



State of Wisconsin \ DEPARTMENT OF TRANSPORTATION



June 7, 1978

DIVISION OF HIGHWAYS
4802 Sheboygan Ave.
P.O. Box 1487
Madison, WI 53701

Mr. Thomas Freitag
Regulatory Functions
U.S. Army Corps of Engineers
Rock Island District
Clock Tower Bldg.
Rock Island, Ill. 61201

Dear Tom:

Regarding our telephone conversation of May 23, I am sending you a copy of an excerpt from DNR's Rock River reclamation EIS. Unfortunately, they had only one copy to loan and it was not entirely legible, hence the poor quality copies.

Recall also that the individual with expertise on clams of the Rock River is Mr. Harold Mathiak who lives in Horicon. I would suggest contacting him for further information.

My research dealt only with effects of the toxin Antimycin on three species.

I hope this information will be of use to you.

Sincerely,

Mary E. O'Brien
Staff Geologist

Attachment

Appendix I

PRE-TREATMENT SURVEYS

Rock River Chemical Reclamation Program

Introduction
Mammals
Water Birds
Herons and Egrets
Turtles
Warm Water Fish
Trout
Macro-Invertebrates
Snails
Mussels
Zooplankton
Phytoplankton
Vegetation
Water Quality
Human Benefits
General Faunal Inventories

