

WISCONSIN DEPARTMENT OF NATURAL RESOURCES
Fishery Survey Report for the Brill River,
Barron County, Wisconsin 2023

WATERBODY IDENTIFICATION CODE: 2106500



Photo Credit: Craig Landes



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Introduction

The Brill River is a tributary to the Red Cedar River and is located in northeast Barron County. The Brill River originates as the outflow of Long Lake in Washburn County and flows into the Red Cedar River upstream of Rice Lake. The stream is 4.6 miles in length and has approximately 3 miles of Class II trout water from the Barron/Washburn County line downstream to 26th Avenue, near the unincorporated community of Brill. Water temperatures are marginal for trout, and high water temperatures likely limit the fishery. The watershed is largely composed of forested and row-crop agricultural land, with some grassland to a lesser extent.

Brown trout are the predominant trout species in the Brill River, but brook trout are also present. Brown trout were stocked annually from 1972 to 2022 by the Wisconsin Department of Natural Resources (DNR). St. Croix strain yearlings and large fingerings were stocked from 1992 – 2003 and Timber Coulee, the southwest feral strain, large fingerlings were stocked from 2005 – 2022 (Appendix Table 1). Brown trout stocking occurred during late September or early October each fall. Natural recruitment of brown trout has been evident, and to further assess the contribution of natural recruits to the adult population, stocking was discontinued following 2022.

The trout fishing season in Wisconsin opens the first Saturday in May and closes Oct. 15. There are no gear restrictions for the Brill River, but a special fishing regulation occurs with a daily bag limit and length limit of two trout over 12 inches.

Methods

One station located at 27 1/2 Avenue was sampled on July 26, 2023. This site serves as a fisheries assessment trout trend site and has been sampled annually since 2007. Sampling occurred upstream along a 0.19 mile transect, which was determined by multiplying the mean stream width by 35. Sampling was conducted using a barge stream electrofishing unit with three electrodes and dip netters. All trout were identified to species, measured to the nearest 0.1 inch and immediately released following completion of the transect. Catch per unit effort (CPUE; index of relative abundance) was estimated as catch per mile. The CPUE of each trout species was compared to previous surveys and species-specific averages for Barron and Polk counties. Size structure was assessed using the proportional size distribution (PSD) indices (Neumann et al. 2013). The PSD value for a species is the number of fish of a specified length or longer divided by the number of fish of stock length or longer, the result multiplied by 100.

Habitat was not evaluated during this survey. Anecdotally, the Brill River flows through mostly grassland and forested areas with little development. The river is relatively shallow with predominantly riffle habitat and only a few deeper holes. Overhanging grass along the streambanks is the primary habitat feature as very little woody habitat is present. Substrates consisted of gravel and cobble with faster flows

and transitions to predominately sand with increasing aquatic vegetation and slower flow near the end of the transect.

Results

BROWN TROUT

There were 129 brown trout collected during 2023 with a CPUE of 558 fish/mile. Brown trout CPUE was well above the historical average (408 ± 29 fish/mile; standard error; 2007 - 2023) and the Barron and Polk counties mean CPUE (201 ± 67 fish/mile; standard error; indexed using 39 survey sites across 22 streams within the past decade). The CPUE of brown trout ≥ 6 inches (index of adult abundance) was 316 fish/mile, which was greater than the historical mean (260 ± 82 fish/mile; standard deviation) but remained stable through time with a high inter-annual variation. ($P > 0.05$; simple linear regression; Figure 1).

