



WISCONSIN DEPARTMENT OF NATURAL RESOURCES

2023 Stream Survey Report on Fish Kill North Branch Embarrass River, Shawano County

WBIC 301300

Introduction And Objectives

The North Branch Embarrass River is a stream with 33.9 miles of Class I, II and III trout water. It originates in the northwest corner of Shawano County flows southeast through Bowler and eventually converges with the South Branch at Caroline to become the Embarrass River. Eighteen public road crossings, along with 40 acres of DNR managed public land abutting the river, provide fishing access to the North Branch Embarrass River. The objectives of the rotational surveys are to determine species composition, relative abundance and size structure for trout and other gamefish species. This report documents the May 2023 partial fish kill, which was investigated thoroughly. The kill occurred approximately from Old CTH D downstream to Tilleda Pond, and dead fish were observed throughout the stream over approximately 10.5 miles. Results from these surveys compared to historical surveys will be used to show the impact to the fishery.

DNR Contact

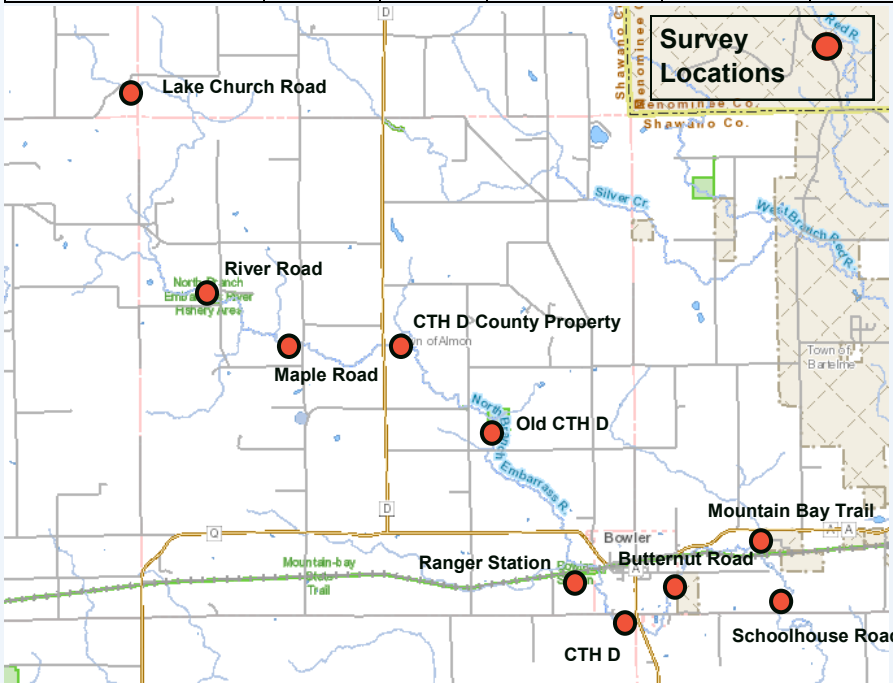
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Regulations

Category: Green
Daily Bag and Size Limit:
5 and no size

SURVEY INFORMATION

Station	Survey Date	Station Length	Temperature (°F)	Mean Stream	GPS (Start)	Gear	Dippers	IBI
Schoolhouse Road	8/3/2023	871 ft	64	24.8 ft	44.85594, -88.94673	Stream Shocker	3	Yes
Mountain Bay Trail	8/1/2023	905 ft	60	25.8 ft	44.86588, -88.95062	Stream Shocker	3	Yes
Butternut Ln.	8/3/2023	904 ft	64	25.8 ft	44.86219, -88.97090	Stream Shocker	3	Yes
CTH D	8/1/2023	1051 ft	59	30.0 ft	44.85313, -88.97994	Stream Shocker	3	Yes
Ranger Station	8/3/2023	952 ft	62	27.2 ft	44.86402, -88.99098	Stream Shocker	3	Yes
Old CTH D	8/2/2023	797 ft	62	22.8 ft	44.88480, -89.01649	Stream Shocker	3	Yes
CTH D County Property	7/27/2023	2000 ft	61	16.1 ft	44.90260, -89.03510	Stream Shocker	3	Yes
Maple Road	8/2/2023	717 ft	60	20.5 ft	44.90364, -89.06269	Stream Shocker	3	Yes
River Road	8/2/2023	649 ft	60	18.5	44.91125, -89.08293	Stream Shocker	3	Yes
Lake Church Road	8/7/2023	330 ft	58	5.4 ft	44.94811, -89.10616	Backpack Shocker	1	Yes



