Sporley Lake
Marquette County, T45-46N, R24W, Sec. 5,31,32
Chocolay River Watershed, Last surveyed 2009

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Environment

Sporley Lake is a pothole lake located in southeast Marquette County, at T46N, R24W, Sec. 32, east of the former K.I. Sawyer airbase (Figure 1). Topography consists of gently rolling hills of coarse glacial remains, mostly of sand and gravel substrate. Vegetation is a dense mixture of predominantly maple, with birch, pine, and spruce components. The watershed is very small, largely restricted to direct runoff from the adjacent uplands and probably some underwater springs. Lake level has historically remained constant except for two periods of low water. Local opinion and memory is that lake level fell when K.I. Sawyer AFB came into existence nearby and began withdrawing water from several new wells. The level apparently rose when the base closed. The level fell once again in 2007 and remains low. There is new concern that recent water wells for the K.I. Sawyer golf course are the cause of low lake levels. The Department of Natural Resources and Environment (DNRE), Water Resources Division is currently investigating to determine if there is any validity for that opinion. There is a small, intermittent outlet flowing northwest into Big Trout Lake. The public access site is an unimproved gravel shoreline with a courtesy pier, parking for about 5 vehicles with trailers, and an outhouse.

Sporley Lake is estimated at 77 acres, with relatively steep contours and a maximum depth of 42 ft (Figure 2). One large shoal, 10-15 ft deep, along the north shoreline results in the littoral zone (0-15 ft) comprising about 25% of the total surface area. There was a thermocline at 22 ft in July, 2009. Dissolved oxygen fell from 7.4 mg/l and 67oF at 24 ft to 0.2 mg/l and 65oF at 27 ft. Alkalinity during that survey was 8 mg/l, while the secchi disk reading was 22 ft.

History

Sporley Lake has been managed as a trout lake since 1943. The lake, however, is a cool water body rather than cold, and yellow perch, white suckers, and sunfish were constantly competing for food with the trout. Consequently, there were three rotenone chemical treatments from 1947 until 1972, and five manual removals from 1981 until 2004. Removals during 1981, 1986, 1992, and 1993 ranged from 29.7 to 39.8 lbs/acre of yellow perch and white suckers. The 2004 effort resulted in 23.7 lbs/acre removed.

From 1942 until 1978, rainbow trout were stocked in numbers ranging 5,000 to 11,400 annually. Since 1981, about 5,000 splake yearlings were stocked each year, while 1,000 brown trout yearlings were stocked every third year. Brown trout strains consisting of Plymouth Rock, Wild Rose, and Seeforellen were all stocked. In 1989, 250 adult Assinica strain brook trout were also stocked. Numbers of splake were decreased to 2,650 during 2002 and 2003, concurrently with brown trout increase to 3,000 in an attempt to introduce greater predation on the perch and small suckers.

Water chemistry has changed since 1941, the first recorded limnological data. Dissolved oxygen was 2.9 mg/l at 30 ft in 1941 (Eschmeyer 1942). Alkalinity was 20 mg/l in 1941, 30 mg/l in 1979. Similarly, the secchi disk depth was 11 ft in 1941, 14.7 ft in 1979. A general netting survey was conducted in 2003. Although Sporley is managed as a trout lake, suckers comprised 91% of the fish survey biomass and perch comprised 7.5%. Perch, however, were growing at almost state average rate; they were not stunted. No brown trout were caught, while splake and largemouth bass each comprised about 1%. A manual removal was conducted during the spring of 2004, during which both yellow perch and white suckers were removed. A total of 14.5 lbs/acre of yellow perch and 9.7 lbs/acre of white suckers were taken during the removal effort.

Beginning in 2004, there was the potential for getting advanced yearling splake and brown trout, stocked large enough to enter the lake as piscivores. The projected change in targeted forage meant they would target small perch and minnows as forage rather than zooplankton. That larger size meant a theoretical ability to control the perch population. The stocking request was changed in 2004 to 4,500 advanced yearling splake from 2004 to 2008, with no brown trout request. Unfortunately, the fish never arrived from the hatchery large enough to have switched their food preference from zooplankton to fish. The stocked splake were not only smaller than predicted, there were only about 1,300 per year. In 2008, 100 adult lake trout, surplus brood stock, were put into the lake.

