Peterson Creek
Manistee and Wexford Counties
Manistee River Watershed, last surveyed in 2008

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Environment

Peterson Creek is a second-order tributary to the Manistee River in western Wexford County and eastern Manistee County, near Harrietta, Michigan (Fig. 1). The headwaters of Peterson Creek flow from springs just north of M-55 in Section 10 of South Branch Township. A headwater tributary of Peterson Creek is Johnson Creek, which emerges from springs at the foot of the western slopes of the Caberfae Ski Resort, which has elevations nearing 1,600 feet. Johnson Creek flows south for approximately two miles before joining with Peterson Creek. From there, Peterson Creek flows mostly west until it crosses under M-37. Then it turns and flows northwest before flowing into Tippy Dam Pond (an impoundment of the Manistee River). Sands Creek is the only other named tributary in the Peterson Creek subwatershed, and it joins Peterson Creek between M-37 and Warfield Road. After flowing under Warfield Road, Peterson Creek continues for approximately 1.5 miles before entering Tippy Dam Pond (Fig. 1). In that distance, it drops nearly 150 feet in elevation. Due to this drop, as it nears Tippy Dam Pond, Peterson Creek flows through a deeply incised valley. Peterson, Johnson, and Sands Creeks flow through a mix of private and federally-owned land. The federally owned forest land is managed by the US Forest Service (USFS) as the Manistee National Forest. The terrain in the Peterson Creek subwatershed is hilly and mostly forested, with predominantly sandy soils.

Peterson Creek and its tributaries are Designated Trout Streams (Fisheries Order 210), and are classified as Top Quality Trout Feeder Streams (Anonymous 2000). Peterson Creek and its tributaries are regulated as Type-1 Trout Streams, which means that they can be fished from the last Saturday in April through September 30. The minimum size limits are 7" for brook trout, 8" for brown trout, and 10" for rainbow trout. A total of five trout can be kept per day, with no more than three of those over 15".

History

The first known fish stocking of Peterson Creek occurred in 1947 when 440 yearling brook trout were stocked along with 215 yearling and 225 adult rainbow trout. Brook trout were also stocked from 1948-1954 and in 1962, and rainbow trout were stocked from 1947-1961. Sands Creek was also stocked with brook trout in 1947, 1950, and 1951, and with rainbow trout in 1949 and 1950. No early stocking records exist for Johnson Creek. These early fish stocking efforts were conducted by the Michigan Department of Conservation (MDOC; the precursor to the Michigan Department of Natural Resources (DNR)).

A dam was constructed on Peterson Creek in 1954 by a private individual, for the purpose of creating a fishing pond. The pond was known as "Garlets' Pond". It was located just upstream of the M-37 crossing. Between 1960 and 1985, Garlets' Pond was stocked with rainbow trout by the DNR. In 1989, the dam washed out in heavy rains, resulting in the introduction of large amounts of sand to the

bedload of the stream. As a result, the USFS installed two sand traps in Peterson Creek, which were maintained regularly until 2009. The traps have since been abandoned and the sites restored. The dam was never rebuilt.

In early September, 1993, there was another sedimentation incident in the Peterson Creek watershed. The Caberfae Ski Resort was constructing a golf course, and a major rain event caused large amounts of sand and sediment to enter Johnson Creek. After the incident, the USFS installed a sand trap on Johnson Creek in an attempt to remove some of the introduced sediment from the streambed. The sandtrap was located in Section 2 of South Branch Township. It was emptied a total of 12 times between 1993 and 1999. A settlement agreement was eventually reached between the Michigan Department of Environmental Quality (DEQ), USFS, and Caberfae in which Caberfae helped defray the sand trap operating costs incurred by the USFS. The Johnson Creek sand trap has not been maintained since 1999.

Historical Fisheries Surveys

Peterson Creek

The first known fisheries survey of Peterson Creek was conducted on September 14, 1951 by the MDOC, utilizing a backpack shocking unit. The survey took place near the M-37 crossing, both upstream and downstream. Approximately 315 feet of stream was sampled. In that time, the researchers caught 21 brook trout (from 2.9 to 8.0 inches), 14 brown trout (from 2.4 to 12.4 inches), and 3 rainbow trout (from 5.2 to 5.6 inches). The stream was between 3 and 8 feet wide, and between 1 and 14 inches deep. The bottom consisted of sand, gravel, silt, detritus, and a trace of clay, and cover was in the form of overhanging banks, logs, and brush. The water temperature at 3:15pm was 56°F, while the air temperature was 66°F.