Metric Descriptions

- **Catch per unit effort (CPUE)** is a method of quantifying fish population relative abundance. For all trout surveys, we typically quantify CPUE as the number of a given size class of trout captured per mile of stream. CPUE indexes are compared to other trout streams throughout Wisconsin by what percentile (PCTL) they fall out in. For example, if a CPUE is in the 90th percentile, it is higher than 90% of the other CPUEs in the state. CPUE percentiles can also be used to categorize trout abundance as low density (<33rd percentile), moderate density (33rd - 66th percentile), high density (66th - 90th percentile) and very high density (>90th percentile).
- **Length frequency distribution** is a graphical representation of the number or percentage of fish captured by half-inch or one-inch size intervals.
- **Index of Biotic Integrity (IBI)** is a rating of environmental quality based on the fish assemblage. Scores of 90 - 100 indicate excellent stream quality, while scores less than 30 indicate poor stream quality. Our analysis utilizes the IBI for Wisconsin coldwater streams. Coldwater streams in Wisconsin are those in which the maximum daily mean water temperature is usually <22° C (71.6°F). A coolwater stream IBI may also be used when a stream doesn't fit the temperature criteria for a coldwater stream.

Survey Method

- All streams are sampled according to DNR wadable streams monitoring protocols.
- All trout are counted and measured and all other species are counted in order to calculate an Index of Biotic Integrity (IBI) score.
- Metrics used to describe trout populations include average length, catch per unit effort (CPUE) and length frequency distribution.



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BROOK TROUT SIZE AND ABUNDANCE (CPUE) METRICS									
Station	Total Number Sampled	Average Length (inches)	Length Range (inches)	CPUE (No. per Mile) Statewide Percentile in Parentheses					
				Total CPUE (PCTL)	YOY CPUE	≥5" CPUE (PCTL)	≥8" CPUE (PCTL)	≥10" CPUE (PCTL)	≥12" CPUE (PCTL)
Schoolhouse Road	9	7.3	3.5 - 9.3	55 (28)	6	48 (36)	12 (42)	-	-
Mountain Bay Trail	39	5.3	2.2 - 11.6	228 (53)	99	122 (56)	35 (66)	6 (69)	-
Butternut Road	5	8.1	7.0 - 10.4	29 (18)	-	29 (27)	12 (42)	6 (69)	-
CTH D	20	6.9	2.9 - 8.7	106 (38)	5	100 (52)	15 (45)	-	-
Ranger Station	58	6.4	3.4 - 9.1	322 (61)	6	294 (78)	39 (68)	-	-
Old CTH D	196	4.6	2.1 - 8.8	1299 (90)	583	636 (92)	53 (75)	-	-
CTH D County Property	547	5.0	1.1 - 9.5	1444 (92)	454	921 (96)	40 (68)	-	-
Maple Road	99	6.4	2.4 - 9.8	729 (80)	66	648 (92)	37 (67)	-	-
River Road	118	4.5	1.9 - 8.4	960 (86)	528	399 (85)	8 (35)	-	-
Lake Church Road	17	3.4	2.2 - 5.4	272 (57)	192	48 (36)	-	-	-

