

Middle Branch Embarrass River  
At Wittenberg  
Water Quality Standards  
and  
Advanced Treatment Review

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Bureau of Water Resources Management  
Wisconsin Department of Natural Resources

February, 1986

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Middle Branch Embarrass River  
Village of Wittenberg  
Water Quality Standards/AT Review  
February, 1986

SUMMARY

Based on a review of available data and current knowledge of characteristics and uses, the Middle Branch Embarrass River is properly classified as a cold water fish and aquatic life and recreational use surface water. The stream contains an abundant population of forage fish, brown trout and brook trout, and is officially classified as a trout stream in the publication "Wisconsin Trout Streams," 1980, WDNR.

Water quality standards for cold water fish and aquatic life streams in Chapter NR 102, Wis. Adm. Code apply to the Middle Branch Embarrass River. Effluent limits have been developed for the proposed discharge from the Village of Wittenberg to maintain water quality standards and protect the high quality sport fishery in the stream. Because of the generally high stream flow to effluent flow ratio, secondary limits for BOD and suspended solids will apply. Flow related limits have been provided for ammonia.

INTRODUCTION

This report presents the results of an evaluation of the designated uses and water quality standards for the Middle Branch Embarrass River near Wittenberg, Wisconsin. The evaluation was conducted in conjunction with proposed modifications to the Wittenberg Waste Water Treatment Plant which is proposed to discharge to the river.

The objective of this effort is to review and propose revisions, if necessary, to previously designated uses and water quality standards in conformance with Section 144.025(2)(b), Wis. Stats., Section 303(c) of the Federal Clean Water Act, EPA Water Quality Standards Regulations 40 (CFR, Part 131) and Section 24 of the Municipal Waste Water Treatment Construction Grant Amendments of 1981. The following issues are considered in the review process:

1. Current and attainable uses of the water body based on its biological, physical and chemical characteristics,
2. factors impairing attainable uses, and
3. management necessary to eliminate or control impairing factors considering environmental, technological and socioeconomic consequences of such actions.

#### DESCRIPTION OF PROJECT

The existing waste water treatment facility at Wittenberg is not performing satisfactorily and needs to be rebuilt. Several waste treatment alternatives and disposal sites have been proposed and evaluated. The treatment alternative chosen consists of upgrading and expanding the existing aerated lagoon treatment system with discharge of the effluent to the Middle Branch Embarrass River. This discharge alternative has been opposed by the public, presumably because the Middle Branch Embarrass River is a trout stream. However, all the surface water discharge sites available to Wittenberg are trout streams or drain directly to trout streams. Department of Natural Resources' staff feel the selected alternative is the most environmentally sound.

## DESCRIPTION OF RESOURCE

The Middle Branch Embarrass River arises in Langlade County and flows southward to join the Embarrass River in Shawano County. It is one of the major rivers in Shawano county. The location of the river and proposed site for the Wittenberg discharge is shown on Figure 1. A good description of the river and its watershed is provided in a 1974 report which is attached as Appendix I. Even though the report is almost 12 years old, it is considered valid because little has changed. The 1974 report documents the Middle Branch Embarrass River as a Class II trout stream.

The report indicates stream bank erosion and other nonpoint sources were a major problem in 1974. Since then, better land management has been practiced in the watershed and, based on 1985 habitat ratings, stream habitat has apparently improved. Habitat ratings and macroinvertebrate data collected in 1985 are attached as Appendix II. The data indicates the stream contains excellent habitat. Macroinvertebrate Biotic Index data indicates that water quality is very good.

## STREAM CLASSIFICATION AND WATER QUALITY STANDARDS

The Middle Branch Embarrass River is a Class II trout stream and is highly regarded by sport fishermen. Class II trout streams are streams with natural reproduction but stocking may be required to maintain a desirable sport fishery. For water quality standards the stream is classified as a cold water fish and aquatic life and recreational use surface water. This classification is defined as a surface water capable of supporting a cold water sport fishery. In addition to trout fishing, the stream is used for canoeing and is listed as a canoe route in various guide books.

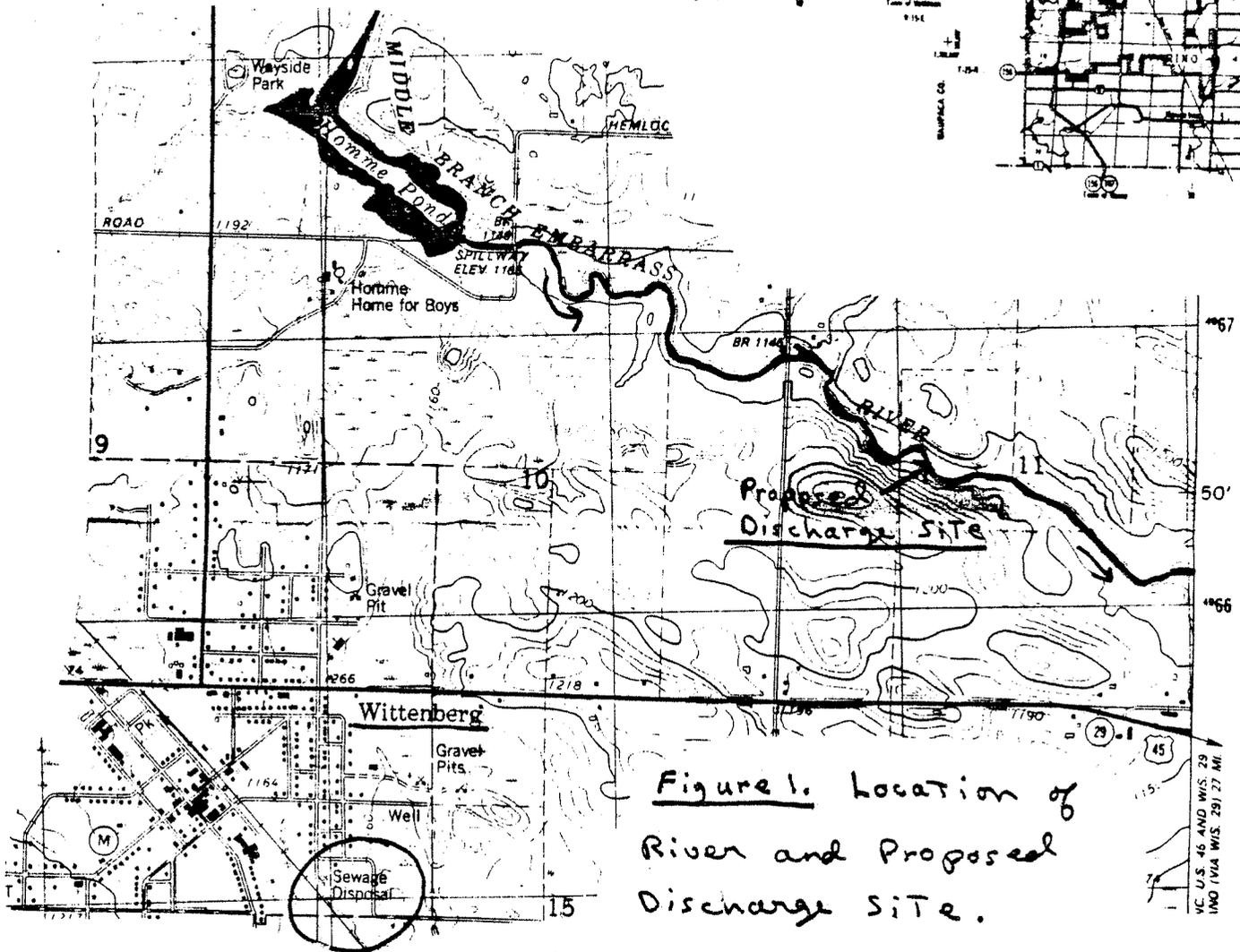
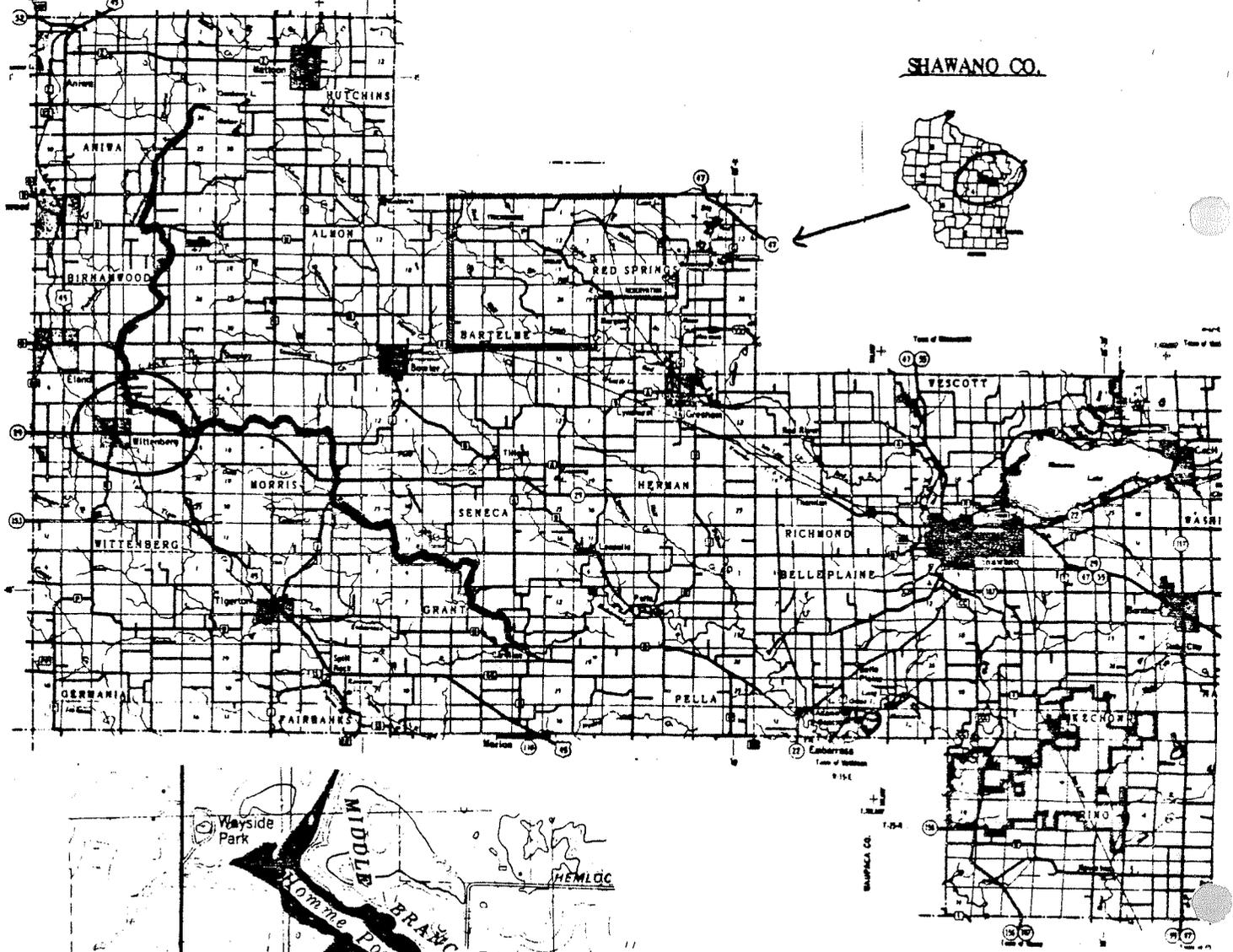


Figure 1. Location of River and Proposed Discharge Site.

U.S. GEOLOGICAL SURVEY  
VIC. U.S. 46 AND WIS. 29  
1:50,000 (VIA WIS. 29) 27 MI.

Water quality standards for surface waters classified as fish and aquatic life and recreational use are codified in Chapter NR 102, Wisconsin Administrative Code, which is attached as Appendix III.

Effluent limits necessary to maintain water quality standards in the Middle Branch Embarrass River were supplied to the Village's consultant in 1984. The limits and method of calculation are provided in Appendix IV. In summary, secondary limits for BOD and suspended solids are sufficient to protect aquatic life. Because of the extreme toxicity of ammonia nitrogen ( $\text{NH}_3\text{-N}$ ) to salmonids, flow related effluent limits for un-ionized ammonia were calculated for the discharge.

JB:TD:bm

APPENDIX I

Stream Survey Report  
Middle Branch Embarrass River, 1974

Department of Natural Resources  
INTRA-DEPARTMENT  
MEMORANDUM

REC'D DNR

NOV 19 1974

GREEN BAY

Wausaukee

Station

IN REPLY REFER TO: 3610

Date November 8, 1974

TO: S. G. DeBoer

ATTN: C. L. Cline

FROM: T. F. Thuemler

SUBJECT: Stream Survey Report on the Middle Branch of the Embarrass River,  
Shawano and Langlade Counties.

The Middle Branch of the Embarrass River arises from a spring source south of Antigo in Langlade County and then flows through western Shawano County to its junction with the South Branch in the Caroline Pond. It is a tributary to the Embarrass River, which is located in the Wolf River drainage. The Middle Branch has an average width of 37 feet and a total length of 43.4 miles, of which 40.3 miles are in Shawano County. Its watershed has a total area of 157 square miles.

The survey on the waters of this system took place during the summer of 1973.

Chemical Properties:

The Middle Branch is a hard water stream having slightly alkaline, light brown water. The stream appears slightly turbid at most times due to the large amount of cattle pasturing that occurs along its banks and its resultant siltation. The water quality figure shows the chemical properties along different sections of the river. Chlorides were sampled at Station 26 and determined to be 5 mg/L. This is somewhat higher than most streams in northeastern Wisconsin and is probably related to the high degree of agriculture in this watershed. No sources of pollution were evidenced in our survey or in the "Pollution Investigation Survey of the Wolf River Basin of April, 1971.

Physical Properties:

The Middle Branch arises from a spring source in southern Langlade County and has good groundwater recharge throughout its upper stretches. In addition, many fine coldwater feeders enter the main stem as it flows downstream. Because of the large amount of agriculture occurring in the watershed the flow fluctuates considerably, during the spring of 1973 the river was way over its banks in many locations. Streamflow readings were taken at two locations on the Middle Branch during the summer of 1974. At station 8 the discharge on July 24 was 6.24 cfs. and at station 33 on September 17 the flow was determined to be 19.36 cfs. The Middle Branch flows at a moderate velocity over most of its length, however there are some rapid water areas particularly in the lower reaches of the river.

Due to the excellent groundwater input to the Middle Branch, water temperatures above Homme Pond remain well within the limits of trout. Below the pond fewer coldwater feeders and spring seeps are found and hence water temperatures warm above optimal conditions for trout. Trout present in the lower reaches of the river generally congregate at the mouths of the smaller spring feeders at these times. The following temperatures were taken by D. Ryan on June 30, 1966 after approximately two weeks of very hot weather. The average air temperature during the time these readings were made was over 86°F.

<u>Station #</u>	<u>Water Temperature</u>	<u>Station #</u>	<u>Water Temperature</u>
4	71°F	30	82°F
7	70°F	40	79°F
28	78°F	41	82°F

(The station numbers refer to those on the survey map)

Water temperatures on the water quality figure, although taken in late September, show the same trend.

The stream bottom type is composed primarily of sand, but also contains rubble, gravel and boulders. Good trout spawning areas exist throughout the upper reaches (see map) and in many of the small feeder streams. The relatively steep gradient of 11.98 feet per mile limits the silt buildup in the stream to backwater areas or places where cattle have caused stream bank erosion.

Instream cover for trout is somewhat limited in the upper reaches of the stream. Fallen logs and trees, other debris, and rocks and boulders afford the majority of the cover. There are very few hiding places for larger trout. Below county highway N you get deeper pools, more undercut banks and boulder strewn riffles. Downstream from Homme Pond the undercut banks and deep pools become even more prevalent and cover no longer appears limiting.

#### Watershed Land Use:

Agriculture is the number one industry in the county and about forty percent of the land in this watershed is used for this endeavor. Cattle are allowed to pasture along stream banks throughout much of the watershed and this has caused a severe erosion and siltation problem (see map). Farmers' fences crossing streams presents another problem in certain areas. Commercial forests are the second ranking land use in the county. Farm wood lots contain most of the forest lands. There is little industrialization, nor are there any towns or villages located directly in the watershed. The towns of Aniwa, Birnamwood, Eland, Wittenberg and Caroline, however, are found just outside of it, and Antigo is less than ten miles from the headwaters of the stream.

There is one dam located on the Middle Branch near the town of Wittenberg. It has a head of 24 feet and forms the 40 acre Homme Pond.

#### Biological Characteristics:

Aquatic vegetation is limited to only a few types and there are only scattered beds of these. Eel grass is the most prevalent aquatic and were found provides cover for fingerling trout and places of attachment for invertebrate food items.

A good food grade is present in the Middle Branch. Caddis, stone, mayflies, amphipods and crayfish can be found in different portions of the stream. In addition a diverse forage fish population is present. The number of species as well as the quantity of fish, other than trout, increases as you go downstream. Certain species of darters, northern hogsuckers, northern redhorse and stonerollers were quite common in the lower portion of the river, but not found at all in its upper reaches. The dam at Homme Pond appears to be an effective barrier to warmwater fish, as six species found below the dam were not present above it. Carp have been reported to be present in the lower portion of the river, however none were captured in this survey nor were any collected in previous samplings. In no area does the rough fish population appear to be large enough to affect trout production.

