

Pine Creek
Manistee County
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Environment

Pine Creek is a small, second order tributary to the Manistee River in southeastern Manistee County, Michigan (Figure 1). Pine Creek begins in a swamp in Section 34 of Norman Township, just north of the Manistee/Lake County line. From there it flows west for several miles before entering Sunnybrook Pond, a private impoundment. After exiting Sunnybrook Pond, Pine Creek flows generally northwest for approximately 20 miles before entering the Manistee River at a location locally known as the "Udell Rollway". As it progresses downstream Pine Creek is fed by the outlet streams from Dorner Lake, Lost Lake, Chittenden Lake, and Pine Lake. From it's headwaters to M-55, Pine Creek is relatively low gradient, flowing through both coniferous and deciduous forests, including numerous wetlands. Downstream of M-55, Pine Creek has much higher gradient and flows through an incised valley as it enters the Manistee River valley prior to joining the Manistee River. While substrates in the upper reaches of Pine Creek consist mostly of sand and silt with the occasional gravel patch, substrates downstream of M-55 consist mostly of gravel and cobble, with some sand. The Pine Creek watershed is mostly forested, flowing through a mix of private and federally owned land. The federally owned land is managed by the U. S. Forest Service (USFS) as part of the Manistee National Forest.

There are several man-made dams on Pine Creek. The Sunnybrook Dam is the largest of these, located approximately two miles downstream of the headwaters of Pine Creek in Section 32 of T21N R13W. The Sunnybrook Dam was constructed in 1890 on a narrow gauge railway during logging operations. It reportedly failed during the large flood of 1986 and was rebuilt shortly after its failure (Shawn Kelley, personal communication). Another man-made dam is located just downstream of Snyder Road. Additionally, there are likely a number of beaver impoundments on Pine Creek and its tributaries.

Pine Creek is a Designated Trout Stream (Fisheries Order 210), and is classified as a Top Quality Trout Feeder Stream. Pine Creek is regulated as a Type-1 Trout Stream, which means that it can only be fished from the last Saturday in April through September 30. The minimum size limits are 7 inches for brook trout, 8 inches for brown trout, and 10 inches for rainbow trout. A total of five trout per day may be harvested, with no more than three over 15 inches.

History

The first known fish stocking of Pine Creek occurred in 1889 when brook trout were stocked. Brook trout were again stocked in 1896, 1897, 1905, 1909, 1909, 1910, and 1933 through 1954. Brown trout were first stocked in 1947, and they were stocked annually through 1952. Rainbow trout were first stocked in 1938. They were also stocked in 1939, 1947, and from 1950 to 1960; and then again in 1964. The 1964 rainbow trout stocking was the last recorded stocking for Pine Creek. The early fish stockings (1896 through 1910) were likely conducted by the Michigan Fisheries Commission. The 1933-1964 fish stockings were likely conducted by the Michigan Department of Conservation

(MDOC; the precursor to the Michigan Department of Natural Resources (DNR)). Rainbow trout were first stocked into Pine Creek in 1938 but they were present in Pine Creek earlier than that. DNR records indicate there were steelhead egg-takes conducted on Pine Creek by the MDOC during the period from 1924-1929.

The first known fisheries survey of Pine Creek was done on July 15, 1966 by the MDOC. The researchers shocked for 15 minutes downstream of Hoxeyville Road in Section 29 of Norman Township. Two 6 inch brook trout were caught. Other species caught in the survey included blacknose dace, common shiner, and central mudminnow. The water temperature on that day was recorded as 76 || F, and the air temperature was 80 || F.

Carl (1983) studied juvenile coho salmon and rainbow trout (steelhead) in Pine Creek. He determined that coho salmon and rainbow trout grew larger in Pine Creek than in streams along the West Coast of the United States, possibly due to greater growth during Michigan winters. Carl also determined that coho salmon smolt estimates were lower in Pine Creek than in typical West Coast streams. He also determined that interspecific competition between coho salmon and rainbow trout did not seem to be taking place, possibly due to spatial segregation in the stream. During the study, he observed that juvenile rainbow trout and Chinook salmon seemed to prefer faster areas of the stream, while juvenile coho salmon preferred pools or the slower stream margins. He also determined that coho salmon were easier to catch than Chinook salmon or steelhead, again likely due to their habitat preference of pools and slower stream margins.

