

WISCONSIN DEPARTMENT OF NATURAL RESOURCES
2023 Pine Creek Watershed Report
Pierce County



Photo Credit: Kasey Yallaly

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Executive Summary

Pine Creek is a class I trout stream located in western Pierce County. Historically, the predominant trout species in Pine Creek was brook trout, which were present in high densities until approximately 2010 when the relative abundance of brook trout began to decrease while brown trout catch rates increased simultaneously. By 2013, the fishery had converted from a brook trout dominated to a brown trout dominated fishery. Habitat improvement work that was conducted may have influenced this occurrence by allowing brown trout to outcompete brook trout for both habitat and food resources. In addition, recent trends in Wisconsin Trout populations have shown an overall decline in brook trout abundance and an increase in brown trout abundance statewide. In 2024, new angling regulations for the Pine Creek watershed are intended to promote angler harvest of brown trout, while not allowing harvest of brook trout in an effort to help increase the native and genetically distinct population of brook trout in Pine Creek. North Branch of Pine Creek had a very low brook trout CPE in 2023 with just 16 fish per mile, and no brown trout present. Reclassification of North Branch Pine Creek from class II to class III may be warranted, but more sampling is required throughout North Branch of Pine Creek to confirm these findings.

MANAGEMENT RECOMMENDATIONS

- Continue to promote the harvest of brown trout.
- Work with local landowners to acquire streambank easements throughout the watershed.
- Consider brown trout removal by electrofishing if conditions warrant.

WATERSHED LOCATION

The Pine Creek Watershed is located in southwestern Pierce County, south of the village of Maiden Rock. The perennial flow of Pine Creek begins with several smaller tributaries that flow into Pine Creek which then flow west and discharges into Lake Pepin.

PURPOSE OF SURVEY

The purpose of this survey was to evaluate the status and health of the fishery within the Pine Creek Watershed. This survey documented trout species presence, relative abundance and size structure of the population. Natural reproduction and survival of trout was assessed to inform management activities including trout regulation effectiveness and appropriateness, habitat improvement needs and stocking within the watershed.

DATES OF FIELDWORK

The Pine Creek watershed was surveyed on June 26th and July 5th-2023.

SPECIES SAMPLED

- Brook trout
- Brown trout
- Mottled sculpin
- Brook stickleback
- Johnny darter
- Central mudminnow
- Burbot
- Northern pike
- Yellow perch

Introduction

The Pine Creek watershed is located in south-western Pierce County and is composed of the main branch of Pine Creek, the North Branch of Pine Creek and several other unnamed spring fed tributary streams. Pine Creek flows west into Lake Pepin south of the Village of Maiden Rock. The watershed mainly consists of heavily forested hillsides with the lower two miles of Pine Creek flowing through a mixture of prairie wetland and flood plain forest habitats. The Pine Creek Watershed consists of 2.6 miles of class I trout water and three miles of class II water, with several bridge access areas and the Pine Creek Fishery Area, which harbors 246 acres of Wisconsin Department of Natural Resources (DNR) owned public land which has had habitat restoration work conducted throughout most of the state fishery. Pine Creek is a high-gradient coldwater stream consisting of large cobble and gravel substrates in the headwaters and mid-reaches. As it flows west, through the DNR State Fishery Area, deeper pools and undercut banks are present. Near Lake Pepin, Pine Creek begins to widen and consists of mainly sand substrate with vertical banks and bank erosion is common. In conjunction with the habitat improvement project, brown trout were mechanically removed using electrofishing in 2007 and 2008 to further attempt to improve the brook trout population. Historically, brook trout were the dominant species in Pine Creek. In 2009 and 2010, brook trout abundance approached almost 8,000 fish per mile. Initial results from the habitat improvement project and brown trout removals looked positive. However, in the years of 2011-2012, brown trout densities began to increase and by 2013 the fishery converted from a brook trout dominated fishery to a brown trout dominated fishery. Prior to 2020, the section of stream near the Legion Outpost flowed underground, which created a natural barrier to fish movement from downstream and upstream sections. This natural barrier prevented brown trout from colonizing the headwater reaches of Pine Creek. However, with relatively high groundwater levels in the area, the previously underground section of the stream began flowing above ground in its entirety, making fish passage possible. The brook trout in Pine Creek are also a genetically distinct population making this area a high conservation priority. With upstream fish

passage now possible, the arrival of brown trout in the upper reaches of the stream, the remaining population of brook trout may be at risk.

STOCKING

There are no fish stocking records within the watershed.