#### Trout Populations:

Over 20% of the Middle Branch of the Embarrass was surveyed during the summer of 1973 using mainly one 250 volt D.C. stream shocker with two electrodes. The efficiency of this equipment varied greatly as we proceeded downstream. Based on their population estimates made at stations 4, 18 and 30 our efficiencies were 65%, 33% and 4% respectively. That means that at station 4, located in the upper stretch of the stream, with a single run we captured about 65% of the trout present in that station. One can see that as we worked downstream and the river became wider and deeper we sampled a much smaller proportion of the trout population.

Our survey findings show an excellent naturally reproducing brook trout population present in the Middle Branch from the headwaters down to Homme Pond. In the headwaters section growth of trout is fairly slow, however as you proceed downstream and the water gets deeper and instream cover increases, the growth rate also improves. This can be seen from the two length frequency figures that cover this stretch of stream. Data from the population estimates also reflects this. In station 4, located in the headwaters, only 14% of the brook trout population (excluding fingerlings) was of legal size when the estimate was made on August 28, 1973; however downstream at station 18, sampled on August 30, 1974, 42% of the brook trout population had attained the legal size of six inches. The standing crop of trout present was much greater in station 4 than in 18, 43.3 pounds per acre versus 27.2. Although there is a much denser population of trout in the headwaters region, the angler will have better success fishing the downstream region as there are more legal trout in that portion.

Below Homme Pond the Middle Branch has a mixed brook and brown trout population. This lower stretch does not have nearly the fishery that the upper reaches has. Natural reproduction of both brook and brown trout is non-existent. Some sublegal brook trout were captured, and since none were planted below legal size, these probably came down from some of the fine coldwater feeders that enter the main stem along this portion. Recruitment from these tributaries must keep the brook trout population going in this portion, for stocked brook trout accounted for less than 2% of the total number captured. On the other hand the brown trout population is probably being maintained through planting. The 1973 stocking of browns accounted for 60% of the population that we sampled. It was noted that the trout congregated at the mouths of coldwater feeders, spring seeps and rapid water areas during the heat of the summer, which was

when our survey was conducted. The angler fishing these lower reaches of the Middle Branch would probably not catch as many trout, but those he did take would be bigger fish.

Trout in the entire system were generally free of any parasites, with the exception of a few brown trout in the lower Embarrass on which the ectoparasitic copepod Argulus spp. was found. It was not found in large enough numbers to be of any circumstance, however.

In a creel census conducted on the Middle Branch of the Embarrass during the 1973 trout season, 159 anglers were interviewed and they had caught 121 trout or roughly three trout for every four fishermen. Of the total 121 trout caught, only seven were browns. Most of the fishing occurred during the opening week-end of the season, even though conditions were near or above flood stage on most of the streams at this time.

#### Prior Management:

Partial surveys were conducted on sections of the Middle Branch in 1961, 1953, 1950, 1949 and 1948. All of these samplings found good trout populations in the upper reaches of the stream and recognized as the major problem, cattle pasturing stream banks. Brasch in 1948 also pointed out the adverse effect of the Homme dam on downstream water quality.

The Middle Branch has been stocked over the past ten years with a yearly average of 2800 holdover brook trout, 4150 fingerling brooks, and 2580 holdover brown trout. Rainbow trout, 700 yearlings, were stocked once in the spring of 1969. In the past few years the browns were all stocked between Homme Pond and Caroline and the brooks between county highway N and state highway 29.

#### Land Ownership and Access:

There is very little public ownership within this watershed. The state has eighty acres of public fishing grounds with 2080 feet of frontage in the town of Aniwa. The town of Morris maintains a park of 1.3 acres having 325 feet of frontage. The town of Grant owns .94 acres of land having 100 feet of frontage. The town of Birnamwood maintains a park having 2.4 acres of land and 740 feet of river frontage. A town road ending and some county land provide for an additional 146 feet of frontage. Access can also be obtained from 25 road crossings scattered along the length of the river.

#### Management Recommendations:

The entire portion of river in Langlade County (3.1 miles) should be considered Class I trout water. The Middle Branch from the Shawano County line to Homme Pond, a distance of 18.7 miles, is also Class I water. The portion of stream from Homme Pond to Caroline Pond (21.6 miles) is Class II trout water.

Holdover brown trout stocking should be continued in the Class II portion of stream, as we appear to be getting some carryover from these plants. All brook trout stocking should be discontinued because the upper portion of river is Class I water and poor survival was found from the plantings in the Class II section.

Habitat protection is badly needed along the Middle Branch and many of its Class I feeders. Erosion of stream banks and silting over of spawning beds is occurring due to poor farming practices. We need to get some form of land control (i.e. perpetual easements or acquisition) in order that we may fence these areas and prevent further deterioration. This is the biggest problem we face in this watershed.

If land control is obtained some habitat improvement should be done in an effort to produce more instream cover in the upper reaches of the river. Presently cover, especially for large trout, is lacking in this area. Some half-log devices could be tried on the small parcel of land the state now owns. This would then serve as a demonstration area for further development at a later date.

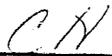
Fishing pressure right now is not great enough to warrant any more restrictive regulations. A large number of fish should be taken from the upper portion of the Middle Branch to try and thin out the present population. If we could get a large enough harvest here we may be able to improve the growth on the remaining trout. We have found out that most of the fishing occurs on the opening weekend and the angler is limited at that time to catching only five trout. This restriction should be rescinded for streams such as the Middle Branch in an effort to obtain a larger harvest.

  
T. F. Thuemler

TFT:bc

cc: J. Brasch  
M. Burdick  
M. Johnson

APPROVED:

  
\_\_\_\_\_  
C. E. Higgs

11-18-74  
Date

NOTED:

\_\_\_\_\_  
Date

STREAM SUMMARY REPORT

Name Middle Branch Embarrass River County Shawano & Langlade

Location Western Shawano County Tributary to: Embarrass River

Size: Average width of trout water 37 ft. Total length of trout water 43.4 mi.

Area of trout water 183 acres. Total length of stream 43.4 mi.

Drainage Area: Direct 90 sq. mi. Total 157 square miles Shawano Co. portion: 40.3 miles  
Langlade County portion: 3.1 miles

Flow: 37.0 cfs. (estimated) Average velocity Moderate

Temperatures: Average 60°F Minimum 52°F Maximum 74°F

See water quality figure; below Homme Pond stream warms considerably.

Open Marsh 5%, Shrub Marsh 15%, Meadow Pasture 15%, Swamp Hardwood 15%, Upland Hardwoods 15%  
Watershed Land Use: Cultivated 20%, Firm Pasture 5%, Swamp Conifers 5%, Upland Conifers 5%;

Bank Cover: Cultivated 1%, Pasture 12%, Forest 10%, Swamp 31%, Marsh 46%.

Instream Cover: Somewhat limited for larger trout above Hwy N; Good cover below this point.

Pool Grade and Pool-Riffle Ratio: A-7%, B-72%, C-21%; 80% Flatwater, 19% Riffle, 1% Rapids

M.P.A. 185 ppm. Conductance: 351 micro-mho/cm pH: 8.2  
@ 77°F

Problems (List): (1) Cattle pasturing causes bank breakdown and erosion throughout the stream;  
(2) Stream temperature warms appreciably below Homme Pond; (3) Instream cover limited  
in upper reaches of stream.

Fishing Conditions: Access Very limited public ownership; however access is available from 26 road  
crossings.

Fishability Good to excellent throughout entire stream length.

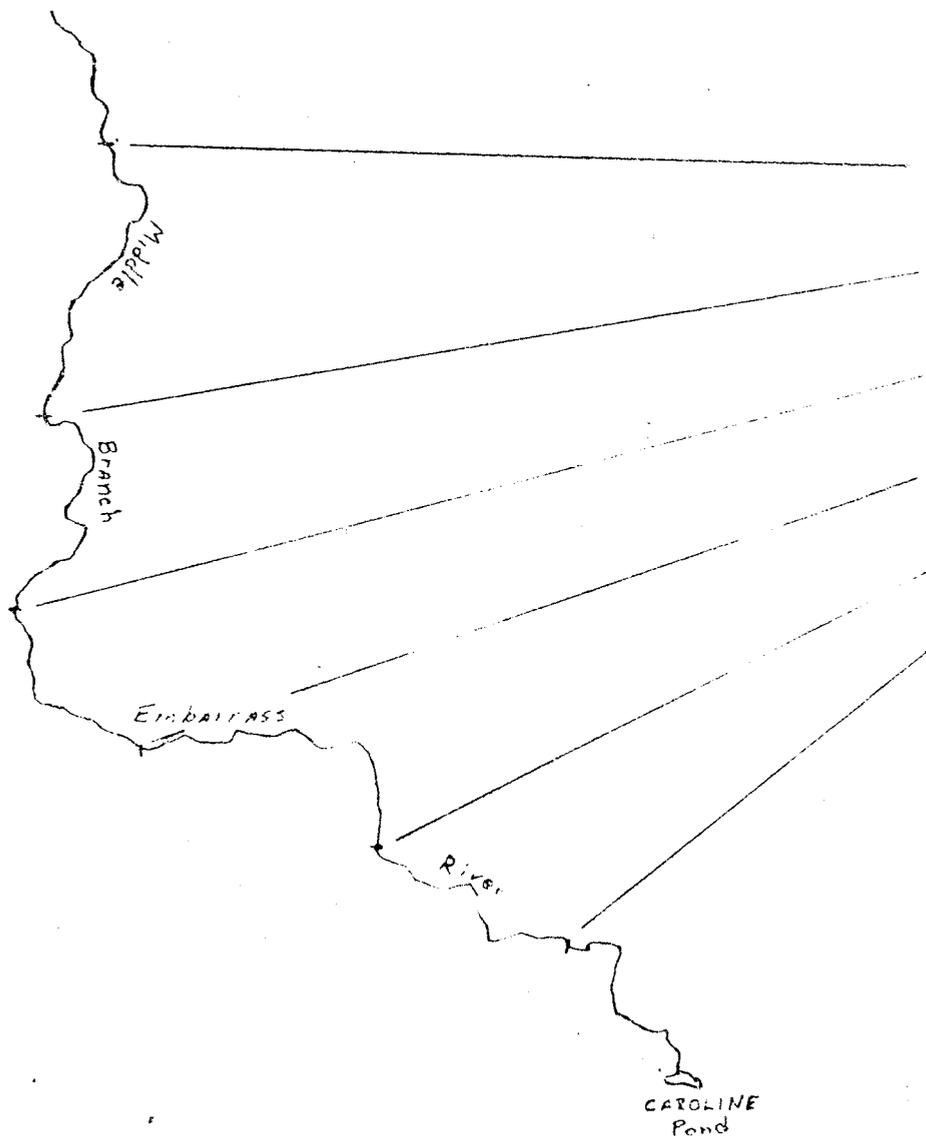
Fishing intensity Heavy during first part of season, light thereafter.

Comments: Additional data on the above characteristics can be found in the narrative  
portion of this report.

Date 11/14/74

Investigator Thomas F. Thuemler

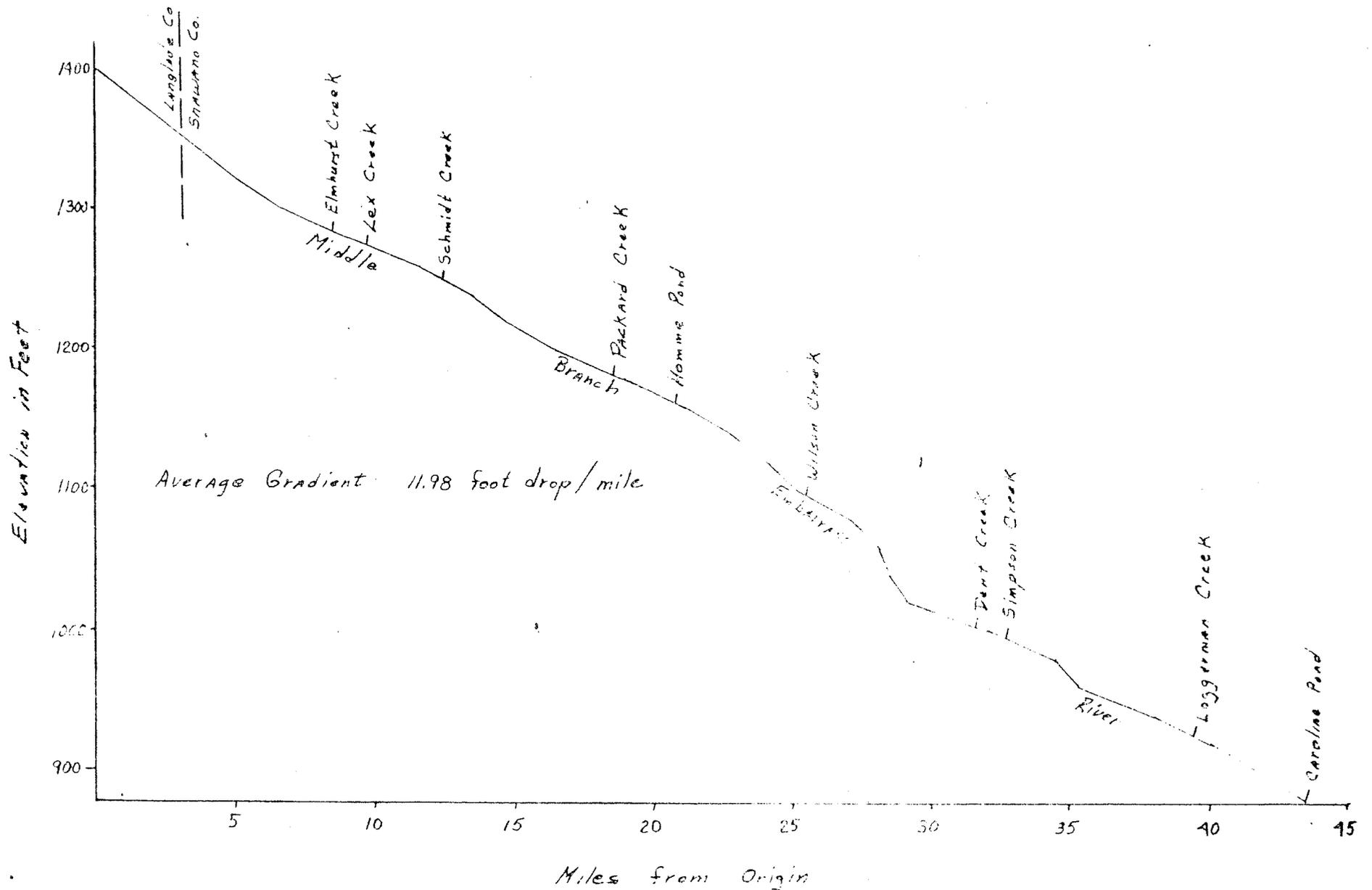
# Water Quality on the Middle Branch Embarrass River



Water Temp.	M.P.A.	Conductance at 77°F	pH
55°F	190 ppm	367 micro-mho/cm	7.8
55°	187	335	7.9
56°	184	340	7.8
61°	180	329	8.0
60°	168	329	7.8
62°	185	351	8.2

samples taken on September 22, 1974  
Average Air Temperature - 68°F

# Gradient of the Middle Branch of the Embarrass River



STREAM DISCHARGE DATA

STREAM <b>Middle Branch Embarrass</b>	COUNTY <b>Shawano</b>	LOCATION OF STREAM		
		Township <b>27N</b>	Range <b>11E</b>	Section <b>13</b>
				Forty <b>NW NW</b>

ESTIMATED WATER STAGE IN FEET:	<input type="checkbox"/> Above <input type="checkbox"/> Normal <input checked="" type="checkbox"/> Below	REFERENCE POINT FOR LEVELS <b>Benchmark on SW corner of bridge. Elev. 1132.55--water level 13.9 below benchmark</b>
--------------------------------	--	--

CONDITIONS AFFECTING MEASUREMENTS --- Wind, bottom, ice, etc. <b>Bottom - small rubble</b>	TEMPERATURE WATER <b>Air - 68°F</b> <b>Water-61°F</b>
---	---

INSTRUMENT --- Name and number <b>Gurley Pygmy Current meter #TR4236</b>	EXACT LOCATION OF MEASUREMENT ON STREAM <b>20' upstream from bridge on Cardinal Lane.</b>
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OBSERVER <b>Burdick, Wnek &amp; Thuemler</b>	DATE <b>9/17/74</b>	TIME OF DAY <b>11:05</b>
---	------------------------	-----------------------------

