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Region 2

FISH POPULATION STATUS IN EIGHT MAJOR LAKES IN THE CLEARWATER RIVER DRAINAGE, MONTANA, 1995-2002

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ABSTRACT

Fish populations have been monitored on eight major lakes in the Clearwater River drainage in west central Montana since 1995. The eight major lakes include Clearwater, Rainy, Marshall, Alva, Inez, Seeley, Placid and Salmon lakes. The lakes have a combined surface area of 3,888 acres, and they support a significant and heavily utilized sport fishery.

The bulk of the sport fishery in these lakes historically was provided by kokanee, westslope cutthroat trout, brown trout, yellow perch and largemouth bass. An unwanted illegal introduction of northern pike occurred in the drainage in the late 1980's or early 1990's. This introduction has had a profound negative impact on the fishery, reducing densities of other desirable fish species by 70 to over 90 percent. Problems and strategies associated with management of the sport fishery in the presence of northern pike population expansion are discussed.

INTRODUCTION

A basic inventory is essential in formulating management plans for maintaining and utilizing a fishery. Seldom is this information complete for an entire area or drainage. Streams and lakes in the Clearwater River drainage in west central Montana support a significant and heavily utilized sport fishery. Prior to this study, basic data on the aquatic resources of this area were lacking.

Unwanted illegal fish introductions, increasing subdivision and human encroachment on lands adjacent to streams and lakes, and increasing fishing and recreational use of all waters were beginning to affect fish populations in the Clearwater River drainage. For these reasons the Montana Department of Fish, Wildlife and Parks (MFWP) initiated this study on July 1, 1995. Without basic inventory data, little could be done to evaluate conflicting resource demands and minimize adverse impacts on the aquatic resource.

DESCRIPTION OF STUDY AREA

The Clearwater River drainage lies in west central Montana, and is the principal tributary of the Blackfoot River. Eight major lakes in the drainage are commonly referred to as the "Clearwater Chain of Lakes". These lakes include Clearwater, Rainy, Marshall, Alva, Inez, Seeley, Placid and Salmon lakes (Figure 1). Principal streams in the drainage include the Clearwater River, which originates at the outlet of Clearwater Lake, East and West Forks of the Clearwater River, and Morrell, Owl, Placid, Deer, Trail and Blanchard creeks. Important smaller lakes in the drainage include Harpers, Blanchard, Elbow, Elsina, Dinah, Spook and Hidden lakes.

TECHNIQUES

Lake Morphometry

Morphometric data was collected on the eight major lakes in the Clearwater River drainage during the ice free period in 2002. Bathymetric maps were developed for each lake with 5 ft contour intervals using hydroacoustic and GPS instrumentation. Physical characteristics measured for each lake included surface area, lake volume, aquatic weed surface area, maximum depth and elevation.

Gill Nets

Fish were sampled with standard "Montana" experimental floating and sinking nylon or monofilament gill nets 6 x 125 ft with graduated mesh size from 3/4 to 2 inches square measure. Overnight stationary sets with these nets generally produced good catches of a wide variety of fish species. The nets were equally distributed around the entire perimeter of each lake each year to produce a representative catch.

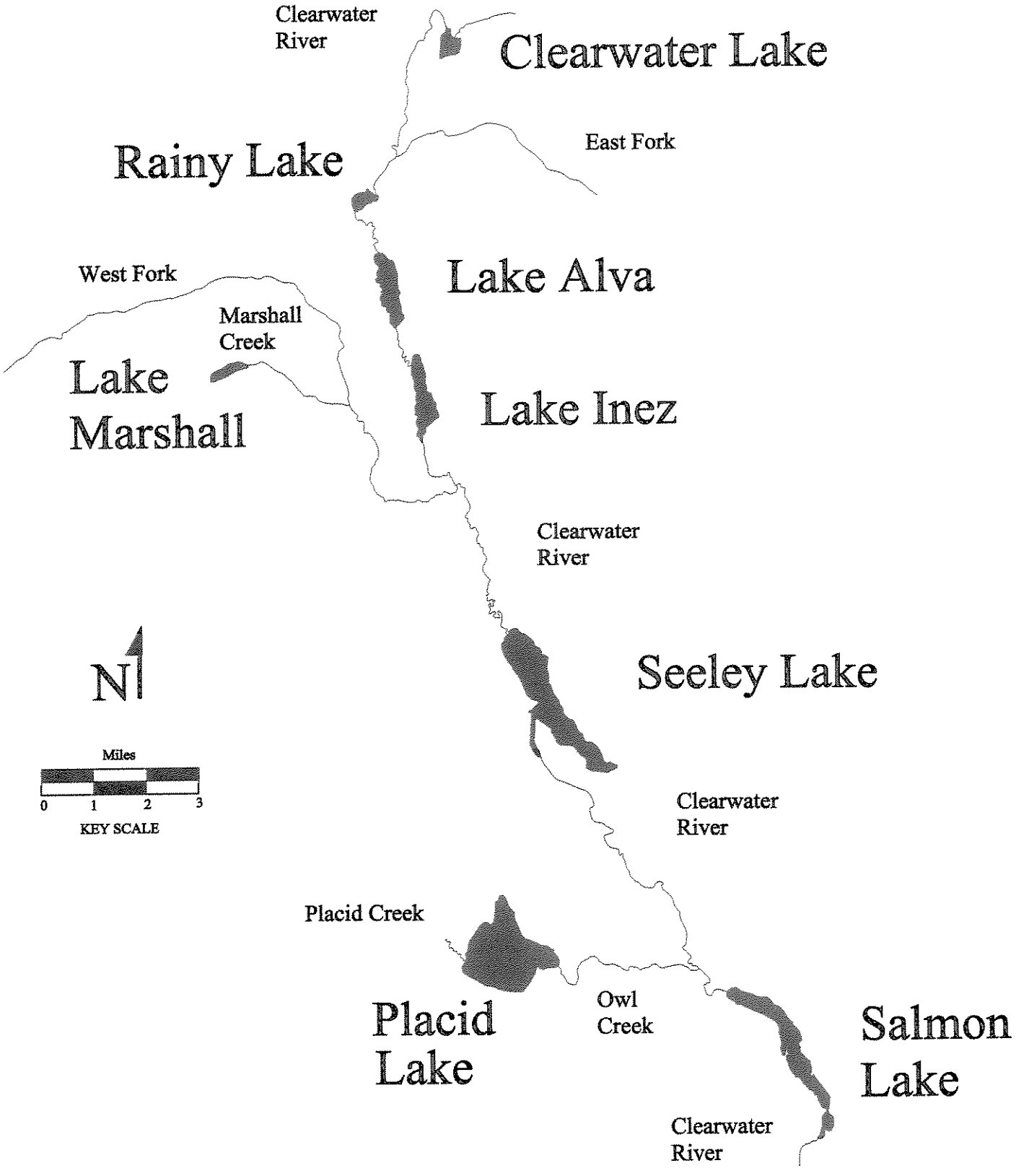


Figure 1. A map of the Clearwater River drainage depicting the location of the eight major lakes.

During the present study 15 to 60 gill net sets were made each year in each lake. The number of gill nets set in each lake depended on the size and complexity of the lake. Gill netting was continued each year on each lake until catch statistics stabilized around a mean. The locations of each gill net set were marked on USGS topographic maps each year. In addition, GPS coordinates for each gill net set were recorded for future reference.

Fish Sample Processing and Tagging

Sampled fish were measured to the nearest millimeter in total length, and weighed to the nearest 10 grams. Sex and spawning condition (gravid, ripe or spawned) were recorded for fish captured during their spawning period. Several game fish species were marked with individually numbered Floy T-tags to evaluate growth rate, movement and angler harvest.

FINDINGS, RESULTS AND DISCUSSION

Lake Morphometry, Physical Characteristics and Limnological Conditions

The eight major lakes in the Clearwater River drainage have a combined surface area of 3,888 acres (Table 1). Placid Lake, the largest lake in the drainage has a surface area of 1,300 acres and a volume of 64,215 acre-ft. The smallest of the eight major lakes, Rainy Lake, is 81 acres in surface area and 1,420 acre-ft in volume. Maximum lake depths range from 125 ft in Seeley Lake to 29.4 ft in Rainy Lake. Lake elevations range from 4,786 ft MSL at Clearwater Lake to 3,909 ft MSL at Salmon Lake.

The eight major lakes are becoming increasingly more eutrophic due to nutrient enrichment associated with an increasing human population residing and recreating in the drainage. Rooted aquatic vegetation enhanced by nutrient enrichment presently occupies 265.32 acres, or 6.8 percent, of the total surface area of the lakes. Long time local residents indicate rooted aquatic weeds have consistently increased over time in the past 40 to 50 years. Summer algae blooms have been increasing particularly in Inez, Placid and Salmon lakes and to some extent in Seeley Lake. Winter fish kills associated with dissolved oxygen depletion related to weed and algae decomposition occur in Placid Lake. Toxic algae blooms have resulted in fish kills in Salmon and Inez lakes in late summer and early fall.

Bathymetric maps developed in 2002 for the eight major lakes in the Clearwater River drainage are shown in Appendix 1. Mapping of rooted aquatic vegetation reveals its growth occurs only in depths of up to 20 feet. Aquatic vegetation densities will be reevaluated next year to determine how much of each lake's surface area less than 20 feet in depth is occupied by rooted aquatic vegetation. This will provide a better index of eutrophication for each lake.

Since human population densities and nutrient enrichment continue to increase, little can be done to retard increased growths of unwanted aquatic weeds and algae. Improvement of septic systems for human dwellings in close proximity to lakes and streams would help mitigate the problem.

Table 1. Physical characteristics of the eight major lakes in the Clearwater River drainage.

Lake	Surface Acres	Volume Acre-Feet	Weed Area Acres	Maximum Depth Feet	Elevation Feet MSL
Clearwater	103	2,087	12.33	42	4786
Rainy	81	1,420	8.97	29.4	4094
Marshall	85	2,700	5.21	57	4751
Alva	314	15,477	8.45	90.1	4074
Inez	298	11,577	17.1	74	4061
Seeley	1,047	58,853	62	125	3993
Placid	1,300	64,215	120.65	92.6	4123
Salmon	660	20,341	30.61	64.8	3909
TOTAL	3,888	176,670	265.32		

Fish Population Status and Management

Relative abundances of fish populations in the eight major lakes in the drainage have been monitored since 1995 by experimental gill netting. Results of these surveys are shown in Figures 2 through 14, Tables 2 through 7 and Appendix 2.

The bulk of the sport fishery in these lakes historically was provided by kokanee, westslope cutthroat trout, brown trout, yellow perch and largemouth bass along with a few bull and rainbow trout. Mountain whitefish provided an underutilized sport fishery. An unwanted illegal introduction of northern pike occurred in the drainage in the late 1980's or early 1990's. Expansion of the pike population has had a detrimental impact on the diverse sport fishery which existed prior to their introduction. In several lakes, including Salmon, Inez and Seeley, northern pike are providing an increasing or dominant proportion of the sport fishery.

Northern pike were detected in gill net surveys at high densities at the onset of studies initiated in 1995 on Salmon and Inez lakes (Figures 5 and 8) and at a low density in Lake Alva (Figure 11). Following a relatively high water year in 1997, northern pike moved into Seeley Lake as a result of upstream movement in the Clearwater River from Salmon Lake and/or downstream movement in the Clearwater River from Lake Inez (Figures 2 and 3). Northern pike reproduction was detected 1999, and the population is presently established in Seeley Lake at a high density.

Northern pike population density increases in Seeley, Salmon and Inez lakes have had profound negative impacts on other game and nongame species (Figures 4,7 and 10). Northern pike predation depleted populations of other species which provided their food supply by 1995 in Salmon and Inez lakes and, in response to depletion of their food supply, northern pike declined in density in each subsequent year through 1999 (Figures 5 and 8). Recovery of kokanee, trout and other species densities in these lakes occurred as northern pike declined in abundance, but this, in turn, has led to a recovery and subsequent increase in northern pike densities.

It is apparent that population densities of northern pike and other species in Salmon, Inez and Seeley lakes will vary significantly as northern pike go through cycles of population expansion and contraction related to availability of their food supply which, in part, consists of other game fish species of considerable importance to anglers.

Westslope cutthroat trout and kokanee populations in the Clearwater drainage lakes are presently enhanced by hatchery supplementation. Hatchery plants were significantly decreased or eliminated in the pike infested lakes, including Salmon, Inez and Seeley, during northern pike population density expansion periods. Some hatchery supplementation was resumed as pike reached significantly reduced densities in Salmon and Inez lakes to determine whether a diverse fishery could be provided periodically in these lakes. Additional sampling and data analysis are needed to evaluate this management strategy.

Northern pike were illegally introduced into Lake Alva prior to the inception of this study. Pike were detected at very low densities in gill net surveys conducted in 1995 and 1998, but have not been observed in sampling since 1998. It appears northern pike population survival has failed in Lake Alva, probably due to failure of the population to reach a critical mass and successfully reproduce. Suitable habitat exists for northern pike population expansion in Lake Alva, and the lake could eventually succumb to fishery degradation if northern pike are reintroduced by human endeavor (bucket biologists) or movement upstream in the Clearwater River from Lake Inez. Movement of northern pike and other species from Lake Inez to Lake Alva through the Clearwater River is presently severely hindered, if not precluded, by extensive beaver dams. A high flood breaching these dams could result in movement of northern pike from Lake Inez to Lake Alva, the expansion of northern pike in Alva and the collapse of the exceptionally valuable kokanee/westslope cutthroat trout fishery which presently exists in this lake.

Placid Lake is presently free of northern pike due, in part, to the outlet structure on the lake which precludes movement of northern pike from Salmon or Seeley lakes through the Clearwater River and Owl Creek and into Placid Lake. However, the outlet structure on Placid Lake will be breached during a high flood at some time in the future, and northern pike could be introduced into Placid Lake at that time. Feasibility of a man-made barrier to northern pike passage in the bypass channel around the outlet structure should be evaluated to eliminate or reduce the potential for an undesired introduction of northern pike into Placid Lake by movement of fish from infested lakes.

Clearwater, Rainy and Marshall lakes are also presently pike free. A man-made fish barrier in the Clearwater River downstream from Rainy Lake, commonly referred to as the Rainy Lake fish barrier, precludes movement of northern pike from lower elevation lakes into Rainy and Clearwater lakes. Natural fish barriers prevent northern pike movement into Marshall Lake. These three lakes are presently managed as westslope cutthroat/bull trout fisheries, and they are the only three of the eight major lakes which do not contain kokanee.

In the 1960's MFWP installed two fish barriers in the Clearwater River drainage. The lower barrier, on the Clearwater River downstream of Lake Inez, is commonly referred to as the Lake Inez fish barrier. The upper, or Rainy Lake fish barrier, is located on the Clearwater downstream of Rainy Lake. The barriers, in conjunction with chemical rehabilitation of lakes upstream of the barriers, constituted an attempt to eliminate yellow perch, then considered an undesirable species, and enhance salmonid populations. This reclamation effort was not successful in eradication of yellow perch, but it was unintentionally successful in eliminating northern pikeminnows and peamouth in lakes upstream from the barriers.

Westslope cutthroat trout survival and population densities are presently substantially enhanced in Inez, Alva, Rainy, Marshall and Clearwater lakes apparently due to lack of predation by or food competition with northern pikeminnows and peamouth (Tables 2 through 7). Inez, Alva and Clearwater lakes are presently supplemented with hatchery westslope cutthroat trout which significantly enhances natural recruitment. Westslope cutthroat trout in Rainy and Marshall

lakes persist entirely due to natural reproduction, but their present densities appear low when compared to hatchery supplemented lakes. In an attempt to improve westslope cutthroat trout densities in Rainy and Marshall lakes, hatchery supplementation was resumed in these lakes in 2003.

CONCLUSIONS

An unwanted illegal introduction of northern pike is, by far, the largest factor impairing fish populations in lakes in the Clearwater River drainage. Northern pike population expansions in Inez, Salmon and Seeley lakes have reduced other desirable fish species densities by 70 to over 90 percent.

Of particular concern are westslope cutthroat trout and bull trout. Currently, bull trout are listed as a Threatened Species under the Endangered Species Act, and westslope cutthroat trout are considered a sensitive species by Region 1 of the Forest Service and a Species of Special Concern by MFWP. While westslope cutthroat populations in lakes in the Clearwater River drainage can be supported by hatchery supplementation, this management option is not available for bull trout. Bull trout have been reduced in density by over 90 percent in Inez and Seeley lakes, and they are nearly extinct in Salmon Lake due to northern pike predation and competition.