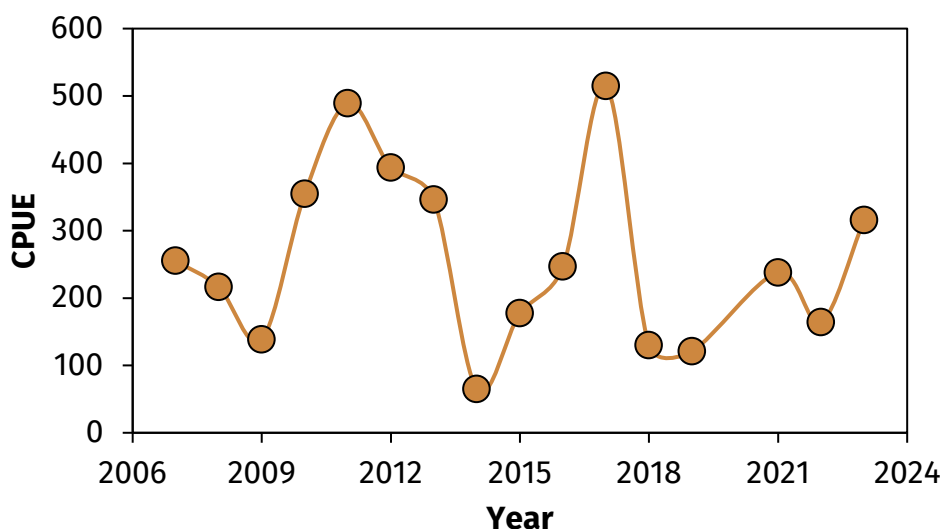


Figure 1. CPUE of brown trout ≥ 6 inches sampled from the Brill River, Barron County, Wis. during 2007 - 2023.

The size structure of the brown trout population remained good, with 10% of the population greater than 15 inches (Figure 2). Brown trout ranged in length from < 3 inches to 19.0 inches with all length bins represented, which suggested multiple age classes were present (Figure 2). The PSD-9 was 49, which was slightly above the historical average but within the degree of inter-annual variation ($PSD-9 = 41 \pm 16$; standard deviation; Figure 3). The $PSD-12 = 23$, $PSD-15 = 15$ and $PSD-18 = 3$. Population size structure remained stable through time with a high degree of inter-annual variation (Figure 3).

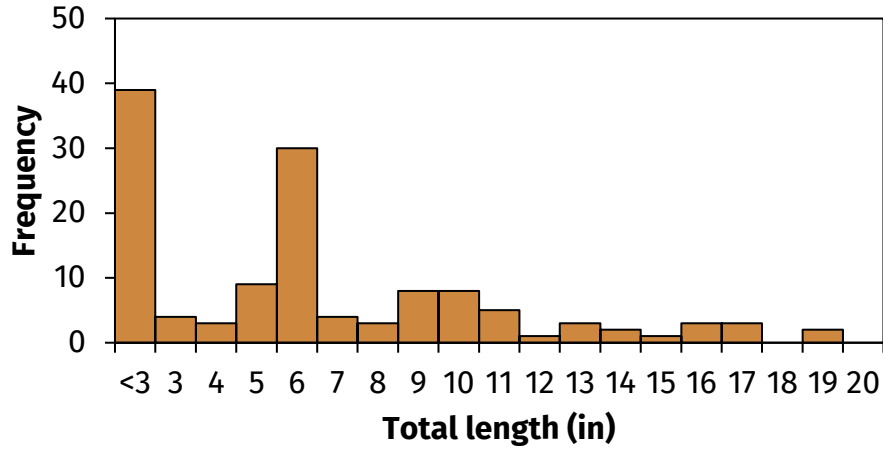


Figure 2. Length frequency histogram of brown trout sampled from the Brill River, Barron County, Wis. during 2023.