REGULATIONS

Previously, Pine Creek fell under the standard Pierce County regulations for trout, which was three trout in total with a minimum length limit of 12 inches for brown trout and a minimum length limit of 8 inches for brook trout. In 2020 the trout angling regulation was changed to an 8 inch minimum length limit with a 3 bag in an effort to encourage brown trout harvest. New angling regulations were again implemented in 2024 to further promote the native brook trout population since brown trout have been found to outcompete brook trout for available habitat and food resources. The new regulations are a daily bag limit of five brown trout with no minimum length limit, and any brook trout caught must be immediately released. Angler harvest of brown trout is strongly encouraged.

HABITAT IMPROVEMENT

The Pine Creek Fishery Area is a large section of DNR property located along County Highway AA. Prior to the habitat improvement project, the area was a heavily grazed cattle pasture with high vertical banks and the stream channel was wide and mostly shallow run type habitat, with silt and sand as the primary stream substrate. The majority of the stream flowing through the fishery area was restored beginning in 2009 with some smaller sections being added in the following years for a total of 6,500 feet of stream habitat improvements. The restoration efforts included the removal of invasive and undesirable trees and vegetation, sloping of banks, stabilizing banks with several thousand tons of rock, narrowing of the stream and placement of instream habitat structures. These instream structures included plunge pools, LUNKER structures, large boulders and root wads. The riparian area has converted from a grazed pasture to a prairie/grassland and woodland stream bottom community.

PUBLIC ACCESS

Public access to Pine Creek Includes the Pine Creek Fishery Area which is located off of County Highway AA and includes 246 acres of DNR owned land on both banks of the main stem of Pine Creek and several tributaries. Other access points are limited to bridge access.

LAND USE

The main land use within the Pine Creek watershed is agricultural (42.14%), followed by forested (24.32%) and grassland (23.42%).

Methods

A total of four stations were sampled during the watershed survey. A backpack shocker with a single electrode and a stream barge shocker using three electrodes were used. Station length was determined by multiplying the Mean Stream Width (MSW) by 35. All fish were collected at predetermined stations and were counted and identified to species. All trout were identified to species and measured to the nearest 0.1 inch. Relative abundance as measured by catch rates or Catch Per Effort (CPE; fish per mile) of brook and brown trout were compared to other Class 1 trout streams in the Driftless Area to determine percentiles.

The Index of Biotic Integrity (IBI) was used as a measure of biological attributes that are influenced by human activities to assess the overall health of the stream. The index uses the species present to assess water quality and thermal regimes within a waterbody. Coldwater IBI's range in score from 0-100 with a high score (90-100) interpreted as an Excellent integrity rating, and 10-20 being interpreted as a Poor integrity rating. Station 1 and North Branch of Pine Creek Station 1 included Coldwater IBI surveys.

SURVEY EFFORT

Station 2A and Station 3 are trend sites and are surveyed annually. Habitat was not quantitatively evaluated during surveys; however, Station 3 features a high gradient stream with large cobble and gravel substrates. Station 3 is also in the headwater reaches of Pine Creek and was historically separated from the lower reaches of Pine Creek due to the stream flowing underground. Station 2A is within the habitat improvement area and has a mixed substrate of sand and gravel with large boulders and cobble throughout. Overhead tree cover is non-existent in Station 2A as the stream runs through prairie type landscape. Station 1 and North Branch of Pine Creek 1 both have a sand and silt substrate with a low gradient. Station 1 has several sections of severe bank erosion and beaver activity was observed in Station 1 above State Highway 35.

Table 1, Number and location of stations sampled.

Station Number	Station Name/Location	Station Length (ft)	Mean Stream Width (m)
1	Pine CR HWY 35	1187	11.2
2A	Pine CR CTH AA	652	5.6
3	East Pine CR RD	328	2.7
NB Pine 1	North Branch Pine CR 1	328	2

Results

PINE CREEK

Brook trout were found in all stations surveyed with densities ranging from low to high. Total relative abundance of brook trout ranged from 9 fish per mile in Station 1

which is in the 10th percentile of Class I trout streams, to 933 fish per mile at Station 3 which places it in the 90th percentile for other Class I streams in the Driftless Area (Table 2). The average relative abundance of brook trout in Pine Creek is 300 fish per mile. Brown trout were found in 3 of the 4 stations surveyed ranging from low to high abundance, the lowest abundance was in station 3 with 112 per mile placing it in the 15th percentile of similar Class I streams in the Driftless Area. Station 2A had the highest relative abundance at 5,416 fish per mile which is in the 95th percentile for other Class I Driftless Area streams (Table 3). Station 1 contained the highest number of brown trout ≥ 15 inches (Table 3) and average total relative abundance of brown trout was 1,909 fish per mile. Catch rates declined from 2021, at which time densities were over 10,000 fish per mile in Station 2A. Catch rates have returned to more average levels during the current survey (Figure 2).