Distance from Bank	Depth	Depth of Observation	Revolutions	Time in Seconds	Velocity			Area of Section			Discharge
					At Point	Mean in Vertical	Mean in Section	Area of Section	Mean Depth	Width	
1	.5'	.4	6	30			.20	.25	.25	1	.050
2	.85	.4	9	30			.30	.675	.675	1	.203
3	.9	.4	15	30			.50	.875	.875	1	.438
4	.95	.6	17	30			.57	.925	.925	1	.527
5	1	.6	17	30			.57	.975	.975	1	.556
6	1	.8	19	30			.63	1	1	1	.630
7	.95	.7	19	30			.63	.975	.975	1	.614
8	1	.7	22	30			.73	.975	.975	1	.712
9	1	.7	22	30			.73	1	1	1	.730
10	1.5	.5	19	30			.63	1.25	1.25	1	.788
11	1	.5	19	30			.63	1.25	1.25	1	.788
12	1	.5	21	30			.70	1	1	1	.700
13	1.1	.5	19	30			.63	1.05	1.05	1	.662
14	1.15	.7	21	30			.70	1.125	1.125	1	.788
15	1.2	.7	20	30			.67	1.175	1.175	1	.788
16	1.2	.7	21	30			.70	1.2	1.2	1	.840
17	1.2	.5	19	30			.63	1.2	1.2	1	.756
18	1.2	.5	17	30			.57	1.2	1.2	1	.684

SUMMARY							1.10	32'	19.356 cfs
(over)		Mean Velocity		Area of	Mean Depth	Total Width	Discharge		



STREAM DISCHARGE DATA

STREAM Mid. Br. Embarrass	COUNTY Shawano	LOCATION OF STREAM Township Range Section Forty 29N 11E 11 3			
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ESTIMATED WATER STAGE IN FEET: <input type="checkbox"/> Above <input type="checkbox"/> Normal <input checked="" type="checkbox"/> Below	REFERENCE POINT FOR LEVELS Culvert on Hwy Z upstream side 5' 1" from water line.
--	---

CONDITIONS AFFECTING MEASUREMENTS --- Wind, bottom, ice, etc. None. Sand & gravel bottom.	TEMPERATURE WATER Air 74°F 10:45 Water 62°F a.m.
--	--

INSTRUMENT --- Name and number Gurly Pygmy Current Meter	EXACT LOCATION OF MEASUREMENT ON STREAM 50 ft. downstream from spring pond outlet.
---	---

OBSERVER T. F. Thuemler	DATE 7/24/74	TIME OF DAY 10:45 a.m.
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Distance from Bank	Depth	Depth of Observation	Revolutions	Time in Seconds	Velocity			Area of Section			Discharge
					At Point	Mean in Vertical	Mean in Section	Area of Section	Mean Depth	Width	
1	.35	.2	10	30			.33	.175	.175	1	.0578
2	.5	.3	13	30			.433	.5	.5	1	.2165
3	.6	.4	14	30			.467	.6	.6	1	.2802
4	.7	.4	15	30			.500	.7	.7	1	.3500
5	.75	.4	15	30			.500	.75	.75	1	.3750
6	.8	.4	16	30			.533	.8	.8	1	.4264
7	.9	.6	19	30			.633	.9	.9	1	.5697
8	1.1	.6	19	30			.633	1.1	1.1	1	.6963
9	1.2	.6	20	30			.667	1.2	1.2	1	.8004
10	1.2	1.0	18	30		.633 .600	.616	1.2	1.2	1	.7392
11	1.2	.75	16	30			.533	1.2	1.2	1	.6396
12	1.15	.75	12	30			.400	1.15	1.15	1	.4600
13	.9	.6	11	30			.367	.9	.9	1	.3303
14	.6	.5	10	30			.333	.6	.6	1	.1998
15	.3	.2	8	30			.267	.3	.3	1	.0801
16	.15	.1	3	30			.100	.15	.15	1	.0150
17 ft. wide			2	30			.067	.075	.075	1	.0050

SUMMARY

(over)

Mean Velocity

Area of

Mean Depth

Total Width

Discharge

FISH DATA SUMMARY

Middle Br. Embarrass River

Shawano & Langlade County

METHOD OF SAMPLING		AREA SAMPLED		NO. MARKED FISH STOCKED		STOCKING DATES												
110V A.C. backpack shocker		9.87 acres		None in this section.		None in this section.												
300V D.C. stream shocker		3.25 mi.																
SPECIES		STATION NUMBERS															TOTAL	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Brook trout	Fingerling 3.0		37	20	12	19	6	14	11	40	4	6	15	4	27	1	216	
	Yearling 3.0-5.9	2	306	859	290	431	253	300	411	363	124	157	340	226	165	76	4303	
	Adults >5.9	2	118	265	87	86	95	99	148	123	59	40	124	71	50	66	1433	
	Marked Fish																	
	TOTAL	4	461	1144	389	536	354	413	570	526	187	203	479	301	242	143	5952	
Rainbow trout	Fingerling																	
	Yearling <5.9			1													1	
	Adults												1				1	
	Marked Fish																	
	TOTAL			1									1				2	
	Fingerling																	
	Yearling																	
	Adults																	
	Marked Fish																	
	TOTAL																	
Other species:	Johnny darter												S	S				
	Brook lamprey												S		C	C		
	Finescale dace									S								
	Common shiner							C	S	C			C	C	C			
	White sucker					S	S	C		C		C	A	A	C	A		
	Blacknose dace					S		C	S	C		C	C	C	C	S		
	Longnose dace					C					C	C	S	S	C	S		
	Creek chub					S		C		C			C	C		S		
	Brook stickleback			S					S									
	Mottled sculpin		C	C	S	C	C	S	S	C	C	S		C	C			
	Central mudminnow			S		S												
		TOTAL	4	461	1145	389	536	354	413	570	526	187	203	479	302	242	143	5954

MODAL SIZES OF THE PRIMARY SPECIES  
See Length Frequency Figure

TROUT	NUMBER PER ACRE *		TROUT	ESTIMATED POUNDAGE PER ACRE	
	TROUT	OTHER SPECIES		TROUT	OTHER SPECIES
603		----	43		----

EVALUATION  
\*See population estimates.

Excellent naturally reproducing brook trout population in this portion of the stream. Many of the fingerling brooks were too small to capture at the time of the survey. Only 25% of the trout (excluding fingerlings) were of legal size.

DATE June 1973	INVESTIGATOR Boyd, Brum, Lutterbie
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Mid. Br. Embarrass River

FISH DATA SUMMARY

Shawano County

METHOD OF SAMPLING		AREA SAMPLED		NO. MARKED FISH STOCKED		STOCKING DATES											
D.C. stream shocker		2.45 miles 12.76 acres		4,000 brook trout		4/27/73											
SPECIES		STATION NUMBERS												TOTAL			
		16	17	18	19	20	21	22	23	24	25*	26*	27		28		
Brook trout	Fingerling	3	11	47	98	12	67	5	115	66	1	12	15	16			468
	Yearling 5.9	28	21	85	87	9	54	11	23	11	1	28	19	12			389
	Adults 5.9	46	42	66	103	17	111	48	103	50	2	35	37	40			700
	Marked Fish																
	TOTAL		77	74	198	288	38	232	64	241	127	4	75	71	68		
Brown trout	Fingerling																
	Yearling																
	Adults 5.9												1				1
	Marked Fish																
	TOTAL												1				1
Other species																	
	Hornychub												S	S			
	Finescale dace																
Brook Lamprey	C	C	C	C	C			C	C	C	C	C	C				
White sucker	A	A	C	C	A	C	C	C	C	C	C	C	C				
Blacknose dace	C	C	C	C	C	C	C	C	C		C	C					
Longnose dace	C	C	C	C	A	C	C	C	C		C	C					
Common shiner	S							S	C	C	C	C	A				
Creek chub	C	S	C	C	C	C	C	C	C	C		C	C				
Johnny darter	C	S	C	S	C	C		C	C	C	S	S	S				
Mottled sculpin			C	C	A	C	C	C	C	C	C	C	C				
Fantail darter				S	S	C		S	S		S	S	S				
Redbelly dace				C													
Central mudminnow				C	C												
Blackside darter					S	S			S				C				
No. hogsucker					S				C	C		C					
Banded darter									S								
GRAND TOTAL		77	74	198	288	38	232	64	241	127	4	75	72	68			1558

MODAL SIZES OF THE PRIMARY SPECIES  
See length frequency figure.

TROUT	NUMBER PER ACRE **		TROUT	ESTIMATED POUNDAGE PER ACRE **	
		OTHER SPECIES			OTHER SPECIES
122		----	27		----

EVALUATION  
\*High water caused low shocker efficiency. \*\*See population estimates.

This section of stream has a very good native brook trout population. Trout up to thirteen inches were captured in our survey and growth appeared to be better than in the upstream section.

DATE June 25 - July 11, 1973	INVESTIGATOR Boyd, Brum, Lutterbie
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FISH DATA SUMMARY

Mid. Br. Embarrass River

Shawano County

METHOD OF SAMPLING		AREA SAMPLED		NO. MARKED FISH STOCKED		STOCKING DATES										
300V D.C. Stream Shocker		19.18 acres 3.5 miles		4,000 brook trout 2,000 brown trout		4/27/73 4/19/73										
SPECIES		STATION NUMBERS														TOTAL
		29	30	31	32	33	34	35	36	37	38	39	40	41	42	
Brook trout	Fingerling															
	Yearling <5.9	21	2	3	3			9	2	14						
	Adults >5.9	43	3	6	2	1		12	9	70	4		2	5		
	Marked Fish							4								
	TOTAL	64	5	9	5	1		25	11	84	4		2	5		
Brown trout	Fingerling															
	Yearling <5.9											1				
	Adults >5.9	7			2		4	2	6	2	2	2	4	2	1	
	Marked Fish						4	1	7	3	16	3	3	8	7	
	TOTAL	7			2		8	3	13	5	18	6	7	10	8	
Other species	Central mudminnow					C	C	C				C		S		
	Pumpkinseed					S										
	Blackside darter		C	C	A	C	C	C		C	C	C	C	C		
	Brook lamprey		C	C	C	C	C	C			C	C	C			
	Rock bass		S		C	C	S	S			C	S		S		
	Blacknose dace	C	C	C	C	C	S	C	S	C	C		C			
	Brook stickleback	S			S											
	Mottled sculpin	C	C						S							
	No. hogsucker	C	C	A	C	C	C	C	C	C	A	C	C	A	A	
	Hornyhead chub	C			C	C	C	C	S	C	C	C	C	C	C	
Creek chub	C	C		C	C	C	C	S	C	C	C	C	C			
Common shiner	C	C	A	A	A	A	A	A	A	A	C	A	A			
Yellow bullhead	S	S	S	S	S	S		S		S						
Fantail darter	S			S	S						C		S			
Banded darter	S	S	C	S		S	S							S		
Johnny darter	S	C	C	C	S	S	S			C		C	S			
White sucker	C	C	A	C	C	C	C	C	C	A	C	C	A	A		
No. redhorse	C	S	S		S	C	C	C	C	C	S	C	C	A		
Longnose dace	C	C	C		C	C	C	A	C	C				A		
Stoneroller	C		C	C	C	C	C	A								
Bluntnose minnow						C		C								
Finescale dace								S								

MODAL SIZES OF THE PRIMARY SPECIES  
See length frequency figure

NUMBER PER ACRE		ESTIMATED POUNDAGE PER ACRE	
TROUT	OTHER SPECIES	TROUT	OTHER SPECIES
18	----	16	----

EVALUATION  
\* See population estimates.  
Stream shocker efficiency was much lower in this section of river because of the deep water and width of the river.  
A mixed brook and brown trout population is found in this portion. Natural reproduction of both species is limited. The 1973 brown trout stocking accounted for 60% of the browns captured. The 1973 brook trout plant only accounted for 2% of the brooks captured.

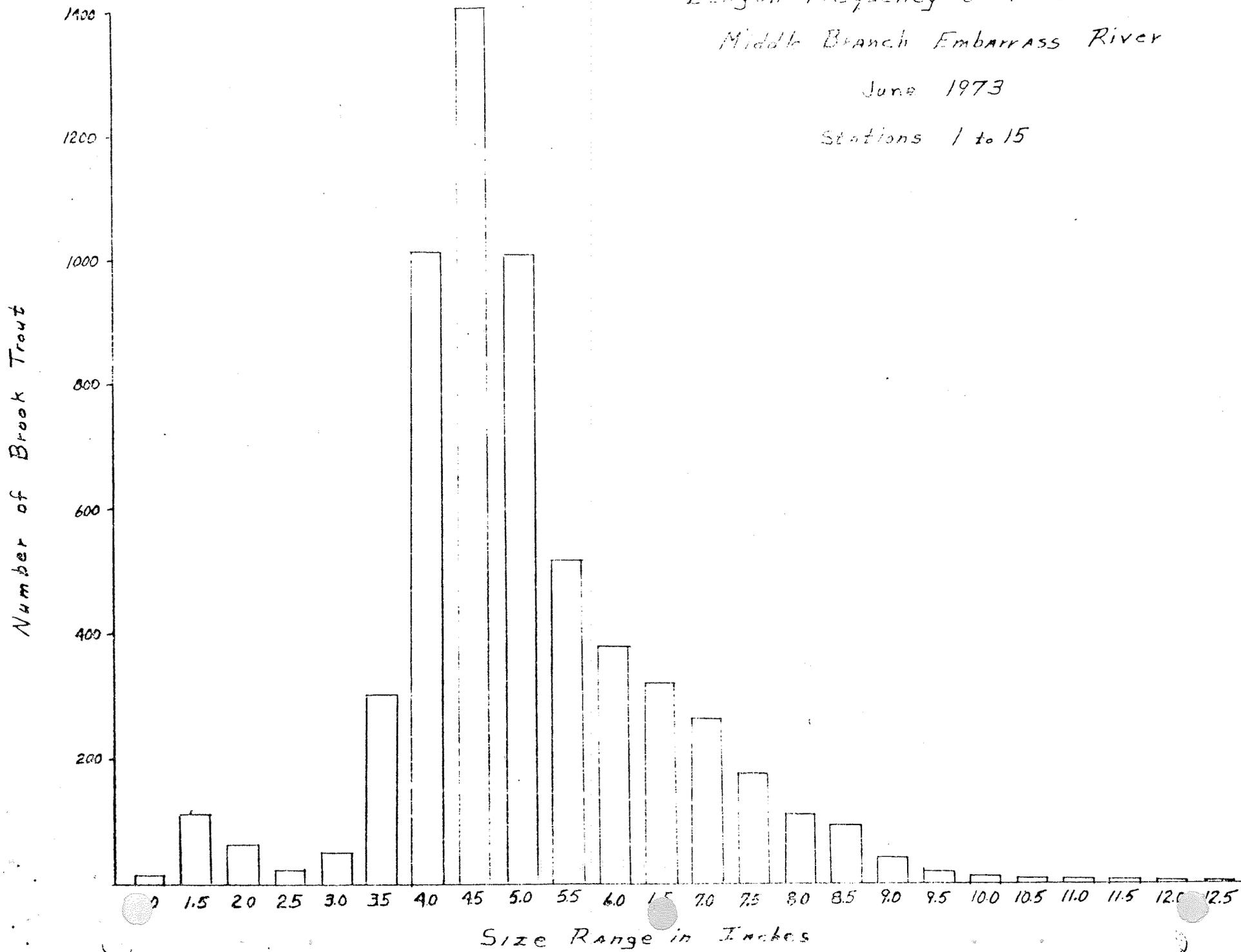
DATE July & September 6, 1973	INVESTIGATOR Boyd, Brum, Lutterbie
----------------------------------	---------------------------------------