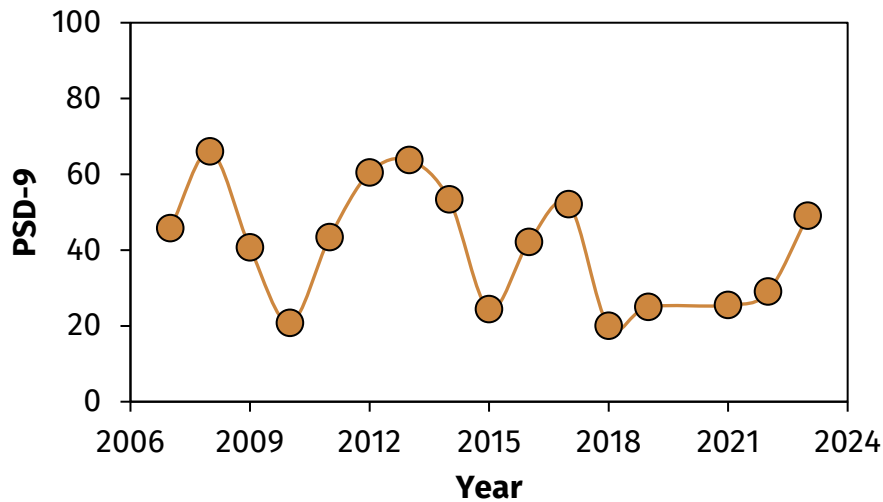


Figure 3. PSD-9 of brown trout sampled from the Brill River, Barron County, Wis. during 2007 - 2023.

A good naturally recruited brown trout year class occurred during 2023. Most brown trout sampled were < 3 inches in length and represented young-of-year (YOY) fish (Figure 2). Large fingerling brown trout are stocked in the fall (September or October), so YOY fish sampled during the summer were presumed to be natural recruits. The CPUE of YOY brown trout was 169 fish/mile, which was above the historical mean (108 ± 27 fish/mile; standard error; Figure 4). Recruitment rates during 2007 – 2013 (41 ± 19 YOY/mile; standard error) were lower than in 2016 – 2023 (127 ± 36 YOY/mile; standard error; $P = 0.02$; t-test). Recruitment was highly variable annually but appears to have generally increased through time despite no trend being detected ($P = 0.14$; simple linear regression; Figure 4).

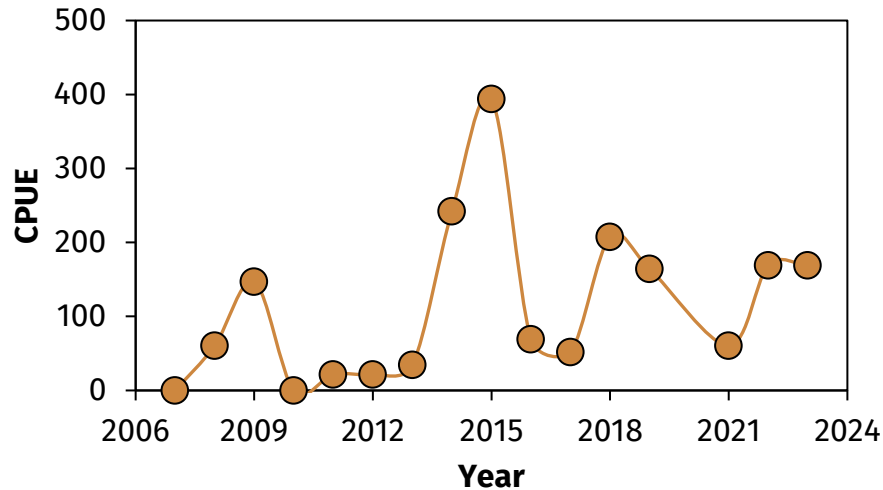


Figure 4. CPUE of young-of-year (< 3 inches) brown trout sampled from the Brill River, Barron County, Wis. during 2007 - 2023.

BROOK TROUT

A low density, naturally reproducing brook trout population was present in the Brill River. There were 10 brook trout collected with a CPUE of 43 fish/mile (Figure 5). Brook trout CPUE during 2023 was above the historical average (34 ± 9 fish/mile; standard error; 2007 - 2023) but well below the Barron and Polk counties mean CPUE (623 ± 88 fish/mile; standard error; indexed using 77 survey sites across 41 rivers and streams during the past decade). Brook trout relative abundance generally increased over time, although no temporal trend in CPUE was detected ($P = 0.08$; simple linear regression). However, CPUEs during 2007 – 2014 (14 ± 9 fish/mile; standard deviation) were lower than in 2015 – 2023 (56 ± 40 fish/mile; standard deviation; $P = 0.02$; t-test).