Department of Natural Resources
Madison, Wisconsin

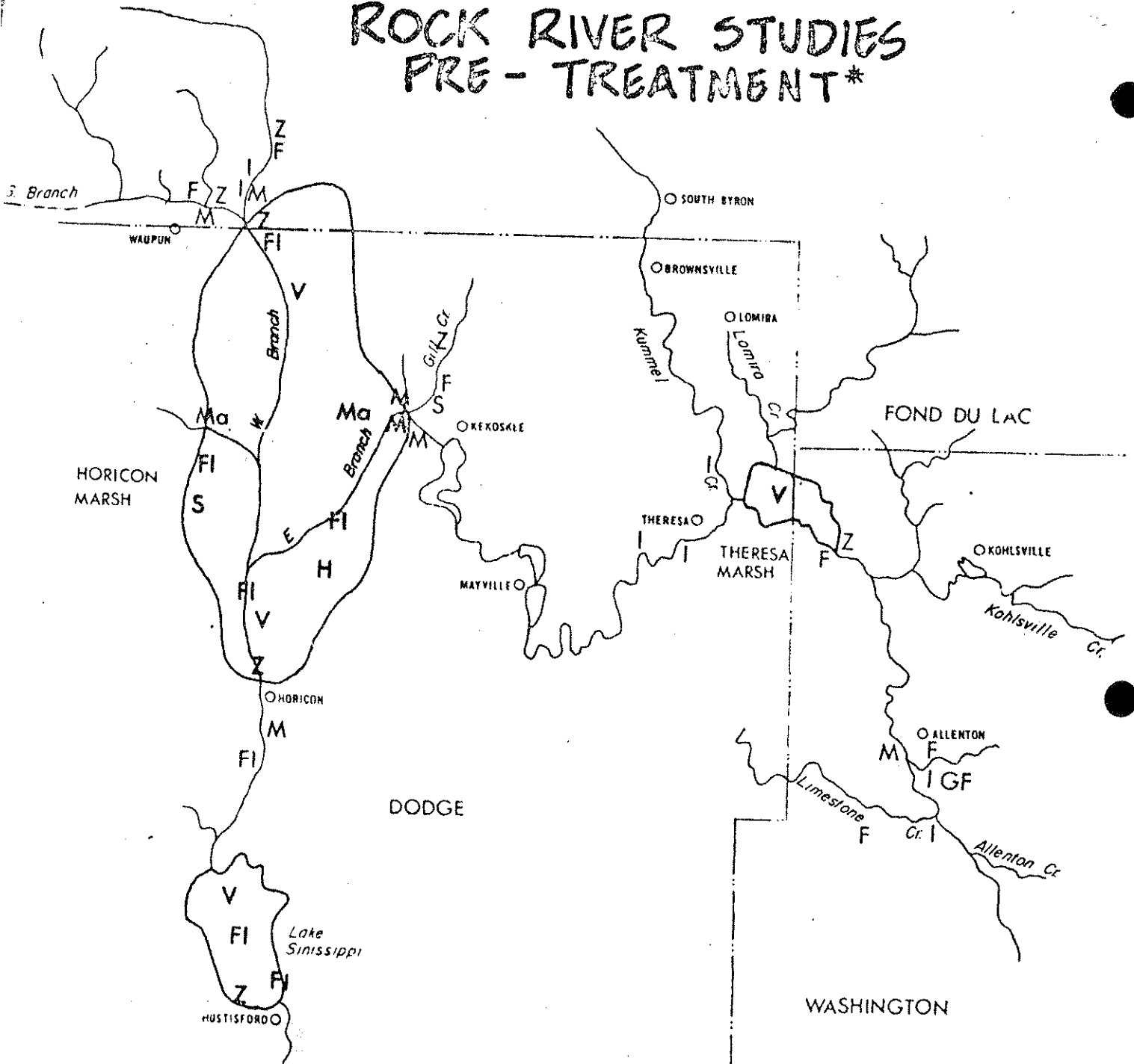
March 1, 1972

INTRODUCTION

Pre-treatment surveys were made at selected stations on the East and West Branches of the Rock River, Horicon Marsh and Lake Sinissippi to obtain baseline data on the kinds and abundance of aquatic flora and fauna and to detect seasonal trends in water chemistry. Surveys were conducted by various persons in the Bureaus of Research, Fish Management and Game Management during the spring, summer and fall of 1971. Most of the surveys were made prior to treatment, although a few (specifically noted in the following reports) were carried out post-treatment.

Chemical treatment of the East Branch of the Rock River occurred from August 9-20, 1971.

ROCK RIVER STUDIES PRE-TREATMENT*



LEGEND:

- F FISH
- FI FISH-IMPOUNDMENTS
- GF GENERAL FAUNA
- H HERONS & EGRETS
- I MACRO-INVERTEBRATES (Insects)
- M MUSSELS
- Ma SMALL MAMMALS
- Q WATER QUALITY (not shown)
- R REPTILES & AMPHIBIA (not shown)
- S SNAILS
- V VEGETATION
- Z ZOOPLANKTON & PHYTOPLANKTON

MUSSELS

Horicon Area

METHODS

The Rock River and tributaries upstream from the Hustisford Dam were selected for a study of the mussel populations prior to antimycin treatment. Excluded was the East Branch of the Rock River above Kekeskee because treatment had already taken place in this area. Hundreds of feet of stream was sampled at each road crossing by walking the streams or stream edges watching for mussels and hand grubbing through the bottom substrates in likely locations where water depth was less than two feet.

Brailing equipment (a board with dangling crowfoot hooks) was also used, towed slowly downstream over the bottom on the East Branch of the Rock River below Kekeskee and in the Rock River below the Horicon Dam, where water depths were greater than two feet. All tows were unsuccessful due to the extremely low population of clams and the fact that mussels will not always face upstream in the slow moving waters so characteristic of the Rock River system in this area.

The mussels were prepared for identification by removing and discarding the viscera with a jackknife and scrubbing the exterior with a brush and detergent to remove algae and other detritus adhering to the shell. Billy G. Isom, a mussel expert from Mussel Shoals, Alabama, who assisted us from three days in collecting and polishing our techniques, sorted and identified representatives of each species. All shells in which there was a doubt about identification were taken to Alabama where identifications were made after further study.

Since few live mussels could be found, remnant shells were collected and identified to determine what species may have inhabited the area in the past. Shells were collected only if they appeared adequate for identification or if they appeared different from others already collected at that site.

RESULTS AND DISCUSSION

Live specimens were found at only three locations, and these consisted of three species and 20 individuals (Table 26). The collection of remnant shells yielded seven additional species that had once inhabited this study area (Table 27).

The poverty of mussels may be due to such problems as poor dissolved oxygen concentrations which exist, especially during the winter, slow water movement, and the large amounts of silt being carried in the water.

Since the mussels are so scarce in this study area, further studies will not be conducted.