Length Frequency of Brook Trout

Middle Branch Embarrass River

June 1973

Stations 1 to 15

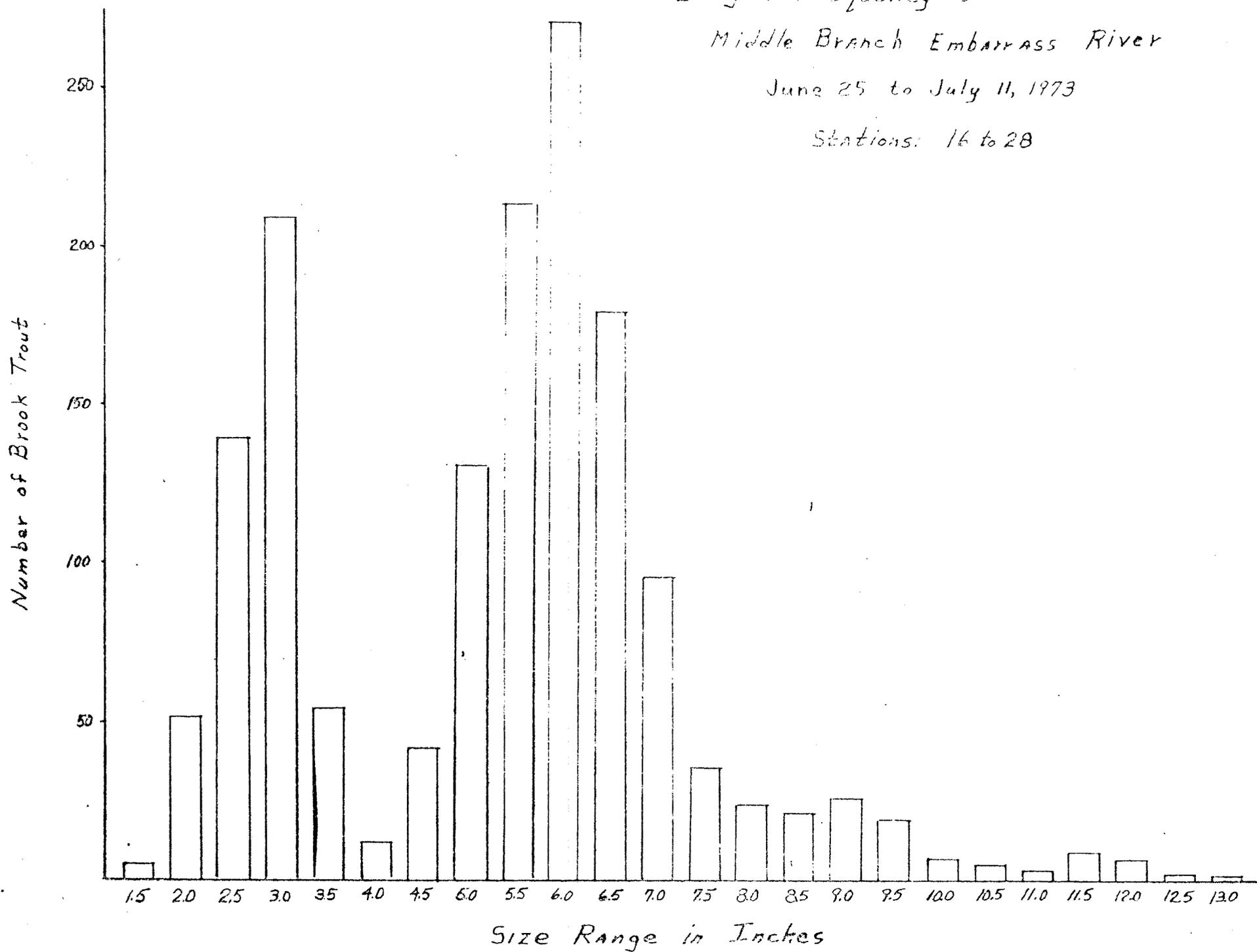


Length Frequency of Brook Trout

Middle Branch Embarrass River

June 25 to July 11, 1973

Stations: 16 to 28



Length Frequency of Brook Trout

Middle Branch Embarrass River

July, 1973

Stations: 29 to 42

Number of Brook Trout

40

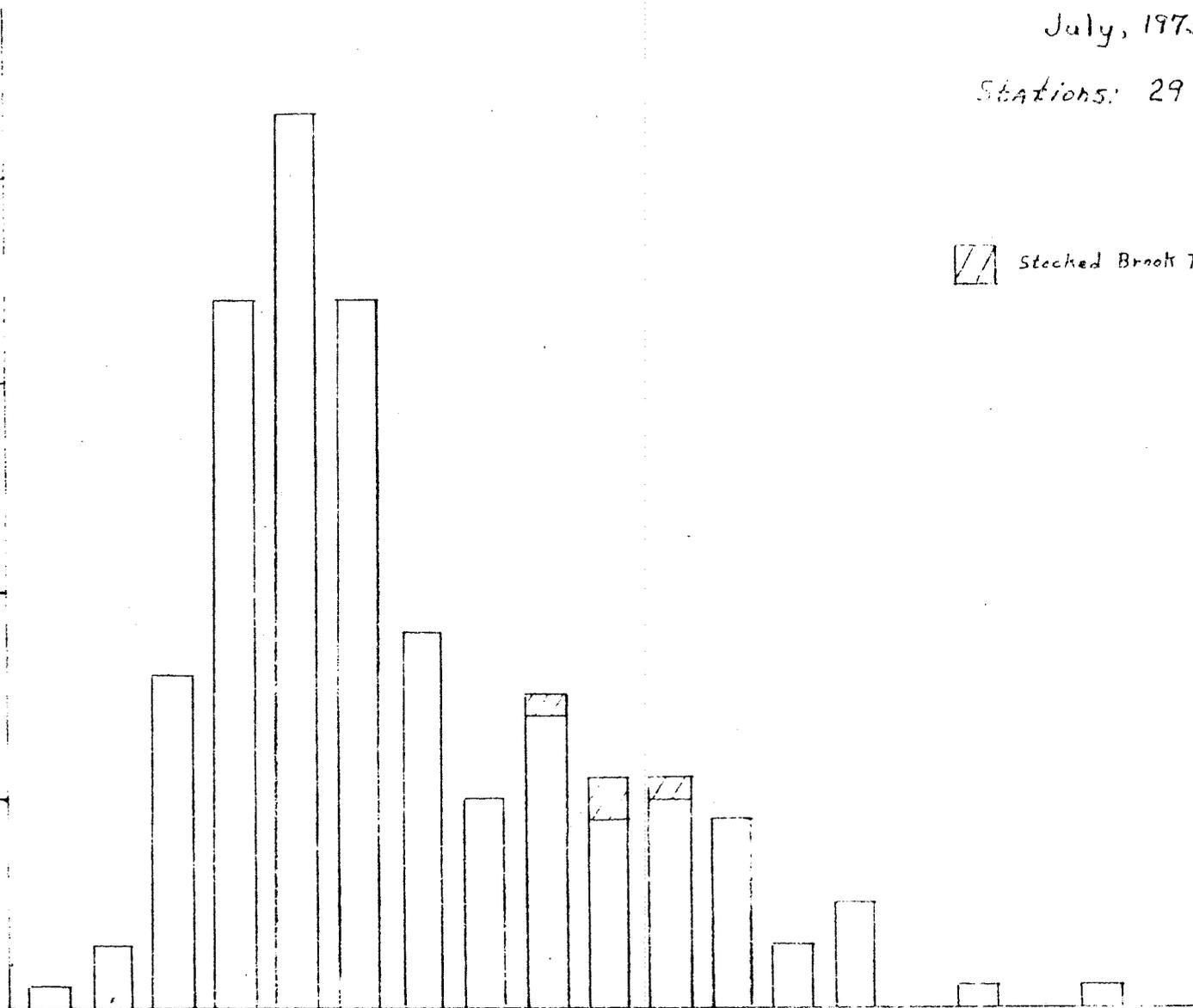
30

20

10



Steeked Brook Trout



4.0

4.5

5.0

5.5

6.0

6.5

7.0

7.5

8.0

8.5

9.0

9.5

10.0

10.5

11.5

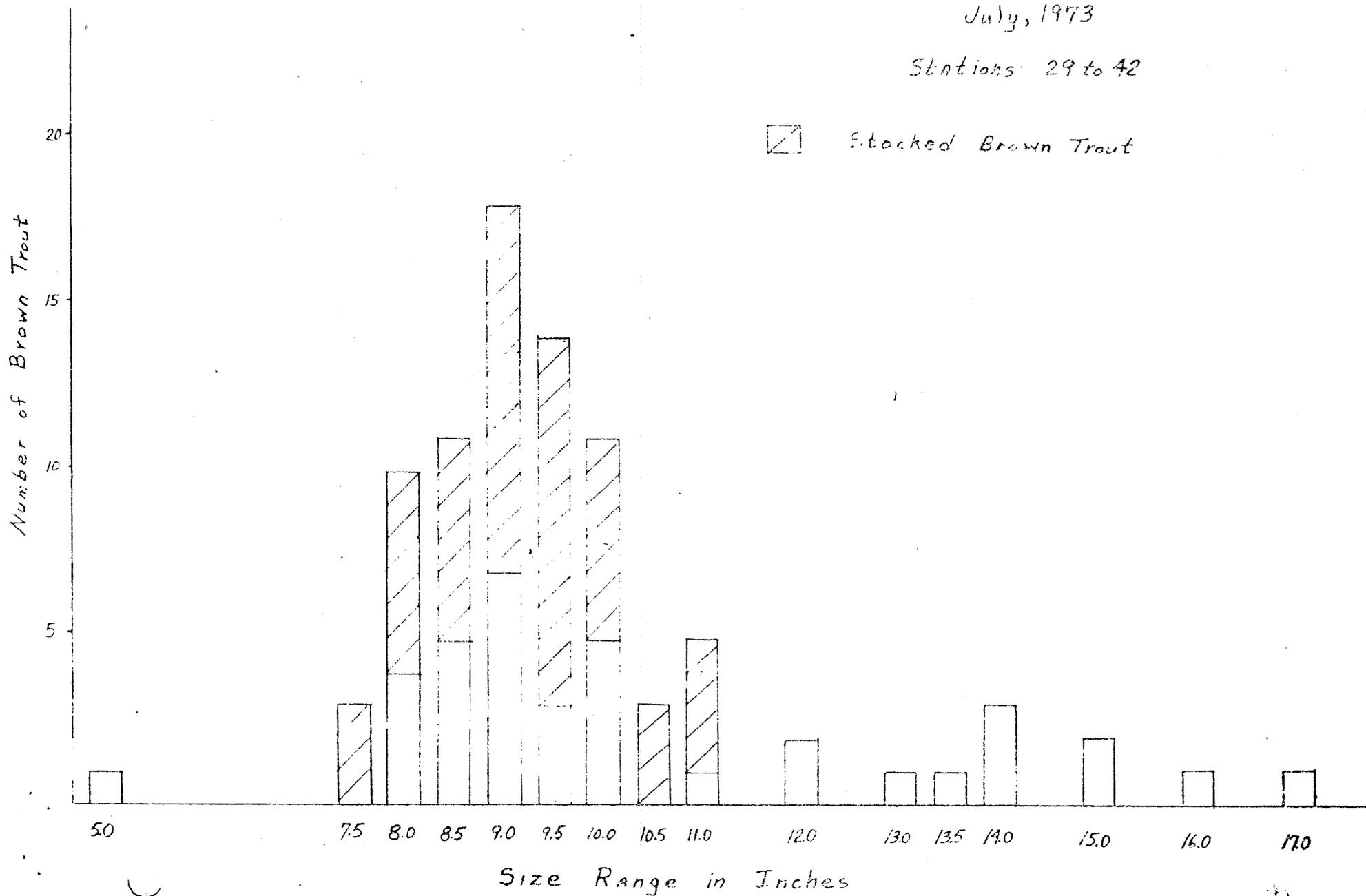
12.5

Size Range in Inches

Length Frequency of Brown Trout  
Middle Branch Embarrass River

July, 1973

Stations 29 to 42



Middle Branch Embarrass River

NAME OF STATION: PE-4 SAMPLING DATE: 8/28/73

Length: 1125' Width: 26' Acres .67 Miles .21

	BROWN TROUT	BROOK TROUT	TOTAL
Population Estimate (# in Station)		1310	
Density - Per mile:		6238	
Per acre:		1955	
Total Biomass (lbs/acre):		43.3	
		95% C.L. (1235-1385)	

Legal Fish - (over 6")

Population Estimate (in station)		61	
Density - Per mile:		290	
Per acre:		91	
Biomass (lbs/acre):		9.5	
Average length (inches):		6.8	
Average weight <sup>grams</sup> ( <del>ounces</del> ):		49	
Per cent of population legal fish:		5	

Age Group - Fish 0 - Fingerlings

Population Estimate (# in station):		875	
Density - Per mile:		4167	
Per acre:		1306	
Biomass: (lbs/acre)		13.2	
Average length (inches)		2.8	
Average weight <sup>grams</sup> ( <del>ounces</del> ):		4.7	
Per cent of population age group		67	

STATION FISH SAMPLING SUMMARY  
FORM 3600-57

DEPARTMENT OF NATURAL RESOURCES

REAM Mid. Br. Embarrass River				INVESTIGATOR Meyers, Boyd, Brun, Thuemler			
Area Sampled:	LENGTH 1125 ft.	WIDTH 26 ft.	AREA (ACRES) 0.67	STATION NO. PE - 4	NO. PER ACRE	DATE 8/28/73	

SIZE RANGE	Brook trout			SPECIES		PE = $\hat{N} = \frac{M(C-1)}{R+1}$	Ave. Wt.	
	1st run	M	2nd run	C	Recaps			
1								
.0 - 1.4								
.5 - 1.9								
1.0 - 2.4								
1.5 - 2.9		461		369	194	875	4.7	4113
2.0 - 3.4								
2.5 - 3.9								
3.0 - 4.4		77		62	43	110	11	1210
3.5 - 4.9		115		79	65	139	14	1946
4.0 - 5.4		70		62	53	82	21	1722
4.5 - 5.9		39		33	30	43	28	1204
5.0 - 6.4		28		20	14			
5.5 - 6.9		11		13	14	46	40	1840
6.0 - 7.4		4		4	3			
6.5 - 7.9		4		3	3	15	75	1125
7.0 - 8.4		4		3	3			
7.5 - 8.9		2		3	3			
8.0 - 9.4								
8.5 - 9.9								
9.0 - 10.4								
9.5 - 10.9								
10.0 - 11.4	$V(\hat{N}) = \frac{(\hat{N})^2 (C-R)}{C+1 R+1}$					Biomass 43.7 lbs./acre		
10.5 - 11.9								
11.0 - 12.4								
11.5 - 12.9	$V(\hat{N}) = 1396.34$							
12.0 - 13.4								
12.5 - 13.9	$95\% \text{ CI} = \hat{N} + 27/1396.34$							
13.0 - 14.4								
13.5 - 14.9	$95\% \text{ CI} = 1310 + 75$							
14.0 - 15.4	$= 1235 - 1385$							
14.5 - 15.9								
15.0 - 16.4						Efficiency = 425/651 = 65%		
15.5 - 16.9								
16.0 - 17.4								
16.5 - 17.9								
17.0 - 18.4								
17.5 - 18.9								
18.0 - 19.4								
18.5 - 19.9								
19.0 - 20.4								
19.5 - 20.9								
20.0 - 21.4								
20.5 - 21.9								
21.0 - 22.4								
21.5 - 22.9								
22.0 - 23.4								
22.5 - 23.9								
23.0 - 24.4								
23.5 - 24.9								
+ (give actual size)								
<b>TOTAL</b>		305		651	425	1310		13160

Middle Branch Embarrass River

NAME OF STATION: PE-18 SAMPLING DATE: 8/30/73

Length: 1000' Width: 50' Acres 1.15 Miles .19

	BROWN TROUT	BROOK TROUT	TOTAL
Population Estimate (# in Station)		859	
Density - Per mile:		4521	
Per acre:		747	
Total Biomass (lbs/acre):		27.2	
95% Confidence Limits 700-1018			

Legal Fish - (over 6")

Population Estimate (in station)		157	
Density - Per mile:		826	
Per acre:		137	
Biomass (lbs/acre):		12.7	
Average length (inches):		6.6	
Average weight ( <sup>grams</sup> <del>XXXXX</del> ):		43	
Per cent of population legal fish:		18	

Age Group - Fish 0 - Fingerlings

Population Estimate (# in station):		485	
Density - Per mile:		2553	
Per acre:		422	
Biomass: (lbs/acre)		4.9	
Average length (inches)		3.1	
Average weight ( <sup>grams</sup> <del>XXXXX</del> ):		5.4	
Per cent of population age group		56	

STATION FISH SAMPLING SUMMARY  
FORM 3600-57

DEPARTMENT OF NATURAL RESOURCES

REAM Middle Branch Embarrass River				INVESTIGATOR Meyers, Boyd, Brum		
Area Sampled:	LENGTH 1000ft.	WIDTH 50 ft.	AREA (ACRES) 1.15	STATION NO. PE 18	NO. PER ACRE 747	DATE 8/30/73

SIZE RANGE	Brook trout		SPECIES				Avg.		
	1st run	M	2nd run	C	Recaps	R	PE=N= $\frac{M(C+1)}{R+1}$	Wt.	Biomass
1									
0 - 1.4									
.5 - 1.9									
1.0 - 2.4		3					3		
.5 - 2.9		22		17		6	57		
1.0 - 3.4		70		65		18	243	485	5.4 2619
.5 - 3.9		48		48		13	168		
1.0 - 4.4		4		6		1	14		
.5 - 4.9		13		10		5	24	74	336
1.0 - 5.4		33		18		7	78	19	1482
.5 - 5.9		42		29		10	115	26	2990
1.0 - 6.4		34		22		8	87	34	2958
.5 - 6.9		12		11		2	48	42	2016
1.0 - 7.4		6		2		2	6	51	306
.5 - 7.9		4		3		2	5	62	310
1.0 - 8.4		2		1			4	82	328
.5 - 8.9		4		1		1	4	96	384
1.0 - 9.4		2		2		1			
.5 - 9.9		1							
1.0 - 10.4				1		1	3	160	480
.5 - 10.9									
1.0 - 11.4									
.5 - 11.9									
1.0 - 12.4									
.5 - 12.9		(N) <sup>2</sup> (C-R)							
1.0 - 13.4		V(N) = (C+1)(R+1)							
.5 - 13.9									
1.0 - 14.4		V(N) = 6346.6							
.5 - 14.9								Biomass =	27.22 lbs/acre
1.0 - 15.4		95% C.L = N*27/V(N)							
.5 - 15.9									
1.0 - 16.4		95% C.L = 859*27/(6346.6)							
.5 - 16.9									
1.0 - 17.4		95% C.L = 859*159						Efficiency =	$\frac{77}{236} = 33\%$
.5 - 17.9									
1.0 - 18.4		95% C.L = 700 = 1018							
.5 - 18.9									
1.0 - 19.4									
.5 - 19.9									
1.0 - 20.4									
.5 - 20.9									
1.0 - 21.4									
.5 - 21.9									
1.0 - 22.4									
.5 - 22.9									
1.0 - 23.4									
.5 - 23.9									
1.0 - 24.4									
.5 - 24.9									
+ (give actual size)									
<b>TOTAL</b>		302		236		77	859		14209

