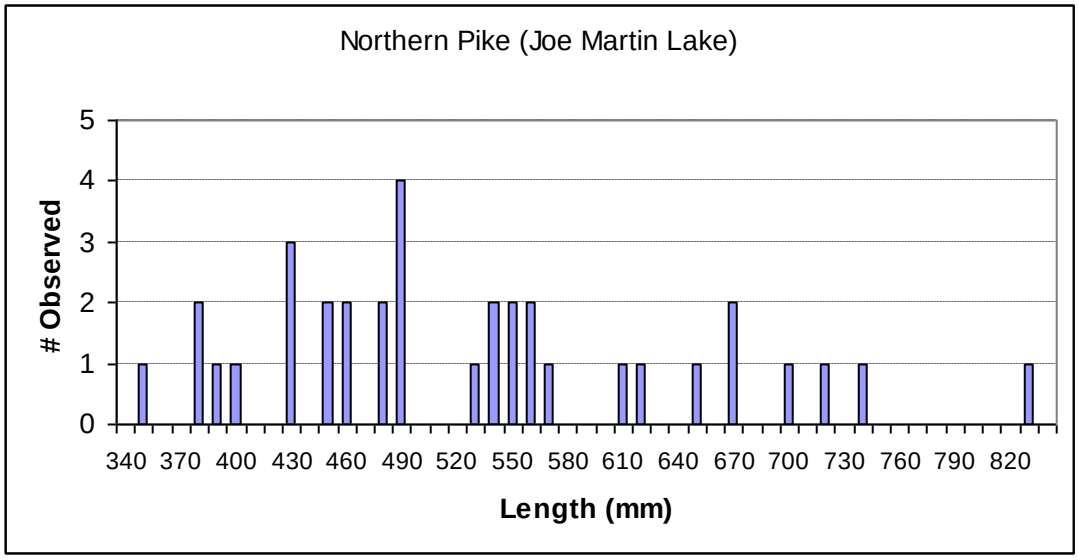

Figure 2. Length frequency distribution of northern pike observed in Joe Martin Lake 2008.

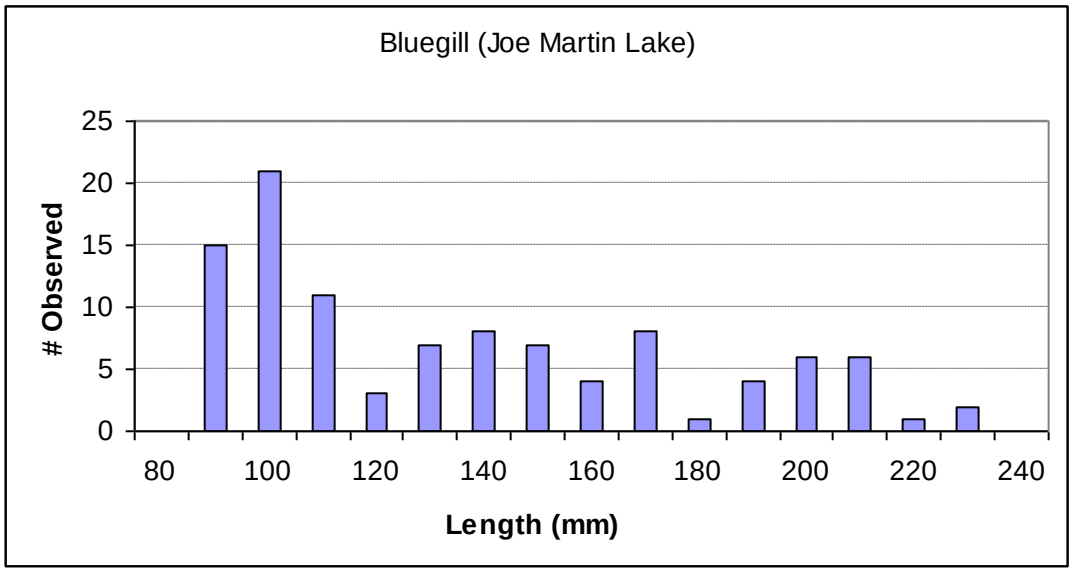

Figure 3. Length frequency distribution of bluegill observed in Joe Martin Lake 2008.

