

Aquatic Invasive Species Monitoring Project

Year 2013 Report

To the

Fox River Navigational System Authority

By

Bart De Stasio, Ph.D.

**Department of Biology
Lawrence University
Appleton, WI 54911**

September 17, 2013

Objectives

As stated in the Aquatic Invasive Species (AIS) Control and Monitoring Plan of the Fox River Navigational System Authority (FRNSA, June 2006 version, Appendix B), the objective of the Rapide Croche AIS Monitoring Plan is to “monitor the presence and map the distribution of fish and invertebrate AIS in the Fox River two pools immediately up and downstream of Rapide Croche Lock.”

Following consultation with the AIS Committee in 2007, the plan was amended to include sampling of three navigation pools immediately upstream and downstream of the Rapide Croche Lock. Monitoring studies have been conducted every summer at the three upstream and three downstream sites since that time. The studies were completed under the supervision of Dr. Bart De Stasio, Ph.D., Department of Biology, Lawrence University, Appleton, WI. Two students were employed during the summer of 2013 to carry out the investigations.

Sampling Design

Monitoring occurred at six sites along the lower Fox River, WI during the summer of 2013. These sites were extensions of the six sites sampled in 2006 and 2007, with two sites remaining the same as in previous years. One site above and one below the Rapide Croche lock and dam (FR-3 and FR-4) were the same as those sampled in 2006 and 2007 (Tables 1). In addition, site FR-6 (near the Wrightstown municipal boat launch) was sampled on one date as well. Each sampling site designated a general area for sampling efforts, and was further separated into mid-channel versus near-shore sampling locations, depending on the type of sampling performed. We conducted 25 different sampling trips on 16 days during the summer (Table 2). Each site was sampled at least four times over the course of the summer. Separate boats were employed upstream and downstream of the Rapide Croche dam site on each date, and all nets and equipment were sanitized thoroughly using bleach prior to the next sampling event according to the protocols established by the WI DNR to prevent the spread of AIS (http://dnr.wi.gov/fish/documents/disinfection_protocols.pdf).

Table 1. Latitude and Longitude coordinates of the sites sampled along the lower Fox River, WI during summers 2008-2013.

Location	Latitude	Longitude
Upstream of Rapide Croche		
FR-A (above Cedar lock)	N 44° 16.562	W 88° 20.541
FR-B (above Kaukauna Guard lock)	N 44° 16.665	W 88° 17.042
FR-3 (above Rapid Croche lock)	N 44° 19.077	W 88° 11.962
Downstream of Rapide Croche		
FR-4 (below Rapid Croche lock)	N 44° 18.947	W 88° 11.413
FR-6 (Wrightstown Boat Launch)	N 44° 19.238	W 88° 10.531
FR-C (above DePere dam)	N 44° 25.813	W 88° 04.273
FR-D (below DePere dam)	N 44° 27.742	W 88° 03.354

Table 2. Sampling effort upstream and downstream of the Rapide Croche dam on the lower Fox River, WI during summer 2013. Dates on which sampling was performed at each site are indicated for each type of sampling effort.

Date and Site	Dip Net	Plankton Tow	Benthic Grab	Seine Netting	Fish Trap
6/13 FR-A	X	X	X	X	
6/18 FR-B	X	X	X	X	
6/20 FR-D	X	X	X	X	
6/25 FR-3	X	X	X	X	
6/27 FR-4	X	X	X	X	
6/27 FR-6	X	X	X	X	
7/2 FR-C	X	X	X	X	X
7/8 FR-A	X	X	X	X	X
7/8 FR-B	X	X	X	X	X
7/11 FR-3	X	X	X	X	X
7/16 FR-4	X	X	X	X	X
7/16 FR-D	X	X	X	X	X
7/16 FR-C	X	X	X	X	
7/23 FR-A	X	X	X	X	X
7/23 FR-B	X	X	X	X	X
7/25 FR-3	X	X	X	X	
7/30 FR-C	X	X	X	X	
7/30 FR-D	X	X	X	X	
8/1 FR-4	X	X	X	X	
8/6 FR-A	X	X	X	X	
8/6 FR-B	X	X	X	X	
8/8 FR-C	X	X	X	X	
8/8 FR-D	X	X	X	X	
8/13 FR-3	X	X	X	X	
8/13 FR-4	X	X	X	X	

Sampling Activities

Plankton: On each sampling date oblique tows were performed at the mid-channel location of each site using a Wisconsin-type plankton net with retaining collar (mouth diameter=0.13m, mesh size=63 µm). Samples were preserved in 80% ethyl alcohol and examined in the laboratory using 10X to 400X magnification. All zooplankton in the samples were identified to the species level, when possible, using Edmonson (1965), Balcer et al. (1984), Pennak (1989), Hopkins (1990), and Thorp and Covich (1991). Abundances in samples were not enumerated, but entire samples were examined to determine presence of each species.