Middle Branch Embarrass River

NAME OF STATION: PE-30 SAMPLING DATE: 9/4/73

Length: 950' Width: 53' Acres 1.16 Miles .18

	BROWN TROUT	BROOK TROUT	TOTAL
Population Estimate (# in Station)	_____	<u>132</u>	_____
Density - Per mile:	_____	<u>733</u>	_____
Per acre:	_____	<u>114</u>	_____
Total Biomass (lbs/acre):	_____	<u>15.7</u>	_____
95% Confidence Interval = 0-311			

Legal Fish - (over 6")

Population Estimate (in station)	_____	_____	_____
Density - Per mile:	_____	_____	_____
Per acre:	_____	_____	_____
Biomass (lbs/acre):	_____	_____	_____
Average length (inches):	_____	_____	_____
Average weight (pounds):	_____	_____	_____
Per cent of population legal fish:	_____	_____	_____

Age Group - Fish

Population Estimate (# in station):	_____	_____	_____
Density - Per mile:	_____	_____	_____
Per acre:	_____	_____	_____
Biomass: (lbs/acre)	_____	_____	_____
Average length (inches)	_____	_____	_____
Average weight (pounds)	_____	_____	_____
Per cent of population age group	_____	_____	_____

STATION FISH SAMPLING SUMMARY  
FORM 3600-57

DEPARTMENT OF NATURAL RESOURCES

STREAM Mid. Br. Embarrass				INVESTIGATOR Meyers, Boyd, Brum		
Area sampled:	LENGTH 950 ft.	WIDTH 53 ft.	AREA (ACRES) 1.16	STATION NO. PE 30	NO. PER ACRE	DATE 9/4/73

SIZE RANGE	Brook trout		SPECIES				Avg. Standing	
	1st Run	M	2nd Run	C	Recaps	R	PE = $N = \frac{M(C+1)}{(R+1)}$	Wt. Crop
0 - 1.4								
0.5 - 1.9								
0 - 2.4								
0.5 - 2.9								
0 - 3.4								
0.5 - 3.9								
0 - 4.4								
0.5 - 4.9								
0 - 5.4								
0.5 - 5.9								
0 - 6.4								
0.5 - 6.9		11			1		132	64 8448
0 - 7.4								
0.5 - 7.9			23					
0 - 8.4								
0.5 - 8.9								
0 - 9.4								
0.5 - 9.9								
0 - 10.4								
0.5 - 10.9								
0 - 11.4								
0.5 - 11.9								
0 - 12.4								
0.5 - 12.9								
0 - 13.4								
0.5 - 13.9								
0 - 14.4								
0.5 - 14.9								
0 - 15.4								
0.5 - 15.9								
0 - 16.4								
0.5 - 16.9								
0 - 17.4								
0.5 - 17.9								
0 - 18.4								
0.5 - 18.9								
0 - 19.4								
0.5 - 19.9								
0 - 20.4								
0.5 - 20.9								
0 - 21.4								
0.5 - 21.9								
0 - 22.4								
0.5 - 22.9								
0 - 23.4								
0.5 - 23.9								
0 - 24.4								
0.5 - 24.9								
+ (give actual size)								

Biomass: 15.7 lbs/acre

$$V(\hat{n}) = \frac{(\hat{N})^2 (C-R)}{(C+1)(R+1)}$$

$$V(\hat{n}) = 7986$$

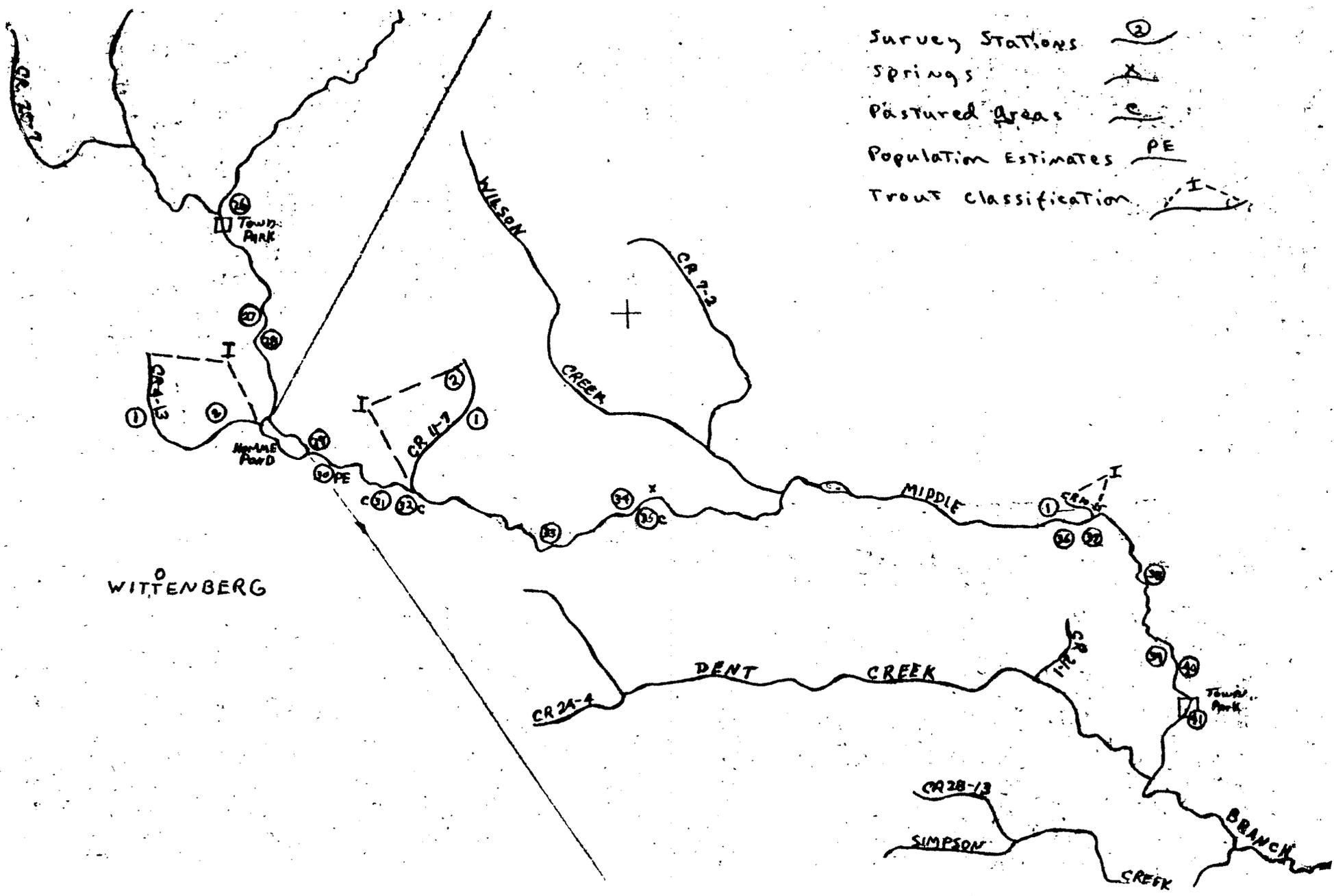
Efficiency = 1/23 = 4%

$$95\% \text{ C.L.} = \hat{N} \pm 2\sqrt{V(\hat{n})}$$

$$95\% \text{ C.L.} = 0 - 311$$

TOTAL

Survey Stations ②  
 Springs X  
 Pastured Areas c  
 Population Estimates PE  
 Trout Classification I



ELAND

I-25

APPENDIX II

Habitat and Macroinvertebrate Data  
Middle Branch Embarrass River, 1985

## CORRESPONDENCE/MEMORANDUM

STATE OF WISCONSIN

Date: October 18, 1985

File Ref: 3600

To: Tim Doelger

From: Ross Langhurst *R Langhurst*

Subject: Trout Stream Classification - Middle Branch Embarrass River

The entire length of the Middle Branch Embarrass River from Homme Pond to Caroline is Class II Trout Stream.

More specifically, Section 11, Tn. 27N, R11E, is stocked annually with brown trout. A small population of brook trout is also present.

RL:ds

Panic Park  
 First Replicate  
 Middle Branch Embarass

10/29/85

	<u>Number of Individuals</u>	<u>Rank</u>	<u>Score</u>
Ephemeroptera Heptagenidae <i>S. vicarium</i>	1	1	1
Ephemeroptera Heptagenidae <i>S. mediopunctatum</i>	1	2	2
Coleoptera Elmidae <i>Optioservus</i> larvae	55	2	110
Amphipoda <i>Gammarus Pseudolimneus</i>	3	2	6
Trichoptera Helicopsychidae <i>Heliocopsyche</i>	10	2	20
Plecoptera Perlidae <i>Paragnetina media</i>	1	1	1
Trichoptera Psychomyiidae <i>Psychomyia flavida</i>	2	2	4
Diptera Tipulidae <i>Antocha</i> spp.	3	2	6
Diptera Tipulidae <i>Hexatoma</i> spp.	1	3	3
Ephemeroptera Ephemeridae <i>Ephemera</i>	1	1	1
Trichoptera Hydropsychidae <i>S. bifida</i>	5	3	15
Trichoptera Hydropsychidae <i>Potamia flava</i>	9	2	18
Plecoptera <i>Taeniopteryx</i> SPP.	2	1	2
Trichoptera Hydropsychidae <i>Cheumatopsyche</i> SPP.	5	3	15
Coleoptera Elmidae <i>Stenelmis</i> larvae	3	3	9
Coleoptera Elmidae <i>Optioseruus triuittaus</i>	1	1	1
Trichoptera Hydroptilidae <i>Leucotrichia</i> spp.	1	3	3
Trichoptera Unidentified 2	2	-	-
Trichoptera Ledtoceridae <i>Ceraclea</i>	2	2	4
Diptera Chironomini <i>Lauterborniella</i>	<u>1</u>	<u>-</u>	<u>-</u>
Number of Individuals	111		225
Number of Individuals used	109		

B.I. = 2.06

Panic Park  
 Second Replicate  
 Middle Branch Embarass

10/29/85

	<u>Number of Individuals</u>	<u>Rank</u>	<u>Score</u>
Amphipida Gammarus Pseudolimneus	6	2	12
Diptera Tipulidae Antocha spp.	10	2	20
Coleoptera Optioservus larvae	45	2	90
Ephemeroptera S Mediopunctatum	5	2	10
Trichoptera Leucotrichia Dictipes	12	3	36
Trichoptera Psychomyia Flavida	6	2	12
Trichoptera Hydropsychidae Cheumatopsyche	4	3	12
Trichoptera Hydropsychidae S. bificia	6	3	18
Coleoptera Elmidae Stenelmis larvae	1	3	3
Trichoptera - Unidentified	3	-	-
Coleoptera Elmidae S. crenata	1	3	3
Trichoptera Hydropsychidae Potamyia	11	2	22
Plecoptera Taeniopteryx	4	1	4
Trichoptera Heliocopsyche	4	2	8
Ephemeroptera Ephemeridae Ephemera	1	1	1
Coleoptera Elmidae O. triuittatus	2	1	2
Trichoptera Obscura	1	2	2
Diptera Chironomidae Microtendipes	2	3	6
Parametriocnemus	1	3	3
Chironomini Lauterborniella	<u>1</u>	<u>-</u>	<u>-</u>
Number of Individuals	126		264
Number of Individuals used	124		

B.I. 2.12

Panic Park  
 Third Replicate  
 Middle Branch Embarass

10/29/85

	<u>Number of Individuals</u>	<u>Rank</u>	<u>Score</u>
Ephemeroptera Heptageniidae S. femortum	2	3	6
Coleoptera Elmidae O. larvae	65	2	130
Trichoptera Psychomyiidae Psychomyia flavida	3	2	6
Coleoptera Elmidae Stenelmis larvae	6	3	18
Diptera Tipulidae Antocha	5	2	10
Ephemeroptera Heptageniidae S. mediopunctatum	3	2	6
Trichoptera Hydropsychidae Potamyia	5	2	10
Diptera Ceratopogonidae Monochela spp.	1	3	3
Plecoptera Taeniopterygidae Taeniopteryx spp.	2	1	2
Trichoptera Philopotamidae C. obscura	2	2	4
Trichoptera Hydroptilidae Leucotrichia spp.	7	3	21
Trichoptera Helicopsychidae H. borealis	8	2	16
Amphipoda Gammarus Pseudolympneus	5	2	10
Trichoptera Hydropsychidae Cheumatopsyche spp.	2	3	6
Trichoptera Hydropsychidae S. bifida	2	3	6
Coleoptera Elmidae O. triuittius	5	1	5
Trchoptera - Unidentified	2	-	-
Diptera Empididae	2	3	6
Diptera Microterdipes	<u>2</u>	<u>3</u>	<u>6</u>

Number of Individuals: 129  
 Number of Individuals uses: 128

271

B.I. 2.11

Middle Branch

Stream Embarrass Reach Location Panic Park Reach Score/Rating 64 Excellent

County Shawano Date 10/29/85 Evaluator Tim Deelger Classification Cold water fish

Rating Item	Category			
	Excellent	Good	Fair	Poor
Watershed Erosion	No evidence of significant erosion. Stable forest or grass land. Little potential for future erosion. <b>(8)</b>	Some erosion evident. No significant "raw" areas. Good land mgmt. practices in area. Low potential for significant erosion. 10	Moderate erosion evident. Erosion from heavy storm events obvious. Some "raw" areas. Potential for significant erosion. 14	Heavy erosion evident. Probable erosion from any run off. 16
Watershed Nonpoint Source	No evidence of significant source. Little potential for future problem. <b>(8)</b>	Some potential sources (roads, urban area, farm fields). 10	Moderate sources (small wetlands, tile fields, urban area, intense agriculture). 14	Obvious sources (major wetland drainage, high use urban or industrial area, feed lots, impoundment). 16
Bank Erosion, Failure	No evidence of significant erosion or bank failure. Little potential for future problem. <b>(4)</b>	Infrequent, small areas, mostly healed over. Some potential in extreme floods. 8	Moderate frequency and size. Some "raw" spots. Erosion potential during high flow. 16	Many eroded areas. "Raw" areas frequent along straight sections and bends. 20
Bank Vegetative Protection	90% plant density. Diverse trees, shrubs, grass. Plants healthy with apparently good root system. <b>(6)</b>	70-90% density. Fewer plant species. A few barren or thin areas. Vegetation appears generally healthy. 9	50-70% density. Dominated by grass, sparse trees and shrubs. Plant types and conditions suggest poorer soil binding. 15	<50% density. Many raw areas. Thin grass, few if any trees and shrubs. 18
Lower Bank Channel Capacity	Ample for present peak flow plus some increase. Peak flow contained. W/D ratio <7. <b>(8)</b>	Adequate. Overbank flows rare. W/D ratio 8-15. 10	Barely contains present peaks. Occasional overbank flow. W/D ratio 15-25. 14	Inadequate, overbank flow common. W/D ratio >25. 16
Lower Bank Deposition	Little or no enlargement of channel or point bars. <b>(6)</b>	Some new increase in bar formation, mostly from coarse gravel. 9	Moderate deposition of new gravel and coarse sand on old and some new bars. 15	Heavy deposits of fine material, increased bar development. 18
Bottom Scouring and Deposition	Less than 5% of the bottom affected by scouring and deposition. <b>(4)</b>	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools. 8	30-50% affected. Deposits and scour at obstructions, constrictions and bends. Some filling of pools. 16	More than 50% of the bottom changing nearly year long. Pools almost absent due to deposition. 20
Bottom Substrate/ Available Cover	Greater than 50% rubble, gravel or other stable habitat. <b>(2)</b>	30-50% rubble, gravel or other stable habitat. Adequate habitat. 7	10-30% rubble, gravel or other stable habitat. Habitat availability less than desirable. 17	Less than 10% rubble gravel or other stable habitat. Lack of habitat is obvious. 22
Avg. Depth Riffles and Runs	Cold >1' <b>(0)</b> Warm >1.5' 0	6" to 1' 6 10" to 1.5' 6	3" to 6" 18 6" to 10" 18	<3" 24 <6" 24
Avg. Depth of Pools	Cold >4' 0 Warm >5' 0	3' to 4' <b>(4)</b> 4' to 5' 6	2' to 3' 18 3' to 4' 18	<2' 24 <3' 24
Flow, at Rep. Low Flow	Cold >2 cfs <b>(0)</b> Warm >5 cfs 0	1-2 cfs 6 2-5 cfs 6	.5-1 cfs 18 1-2 cfs 18	<.5 cfs 24 <1 cfs 24
Pool/Riffle, Run/Bend Ratio (distance between riffles ÷ stream width)	6-7. Variety of habitat. Deep riffles and pools. <b>(4)</b>	7-15. Adequate depth in pools and riffles. Bends provide habitat. 8	15-25. Occasional riffle or bend. Bottom contours provide some habitat. 16	>25. Essentially a straight stream. Generally all flat water or shallow riffle. Poor habitat. 20
Aesthetics	Wilderness characteristics, outstanding natural beauty. Usually wooded or un-pastured corridor. 8	High natural beauty. Trees, historic site. Some development may be visible. <b>(10)</b>	Common setting, not offensive. Developed but uncluttered area. 14	Stream does not enhance aesthetics. Condition of stream is offensive. 16