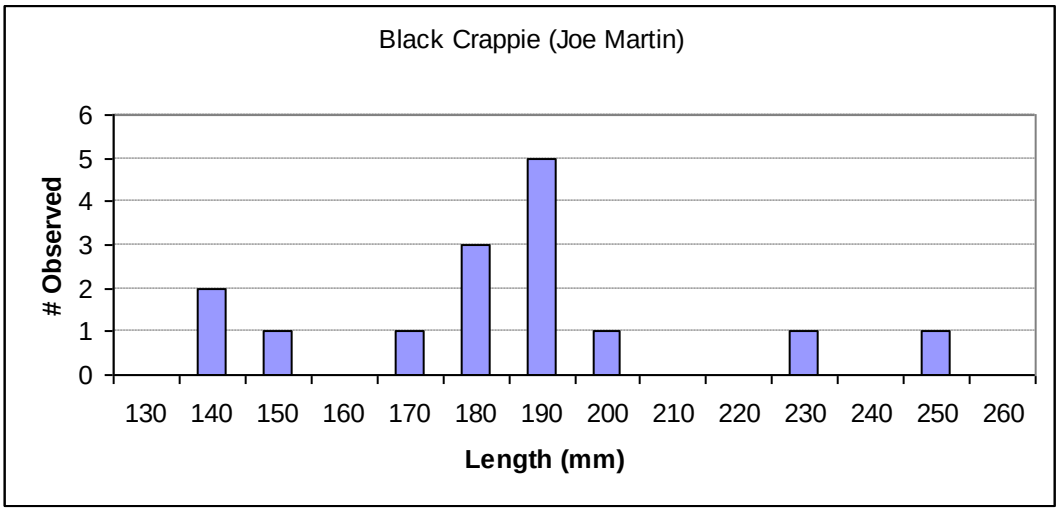

Figure 4. Length frequency distribution of black crappie observed in Joe Martin Lake 2008.

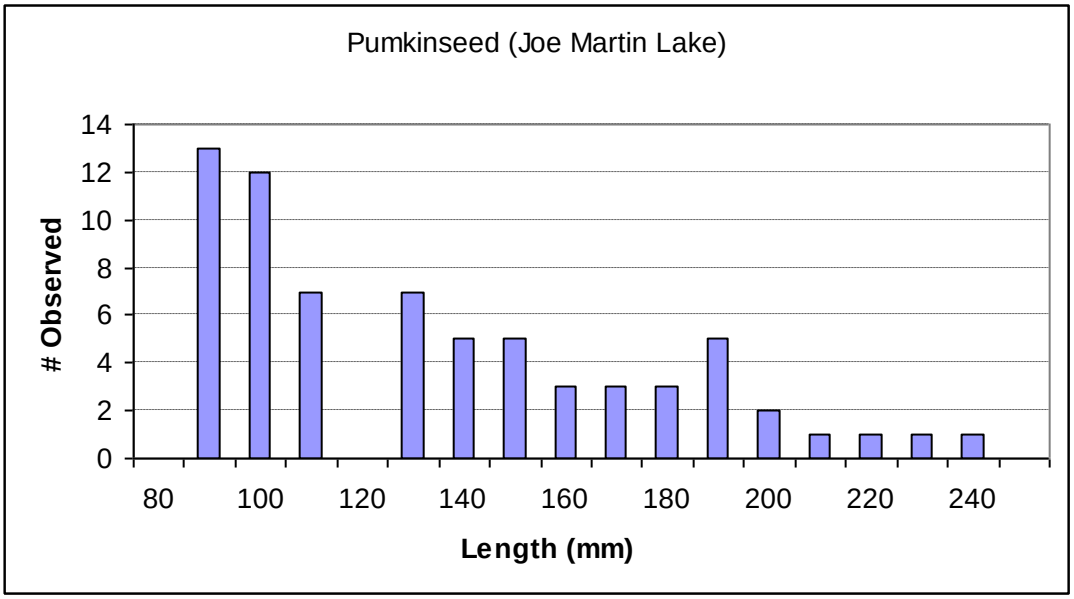

Figure 5. Length frequency distribution of pumpkinseed sunfish observed in Joe Martin Lake 2008.