Current Status

The 2009 intensive survey was conducted July 13-16 (Figure 3). About 60% of survey biomass was tied up in white suckers (Table 1). Also, one 27 in, Age 9 brown trout was captured (Table 2). Brown trout are very piscivorous and in this lake apparently long-lived as well. Both factors make good arguments for a modest resumption of the brown trout stocking to help control the sucker population. Yellow perch were an acceptable 10% of the survey biomass (Table 1). The yellow perch population was represented by six year classes (Table 2). Growth rate was acceptable at 0.3 in slower than state average. The fish community appeared to be in much better balance than it was in the 1990s, likely from the combination of manual removal and reduced salmonid stocking.

Splake numbers stocked per year were 1,300 yearlings from 2005 through 2008. That decreased stocking rate apparently produced a gain in catch numbers from 14 in 2003 to 42 in 2009 (Table 1). Their percent of the survey biomass increased from 1% to 10%, despite being stocked at a smaller than expected average size. Although average size of splake captured in 2009 was slightly smaller than in 2003, 16 in and 17 in fish were caught, compared with the largest at 14 in 2003.

Mortality estimates (Table 3) were generated by Robson and Chapman methodology (1961) using the weighted age frequencies from Table 2. Smallmouth bass, splake, and yellow perch all exhibited unusually high annual and instant mortality estimates.

Analysis and Discussion

Compared with the 2003 survey results, yellow perch numbers fell to only 25% in 2009. Average size was 1.8 in smaller than in 2003, and growth rate fell 0.1 in. Those changes were not expected, since the 2004 manual removal resulted in removal of 14.5 lbs/acre of yellow perch. Such a large population

reduction in a relatively sterile lake should have allowed the surviving perch to grow faster and result in a larger average size. Reasons are unknown at this time, but lake fertility will be discussed later.

Six largemouth bass were captured in 2003, compared with four in 2009 (Table 1). Sizes of the four fish were two less than one in, one 11 in, and one 17 in. Largemouth bass remained a minor component of the lake fish community. In contrast to the largemouth, smallmouth bass numbers increased from 0 in 2003 to 35 in 2009 (Table 1). Only one bass was legal sized at 14 in, and their growth rate was quite slow (Table 2). Since the oldest smallmouth was age 3, the population apparently exploded in 2006, after the last manual removal in 2004.

As discussed in the History section, numbers of splake stocked annually has changed over the past several years. When over 5,000 splake yearlings were stocked, the 2003 survey captured 14, sized at 11-14 in. They comprised less than 1% of the catch biomass, and averaged 12.7 in. Numbers stocked since 2005 have remained about 1,300 yearlings, and the 2009 survey captured 42, sized at 9-17 in (Table 1). Their average size was 11.5, and they comprised 15% of the catch biomass. Those numbers imply a strong potential that this sterile lake had been over-stocked in the past. In fact, Meryl Galbraith, Fisheries Research Biologist who studied this lake, claimed in 1969 that the zooplankton community was deteriorating with no sign of large plankters returning. He emphasized again in 1971 that the lake was "in really bad shape, food-wise." Lake fertility will be discussed later.

One 23 in lake trout was captured in 2009, most likely one of the 100 adults stocked in 2008 when the federal hatcheries culled their broodstock. The Sporley Lake stocking prescription and request call for stocking of excess broodstock, but it is unlikely that many will be stocked from that source. One 27 in brown trout was captured, aged 9. Brown trout were last stocked in 2001, but the capture of this old trout implied potential for renewed stocking at lower rates. Since brown trout are very piscivorous, they should not compete so directly with yellow perch for the limited invertebrate forage.

Smallmouth bass estimated annual mortality (Table 3) was unusually high, and much higher seasonally (instantaneous). While yellow perch mortality was very low for the young year classes, smallmouth bass mortality was uniform from age 1-3. Smallmouth bass average size of 5.1 in implied that such extensive mortality was not due to angling harvest, but rather predation. Salmonid stocking requests have been lowered for the next six years; this lake should be watched very carefully to determine if it is still being over-stocked.

Canadian science reports in The Ottawa Riverkeeper (2008) and the Environmental Research Web (2008), described a study by Dr. John Smol (Smol, 2009) concerning calcium in lakes. The study documented how 1980s acid rain onto terrestrial soils depleted calcium to the extent that currently no new calcium is leaching from certain types of riparian soils into lakes and streams. Even if the water is non-acidic, there may not be enough calcium to support an invertebrate community, including zooplankton. Smol referred to the phenomenon as "lake osteoporosis", and The Ottawa Riverkeeper article described the critical concentration as 1.5 mg/l calcium. The concept may have relevance in Sporley Lake, since Meryl Galbraith, Fisheries Research Biologist, found that the zooplankton community was "distressed" in 1969. Considering the pH in this lake, in conjunction with an alkalinity concentration of only 8 mg/l (CaCO3), the concept of lake osteoporosis may very possibly explain the observed paucity of the lake biota at the base of the food chain. Calcium comprises 25% of the CaCO3

molecule, so 8 mg/l provides only 2 mg/l of actual calcium, which is dangerously close to the established critical concentration.

