

WISCONSIN DEPARTMENT OF NATURAL RESOURCES (DNR) Isabelle Creek 2023 Watershed Survey Report

WBIC 2445000



Photo Credit: Kasey Yallaly



Kasey Yallaly
DNR Senior Fisheries Biologist
January 2024

Executive Summary

Isabelle Creek is a moderately sized coldwater trout stream in central Pierce County. A total of six stations were surveyed in 2023 on Isabelle Creek. Small tributaries did not contain water during the 2023 summer season and were not surveyed. Brown trout were detected at all stations on Isabelle Creek in 2023 in high densities in the downstream-most stations and low densities in the upstream stations. Natural reproduction of brown trout was also detected at all stations except for Station 7 and young-of-year (YOY) trout were in moderate to high densities. Brown trout up to 18 inches were captured within surveys and the average length of adult brown trout (\geq 5.5 inches) was 9.1 inches. Index of Biotic Integrity surveys indicated coldwater communities at each station surveyed with few tolerant species present. Recent survey results indicate that a reclassification of Isabelle Creek to Class I and Class II status is warranted. Changes in fishing regulations are also needed to aid in the reduction of densities of small, abundant trout while offering additional protections to rare, large fish.

MANAGEMENT RECOMMENDATIONS

- Increase the allowable harvest of brown trout by changing the fishing regulation to a 5 fish bag limit and all fish must be less than 12 inches except 1 fish may be over 12 inches.
- Discontinue stocking within impacted portions of the stream.
- Continue streambank easement outreach within the watershed.
- Implement beaver management and control on Isabelle Creek.
- Reclassify the Class III section to Class II status and reclassify the Class II section to Class I status.

WATERSHED LOCATION

The Isabelle Creek watershed is located in south central Pierce County. The headwaters begin within the Village of Ellsworth, WI. The stream flows south and discharges into the Mississippi River in Bay City, WI.

PURPOSE OF SURVEY

The purpose of this survey was to evaluate the status and health of the fishery within Isabelle Creek and its major tributaries. This survey documented trout species present, relative abundance and the 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

All Isabelle Creek stations were surveyed on June 22, 2023. Unnamed tributaries including Jackson Bluff Creek were not surveyed due to lack of water.

SPECIES SAMPLED

- Brown Trout *Salmo trutta*
- Brook Trout *Salvelinus fontinalis*
- Mottled Sculpin *Cottus bairdii*
- Brook Stickleback *Culaea inconstans*

Introduction

Isabelle Creek is a moderately sized coulee-type trout stream located in the upper Driftless Area in southern Pierce County. The stream is 13 miles long and features 7.6 miles of Class II trout water and 3 miles of Class III trout water. The headwaters of the stream are considered warm water and are located within the city of Ellsworth. Flows in this portion of the stream are maintained by effluent from the wastewater treatment plant and the Ellsworth Creamery. Approximately 3 miles downstream of Ellsworth, several large springs enter Isabelle Creek and transition the stream from warm to cool to coldwater. The remainder of the creek downstream to Bay City is considered coldwater. Within the classified sections, the stream features high gradient, cobble riffles with relatively shallow pools. Fine substrates are also common due to flash flooding and upland soil erosion. Brown trout are the dominant trout species throughout Isabelle Creek and only 2 brook trout were detected in the 2023 survey. Periodic fish kills have occurred in the upper reaches of the stream as a result of releases of byproduct material from Ellsworth Creamery.

There are several small unclassified tributaries to Isabelle Creek which include Jackson Bluff Creek and Gerdes Springs. Jackson Bluff Creek did not contain water at the time of surveying in 2023.

STOCKING

Brown trout fingerlings were stocked annually prior to the 1970's through 2018 when annual stocking ceased. Domestic strain brown trout were stocked prior to 2008 and Timber Coulee strain brown trout were stocked from 2008 to 2018. Due to periodic fish kills in 2020 and 2022 that occurred in the upper portion of classified trout water and unclassified water upstream, brown trout fingerlings were stocked in 2021, 2022 and 2023 at CTH V and the upper road crossings on 620th Street in to aid in recovery of the trout fishery.

REGULATIONS

Current fishing regulations are brown and rainbow trout 12 inches and larger may be kept; brook trout 8 inches and larger may be kept with a total bag limit of 3 fish daily.