Fisheries surveys were conducted by the USFS on Pine Creek in 1978 and 1995. In the 1978 survey, three different stations were surveyed. The goal was to establish population estimates for salmonids, but enough salmonids were only captured at one of the three sites (Site 1) to justify a recapture run. That site was in Section 23 of T21N R14W (Norman Township, western portion). At that site brook trout, brown trout, and rainbow trout were captured and population estimates established (Table 1). At Site 2 (Section 17 of western Norman Township), two brook trout and three rainbow trout were captured, and at Site 3 (location unknown), two brown trout and two rainbow trout were captured. Other species observed at the three USFS sites in 1978 included white sucker, bowfin, creek chub, blacknose dace, common shiner, central mudminnow, spottail shiner, and sculpin. Another USFS sampling effort on Pine Creek was conducted in August of 1995, in Section 29 of eastern Norman Township. No salmonids were captured in the effort. Other species observed included blacknose dace, creek chub, longnose dace, and central mudminnow.

On July 23, 2001, the DNR conducted a survey of Pine Creek. This survey was an attempt to collect salmonids for testing for whirling disease. The survey took place at the Huff Road crossing in Section 6 of western Norman Township. DNR fisheries staff sampled several hundred feet upstream of the Huff Road crossing. Twenty-one rainbow trout from 5 to 8 inches in length and nine brown trout from 4 to 7 inches in length were captured and sacrificed. About a dozen brown trout from 9 to 15 inches in length were also observed, as were numerous juvenile coho salmon, and numerous small (<1 inch in length) juvenile steelhead. Two adult steelhead were also captured and released. Other species observed included sculpin and small bluegill. The site had very high gradient, with gravel and cobble being the primary substrates. Fish cover was present in the form of woody debris and undercut banks. The water temperature in Pine Creek was 58 ||, and the conductivity was 174 || s. All sacrificed fish tested negative for whirling disease.

The Little River Band of Ottawa Indians (LRBOI) has also conducted fisheries surveys on Pine Creek since 2002 at fixed sites that are surveyed annually. In 2002, LRBOI conducted a fisheries survey of Pine Creek approximately one mile upstream from the Steinberg Road crossing in Section 16 of western Norman Township (LRBOI 2002). Fish captured at this station included blacknose dace, brown trout, central mudminnow, coho salmon, creek chub, Johnny darter, mottled sculpin, northern redbelly dace, and rainbow trout. The report indicated that the temperature regime in Pine Creek at this station was warmer than optimal for salmonid growth and survival.

From 2006-2009 LRBOI conducted multi-pass depletion estimates for steelhead at the Section 16 station and estimates ranged from 30.8/hectare (75/acre) to 512.8/hectare (1,280/acre) (LRBOI 2009). During the 2009 survey, the 28 rainbow trout captured ranged from 1 to 13 inches in length. Other species captured at the section 16 station in 2009 included brook trout (two fish, two and six inches in length), brown trout, (three fish from 7 to 17 inches in length), Chinook salmon (one three inch fish), blacknose dace, creek chub, green sunfish, Johnny darter, mottled sculpin, white sucker, and sea lamprey. LRBOI also sampled a site on Pine Creek upstream and downstream of Pine Lake Road in Section 14 of western Norman Township in 2009. At the Pine Lake Road stations, species captured included brook trout (12 total from 2 to 11 inches in length), rainbow trout (2 individuals, 2 and 6 inches in length), bluegill, blacknose dace, central mudminnow, creek chub, green sunfish, mottled sculpin, white sucker, and northern redbelly dace.

In the summer of 2009, Pine Creek was sampled in several locations by Water Bureau staff from the Michigan Department of Environmental Quality (DEQ; Anonymous 2009; at that time, they were known as the Michigan Department of Natural Resources and Environment). The DEQ survey used Procedure 51 methods (Anonymous 2009). The goals of the surveys were to identify nonpoint sources of water quality impairment, to assess the current status and condition of Pine Creek, to determine if Michigan Water Quality Standards were being met, and also to evaluate biological temporal trends. Two sites were sampled, one being directly upstream of Pine Lake Road, and the other being directly downstream of Pine Lake Road. The upstream station had a Habitat Evaluation score of 167, giving it an "Excellent" rating, while the downstream station had a Habitat Evaluation score of 141, giving it a "good" rating. The upstream station had a Macroinvertebrate Community score of 2, giving it an "Acceptable" rating, while the downstream station had a Macroinvertebrate Community score of 4, also giving it an "Acceptable" rating.