TABLE 26

Live Mussels Found in the Rock River Watershed Upstream from the Hustisford Dam by Hand Grubbing, Excluding the East Branch Above Kekoskee

Species	(2)	(3)	(4)	Total
	Rock River, East Branch $\frac{1}{4}$ mile above Clark's Bridge	Rock River, East Branch 200 ft. below Clark's Bridge	Rock River, West Branch Hwy. 151	
<u>Lampsilis radiata</u>				
<u>silicuoidea</u>	3	1	0	4
<u>Lasmigona complanata</u>	2	0	0	2
<u>Leptodea fragilis</u>	0	0	1	1
<u>Strophitus rugosus</u>	1	2	0	3
	6	3	1	10

TABLE 27

Remnant Mussel Shells Collected in the Rock River Watershed Upstream from the Hustisford Dam by Hand Grubbing, Excluding the East Branch Above Kekoskee

Species	(1)	(2)	(3)	(4)	(5)	Total
	Rock R., E. Br. Junct. of Gill Creek	Rock R., E. Br. $\frac{1}{4}$ mile above Clark's Bridge	Rock R., E. Br. 200 ft. below Clark's Bridge	Rock R., W. Br. Hwy. 151	Rock R., S. Br. Hwy. 49, N. of Waupun	
<u>Anodonta grandis</u>	0	2	1	1	1	5
<u>Anodonta suborbiculata</u>	0	0	0	1	0	1
<u>Amblema plicata</u>	1	1	1	0	0	3
<u>Elliptio dilatatus</u>	1	0	0	0	1	2
<u>Fusconaia flava</u>	0	1	1	0	0	2
<u>Lampsilis radiata</u>						
<u>silicuoidea</u>	4	0	0	0	0	4
<u>Lasmigona complanata</u>	3	2	1	0	0	6
<u>Ligumia recta</u>	1	0	0	0	0	1
<u>Ptychobranthus fasciolaris</u>	0	0	0	0	1	1
<u>Strophitus rugosus</u>	0	1	0	0	0	1
	10	7	4	2	3	26

Upper Rock River (Post-treatment)

METHODS

The study area was located on the East Branch of the Rock River about a quarter-mile south of Allenton. It extended upstream from a broadened pool at Highway W for 830 feet to a point where a barbed wire crossed the stream. Here the stream, which was near the upper reaches of the East Branch, ranged 8 to 12 feet in width and 6-18 inches in depth. Bordering one side was a bank 2-3 feet in height vegetated with grasses. The opposite bank was only 3-6 inches above the water's surface and vegetation consisted of grasses and sedges. Overlaying most of the firm gravelly bottom were thick layers of silty material.

Sampling began eight days after antimycin treatment and at this time the water was very clear. The study continued until 40 days after treatment when mortality had become too low for further sampling.

The entire area was traversed by two biologists walking abreast upstream collecting all mussels lying on the stream bottom which had died as a result of the antimycin treatment. Only those clams which still had parts of the viscera intact were collected. Empty shells were cast onto the streambanks and disregarded. They dying mussels were collected until the mortality rate became very low. This involved eight collections within a one-month's period (Aug. 19 to Sept. 20). Near the downstream end of the study area, a 25-foot section was measured off where the bottom substrate was hand grabbed thoroughly for both live and dead mussels. The dead mussels were collected and the live specimens were counted, identified, and returned to the stream. This section was sampled at three separate times to determine remaining species and numbers. Two other 25-foot sections, one approximately a half mile and the other about three-fourth's mile upstream to the study area were hand grabbed thoroughly two months after treatment for live mussels to determine survival in a different area.

A one-inch wire mesh fence was placed across the stream at either end of the study area for two days during the time of peak mortality. The object was to catch any mussels which may drift into or out of the study area and bias the study. The method proved that drifting shells were insignificant.

The mussels were prepared for identification by removing the viscera with a jackknife and discarding it. The outside shell surfaces were then scrubbed with a brush and detergent to remove algae and other detritus adhering to the shell. Billy G. Isom, a mussel expert from Mussel Shoals, Alabama, who assisted for three days in the field, sorted and identified representatives of each species. All shells in which there was a doubt about identification were taken to Alabama where identifications were made after further study.

RESULTS AND DISCUSSION

Inhabiting the study area, as well as areas upstream, were 11 species of clams (Table 28). Using the mortality figure and the remaining live individuals at the end of the study, the total population prior to treatment in the 380-foot study area can be roughly estimated at 1,200, or about 3.2 clams per foot of stream. Forty days after the treatment, 740 individuals had died, which approximated 62 percent mortality. Figures indicate that mortality may have reached 80 percent by 65 days after treatment.