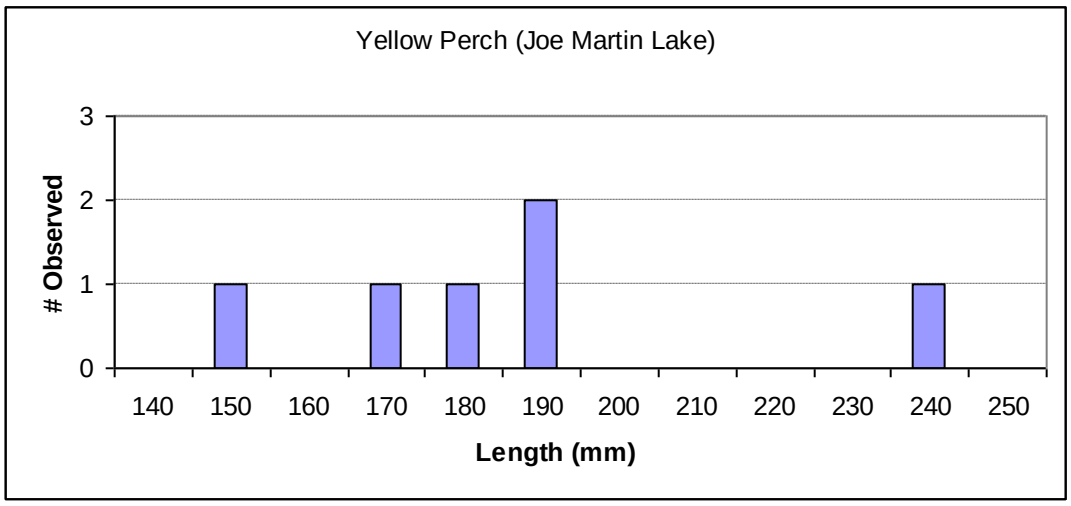

Figure 6. Length frequency distribution of yellow perch observed in Joe Martin Lake 2008.

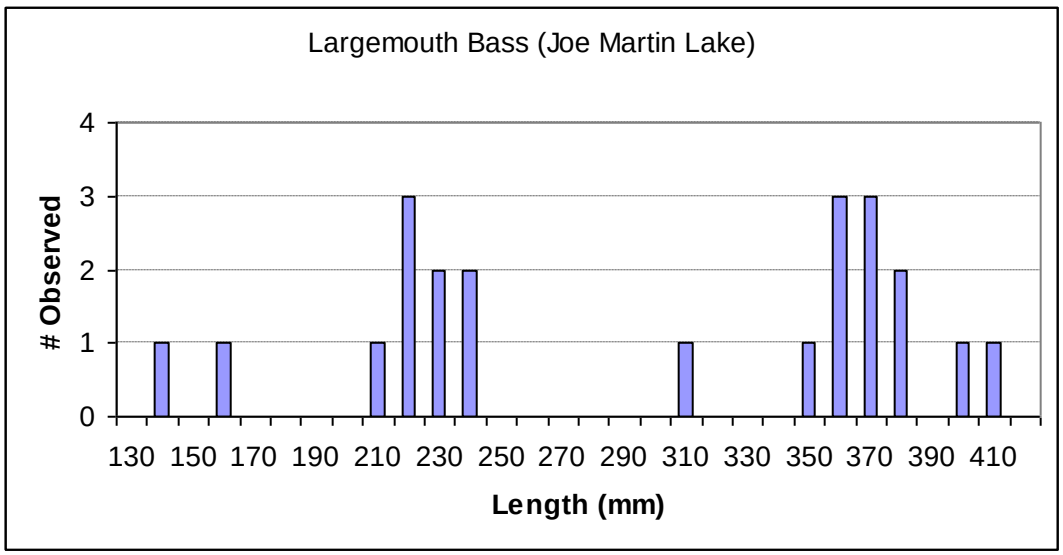

Figure 7. Length frequency distribution of largemouth bass observed in Joe Martin Lake 2008.