Brook trout natural reproduction as determined by catch rates of young-of-year (YOY) fish (brook trout ≤ 4.5 inches) was only found in Station 2A and Station 3. Station 2A had a CPE of 16 fish per mile and Station 3 had a CPE of 96 fish per mile (Table 2). Brown trout YOY were only present in Station 2A and Station 1, with catch rates ranging from 53 fish per mile at Station 1 and 610 fish per mile at Station 2A (Table 3).

Adult brook trout abundance (CPE of fish ≥ 5 inches) was highest in Station 3 with 837 fish per mile and lowest in Station 1 with 9 fish per mile (Table 2). No brook trout were sampled over 9 inches in length in all stations in 2023. The highest density of adult brown trout was found in Station 2A with 4,805 fish per mile and the lowest densities were found in Station 3 with 112 fish per mile (Table 3). Coldwater IBI surveys were performed on Station 1 and North Branch of Pine Creek Station 1. Station 1 resulted in a score of 70 (Good) while North Branch of Pine Creek Station 1 scored a 50 (Fair).

Table 2. Brook trout relative abundance (fish per mile) of total catch rate, young-of-year (YOY), adult (≥ 5 inches), ≥ 8 inches, and ≥ 10 inches. Percentiles are denoted in parentheses and were determined by comparing catch rates to other class I and class II trout streams in the driftless area. (North Branch of Pine Creek St. 1 is the only class II station sampled)

Station	Total	YOY	Adult	≥ 8 inches	≥ 10 inches
1	9 (10)	0 (0)	9 (10)	0	0
2A	241 (60)	16 (40)	225 (60)	56 (65)	0
3	933 (90)	96 (60)	837 (85)	80 (70)	0
NB Pine CR 1	16 (15)	0	16 (15)	16 (35)	0

Table 3. Brown trout relative abundance (fish per mile) of total catch rate, young-of-year (YOY), adult (≥ 5 inches), ≥ 12 inches, and ≥ 15 inches. Percentiles are denoted in parentheses and were determined by comparing catch rates with other class I and class II trout streams in the driftless area. (North Branch of Pine Creek St. 1 is the only class II station sampled)

Station	Total	YOY	Adult	≥ 12 inches	≥ 15 inches
1	200 (25)	53 (45)	146 (20)	93 (75)	62 (95)
2A	5416 (95)	610 (90)	4805 (95)	169 (90)	32 (95)
3	112 (15)	0	112 (20)	16 (30)	0
NB Pine CR 1	-	-	-	-	-

Table 4. Total number of species sampled at 4 Stations in the Pine Creek Watershed

Species	St. 1	St. 2A	St. 3	NB Pine CR 1
Brown trout	45	674	7	0
Brook trout	2	30	58	1
Mottled sculpin	22	-	-	0
Brook stickleback	0	-	-	26
Johnny darter	1	-	-	0
Burbot	2	-	-	0
Northern pike	8	-	-	0
Central mudminnow	1	-	-	0
Yellow perch	2	-	-	0