The peak mortality occurred 16-19 days after treatment when 360 individuals died. However, peak mortalities did not occur on the same dates for all species. There were four peak periods (Fig. 2): immediately or shortly after treatment, for Lampsilis radiata siliquoidea and Anodonta grandis; 16 days after treatment, for Amblema plicata and Strophitus rugosus; 19 days after treatment, for Alasmidonta calceolus, Anodontoides ferrussacianus, and Lasmigona complanata; and 27 days after treatment, for Elliptio dilatatus and Fusconaia flava. The numbers of the two remaining species, Alasmidonta marginata and Leptodea fragilis were too small to place in any one of the curves. This data indicates that treatment with antimycin can affect mussel populations over a long period of time.

Representatives of all but one species survived the treatment of antimycin (Table 29). One species, Alasmidonta calceolus, was eliminated from the study area by the 27th day after treatment and it was also not found in the two upstream areas, at a later date. Elliptio dilatatus survived best in the study area, and both Amblema plicata, and Elliptio dilatatus in the two upstream areas. This difference may be due to the substrates and what species had inhabited the area prior to treatment. The upstream areas were sampled only once and long after treatment. These areas had very thick layers of silt whereas the study area had thinner layers of silt and large exposed portions of firm gravelly bottom.

The study indicates that mussels are affected by the treatment of antimycin over a period of time. There is also indication that certain species may be eliminated by such treatment.

David A. Bratley and Harold A. Mathiak

TABLE 3

Numbers of Dead Clams Found in the 380-foot Study Area of the East Branch of the Rock River at Allenton After Antimycin Treatment*

Species	8-19-71 8 days after treatment	8-23-71 12 days after treatment	8-27-71 16 days after treatment	8-30-71 19 days after treatment	9-2-71 22 days after treatment	9-7-71 27 days after treatment	9-13-71 33 days after treatment	9-20-71 40 days after treatment	Total
<u>Alasmidonta calceolus</u> (Slipper-Shell)	23	7	49	79	29	0	0	0	187
<u>Alasmidonta marginata</u>	0	3	0	0	0	0	0	0	3
<u>Anodonta grandis</u> (Floater)	12	15	12	2	2	0	0	0	43
<u>Anodontoides ferussacianus</u> (Cylindrical Paper Shell)	3	17	41	44	23	4	0	0	132
<u>Amblyma (costata) plicata</u> (Three-Ridge)	0	1	16	8	8	8	4	1	46
<u>Elliptio dilatatus</u> (Lady-Finger)	2	8	14	12	14	32	17	12	111
<u>Fusconaia flava</u> (Pig-Toe)	0	0	3	8	4	12	0	0	27
<u>Lampsilis radiata siliquodea</u> (Fat Muchet)	36	34	19	12	2	1	0	0	104
<u>Lesmignona complanata</u> (White Heel-Splitter)	0	1	9	10	5	2	0	0	27
<u>Leptodea fragilis</u> (Fragile Paper Shell)	0	1	0	0	1	0	0	0	2
<u>Strophitus rugosus</u> (Squaw Foot)	0	24	26	5	3	0	0	0	58
	76	111	189	180	91	59	21	13	740