BROOK TROUT HISTORICAL CPUE/MILE (PCTL)										
Year	Schoolhouse Road	Mountain Bay Trail	Butternut Road	CTH D	Ranger Station	Old CTH D	CTH D County Property	Maple Road	River Road	Lake Church Rd
2005				388.5 (660)			1494.5 (92)			1255.0 (90)
2006			116.8 (40)							
2011	12.5 (6)						1998.6 (96)	453.4 (69)	1390.0 (91)	
2017	174.1 (32)	301.7 (60)	175.4 (48)	650.6 (78)	563.0 (75)	1544.8 (93)	1890.0 (96)	592.8 (76)	665.0 (78)	1008.0 (88)
2021	48.3 (32)				287.3 (59)	293.6 (60)	1322.6 (91)	337.9 (62)	1415.9 (92)	
2023	54.6 (19)	227.5 (54)	29.2 (18)	105.5 (38)	321.7 (61)	1298.6 (90)	1444.1 (92)	729.2 (81)	960.0 (86)	272.0 (58)

Brook Trout Summary

- Brook trout density in the North Branch Embarrass River were moderate to high from the Ranger Station upstream to Lake Church Road, ranking in 57th to 96th percentile when compared to statewide data. Sample sites downstream from the Ranger Station to Schoolhouse Road, were low to moderate, ranging from 28th to 53rd percentile when compared to statewide data.
- Young of year (YOY) brook trout density was variable, ranging from 0 to 528 per mile, but YOY numbers correlated similarly to adult numbers across the sample sites.
- The size structure of brook trout was skewed towards smaller individuals, while brook trout >10 inches generally common in previous surveys, were captured at only two of the 10 samples sites. No 12-inch brook trout were captured at any of the sampling sites, while it is typical to have some fish reaching 12 inches.
- At the Old CTH D sampling site and those further upstream, brook trout densities were similar to those in 2017 and 2021 and showed only minor impacts from the fish kill. Sampling sites from the Ranger Station and those further downstream show a decline since the surveys done in 2017 likely related to the fish kill.
- The fish kill has depleted brook trout numbers in portions of the North Branch Embarrass: However, when looking at catch rates in the affected area, it appears that the adult population sampled in the upper stations have remained stable. While stations further downstream in the kill zone have suffered declines when compared to previous survey records.
- **Recommendations:**
 - Allow brook trout populations to recover through natural recruitment. There is already an abundance of YOY and fish capable of meeting the reproductive needs of the stream.
 - Survey select locations throughout the kill zone in 2024 and reevaluate the status of the brook trout fishery.
 - Keep the existing regulation in place: 5 bag/no size limit.





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BROWN TROUT SIZE AND ABUNDANCE (CPUE) METRICS										
Station	Total Number Sampled	Average Length (inches)	Length Range (inches)	CPUE (No. per Mile) Statewide Percentile in Parentheses						
				Total CPUE (PCTL)	YOY CPUE	≥6" CPUE (PCTL)	≥8" CPUE (PCTL)	≥10" CPUE (PCTL)	≥12" CPUE (PCTL)	≥15" CPUE (PCTL)
Schoolhouse Road	1	12.3	9.1 - 15.0	18 (18)	-	18 (24)	18 (34)	12 (39)	12 (54)	6 (73)
Mountain Bay Trail	4	12.7	2.7 - 21.5	53 (33)	6	47 (40)	47 (50)	29 (55)	29 (69)	18 (91)
Butternut Road	8	15.6	11.0 - 20.2	47 (31)	-	47 (40)	47 (50)	47 (62)	41 (77)	29 (96)
CTH D	11	3.6	2.2 - 7.6	55 (34)	45	10 (15)	-	-	-	-
Ranger Station	42	8.5	2.9 - 24.1	239 (60)	17	166 (65)	105 (66)	44 (61)	39 (76)	22 (93)
Old CTH D	37	6.9	2.3 - 14.8	245 (60)	26	192 (69)	53 (53)	13 (40)	13 (56)	-
CTH D County Property	21	7.1	2.4 - 14.9	55 (34)	8	40 (37)	13 (28)	8 (33)	3 (39)	-
Maple Road	1	10.0	10.0 - 10.0	7 (7)	-	7 (11)	7 (20)	7 (32)	-	-