Management Direction

Sporley Lake fisheries management will concentrate on the salmonid fishery, primarily splake and brown trout with occasional stocking of surplus broodstock lake trout. However, documented water chemistry changes over time, mentioned in the History section, described a lake that has been becoming increasingly more sterile over the last seventy years. Declining alkalinity (calcium) concentration is directly related to increased secchi disk visibility in the water, likely due to decreasing phytoplankton and zooplankton communities. If lake osteoporosis (defined in the Analysis section) is actually limiting production in this lake, the economic cost of over-stocking will be very high. For that reason, stocking numbers should be low or else should be limited to alternate years as suggested so long ago by Merle Galbraith (1979), to allow the zooplankton community time to recover between stocking years. The stocking request beginning in 2010 is for 1,000 yearlings each of splake and brown trout every year, a much lower number than during previous years.

References

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Figure 1. Map of the Sporley Lake, Marquette County area.

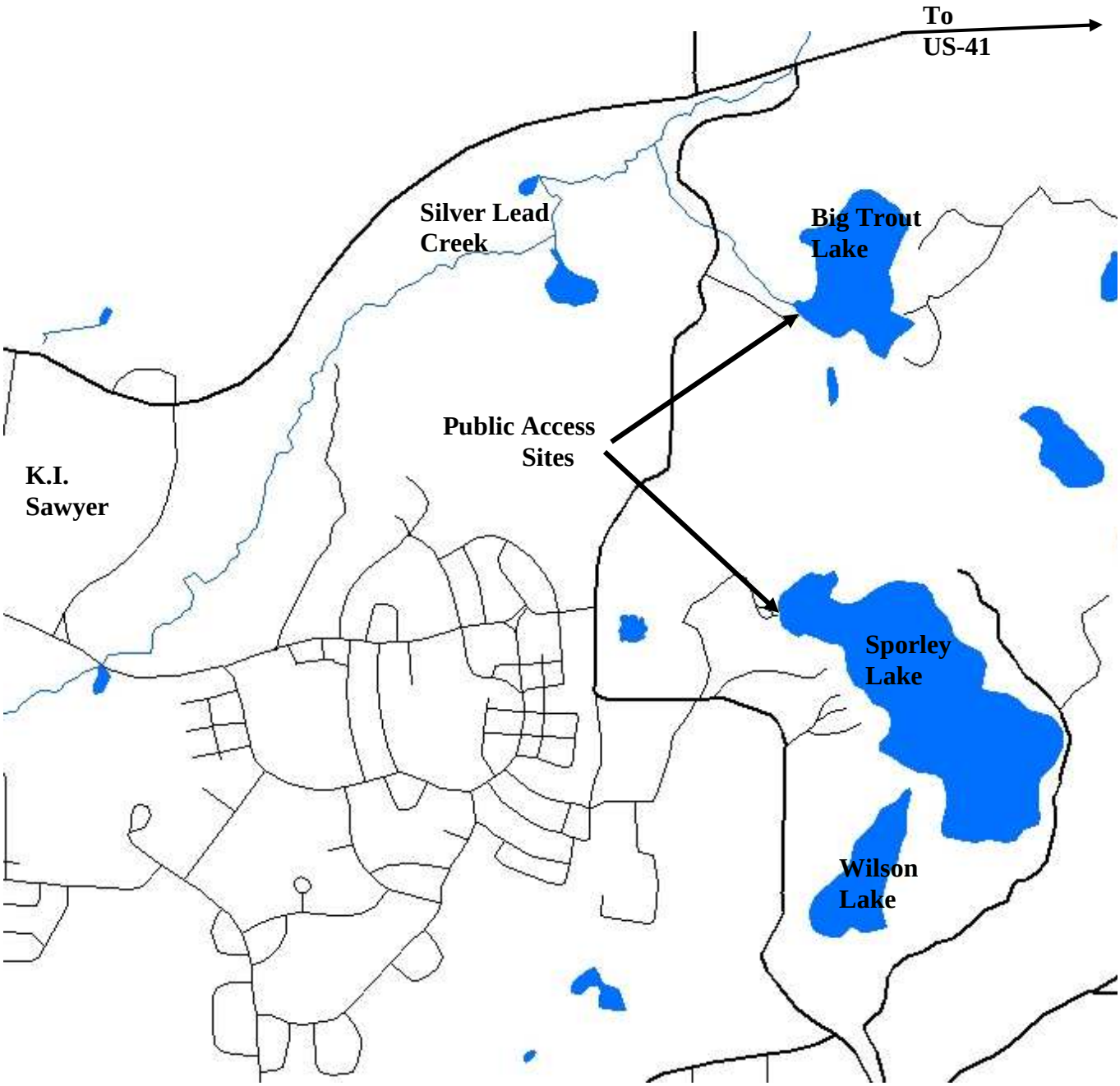

Figure 1. Contour map of Sporley Lake, Marquette County, T45-46 N, R 24W, Sec 5, 31,32.

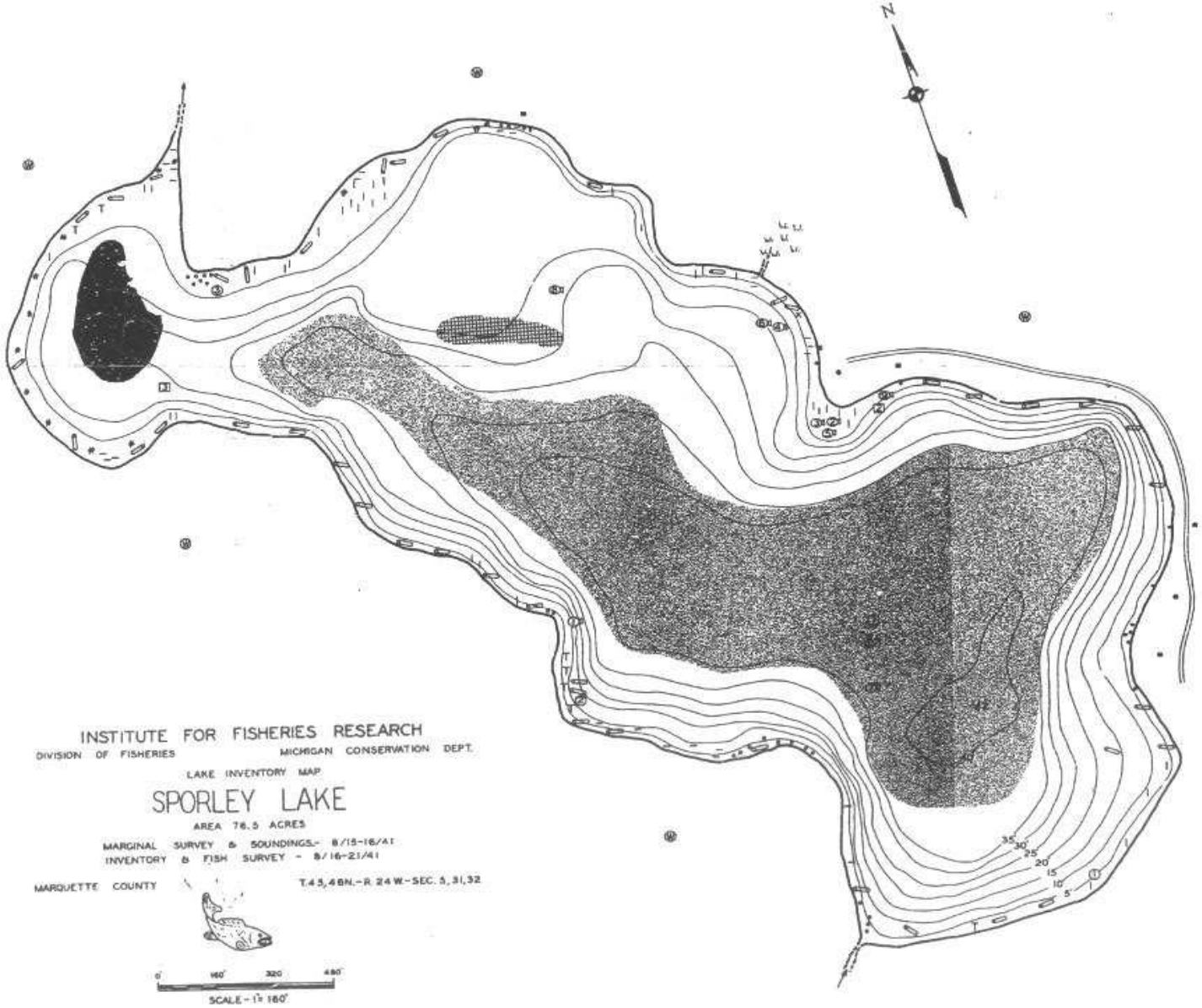

Figure 2. Aerial photograph of Sporley Lake, Marquette County, showing net locations during the 2009 Status and Trends survey.