Peterson Creek was again sampled by MDOC on July 25, 1966. This time, sampling was conducted upstream from 7 Road. In a 15 minute shocker run, 6 brook trout (from 5.7-6.8 inches) and 1 sculpin were caught. The stream averaged 5 feet wide and 6 to 12 inches deep. The water temperature at 9am was 53°F, while the air temperature was 78°F.

The next sampling of Peterson Creek was on August 18, 1989, in response to the Garlets' Pond failure. Three sites were sampled by DNR staff with a backpack electrofishing unit. The furthest upstream site was at 7 Road (upstream of the dam failure). At this site, one 8 inch brown trout was captured, along with three sculpin. However, battery failure was responsible for the poor catch. The researchers observed many trout that they were unable to capture due to the weak battery. The water temperature here was 54°F. The next site sampled was at M-37, which is just downstream of the dam failure location. Approximately 300 feet of stream was sampled, both upstream and downstream of the crossing. Bluntnose minnow, blacknose dace, and white sucker were the only species captured. The researchers attributed the lack of trout to the dam failure. The water temperature here was 61°F. The furthest site downstream sampled on this date was at Warfield Road. Approximately 300 feet of stream was sampled, both upstream and downstream of the crossing. Six brown trout (from 6-10 inches) and two brook trout (from 6-8 inches) were captured. Other species caught included sculpin and black bullhead. The water temperature at the Warfield Road site was 52°F.

Johnson Creek

The first known fisheries survey of Johnson Creek was conducted by the MDOC on July 25, 1966 with a backpack shocking unit. In the survey, the researchers electrofished for 10 minutes downstream of 38 Road in Section 2. One brook trout (2.3 inches in length) was caught, along with one common shiner and six sculpin. The water temperature of Johnson Creek was 57ºF at 11am, while the air temperature was 85°F. The stream averaged 3 feet in width and from one to eight inches deep at the sample site.

Subsequent surveys of Johnson Creek were conducted by the USFS in 1983, although the exact location of the surveys is unknown. Both surveys were conducted in the same location, consisting of approximately 10 minutes of backpack electrofishing. The first survey was conducted on July 28, while the second survey was conducted on August 31. In the first survey, 16 brook trout (from 1-8 inches) and 8 brown trout (from 4-10 inches) were caught. No other species were recorded. Age and growth analysis indicated that the brook trout ranged from 0 to 2 years of age, while the brown trout were from 1 to 2 years of age. The stream reach sampled averaged 8.8 feet wide and up to 2.5 feet deep. Substrates consisted of 65% sand, 30% gravel, and 5% rubble. The stream reach consisted of 80% riffle, 10% "glide" (or run), and 10% pool. The water temperature was recorded as 54°F.

In the August 31, 1983 survey of Johnson Creek, the USFS researchers again caught only brown and brook trout. Three brook trout (from 3-8 inches) and 20 brown trout (from 2-9 inches) were caught. Age and growth analysis showed three year classes of each species (ages 1-3) present in the catch. On August 31, the water temperature of Johnson Creek was 56°.

Sands Creek

The only known fisheries survey of Sands Creek was conducted by the MDOC on July 25, 1966 with a backpack shocking unit. In the survey, the researchers electrofished for 15 minutes both upstream and downstream of 1/2 Road in Section 6. Blacknose dace, creek chub, and juvenile lamprey were the only fish species recorded. The water temperature of Sands Creek was 71ºF at 12:30pm, while the air temperature was 88°F. The stream averaged 3 feet in width and from two to twelve inches deep at the sample site.