Table 1. Number of fish sampled in Joe Martin Lake, August 4-6, 2008 by gear type and by gear ID. Catch per effort, reported as the # fish / net type, is reported at the bottom of the table for both the 2008 data as well as the MN DNR 2001 data.

	Species Code						
Gear I D	Blc	Blg	Lmb	Nop	Pmk	Yep	Grand Total
GN 1	7	26	1	29	2		66
Hook and Line			11				11
TN 1		5			7	4	16
TN 2		14	1		9		24
TN 3		13			7		20
TN 4		2					2
TN 5	3	19	1	1	9	1	34
TN 6	2	7	4	1	14		28
TN 7		8	1	1	13	1	24
TN 8	3	9		1	7		20
Grand Total	15	103	19	33	68	6	245
Unknown Gear		1	3	2	1		
# Fish / GN	7.0	26.0	1.0	29.0	2.0		
# Fish / TN	1.0	9.6	0.9	0.5	8.3	0.8	
# Fish/DNR GN		0.0	1.0	10.0			
# Fish/DNR_TN	2.0	8.0	1.4	0.6	6.4	0.4	

Table 2. Mercury analysis results of bluegill and northern pike, measured in micrograms of mercury per gram of fish tissue (µg/g), for Joe Martin Lake 2008.

Species	Length (mm)	Length (in)	µg/g
BLG	230	9.1	0.167
BLG	228	9.0	0.132
BLG	212	8.3	0.189
NOP	350	13.8	0.125
NOP	544	21.4	0.600
NOP	711	28.0	0.393
NOP	618	24.3	0.553
NOP	556	21.9	0.354
NOP	719	28.3	0.487
PMK	242	9.5	0.090

Table 3. Mean length observed at age for northern pike sampled from Joe Martin Lake in 2008, compared to the area averages established by the Minnesota Department of Natural Resources.

	Length at Age		Area Average	Area Average
Age Class	Length (mm)	Length (in)	Length (mm)	Length (in)
2	418	16.5	374	14.2
3	475	18.7	482	19
4	526	20.7	566	22.3
5	640	25.2	631	24.8
6	680	26.8	705	27.8

Table 4. Age frequency distribution for northern pike observed in Joe Martin Lake 2008.

Length (mm)	Length (in)	# Observed	2	3	4	5	6	7
350	13.8	1						
380	15.0	2	1	1				
390	15.4	1						
400	15.7	1	1					
420	16.5	1	1					
430	16.9	2	2					
450	17.7	2		2				
460	18.1	2	1					
480	18.9	2		1	1			
490	19.3	4		4				
530	20.9	1					1	
540	21.3	2				2		
550	21.7	2			2			
560	22.0	2		1				1
570	22.4	1				1		
610	24.0	2					1	
650	25.6	1						
670	26.4	2				2		
710	28.0	2				2		
740	29.1	1						
830	32.7	1					1	
	Total	35	6	9	3	7	3	1

Table 5. Age frequency distribution for bluegill observed in Joe Martin Lake 2008.

Length (mm)	Length (in)	# Observed	3	4	5	6	7	8	9
90	3.5	15	6	9					
100	3.9	21	13	8					
110	4.3	11		7		4			
120	4.7	3			1	1		1	
130	5.1	7		1		1	4		
140	5.5	8				3		5	
150	5.9	7	4			3			
160	6.3	4		1	3				
170	6.7	8		1	2	5			
180	7.1	1				1			
190	7.5	4			1	1	2		
200	7.9	6			2	2			2
210	8.3	6				2	2	1	
220	8.7	1						1	
230	9.1	2					1		
	Total	104	23	27	9	23	9	8	2

Table 6. Length at age estimates for bluegill sampled from Joe Martin Lake in 2008, compared to the area averages established by the Minnesota Department of Natural Resources. N is the sample size used for the estimates.

Age Class	N	Length (mm)	Length(in)	Area Average Length (mm)	Area Average Length (in)
1	56	43	1.7	48	1.9
2	56	69	2.7	66	2.6
3	56	96	3.8	97	3.8
4	48	118	4.6	127	5
5	37	141	5.6	152	6
6	30	153	6	170	6.7
7	14	162	6.4	181	7.1
8	8	167	6.6	191	7.5
9	2	201	7.9	N/A	N/A

Table 7. Length at age estimates for black crappie sampled from Joe Martin Lake in 2008, compared to the area averages established by the Minnesota Department of Natural Resources.