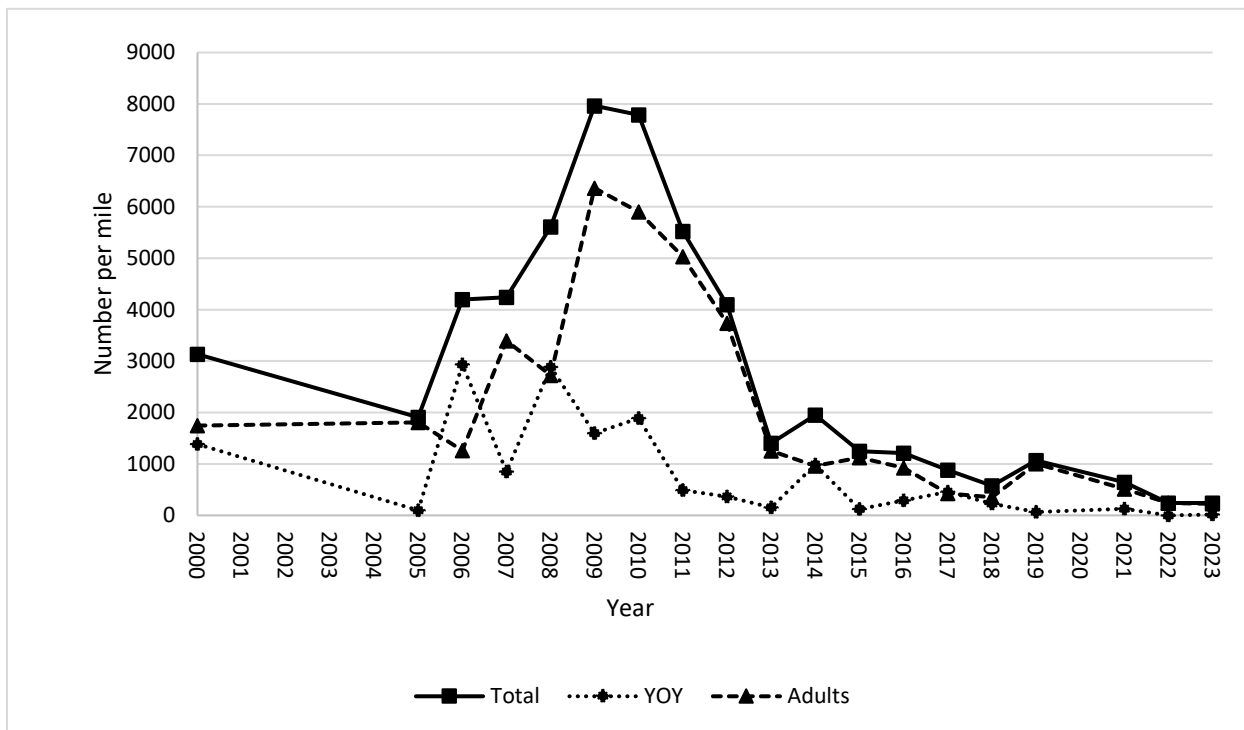


Figure 1. Relative abundance (Catch per Effort (CPE); number per mile) of total, young-of-year (YOY) and Adult (≥ 4.5 inches) brook trout at Station 2A on Pine Creek from 2000 to 2023.

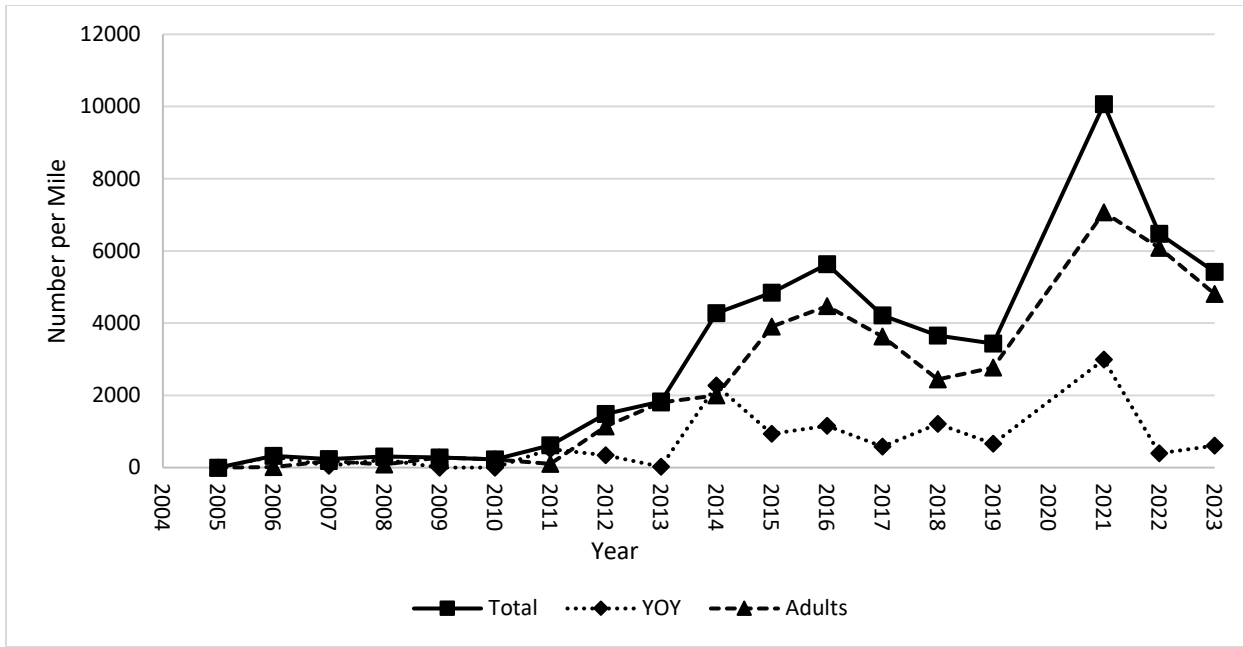


Figure 2. Relative abundance (Catch per Effort (CPE); number per mile) of total, young-of-year (YOY) and Adult (≥ 4.5 inches) brown trout at Station 2A on Pine Creek from 2005 to 2023.