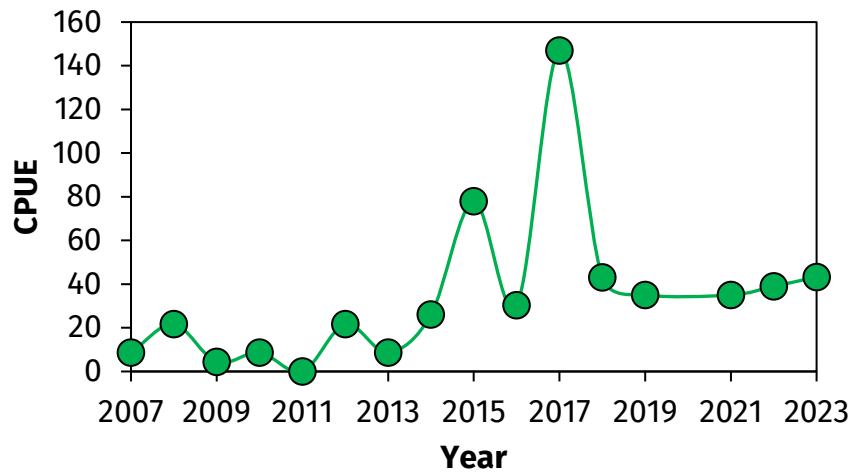


Figure 5. CPUE of brook trout sampled from the Brill River, Barron County, Wis. during 2007 - 2023.

Brook trout ranged in length from < 3 inches to 6.0 inches, with 40% of the population greater than 5 inches and presumably only two age classes present based on the population size structure (Figure 6). Too few fish were sampled to estimate PSD indices. The CPUE of brook trout ≥ 5 inches was 17 fish/mile, which was lower than the historical mean (21 fish/mile) but remained stable through time ($P > 0.05$; simple linear regression; Figure 7).

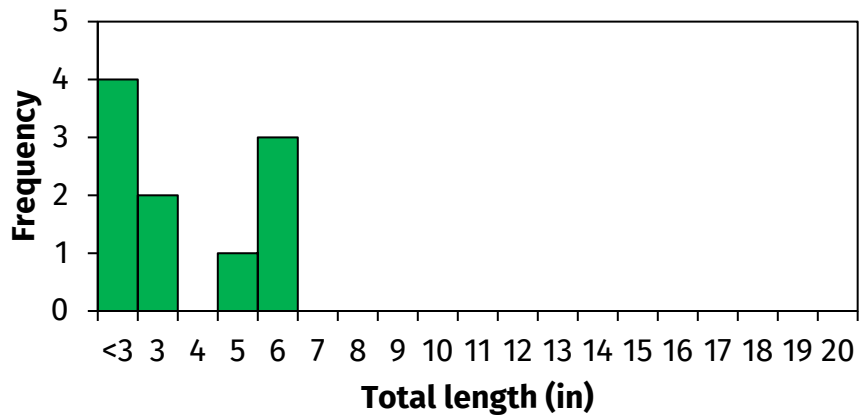


Figure 6. Length frequency histogram of brook trout sampled from the Brill River, Barron County, Wis. during 2023.

