



Summary of Fishery Surveys North Spirit and Spirit Lakes, Taylor/Price County, 2008-2009

WDNR's Fisheries Management Team from Park Falls completed fyke netting and electrofishing surveys in 2008–2009 to assess the status of important fish populations in North Spirit Lake and Spirit Lake. Fall electrofishing evaluated recruitment of young-of-the-year walleyes. Fyke netting in October yielded useful information on black crappies. Fyke nets set shortly after the spring thaw targeted walleye, muskellunge, northern pike, and yellow perch and provided complementary information on black crappies and bluegills. Electrofishing surveys in late spring documented the abundance and size structure of largemouth bass and bluegill populations.

Survey Effort

During our fall electrofishing survey on September 30th, 2008, when the water temperature was 61°F, we sampled 2.24 miles of North Spirit Lake's 5.4 shoreline miles in 1.07 hour. On October 13th, 2008 we set four fyke nets in North Spirit Lake and four more in Spirit Lake and fished them overnight for four net-nights of effort in each lake when water temperature was 57°F. We repeated the same fyke netting effort on April 23rd, 2009, when water temperatures averaged 46°F. On May 21st, 2009 we completed an electrofishing circuit of Spirit Lake's entire shoreline when water temperature averaged 63°F. We sampled 2.01 miles in 1.08 hour, including 0.51 mile sub-sampled for all species in 0.30 hour. Two weeks later, on June 4th, 2009 we completed our late spring electrofishing survey on North Spirit Lake when water temperatures averaged 64°F. We sampled 2.07 miles in 1.07 hour, including 1.04 mile sub-sampled for all species in 0.55 hour. In each spring survey, water temperatures were within the range recommended to represent the status of the targeted populations during their pre-spawning and peak spawning activities.

Habitat Characteristics

North Spirit Lake and Spirit Lake are connected lakes located near the headwaters of the Spirit River about seven miles northeast of Rib Lake, WI. A fixed-crest dam on the outlet of Spirit Lake raises the impoundment level about 3 feet above the natural condition. Average annual flow is 8.2 cubic feet per second. North Spirit Lake (also known as Big Spirit) covers 213 acres with a maximum depth of 22 feet and an average depth of 12 feet. The substrate is 90% gravel and 10% muck. Spirit Lake (also called Little Spirit) covers 126 acres, and its maximum and average depths are 9 feet and 6 feet. The substrate is 65% gravel, 20% muck, and 15% sand. Moderately low water clarity in summer (Secchi depth= 5 feet) indicates high nutrient levels. Both lakes are classified as eutrophic, and both experience dense algae blooms in late summer. With more shallow area where light can penetrate to fine substrate, Spirit Lake supports a higher density of rooted vegetation than North Spirit Lake where steeper shorelines and coarser lakebed materials limit vegetative growth.

Beginning in January every year, Spirit Lakes Improvement Association operates aerators to circulate water and maintain an ice-free area on each lake to reduce the chance of severe winterkill – unusually high fish mortality caused by very low or depleted dissolved oxygen levels in the ice-covered season. Continuous agitation prevents a small fraction of the surface from freezing and allows atmospheric oxygen to dissolve. The channel connecting the two lakes was dredged in February 2010 to improve navigation. The Town of Rib Lake maintains a public boat landing with a dock and parking area on the south shore of Spirit Lake.

Summary of Results

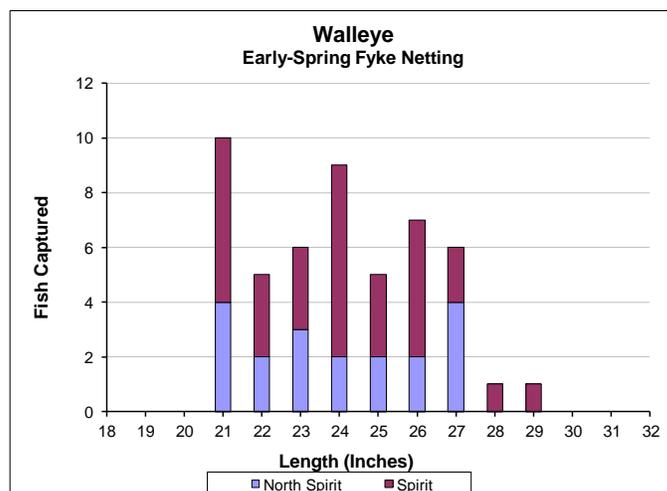
We captured 13 fish species in our netting and electrofishing surveys. Largemouth bass, muskellunge, and walleyes were the principal predator species and the relative abundance of panfish was evenly distributed among black crappies, bluegills, and yellow perch. Complementing the forage base were golden shiners and white suckers. We captured four northern pike (23.5-34.1 inches), indicating low abundance.