Northern pike presently occupy three lakes, Salmon, Inez and Seeley, which collectively constitute 2,005 acres, or 52 percent , of the total lake surface area in the Clearwater River drainage. Alva and Placid lakes are vulnerable to northern pike introduction during a high runoff year due to upstream movement of pike from infested lakes. If this were to occur, northern pike would occupy 3,619 acres, or 93 percent, of the total lake surface area in the drainage. Little could be done to provide a diverse fishery under these circumstances. Significant efforts should be made to insure northern pike introduction does not occur in Placid and Alva lakes.

Angler preference and creel surveys have been conducted in the Clearwater drainage. These surveys indicate anglers strongly prefer the diverse sport fishery which exists in pike free lakes and which existed previously in lakes now infested with northern pike. For these reasons, fishing pressure has shifted significantly from pike infested lakes, Seeley, Salmon and Inez, to pike free lakes, Placid, Alva, Clearwater, Rainy and Marshall.

Hatchery supplementation of westslope cutthroat trout has been resumed or increased in all of the pike free lakes in an effort to accommodate increased fishing pressure and maintain angler satisfaction. For the same reasons hatchery supplementation of kokanee has been increased in Alva and Placid lakes to maintain angler satisfaction for this highly sought after species. Kokanee do not occur and have never been planted in Clearwater, Rainy or Marshall lakes. It would not be prudent to ever plant kokanee in these lakes since they may not be large enough to support desirable populations. In addition, and more importantly, kokanee appear to suppress westslope cutthroat trout population densities due to competition for food, primarily zooplankton,

at early life stages. Additional data, analysis and conclusions pertaining to kokanee/westslope cutthroat trout relationships will be presented in a future report.

Increased fishing pressure on all of the pike free lakes in the drainage has become increasingly problematic in recent years, and is particularly evident on Rainy and Clearwater lakes. Kokanee and westslope cutthroat trout population densities and angler catch rates can be maintained up to a certain point by increased hatchery supplementation. However, angler satisfaction with any fishery is also dependent on whether anglers feel over crowded. Over crowding is becoming an increasingly significant issue on Rainy and Clearwater lakes. Use of these lakes has been restrained to some extent by Forest Service efforts which have included minimizing road signs identifying the lakes and not increasing the size of parking areas. These management policies should be continued.

In summary, northern pike introductions in the Clearwater drainage have created significant fishery and recreational management problems. MFWP will continue to endeavor to provide a diverse fishery in an effort to meet recreational expectations through use of hatchery supplementation, salmonid habitat protection or enhancement, efforts to prevent additional unwanted introductions of exotic species, and other management strategies.

Figure 2. Average number of northern pike captured per overnight gill net set in Seeley Lake from 1995 through 2001 in fall sampling.

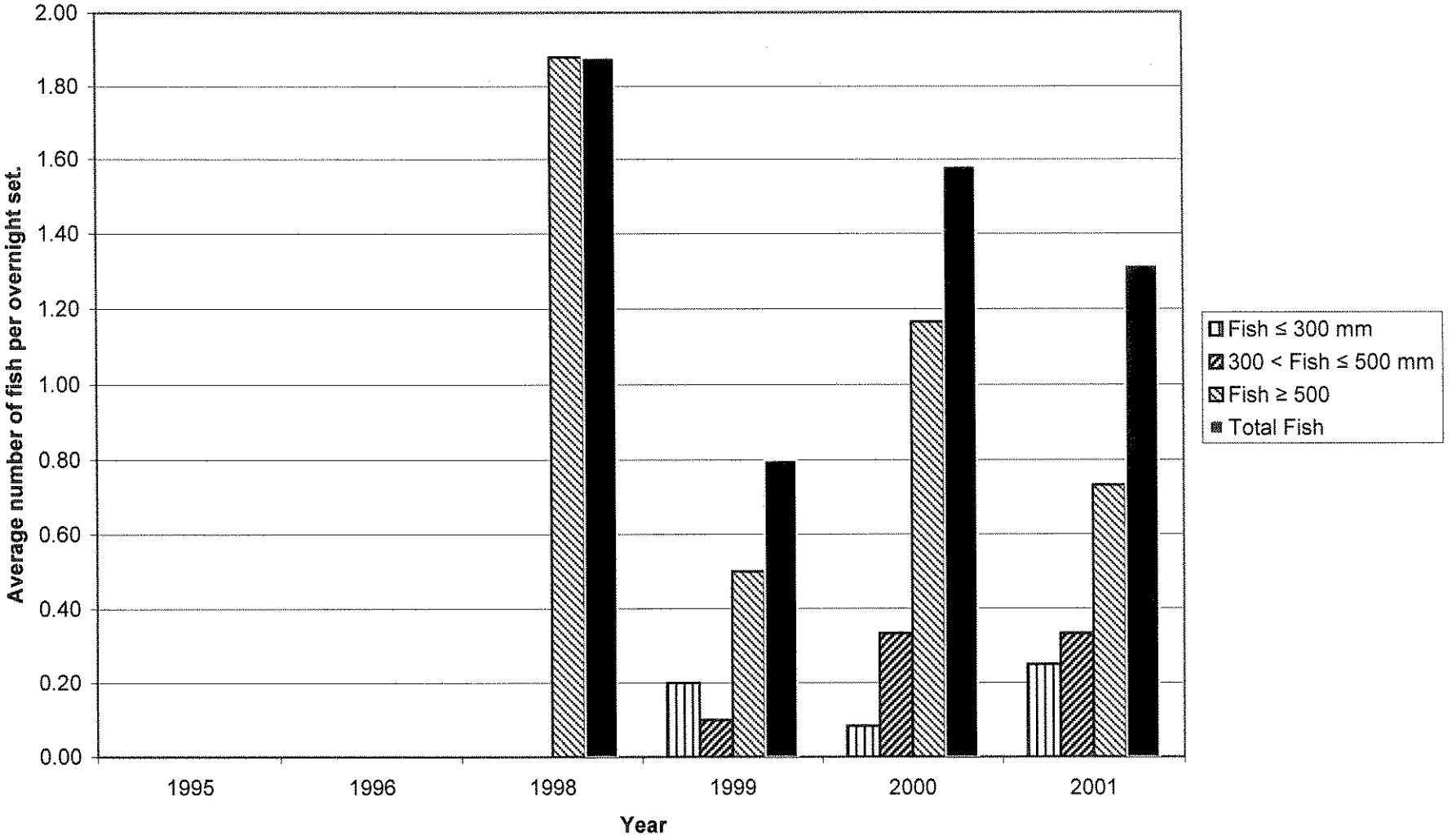


Figure 3. Length frequency of northern pike captured in fall gill net sampling on Seeley Lake from 1995 through 2001.

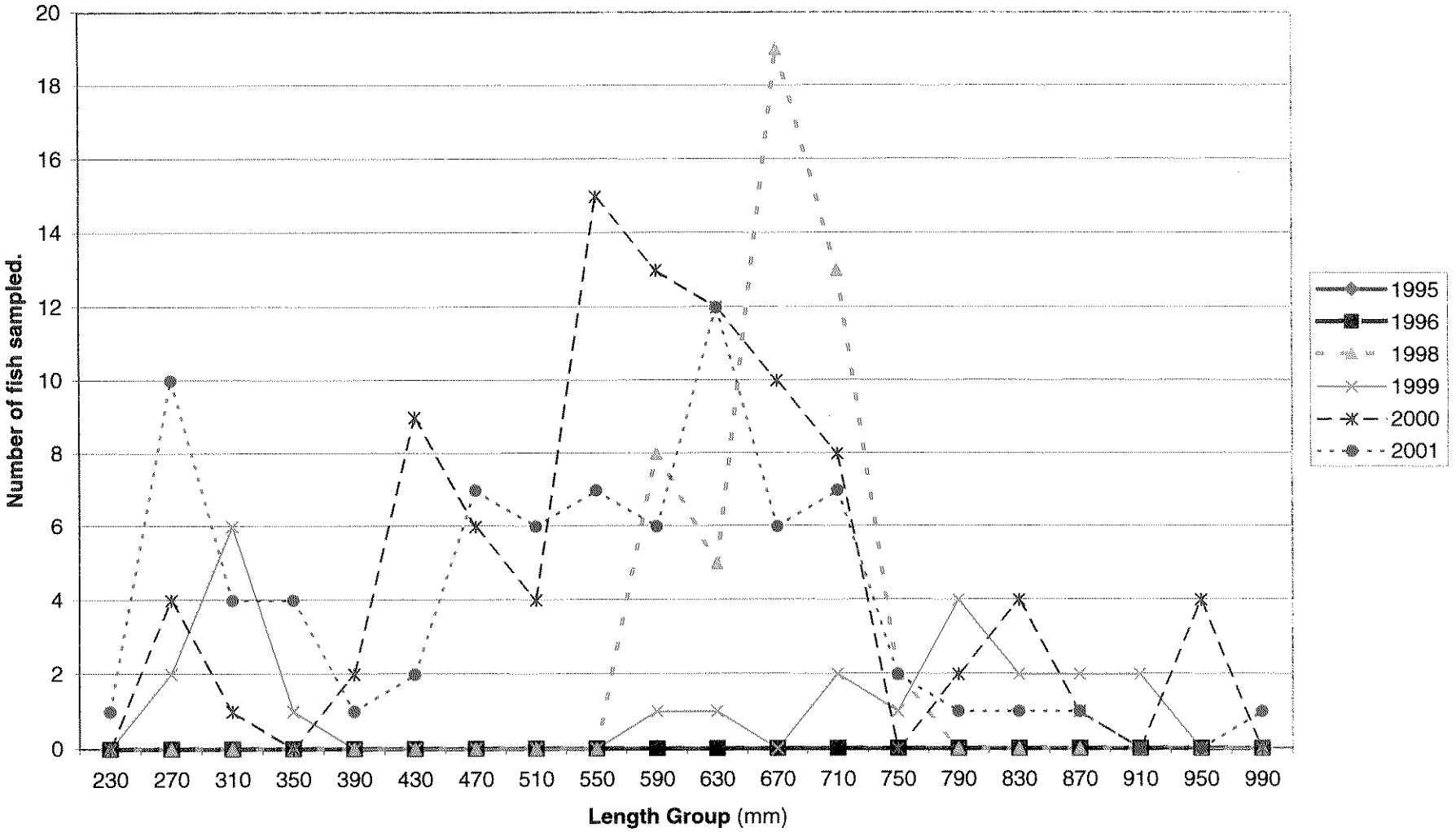


Figure 4. Average number of fish captured per overnight gill net set in Seeley Lake from 1995 through 2001 in fall sampling.

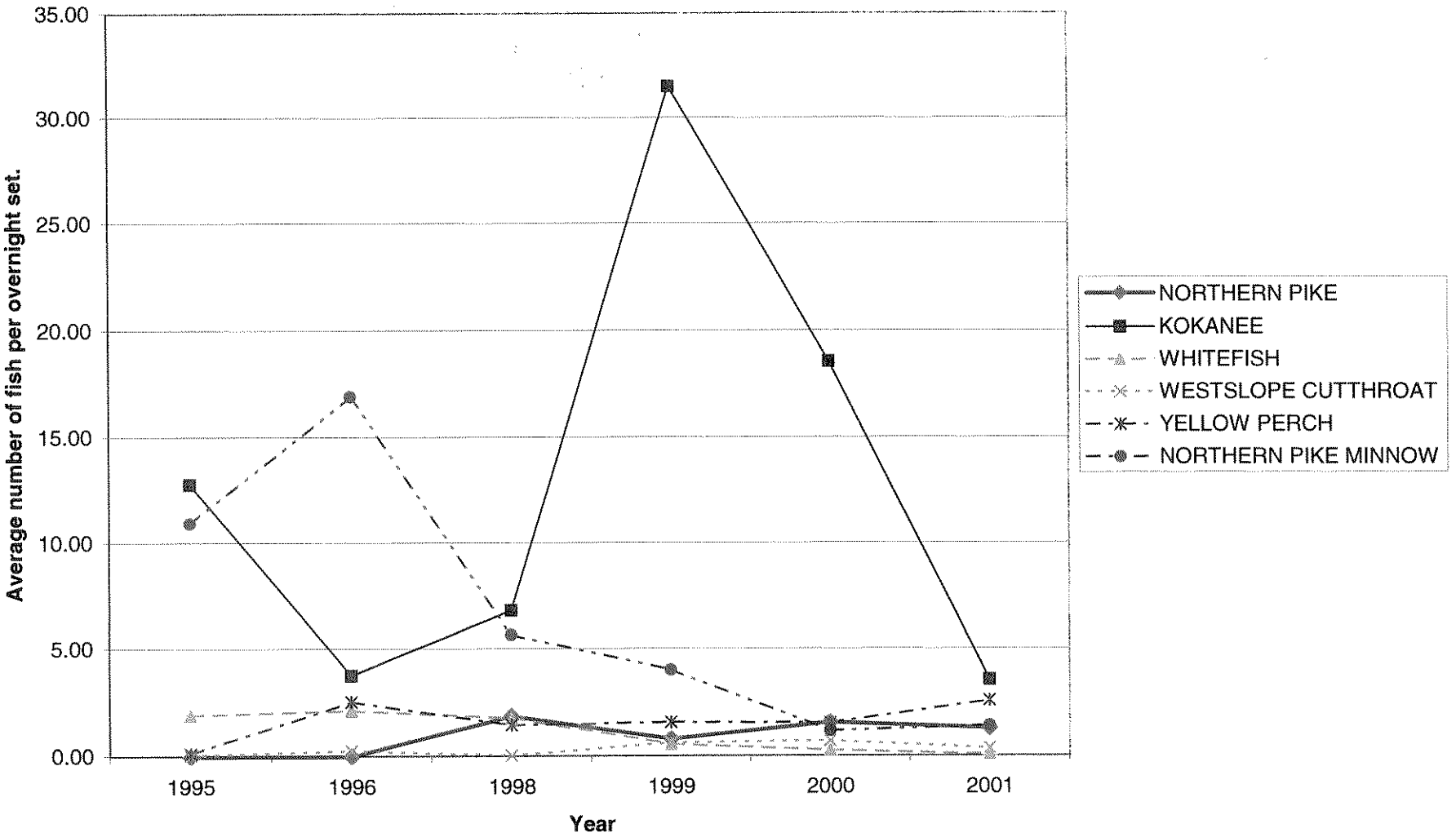


Figure 5. Average number of northern pike captured per overnight gill net set in Salmon Lake from 1995 through 2001 in fall sampling.

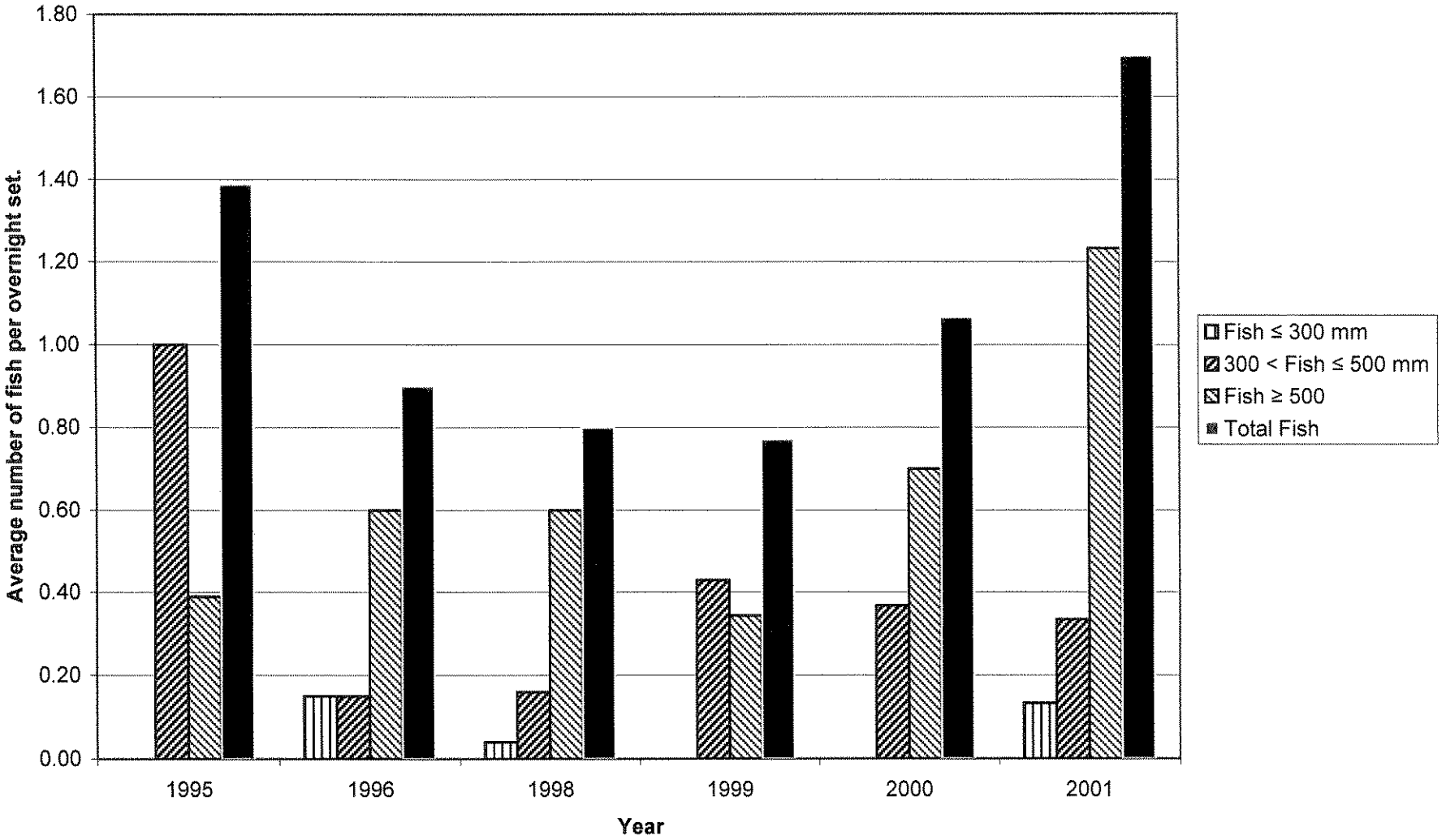


Figure 6. Length frequency of northern pike captured in fall gill net sampling on Salmon Lake from 1995 through 2001.