Benthic invertebrates: Mid-channel areas were sampled using a standard Ekman grab sampler (0.15m X 0.15m box size). Replicate grab samples were collected at each site and filtered through a wash bucket with mesh bottom (mesh size=500um). Both shoreline areas at each site were sampled with a combination of dip netting and beach seining techniques. Animals captured were washed into sorting trays and later preserved with 80% ethyl alcohol. Specimens were identified in the laboratory to the species level, where possible, using the references listed above for plankton identifications as well as Pecharsky et al. (1990), Merritt et al. (2008) and Hilsenhoff (1995).

Fish: Fish were sampled at each of the sites using a combination of trapping and seining techniques. Three sizes of cod-end type traps were employed; standard “minnow” traps (length=0.42m, opening=22mm, mesh=6.4mm), elongated eel traps (length=0.78m, opening=40mm, mesh=6.4mm), and larger hand-made traps of the same design (length=2m, opening=125mm, mesh= 12.5mm). Traps were deployed without bait for a maximum of 24 hours, emptied, and redeployed during mid-summer at each site (see Table 2). Trapping included mid-channel as well as shoreline locations at each site. We conducted at least five beach seine hauls at each shoreline location on each sampling day (1/4 inch mesh, 20 ft length). If possible, specimens were identified in the field to the species level and then released. Specimens of new species compared to existing records or specimens difficult to identify in the field were saved live for later identification in the laboratory. Upon return to the laboratory specimens were frozen for disposal or transferred to ethyl alcohol (70%) for long-term preservation. Specimens were identified to the species level when possible, using Hubbs and Lagler (2004), Lyons et al. (2000), and the Wisconsin Fish ID software (2005).

Results

Fish:

A total of 29 species of fish and one species of turtle were collected from the seven sites during the summer of 2013 (plus one hybrid specimen and three specimens that are pending positive identification; Table 3). Twenty-four species of fish were observed downstream of the Rapide Croche dam, while 20 of the total 29 species were found upstream of Rapide Croche. Besides the common carp (*Cyprinus carpio*), two invasive fish species, the white perch (*Morone americana*) and the round goby (*Neogobius melanostomus*), were documented during the summer, as in previous years. White perch were found both above and below the Rapide Croche dam at site FR-3, FR-4 and FR-D. Round goby was found at all sites below Rapide Croche dam. As in previous years the common carp is a well-established non-native species found throughout the lower Fox River. No sea lamprey (*Petromyzon marinus*) were collected at any sites during 2013.

Table 3. Fish species presence documented in the lower Fox River, WI upstream and downstream of the Rapide Croche dam during summer 2013. A value of one indicates presence. Sites FR-A, -B and -3 are upstream, with FR-4, -6, -C and -D downstream of Rapide Croche dam. The white perch and round goby (highlighted) were the only invasive fish species observed (besides common carp).