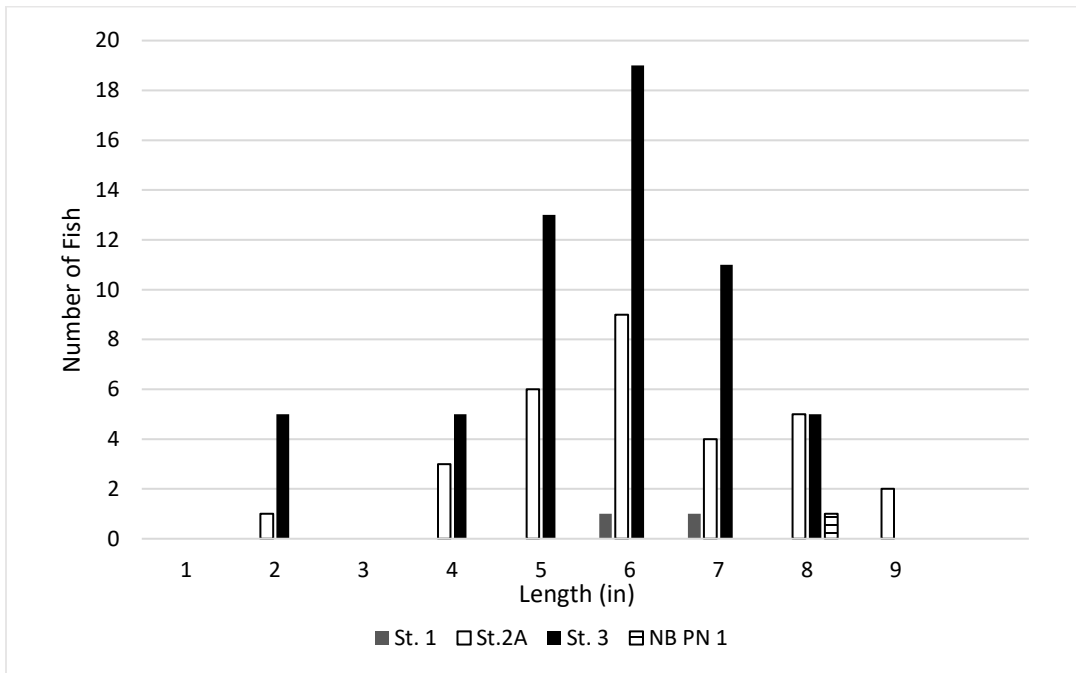


Figure 3. Length distribution of brook trout collected from four stations in the Pine Creek watershed in 2023.

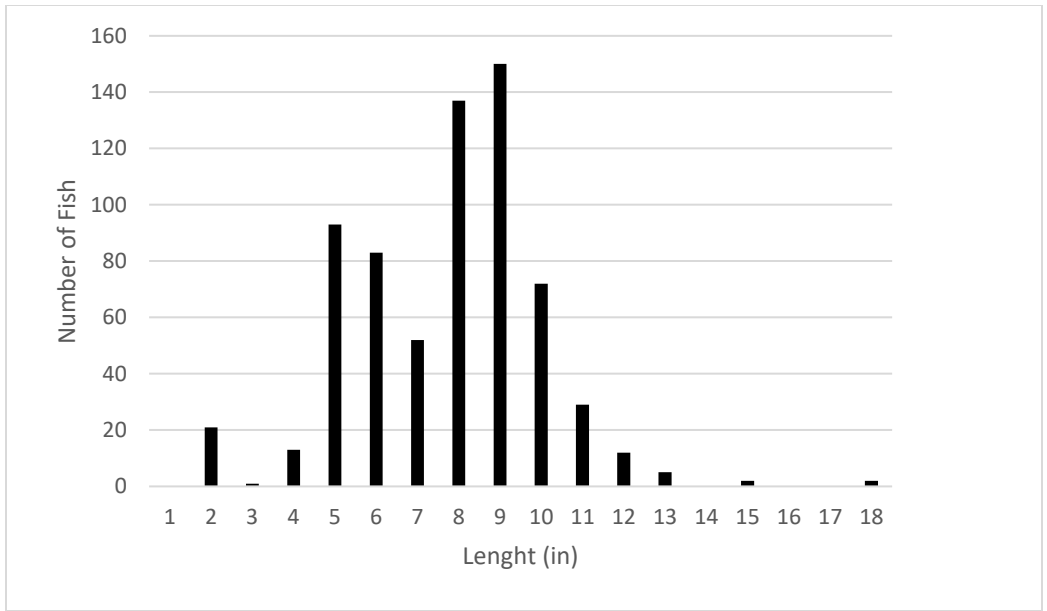


Figure 4. Length distribution of brown trout collected in Station 2A in 2023.