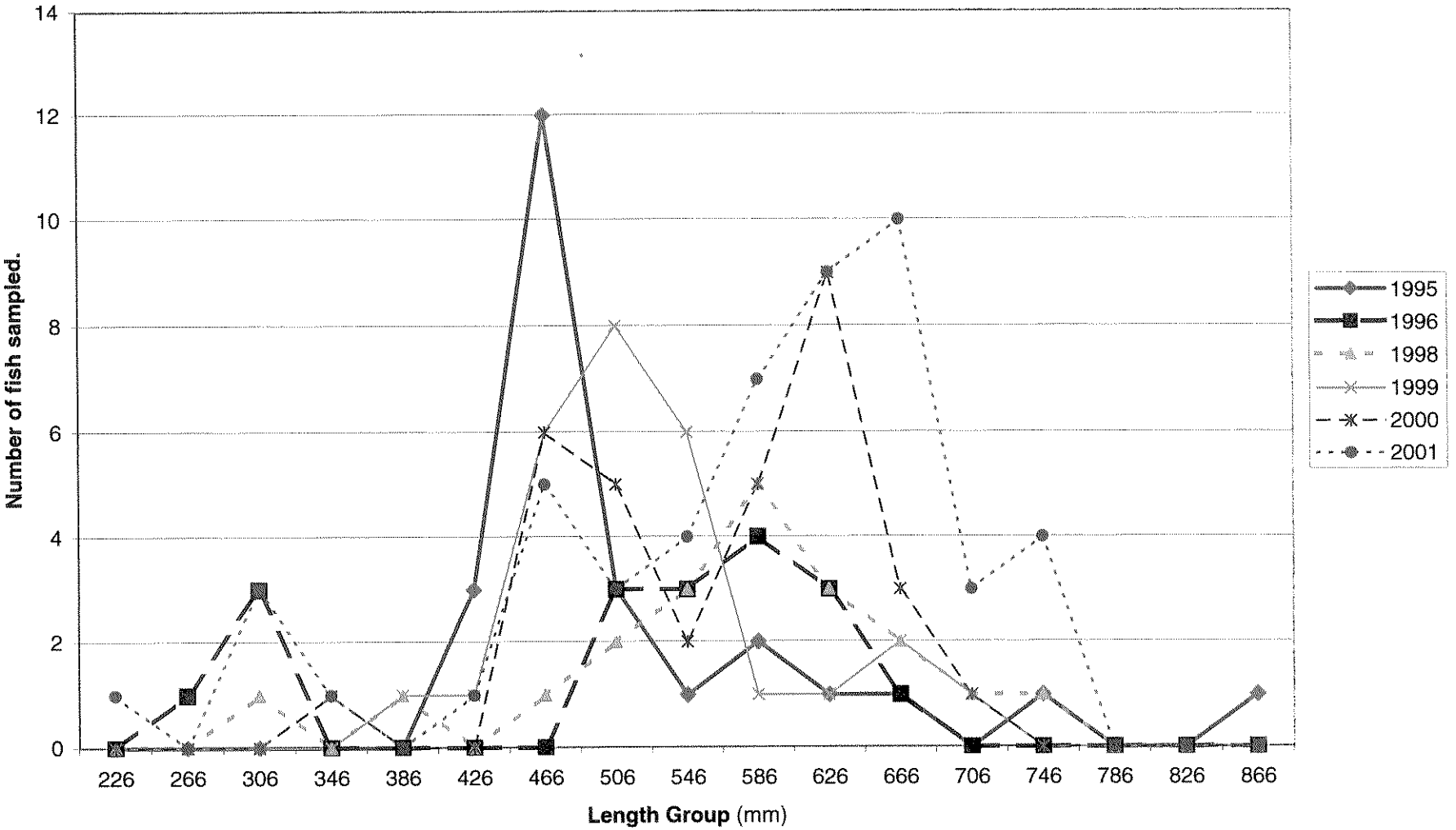


Figure 7. Average number of fish captured per overnight gill net set in Salmon Lake from 1995 through 2001 in fall sampling.

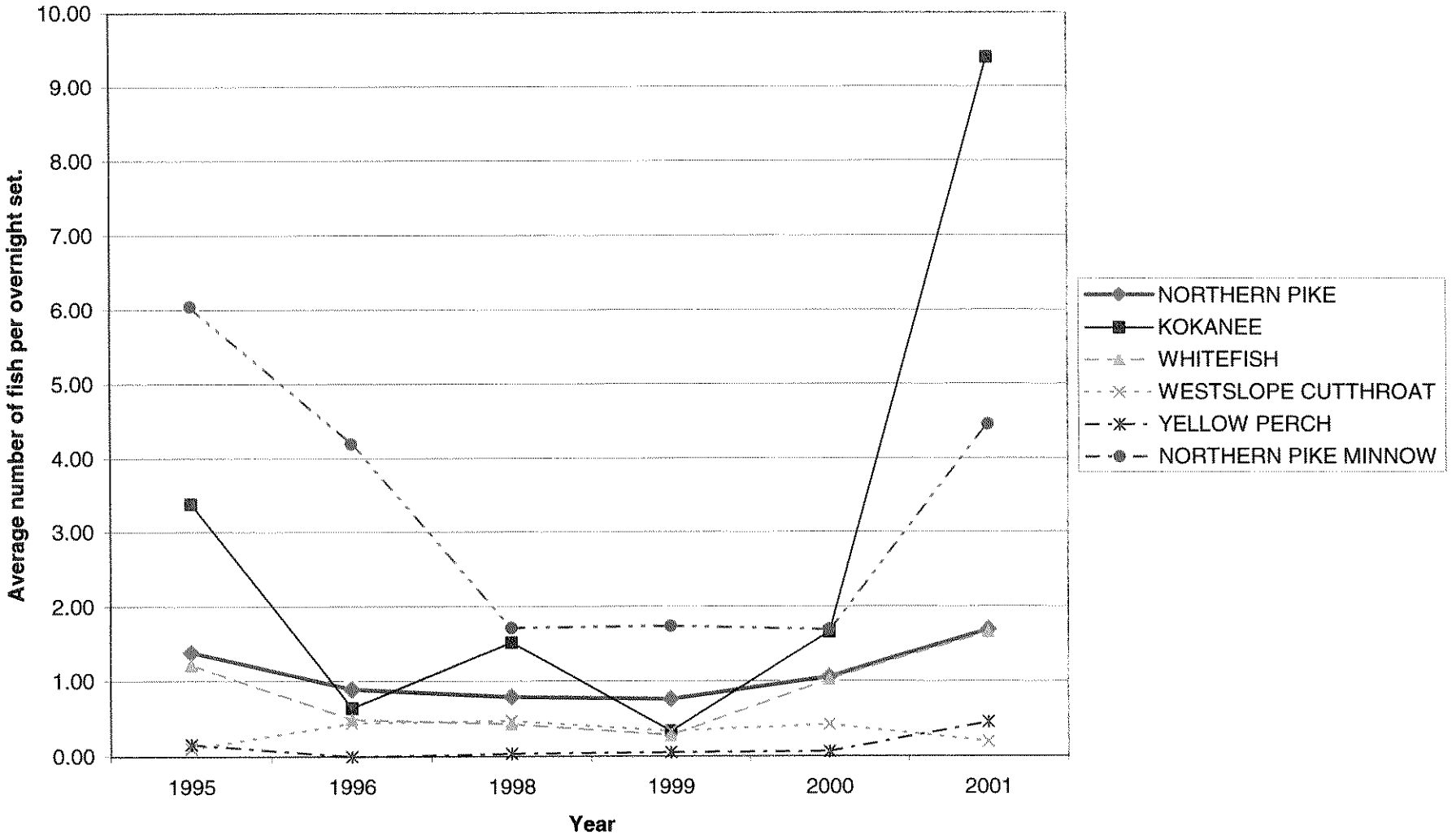


Figure 8. Average number of northern pike captured per overnight gill net set in Lake Inez from 1995 through 2001 in fall sampling.

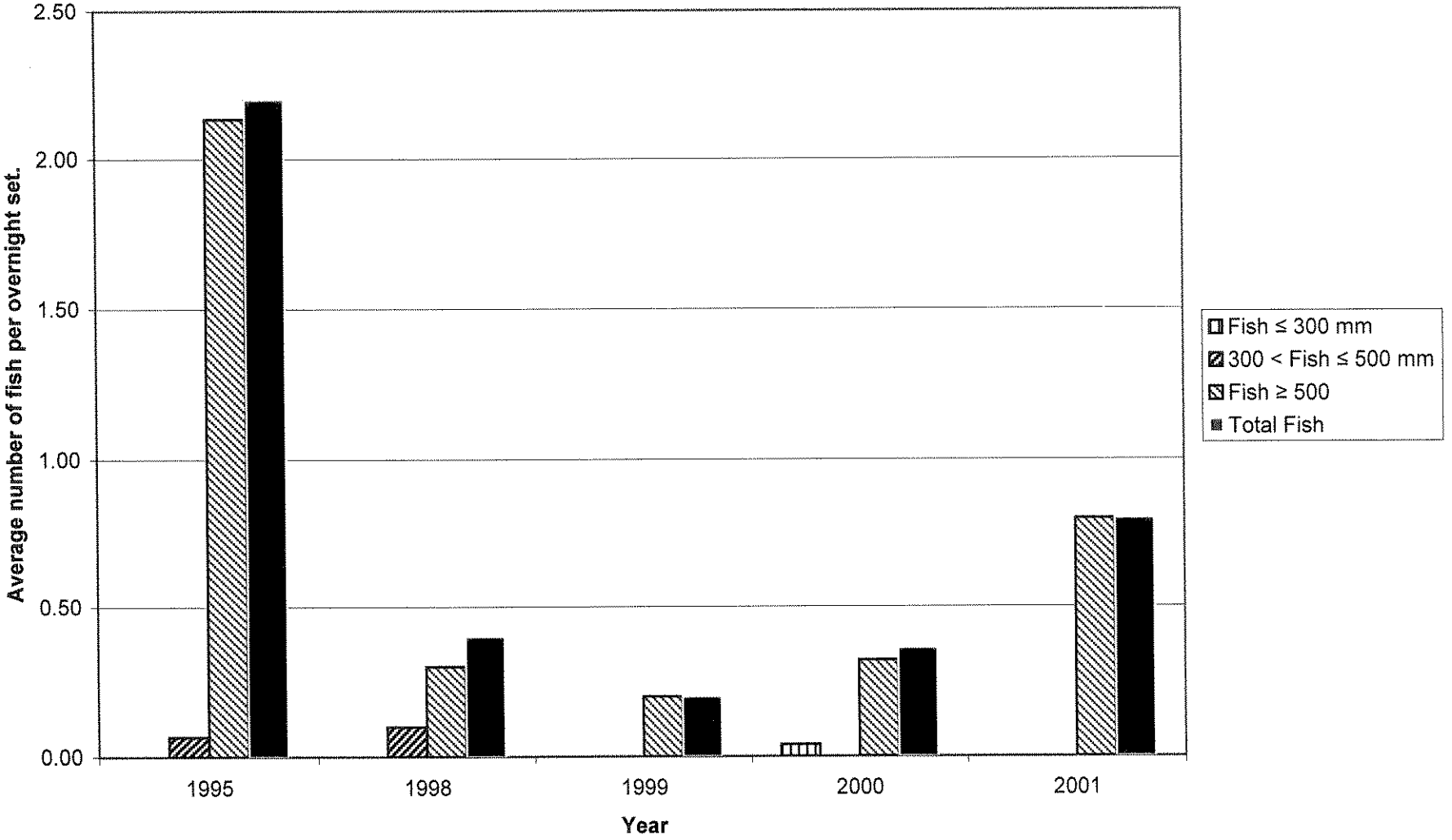


Figure 9. Length frequency of northern pike captured in fall gill net sampling on Lake Inez from 1995 through 2001.

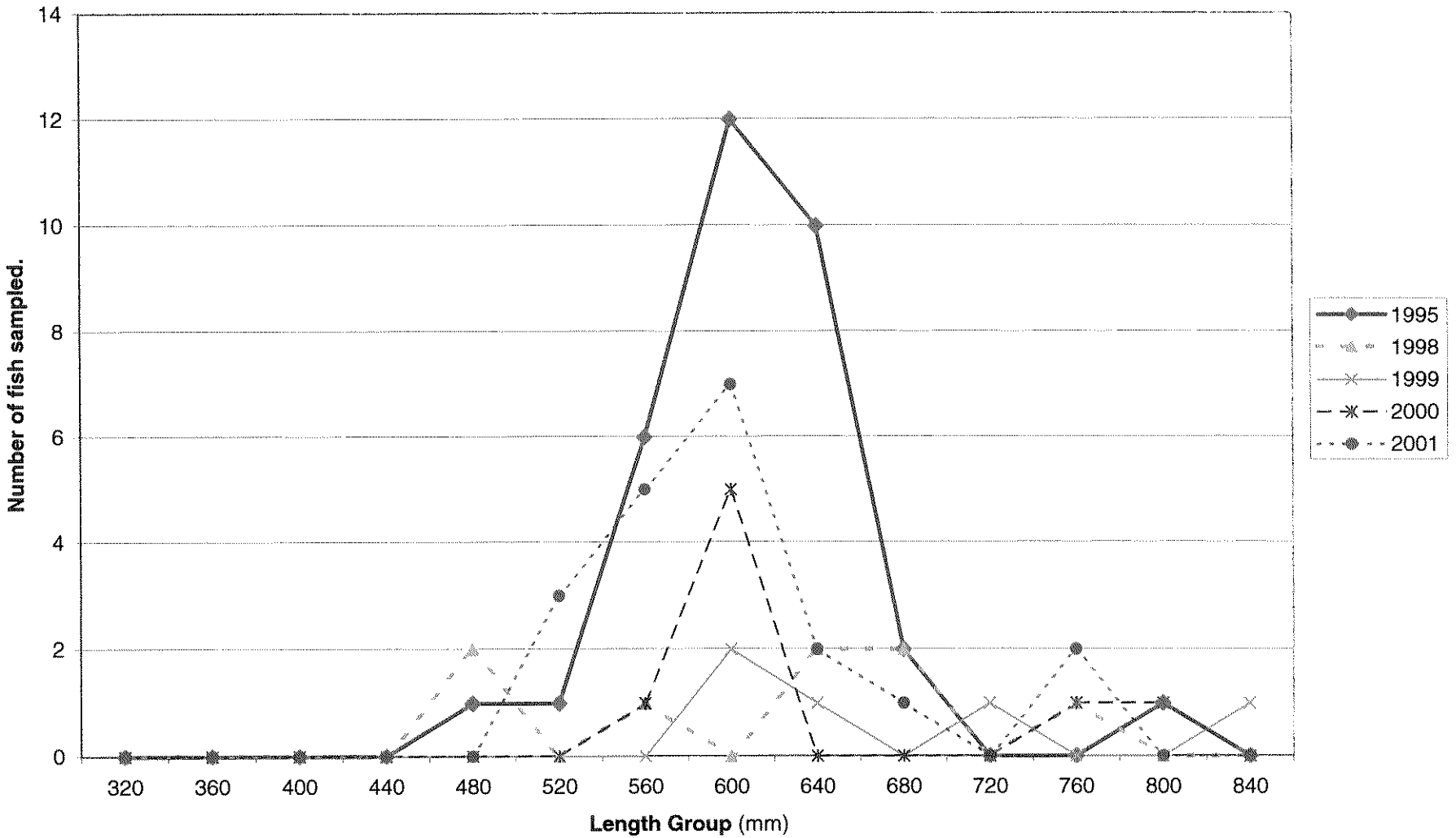


Figure 10. Average number of fish captured per overnight gill net set in Lake Inez from 1995 through 2001 in fall sampling.