Current Status

Peterson Creek has been sampled several times in recent years by DNR Fisheries personnel. One survey was conducted on August 21, 2002. This survey was conducted according to Random Stream Status and Trends protocols (Wills et al. 2008). The survey station consisted of 800 feet of stream sampled with a backpack shocker. Sampling took place downstream of the Warfield Road crossing (Fig. 2), up to the large culvert pool just downstream of the culvert outlet. In that 800 foot reach, a total of 251 brown trout (from 2.7-13.5 inches) and 23 brook trout (from 2.5 to 7.9 inches) were caught (Table 1). One 6.8 inch tiger trout (brook/brown trout hybrid) was also caught. Other species present included sculpin (162 fish from 1-4 inches), white sucker (4 fish from 3-5 inches) and one creek chub. Age and growth analysis showed that five different year classes of brown trout (ages 0-4) and three year classes of brook trout (ages 0-2) were present (Table 2).

Habitat analysis was also conducted as part of the 2002 survey. It showed that Peterson Creek had an average width of 21.9 feet, an average depth of 0.5 feet, and a discharge of 6.7 cfs. Stream morphology analysis (Table 3) showed that in this reach Peterson Creek consisted of 65.2% run, 26% riffle, and 8.8% pool. Substrates consisted of 53.9% sand, 35.4% gravel, 6.2% large cobble, and 4.6% small

cobble. Embeddedness was relatively high, with 71.4% of the gravel and cobble more than 50% covered with sand. Nearly 4,000 square feet of instream log jam habitat was present, covering nearly 23% of the stream. The streambank vegetation consisted of 69.2% large coniferous trees, 23.1% large deciduous trees, and 7.7% small deciduous trees. Streambank condition was considered "good" for 100% of the station. Temperature data was collected with the use of a continuous recording thermometer (Table 4). The July 2002 average temperature of Peterson Creek was 58.1°F, while the highest temperature recorded in the summer of 2002 was 63.7°F, recorded in June.

The most recent DNR fisheries survey of the Peterson Creek watershed was conducted June 12, 2008, with a backpack shocking unit. Four sites were surveyed- three on Peterson Creek and one on Johnson Creek (Fig. 2). The Johnson Creek sample site (Fig. 2, site 1) began at the confluence with Peterson Creek and proceeded upstream for 300 feet. In that reach, the researchers caught 21 brook trout (1-10.3 inches), six brown trout (4-10.1 inches), and one sculpin (Table 5). The stream was approximately five feet wide and one foot deep, with the deepest hole being 2.5 feet. Substrates were 95% sand and 5% gravel, and morphology consisted of 75% run and 25% riffle. There were numerous undercut banks which provided cover. The water temperature was 59°F and the air temperature was 80°F at 1:40 pm.

The furthest upstream sample site on Peterson Creek extended for 100 feet upstream of the confluence with Johnson Creek (Fig. 2, site 2). Here, Peterson Creek is actually smaller than Johnson Creek, and only about three feet wide. In this reach, the researchers caught only one 4-inch brook trout (Table 6). The stream was up to one foot deep, with substrates being 50% sand and 50% gravel. Morphology consisted of 50% run and 50% riffle. The water temperature was 59°F and the air temperature was 80°F at 1:30pm.

The next site downstream sampled on June 12, 2008 was at 7 Road (Fig 2, site 3). The researchers shocked 100 feet of stream up to the crossing. In that reach, they caught 17 brook trout (1-9.5 inches), 7 brown trout (4-11.5 inches), 6 sculpin, one blacknose dace, and one white sucker (Table 7). The stream was approximately 10 feet wide and averaged 1 foot deep, with holes up to 3 feet in depth. Substrates were 98% sand and 2% fine gravel. Stream morphology consisted of 75% run and 25% pool. The water temperature was 59°F at 1:15pm, while the air temperature was 80°F.

The furthest site downstream sampled by MDNR in 2008 was in Section 1 of Norman Township, Manistee County (Fig. 2, site 4). This site was located just upstream of a now-defunct USFS sand trap, and 250 feet of stream was shocked. No trout were caught at this site. The catch consisted of 12 blacknose dace and 6 creek chubs (Table 8). The stream averaged 6 feet wide and 6 inches deep. Morphology consisted of 33% pool, 33% run, and 33% riffle. Substrates consisted of 66% sand and 34% gravel. The water temperature was 62°F at 12:30pm and the air temperature was 80°F.