Walleye



Early Spring Fyke Netting

	Number per net-night $\geq 10''$	Quality Size $\geq 15''$	Preferred Size $\geq 20''$	Memorable Size $\geq 25''$
North Spirit	4.8	100%	100%	42%
Spirit	7.8	100%	100%	39%
Combined	6.3	100%	100%	40%



Our low capture rate of walleye during our spring fyke netting survey suggests low adult population abundance in both lakes. All of the walleyes captured were large mature fish over 21 inches in length. These highly productive lakes allow a high proportion of walleyes to reach memorable size (≥ 25 inches) and they show their capability of growing walleye to trophy size (≥ 30 inches). Walleye catch rate in North Spirit Lake has declined in spring nets from 11 fish per net-night in 2001, to 7.7 per net-night in 2004, to 4.8 per net-night in 2009. This decreasing trend in walleye catch rates coincided with an increasing trend in muskellunge catch rates over the same period.

Our fall 2008 electrofishing survey on North Spirit Lake documented no natural recruitment of walleyes hatched in-lake that spring, but we did find one and two year old walleyes that were presumed survivors from stocking in 2006 and 2007. In the absence of successful natural reproduction, walleye recruitment is maintained primarily through persistent stocking efforts. From 1988-1996 and 2001-2004, WDNR planted small walleye fingerlings (~3 inches) annually into North Spirit Lake. Spirit Lake received small fingerlings once in 2000. In 2006-2008 large fingerling walleyes were purchased and planted by local groups with the WDNR approval. Since this survey, the Rib Lake Area Fish & Game Association,

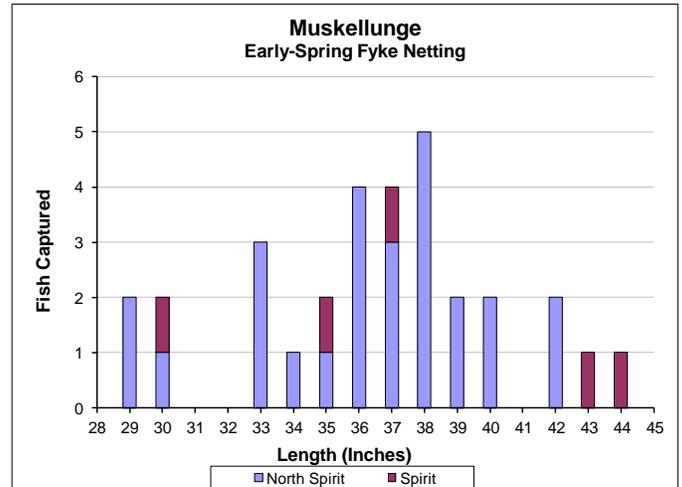
with support from neighboring sportsmen’s organizations, has reared and stocked walleyes annually from 2009 to 2014 in both North Spirit and Spirit lakes at rates of about 4-7 large fingerlings per acre. Increased survival of fingerlings stocked at larger size should build a higher abundance of adult walleyes and enhance their predatory control of panfish density, improving panfish size structure. A proposed regulation change, if approved, would take effect in spring 2016 and would remove the 14- to 18-inch protected slot length limit and restore the statewide 15-inch minimum length limit in both lakes.

Muskellunge



Early Spring Fyke Netting

	Number per net-night $\geq 20''$	Quality Size $\geq 30''$	Preferred Size $\geq 38''$	Memorable Size $\geq 42''$
North Spirit	6.5	92%	42%	8%
Spirit	1.3	100%	40%	40%
Combined	3.9	94%	42%	13%