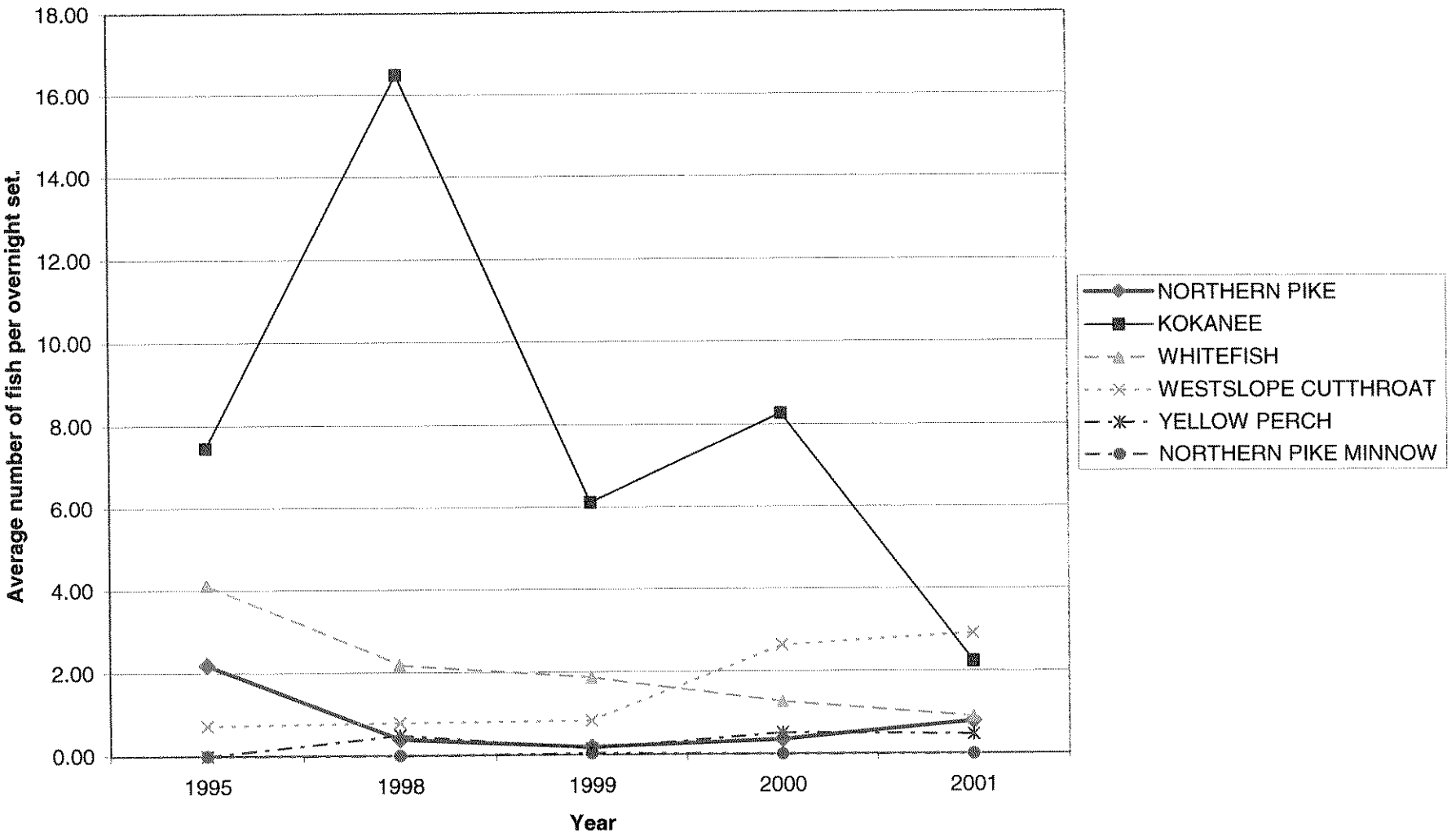


Figure 11. Average number of northern pike captured per overnight gill net set in Lake Alva from 1995 through 2001 in fall sampling.

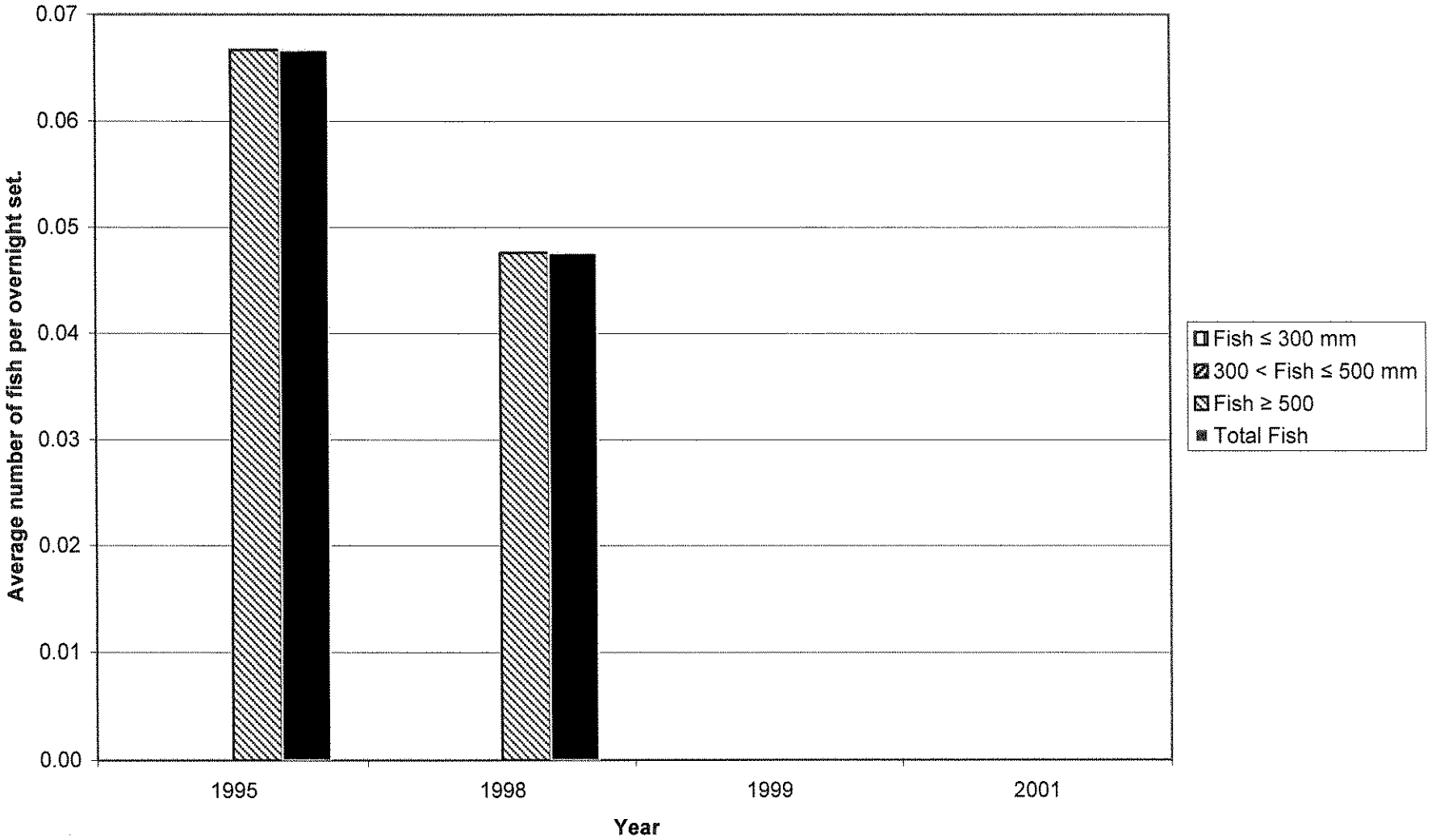


Figure 12. Length frequency of northern pike captured in fall gill net sampling on Lake Alva from 1995 through 2001.

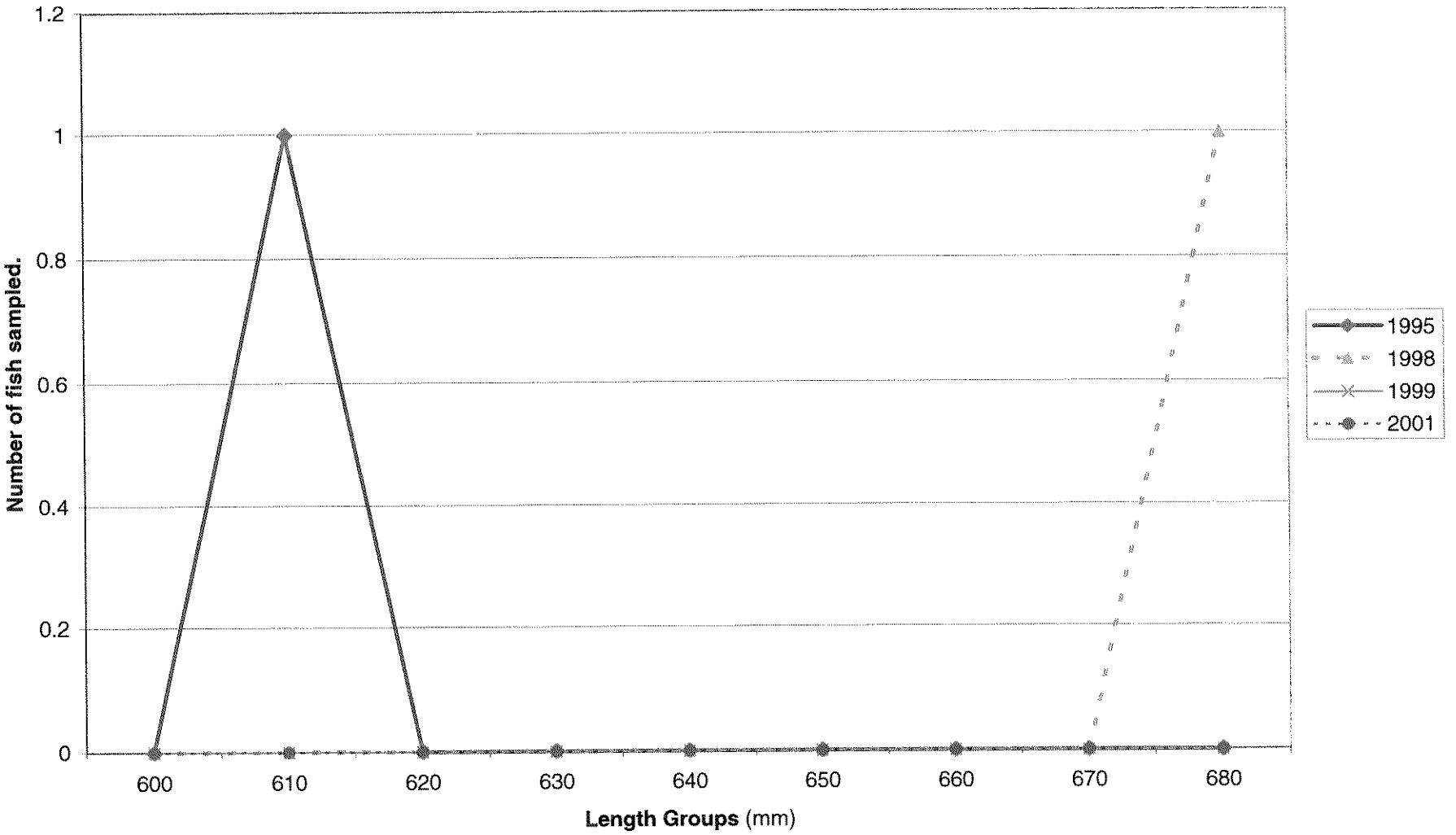


Figure 13. Average number of fish captured per overnight gill net set in Lake Alva from 1995 through 2001 in fall sampling.

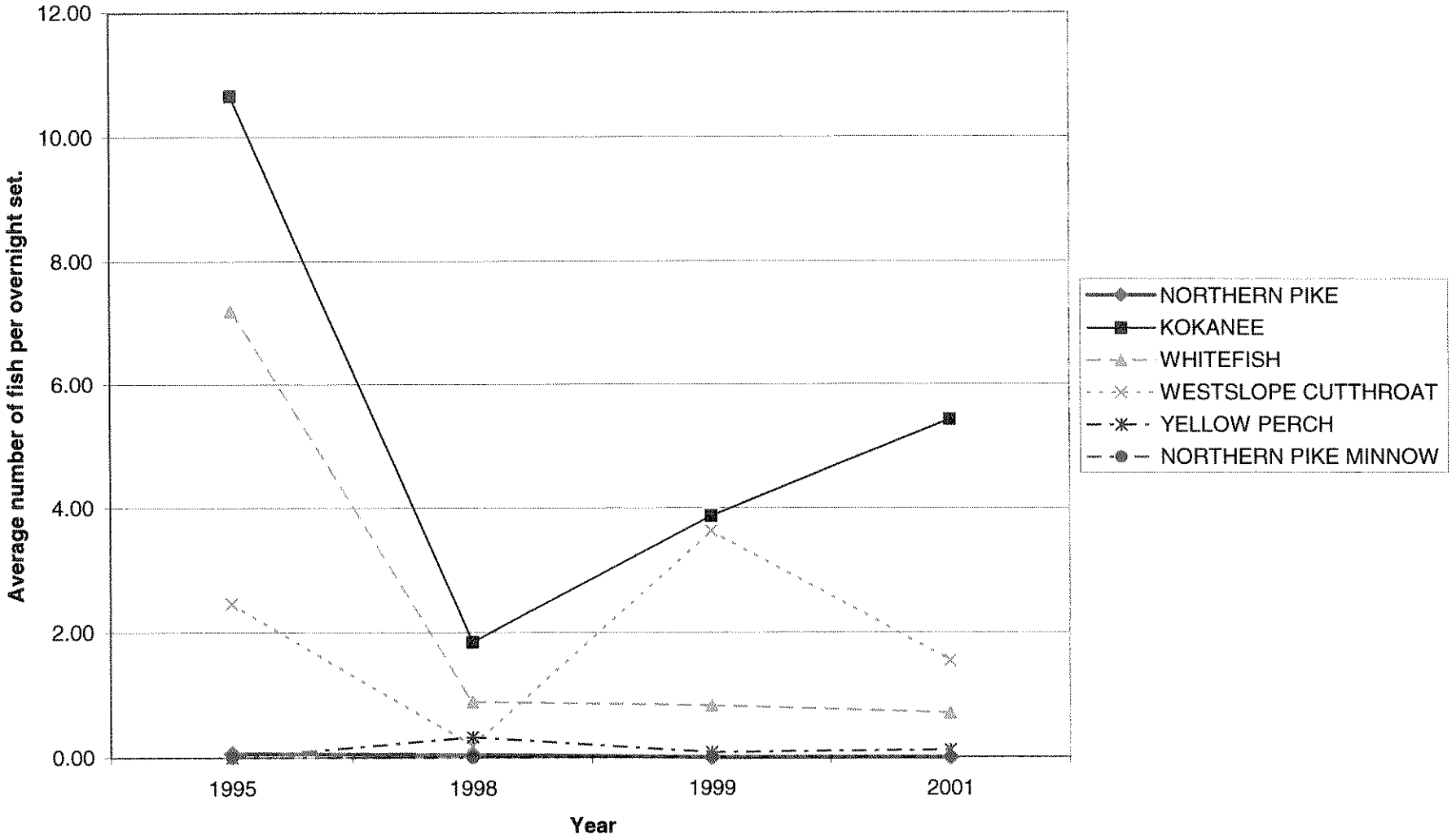


Figure 14. Average number of fish captured per overnight gill net set in Placid Lake from 1995 through 2001 in fall sampling.