HABITAT IMPROVEMENT

A recent trout habitat improvement project was completed on Isabelle Creek off of 620th Street, which included 3,500 ft of intensive habitat work including bank shaping and installation of instream habitat. This project occurred on private land with the assistance of Pierce County Land Conservation Department. The Pierce County Land Conservation Department has also assisted private landowners within the watershed by installing 11.4 acres of grassed waterways, 3.5 acres of critical area planting, 10 grade stabilization structures (dams) and 851 acres of Nutrient Management Plans since 2019. Several stream bank stabilization projects have been completed and are ongoing on Isabelle Creek off of CTH EE on private lands.

PUBLIC ACCESS

Currently, there are two DNR Streambank Easements on Isabelle Creek. The lowermost easement is located within the town of Bay City just upstream of STH 35. Access for this easement is only by stream access from STH 35. The upper easement is located within the town of Esdaile. Access is available through the town park located near the bridge on CTH EE. Public fishing access is also available from several bridge crossings on CTH V, 620th Street, CTH EE and STH 35.

LAND USE

Land use within the watershed is largely composed of agricultural land (41%) and forest land (26%), followed by a mix of grassland (23%) and other uses.

Methods

A total of 6 stations were sampled on Isabelle Creek in 2023 (Table 1). Sampling on one station on Jackson Bluff Creek was attempted but no water was present at the site. Sampling was conducted between June 15th and September 15th using a backpack stream electrofishing unit with a single electrode and a stream barge electrofishing unit with up to 3 electrodes. The length of stations was determined by multiplying the mean stream width by 35. Stations were located upstream of all road crossings. All fish species were collected at selected predetermined stations and were counted and identified to species. All trout were identified to species and measured to the nearest 10th of an inch. Relative abundance as measured by catch rates and expressed as catch per effort (CPE; fish/mile) of brown trout were compared to other Class II brown trout streams within the state and percentiles were assigned for each length or age class.

The coldwater 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 assemblage present to assess water quality and thermal regimes within a waterbody. IBI's range in score from 0 to 100 with a high score (90-100) interpreted as an Excellent integrity rating and 10-20 interpreted as a Poor integrity rating. Stations 3, 5 and 7 included IBI sampling.

SURVEY EFFORT

Station 2 is a trend site in addition to the rotation sampling. Habitat was not quantitatively evaluated during the surveys. However, anecdotally, the stream at Station 7 featured high-gradient riffles with very few pools and several springs were present within the station. Filamentous algae was prevalent at this station. Stations 2-6 were composed of relatively similar habitat with high gradient riffles and large cobble and gravel substrates. Beaver activity in the form of dams and recent cuttings was apparent at most stations along 620th Street. Several dams resulted in the creation of long slow-moving pools with considerable sedimentation upstream of the dams. Most stations featured wooded or tall grassland riparian corridors. Stations 6 and 7 were within the area directly impacted by the fish kill in 2022.

Table 1. Number and location of stations surveyed on Isabelle Creek in 2023.

Station Number	Station Location/Name	Station Length (ft)	Mean Stream Width (m)
2	Top of Riffle Along CTH EE	836	6.7
3	10m Upstream of CTH EE (Esdaile)	738	6.4
4	10m Upstream of driveway off of CTH EE	804	6.8
5	100ft Upstream of 620 th St	501	4.9
6	620 th St	504	4.8
7	15m Upstream of CTH V	476	4.1

Results

ISABELLE CREEK

Brown trout were detected at all stations surveyed on Isabelle Creek in 2023. A total of 2 brook trout were sampled at Station 6. CPE of brown trout ranged from 144/mile at Station 7 to 1588/mile at Station 3 which resulted in percentiles ranging from the 35th to the 95th percentile for Class II brown trout streams in the Driftless Area of Wisconsin. The lowermost stations near and downstream of Esdaile contained the highest densities of brown trout and resulted in densities in the 85th and 95th percentiles. Stations located within the upstream portions of the Class III and Class II portions of stream contained relatively lower densities of brown trout with densities ranging from the 35th to 75th percentiles. Total trout densities at the Station 2 trend site dropped from 2022 levels but were still above the long-term average at that site of 934/mile (Figure 1). Long term brown trout densities at Station 2 show an overall increasing trend since then 1970s (Figure 3). Total trout densities at Station 3 have remained stable throughout historical and current surveys (Figure 3). Stations 4 through 7 showed similar trends which display increases in trout densities through 2017 and then a severe drop in densities from 2017 to 2023 (Figure 3).