Length (mm)	Length (in)	# Observed	2	3	4	5
140	5.5	2	2			
150	5.9	1				
170	6.7	1		1		
180	7.1	3		3		
190	7.5	5		3	2	
200	7.9	1			1	
230	9.1	1			1	
250	9.8	1				1
	Total	15	2	7	4	1

Table 8. Length at age estimates for black crappie sampled from Joe Martin Lake in 2008, compared to the area averages established by the Minnesota Department of Natural Resources. N is the sample size used for the estimates.

Age Class	N	Length (mm)	Length (in)	Area Average Length (mm)	Area Average Length(in)
1	13	62	2.4	46	1.8
2	13	105	4.1	100	3.9
3	12	152	6.0	155	6.1
4	5	180	7.1	196	7.7
5	1	228	9.0	227	8.9

Table 9. Length at age estimates for pumpkinseed sunfish sampled from Joe Martin Lake in 2008, compared to the area averages established by the Minnesota Department of Natural Resources. N is the sample size used for the estimates.

Age Class	N	Length (mm)	Length (in)	Area Average Length(mm)	Area Average Length(in)
1	51	50	2	46	1.8
2	51	73	2.9	104	4.1
3	51	97	3.8	130	5.2
4	50	119	4.7	165	6.5
5	31	139	5.5	196	7.7
6	18	141	5.6	244	9.8
7	12	138	5.4		
8	8	145	5.7		
9	1	149	5.9		

Table 10. Age frequency distribution for pumpkinseed sunfish observed in Joe Martin Lake 2008.

Length (mm)	Length (in)	# Observed	3	4	5	6	7	8	9
90	3.5	13		13					
100	3.9	12		9	3				
110	4.3	7		5		1			
120	4.7	0							
130	5.1	7			2	2	2		
140	5.5	5			1		1	3	
150	5.9	5					1	3	1
160	6.3	3		1	1			1	
170	6.7	3	1	1	1				
180	7.1	3		3					
190	7.5	5			4	1			
200	7.9	2			2				
210	8.3	1			1				
220	8.7	1				1			
230	9.1	1		1					
240	9.4	1				1			
	Total	69	1	33	15	6	4	7	1

Table 11. Length at age estimates for yellow perch sampled from Joe Martin Lake in 2008, compared to the area averages established by the Minnesota Department of Natural Resources. N is the sample size used for the estimates.

Age Class	N	Length (mm)	Length (in)	Area Average Length (mm)	Area Average Length (in)
1	5	68	2.7	60	2.4
2	5	107	4.2	100	3.9
3	5	146	5.7	136	5.4
4	5	175	6.9	166	6.5
5	1	216	8.5	192	7.6
6	1	235	9.2	214	8.4

Table 12. Length at age estimates for largemouth bass sampled from Joe Martin Lake in 2008, compared to the area averages established by the Minnesota Department of Natural Resources. N is the sample size used for the estimates.

Age Class	N	Length (mm)	Length (in)	Area Average Length (mm)	Area Average Length (in)
1	23	82	3.2	72.5	2.9
2	23	153	6	160.9	6.3
3	17	214	8.4	234.6	9.2
4	13	272	10.7	294.8	11.6
5	9	316	12.4	336.0	13.2
6	9	348	13.7	367.0	14.4
7	7	364	14.3	396.5	15.6
8	2	380	15	423.8	16.7

Table 13. Age frequency distribution for largemouth bass observed in Joe Martin Lake 2008.

Length (mm)	Length (in)	# Observed	2	3	4	5	6	7	8
150	5.9	1	1						
170	6.7	1	1						
220	8.7	1	1						
230	9.1	3	1	1	1				
240	9.4	2		2					
250	9.8	2		1	1				
320	12.6	1			1				
360	14.2	1						1	
370	14.6	3						2	1
380	15.0	3						3	
390	15.4	2			1		1		
410	16.1	1							1
420	16.5	1					1		
	Total	22	4	4	4		2	6	2