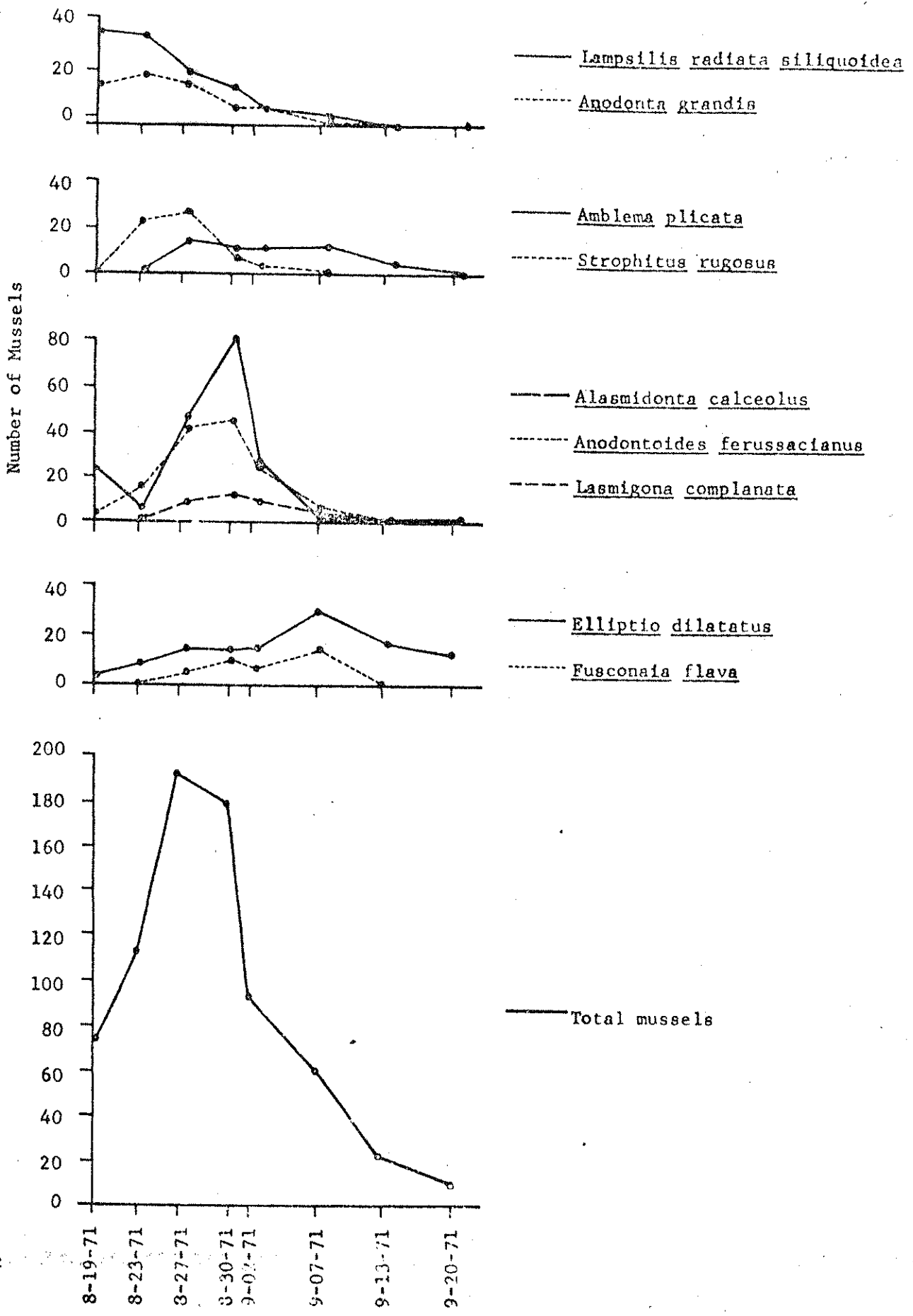
*Treatment date was 8-11-71

TABLE 29

Number of Living Mussels Remaining Within 25-foot Sections in the East Branch of the Rock River at Allenton After Antimycin Treatment.

Species	9-2-71 Study Area 22 days after treatment	9-20-71 Study Area 40 days after treatment	10-15-71 Study Area 65 days after treatment	10-15-71 ¼ mile up- stream 65 days after treatment	10-15-71 ¼ mile up- stream 65 days after treatment
<u>Alasmidonta calceolus</u>	0	0	0	0	0
<u>Alasmidonta marginata</u>	0	1	0	0	0
<u>Amblera (costata) plicata</u>	0	1	0	46	1
<u>Anodonta grandis</u>	0	0	0	0	1
<u>Anodontoides ferussacianus</u>	0	0	0	1	0
<u>Elliptio dilatatus</u>	0	26	13	14	1
<u>Fusconia flava</u>	0	0	0	7	0
<u>Lampsilis radiata siliquoidea</u>	0	2	2	8	5
<u>Lasimona complanata</u>	0	0	0	5	2
<u>Leptodea fragilis</u>	0	0	0	0	0
<u>Strophitus rugosus</u>	0	0	0	0	0
	44	30	15	81	10

Figure 2. Numbers of dead mussels found in the 380 study area of the east branch of the Rock River at Allenton after antimycin treatment.



Date:

Days after

WARM WATER FISH

INTRODUCTION

The objective of this phase of the studies was to determine the fish species composition and abundance before and after chemical reclamation in selected warmwater streams in the Rock River system above the Hustisford Dam (Priegel and Bryneldson), and in Horicon Marsh and Lake Sinissippi (Priegel).