Brown trout lengths ranged from one to 18 inches within all stations (Figure 2). Adult brown trout (≥ 5.5 inches) resulted in an average length of 9.1 inches between all stations. Adult brown trout average length in individual stations resulted in average lengths of 9.9 inches (St. 2), 9.5 inches (St. 3), 7.2 inches (St. 4), 7.7 inches (St. 5), 10.2 inches (St. 6) and 6.9 inches (St. 7), respectively. The CPE of adult brown trout ranged from 144/mile at Station 7 to 1345/mile at Station 3 with an average density of 534/mile (Table 2). CPE of preferred size brown trout (≥ 12 inches) ranged from 0/mile at Stations 5 and 7 to 133/mile at Station 2. Stations 2, 3 and 4 resulted in the highest overall size structure with densities of preferred size brown trout in the 85th percentile at each of these stations. Brown trout larger than 15 inches were only detected at Station 2 with densities in the 85th percentile. The only 2 brook trout captured in all stations were 9.8 and 11.2 inches in length.

Natural reproduction of brown trout, as represented CPE of YOY brown trout (≤ 5.5 inches) was documented at all stations except for Station 7 (Table 2). The CPE of YOY brown trout ranged from 11/mile (40th percentile) at Station 6 to 354/mile (90th percentile) at Station 2. YOY densities were highest in downstream stations with densities at Stations 2, 3 and 4 in the 80th-90th percentiles. The average length of YOY brown trout in all stations was 2.4 inches. No natural reproduction of brook trout was documented.

IBI surveys conducted at Stations 3, 5 and 7 all resulted in ratings of Good (Table 3). Stations 3 and 7 received a Coldwater IBI score of 70 while Station 5 received a score of 60. Each station contained 1 intolerant species. Station 5 received a slightly lower percent top carnivore score which resulted in the total IBI score of 60. Non-game species detected within surveys included mottled sculpin and brook stickleback.