In the summer of 2009, Peterson Creek was sampled in several locations by Water Bureau staff from the Michigan Department of Environmental Quality (DEQ; Anonymous 2010; at that time, they were known as the Michigan Department of Natural Resources and Environment). The DEQ survey used Procedure 51 methods (MDEQ 1990). The goals of the surveys were to identify nonpoint sources of water quality impairment, to assess the current status and condition of Peterson 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 downstream of 7 Road, and the other at M-37. The 7 Road station had a Habitat Evaluation score of 128, giving it a Good (Slightly Impaired) rating, while the M-

37 station had a Habitat Evaluation score of 122, also giving it a Good (Slightly Impaired) rating. Both stations had Macroinvertebrate Community scores of 7, giving them an "Excellent" rating.

Further sampling of Peterson Creek was conducted by personnel from the University of Notre Dame in 2009 (Janetski et al. 2011). Since Chinook salmon from Lake Michigan cannot access Peterson Creek, it was used as the control stream in a study on the effects of adult Chinook salmon on the movement of resident brook trout. The primary study stream was Pine Creek, a nearby tributary to the Manistee River that has both resident brook trout and migratory Chinook salmon (Tonello 2011). In the study, the researchers placed passive integrative responder (PIT) tags in brook trout to record their movements within the stream. In Peterson Creek, the brook trout tended to move more frequently during the day, more frequently at lower temperatures, and faster (although not further) than the brook trout of Pine Creek (Janetski et al. 2011).

Analysis and Discussion

From 2002-2011, a total of 51 Random Stream Status and Trends surveys were conducted statewide by the DNR in which brown trout were present in the catch. Of those, Peterson Creek ranked second in brown trout abundance at 1,657 brown trout per mile. Only the Upper Manistee River near M-72 had more brown trout per mile than Peterson Creek (MDNR Fisheries Division unpublished data). Brook trout were present in 57 Random Stream Status and Trends surveys, and of those, Peterson Creek ranked 27th with 172 brook trout per mile.

When compared with the habitat of other random Status and Trends stream stations statewide, the habitat of Peterson Creek ranked higher in most parameters (Table 3). For example, while the bank condition of the Peterson Creek station was considered good for 100% of the station, other streams statewide had good ratings for only 77% of the lengths of their stations. Peterson Creek had more woody material and instream structure than other streams statewide. Peterson Creek had more channel diversity as well, with a good mix of riffles, runs, and pools while other streams statewide had mostly run habitat. The superior habitat found in Peterson Creek is not surprising, due to the fact that it mostly flows through land that is in a forested, undeveloped state. While the Peterson Creek station did have more gravel than other Status and Trends streams in Michigan, it also had more sand. Also, the gravel of Peterson Creek was more highly embedded (covered) with sand than that of other streams. This is not surprising, due to the sandy soils found in the area.

Clearly, Peterson Creek is an outstanding fisheries resource, as one of the most productive small brown trout streams in the state. The results of the recent fisheries surveys are fairly similar to the results of the historical fisheries surveys, with brown and brook trout being predominant. The stream and its tributaries appear to have a good mix of habitat conditions for coldwater fish, including cold water temperatures, good riffle, run, pool sequences, a mix of sand and gravel substrates, and banks with abundant natural vegetation.

Management Direction

The primary management goal for Peterson Creek should be protection. Peterson Creek has had several large sedimentation events in recent history. Due both to the actions taken by the USFS to

remove the sediment (sand traps) and the natural ability of the stream to cleanse itself, Peterson Creek does not appear to have suffered any long-term effects from the events. However, everything possible should be done to avoid such events in the future. No dams should be constructed along its course, and development projects should be well-planned and closely monitored in cooperation with MDEQ. USFS timber management in the watershed, and particularly those actions close to the stream, should be planned with the conservation of Peterson Creek in mind.