METHODS

In the streams, the fish populations were sampled with a D. C. stream or back-pack shocker during daylight hours in selected areas. A sample of fish were measured to the nearest 0.1 inch (total length). Minnows, darters and other small fish were identified and counted in the lab. The sampling stations were:

Station 1: Limestone Creek, Washington County-C.T.H. W bridge to bridge at Crook Road, a distance of 1.5 miles.

Station 2: Gill Creek, Dodge County-Farmersville Road bridge to C.T.H. Y bridge, a distance of 1.2 miles.

Station 3: East Branch of Rock River, Washington County-C.T.H. D bridge to Bridge Road bridge, a distance of 1.5 miles.

Station 4: West Branch of Rock River, Fond du Lac County-Hwy. 151 bridge to C.T.H. AS bridge, a distance of 1.0 mile.

Station 5: South Branch of Rock River, Fond du Lac County-bridge in Sec. 26 to bridge in Sec. 34 (T-14-N, R-14-E), a distance of 1.3 miles.

In the impoundments, sampling was done with a pulsed D. C. shocker boat during daylight hours. All fish were measured to the nearest 0.1 inch (total length). Scales were taken from game and panfish species. The pectoral spines were taken from bullheads. All game and panfish species were weighed to the nearest 0.01 pound. Minnows, darters and other small nongame species were identified and counted. The sampling stations were:

Horicon Marsh

Station 1: Main ditch - from City of Horicon north to main east-west dike, a distance of 5.0 miles.

Station 2: East Branch of Rock River - Greenhead access to Clark's bridge, a distance of 2.0 miles.

Station 3: Burnett Ditch - from access area to main north-south ditch, a distance of 2.0 miles.

Station 4: West Branch of Rock River - Chester bridge to main north-south ditch, a distance of 3.5 miles.

Lake Sinissippi

Station 1: River Bend Park, City of Horicon to Woods Bridge, a distance of 2.5 miles.

Station 2: Hustisford Dam along the east shoreline to Marina, a distance of 2.0 miles.

Station 3: Around Radloff Island, a distance of 1.5 miles.

RESULTS

Stream Surveys (Tables 17 and 18).

Station 1 - Limestone Creek - The section of Limestone Creek sampled flows through a swampy lowland (Allenton Wildlife Area). Only 19 fish, representing eight species were captured. No carp were taken during the sampling period, however, carp were observed at C.T.H. W bridge on a previous occasion. The fish population was composed mainly of forage species: central mudminnow, stoneroller, common shiner, southern redbelly dace, bluntnose minnow, creek chub and white sucker plus one yellow bullhead.

Station 2 - Gill Creek - Gill Creek is a small, fast moving tributary to the East Branch of the Rock River which was previously managed for brown trout. No trout were captured or observed during the sampling period nor were any carp captured or observed. White suckers were abundant ranging from 3.2 to 10.8 inches in total length with an average of 6.1 inches. In addition to white suckers only the following forage species were present: bluntnose minnow, longnose dace, creek chub, pearl dace, brook stickleback and mottled sculpin. The longnose dace and mottled sculpin were not found in any of the other four streams sampled.

Station 3 - East Branch of Rock River - During the course of sampling the five warmwater streams, 27 species of fish were captured and 20 of these species were captured in the East Branch. Carp were very numerous averaging 13.4 inches. Twenty-two northern pike were captured ranging in total length from 6.0 to 22.7 inches and averaging 13.4 inches. Panfish species taken included the black bullhead, yellow bullhead, rock bass, green sunfish, pumpkinseed and bluegill. The following species were only taken in the East Branch: redbfin shiner, stonecat, black-stripe topminnow, rock bass, pumpkinseed, bluegill and blackside darter.

Station 4 - West Branch of Rock River - Thirteen species of fish were captured in the West Branch. Carp were very abundant and white suckers were abundant. Only eight johnny darters were taken for identification purposes, however, they were very abundant. Besides the East Branch, this was the only stream in which northern pike were captured. They ranged in length from 7.0 to 15.0 inches and averaged 9.0 inches. The rainbow darter was only taken in this stream.

Station 5 - South Branch of Rock River - Although not captured, eight northern pike were observed. Besides these northern pike only forage species were captured or observed. Stonerollers, southern redbelly dace and fathead minnows were abundant.

Impoundment Surveys (Tables 19 and 20).

Horicon Marsh

Station 1 - Main Ditch - Ten species of fish were collected with the sample dominated by carp and black bullheads. The average length of the carp was 9.3 inches in total length with 28.8 percent of the sample composed of carp in the five-inch group and 23.3 percent in the 10-inch group. No game fish species were taken. One common shiner and fathead minnow were captured and the area was void of minnows.