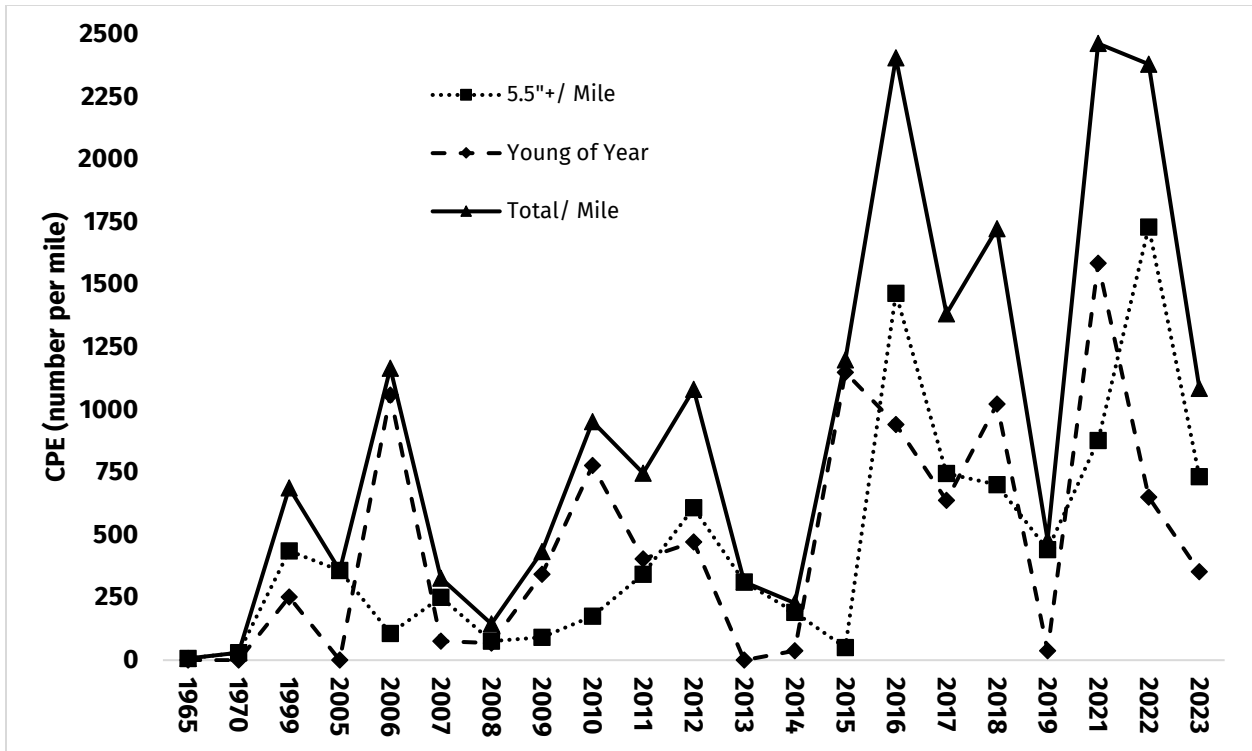


Figure 1. Relative abundance (Catch per Effort (CPE); number/mile) of total, young-of-year (YOY) and Adult (≥ 5 inches) brown trout at Station 2 on Isabelle Creek from 1965 to 2023.

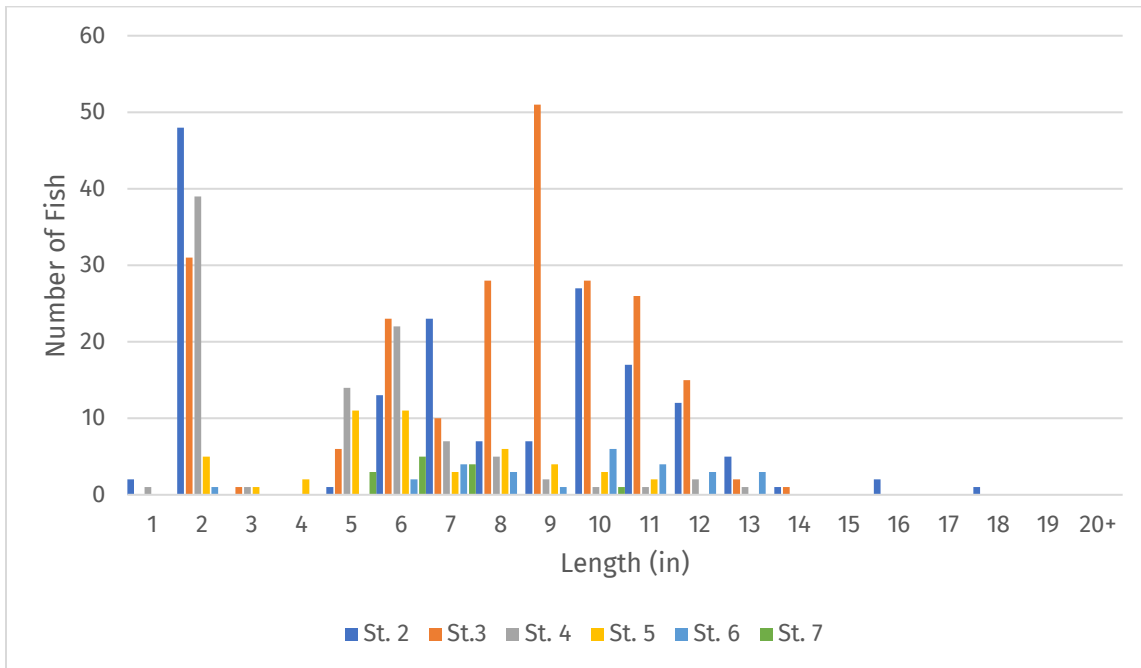


Figure 2. Length distribution of brown trout collected from Isabelle Creek in 6 stations in 2023.

Table 2. Relative abundance of total, young-of-year (YOY), adult (≥ 5.5 inches), ≥ 12 inch, and ≥ 15 inch brown trout at 6 stations on Isabelle Creek in 2023. Percentiles of catch rates (fish/mile) are denoted in parentheses. Percentiles were assigned from catch rates of Class II brown trout streams in the Driftless Area in Wisconsin.