References

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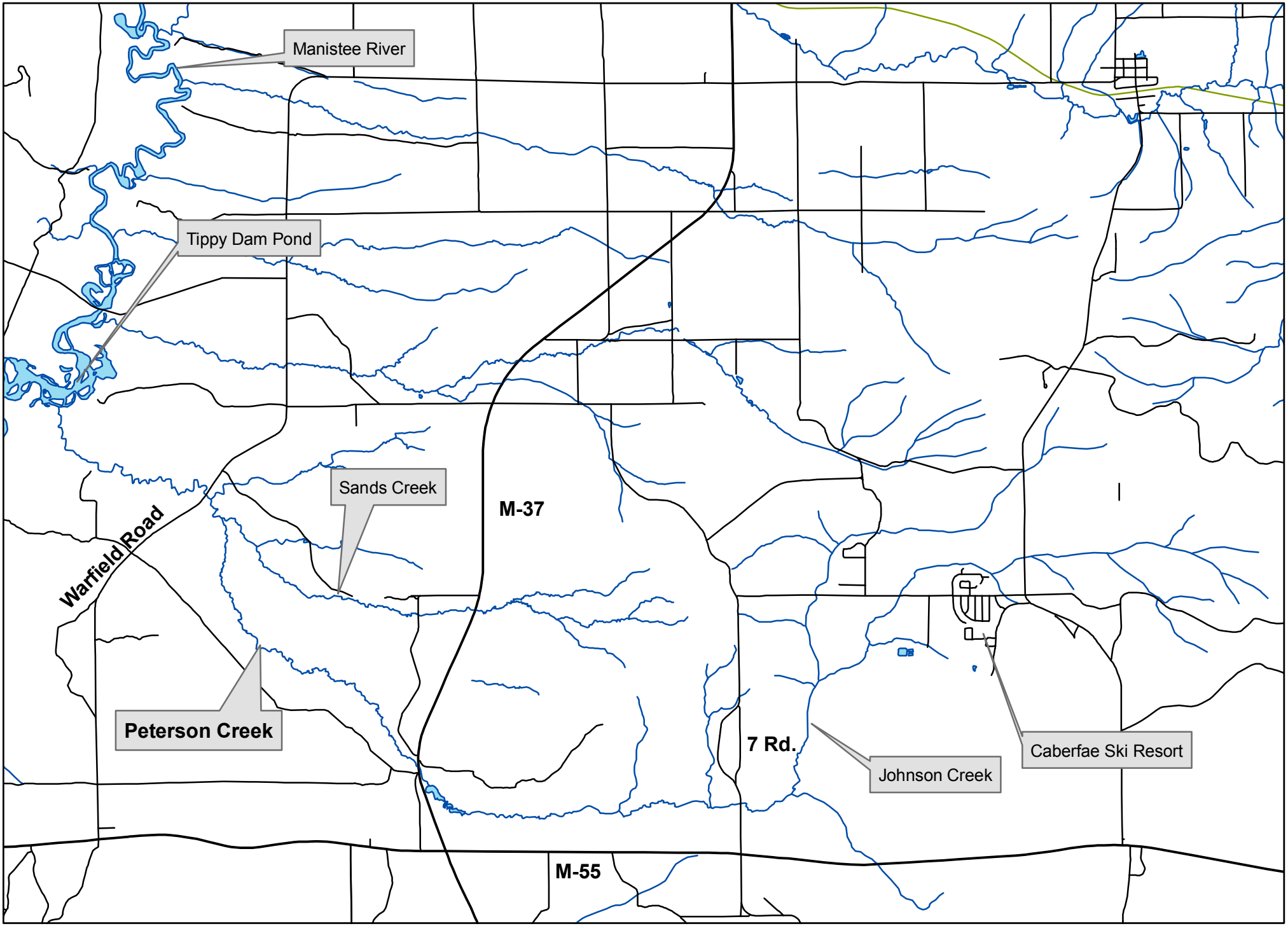

Figure 1. The Peterson Creek subwatershed, Wexford and Manistee Counties, MI.