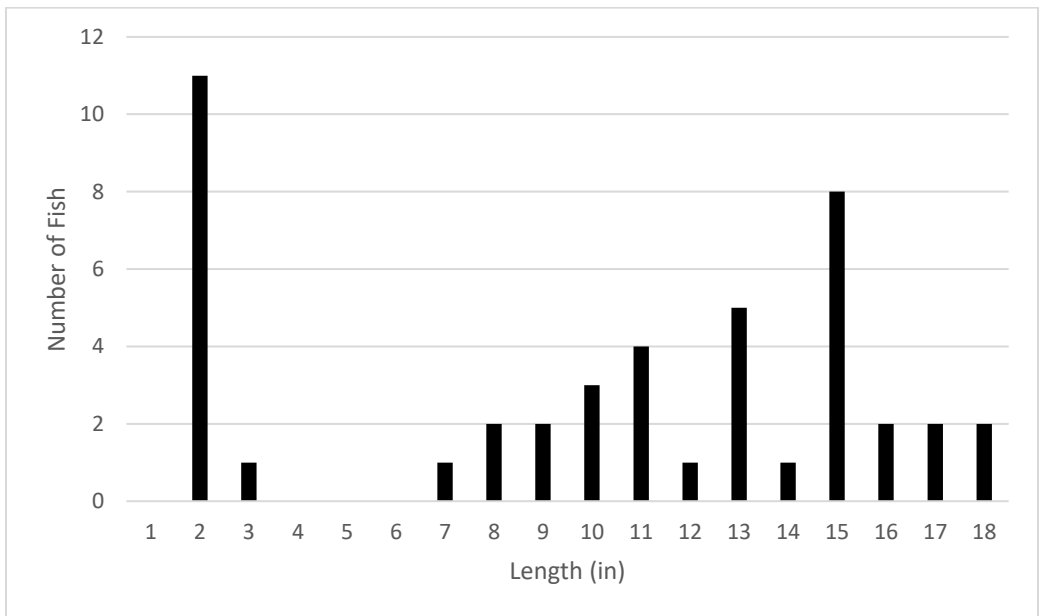


Figure 5. Length distribution of brown trout collected in Station 1 in 2023.

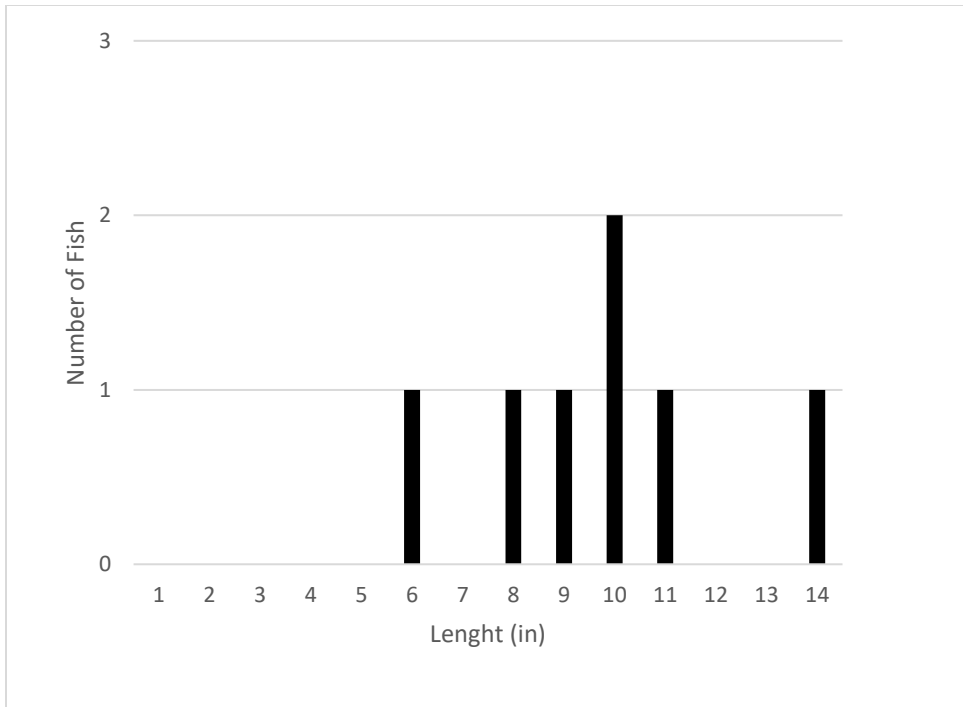


Figure 6. Length distribution of brown trout collected in Station 3 in 2023.