A brook trout movement study was conducted on Pine Creek by researchers from Notre Dame and Lake Superior State Universities (Janetski et al. 2011). During this study, the researchers determined that the arrival of spawning salmon spurred movement within the stream by resident brook trout. In a nearby control stream (Peterson Creek) that does not receive salmon runs, such movements did not occur. Although the researchers predicted that the arrival of spawning salmon would impact brook trout movement patterns over the full duration of the salmon run, the movements were short lived, only lasting for several days. Since the salmon had not yet begun spawning when the brook trout movement occurred, the researchers hypothesized that the brook trout movement was the result of interference competition for holding positions within the stream. However, the researchers also surmised that the negative effects on the brook trout due to increased movement were likely offset by subsequent nutritional gain through subsequent salmon egg consumption by the brook trout.

A habitat restoration evaluation study was completed by LRBOI and Grand Valley State University from 2004-2008 (M. Holtgren, LRBOI, personal communication). Three road crossings were improved and pre- and post biological monitoring data were collected during this project. Positive changes were noted within the fish community as a result of the restoration work.

Within the last ten years, nearly every road/stream crossing in the watershed has been replaced by the Manistee County Road Commission (MCRC). The Huff Road crossing was replaced in 2004, Seaman Road and Pine Lake Road (mainstem Pine Creek) in 2005, and Steinberg Road in 2006 and then again in 2008 after it was damaged in a major storm event. Ongoing or recently completed projects from the summer of 2011 include Bosschem Road (both the mainstem and the Chittenden Lake outlet stream) and Pine Lake Road (the Pine Lake outlet stream, both the road and the USFS snowmobile trail crossing). Many of the crossings were aging culverts that were replaced by clear span bridges, including some timber bridges. If the replacement structure was a culvert it was generally larger and provided more flow capacity than the culvert it replaced. Funding sources and partners for these projects have varied, but generally included the Lower Manistee River Partnership, Conservation Resource Alliance (CRA), USFS, LRBOI, DNR, and DEQ.

Current Status

The most recent DNR fisheries surveys of the Pine Creek subwatershed were conducted on May 12th, 2010. Sampling was conducted with a Wisconsin battery-powered 12-volt backpack shocker. A total of five different sites within the watershed were sampled (Fig. 2). The sampling technique was a basic one-pass effort, aimed at determining the presence or absence of species at any particular site. The lengths of survey stations varied between 150 and 250 feet, depending on the location and characteristics of that site. Any fish captured were immediately returned to the water after being measured, and age/growth information was not obtained. The sample sites will be discussed in order of progression down the watershed, starting with the furthest upstream site.

The furthest upstream site sampled was approximately $\frac{1}{4}$ mile upstream of the Sunnybrook Dam, in Section 33 of 21N 13W (Site 1 on Fig. 2). This site is roughly 1.5 miles downstream of the headwaters of Pine Creek. At this site, 250 feet of stream was sampled, with brook trout and sculpin being the predominant species (Table 2). A total of 31 brook trout from 1 to 6 inches and 12 sculpin from 1 to 3 inches in length were captured. Other species present at this site included blacknose dace, central mudminnow, and northern redbelly dace. All of these species were represented by one individual respectively. Pine Creek was approximately 12 feet wide and 3 inches deep at this site. Substrates were predominantly sand and silt, with a very small amount of gravel present. The stream appeared to be overly wide and shallow, but seems to be receiving significant groundwater inputs. At this location Pine Creek flows through a hemlock forest, and has abundant woody structure in the stream.