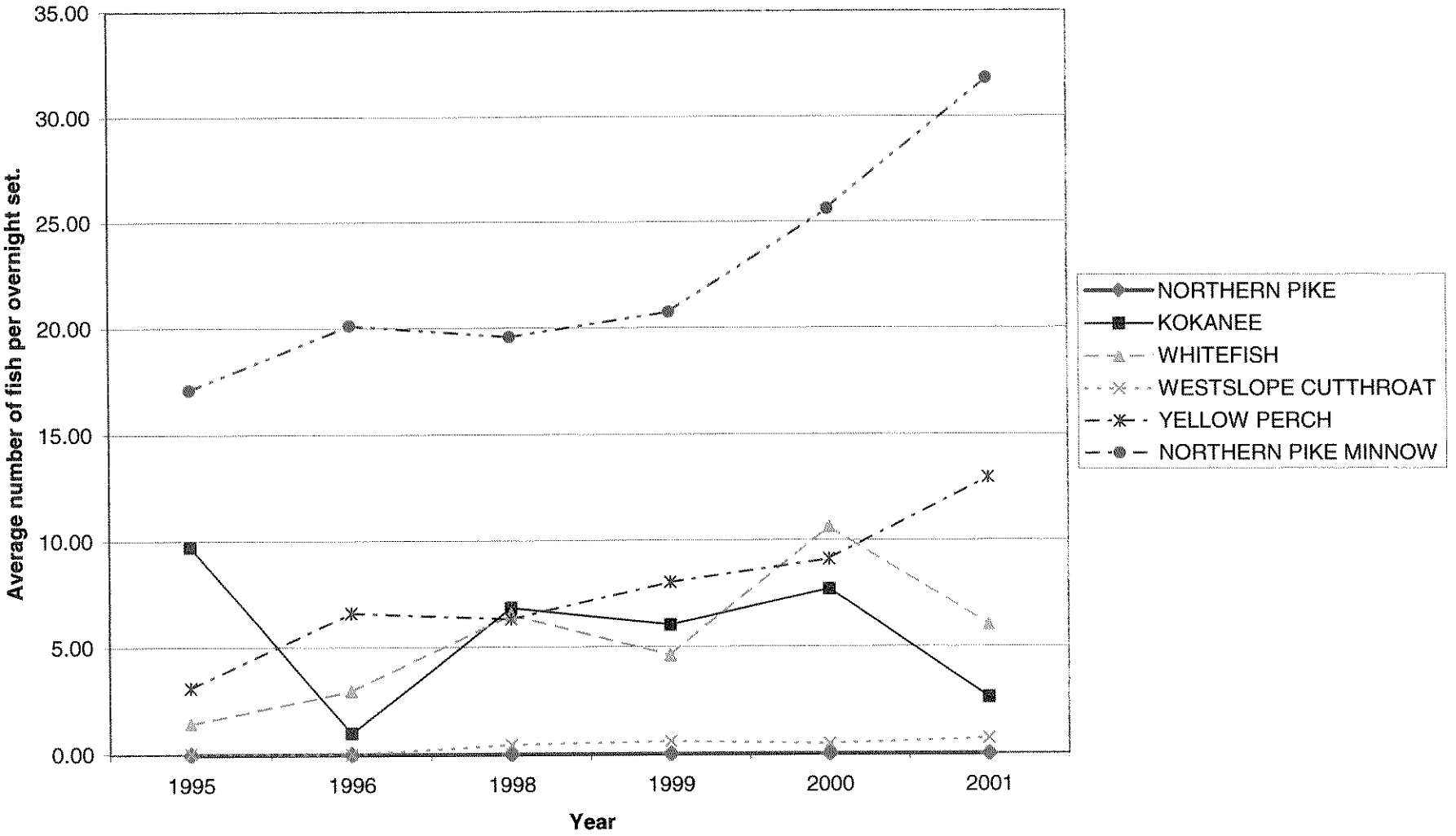


Table 2.

Catch rate summary for experimental gill net surveys conducted on the Clearwater River drainage lakes in 2001, expressed as number of fish captured per overnight net set.

Fish Species	Salmon 30*	Seeley 60	Alva 25	Inez 25	Placid 30	Rainy 15	Marshall 20	Clearwater 20
NORTHERN PIKE	1.70	1.32		0.80				
NORTHERN PIKE MINNOW	4.47	1.43			31.83			
PEAMOUTH	0.13				16.97			
KOKANEE	9.40	3.58	5.44	2.24	2.67			
RAINBOW TROUT	0.37	0.02			0.03			
RAINBOW X CUTTHROAT					0.07			
WESTSLOPE CUTTHROAT	0.20	0.37	1.56	2.92	0.73	2.60	0.35	7.10
BROWN TROUT	0.80	0.18			0.53			
BROOK TROUT				0.08			1.30	0.15
BULL TROUT	0.10	0.08	0.04	0.04		0.07		
WHITEFISH	1.67	0.08	0.72	0.92	6.03		0.15	
PUMPKIN SEED	0.10	0.82			2.03			
YELLOW PERCH	0.47	2.60	0.12	0.48	12.97	4.00		
LARGE MOUTH BASS		0.03			0.43			
Total	19.40	10.52	7.88	7.48	74.30	6.67	1.80	7.25

* Number of net sets in lake.

Table 3.

Catch rate summary for experimental gill net surveys conducted on the Clearwater River drainage lakes in 2000, expressed as number of fish captured per overnight net set.

Fish Species	Salmon 30*	Seeley 60	Inez 25	Placid 30
NORTHERN PIKE	1.07	1.58	0.36	
NORTHERN PIKE MINNOW	1.70	1.18		25.63
PEAMOUTH	0.07			15.23
KOKANEE	1.67	18.58	8.28	7.70
RAINBOW TROUT	0.07	0.07		0.37
RAINBOW X CUTTHROAT	0.03	0.02		1.00
WESTSLOPE CUTTHROAT	0.43	0.70	2.64	0.47
BROWN TROUT	0.20	0.22		0.60
BROOK TROUT			0.04	
BULL TROUT		0.23	0.16	0.03
WHITEFISH	1.03	0.27	1.28	10.67
PUMPKIN SEED	0.07	0.20	0.24	0.70
YELLOW PERCH	0.07	1.57	0.52	9.13
LARGE MOUTH BASS				0.07
Total	6.40	24.62	13.52	71.60

* Number of net sets in lake.

Table 4.

Catch rate summary for experimental gill net surveys conducted on the Clearwater River drainage lakes in 1999, expressed as number of fish captured per overnight net set.

Fish Species	Salmon 35*	Seeley 30	Alva 25	Inez 25	Placid 30
NORTHERN PIKE	0.77	0.80		0.20	
NORTHERN PIKE MINNOW	1.74	4.03		0.04	20.77
PEAMOUTH	0.14	0.03			45.47
KOKANEE	0.34	31.53	3.88	6.12	6.03
RAINBOW TROUT	0.03		0.12	0.16	0.20
RAINBOW X CUTTHROAT		0.13	1.16	1.72	0.47
WESTSLOPE CUTTHROAT	0.34	0.63	3.64	0.84	0.60
BROWN TROUT	0.29	0.23			0.47
BROOK TROUT			0.04		
BULL TROUT		0.43	0.16	0.16	0.07
WHITEFISH	0.29	0.57	0.84	1.88	4.63
PUMPKIN SEED		0.27			0.10
YELLOW PERCH	0.06	1.60	0.08	0.16	8.03
LARGE MOUTH BASS	0.03	0.10			0.07
Total	4.03	40.37	9.92	11.28	86.90

* Number of net sets in lake.

Table 5.

Catch rate summary for experimental gill net surveys conducted on the Clearwater River drainage lakes in 1998, expressed as number of fish captured per overnight net set.

Fish Species	Salmon 25*	Seeley 25	Alva 21	Inez 20	Placid 25
NORTHERN PIKE	0.80	1.88	0.05	0.40	
NORTHERN PIKE MINNOW	1.72	5.68			19.60
PEAMOUTH	0.48				16.36
KOKANEE	1.52	6.84	1.86	16.50	6.84
RAINBOW TROUT	0.16				0.20
RAINBOW X CUTTHROAT		0.52	4.67	0.15	2.84
WESTSLOPE CUTTHROAT	0.48	0.04	0.19	0.80	0.44
BROWN TROUT	0.16	0.04			0.32
BROOK TROUT					
BULL TROUT		0.12		0.10	
WHITEFISH	0.44	1.80	0.90	2.20	6.52
PUMPKIN SEED		0.68		0.05	0.52
YELLOW PERCH	0.04	1.48	0.33	0.50	6.32
LARGE MOUTH BASS		0.16			0.12
Total	5.80	19.24	8.00	20.70	60.08

* Number of net sets in lake.

Table 6.

Catch rate summary for experimental gill net surveys conducted on the Clearwater River drainage lakes in 1996, expressed as number of fish captured per overnight net set.

Fish Species	Salmon 20*	Seeley 27	Placid 15
NORTHERN PIKE	0.90		
NORTHERN PIKE MINNOW	4.20	16.93	20.13
PEAMOUTH	0.50	0.04	22.40
KOKANEE	0.65	3.78	1.00
RAINBOW TROUT	0.20		0.40
RAINBOW X CUTTHROAT	0.05	0.07	0.20
WESTSLOPE CUTTHROAT	0.45	0.26	
BROWN TROUT	0.20	0.26	0.40
BROOK TROUT			
BULL TROUT		0.59	
WHITEFISH	0.50	2.15	3.00
PUMPKIN SEED		0.59	0.40
YELLOW PERCH		2.56	6.60
LARGE MOUTH BASS		0.07	0.27
Total	7.65	27.30	54.80

* Number of net sets in Lake.

Table 7.

Catch rate summary for experimental gill net surveys conducted on the Clearwater River drainage lakes in 1995, expressed as number of fish captured per overnight net set.

Fish Species	Salmon 18*	Seeley 15	Alva 15	Inez 15	Placid 15
NORTHERN PIKE	1.39		0.07	2.20	
NORTHERN PIKE MINNOW	6.06	10.93			17.13
PEAMOUTH	1.22				4.40
KOKANEE	3.39	12.80	10.67	7.47	9.73
RAINBOW TROUT				0.13	0.40
RAINBOW X CUTTHROAT	0.06	0.53			0.13
WESTSLOPE CUTTHROAT	0.11	0.07	2.47	0.73	0.07
BROWN TROUT	0.39	0.40			0.07
BROOK TROUT			0.07		
BULL TROUT		1.00	1.07	0.40	
WHITEFISH	1.22	1.93	7.20	4.13	1.47
PUMPKIN SEED		0.13			
YELLOW PERCH	0.17	0.13			3.13
LARGE MOUTH BASS		0.07			
Total	14.00	28.00	21.53	15.07	36.53

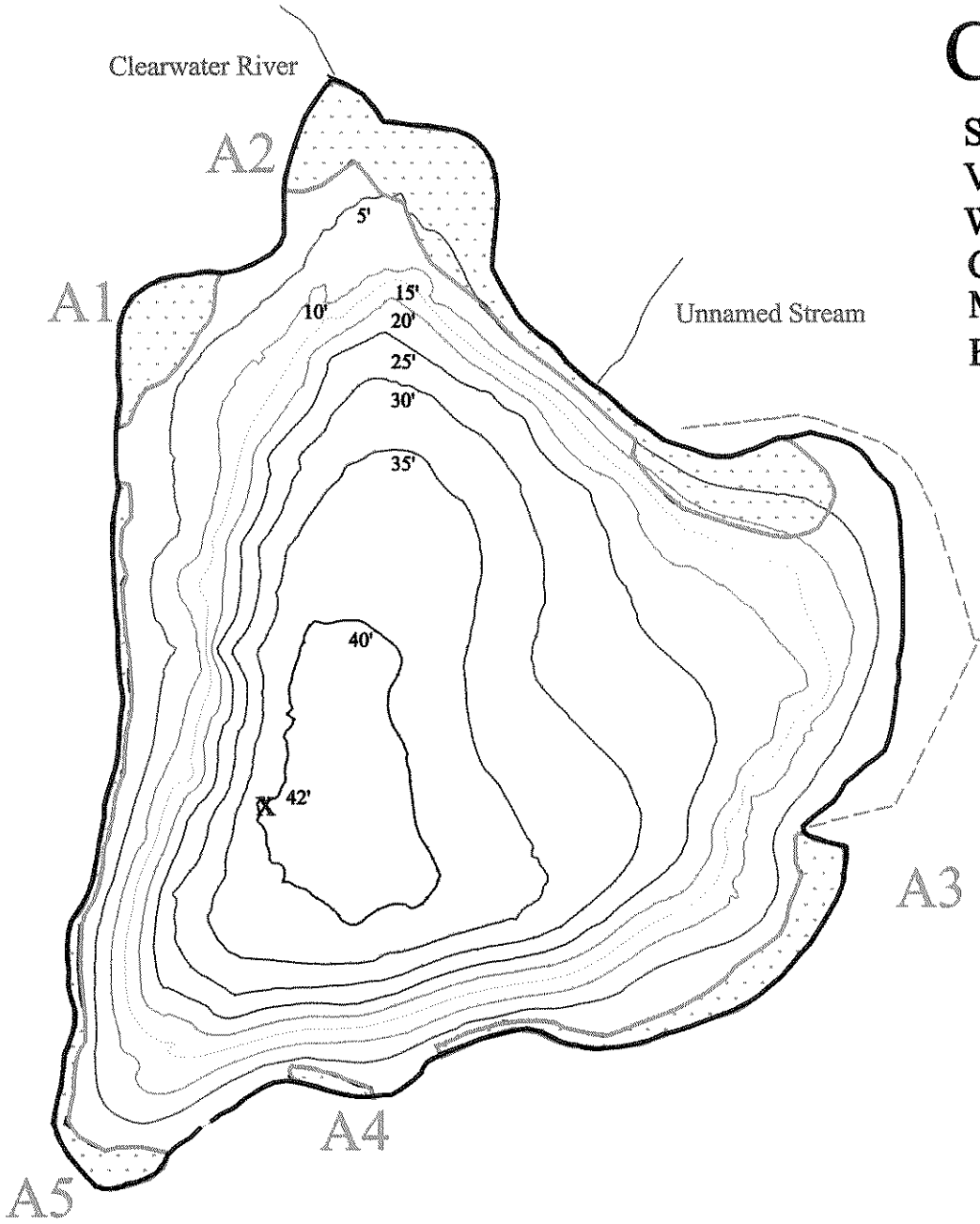
* Number of nets set in lake.