Column Totals:

Column Scores E 50 +G 14 +F \_\_\_\_\_ +P \_\_\_\_\_ = 64 = Score

<70 = Excellent, 71-129 = Good, 130-200 = Fair, >200 = Poor

SEGMENT DATA SHEET

Treatment Plant: WITTENBERG

Segment # \_\_\_\_\_

Date: 10/29/85

Observation # \_\_\_\_\_

Recorders Int.: TD

Stake &/or Sample # \_\_\_\_\_

Distance Downstream \_\_\_\_\_ paces or feet

Time \_\_\_\_\_ pH \_\_\_\_\_

Measurement Conditions

DO 10.8 (Unit # \_\_\_\_\_)

Sun - Shade  
Riffle Run - Pool  
 Before - With - After/Dye

Temp 8 °C

% Overcast 30

% Shade 0

Est. Stream Width 50' Est. Stream Depth Ave. \_\_\_\_\_

Bottom Type ROCK, RUBBLE, SAND

	% Stream Found	Comments
SLUDGE	<u>0</u> %	Depth <u>None</u>
MUD	<u>0</u> %	Depth <u>None</u>
MACROPHYTES	<u>0</u> %	

	Scarce	Common	Abundant
- Elodea	<u>s</u>	c	a
- Potomageton	<u>s</u>	c	a
- Sagittaria	<u>s</u>	c	a
- Myriophyllum	<u>s</u>	c	a
- Vallisneria	<u>s</u>	c	a
-	<u>s</u>	c	a
-	<u>s</u>	c	a

FILAMENTOUS ALGAE	<u>0</u> %	Stream
SLIMES	<u>0</u> %	Stream
LITTER & DETRITUS	<u>5</u> %	Depth _____

Fish Observed TROUT

Land marks (major) PANIC PARK

Land Use UPLAND HARDWOOD & SWAMP

Other \_\_\_\_\_

CTH Q  
Middle Branch Embarass

10/29/85

	<u>Number of Individuals</u>	<u>Rank</u>	<u>Score</u>
Diptera Tripulidae Antocha	31	2	62
Trichoptera Hydropsychidae S. bifida	13	3	39
Odanata Gomphidae Progomphus	1	0	0
Ephemeroptera Heptageniidae S. mediopunctatum	12	2	24
Plecoptera Pieronarcyidae Pteronarchys spp.	1	1	1
Ephemeroptera Gligoneuriidae Isonychia spp.	1	2	2
Plecoptera Taeniopterygidae Taeniopteryx spp.	2	1	2
Trichoptera Psychomyiidae Psychomyia flavida	3	2	6
Trichoptera Hydropsychidae Potamyia flava	11	2	22
Trichoptera Hydroptilidae Leucotrichia pictipes	17	3	51
Amphipoda Gammarus Pseudolimneus	1	2	2
Coleoptera Elmidae S. crenata	4	3	12
Coleoptera Elmidae O. trivittatus	4	1	4
Ephemeroptera Ephemerellidae Seratella deficiens	1	1	1
Trichoptera Hydropsychidae Cheumatopsyche spp.	6	3	18
Trichoptera Philopotamidae C. obscura	3	2	6
Plecoptera Perlidae Paragnetina media	2	1	2
Coleoptera Elmidae Stenelmis larvae	1	3	3
Diptera Tipulidae Dicranota	1	2	2
Diptera Chironomidae Eukiefferiella spp.	1	2	2
Diptera Chironomidae Diamesa spp.	1	2	2
Diptera Chironomidae Cricotopus spp.	1	4	4
Diptera Chironomidae Microtendipes spp.	<u>1</u>	<u>3</u>	<u>3</u>

Total Number of individuals: 119

270

B.I. 2.26

Department of Natural Resources

Middle Branch

Reach Score/Rating 68 / Excell.

Stream Embarrass Reach Location CTH Q

Classification Cold water Fish

County Shawano Date 10/29/85 Evaluator Tim Doelger

Rating Item	Category			
	Excellent	Good	Fair	Poor
Watershed Erosion	No evidence of significant erosion. Stable forest or grass land. Little potential for future erosion. <u>8</u>	Some erosion evident. No significant "raw" areas. Good land mgmt. practices in area. Low potential for significant erosion. 10	Moderate erosion evident. Erosion from heavy storm events obvious. Some "raw" areas. Potential for significant erosion. 14	Heavy erosion evident. Probable erosion from any run off. 16
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Bank Vegetative Protection	90% plant density. Diverse trees, shrubs, grass. Plants healthy with apparently good root system. <u>6</u>	70-90% density. Fewer plant species. A few barren or thin areas. Vegetation appears generally healthy. 9	50-70% density. Dominated by grass, sparse trees and shrubs. Plant types and conditions suggest poorer soil binding. 15	<50% density. Many raw areas. Thin grass, few if any trees and shrubs. 18
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Lower Bank Deposition	Little or no enlargement of channel or point bars. <u>6</u>	Some new increase in bar formation, mostly from coarse gravel. 9	Moderate deposition of new gravel and coarse sand on old and some new bars. 15	Heavy deposits of fine material, increased bar development. 18
Bottom Scouring and Deposition	Less than 5% of the bottom affected by scouring and deposition. <u>4</u>	5-30% affected. Scour at constrictions and where grades steeper. Some deposition in pools. 8	30-50% affected. Deposits and scour at obstructions, constrictions and bends. Some filling of pools. 16	More than 50% of the bottom changing nearly year long. Pools almost absent due to deposition. 20
Bottom Substrate/Available Cover	Greater than 50% rubble, gravel or other stable habitat. <u>2</u>	30-50% rubble, gravel or other stable habitat. Adequate habitat. 7	10-30% rubble, gravel or other stable habitat. Habitat availability less than desirable. 17	Less than 10% rubble gravel or other stable habitat. Lack of habitat is obvious. 22
Avg. Depth Riffles and Runs	Cold >1'	0 6" to 1' <u>3</u>	6 3" to 6"	18 <3"
	Warm >1.5'	0 10" to 1.5'	6 6" to 10"	18 <6"
Avg. Depth of Pools	Cold >4'	0 3' to 4' <u>3</u>	6 2' to 3'	18 <2'
	Warm >5'	0 4' to 5'	6 3' to 4'	18 <3'
Flow, at Rep. Low Flow	Cold >2 cfs <u>0</u>	0 1-2 cfs	6 .5-1 cfs	18 <.5 cfs
	Warm >5 cfs	0 2-5 cfs	6 1-2 cfs	18 <1 cfs
Pool/Riffle, Run/Bend Ratio (distance between riffles + stream width)	5-7. Variety of habitat. Deep riffles and pools. <u>4</u>	7-15. Adequate depth in pools and riffles. Bends provide habitat. 8	15-25. Occasional riffle or bend. Bottom contours provide some habitat. 16	>25. Essentially a straight stream. Generally all flat water or shallow riffle. Poor habitat. 20
Aesthetics	Wilderness characteristics, outstanding natural beauty. Usually wooded or un-pastured corridor. 8	High natural beauty. Trees, historic site. Some development may be visible. <u>10</u>	Common setting, not offensive. Developed but uncluttered area. 14	Stream does not enhance aesthetics. Condition of stream is offensive. 16

Column Totals:

Column Scores E 42 + G 26 + F \_\_\_\_\_ + P \_\_\_\_\_ = 68 = Score

<70 = Excellent, 71-129 = Good, 130-200 = Fair, >200 = Poor

SEGMENT DATA SHEET

Treatment Plant: Wittenberg

Date: 10/29/85

Recorders Int.: TD

Segment # \_\_\_\_\_

Observation # \_\_\_\_\_

Stake &/or Sample # \_\_\_\_\_

Distance Downstream \_\_\_\_\_ paces or feet

Time \_\_\_\_\_ pH \_\_\_\_\_

DO 11.2 (Unit # \_\_\_\_\_)

Temp 8 °C

Measurement Conditions

Sun - Shade  
Riffle - Run - Pool  
Before - With - After/Dye

% Overcast 30

% Shade 20

Est. Stream Width 50' Est. Stream Depth 12-24"

Bottom Type ROCK, GRAVEL, BOULDERS

% Stream Found

Comments

SLUDGE 0 % Depth \_\_\_\_\_

MUD 0 % Depth \_\_\_\_\_

MACROPHYTES 0 %

	Scarce	Common	Abundant
- Elodea	s	c	a
- Potomageton	s	c	a
- Sagittaria	s	c	a
- Myriophyllum	s	c	a
- Vallisneria	s	c	a
-	s	c	a
-	s	c	a

FILAMENTOUS ALGAE 0 % Stream

SLIMES 0 % Stream

LITTER & DETRITUS 5 % Depth \_\_\_\_\_

Fish Observed \_\_\_\_\_

Land marks (major) CTH Q

Land Use AG & Woods

Other \_\_\_\_\_

APPENDIX III

Water Quality Standards NR 102, Wis. Adm. Code

## Chapter NR 102

WATER QUALITY STANDARDS FOR  
WISCONSIN SURFACE WATERS

NR 102.01	Definitions	NR 102.05	Lake Michigan and Lake Superior thermal standards
NR 102.02	Categories of standards	NR 102.06	Mississippi River thermal standards
NR 102.03	Guidelines for application of standards	NR 102.07	Review of thermal standards
NR 102.04	Enforcement		

**History:** Chapter NR 102 as it existed on September 30, 1973 was repealed and a new chapter NR 102 was created, effective October 1, 1973.

POLICY STATEMENT WITH REFERENCE TO  
CHAPTERS NR 102 TO NR 104

## Preamble

Water quality standards are statements of the characteristics of a water which must be maintained to make it suitable for specified uses. The standards, when applied to specific waters, such as a lake or stretch of river, are meaningful for achieving, maintaining or upgrading, and documenting the quality of the water. In addition to the water quality standards, other measures may be implemented to control pollution of surface waters.

The standards are based on available scientific knowledge and are the present goal. The ultimate goal shall be to permit use of all the water resources of the state for multiple purposes including aesthetic, agriculture, aquatic and wildlife, industry, potable water supply, hydro-power, navigation, and recreation.

It is the purpose of these rules to designate the uses for which the various waters of Wisconsin shall be maintained and protected; to prescribe the water quality required to sustain the designated uses; and to indicate methods to implement, achieve, and maintain the prescribed water quality. The department of natural resources will determine what must be done in each case to obtain the necessary water quality and the time schedule which may be set realistically to achieve it. As technology permits, classification of waters will be reevaluated to reflect these advances.

The Federal Water Pollution Control Act of 1965 required that each state adopt water quality criteria and a plan for applying them to interstate waters within the state. Standards for interstate waters were adopted and became effective on June 1, 1967.

Chapter 144, Stats., authorizes and directs the adopting of rules setting standards of water quality. It recognizes that different standards may be required for different waters or portions thereof. The intent is set forth: "... standards of quality shall be such as to protect the public interest, which includes the protection of the public health and welfare and the present and prospective future use of such waters for public and private water supplies, propagation of fish and aquatic life and wildlife, domestic and recreational purposes, and agricultural, commercial, industrial and other legitimate uses. In all cases where the potential uses of water are in conflict, water quality standards shall be interpreted to protect the general public interest." Standards for intrastate waters were adopted and became effective on September 1, 1968.

In establishing such standards, consideration has been given to their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial and other legitimate uses.

The objective of the Federal Water Pollution Control Act Amendments of 1972 is to restore and maintain the chemical, physical and biological integrity of the nation's waters. In order to achieve this objective, it is the national goal that the discharge of pollutants into navigable waters be eliminated by 1985. Furthermore, it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish and wildlife and provides for recreation in and on the water be achieved by July 1, 1983. The amendments further require the establishment of water quality standards for all waters consistent with the applicable requirements of the Act.

Present and possible uses of interstate waters or sections therein have been determined with respect to: municipal, industrial, cooling, irrigation, wildlife and stock water supply; tolerant, facultative and intolerant fishery; whole and partial body contact; aesthetics; hydro power, commercial shipping and waste assimilation. The standards and water use designations are subject to revisions as more data and information become available.

#### Implementation

Wisconsin legislation requires the formulating, periodic updating and carrying out of long-range comprehensive plans to guide the development, management, and protection of water resources. Statutes authorize issuance and adoption of rules with regard to available systems, and methods and means for preventing and abating water pollution. Penalties are provided for not complying with the law, rules, permits and orders. Assessments for fish damages and fines will continue to be used to curb discharges of deleterious substances and to handle intermittent pollution problems. A permit program in conformity with Section 402 (b) Federal Water Pollution Control Act Amendments of 1972 is being initiated, and when adopted will be used to implement effluent requirements and the water quality standards. Wisconsin has been systematically making pollution surveys and monitoring the surface water quality of all surface waters. Funds have been made available for this purpose.

State and federal financial assistance programs encourage municipalities to construct new or improved pollution prevention and abatement facilities. Legislation provides that industry may acquire land by condemnation for construction of waste disposal facilities. Tax laws permit writing off waste treatment plant construction costs in the year of expenditure and exemption of these facilities from real estate tax.

**NR 102.01 Definitions.** (1) "Mean tolerance level (TL<sub>m</sub>)" means the concentration of a substance at which there is a 50% mortality rate of bio-assay test organisms in a stated exposure time.

(2) "Mixing zone" means a region in which a discharge of different characteristics than the receiving water is in transit and progressively diluted from the source to the receiving system.

(3) "Natural conditions" means the normal daily and seasonal variations in climatic and atmospheric conditions, and the existing physical and chemical characteristics of a water or the course in which it flows.

(4) "Natural temperature" means the normal existing temperature of a surface water including daily and seasonal changes outside the zone of influence of any artificial inputs.

(5) "Resource management" means the application of control techniques to enhance or preserve a surface water in accordance with statutory provisions and in the general public interest.

(6) "Sanitary survey" means a thorough investigation and evaluation of a surface water including bacteriological sampling to determine the extent and cause of any bacterial contamination.

(7) "Surface waters" means all natural and artificial named and unnamed lakes and all naturally flowing streams within the boundaries of the state, but not including cooling lakes, farm ponds and facilities constructed for the treatment of wastewaters (the term waters as used in this chapter means surface waters).

(8) "Unauthorized concentrations of substances" means pollutants or other chemicals introduced into surface waters without prior permit or knowledge of the department, but not including accidental or unintentional spills.

(9) "Best practicable control technology" means that level of treatment established by the department under s. 147.04 (2)

Register, November, 1979, No. 286  
Environmental Protection

(a), Stats., for categories and classes of point sources to be achieved by not later than July 1, 1977.

(10) "Best available control technology" means that level of treatment established by the department under s. 147.04 (2) (b) 1., Stats., for categories and classes of point sources to be achieved by not later than July 1, 1983.

History: Cr. Register, September, 1973, No. 213, eff. 10-1-73.

**NR 102.02 Categories of standards.** (1) **GENERAL.** To preserve and enhance the quality of waters, standards are established to govern water management decisions. Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development or other activities shall be controlled so that all waters including the mixing zone and the effluent channel meet the following conditions at all times and under all flow conditions:

(a) Substances that will cause objectionable deposits on the shore or in the bed of a body of water, shall not be present in such amounts as to interfere with public rights in waters of the state.

(b) Floating or submerged debris, oil, scum or other material shall not be present in such amounts as to interfere with public rights in waters of the state.

(c) Materials producing color, odor, taste or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state

(d) Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.

(2) **REVISED STANDARDS.** It should be recognized that these standards will be revised as new information or advancing technology indicate that revisions are in the public interest. Water used for hydropower and commercial shipping depends mainly on quantity, depth and elevation; consequently, no specific quality standards for these uses have been prepared.

(3) **STANDARDS FOR FISH AND AQUATIC LIFE.** Except for natural conditions, all waters classified for fish and aquatic life shall meet the following criteria:

(a) Dissolved oxygen: Except for waters classified as trout streams in Wisconsin Trout Streams, Publication 213-72, the dissolved oxygen content in surface waters shall not be lowered to less than 5 mg/l at any time.

(b) Temperature: 1. There shall be no temperature changes that may adversely affect aquatic life.

2. Natural daily and seasonal temperature fluctuations shall be maintained.

3. The maximum temperature rise at the edge of the mixing zone above the existing natural temperature shall not exceed 5° F for streams and 3° F for lakes.

Register, November, 1979, No. 286  
Environmental Protection

4. The temperature shall not exceed 89° F for warm water fish.
- (c) pH: The pH shall be within the range of 6.0 to 9.0, with no change greater than 0.5 units outside the estimated natural seasonal maximum and minimum.
- (d) Unauthorized concentrations of substances are not permitted that alone or in combination with other materials present are toxic to fish or other aquatic life. The determination of the toxicity of a substance shall be based upon the available scientific data base. References to be used in determining the toxicity of a substance shall include, but not be limited to:

1. "Quality Criteria for Water". EPA-440/9-76-003. United States Environmental Protection Agency, Washington, D. C., 1976, and

2. "Water Quality Criteria 1972". EPA-R3-73-033. National Academy of Sciences, National Academy of Engineering. United States Government Printing Office, Washington, D.C., 1974.