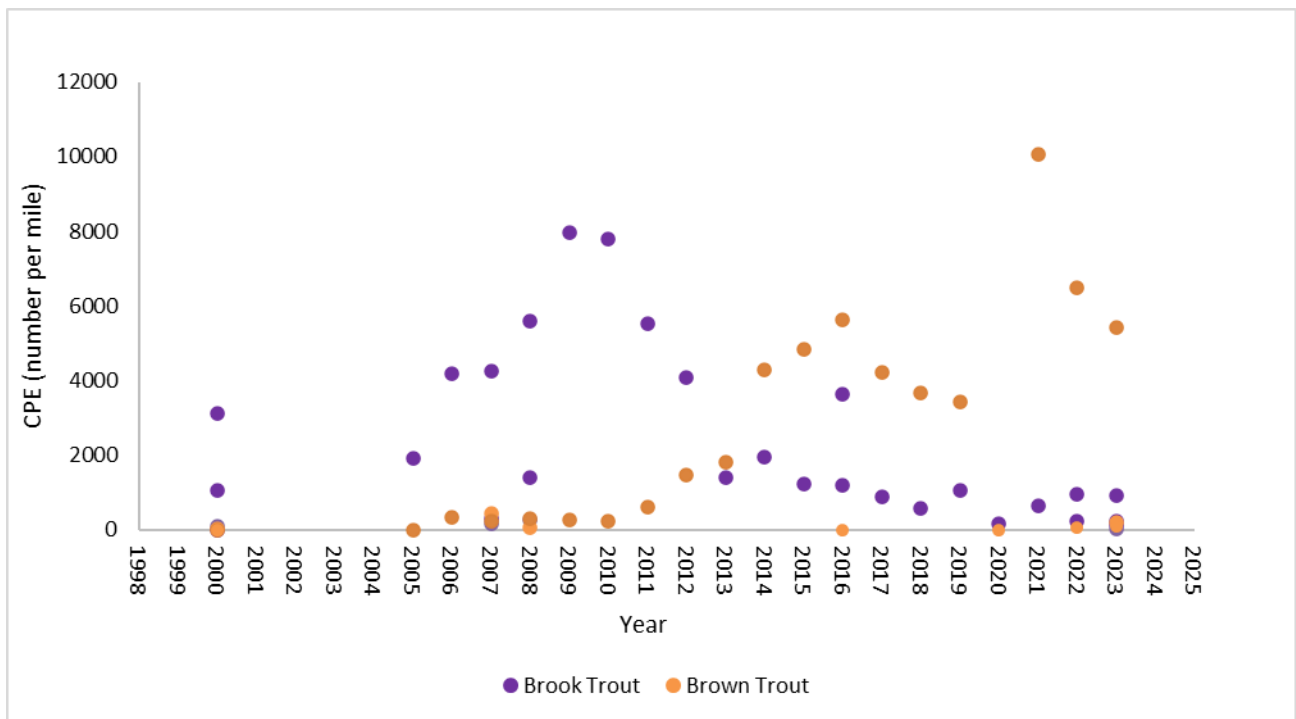


Figure 7: Relative abundance of brook and brown trout across all four Stations since the Year 2000.

Discussion

Historically, Pine Creek contained a high-density brook trout population with a mean density of around 4,500 fish per mile prior to 2013, with excellent size structure.