STATION	TOTAL CPE	YOY CPE	ADULT CPE (≥ 5.5 INCHES)	CPE ≥ 12 INCHES	CPE ≥ 15 INCHES
Station 2	1086 (85)	354 (90)	733 (80)	133 (85)	19 (85)
Station 3	1588 (95)	243 (80)	1345 (90)	129 (85)	0 (0)
Station 4	630 (75)	289 (85)	342 (60)	125 (85)	0 (0)
Station 5	506 (70)	137 (75)	369 (65)	0 (0)	0 (0)
Station 6	283 (50)	11 (40)	272 (55)	63 (70)	0 (0)
Station 7	144 (35)	0 (0)	144 (40)	0 (0)	0 (0)

Table 3. Total number of each species captured at 6 stations on Isabelle Creek, summer 2023. (. Indicates species were not targeted).

SPECIES	STATION 2	STATION 3	STATION 4	STATION 5	STATION 6	STATION 7
Brown Trout	172	222	96	48	27	13
Brook Trout	0	0	0	0	2	0
Mottled Sculpin	.	77	.	55	.	10
Brook Stickleback	.	0	.	3	.	1

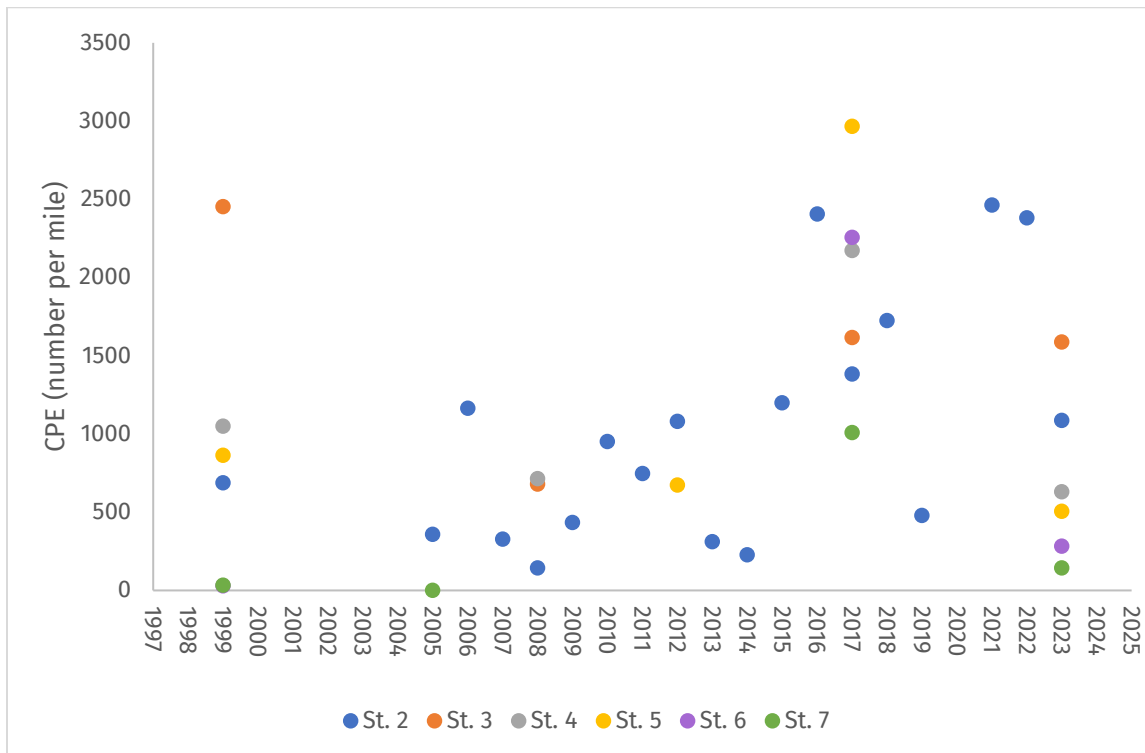


Figure 3. Total relative abundance of brown trout as expressed by catch per effort (CPE) collected from 6 stations in Isabelle Creek in 2023.