3. Questions concerning the permissible levels, or changes in the same, of a substance, or combination of substances, of undefined toxicity to fish and other biota shall be resolved in accordance with the methods specified in "Water Quality Criteria 1972", "Standard Methods for the Examination of Water and Wastewater", 14th Edition, 1975 (American Public Health Association, New York) or other methods approved by the department of natural resources.

(e) Streams classified as trout waters by the department of natural resources (Wisconsin Trout Streams, Publication 213-72) shall not be altered from natural background by effluents that influence the stream environment to such an extent that trout populations are adversely affected.

1. There shall be no significant artificial increases in temperature where natural trout reproduction is to be protected.

2. Dissolved oxygen in classified trout streams shall not be artificially lowered to less than 6.0 mg/l at any time, nor shall the dissolved oxygen be lowered to less 7.0 mg/l during the spawning season.

3. The dissolved oxygen in great lakes tributaries used by stocked salmonids for spawning runs shall not be lowered below natural background during the period of habitation.

(4) STANDARDS FOR RECREATIONAL USE. A sanitary survey and/or evaluation to assure protection from fecal contamination is the chief criterion in determining the suitability of a surface water for recreational use. In addition, the following bacteriological guidelines are set forth:

(a) The membrane filter fecal coliform count shall not exceed 200 per 100 ml as geometric mean based on not less than 5 samples per month, nor exceed 400 per 100 ml in more than 10% of all samples during any month.

(5) STANDARDS FOR PUBLIC WATER SUPPLY. In addition to the standards for fish and aquatic life and recreational use, waters used as a public water supply shall meet the following criteria at sites where water is withdrawn for treatment and distribution as a potable water:

(a) Dissolved solids. Not to exceed 500 mg/l as a monthly average value, nor exceed 750 mg/l at any time.

(b) The intake water supply will be such that by appropriate treatment and adequate safeguards it will meet the Public Health Service Drinking Water Standards 1962.

Note: Copies of Public Health Service Drinking Water Standards, 1962 are available for inspection at the office of the department of natural resources, secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

(c) Concentrations of other constituents must not be hazardous to health.

History: Cr. Register, September, 1973, No. 213, eff. 10-1-73; am. (3), Register, December, 1977, No. 264, eff. 1-1-78.

**NR 102.03 Guidelines for application of standards.** (1) INTERPRETATION. It is the goal of the department of natural resources that, wherever attainable, surface waters in Wisconsin shall provide for the protection and propagation of fish and aquatic life and provide for recreational uses in and on the water by July 1, 1983. The surface water quality criteria and use classifications set forth herein are the standards to be achieved by July 1, 1977. In those cases where the water quality currently conforms to the criteria set forth in this chapter, such waters shall be maintained at that or a higher quality. In those cases where the criteria are not currently being met, because of inadequate waste treatment or insufficient stream flow, waste control measures must be employed to satisfy the criteria in accordance with the stated objectives. This includes treatment better than best practicable control technology where required to meet the criteria. At this time, variances are provided from the surface water quality criteria where existing conditions (natural background, combined sewers, sludge banks, insufficient stream flow, etc.) are such that the criteria may not be met by applying technology beyond best practicable treatment. It is anticipated that the application of best available control technology will achieve the 1983 water quality goals of the department in all surface waters. If the 1983 water quality goal cannot be achieved by the application of the best available control technology, more stringent control measures may be required to attain and maintain the stated criteria without variance. However, if it is determined that there is no reasonable relationship between the economic and social cost of achieving such limitations, including any economic and social dislocation in any affected community or communities, and the social and economic benefits to be obtained by achieving such water quality, variances from the 1983 water quality criteria goal shall be provided.

(2) ANTIDegradation. No waters of the state shall be lowered in quality unless it has been affirmatively demonstrated to the department that such a change is justified as a result of necessary economic and social development, provided that no new or increased effluent interferes with or becomes injurious to any assigned uses made of or presently possible in such waters.

(3) STREAMFLOW. Water quality standards will not be maintained under all natural occurrences of flow, temperature or other water quality characteristics. The design of water quality related effluent limitations or other management practices shall be based upon:

Register, August, 1981, No. 308  
Environmental Protection

Register, October, 1978, No. 288  
Environmental Protection

Register, November, 1979, No. 286  
Environmental Protection

## Chapter NR 102

WATER QUALITY STANDARDS FOR  
WISCONSIN SURFACE WATERS

NR 102.01	Definitions	NR 102.05	Lake Michigan and Lake Superior thermal standards
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**History:** Chapter NR 102 as it existed on September 30, 1973 was repealed and a new chapter NR 102 was created, effective October 1, 1973.

POLICY STATEMENT WITH REFERENCE TO  
CHAPTERS NR 102 TO NR 104

## Preamble

Water quality standards are statements of the characteristics of a water which must be maintained to make it suitable for specified uses. The standards, when applied to specific waters, such as a lake or stretch of river, are meaningful for achieving, maintaining or upgrading, and documenting the quality of the water. In addition to the water quality standards, other measures may be implemented to control pollution of surface waters.

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It is the purpose of these rules to designate the uses for which the various waters of Wisconsin shall be maintained and protected; to prescribe the water quality required to sustain the designated uses; and to indicate methods to implement, achieve, and maintain the prescribed water quality. The department of natural resources will determine what must be done in each case to obtain the necessary water quality and the time schedule which may be set realistically to achieve it. As technology permits, classification of waters will be reevaluated to reflect these advances.

The Federal Water Pollution Control Act of 1965 required that each state adopt water quality criteria and a plan for applying them to interstate waters within the state. Standards for interstate waters were adopted and became effective on June 1, 1967.

Chapter 144, Stats., authorizes and directs the adopting of rules setting standards of water quality. It recognizes that different standards may be required for different waters or portions thereof. The intent is set forth: "... standards of quality shall be such as to protect the public interest, which includes the protection of the public health and welfare and the present and prospective future use of such waters for public and private water supplies, propagation of fish and aquatic life and wildlife, domestic and recreational purposes, and agricultural, commercial, industrial and other legitimate uses. In all cases where the potential uses of water are in conflict, water quality standards shall be interpreted to protect the general public interest." Standards for intrastate waters were adopted and became effective on September 1, 1968.

In establishing such standards, consideration has been given to their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial and other legitimate uses.

The objective of the Federal Water Pollution Control Act Amendments of 1972 is to restore and maintain the chemical, physical and biological integrity of the nation's waters. In order to achieve this objective, it is the national goal that the discharge of pollutants into navigable waters be eliminated by 1985. Furthermore, it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish and wildlife and provides for recreation in and on the water be achieved by July 1, 1983. The amendments further require the establishment of water quality standards for all waters consistent with the applicable requirements of the Act.

Present and possible uses of interstate waters or sections therein have been determined with respect to: municipal, industrial, cooling, irrigation, wildlife and stock water supply; tolerant, facultative and intolerant fishery; whole and partial body contact; aesthetics; hydro power, commercial shipping and waste assimilation. The standards and water use designations are subject to revisions as more data and information become available.

#### Implementation

Wisconsin legislation requires the formulating, periodic updating and carrying out of long-range comprehensive plans to guide the development, management, and protection of water resources. Statutes authorize issuance and adoption of rules with regard to available systems, and methods and means for preventing and abating water pollution. Penalties are provided for not complying with the law, rules, permits and orders. Assessments for fish damages and fines will continue to be used to curb discharges of deleterious substances and to handle intermittent pollution problems. A permit program in conformity with Section 402 (b) Federal Water Pollution Control Act Amendments of 1972 is being initiated, and when adopted will be used to implement effluent requirements and the water quality standards. Wisconsin has been systematically making pollution surveys and monitoring the surface water quality of all surface waters. Funds have been made available for this purpose.

State and federal financial assistance programs encourage municipalities to construct new or improved pollution prevention and abatement facilities. Legislation provides that industry may acquire land by condemnation for construction of waste disposal facilities. Tax laws permit writing off waste treatment plant construction costs in the year of expenditure and exemption of these facilities from real estate tax.

**NR 102.01 Definitions.** (1) "Mean tolerance level (TL<sub>m</sub>)" means the concentration of a substance at which there is a 50% mortality rate of bio-assay test organisms in a stated exposure time.

(2) "Mixing zone" means a region in which a discharge of different characteristics than the receiving water is in transit and progressively diluted from the source to the receiving system.

(3) "Natural conditions" means the normal daily and seasonal variations in climatic and atmospheric conditions, and the existing physical and chemical characteristics of a water or the course in which it flows.

(4) "Natural temperature" means the normal existing temperature of a surface water including daily and seasonal changes outside the zone of influence of any artificial inputs.

(5) "Resource management" means the application of control techniques to enhance or preserve a surface water in accordance with statutory provisions and in the general public interest.

(6) "Sanitary survey" means a thorough investigation and evaluation of a surface water including bacteriological sampling to determine the extent and cause of any bacterial contamination.

(7) "Surface waters" means all natural and artificial named and unnamed lakes and all naturally flowing streams within the boundaries of the state, but not including cooling lakes, farm ponds and facilities constructed for the treatment of wastewaters (the term waters as used in this chapter means surface waters).

(8) "Unauthorized concentrations of substances" means pollutants or other chemicals introduced into surface waters without prior permit or knowledge of the department, but not including accidental or unintentional spills.

(9) "Best practicable control technology" means that level of treatment established by the department under s. 147.04 (2)

(a), Stats., for categories and classes of point sources to be achieved by not later than July 1, 1977.

(10) "Best available control technology" means that level of treatment established by the department under s. 147.04 (2) (b) 1., Stats., for categories and classes of point sources to be achieved by not later than July 1, 1983.

History: Cr. Register, September, 1973, No. 213, eff. 10-1-73.

**NR 102.02 Categories of standards.** (1) **GENERAL.** To preserve and enhance the quality of waters, standards are established to govern water management decisions. Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development or other activities shall be controlled so that all waters including the mixing zone and the effluent channel meet the following conditions at all times and under all flow conditions:

(a) Substances that will cause objectionable deposits on the shore or in the bed of a body of water, shall not be present in such amounts as to interfere with public rights in waters of the state.

(b) Floating or submerged debris, oil, scum or other material shall not be present in such amounts as to interfere with public rights in waters of the state.

(c) Materials producing color, odor, taste or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state

(d) Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.

(2) **REVISED STANDARDS.** It should be recognized that these standards will be revised as new information or advancing technology indicate that revisions are in the public interest. Water used for hydropower and commercial shipping depends mainly on quantity, depth and elevation; consequently, no specific quality standards for these uses have been prepared.

(3) **STANDARDS FOR FISH AND AQUATIC LIFE.** Except for natural conditions, all waters classified for fish and aquatic life shall meet the following criteria:

(a) Dissolved oxygen: Except for waters classified as trout streams in Wisconsin Trout Streams, Publication 213-72, the dissolved oxygen content in surface waters shall not be lowered to less than 5 mg/l at any time.

(b) Temperature: 1. There shall be no temperature changes that may adversely affect aquatic life.

2. Natural daily and seasonal temperature fluctuations shall be maintained.

3. The maximum temperature rise at the edge of the mixing zone above the existing natural temperature shall not exceed 5° F for streams and 3° F for lakes.

4. The temperature shall not exceed 89° F for warm water fish.

(c) pH: The pH shall be within the range of 6.0 to 9.0, with no change greater than 0.5 units outside the estimated natural seasonal maximum and minimum.

(d) Unauthorized concentrations of substances are not permitted that alone or in combination with other materials present are toxic to fish or other aquatic life. The determination of the toxicity of a substance shall be based upon the available scientific data base. References to be used in determining the toxicity of a substance shall include, but not be limited to:

1. "Quality Criteria for Water". EPA-440/9-76-003. United States Environmental Protection Agency, Washington, D. C., 1976, and

2. "Water Quality Criteria 1972". EPA-R3-73-033. National Academy of Sciences, National Academy of Engineering. United States Government Printing Office, Washington, D.C., 1974.

3. Questions concerning the permissible levels, or changes in the same, of a substance, or combination of substances, of undefined toxicity to fish and other biota shall be resolved in accordance with the methods specified in "Water Quality Criteria 1972", "Standard Methods for the Examination of Water and Wastewater", 14th Edition, 1975 (American Public Health Association, New York) or other methods approved by the department of natural resources.

(e) Streams classified as trout waters by the department of natural resources (Wisconsin Trout Streams, Publication 213-72) shall not be altered from natural background by effluents that influence the stream environment to such an extent that trout populations are adversely affected.

1. There shall be no significant artificial increases in temperature where natural trout reproduction is to be protected.

2. Dissolved oxygen in classified trout streams shall not be artificially lowered to less than 6.0 mg/l at any time, nor shall the dissolved oxygen be lowered to less 7.0 mg/l during the spawning season.

3. The dissolved oxygen in great lakes tributaries used by stocked salmonids for spawning runs shall not be lowered below natural background during the period of habitation.

(4) STANDARDS FOR RECREATIONAL USE. A sanitary survey and/or evaluation to assure protection from fecal contamination is the chief criterion in determining the suitability of a surface water for recreational use. In addition, the following bacteriological guidelines are set forth:

(a) The membrane filter fecal coliform count shall not exceed 200 per 100 ml as geometric mean based on not less than 5 samples per month, nor exceed 400 per 100 ml in more than 10% of all samples during any month.

(5) STANDARDS FOR PUBLIC WATER SUPPLY. In addition to the standards for fish and aquatic life and recreational use, waters used as a public water supply shall meet the following criteria at sites where water is withdrawn for treatment and distribution as a potable water:

(a) Dissolved solids. Not to exceed 500 mg/l as a monthly average value, nor exceed 750 mg/l at any time.

(b) The intake water supply will be such that by appropriate treatment and adequate safeguards it will meet the Public Health Service Drinking Water Standards 1962.

Note: Copies of Public Health Service Drinking Water Standards, 1962 are available for inspection at the office of the department of natural resources, secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

(c) Concentrations of other constituents must not be hazardous to health.

History: Cr. Register, September, 1973, No. 213, eff. 10-1-73; am. (3), Register, December, 1977, No. 264, eff. 1-1-78.

**NR 102.03 Guidelines for application of standards.** (1) INTERPRETATION. It is the goal of the department of natural resources that, wherever attainable, surface waters in Wisconsin shall provide for the protection and propagation of fish and aquatic life and provide for recreational uses in and on the water by July 1, 1983. The surface water quality criteria and use classifications set forth herein are the standards to be achieved by July 1, 1977. In those cases where the water quality currently conforms to the criteria set forth in this chapter, such waters shall be maintained at that or a higher quality. In those cases where the criteria are not currently being met, because of inadequate waste treatment or insufficient stream flow, waste control measures must be employed to satisfy the criteria in accordance with the stated objectives. This includes treatment better than best practicable control technology where required to meet the criteria. At this time, variances are provided from the surface water quality criteria where existing conditions (natural background, combined sewers, sludge banks, insufficient stream flow, etc.) are such that the criteria may not be met by applying technology beyond best practicable treatment. It is anticipated that the application of best available control technology will achieve the 1983 water quality goals of the department in all surface waters. If the 1983 water quality goal cannot be achieved by the application of the best available control technology, more stringent control measures may be required to attain and maintain the stated criteria without variance. However, if it is determined that there is no reasonable relationship between the economic and social cost of achieving such limitations, including any economic and social dislocation in any affected community or communities, and the social and economic benefits to be obtained by achieving such water quality, variances from the 1983 water quality criteria goal shall be provided.

(2) ANTIDegradation. No waters of the state shall be lowered in quality unless it has been affirmatively demonstrated to the department that such a change is justified as a result of necessary economic and social development, provided that no new or increased effluent interferes with or becomes injurious to any assigned uses made of or presently possible in such waters.

(3) STREAMFLOW. Water quality standards will not be maintained under all natural occurrences of flow, temperature or other water quality characteristics. The design of water quality related effluent limitations or other management practices shall be based upon:

Register, August, 1981, No. 308  
Environmental protection

Register, October, 1978, No. 288

Environmental protection

Register, November, 1979, No. 286  
Environmental Protection

(a) The average minimum 7-day low streamflow which occurs once in 10 years (7-day  $Q_{10}$ ); or,

(b) In the case of dissolved oxygen and wherever sufficient data on streamflow and temperature are available, by application of a 0.274% level of nonattainment. This is equivalent to an expected nonattainment of the dissolved oxygen criterion of one day per year.

(4) **MIXING ZONES.** Water quality standards must be met at every point outside of a mixing zone. The size of the mixing zone cannot be uniformly prescribed, but shall be based on such factors as effluent quality and quantity, available dilution, temperature, current, type of outfall, channel configuration and restrictions to fish movement. As a guide to the delineation of a mixing zone, the following shall be taken into consideration:

(a) Limiting mixing zones to as small an area as practicable, and conforming to the time exposure responses of aquatic life.

(b) Providing passageways in rivers for fish and other mobile aquatic organisms.

(c) Where possible, mixing zones being no larger than 25% of the cross-sectional area or volume of flow of the stream and not extending more than 50% of the width.

(d) For contaminants other than heat, the 96-hour  $TL_m$  to indigenous fish and fish food organisms not being exceeded at any point in the mixing zone.

(e) Mixing zones not exceeding 10% of a lake's total surface area.

(f) Mixing zones not interfering with spawning or nursery areas, migratory routes, nor mouths of tributary streams.

(g) Mixing zones not overlapping, but where they do, taking measures to prevent adverse synergistic effects.