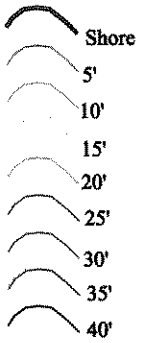
APPENDIX 1

Bathymetric Maps of Eight Major Lakes in the Clearwater River Drainage

Clearwater Lake

Surface Acres: 103
Volume: 2,087 Acre Feet
Weed Area =12.33 Acres
Contour Interval = 5'
Maximum Depth 42'
Elevation 4786' MSL





N

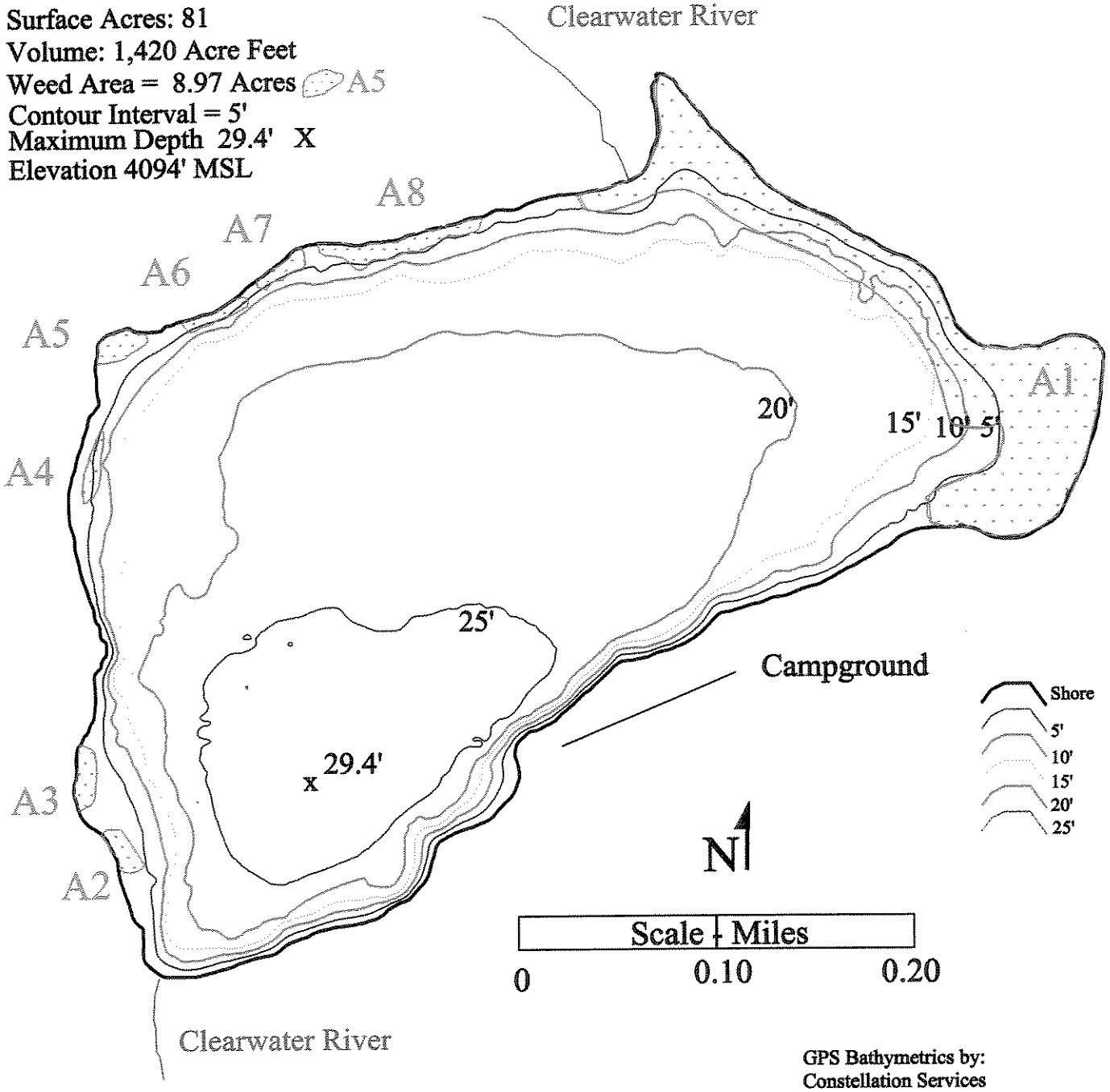
Scale - Miles

0 0.10 0.20

GPS Bathymetrics by:
Constellation Services
GPS & Natural Resource Management
P.O. Box 949
Helena, MT 59624
(406) 457-9197 mreller@mt.net

Rainy Lake

Surface Acres: 81
Volume: 1,420 Acre Feet
Weed Area = 8.97 Acres
Contour Interval = 5'
Maximum Depth 29.4' X
Elevation 4094' MSL



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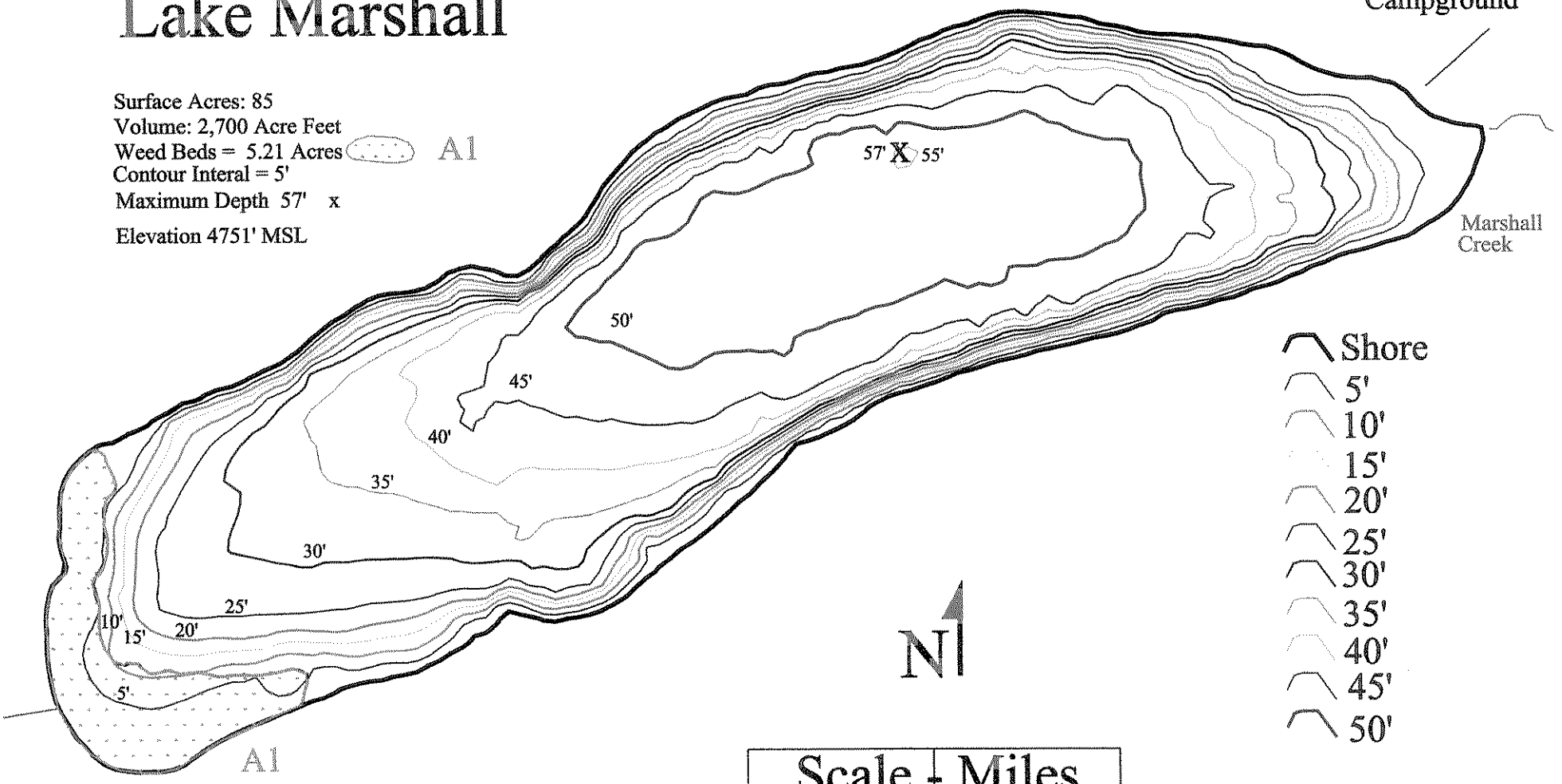
Lake Marshall

Surface Acres: 85
Volume: 2,700 Acre Feet
Weed Beds = 5.21 Acres
Contour Interal = 5'
Maximum Depth 57' x
Elevation 4751' MSL



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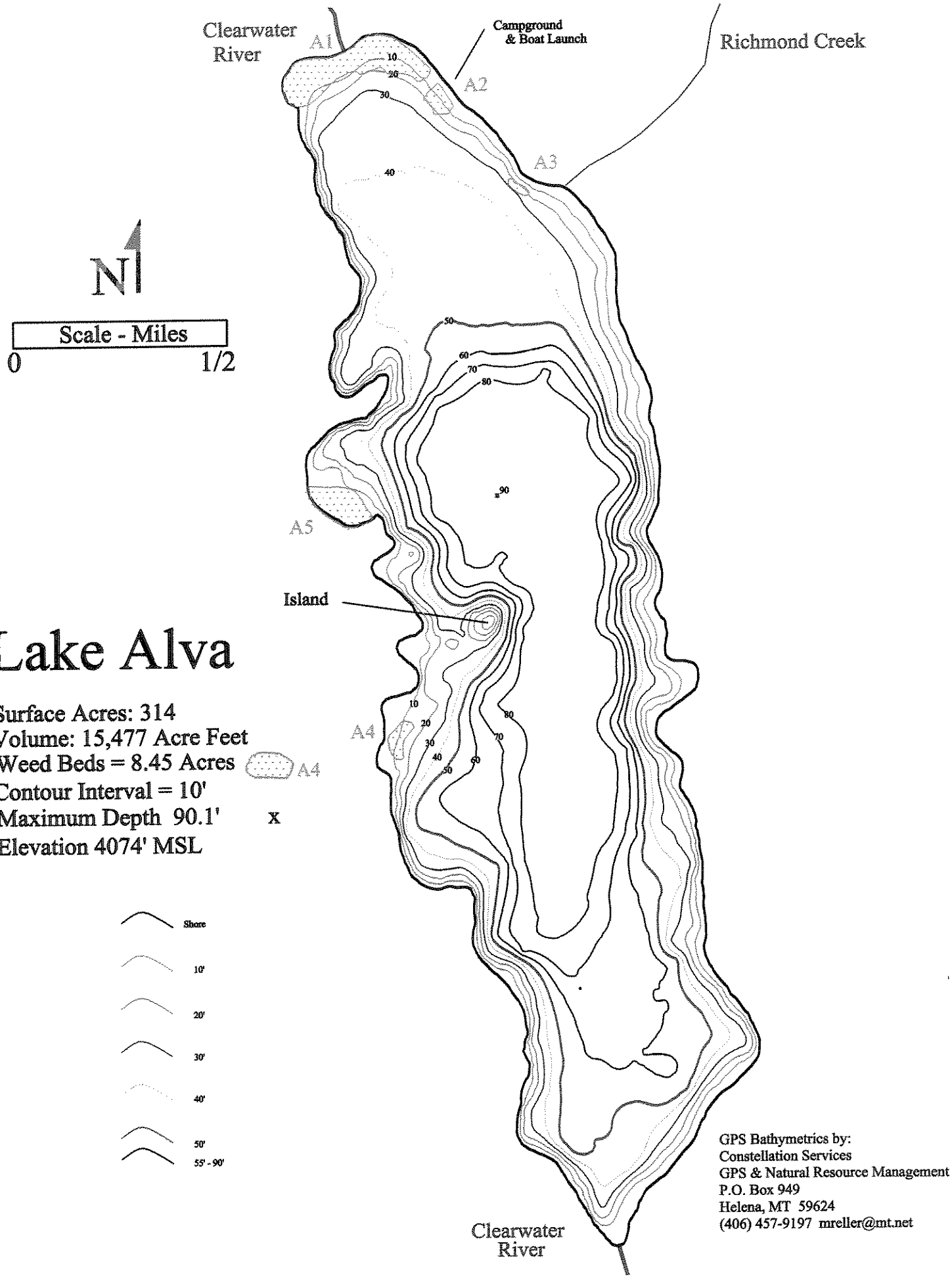

Lake Alva

Surface Acres: 314
Volume: 15,477 Acre Feet
Weed Beds = 8.45 Acres
Contour Interval = 10'
Maximum Depth 90.1'
Elevation 4074' MSL

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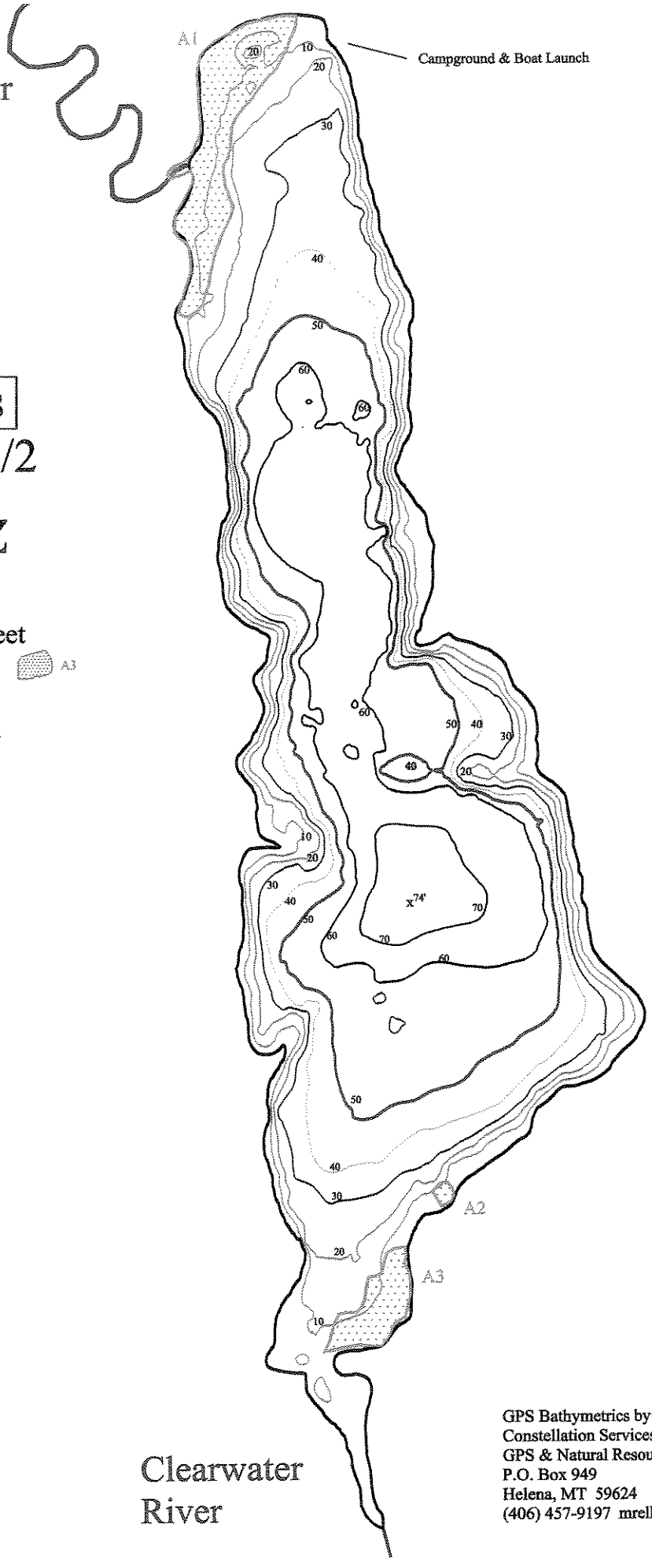

N

Scale - Miles

0 1/2

Lake Inez

Surface Acres = 298
Volume = 11,577 Acre feet
Weed Area =17.1 Acres
Countour Interval = 10'
Maximum Depth 74' x
Elevation 4061' MSL

Shore
10'
20'
30'
40'
50'
55' - 74'

GPS Bathymetrics by:
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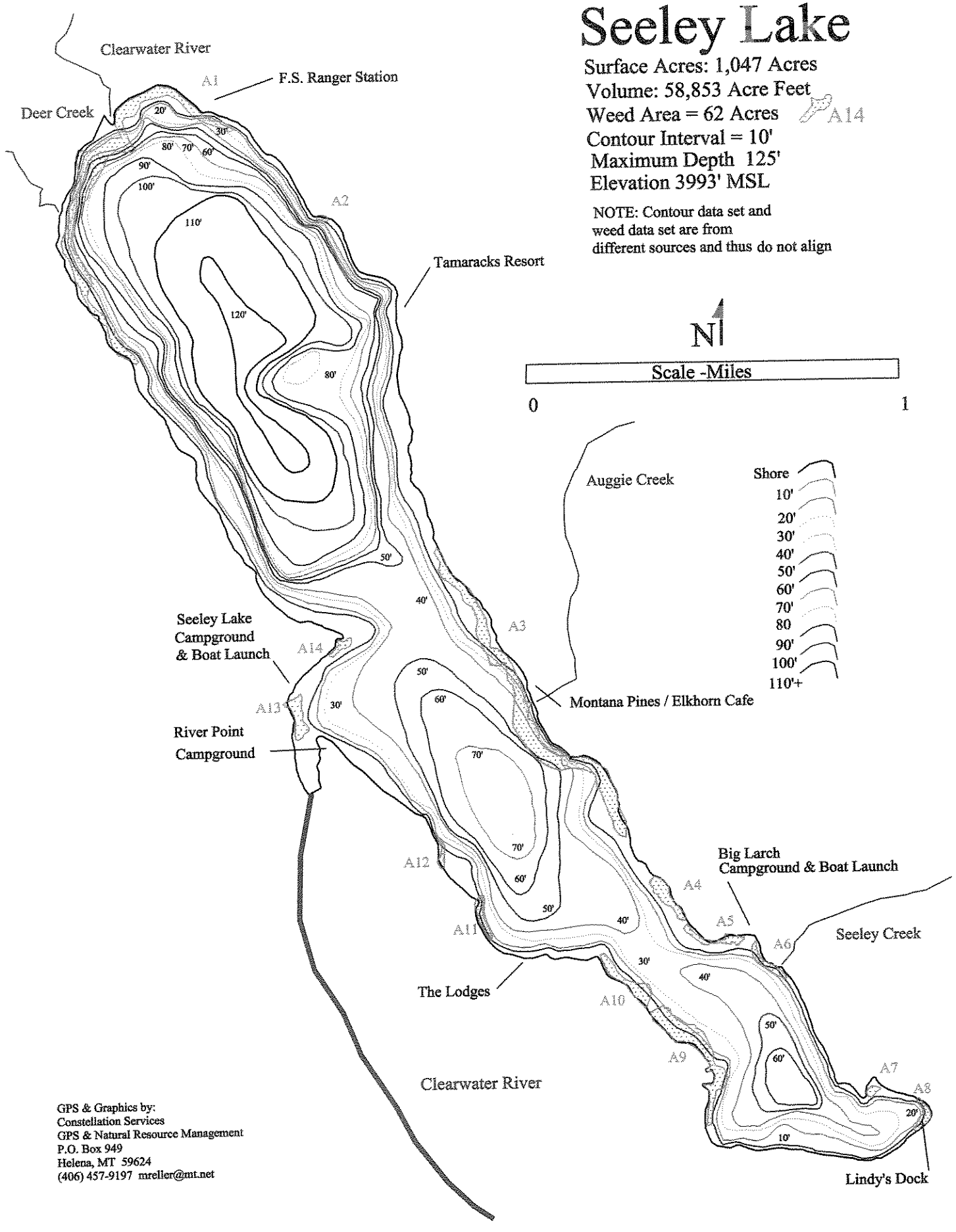
Seeley Lake