Station 2 - East Branch of Rock River - Fifteen species were captured in this area with carp and black bullheads dominating the catch. The carp averaged 10.9 inches with 49.5 percent of the sample being comprised of carp in the 10 and 11-inch group. Four walleyes were taken and this is the only area where walleyes were either captured or observed.

Station 3 - Burnett Ditch - Carp and black bullheads dominated the catch with carp averaging 8.5 inches. Carp in the five-inch group comprised 32.1 percent of the sample. Six northern pike were taken in the area of Burnett Ditch previously dredged. The majority of fish were taken in the dredged area.

Station 4 - West Branch of Rock River - Carp, again, dominated the catch but only 29 were taken averaging 13.4 inches. Only northern pike (2), pugnose minnows (5), white suckers (2) and black bullheads (3) were taken in this area which is located in the federal part of the marsh.

Lake Sinissippi

Station 1 - River Bend Park - This river area between the Horicon dam and Lake Sinissippi was dominated by carp, black and brown bullheads. Young-of-the-year northern pike were captured in this area as well as adults. Carp averaged 13.7 inches in total length with 65.5 percent of the sample in the 13 and 14-inch groups.

Station 2 - East Shore of Lake Sinissippi - Complete dominance of carp was noted in this area. Only 11 other fishes representing five species were taken. The carp averaged 13.0 inches.

Station 3 - Radloff Island - Only 63 carp and five black bullheads were taken in this area.

DISCUSSION

Stream Surveys

Besides Gill Creek which could be considered a Class 3 trout stream, these streams are small, sluggish streams with fluctuating water levels. The fish populations were typical for streams in this section of Wisconsin. No rare or endangered species were found. Uncommon species encountered were the redbfin shiner, peal dace, rainbow darter, fantail darter and blackside darter.

The section of Gill Creek and the South Branch of the Rock River sampled could be eliminated from the chemical treatment program as no carp were present nor is it likely that they will utilize these sections. Gill Creek has a high gradient (31.3 feet per mile), a streambed of gravel and rubble, clear water and is a potential brown trout stream. The South Branch flow is subject to extremes and at times is completely dry as noted on September 22, 1971.

Nongame species present now should be reintroduced after chemical treatment, especially the uncommon species.

None of these streams will be sampled in 1972.

Impoundment Surveys

The fish population in each area sampled was completely dominated by carp. Winterkills must be an important factor in the state area of Horicon Marsh as the carp population in this area (Stations 1, 2 and 3) was composed of fish in length groups five to 10-11 inch. In the federal area (Station 4) the carp averaged 13.4 inches and the population was composed of various age groups. Winterkills must also occur in Lake Sinissippi as no carp over 21 inches were taken and only 23 (5.9 percent of total sample) were over 16 inches. Black bullheads were abundant in the state area of Horicon Marsh and the river between the City of Horicon and Lake Sinissippi. Walleyes were only taken in the area where the East Branch enters Horicon Marsh. Northern pike were taken at four of the seven stations sampled but never in any numbers. A variety of small panfish were taken in the state area of Horicon Marsh but not in any quantities. No rare or endangered species were encountered.