The next site was sampled just downstream of the Hoxeyville Road crossing, which is several hundred yards downstream of the Sunnybrook Dam (Site 2 on Fig. 2). The station began 150 feet downstream of the road crossing and ended at the Hoxeyville Road culvert. Although the site appeared to have decent habitat, no trout were present. Species caught included blacknose dace, creek chub, and central mudminnow (Table 3). Although the water temperature was relatively cool on the day of sampling, it is likely that trout are not present in this stream reach due to the warming effects of the Sunnybrook

Dam. At this location, Pine Creek was approximately five feet wide and four inches deep, with the substrates consisting of 20% silt, 20% sand, 50% gravel, and 10% cobble.

Progressing downstream, the next site sampled was immediately below the Seaman Road crossing, where a 160 foot reach upstream to the road crossing was sampled (Site 3 on Fig. 2). Here, the salmonid catch consisted of one brook trout, one juvenile Chinook salmon, and three juvenile coho salmon (Table 4). Other species caught included blacknose dace, brook stickleback, creek chub, white sucker, hornyhead chub, central mudminnow, and northern redbelly dace. The stream was approximately 10 feet wide and 6 inches deep at this site. Substrates at this site consisted primarily of sand and silt, although a small amount of gravel was present. There was a sparse amount of woody debris in the stream providing some cover. The Seaman Road crossing was replaced in 2007 by the Manistee County Road Commission.

The next site downstream was just above Pine Lake Road, where 125 feet of stream upstream from the road crossing was sampled (Site 4 on Fig. 2). Here, the salmonid catch consisted of five brook trout from 4 to 8 inches in length and four rainbow trout from 5 to 6 inches in length (Table 5). Other species caught included blacknose dace, creek chub, white sucker, green sunfish, hornyhead chub, central mudminnow, and sculpin. Pine Creek was approximately 15 feet wide and 1 foot deep at this site. Substrates consisted of 50% sand, 40% gravel, and 10% silt. There was abundant woody debris within the stream channel, and the overall habitat of this reach was better than any of the other sites sampled in 2010.

The furthest downstream site is found by traveling an unmarked two-track road located south of Steinberg Road, in the SW $\frac{1}{4}$ of Section 16, on USFS land (Site 5 on Fig. 2). A 200 foot reach was sampled at this site. Here, the salmonid catch consisted of two rainbow trout, four and six inches in length and one juvenile Chinook salmon (Table 6). Other species caught included blacknose dace, Johnny darter, and sculpin. Several adult steelhead were also observed in the act of spawning on the abundant gravel found in this reach. No attempt was made to capture the adult steelhead. Pine Creek in this area flows through tag alder swamp and is relatively low gradient. There appears to have been some instream habitat work done in this reach, likely by USFS personnel. The stream averaged roughly 15 feet wide and 1 foot deep, and had sparse woody debris cover. Substrates consisted of 50% sand, 30% gravel, and 20% silt.

Several fish surveys were conducted in the Pine Creek watershed in 2011 by researchers from Notre Dame University, in cooperation with the USFS (Bob Stuber, USFS, personal communication). These surveys were conducted to evaluate the two new road stream crossing structures, one at Bosschem Road which spans Pine Creek itself, and the other crosses the Chittenden Lake outlet stream. The first survey was conducted in the tributary to Pine Creek that flows out of Chittenden Lake, both upstream and downstream of Bosschem Road. No salmonids were captured in this tributary. Species caught included blacknose dace, brook stickleback, creek chub, central mudminnow, green sunfish, mottled sculpin, bluegill, common shiner, northern redbelly dace, and white sucker. The second survey was the mainstem of Pine Creek, both upstream and downstream of the Bosschem Road crossing. In this survey, brook trout, rainbow trout, and juvenile Chinook salmon were caught, as well as bluegill, blacknose dace, creek chub, central mudminnow, green sunfish, largemouth bass, mottled sculpin, rainbow trout, and white sucker.

Analysis and Discussion

According to Rozich (1998) "Pine Creek is an important producer of steelhead (rainbow trout) and Chinook smolts". This observation still holds true, and could be expanded to include coho salmon as well. Pine Creek remains a coldwater stream that supports self-sustaining populations of brook trout, brown trout, rainbow trout (steelhead), coho salmon, and Chinook salmon. Of five sites sampled during the 2010 DNR survey of Pine Creek, salmonids were present at four of the sites. However, based on the number of non-salmonid species captured during the 2010 survey at all survey locations, Pine Creek has warmer than ideal water temperatures for much of its length. Warmer water temperatures are likely the result of dams and from surface flows exiting numerous inland lakes in the subwatershed. Despite this fact, Pine Creek remains as a significant contributor of wild salmonids to the Manistee River and Lake Michigan.