Discussion

According to IBI ratings, Isabelle Creek is composed of a warm-water community upstream of CTH V which transitions into cold-water downstream of CTH V to Bay City. Surveys were not conducted at Stations 1 (Bay City) or 8 (410th Avenue) due to Station 1 requiring a large number of staff to complete and Station 8 being surveyed the prior year during the fish kill investigation. Station 8 contained a relatively diverse fish community in 2022 and 2020 during fish kill investigations and experienced a complete kill during those years. Historical data from Station 8 indicated that trout have never been documented at that station due to a warm thermal regime. Coldwater IBI scores from previous surveys have indicated a reduction in stream temperatures and potential improvement in water quality since the early 2000's. Within Station 3, the 1999 survey documented higher abundances of mottled sculpin as well as the presence of high densities of white sucker and longnose dace. Longnose dace and white sucker were absent from the 2023 survey. The 1999 survey of Station 5 resulted in very high abundance of mottled sculpin along with longnose dace, white sucker, blacknose dace and brook stickleback in moderate to low abundances. The 2012 survey only detected longnose dace and only mottled sculpin were present during 2017 survey. The 2005 survey of Station 7 resulted in high abundance of brook stickleback, while white sucker, fathead minnows and longnose dace were present in moderate abundance. The reduction in species diversity, reduction in tolerant species presence and increase in mottled sculpin and trout abundance indicates the transition to cold-water communities since the early 2000's which is likely due to increased ground water levels and improvements in land use within the watershed throughout the past several decades (Dieterman et al. 2020).

Along with improvement in cold-water fish communities, natural reproduction of trout has also improved within Isabelle Creek. No natural reproduction of trout was documented prior to 1999. From 1999 to 2005, natural reproduction was low or non-existent in some years. Since 2006, reproduction has been relatively strong and stable within the trend station with the exception of 2013, 2014 and 2019. The area experienced drought conditions in 2011-2012 which likely influenced trout populations during 2013 and 2014 (Elliot 1987; Hakala and Hartman 2004). A large flood event during the spring of 2019 likely negatively impacted the 2019-year class of trout by scouring unhatched eggs or displacing recently hatched fry (Nislow et al. 2004; Lobon-Cervia and Mortensen 2005). The years of 2015 and 2021 resulted in the strongest year classes of trout. This phenomenon was likely due to stable water levels during the spring hatching period. In the remaining stations surveyed, natural reproduction has remained relatively consistent throughout the years with the exception of 2023. Stations 5, 6 and 7 were heavily impacted by the fish kills that occurred in 2020 and 2022. This is evidenced by the reduced densities of adult trout which resulted in a weaker year class in 2023. However, natural reproduction was documented at all stations except for Station 7, indicating that spawning activity still occurred in the fall of 2022 despite the fish kill in August of 2022. Brown trout from the lower reaches of Isabelle Creek that were unaffected by the kill, likely migrated

upstream into these reaches to spawn. Large fingerling and yearling trout have also been stocked within Stations 5, 6 and 7 since the fish kills to boost the recovery of the trout population in this area. Catch rates of YOY trout were high in all stations except for Station 7 and densities were above the 75th percentile in these stations when compared to Driftless Area Class II brown trout streams.

The size structure of adult brown trout within the stations that were unaffected by the fish kills was relatively good with catch rates of trout larger than 12 inches in the 85th percentile. However, only 1 station yielded brown trout larger than 15 inches. The lack of larger fish is likely the result of habitat and high trout densities. Isabelle is a high gradient stream and deep pool habitat with overhead cover is lacking in many locations. However, downstream from the town of Esdaile, spring and groundwater inputs increase stream size and riffle-pool-run sequences become more common with deeper pools. Much of the stream within this section flows through open pasture and crop land and lack a tree canopy. The lack of shading results in an increase in aquatic macrophyte growth and likely an increase in in-stream productivity as well. Upstream of Esdaile, Isabelle Creek flows through forested, limestone bedrock with limited aquatic macrophytes cobble/boulder habitats which may limit the amount of adult brown trout habitat.

In addition, with high levels of natural reproduction and survival of trout without the aid of stocking, densities of younger, smaller trout in the 6–12-inch range are high. The current fishing regulation focuses any harvest pressure on larger fish that are rare and desirable. Therefore, to aid in increasing the size structure of brown trout, a regulation that focuses more harvest on the abundant smaller trout and protects larger fish would be beneficial. Focusing harvest on abundant smaller trout would reduce trout densities within that size range and allow remaining trout to reach a faster growth potential and larger maximum size. The current regulation is no longer appropriate on Isabelle Creek with the increase in natural reproduction and survival. The current regulation of the 12-inch minimum length limit with a bag limit of 3 for brown trout, focuses any harvest on larger fish that are rarer within the population. A new regulation is needed to provide protection to rare, large fish while focusing harvest on abundant small fish. This would aid in reducing densities of abundant small fish which would help to reduce intraspecific competition and improve growth rates. A 12-inch maximum length limit would focus harvest on smaller fish while protecting larger older trout while a 1 fish over 12 inches would allow for the harvest of a trophy or foul hooked fish. Increasing the bag limit to 5 would also aid in reducing densities of small, abundant trout. No further stocking is recommended within the watershed as populations are sustained by natural reproduction. However, stocking may be needed to supplement areas impacted by fish kills.