Surface Acres: 1,047 Acres
Volume: 58,853 Acre Feet
Weed Area = 62 Acres
Contour Interval = 10'
Maximum Depth 125'
Elevation 3993' MSL

NOTE: Contour data set and weed data set are from different sources and thus do not align



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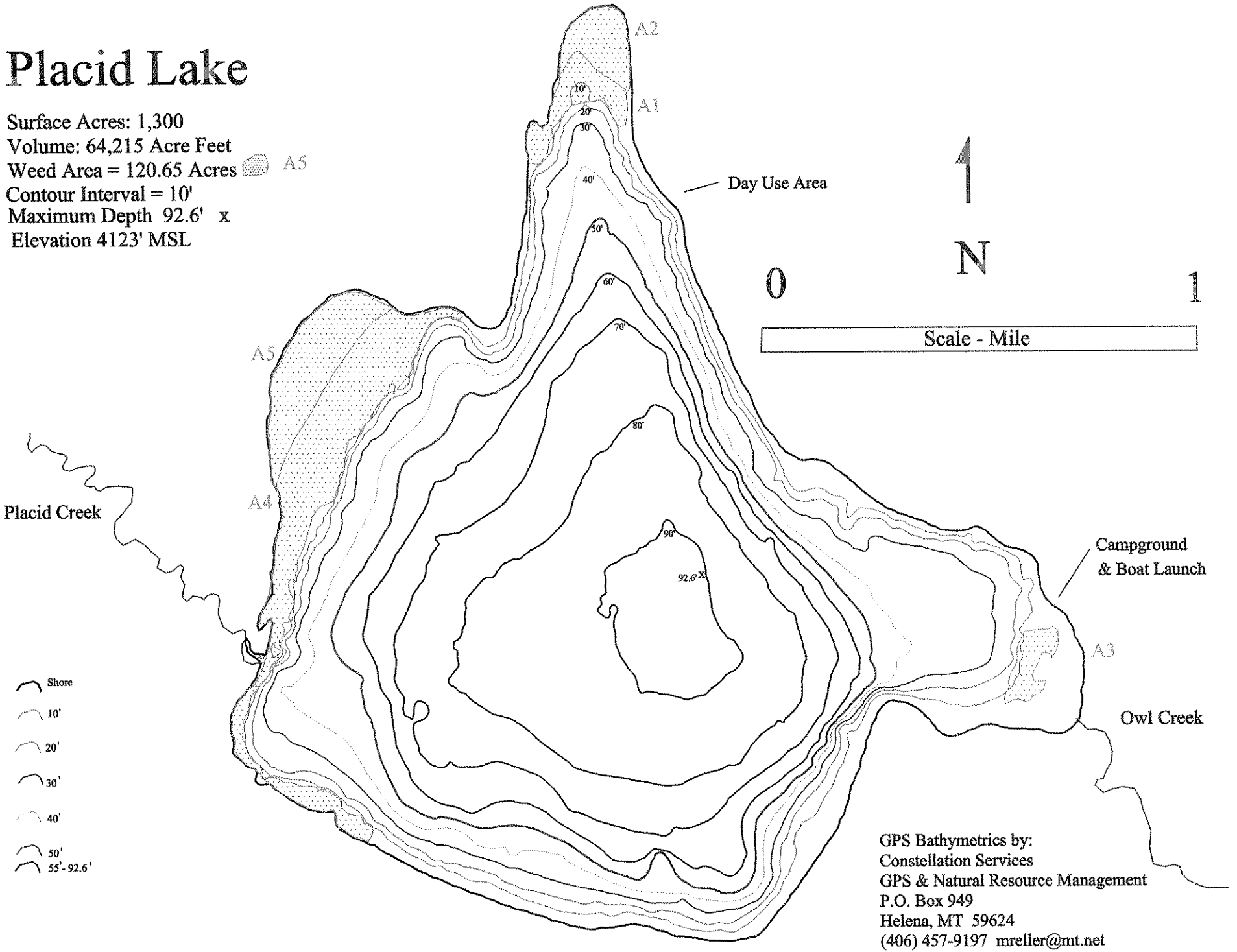
Placid Lake

Surface Acres: 1,300
Volume: 64,215 Acre Feet
Weed Area = 120.65 Acres
Contour Interval = 10'
Maximum Depth 92.6' x
Elevation 4123' MSL



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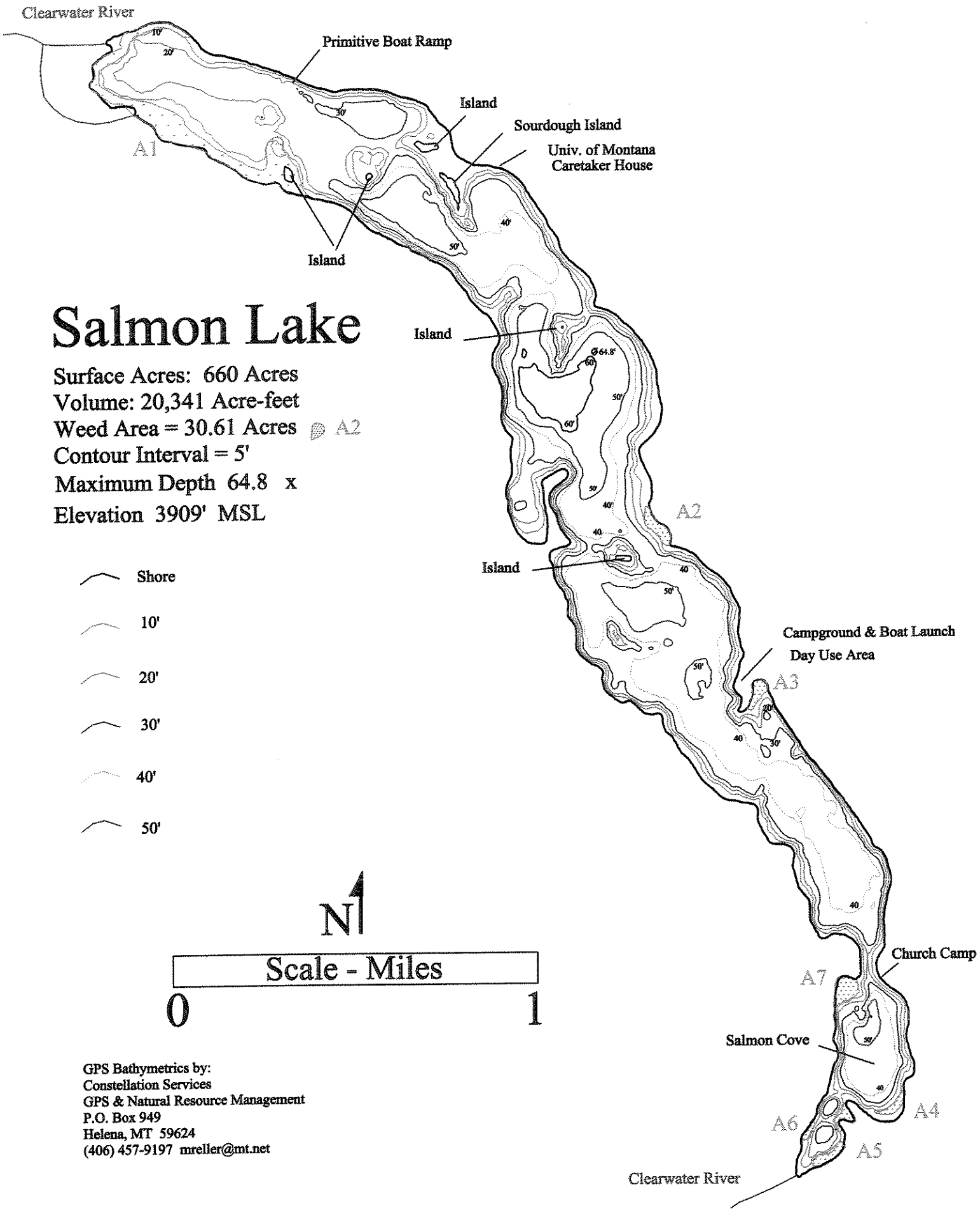
Clearwater River
Primitive Boat Ramp
Island
Sourdough Island
Univ. of Montana
Caretaker House
Island
A1
Island
A2
Island
Campground & Boat Launch
Day Use Area
A3
Church Camp
A7
Salmon Cove
A4
A6
A5
Clearwater River
Salmon Lake
Surface Acres: 660 Acres
Volume: 20,341 Acre-feet
Weed Area = 30.61 Acres
Contour Interval = 5'
Maximum Depth 64.8 x
Elevation 3909' MSL
Shore
10'
20'
30'
40'
50'
N
Scale - Miles
0
1
GPS Bathymetrics by:
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APPENDIX 2

Tabular Summaries of Gill Net Surveys
Conducted in
Clearwater River Drainage Lakes
Since 1995

Appendix Table1.

Species composistion, number and size of fish sampled by experimental gill netting on Lake Marshall in 2002.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	0	-	-	-	-	-	-
RAINBOW TROUT	1	237.0	-	-	120.00	-	-
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	3	240.0	178	352	168.33	45	410
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	8	201.6	178	234	95.63	75	150
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	20	205.9	193	232	73.50	50	100
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	0	-	-	-	-	-	-
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	32						

Appendix Table 2.

Species composistion, number and size of fish sampled by experimental gill netting on Lake Marshall in 2001.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	0	-	-	-	-	-	-
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	7	309.9	188	425	328.57	60	775
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	26	184.3	120	270	71.92	35	220
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	3	200.0	190	210	56.67	45	70
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	0	-	-	-	-	-	-
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	36						

Appendix Table 3.

Species composistion, number and size of fish sampled by experimental gill netting on Clearwater Lake in 2002.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	0	-	-	-	-	-	-
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	15	288.0	167	488	428.67	50	1250
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	1	335.0	-	-	470.00	-	-
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	0	-	-	-	-	-	-
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	0	-	-	-	-	-	-
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	16						

Appendix Table 4.

Species composistion, number and size of fish sampled by experimental gill netting on Clearwater Lake in 2001.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	0	-	-	-	-	-	-
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	142	238.1	74	475	220.53	35	1205
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	3	385.7	300	508	840.00	300	1690
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	0	-	-	-	-	-	-
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	0	-	-	-	-	-	-
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	145						

Appendix Table 5.

Species composistion, number and size of fish sampled by experimental gill netting on Rainy Lake in 2002.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	0	-	-	-	-	-	-
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	70	254.8	170	490	206.07	35	1150
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	3	600.0	550	640	2076.67	1580	2510
WHITEFISH	0	-	-	-	-	-	-
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	52	167.5	145	233	53.85	30	160
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	125						

Appendix Table 6.

Species composistion, number and size of fish sampled by experimental gill netting on Rainy Lake in 2001.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	0	-	-	-	-	-	-
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	39	267.5	90	381	230.26	45	580
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	1	571.0	-	-	2000.00	-	-
WHITEFISH	0	-	-	-	-	-	-
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	60	160.7	130	203	53.00	30	105
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	100						

Appendix Table 7.

Species composistion, number and size of fish sampled by experimental gill netting on Seeley Lake in 2001.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	79	514.9	230	975	1339.68	70	9525
NORTHERN PIKE MINNOW	86	357.3	179	495	584.67	40	1054
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	215	277.1	210	341	188.95	100	340
RAINBOW TROUT	1	455.0	-	-	1190.00	-	-
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	22	373.0	295	453	579.55	250	1040
BROWN TROUT	11	634.4	350	825	3253.64	450	7700
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	5	547.2	388	640	1674.00	500	2500
WHITEFISH	5	310.6	276	330	282.00	180	400
PUMPKIN SEED	49	116.9	63	190	44.90	10	160
YELLOW PERCH	156	199.1	110	290	111.09	20	360
LARGE MOUTH BASS	2	232.5	210	255	225.00	210	240
Total	631						

Appendix Table 8.

Species composistion, number and size of fish sampled by experimental gill netting on Seeley Lake in 2000.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	95	573.9	237	945	1973.51	100	9979
NORTHERN PIKE MINNOW	71	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	1115	283.2	185	370	202.05	120	390
RAINBOW TROUT	4	391.5	248	450	802.50	170	1270
RAINBOW X CUTTHROAT	1	357.0	-	-	460.00	-	-
WESTSLOPE CUTTHROAT	42	344.3	238	418	450.24	70	720
BROWN TROUT	13	437.8	178	643	1155.38	60	3080
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	14	513.9	360	618	1339.29	450	2230
WHITEFISH	16	301.9	260	397	229.38	150	370
PUMPKIN SEED	12	140.0	90	196	80.83	10	180
YELLOW PERCH	94	178.2	127	315	86.11	30	445
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	1477						

Appendix Table 9.

Species composistion, number and size of fish sampled by experimental gill netting on Seeley Lake in 1999.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	24	588.8	250	880	3205.96	110	8528
NORTHERN PIKE MINNOW	121	278.8	195	406	271.67	60	640
PEAMOUTH	1	214.0	-	-	80.00	-	-
KOKANEE	946	280.3	146	395	196.45	80	290
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	4	350.8	315	418	465.00	330	750
WESTSLOPE CUTTHROAT	19	315.4	214	370	343.68	120	600
BROWN TROUT	7	448.4	355	568	1085.71	440	2340
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	13	485.5	350	655	1241.15	350	3270
WHITEFISH	17	269.5	178	380	190.00	50	360
PUMPKIN SEED	8	163.8	98	212	89.13	3	130
YELLOW PERCH	48	181.2	135	268	92.60	30	230
LARGE MOUTH BASS	3	260.0	150	374	350.00	40	760
Total	1211						

Appendix Table 10.

Species composistion, number and size of fish sampled by experimental gill netting on Seeley Lake in 1998.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	47	651.7	560	725	2308.00	1032	3960
NORTHERN PIKE MINNOW	142	319.6	133	626	426.11	30	2310
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	171	300.9	240	375	221.41	105	290
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	13	328.5	292	388	333.62	207	490
WESTSLOPE CUTTHROAT	1	360.0	-	-	440.00	-	-
BROWN TROUT	1	512.0	-	-	1500.00	-	-
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	3	383.3	377	396	423.33	380	450
WHITEFISH	45	264.9	215	330	146.56	70	270
PUMPKIN SEED	17	157.5	65	170	88.76	54	113
YELLOW PERCH	37	187.6	118	262	82.57	30	200
LARGE MOUTH BASS	4	300.3	180	460	462.00	100	1048
Total	481						

Appendix Table 11.

Species composistion, number and size of fish sampled by experimental gill netting on Seeley Lake in 1996.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	457	295.3	186	540	292.29	50	1800
PEAMOUTH	1	222.0	-	-	100.00	-	-
KOKANEE	102	300.6	237	361	227.85	130	420
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	2	282.0	279	285	230.00	220	240
WESTSLOPE CUTTHROAT	7	337.4	261	366	388.57	170	500
BROWN TROUT	7	471.1	335	680	1334.29	340	3300
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	16	398.3	306	476	514.44	260	801
WHITEFISH	58	255.0	171	309	146.30	40	260
PUMPKIN SEED	16	146.9	102	180	75.63	20	150
YELLOW PERCH	69	204.1	147	315	121.84	7	470
LARGE MOUTH BASS	2	272.5	257	288	295.00	250	340
Total	737						

Appendix Table 12.