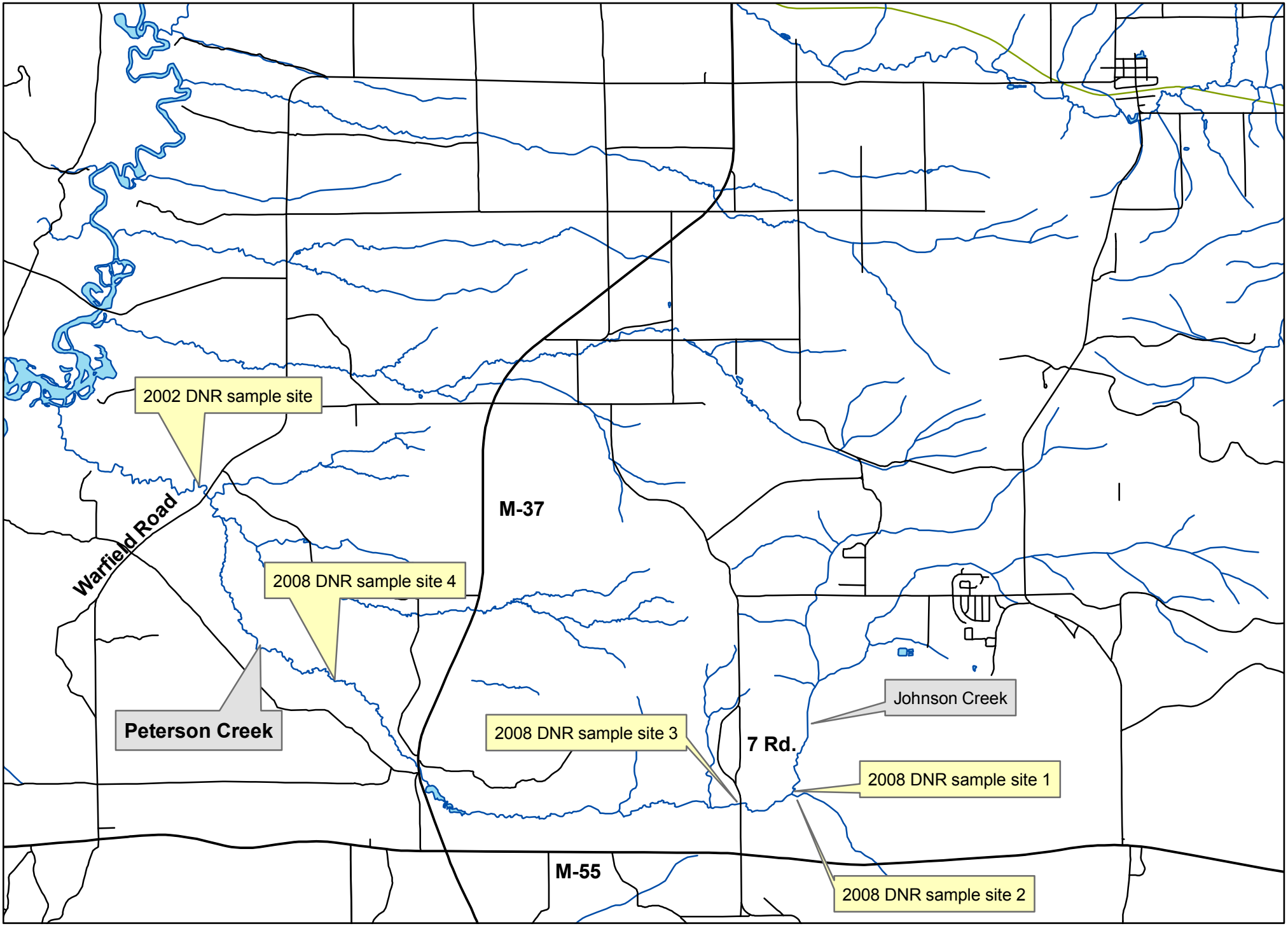

Figure 2. Recent DNR sample sites in the Peterson Creek subwatershed, Wexford and Manistee Counties, MI.

Table 1. Catch from 8/21/2002 DNR Status and Trends Random electrofishing survey of Peterson Creek downstream of Warfield Road.

Inch Class	Brook trout	Brown trout	Creek chub	Sculpin	Tiger trout	White sucker
1				35		
2	6	23		59		
3	3	70	1	61		1
4		4		7		1
5	8	52				2
6	6	41			1	
7	3	21				
8		16				
9		14				
10		7				
11		1				
12						
13		2				
Total:	26	251	1	162	1	4

Table 2. Average total length-at-age and growth (relative to the state average, in inches) for fish sampled from Peterson Creek by the DNR on August 12, 2002.