BROWN TROUT HISTORICAL CPUE/MILE (PCTL)								
Year	Schoolhouse Road	Mountain Bay Trail	Butternut Road	CTH D	Ranger Station	Old CTH D	CTH D County Property	Maple Road
2005				573.3 (78)			42.8 (30)	
2006			51.9 (33)					
2011	6.3 (6)						229.3 (60)	11.5 (12)
2017	47.5(32)	86.2 (41)	110.4 (46)	735.4 (83)	224.1 (59)	506.7 (7)	237.6 (60)	18.5 (19)
2021	48.3 (32)				229.9 (60)	120.7 (47)	298.3 (64)	12.1 (13)
2023	18.2 (19)	52.5 (33)	46.7 (31)	55.2 (34)	238.5 (60)	245.2 (61)	55.4 (34)	7.4 (8)

COLDWATER IBI SCORES AND NUMBER OF FISH SAMPLED IN NORTH BRANCH EMBARRASS RIVER - 2023									
Species	Schoolhouse Road	Mountain Bay Trail	Butternut Road	CTH D	Ranger Station	Old CTH D	Maple Road	River Road	Lake Church Rd
Blackside Darter	-	-	-	-	1	-	-	-	-
Brook Stickleback	2	1	-	-	-	-	-	1	1
Brook Trout	9	39	5	21	58	196	99	118	17
Brown Trout	3	9	8	11	43	37	1	-	-
Central Mudminnow	5	4	1	-	-	-	-	-	-
Creek Chub	16	45	10	5	9	25	27	33	-
Johnny Darter	5	12	-	3	1	8	16	25	-
Longnose Dace	-	-	-	9	1	3	-	-	-
Pearl Dace	5	49	4	-	-	3	28	17	-
Pumpkinseed	-	3	-	-	-	-	-	-	-
Blacknose Dace	4	5	2	-	3	7	27	38	-
White Sucker	-	46	49	17	23	53	10	20	-
Score	50 (Fair)	40 (Fair)	30 (Fair)	50 (Fair)	50 (Fair)	50 (Fair)	60 (Good)	60 (Good)	80 (Good)

Brown Trout Summary

- Brown trout density in the North Branch Embarrass River was moderate near the Ranger Station and Old CTH D, ranking in the 65th to 69th percentile, respectively, when compared to statewide data. Sample sites downstream from the Ranger Station to Schoolhouse Road were low to moderate, ranging from the 15th to 40th percentile when compared to statewide data.
- Young of year (YOY) brown trout density was variable, ranging from 0 to 45 per mile. Densities did not follow the adult abundance trends as was documented for brook trout.
- While historically a brook trout dominated stream with most of the sampling locations at low to moderate numbers of brown trout, the size structure of brown trout at several of the sites show an abundance of fish >15 inches when compared to data throughout the state (73rd to 99th percentile).
- Population trends observed appear on a path similar to brook trout. Densities at the Ranger Station site and those further upstream were similar to those in 2017 and 2021. Sampling sites downstream from the Ranger Station have declined in abundance since the surveys were completed in 2017.
- IBI's were conducted at all sampling sites this year and results showed either fair or good cold water ratings. The Class II trout water had the lower scores and the Class I water showed higher scores, which is typical for many trout streams in this area of the state.
- **Recommendations:**
 - The brown trout population will be allowed to recover through natural recruitment. The river has an abundance of larger brown trout available to meet reproduction needs, and department guidance does not allow for stocking brown trout in naturally reproducing brook trout water.
 - Survey select locations throughout the kill zone in 2024 and reevaluate the status of the brown trout fishery.
 - Keep the existing regulation in place: 5 bag/no size limit.