The fish kills that occurred in 2020 and 2022 impacted the entire Class III section of stream. Additional warm-water fisheries resources were also lost upstream of the classified water. The fish kill in 2020 appeared to be a complete kill that affected trout and non-game species. Brown trout were restocked in the impacted area as

yearlings in the spring of 2021 and large fingerlings in the fall of 2021. The next fish kill occurred in August of 2022 and affected approximately 3 miles of classified trout water. Re-stocking of large fingerlings occurred in late September of 2022 and 2023 within the impacted area. Surveys in 2023 documented survival of stocked fish as well as the movement of brown trout from downstream locations into previously impacted locations. Stocking should be discontinued within these areas as trout movement is apparent and multiple year classes were detected at stations within the impacted areas. Mottled sculpin and brook stickleback were also detected at Station 7, indicating survival or upstream movement into impacted portions of the stream.

The current trout stream classifications on Isabelle Creek include Class III water from approximately 0.35 miles upstream of CTH V downstream to a private stream crossing off of 620th Street for a total of 3 miles of Class III water. The Class II section begins at the private crossing off of 620th Street and continues downstream to the STH 35 crossing at Bay City for a total of 7.6 miles of Class II water. According to the results of recent surveys, this classification is incorrect. Natural reproduction was documented at all stations in 2023 except for Station 7 which was the upstream-most station. Natural reproduction was likely impacted and suppressed due to the recent fish kills within these areas. Prior to the fish kills, in 2017, YOY abundance was moderate to high within Stations 5 and 6 at 1404 YOY/mile and 187 YOY/mile, respectively. Multiple year classes of trout were present at all stations as well. Densities of trout were high in lower stations and moderate to low in upstream stations. Low densities were documented at Stations 6 and 7. These stations were within the portions of stream that were directly impacted by the fish kills which resulted in unnaturally low densities of trout. Prior to the fish kills, adult densities in these stations ranged from 1009/mile to 2071/mile. Therefore, it is recommended that the current classified portions of Isabelle Creek be reclassified to Class I and Class II status.

Management Recommendations

1. Increase the allowable harvest of brown trout by changing the fishing regulation to a 5 fish bag limit and all fish must be less than 12 inches except 1 fish may be over 12 inches.
2. Discontinue stocking within impacted portions of the stream.
3. Continue streambank easement outreach within the watershed.
4. Implement beaver management and control on Isabelle Creek.
5. Reclassify the Class III section to Class II status and reclassify the Class II section to Class I status.

References

Deiterman, D.J., R.J.H. Hoxmeier, J. Roloff and D.F. Staples. 2020. Use of long-term (40+ year) trend data to evaluate management actions on brown trout, *Salmo trutta*, populations in groundwater-fed streams. *Fisheries Management and Ecology* 27(6):551-566.

Elliot, J.M. 1987. Population regulation in contrasting populations of trout *Salmo trutta* in two Lake District streams. *Journal of Animal Ecology* 56:83-98.

Hakala, J.P and K.J. Hartman. 2004. Drought effect on stream morphology and brook trout (*Salvelinus fontinalis*) populations in forested headwater streams. *Hydrobiologia* 515:203-213.

Lobon-Cervia, J. and E. Mortensen. 2005. Population size in stream-living juveniles of lake-migratory brown trout *Salmo trutta* L.: the importance of stream discharge and temperature. *Ecology of Freshwater Fish* 14:394-401.

Nislow, K.H., S. Einum and C.L. Folt. 2004. Testing predictions of the critical period for survival concept using experiments with stocked Atlantic salmon. *Journal of Fish biology* 65:188-200.

Warren, D.R., A.G. Ernst and B.P. Baldigo. 2009. Influence of spring floods on year-class strength of fall- and spring spawning salmonids in Catskill Mountain Streams. *Transactions of the American Fisheries Society* 138:200-210.