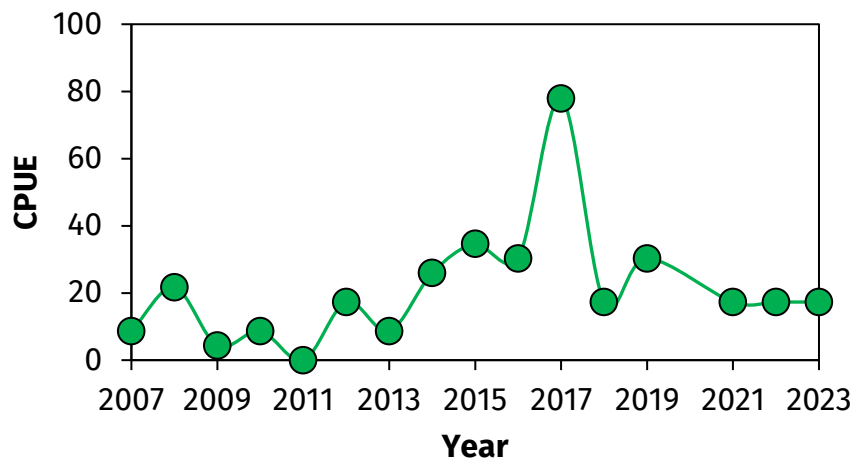


Figure 7. CPUE of brook trout ≥ 5 inches sampled from the Brill River, Barron County, Wis. during 2007 - 2023.

The CPUE of YOY brook trout was 17 fish/mile, which resembled the historical mean (14 ± 5 fish/mile; standard error; Figure 8). Recruitment rates were highly variable annually but generally increased since 2013, although no temporal trend was detected ($P = 0.08$; simple linear regression). Despite this, recruitment rates during

2007 – 2013 (1.0 ± 0.8 YOY/mile; standard error) were lower than in 2016 – 2023 (20 ± 7 YOY/mile; standard error; $P < 0.01$; t-test).

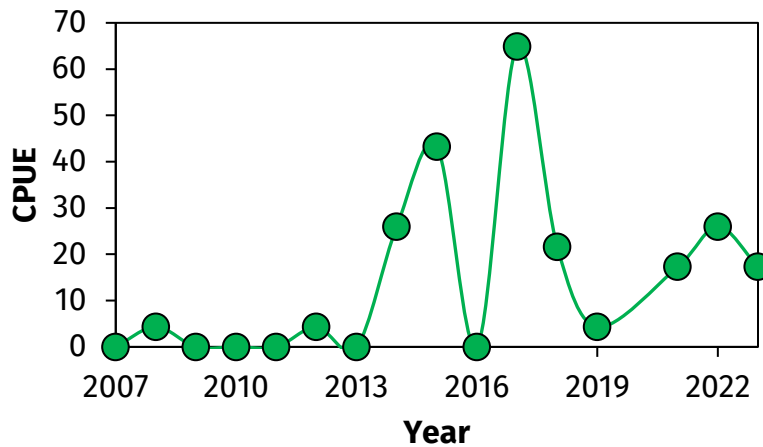


Figure 8. CPUE of young-of-year (< 3 inches) brook trout sampled from the Brill River, Barron County, Wis. during 2007 - 2023.

Discussion

A quality brown trout fishery occurs in the Brill River. Population abundance was moderate but temporally stable, which suggests the population may be at carrying capacity. Size structure was high, with good catch rates of brown trout greater than 15 inches and overall good trophy potential. Multiple year classes were represented in the size structure which indicates good annual recruitment.

The brook trout population remained at a low density, but rates of natural recruitment over the past decade increased, which coincided with a similar temporal increase in population abundance. Brook trout abundance is not expected to drastically increase due to the presence of a thriving brown trout population and marginal thermal conditions. Management will continue to focus primarily on maintaining a quality brown trout population.

Only a few river miles of the Brill River support suitable thermal conditions for trout. Thermal conditions tend to be warmer than smaller headwater streams and would likely be classified as marginal trout water. Marginal thermal conditions on the warmer end typically support greater forage abundance and fast growth of brown trout. Although age and growth data were not collected during this survey, growth was presumably fast based on high size structure, warm water temperatures and a robust minnow forage base. However, it is likely that warmer conditions are limiting the population growth of brook trout, as they tend to prefer cooler water temperatures.