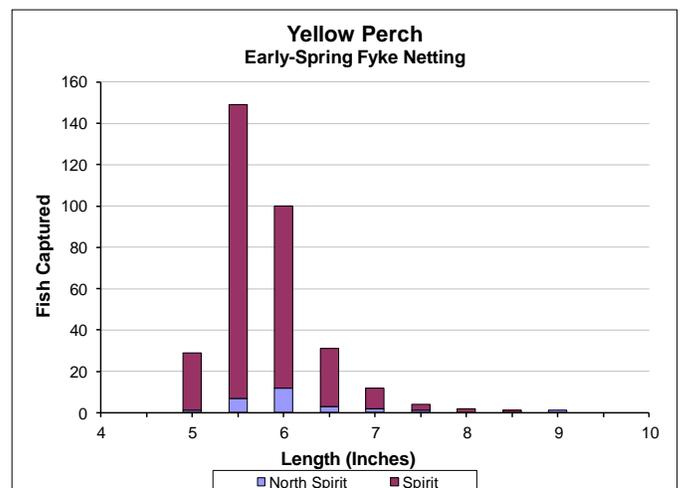
Our catch rate of muskellunge in North Spirit ranked in the 95th percentile for class A2 (action) musky waters. Catch rates in Spirit Lake ranked in the 75th percentile. These very high catch rates indicate very high population abundance. Musky fyke net catch rates have steadily increased from 0.4 adults per net-night in 2001 to 1.4 in 2004 and 6.5 in 2009. Addition of new recruits to the musky population in both lakes has been maintained by stocking large fingerlings. Concerned that high adult abundance might lead to intense food competition and impaired growth, WDNR temporarily suspended musky stocking in 2009. After hearing reports that avid musky anglers were encountering few young muskies < 30 inches long, in 2014 WDNR approved an application from Central Wisconsin Chapter, Muskies, Inc. to annually purchase and stock muskellunge at a rate of 0.25 large fingerlings per acre to maintain the population. Lower adult musky abundance and greater forage availability (especially perch, their preferred food) have resulted in less intense competition and a higher proportion of memorable-size muskellunge (≥ 42 inches) in Spirit Lake.

Yellow Perch



Early Spring Fyke Netting

	Number per net-night $\geq 5''$	Quality Size $\geq 8''$	Preferred Size $\geq 10''$
North Spirit	6.8	4%	0%
Spirit	76	1.0%	0%
Combined	41	1%	0%



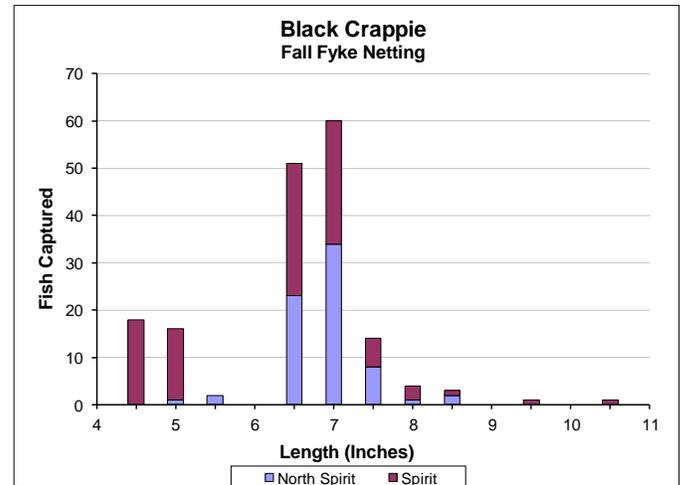
Our catch rate of yellow perch was over ten times higher in Spirit Lake than North Spirit Lake during our early spring fyke netting survey. Our capture rates indicate high population abundance in Spirit Lake and low perch abundance in North Spirit Lake. Both populations had poor size structure with very few perch reaching quality size (≥ 8 inches). Yellow perch serve as the preferred forage of walleye, largemouth bass, and muskellunge, and muskies tend to selectively eat the largest perch to obtain an efficient ration. The very high abundance of muskellunge in North Spirit Lake may be suppressing yellow perch numbers and size there.