Due to its small size, Pine Creek will probably never be a "destination" fishery, even though we have documented the continued presence of quality salmonids. However, Pine Creek can certainly offer an excellent small-stream angling opportunity. In addition, the migratory salmonids naturally produced in Pine Creek (steelhead, coho salmon, Chinook salmon, and possibly brown trout) will continue to provide recreation for Lake Michigan and Manistee River anglers.

Management Direction

Currently, the Pine Creek watershed produces good numbers of naturally produced salmonids without the assistance of stocking. Many of the fish produced in Pine Creek are migratory salmon and steelhead that provide angling opportunity in Lake Michigan and the Manistee River. Therefore, development in this watershed should be done wisely, without filling wetlands or damaging the stream in any way. Unwise development in the watershed may lead to further degradation of the watershed and further elevation of water temperatures. Instead the rural nature of the watershed should be maintained, with as much of the watershed as possible left in a forested, undeveloped state. If the opportunity arises, the effects of removing the existing man-made dams on Pine Creek should be evaluated. It is possible that removing these dams will improve the temperature regime of Pine Creek and may increase salmonid production. One particular action that would protect Pine Creek would be a Natural Rivers designation.

Additional fisheries surveys of the Pine Creek watershed would be useful. In particular, the reach downstream of M-55 should be surveyed, preferably with a mark/recapture study to establish salmonid population estimates. Also, a temperature study of Pine Creek and some of the larger tributaries should be conducted, with autonomous thermometers placed in the stream to record temperatures during the summer months of June, July, and August. Procedure 51 (Anonymous 2010) stream habitat surveys should be completed throughout the watershed to further quantify the level of habitat degradation within the watershed. Water quality monitoring and invertebrate surveys would also help to provide further enlightenment as to the state of the Pine Creek watershed.

References

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Rozich, T. J. 1998. Manistee River Assessment. MI Department of Natural Resources, Fisheries Division, Special Report Number 21. Ann Arbor, MI.

Figure 1. The Pine Creek subwatershed, Manistee County, Michigan.