Gordon R. Priezel

TABLE 17 Fish Species Taken in Warmwater Streams, Rock River System, 1971

Common Name	Scientific Name	Station			
		1	2	3	4
Central mudminnow	<u>Umbra limi</u> (Kirtland)	1		1	4
Northern pike	<u>Esox lucius</u> Linnaeus			22	27
Stoneroller	<u>Campostoma anomalum</u> (Rafinesque)	3		17	
Carp	<u>Cyprinus carpio</u> Linnaeus			145	*
Common shiner	<u>Notropis cornutus</u> (Mitchill)	2		2	
Redfin shiner	<u>Notropis umbratilis</u> (Girard)			15	
Southern redbelly dace	<u>Phoxinus erythrogaster</u> (Rafinesque)	1			88
Bluntnose minnow	<u>Pimephales notatus</u> (Rafinesque)	3	9	26	6
Flathead minnow	<u>Pimephales promelas</u> Rafinesque				5
Longnose dace	<u>Rhinichthys cataractae</u> (Valenciennes)		28		
Creek chub	<u>Semotilus atromaculatus</u> (Mitchill)	5	6	1	1
Pearl dace	<u>Semotilus margarita</u> (Cope)		1		
White sucker	<u>Catostomus commersoni</u> (Lacépède)	3	102	38	*
Black bullhead	<u>Ictalurus melas</u> (Rafinesque)			85	9
Yellow bullhead	<u>Ictalurus natalis</u> (Lesueur)	1		5	
Stonecat	<u>Noturus flavus</u> Rafinesque			1	
Blackstripe topminnow	<u>Fundulus notatus</u> (Rafinesque)			46	
Brook stickleback	<u>Culaea inornata</u> (Kirtland)		11		
Rock bass	<u>Ambloplites rupestris</u> (Rafinesque)			20	
Green sunfish	<u>Lepomis cyanellus</u> Rafinesque			80	8
Pumpkinseed	<u>Lepomis gibbosus</u> (Linnaeus)			10	
Bluegill	<u>Lepomis macrochirus</u> Rafinesque			2	
Rainbow darter	<u>Etheostoma caeruleum</u> Storer				11
Fawnail darter	<u>Etheostoma flabellare</u> Rafinesque			2	1
Johnny darter	<u>Etheostoma nigrum</u> Rafinesque			3	8
Blackside darter	<u>Percina maculata</u> (Girard)			1	
Mottled sculpin	<u>Cottus bairdii</u> Girard		24		

TABLE 18 Length range and average length (in parenthesis) in inches (total length) of fish species taken in warmwater streams, Rock River System, 1971

Species	Station				
	1	2	3	4	5*
Northern pike			6.0-22.7(13.4)	7.0-15.0(9.0)	
Carp			10.7-22.8(13.4)		
Longnose dace		3.4-4.3(3.7)			
Creek chub	5.3-6.7(6.0)	7.5		5.0	
White sucker	8.2-11.0(9.6)	3.2-10.8(6.1)	5.6-13.8(10.2)		
Black bullhead			2.8-8.0(4.3)	6.5-8.5(7.5)	
Yellow bullhead			4.8-8.7(7.2)		
Rock bass			3.2-8.9(5.5)		
Green sunfish			3.3-4.1(3.5)	4.3-4.4(4.4)	
Pumpkinseed			3.2-4.4(3.8)		
Bluegill			2.0-3.4(2.7)		
Fantail darter			2.3		
Mottled sculpin		3.7-4.2(4.1)			

* No lengths taken

APPENDIX I

Macro-invertebrate Sampling Stations on the East and West Branches of the Rock River

East Branch

Station 1 (11N., 18E., Section 22)

Site 1 Slow current, gravel-mud bottom, on the Rock River $\frac{1}{4}$ mile below junction of Allenton and Limestone Creeks.

Site 2 Fast current, rock bottom, 100 feet downstream from Site 1.

Station 2 (11N., 18E., Sections 15 and 22)

Site 3 Slow current, rock and gravel bottom, unnamed creek 20 feet south of Hillcrest Road.

Site 4 Fast current, rock and gravel bottom, unnamed creek 10 feet north of Hillcrest Road.

Station 3 (12N., 17E., Sec. 3)

Site 5 Slow current, mud-sand and gravel bottom, Kummel Creek 30 feet west of bridge on state highway 175.

Site 6 Fast current, gravel bottom, Kummel Creek 20 feet downstream from Site 5.

Station 4 (12N., 17E., Sec. 16)

Site 7 Fast current, gravel bottom, Rock River 100 feet north of the Theresa sewage plant.

Site 8 Medium current, rock and gravel bottom, Rock River 20 feet downstream from Site 7.

Station 5 (12N., 17E., Sec. 17)

Site 9 Slow current, gravel bottom, directly under bridge on County Trunk Highway AY near the bank.

Site 10 Slow current, mud-gravel bottom, middle of river under bridge on County Trunk Highway AY.

West Branch

Station 1 (14N., 15E., Sec. 24)

Site 1 Slow current, rock bottom, Rock River 100 feet downstream from U.S.G.S. gauging station.

Site 2 Fast current, gravel bottom, Rock River 50 feet downstream from Site 1.

Station 2 (14N., 15E., Sec. 26)

Site 3 Fast current, rock and gravel bottom, Rock River 100 feet upstream from bridge on County Trunk Highway D.

Site 4 Slow current, mud and rock bottom, Rock River 50 feet downstream from Site 3.