Black Crappie



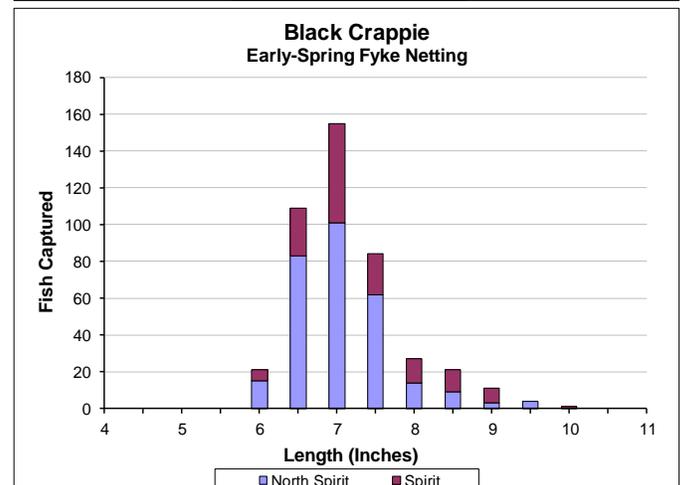
Fall Fyke Netting

	Number per net-night ≥ 5 "	Quality Size ≥ 8 "	Preferred Size ≥ 10 "	Memorable Size ≥ 12 "
North Spirit	18	4%	0%	0%
Spirit	20	7%	1%	0%
Combined	19	6%	0.7%	0%



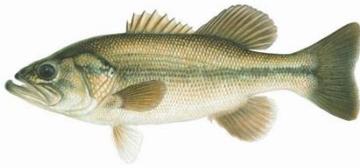
Early Spring Fyke Netting

	Number per net-night ≥ 5 "	Quality Size ≥ 8 "	Preferred Size ≥ 10 "	Memorable Size ≥ 12 "
North Spirit	73	10%	0%	0%
Spirit	36	24%	0.7%	0%
Combined	54	15%	0.2%	0%



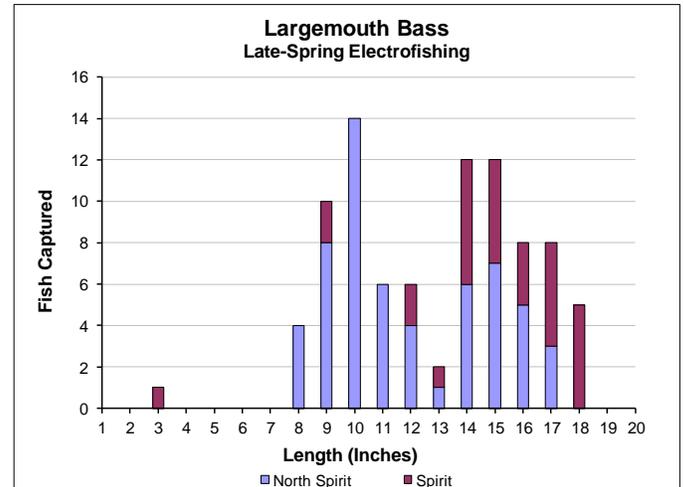
Black crappies were captured at rates that indicate a high abundance during our spring and fall netting surveys. Size structure was poor in both lakes with few crappies reaching preferred size. Age analysis using scales revealed similar growth rates on North Spirit and Spirit Lakes. Pooling age estimates from both lakes, black crappies grew to 7.4 inches in 4 years (range 7.0-7.9, n=20), compared to the regional average of 8.3 inches at age 4.

Largemouth Bass



Late Spring Electrofishing

	Number per mile $\geq 8''$	Number per hour $\geq 8''$	Quality Size $\geq 12''$	Legal Size $\geq 14''$	Preferred Size $\geq 15''$
North Spirit	28	54	45%	36%	26%
Spirit	14	27	93%	83%	62%
Combined	21	40	61%	52%	38%



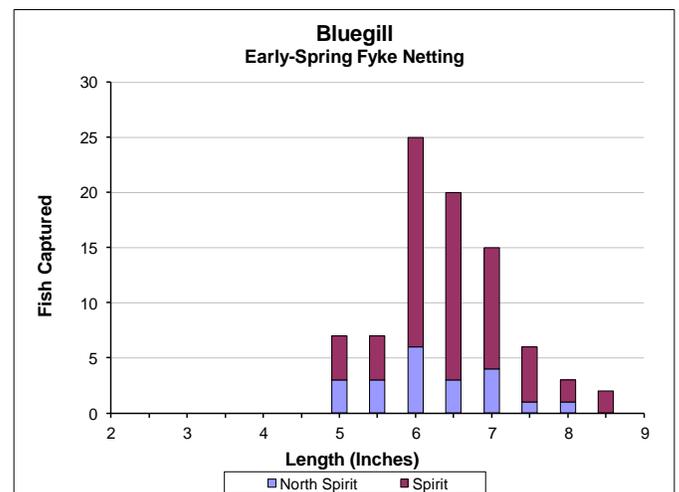
Our capture rate by electrofishing indicates a moderate population abundance of largemouth bass in Spirit and North Spirit lakes. Age analysis using scales revealed satisfactory growth rates that trended near the regional average. Largemouth bass in Spirit Lake reached an average length of 14.4 inches after 6 years of growth (range 13.8-15.3, n=7). Moderate abundance and satisfactory growth result in excellent size structure with a high proportion of the bass captured reaching preferred size (≥ 15 inches). Largemouth bass were stocked in Spirit Lake at a rate of 50 small fingerlings per acre in 1999 and 25 large fingerlings per acre in 2001, but the length distribution of our sample suggests that natural reproduction is supplying new recruits since stocking ended.