Table 1. Number, weight, and length by species for Sporley Lake, Marquette County, from the status and trends survey using fyke and gill nets, maxi mini fyke nets, and seine, July 13-16, 2009.

Species	Number	Percent by number	Weight (lb)	Percent by weight	Length range (in.)*	Average length (in.)	Percent legal Size**
Bluntnose minnow	24	8.5	0.2	0.1	2-3	2.7	---***
Brown trout	1	0.4	9.0	6.1	27-27	27.5	100
Crayfish	2	0.7	0.0	0.0	3-4	4.0	---
White sucker	37	13.1	88.3	59.6	16-20	18.2	---
Lake trout	1	0.4	4.5	3.0	23-23	23.5	100
Largemouth bass	4	1.4	3.6	2.5	0-17	7.5	25
Northern redbelly dace	1	0.4	0.0	0.0	2-2	2.5	---
Pumpkinseed	2	0.7	0.4	0.2	5-6	6.0	50
Painted turtle	5	1.8	0.0	0.0	6-7	7.1	---
Smallmouth bass	35	12.4	5.1	3.5	0-14	5.1	3
Splake hybrid	42	14.9	22.6	15.3	9-23	11.5	88
Yellow Perch	128	45.4	14.4	9.7	0-9	5.5	29

* Note some fish may be measured to 0.1 inch, others to inch group: e.g., “5” = 5.0 to 5.9 inches; “12” = 12.0 to 12.9 inches, etc.
** Percent legal or acceptable size for angling harvest.
*** “---“ signifies a species for which there is no minimum legal/acceptable harvest size.

Table 2. Weighted mean length and age composition by species for Sporley Lake, Marquette County, from the status and trends survey using fyke and gill nets, maxi mini fyke nets, and seine, July 13-16, 2009.

Species/Age	No. aged	Length range (in.)	State average len. (in.)	Weighted mean len. (in.)	Weighted age Freq. (%)	Mean growth Index*
Brown trout						---
Age IX	1	27.6-27.6		27.6	100	
Lake trout						---
Age VII	1	23.1-23.1	25.6	23.1	100	
Largemouth bass						---
Age III	1	11.1-11.1	10.6	11.1	50	
Age VII	1	17.9-17.9	16.7	17.9	50	
Pumpkinseed						---
Age III	2	5.4-6.2	5.2	5.8	100	
Smallmouth bass						-1.3
Age I	11	3.7-5.1	5.5	4.2	79	
Age II	4	6.3-8.4	8.8	7.2	12	
Age III	3	11.1-14.2	11.1	12.5	9	
Splake hybrid						-1.3
Age I	15	9.3-11.2	10.3	10.3	55	
Age II	13	10.3-12.1	12.6	11.3	33	
Age III	1	16.0-16.0	15.0	16.0	2	
Age IV	4	16.5-17.4	17.3	16.9	10	
Yellow Perch						-0.3
Age I	1	4.0-4.0	4.0	4.0	2	
Age II	2	5.8-6.1	5.7	6.1	6	
Age III	10	6.1-7.7	6.8	6.6	50	
Age IV	17	6.8-8.4	7.8	7.5	35	
Age VI	4	8.7-9.2	9.7	8.9	4	
Age VII	2	9.2-8.9	10.5	9.5	2	

* Mean growth index is the average deviation from the state average length at age.

Table 3. Sporley Lake, Marquette County, mortality rate estimates (Robson and Chapman 1961) for several species from catch curves produced by intensive survey, July 13-16, 2009.

Species	Age(s)	Percent Annual Mortality	Percent Instant Mortality*	Growth Index (in.)	Comments
Smallmouth bass				-1.3	High annual mortality may not be sustainable. The high instant mortality implies intensive summer harvest.
	1 – 3	77	146		
Splake hybrid				-1.3	The splake population benefits from annual stocking. Even so, mortality estimates are high.
	1 – 4	60	91		
Yellow perch				-0.3	Estimates imply little mortality until the perch reach about 6.5 in. Because of that phenomenon, mortality may be due largely to angling harvest rather than predation.
	1	2			
	2	6			
	3	55			
	4 – 7	62	97		

* Greater instant mortality implies more angling harvest during summer months (or greater predation harvest due to increased predator metabolism in the summer and the need to intake more calories).