Natural recruitment of brown trout was relatively consistent over time but the contribution of natural recruits and stocked fish to the adult population remained unknown. In the absence of future stocking, we will assess the contribution of natural recruits to the adult population. Spawning habitat was plentiful throughout the sampling transect on the Brill River and does support natural reproduction of both trout species. Stocking of brown trout in the Brill River is currently not recommended, as natural recruitment seems sufficient to support a viable population. Natural recruitment will continue to be indexed annually, and if YOY and adult catch rates significantly decline, then stocking may again be considered to support a fishable population.

The DNR designates type II trout streams as having some natural reproduction, though insufficient to maintain a viable population, necessitating stocking to support a desirable fishery. Adult fish in these streams often exhibit strong survival rates with conditions suitable for producing larger-than-average-sized fish. In contrast, type I streams boast ample natural reproduction, sustaining populations near carrying capacity and do not require stocking. However, these streams are typically small, cold headwaters with slow-growing trout. The brown trout population in the Brill River currently falls between type I and II classifications, as natural reproduction appears to support a population with good growth and size structure despite marginal thermal habitat conditions. To consider a potential reclassification of the Brill River trout fishery, additional survey data is required in the absence of stocking.

The Brill River stands out as one of a few streams in Barron and Polk counties with conditions conducive to producing trophy-sized brown trout, or those exceeding 20 inches in length. The existing special fishing regulation, a daily bag limit of two trout over 12 inches, will be maintained to minimize harvest mortality and preserve a high population size structure.

Recommendations

1. Maintain a stable adult (≥ 6 inches) brown trout population near the historical average of 260 ± 82 fish/mile (\pm standard deviation). This population benchmark should continue to support moderate density with a high size structure. Stocking may be considered if population abundance declines below this benchmark consistently, which would indicate poor survival of natural recruits to the adult population.
2. Brown trout natural recruitment should be closely monitored following cessation of stocking. Catch rates of 127 ± 64 YOY brown trout/mile (average of 2016 – 2023; \pm standard deviation) should continue to support a quality population. Stocking may be considered if natural recruitment declines consistently below this benchmark.
3. The current special fishing regulation of a daily bag limit of two trout over 12 inches should be maintained.

4. Following the 2028 summer survey, analyses of recruitment, age, growth and population demographics should be revisited, and if warranted, the reclassification of the Brill River trout fishery should be considered.
5. Habitat enhancement efforts are encouraged and should be explored if possible; however, this would likely require streambank easements or fee title acquisition.

Acknowledgements

Special thanks to Craig Landes and Aaron Cole for assisting with field collection, aging and data entry.

References

Neumann, R.M., C.S. Guy, and D.W. Willis. 2013. Length, weight, and associated indices. Pages 637-676 in A.V. Zale, D.L. Parrish, and T.M. Sutton, editors. Fisheries techniques, 3rd edition. American Fisheries Society, Bethesda, Maryland.

Appendices

Appendix Table 1. Brown trout stocking records for the Brill River, 2000 – 2022.

YEAR	STRAIN	NUMBER STOCKED	AVG. LENGTH (IN.)
2022	Timber Coulee	5,500	3.3
2021	Timber Coulee	5,800	3.2
2020	Timber Coulee	6,000	3.2
2019	Timber Coulee	5,516	2.9
2018	Timber Coulee	4,965	2.95
2017	Timber Coulee	7,200	3.1
2016	Timber Coulee	6,236	3
2015	Timber Coulee	6,950	3
2014	Timber Coulee	2,246	2.7
2013	Timber Coulee	3,146	2.6
2012	Timber Coulee	7,999	2.9
2011	Timber Coulee	8,800	2.8
2010	Timber Coulee	4,420	3.2
2009	Timber Coulee	5,399	3.2
2008	Timber Coulee	5,250	3.1
2007	Timber Coulee	4,500	3.2
2006	Timber Coulee	6,000	3.3
2005	Timber Coulee	6,000	3.5
2004	Timber Coulee	12,000	1.8

2003	St. Croix	20,000	3
2003	St. Croix	2,000	9.3
2002	St. Croix	2,000	9.2
2001	St. Croix	4,000	9.15
2000	St. Croix	2,000	5.5