Bluegill



Early Spring Fyke Netting

	Number per net-night $\geq 3''$	Quality Size $\geq 6''$	Keeper Size $\geq 7''$	Preferred Size $\geq 8''$
North Spirit	5.3	71%	29%	5%
Spirit	16	88%	31%	6%
Combined	11	84%	31%	6%

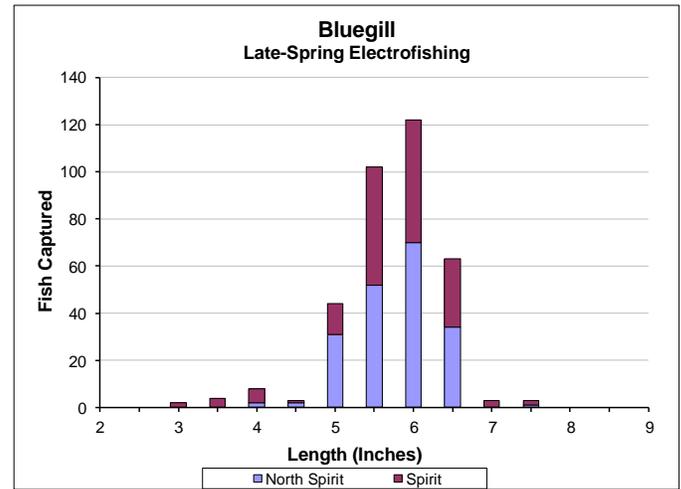


Our combined electrofishing catch rate indicates high bluegill population abundance in both lakes. There was no substantial difference in bluegill size structure between Spirit and North Spirit lakes. Early spring fyke netting survey captured higher proportions of quality-, keeper-, and preferred-size bluegills than our late spring electrofishing surveys did, and preferred-size bluegills were undetected by electrofishing. Although we did not estimate bluegill ages, we suspect high abundance is resulting in

slower-than-average growth, yet some bluegills are surviving long enough to reach preferred size (≥ 8 inches). The high nutrient levels of these eutrophic lakes may be producing enough food to support high densities of bluegills and still maintain fair size structure.

Late Spring Electrofishing

	Number per mile $\geq 3''$	Number per hour $\geq 3''$	Quality Size $\geq 6''$	Keeper Size $\geq 7''$	Preferred Size $\geq 8''$
North Spirit	185	349	55%	0.5%	0%
Spirit	318	540	53%	3%	0%
Combined	228	416	54%	2%	0%