Around 2011, the brown trout population began to increase substantially following the stream habitat project that was completed and termination of brown trout removal efforts. As brown trout densities increased, brook trout densities began to simultaneously decline, likely because brown trout have been found to outcompete brook trout for habitat and food resources (DeWald & Wilzbach 1992) (Olson et al. 2024). In a study conducted in southwestern Ontario by Witzel and Maccrimmon (2011), redd-site selection for both brown and brook trout was studied. This study documented that brook trout spawned exclusively in areas of groundwater seepage while brown trout were able to use a wider variety of spawning substrates, including faster sections of water (Maccrimmon & Witzel 2011). Based off these findings, brown trout are able to indirectly compete with brook trout for spawning habitat by being able to use a wider variety of available habitat. Brown trout are also able to become piscivorous at an earlier stage in life, which allows them to utilize more available food resources (DeWald & Wilzbach 1992). This includes juvenile brook trout, which further reduces brook trout abundance in streams where brown and brook trout co-occur. In the study conducted by DeWald and Wilzbach (1992), wild brook trout and hatchery raised brown trout were held in an artificial stream channel to observe and study habitat use, feeding behavior and overall growth of each species both alone and co-occurring together. The study found that prey capture rates were higher for brown trout in mixed species trials, brook trout also shifted out of available microhabitats in the presence of brown trout (DeWald & Wilzbach 1992). Instantaneous growth of brown trout in mixed species trials was positive, but brook trout lost weight in the presence of brown trout (DeWald & Wilzbach 1992). In Pine Creek, brown trout numbers increased until they peaked in 2021 with densities of 10,000 fish per mile in Station 2A. Since 2021, numbers have declined to lower levels but remain at high densities. The increase in brown trout densities coincided with the completion of over 2.2 miles of stream restoration that was completed between 2007 and 2011. This disturbance appears to have given brown trout an advantage as the habitat appears to be more suitable for adult brown trout. The North Branch of Pine Creek is one of the main tributaries of Pine Creek. In the past it has contained a moderate size brook trout population. However according to recent surveys, brook trout appear to be in decline. This could be due to several factors including temperature increases due to increased sedimentation. Historically, the substrate of this section consisted of sand and silt with deeply embedded gravel. Erosion in upstream locations has resulted in sedimentation downstream which has led to reduced depth and flow of this tributary. The reduction in depth and flow of the stream may have caused temperature to rise which could be a cause for the decline in brook trout densities since 2008, however this has not been verified. Densities declined from 257 fish per mile in 2008 to 16 fish per mile in 2023. Increases in sedimentation have also been found to negatively impact YOY brook trout recruitment and abundance, by reducing spawning habitat and decreasing dissolved oxygen levels necessary for egg development (Hartman & Hakala 2006). With the current low densities of brook trout and the absence of YOY and only one age class present, it is possible that a reclassification of the North Branch of Pine Creek from a Class II to Class III could be warranted. Further sampling on North Branch of Pine

Creek is required to confirm this reclassification. Pine Creek is classified as a Brook Trout Reserve Stream (BTRS), which means it has the ability to sustain brook trout populations through the mid-21st century despite a warming climate. The invasion of brown trout has made management of the brook trout population very difficult. Brown trout removal may be an option that could be used to reduce brown trout densities. This technique has been used on other brook trout reserve streams and driftless streams (Olson et al. 2024) including Cady Creek in northeastern Pierce County and Maple Dale Creek in Vernon County. However, for Pine Creek such a removal would be difficult and require significant resources due to high densities of brown trout and well-established populations. In addition, the Rush River which has a high-density brown trout fishery empties into Lake Pepin near Maiden Rock just two miles northwest of the mouth of Pine Creek. Elimination of brown trout is not likely possible due to this potential recruitment source. Removal of brown trout in the uppermost portion of Pine Creek near Station 3 seems to be the most warranted. This area was formally separated from lower Pine Creek but now flows year-round. Brown trout abundance is very low at this time and brown trout natural reproduction was not documented. If ground water flows decline again, this area could be isolated and provide an opportunity for a brown trout removal project. Another solution would be to chemically treat the stream with rotenone which would kill all species present. Restocking the stream with Pine Creek strain brook trout from the headwaters would be needed. However, this option would likely be short to moderately lived. As mentioned earlier, it is likely brown trout from the nearby Rush River which empties into Lake Pepin just north of Pine Creek would find their way into Pine Creek and re-occupy and recolonize this restored reach. The third option may be to annually remove brown trout from the mainstem of Pine Creek with the goal of reducing densities but realizing that complete removal is not likely. This might provide enough balance in the fishery where the brook trout population may increase to more desirable levels. This level of management effort would be labor intensive and costly; however, it could be considered if funding and resources were available.

Pine Creek features a high-density brown trout population in the main stem as well as a high-density brook trout population in the headwaters. The stream has excellent water quality and thermal conditions based on the results of the 2023 survey. The head waters of Pine creek provide excellent brook trout spawning and rearing habitat despite the high densities of brown trout in the lower reaches of the stream. Adult brown trout densities have increased slightly in the headwaters of Pine Creek since high water events caused the stream to flow above ground in its entirety. Pine Creek is a BTRS so protecting this genetically distinct brook trout population is a priority. Continued monitoring is necessary to determine if any management actions are required. Downstream of the Pine Creek Fishery Area features adult trout habitat with reduced densities of YOY. Upstream of STH 35, Pine creek is more similar to a coolwater stream containing a relatively more diverse fish community and can become flooded annually when the Mississippi River water levels are high. Additional habitat restoration work is not likely to improve conditions in this area due to this

situation. Overall, Pine Creek is a healthy stream system with high populations of trout. The continued promotion of brown trout harvest is recommended, and removals should be considered to further protect the native brook trout population and to properly manage the watershed and fishery.

Management Recommendations

- Continue to promote angler harvest of brown trout.
- Work with local landowners to acquire streambank easements throughout the watershed.
- Consider brown trout removals in Pine Creek to maintain the native brook trout fishery.

References

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