Year	Species	Age	Number aged	Length Range (In.)	Weighted mean length (in.)	Mean growth index (in.)
2002	Brook trout	0	8	2.5-3.5	2.91	0.4
		1	16	5.2-7.5	6.13	
		2	1	7.9-7.9	7.90	
	Brown trout	0	20	2.7-3.8	3.24	-1.2
		1	24	4.6-7.1	5.88	
		2	19	7.3-9.4	8.06	
		3	15	8.7-13.8	10.02	
		4	1	13.5-13.5	13.50	
	Tiger trout	1	1	6.8-6.8	6.80	-

Table 3. Habitat characteristics of Peterson Creek compared with the median of other random Status and Trends streams in Michigan. Statewide Median data from MDNR (unpublished data).

Habitat parameter		Peterson Creek	Statewide Median
Bank Condition		100% good	77% good
Large Woody Material (% of station covered)		3.9%	0.4%
Instream Structure (% of station covered)		22.7%	0.6%
Mesohabitat	% Pool	8.8%	0.0%
Mesohabitat	% Riffle	26.0%	5.0%
Mesohabitat	% Run	65.2%	90.1%
Riparian Condition	% yard	0.0%	0.0%
Riparian Condition	% grass-forb	0.0%	8.3%
Riparian Condition	% tag alder	0.0%	0.0%
Riparian Condition	% sm conifer	0.0%	0.0%
Riparian Condition	% lg conifer	69.2%	16.6%
Riparian Condition	% sm deciduous	7.7%	3.9%
Riparian Condition	% lg deciduous	23.1%	7.1%
Substrate	% silt	0.0%	2.5%
Substrate	% clay	0.0%	0.0%
Substrate	% sand	53.9%	30.8%
Substrate	% gravel	35.4%	18.5%
Substrate	% sm cobble	4.6%	5.3%
Substrate	% lg cobble	6.2%	0.0%
Substrate	% boulder	0.0%	0.0%
Embeddedness	embedded<50	28.6%	47.4%
Embeddedness	embedded>50	71.4%	36.0%

Table 4. Temperature data from Peterson Creek, downstream from Warfield Road.

	2002	2003
January Average		36.6
January Minimum		33.0
January Maximum		40.7
February Average		36.5
February Minimum		33.3
February Maximum		41.3
June Average	56.1	
June Minimum	47.9	
June Maximum	63.7	
July Average	58.1	
July Minimum	52.1	
July Maximum	63.4	
August Average	56.9	
August Minimum	51.6	
August Maximum	62.8	
December Average	38.2	
December Minimum	34.5	
December Maximum	41.8	

Table 5. Catch from the 6/12/2008 DNR electrofishing survey of Johnson Creek, just upstream of the confluence of Peterson and Johnson Creeks (Site 1).

Inch Class	Brook trout	Brown trout	Sculpin
1	3		
2	5		1
3	1		
4	3	3	
5	1		
6	3	2	
7	1		
8	2		
9	1		
10	1	1	
Total:	21	6	1

Table 6. Catch from the 6/12/2008 DNR electrofishing survey of Peterson Creek, just upstream of the confluence of Peterson and Johnson Creeks (Site 2).

Inch Class	Brook trout
1	
2	
3	
4	1
5	
6	
7	
8	
9	
10	
Total:	1

Table 7. Catch from 6/12/2008 DNR electrofishing survey of Peterson Creek at the 7 Road crossing (Site 3).

Inch Class	Blacknose dace	Brook trout	Brown trout	Sculpin	White sucker
1		6		1	
2		1		5	
3	1				
4			2		
5		1			
6		1			1
7		1	1		
8		5	1		
9		2			
10			2		
11			1		
Total:	1	17	7	6	1

Table 8. Catch from 6/12/2008 DNR electrofishing survey of Peterson Creek in Section 1 of eastern Norman Township, Manistee County.

Inch Class	Blacknose dace	Creek chub
1		
2	6	
3	6	2
4		2
5		2
Total:	12	6