(5) **EXEMPTIONS.** The thermal mixing zone provisions of this chapter are not applicable to municipal waste and water treatment plants, to vessels, or to discharges to enclosed harbors.

(6) **RESOURCE MANAGEMENT EXEMPTIONS.** Application of chemicals for water resource management purposes in accordance with statutory provisions is not subject to the requirements of the standards except in case of water used for public water supply.

(7) **ANALYTICAL PROCEDURES.** Methods of sample preservation and analysis shall conform with "Standard Methods for the Examination of Water and Wastewater", 13th Edition, 1971, prepared and edited by the American Public Health Association, American Waterworks Association and Water Pollution Control Federation, or by other methods acceptable to the department of natural resources and not contrary to the requirements of the federal government. The criteria in the Radiation Protection Code, s. H 57.15 Wis. Adm. Code shall apply to the disposal and permissible concentrations of radioactive substances.

Note: Copies of the above publications are available for inspection at the office of the department of natural resources, secretary of state's office and the office of the revisor of

Register, August, 1981, No. 308  
Environmental protection

statutes, and may be obtained for personal use from American Public Health Association, Inc., 1790 Broadway, New York, N.Y. 10019.

History: Cr. Register, September, 1973, No. 213, eff. 10-1-73; renum. (5) and (6) to be (6) and (7), cr. (5), Register, July, 1975, No. 235, eff. 8-1-75; r. and rev. (3), Register, August, 1981, No. 308, eff. 9-1-81.

**NR 102.04 Enforcement.** Financial assistance, industrial incentives, increased surveillance, orders, and permits will be means used to achieve and maintain the adopted water quality standards. Reasonable time schedules to comply with orders and permit conditions depend on the circumstances. All municipal sewage treatment plants shall provide a minimum of secondary treatment and effluent disinfection. Communities with a population of 2,500 and over in the Lakes Michigan and Superior basins shall achieve an 85% reduction of phosphorus on an annual basis, and there shall be a commensurate removal from industrial wastes containing more than 2 mg/l of total phosphorus and having an annual phosphorus discharge greater than 8,750 pounds. Any wastewater discharger—regardless of population, volume or type of waste discharge, or geographic location—may be required to remove excess amounts of phosphorus where such discharges are causing overfertilization of surface waters. A permit program is being initiated in accordance with the Federal Water Pollution Control Act Amendments of 1972 regarding treatment and monitoring requirements for waste discharges to waters of the state. All industrial plants discharging wastes to surface waters are required to provide, as a minimum, an effluent quality established in accordance with the Federal Water Pollution Control Act Amendments of 1972.

History: Cr. Register, July, 1975, No. 235, eff. 8-1-75.

**NR 102.05 Lake Michigan and Lake Superior thermal standards.** For Lake Michigan and Lake Superior the following thermal standards are established so as to minimize effects on the aquatic biota in the receiving waters.

(1) (a) Thermal discharges shall not raise the receiving water temperature more than 3°F above the existing natural temperature at the boundary of mixing zones established in paragraphs (b) and (c).

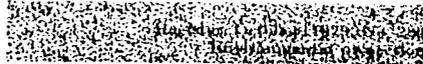
(b) 1. The mixing zone for a shoreline thermal discharge shall be the area included within the perimeter of a rectangular figure extending 1,250 feet in both directions along the shoreline from the outfall and 1,250 feet into the lake.

2. The mixing zone for an offshore thermal discharge shall be the area within a 1,000-foot radius circle with its center at the point of discharge.

(c) The department may, upon request from the owner of a source of thermal discharge, adjust the boundaries of the mixing zone established in paragraph (b) for that source. In no case may any mixing zone so established include an area greater than 72 acres nor may it include more than 2,800 feet of shoreline.

(2) In addition to the limitation set forth in subsection (1), but excepting the Milwaukee Harbor, Port Washington Harbor and the mouth of the Fox River, thermal discharges to Lake Michigan shall not raise the temperature of the receiving waters at the boundary of the established mixing zone above the following limits:

January	----- 45°F	June	----- 70°
February	----- 45°	July	----- 80°
March	----- 45°	August	----- 80°
April	----- 55°	September	----- 80°
May	----- 60°	October	----- 65°



III  
-5-

November ..... 60°      December ..... 50°

History: Cr. Register, September, 1973, No. 213, eff. 10-1-73; r. and rec. Register, July, 1975, No. 243, eff. 8-1-75.

NR 102.06 Mississippi river thermal standards. In addition to the standards for fish and aquatic life, the monthly average of the maximum daily temperature in the Mississippi river outside the mixing zone shall not exceed the following limits:

January.....	40°F	July.....	84°
February.....	40°	August.....	84°
March.....	54°	September.....	82°
April.....	65°	October.....	73°
May.....	75°	November.....	58°
June.....	84°	December.....	48°

History: Cr. Register, July, 1975, No. 235, eff. 8-1-75.

NR 102.07 Review of thermal standards. (1) Whenever the owner of any source of thermal discharges that existed on or before July 31, 1975, in compliance with department guidelines and after opportunity for public hearing, can demonstrate to the satisfaction of the department that the mixing zone established pursuant to this chapter is more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the receiving water, the department may:

(a) Impose a mixing zone with respect to such thermal discharge that will assure the protection and propagation of such a population, or

(b) Exempt such thermal discharge from the thermal requirements of this chapter provided this exemption will not endanger the propagation of such a population.

(2) Any owner desiring a review pursuant to NR 102.07 (1) shall submit a demonstration to the department no later than June 30, 1976. The department shall reach a decision no later than December 31, 1976.

(3) In the event the owner fails to make a satisfactory demonstration pursuant to NR 102.07 (1), the department shall establish a compliance date for the thermal component to be achieved no later than July 1, 1979.

(4) Whenever the owner of any source of thermal discharges that commenced on or after August 1, 1975, in compliance with department guidelines and after opportunity for public hearing, can demonstrate to the satisfaction of the department that the mixing zone established pursuant to this chapter is more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the receiving water, the department may:

(a) Impose a mixing zone with respect to such thermal discharge that will assure the protection and propagation of such a population, or

(b) Exempt such thermal discharge from the thermal requirements of this chapter provided this exemption will not endanger the propagation of such a population.

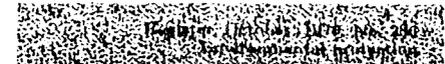


(5) In the event an owner fails to make a satisfactory demonstration pursuant to NR 102.07 (4), the discharge shall be in compliance with the thermal requirements of this chapter upon commencement of the discharge.

(6) The department may require the reduction of thermal discharges or the size and configuration of a mixing zone if it finds that environmental damage is imminent or existent.

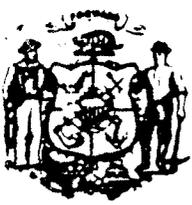
History: Cr. Register, July, 1975, No. 235, eff. 8-1-75; am. Register, February, 1977, No. 254, eff. 3-1-77.

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APPENDIX IV

Effluent Limits for Village of Wittenberg



NOV 20 1984

Carroll D. Basadny  
Secretary

BOX 7921  
MADISON, WISCONSIN 53707

November 27, 1984

IN REPLY REFER TO: 3200

Mr. Don Pirrung  
Donohue & Associates, Inc.  
4738 North 40th Street  
Sheboygan, WI 53081

RE: Streamflow-related Effluent Limitations for the Village of Wittenberg

Dear Mr. Pirrung:

This is in response to your request for streamflow-related effluent limitations for a discharge from the Village of Wittenberg to the Middle Branch of the Embarrass River in NW 1/4, Section 11, T27N - R11E. Effluent limitations on a discharge to this location were given in a letter to Phil Stecker dated October 18, 1983 for 7Q10 low flow conditions. Those limits are as follows:

<u>Parameter</u>	<u>Summer (May-Oct)</u>	<u>Winter (Nov-Apr)</u>
BOD5 & TSS: (Weekly Ave.)	41 mg/l	45 mg/l
(Monthly Ave.)	30-27 mg/l	30 mg/l
NH3-N (Weekly Ave.)	4 mg/l	21 mg/l
pH range	6-9	6-9
DO (minimum)	7 mg/l	no limit

Effluent and stream parameters used in calculating these limits are as follows:

- STP design flow = .245 mgd = .38 cfs
- 7Q10 = 6.3 cfs (Class II trout stream)
- Temperature = 25°C summer, 5°C winter
- Upstream pH = 8.0
- Upstream NH3-N = 0.1 mg/l

As a guide in establishing ranges of streamflows for Wittenberg's effluent limits, ten-year mean monthly low flows (MMQ10) were obtained from USGS for the Middle Branch during May through October:

<u>Month</u>	<u>MMQ10 (cfs)</u>	<u>Month</u>	<u>MMQ10 (cfs)</u>
May	52	Aug.	25
June	44	Sept.	26
July	30	Oct.	29

Stream flow-related effluent limits will not be given for November through April because the BOD<sub>5</sub> and TSS limits will remain at 30 mg/l monthly and 45 mg/l weekly average in accordance with chapter NR 210, Wis. Adm. Code, and because the NH<sub>3</sub>-N limit of 21 mg/l is already relatively high at 7Q<sub>10</sub> flow. Therefore, the May-October limits will be given such that the least stringent NH<sub>3</sub>-N limit will be equivalent to the 21 mg/l winter limit.

Using the effluent and stream parameters presented earlier, two critical streamflow conditions were calculated at the 25°C summer temperature. First, a streamflow of 7 cfs or more in the river is necessary for the "secondary" BOD<sub>5</sub> and TSS limits to apply for Wittenberg at 25°C, a flow slightly above 7Q<sub>10</sub> and well below all summer MMQ<sub>10</sub> values. Second, a streamflow of approximately 42 cfs is necessary for a summer NH<sub>3</sub>-N limit of 21 mg/l at 25°C.

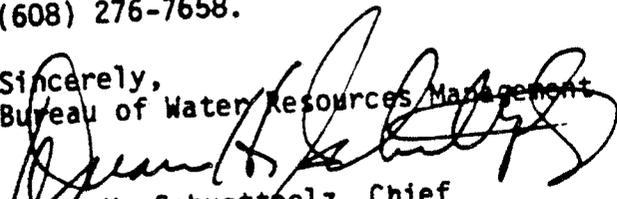
The effects of stream temperature and effluent pH on Wittenberg's NH<sub>3</sub>-N limit have also been studied. Temperature does have some effect on NH<sub>3</sub>-N, so streamflow-related effluent limits will be supplied at temperatures of 20 and 25°C to represent the warmest temperatures expected to occur in typical trout streams. However, because the streamflows are so much greater than the Wittenberg STP design flow (7 to 42 cfs vs. 0.38 cfs), effluent pH has a minimal impact on the downstream pH of which the NH<sub>3</sub>-N limit is indirectly based. Therefore, pH-related effluent limits do not need to be calculated.

Streamflow Range (cfs)	NH <sub>3</sub> -N Limit Ave. (mg/l)	
	@ 25°C	@ 20°C
6.3 - 6.9	4 *	5
7.0 - 9.9	4	6
10.0 - 17.9	5	9
18.0 - 25.9	9	15
26.0 - 33.9	13	21
34.0 - 42.9	17	21
42.0 and up	21	21

\* In this case, limits on BOD<sub>5</sub>, TSS, pH and DO are the same as presented in the October 18, 1983 letter and on page 1 of this letter. At all other situations presented here, the BOD<sub>5</sub> and TSS limits are 30 mg/l monthly average and 45 mg/l weekly average, and the daily pH range limit is 6.0 to 9.0. No dissolved oxygen limit is necessary. In all cases, dechlorination is required because of the sensitivity of cold water fish species to residual chlorine.

If you have any further questions, please contact Jim Schmidt at (608) 276-7658.

Sincerely,  
Bureau of Water Resources Management

  
Marie H. Schuettpelz, Chief  
Surface Water Standards & Monitoring Section

DHS:hf/46120

cc: Jim Doelger, L. Michigan District - Green Bay  
MMW/2 (G. Novotny)

Procedure for Calculating Effluent Limits for  
Wittenberg to the Middle Branch Embarrass River

Effluent limits determined for Wittenberg in 1983 were based on a continuous discharge to the Middle Branch using the  $Q_{7,10}$  of 6.3 cfs. The 26 pound rule and the un-ionized ammonia standard for trout streams were used to calculate the  $BOD_5$  limits of 41 mg/l weekly average summer and secondary in winter and the  $NH_3-N$  limits of 4 mg/l summer and 21 mg/l winter.

Subsequently, in November 1984 the consultant requested flow-related limits for  $NH_3-N$  in summer because the 4 mg/l limit may not be met at all times in May-October. Since the mean monthly low flows in summer varied from 25-52 cfs, and were therefore large enough compared to the  $Q_{7,10}$  to warrant variations in the  $NH_3-N$  limit. Based on the toxicity of un-ionized ammonia to coldwater species, at streamflows of 42 cfs and greater, the  $NH_3-N$  limit would be at least 21 mg/l. It was not necessary to evaluate streamflows resulting in higher limits because the consultant was confident 21 mg/l  $NH_3-N$  could regularly be met at Wittenberg. As a result, there was no need to evaluate streamflow-related  $NH_3-N$  limits in winter.

Because of the variation in streamflow,  $BOD_5$  and TSS limits were also evaluated. In most cases, though, the secondary limits were controlling according to the 26 pound rule. In winter, the limits were always secondary because they were secondary at  $Q_{7,10}$  flows. In summer, though, the limits are slightly more stringent than secondary at the  $Q_{7,10}$  flow of 6.3 cfs. At 7.0 cfs streamflow or higher, secondary limits are adequate for Wittenberg in summer. Because the lowest mean monthly 10-year low flow in summer is 25 cfs (August), it is highly unlikely that Wittenberg will ever find it necessary to meet limits more stringent than secondary. As a result, Wittenberg should be considered to have 30 mg/l monthly average and 45 mg/l weekly average  $BOD_5$  and TSS limits year-round.

JB:bm

## CORRESPONDENCE/MEMORANDUM

December 23, 1983

File Re 8200

To: → Central Office - Madison

(Jim Schmidt)

From: Tim Doelger



Subject: Wittenburg

On December 7, 1983 Bruce Oman (Marinette Area), Al Stranz (LMD Environmental Impact) and myself visited Wittenburg. The purpose of the visit was to evaluate a wetland that is being proposed as a discharge site for the Village, and more specifically to locate, trace, and assess the quality of a tributary to Tiger Creek.

I have attached a USGS map with the seepage cell and the main tributary shown in red. There are two smaller tributaries also marked. The main tributary is approximately eight feet wide and six inches to one foot deep. The bottom is composed mainly of small gravel and sand. There are numerous undercut banks, deep holes, and riffles. Much of the creek was open water indicating good flows which we estimated at 1.5-2 cfs. Al Stranz and Bruce Oman followed the creek upstream to its origin which is a small spring pond approximately 250 yards southeast of the seepage cells. I followed the two smaller tributaries upstream until they became diffused surface water about 200 yards south of the seepage cells.

Fish were observed in the main tributary and local inquiries were made which indicated that it does contain trout. Progressing from south to north towards the seepage cells, the vegetation changes from swamp hardwood and conifers to cedars, to a mixture of marsh grasses, willow brush and alders. All of the area directly to the south of the seepage cells is wet.

Since there is a high probability that this tributary contains a trout population and appears fragile in nature, I would recommend low limits; but since it also has the benefit of being spring fed and fairly well buffered by the adjacent marsh, I don't believe that the limits need to be as low as they are in the present situation with Tiger Creek.

I think with three precautions, that 10-10 limits would protect this resource and be achievable. The precautions are: Directing the discharge to the southwest corner of the seepage cells which is farthest from the creek, pursuing the possibility of spray irrigation during the summer months when BOD<sub>5</sub> and solids are the highest, and discharging through some kind of diffuser pipe to prevent channelization.

To: Jim Schmidt - December 23, 1983

You should be aware that professional judgement was the only tool available to base these recommendations on. Pressure for a timely decision during the winter season eliminated fisheries, chemical and biological inputs which would give further weight to this decision.

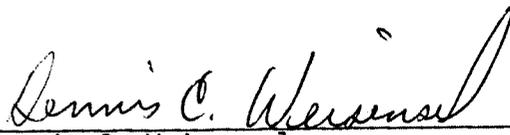
It is my opinion that a discharge to this marsh, while being the best option at this time, is not necessarily the best long term solution. Questions still remain as to possible flooding of the road, ground water contamination, habitat changes, and the unknown capacity of the marsh to retain, absorb and filter the effluent.

It is also my opinion that the best long term solution to these questions would be to relocate or reconstruct the seepage cells so they function as originally designed. If you have questions, please get in touch.

TD:ds

cc: Bruce Oman  
Al Stranz  
Bob Behrens

Noted:

  
Dennis C. Weisensel



RIVER

10

Wittenberg

Gravel Pits

Well

Sewage Disposal

Redeemer Cem

Bethany Church

Well

17

WITTENBERG

CHICAGO

R

E

N

T

17

W

10

E

23

Creek

22

Holy Family Cem

Forest Home Cem

CHERRY LANE

1159

NORTH WESTERN

BR 1120

ROAD 20

1186

Gravel Pit

1170

1160

1153

1200

1154

1159