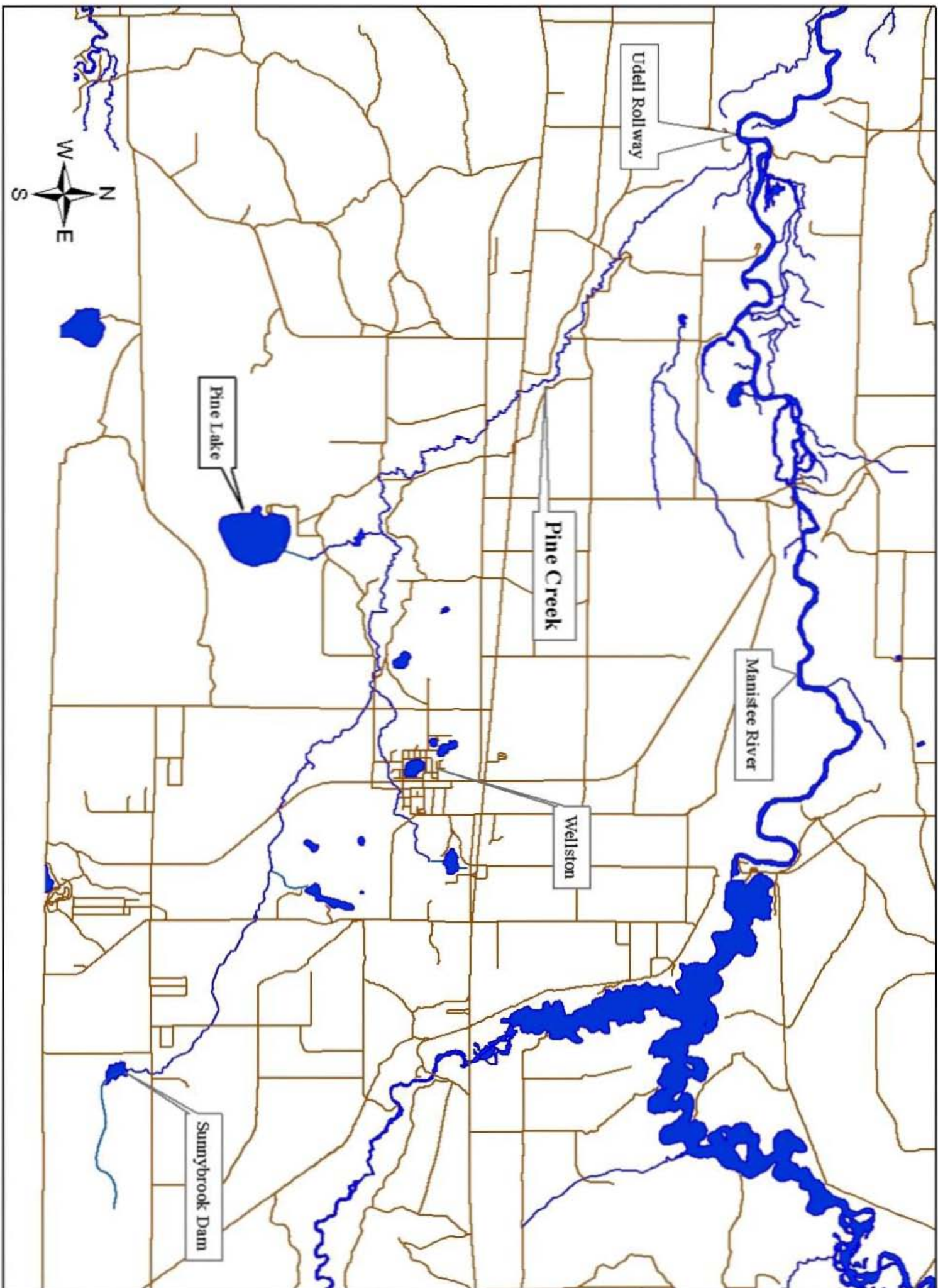


Figure 2. Sample sites from the 2010 DNR fisheries survey of Pine Creek, Manistee County, Michigan.