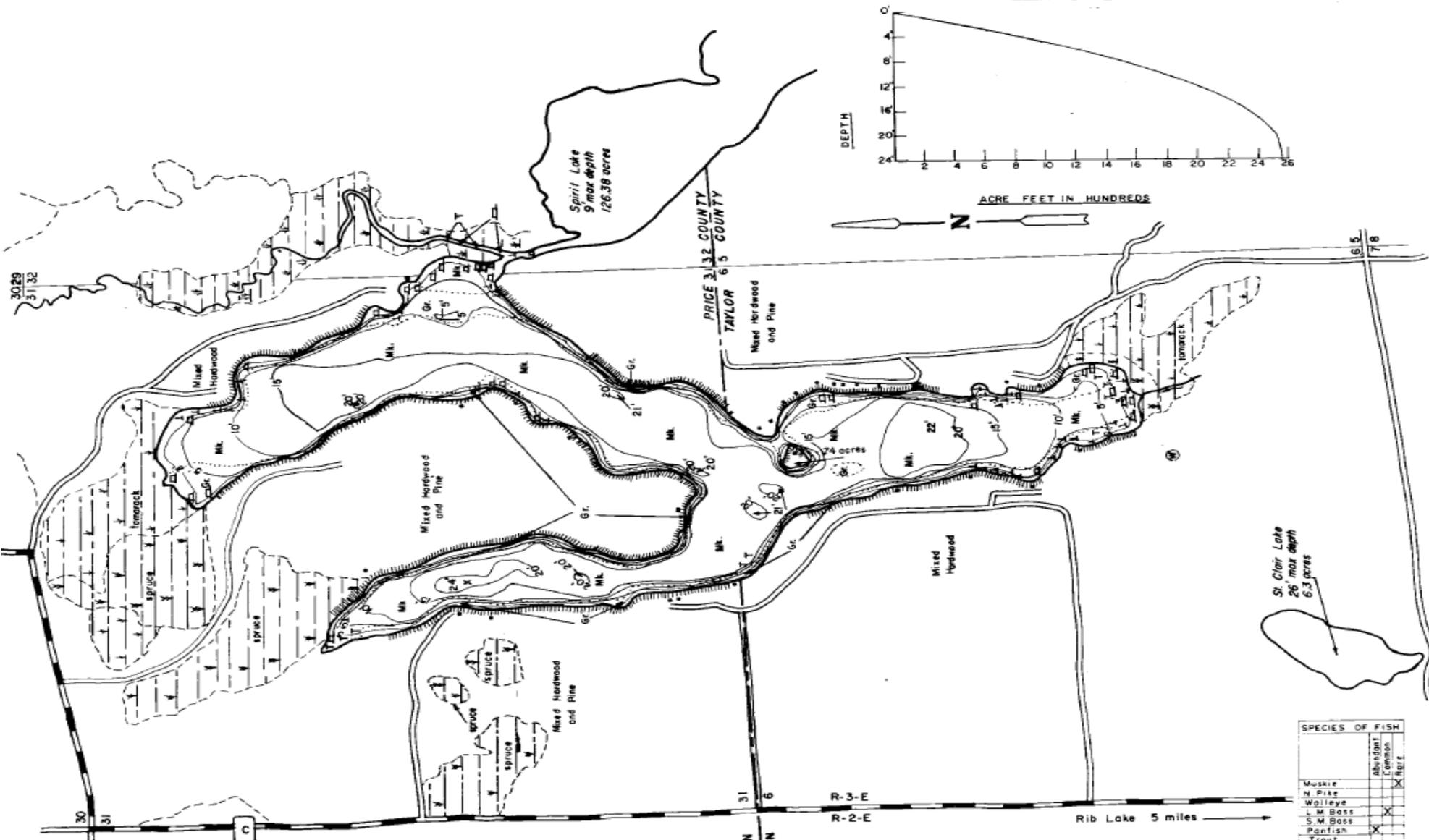


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Written by: Chad Leanna—Fishery Technician, March 2015.

Reviewed by: Jeff Scheirer—Fishery Biologist, March 2015.

Approved for web posting by: Mike Vogelsang—acting Hayward Field Unit Supervisor, March 2015.



EQUIPMENT RECORDING SONAR MAPPED AUGUST 1965
 MO. YR.
 WATER ELEV. 93.70'

NOTE: Bench mark information on Spirit Lake map.

- TOPOGRAPHIC SYMBOLS**
- ⊙ Brush
 - ⊙ Partially wooded
 - ⊙ Wooded
 - ⊙ Cleared
 - ⊙ Pastured
 - ⊙ Agricultural
 - ⊙ B.M. Bench Mark
 - Dwelling
 - ⊙ Resort
- LAKE BOTTOM SYMBOLS**
- P. Peat
 - Mk. Muck
 - C. Clay
 - M. Marl
 - Sd. Sand
 - St. Silt
 - Gr. Gravel
 - R. Rubble
 - Br. Bedrock
 - T. Submergent vegetation
 - ⊥ Emergent vegetation
 - ⊙ Floating vegetation
 - ⊙ Stumps & Snags



◇ Access ◀ Access with Parking ◀ Boat Livery

Field work by G. Miller, M. Perkins, L. Sather Drawn by: D. Laiho

SPECIES OF FISH

	abundant	Common	Rare
Muskie			X
N. Pike			X
Walleye			X
L. M. Bass			X
S. M. Bass			X
Panfish			X
Trout			X

214.02 WITH ISLANDS
 AREA 213.28 ACRES
 UNDER 3FT. 10.4 %
 OVER 20 FT. 5.8 %
 VOLUME 2,527.06 ACRE FT.
 TOTAL ALK. 3.9 P.P.M.
 SHORELINE 5.4 MILES
 MAX. DEPTH 22 FEET