Species composistion, number and size of fish sampled by experimental gill netting on Seeley Lake in 1995.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	164	292.6	182	503	254.11	30	1480
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	192	299.3	212	329	223.02	80	300
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	8	290.3	230	345	266.25	130	480
WESTSLOPE CUTTHROAT	1	391.0	-	-	570.00	-	-
BROWN TROUT	6	562.0	441	737	2116.67	800	3610
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	15	447.5	356	680	888.00	320	3270
WHITEFISH	29	236.6	182	342	121.03	40	360
PUMPKIN SEED	2	149.0	123	175	75.00	20	130
YELLOW PERCH	2	150.5	139	162	40.00	40	40
LARGE MOUTH BASS	1	420.0	-	-	1110.00	-	-
Total	420						

Appendix Table 13.

Species composistion, number and size of fish sampled by experimental gill netting on Salmon Lake in 2001.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	51	556.3	226	742	1555.69	130	3660
NORTHERN PIKE MINNOW	134	182.0	-	-	40.00	-	-
PEAMOUTH	4	-	-	-	-	-	-
KOKANEE	282	269.3	100	788	218.65	30	640
RAINBOW TROUT	11	379.4	295	462	545.45	230	950
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	6	320.8	260	412	361.67	170	650
BROWN TROUT	24	373.8	175	635	744.17	40	3300
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	3	640.3	582	674	2556.67	2010	3030
WHITEFISH	50	355.6	175	396	407.20	40	570
PUMPKIN SEED	3	128.0	120	132	46.67	40	50
YELLOW PERCH	14	217.9	145	338	130.00	20	280
LARGE MOUTH BASS	0	-	-	-	-	-	-

Total 582

Appendix Table 14.

Species composistion, number and size of fish sampled by experimental gill netting on Salmon Lake in 2000.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	32	547.2	320	700	1291.88	200	3000
NORTHERN PIKE MINNOW	51	405.8	370	460	764.23	430	1080
PEAMOUTH	2	-	-	-	-	-	-
KOKANEE	50	282.0	192	455	247.80	50	750
RAINBOW TROUT	2	352.5	340	365	445.00	420	470
RAINBOW X CUTTHROAT	1	374.0	-	-	500.00	-	-
WESTSLOPE CUTTHROAT	13	350.1	245	427	514.62	160	900
BROWN TROUT	6	423.5	175	510	888.33	50	1430
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	31	376.9	340	470	503.39	370	660
PUMPKIN SEED	2	125.0	124	126	65.00	60	70
YELLOW PERCH	2	230.0	220	240	165.00	130	200
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	192						

Appendix Table 15.

Species composistion, number and size of fish sampled by experimental gill netting on Salmon Lake in 1999.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	27	506.8	369	688	1021.85	410	2520
NORTHERN PIKE MINNOW	61	403.3	185	555	774.10	30	1920
PEAMOUTH	5	383.6	350	467	496.00	450	620
KOKANEE	12	317.3	181	432	401.25	60	770
RAINBOW TROUT	1	382.0	-	-	480.00	-	-
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	12	392.2	290	485	645.00	290	840
BROWN TROUT	10	363.2	176	627	647.00	60	1480
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	10	365.9	339	390	524.00	430	640
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	2	168.5	135	202	90.00	60	120
LARGE MOUTH BASS	1	383.0	-	-	800.00	-	-
Total	141						

Appendix Table 16.

Species composistion, number and size of fish sampled by experimental gill netting on Salmon Lake in 1998.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	20	552.6	300	726	1328.35	170	3000
NORTHERN PIKE MINNOW	43	387.1	170	632	664.08	70	1580
PEAMOUTH	12	341.1	330	355	440.00	370	560
KOKANEE	38	306.6	195	450	332.11	60	850
RAINBOW TROUT	4	356.0	260	430	490.00	170	810
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	12	390.5	332	475	654.17	370	1100
BROWN TROUT	4	256.5	173	433	300.00	50	950
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	11	359.2	340	380	461.82	440	540
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	1	250.0	-	-	210.00	-	-
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	145						

Appendix Table 17.

Species composistion, number and size of fish sampled by experimental gill netting on Salmon Lake in 1996.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	18	494.7	262	628	1016.67	120	2220
NORTHERN PIKE MINNOW	84	355.8	190	540	486.43	50	1310
PEAMOUTH	10	322.5	302	348	350.00	290	460
KOKANEE	13	336.2	192	418	446.15	70	720
RAINBOW TROUT	4	395.5	367	422	622.50	510	720
RAINBOW X CUTTHROAT	1	430.0	-	-	700.00	-	-
WESTSLOPE CUTTHROAT	9	363.3	274	415	493.33	180	650
BROWN TROUT	4	292.3	230	375	222.50	100	540
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	10	344.7	330	361	395.00	320	590
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	0	-	-	-	-	-	-
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	153						

Appendix Table 18.

Species composistion, number and size of fish sampled by experimental gill netting on Salmon Lake in 1995.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	25	501.4	388	830	1090.28	330	5557
NORTHERN PIKE MINNOW	109	357.3	187	568	521.38	50	1710
PEAMOUTH	22	316.2	247	347	310.45	140	450
KOKANEE	61	333.6	183	419	386.23	70	740
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	1	323.0	-	-	360.00	-	-
WESTSLOPE CUTTHROAT	2	346.5	341	352	445.00	440	450
BROWN TROUT	7	425.6	389	503	785.71	570	1340
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	22	346.7	316	459	363.18	300	440
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	3	269.7	229	300	306.67	150	400
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	252						

Appendix Table 19.

Species composistion, number and size of fish sampled by experimental gill netting on Lake Inez in 2001.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	20	586.3	505	725	1701.00	950	3200
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	56	304.7	190	576	252.68	80	1550
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	73	301.1	117	472	286.85	90	580
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	2	337.5	305	370	450.00	320	580
BULL TROUT	1	482.0	-	-	1040.00	-	-
WHITEFISH	23	210.4	193	240	76.52	30	130
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	12	148.3	128	210	43.33	20	140
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	187						

Appendix Table 20.

Species composistion, number and size of fish sampled by experimental gill netting on Lake Inez in 2000.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	9	586.3	280	765	1984.44	190	3800
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	207	303.6	180	375	264.30	40	460
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	66	281.3	168	388	274.92	50	600
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	1	340.0	-	-	520.00	-	-
BULL TROUT	4	459.8	415	550	1055.00	700	1650
WHITEFISH	32	217.0	182	290	92.50	50	160
PUMPKIN SEED	6	103.2	94	130	43.33	30	70
YELLOW PERCH	13	165.3	140	217	90.00	50	180
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	338						

Appendix Table 21.

Species composistion, number and size of fish sampled by experimental gill netting on Lake Inez in 1999.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	5	669.4	575	829	2762.60	1460	5443
NORTHERN PIKE MINNOW	1	522.0	-	-	1580.00	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	153	303.4	230	336	259.28	110	350
RAINBOW TROUT	4	283.0	243	337	250.00	150	400
RAINBOW X CUTTHROAT	43	282.9	194	423	271.16	100	880
WESTSLOPE CUTTHROAT	21	312.3	220	375	365.24	120	580
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	4	427.5	390	462	740.00	600	830
WHITEFISH	47	229.1	175	347	107.23	50	180
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	4	208.0	160	250	150.75	70	230
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	282						

Appendix Table 22.

Species composistion, number and size of fish sampled by experimental gill netting on Lake Inez in 1998.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	8	600.4	450	755	1581.13	650	3000
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	330	311.2	212	391	265.11	140	350
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	3	353.0	302	412	473.33	290	740
WESTSLOPE CUTTHROAT	16	300.3	220	400	264.06	105	620
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	2	320.0	220	420	465.00	90	840
WHITEFISH	44	233.1	150	350	111.48	40	180
PUMPKIN SEED	1	131.0	-	-	35.00	-	-
YELLOW PERCH	10	170.8	55	340	126.00	60	220
LARGE MOUTH BASS	0	-	-	-	-	-	-

Total 414

Appendix Table 23.

Species composistion, number and size of fish sampled by experimental gill netting on Lake Inez in 1995.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	33	587.9	462	770	1914.64	660	4763
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	112	329.5	218	366	328.48	110	420
RAINBOW TROUT	2	474.0	405	543	1240.00	720	1760
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	11	315.0	252	356	338.18	140	540
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	6	529.2	381	837	2347.00	470	9072
WHITEFISH	62	242.6	195	343	116.13	60	160
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	0	-	-	-	-	-	-
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	226						

Appendix Table 24.

Species composistion, number and size of fish sampled by experimental gill netting on Lake Alva in 2001.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	136	282.0	240	325	198.16	130	290
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	39	283.1	180	440	260.00	70	780
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	1	587.0	-	-	1670.00	-	-
WHITEFISH	18	217.7	190	325	87.78	40	300
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	3	166.0	135	210	50.00	20	100
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	197						

Appendix Table 25.

Species composistion, number and size of fish sampled by experimental gill netting on Lake Alva in 1999.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	97	292.0	270	325	235.46	180	290
RAINBOW TROUT	3	386.7	350	415	329.33	68	520
RAINBOW X CUTTHROAT	29	371.0	290	450	515.86	260	900
WESTSLOPE CUTTHROAT	91	282.3	126	440	256.65	60	800
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	1	170.0	-	-	70.00	-	-
BULL TROUT	4	417.8	370	488	647.50	380	1140
WHITEFISH	21	222.4	180	255	89.52	50	130
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	2	210.0	170	250	165.00	100	230
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	248						

Appendix Table 26.

Species composistion, number and size of fish sampled by experimental gill netting on Lake Alva in 1998.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	1	671.0	-	-	2045.00	-	-
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	39	307.2	280	360	255.28	190	380
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	98	344.0	133	455	460.86	50	1039
WESTSLOPE CUTTHROAT	4	252.8	166	335	180.75	60	303
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	19	232.3	118	255	99.26	70	130
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	7	206.4	150	227	98.14	40	120
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	168						

Appendix Table 27.

Species composistion, number and size of fish sampled by experimental gill netting on Lake Alva in 1995.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	1	602.0	-	-	1600.00	-	-
NORTHERN PIKE MINNOW	0	-	-	-	-	-	-
PEAMOUTH	0	-	-	-	-	-	-
KOKANEE	160	319.5	210	357	293.94	130	380
RAINBOW TROUT	0	-	-	-	-	-	-
RAINBOW X CUTTHROAT	0	-	-	-	-	-	-
WESTSLOPE CUTTHROAT	37	296.5	206	387	265.14	80	500
BROWN TROUT	0	-	-	-	-	-	-
BROOK TROUT	1	263.0	-	-	190.00	-	-
BULL TROUT	16	323.2	216	434	343.75	90	800
WHITEFISH	108	235.4	185	418	109.17	40	840
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	0	-	-	-	-	-	-
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	323						

Appendix Table 28.

Species composistion, number and size of fish sampled by experimental gill netting on Placid Lake in 2001.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	955	-	-	-	-	-	-
PEAMOUTH	509	-	-	-	-	-	-
KOKANEE	80	318.9	270	335	273.88	150	340
RAINBOW TROUT	1	220.0	-	-	125.00	-	-
RAINBOW X CUTTHROAT	2	315.0	305	325	315.00	300	330
WESTSLOPE CUTTHROAT	22	349.0	273	415	420.91	160	650
BROWN TROUT	16	446.6	330	690	991.56	280	3100
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	181	257.5	144	395	168.01	20	300
PUMPKIN SEED	61	110.2	92	195	34.02	10	90
YELLOW PERCH	389	179.2	135	296	88.70	30	420
LARGE MOUTH BASS	13	272.8	150	328	346.15	50	600
Total	2229						

Appendix Table 29.

Species composistion, number and size of fish sampled by experimental gill netting on Placid Lake in 2000.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	769	-	-	-	-	-	-
PEAMOUTH	457	-	-	-	-	-	-
KOKANEE	231	321.9	205	367	282.77	50	420
RAINBOW TROUT	11	332.5	205	490	424.55	100	1030
RAINBOW X CUTTHROAT	30	383.8	338	470	540.00	350	1140
WESTSLOPE CUTTHROAT	14	333.0	200	447	371.43	110	700
BROWN TROUT	18	391.8	315	570	666.67	240	2320
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	1	430.0	-	-	700.00	-	-
WHITEFISH	320	256.4	146	395	153.09	40	300
PUMPKIN SEED	21	110.5	92	150	46.43	15	100
YELLOW PERCH	274	195.1	130	345	115.04	30	480
LARGE MOUTH BASS	2	265.0	240	290	290.00	210	370
Total	2148						

Appendix Table 30.

Species composistion, number and size of fish sampled by experimental gill netting on Placid Lake in 1999.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	623	-	-	-	-	-	-
PEAMOUTH	1364	-	-	-	-	-	-
KOKANEE	181	325.5	168	380	321.42	50	460
RAINBOW TROUT	6	335.3	256	422	405.83	150	780
RAINBOW X CUTTHROAT	14	349.2	235	440	399.29	240	830
WESTSLOPE CUTTHROAT	18	361.8	260	440	464.17	180	910
BROWN TROUT	14	398.6	169	567	885.71	50	2200
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	2	432.5	300	565	990.00	330	1650
WHITEFISH	139	258.0	165	388	176.58	50	360
PUMPKIN SEED	3	110.7	95	135	36.67	20	50
YELLOW PERCH	241	169.8	36	342	79.83	30	490
LARGE MOUTH BASS	2	231.0	190	272	210.00	110	310

Total 2607

Appendix Table 31.

Species composistion, number and size of fish sampled by experimental gill netting on Placid Lake in 1998.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	490	-	-	-	-	-	-
PEAMOUTH	409	-	-	-	-	-	-
KOKANEE	171	316.9	185	367	287.25	60	1340
RAINBOW TROUT	5	414.6	340	535	561.00	370	1115
RAINBOW X CUTTHROAT	71	380.5	250	460	623.94	240	1500
WESTSLOPE CUTTHROAT	11	334.1	235	485	389.55	130	1200
BROWN TROUT	8	449.1	313	595	1018.75	260	2050
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	163	255.8	114	351	172.61	6	330
PUMPKIN SEED	13	140.8	121	172	68.62	50	112
YELLOW PERCH	158	197.0	135	312	114.30	30	470
LARGE MOUTH BASS	3	124.7	117	130	60.00	30	110
Total	1502						

Appendix Table 32.

Species composistion, number and size of fish sampled by experimental gill netting on Placid Lake in 1996.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	302	399.5	276	550	680.63	170	1680
PEAMOUTH	336	240.9	180	345	137.31	40	390
KOKANEE	15	310.5	281	329	254.00	160	310
RAINBOW TROUT	6	372.7	335	407	563.33	370	690
RAINBOW X CUTTHROAT	3	295.3	182	379	330.00	60	570
WESTSLOPE CUTTHROAT	0	-	-	-	-	-	-
BROWN TROUT	6	415.2	371	445	766.67	500	950
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	45	278.6	249	395	195.33	130	330
PUMPKIN SEED	6	131.2	126	137	51.67	40	60
YELLOW PERCH	99	202.8	142	335	132.26	30	650
LARGE MOUTH BASS	4	294.8	234	363	435.00	170	730
Total	822						

Appendix Table 33.

Species composistion, number and size of fish sampled by experimental gill netting on Placid Lake in 1995.

Fish Species	Number sampled	Average length (mm)	Length Range (mm)		Average Weight (g)	Weight Range (g)	
			min	max		min	max
NORTHERN PIKE	0	-	-	-	-	-	-
NORTHERN PIKE MINNOW	257	309.5	190	536	277.51	40	1490
PEAMOUTH	66	256.5	166	367	167.20	30	450
KOKANEE	146	312.0	250	337	266.16	140	360
RAINBOW TROUT	6	303.7	185	414	250.00	60	540
RAINBOW X CUTTHROAT	2	310.0	225	395	370.00	100	640
WESTSLOPE CUTTHROAT	1	348.0	-	-	400.00	-	-
BROWN TROUT	1	418.0	-	-	690.00	-	-
BROOK TROUT	0	-	-	-	-	-	-
BULL TROUT	0	-	-	-	-	-	-
WHITEFISH	22	286.1	232	380	191.36	110	300
PUMPKIN SEED	0	-	-	-	-	-	-
YELLOW PERCH	47	235.3	148	386	170.64	30	440
LARGE MOUTH BASS	0	-	-	-	-	-	-
Total	548						