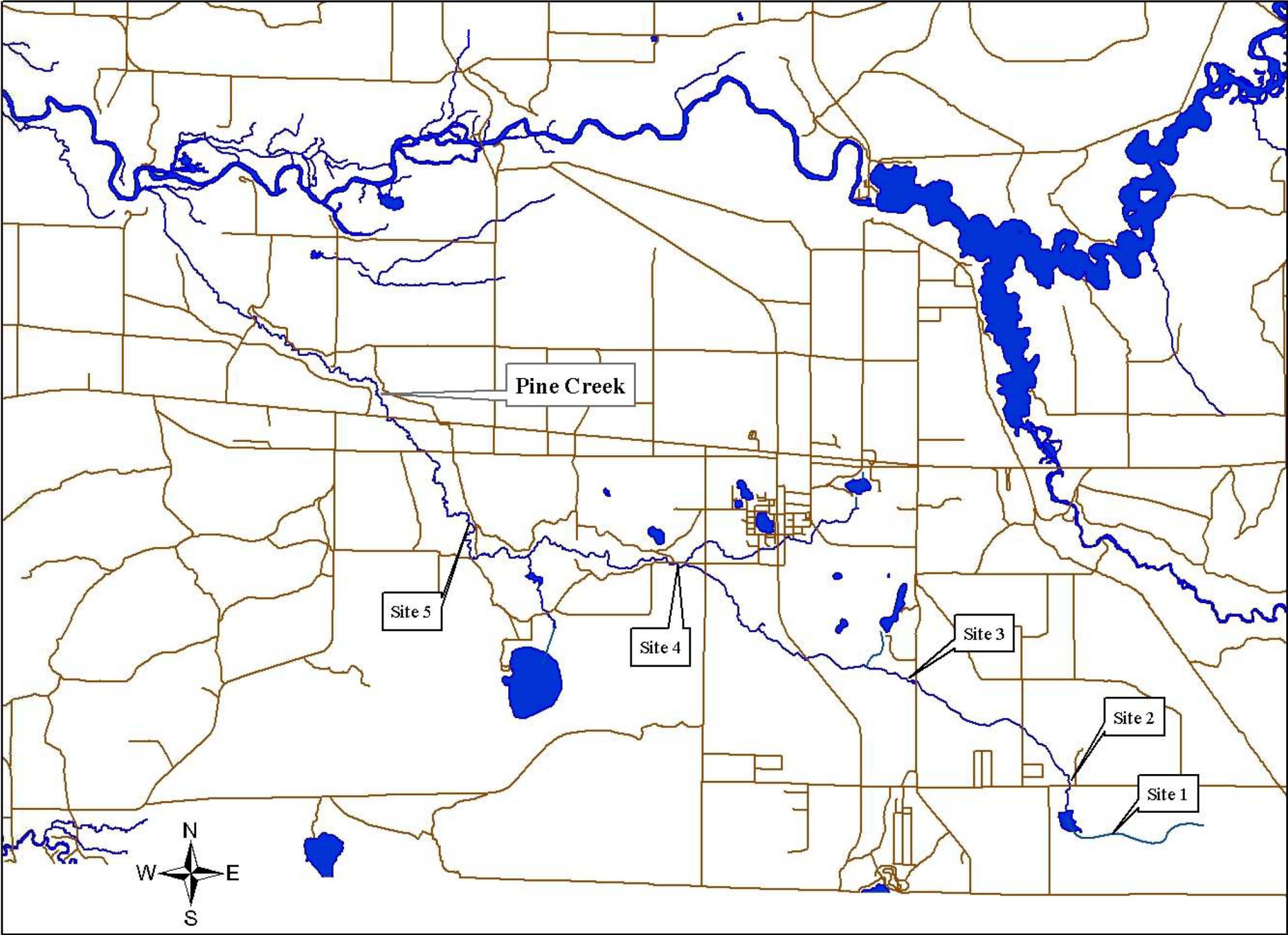


Table 1. Population estimates from the 1978 USFS survey of Pine Creek for brook trout, brown trout, and rainbow trout.

Year	BNT		BKT		RBT	
	#/acre	lbs/acre	#/acre	lbs/acre	#/acre	lbs/acre
1978	24	15.2	47	5.30	155	12.3

Table 2. Catch from the May 12, 2010 DNR electrofishing survey of Pine Creek upstream of Sunnybrook Dam in Section 36 of Norman Township.

Inch Class	Brook trout	Blacknose dace	Central mudminnow	Northern redbelly dace	Sculpin
1	7				
2		1	1	1	8
3	16				1
4	4				3
5	2				
6	2				
Total:	31	1	1	1	12

Table 3. Catch from the May 12, 2010 DNR electrofishing survey of Pine Creek at the Hoxeyville Road crossing.

Inch Class	Blacknose dace	Central mudminnow	Creek chub
1	1		7
2	14	8	25
3		2	2
4			1
Total:	15	10	35

Table 4. Catch from the May 12, 2010 DNR electrofishing survey of Pine Creek at the Seaman Road crossing.

Inch Class	Brook trout	Blacknose dace	Brook stickleback	Central mudminnow	Chinook salmon	Coho salmon	Creek chub	Horny-head chub	Northern redbelly dace	White sucker
1	1	7	2	1			2		1	
2		11	1	6	1	3	4		1	
3		6					7			
4							1			
5							3	1		
6								2		
7										
8								1		2
Total:	1	24	3	7	1	3	17	4	2	2

Table 5. Catch from the May 12, 2010 DNR electrofishing survey of Pine Creek at the Pine Lake Road crossing.

Inch Class	Brook trout	Blacknose dace	Central mudminnow	Creek chub	Green sunfish	Horny-head chub	Rainbow trout	Sculpin	White sucker
1									
2		4	2	3				1	
3		3	1	1	2				
4	1			5					
5	1				1	1	1		
6	1						3		
7									
8	2								
9									
10									
11									
12									
13									
14									
15									
16									
17									1
Total:	5	7	3	9	3	1	4	1	1

Table 6. Catch from the May 12, 2010 DNR electrofishing survey in the SW 1/4 of Section 16 of western Norman Township.

Inch Class	Blacknose dace	Chinook salmon	Johnny darter	Rainbow trout	Sculpin
1					
2	10	1	1		2
3	5				
4				1	
5					
6				1	
Total:	15	1	1	2	2