Fish & Turtles	FR -A	FR -B	FR -3	FR -4	FR -6	FR -C	FR -D
<i>Ambloplites rupestris</i> (Rock bass)	1	1	0	0	0	0	1
<i>Apalone spinifera</i> (Spiny softshell turtle)	0	0	0	0	0	0	1
<i>Aplodinotus grunniens</i> (Freshwater drum)	0	0	0	0	0	0	1
<i>Campostoma anomalum</i> (Central Stoneroller)	0	0	1	0	0	0	0
<i>Carpoides carpio</i> (River Carpsucker)	1	0	0	0	0	0	1
<i>Catostomus commersonii</i> (White Sucker)	0	1	0	0	0	0	0
<i>Culaea inconstans</i> (Brook Stickleback)	0	1	0	0	0	0	0
<i>Cyprinella spiloptera</i> (Spotfin Shiner)	0	0	0	1	1	0	0
<i>Cyprinus carpio</i> (Common carp)	0	0	0	0	0	0	1
<i>Dorosoma cepedianum</i> (Gizzard Shad)	0	0	0	1	0	0	1
<i>Esox masquinongy</i> (Muskellunge)	0	0	0	0	0	0	1
<i>Etheostoma nigrum</i> (Johnny darter)	1	0	1	1	0	0	0
<i>Lepomis cyanellus</i> (Green sunfish)	1	0	0	0	0	0	0
<i>Lepomis gibbosus</i> (Pumpkinseed)	1	1	1	0	0	0	1
<i>Lepomis macrochirus</i> (Bluegill)	1	1	1	1	0	0	1
<i>Micropterus dolomieu</i> (Smallmouth bass)	0	0	1	0	0	1	0
<i>Micropterus salmoides</i> (Largemouth bass)	1	1	1	1	0	0	1
<i>Morone americana</i> (White perch)	0	0	1	1	0	0	1
<i>Morone chrysops</i> (White Bass)	0	1	0	0	0	0	0
<i>Neogobius melanostomus</i> (Round goby)	0	0	0	1	1	1	1
<i>Notemigonus crysoleucas</i> (Golden Shiner)	0	1	0	1	0	0	0
<i>Notropis dorsalis</i> (Bigmouth shiner)	0	0	0	1	0	0	0
<i>Notropis heterolepis</i> (Blacknose shiner)	0	0	1	1	0	0	0
<i>Notropis hudsonius</i> (Spottail Shiner)	0	1	0	1	0	1	1
<i>Notropis wickliffi</i> (Channel shiner)	0	0	0	1	0	1	1
<i>Perca flavescens</i> (Yellow perch)	1	1	1	0	0	1	1
<i>Pimephales notatus</i> (Bluntnose Minnow)	0	1	0	0	0	0	1
<i>Pomoxis annularis</i> (White crappie)	0	0	1	1	0	0	0
<i>Pomoxis nigromaculatus</i> (Black Crappie)	1	0	0	0	0	1	1
<i>Sander vitreus</i> (Walleye)	0	0	0	0	1	0	0
Totals	9	11	10	13	3	6	17

Benthic Invertebrates:

There were 68 groups of benthic invertebrates observed during the summer of 2013, with 58 occurring upstream and 35 downstream of the Rapide Croche dam (Table 4). Zebra mussels were observed both above and below the Rapide Croche dam while rusty crayfish were only found above the dam. The invasive amphipod, *Echinogammarus ischnus*, was again found below the dam this year. Zebra mussels were especially abundant in many areas, and the rusty crayfish was very abundant in the shoreline areas.

Table 4. Benthic invertebrate taxa documented upstream and downstream of the Rapide Croche dam during summer 2013 (value of 1 indicates presence). Highlighted groups are considered “invasive” species.

Macroinvertebrates	FR- A	FR- B	FR- 3	FR- 4	FR- 6	FR- C	FR- D
<i>Dreissena polymorpha</i> (zebra mussel)	1	0	0	1	0	1	0
<i>Orconectes rusticus</i> (rusty crayfish)	1	1	1	1	0	0	1
<i>Orconectes virilis</i> (native crayfish)	0	1	0	0	0	0	1
<i>Hyalella</i> sp. (amphipoda)	0	0	1	0	0	0	0
<i>Ranatra</i> sp. (Water Scorpion)	1	0	1	0	0	0	0
<i>Nehalennia</i> sp. (damselfly)	0	1	0	1	0	0	0
<i>Coenagrion</i> sp. (damselfly)	0	1	0	0	0	0	0
<i>Ischnura</i> sp. (damselfly)	1	0	1	0	0	0	0
<i>Argia</i> sp. (damselfly)	0	0	1	0	0	0	0
<i>Enallagma</i> sp. (damselfly)	1	1	1	1	1	1	1
<i>Serratella</i> sp. (mayfly)	0	0	1	0	0	0	0
<i>Metretopus</i> sp. (mayfly)	0	1	0	0	0	0	0
<i>Tricorythodes</i> sp. (mayfly)	1	1	0	0	0	0	0
<i>Caenis</i> sp. (mayfly)	1	1	1	1	1	1	1
<i>Stenonema</i> sp. (mayfly)	1	0	0	0	0	0	0
Gerridae (water strider)	0	0	0	0	1	0	0
<i>Rheumatobates</i> sp. (water strider)	0	0	1	0	0	0	0
<i>Trepobates</i> sp. (Water strider)	0	0	1	0	0	0	0
Corixidae, Juvenile (waterboatman)	1	1	1	1	0	0	1
<i>Cymatia</i> (waterboatman)	1	0	1	0	1	0	0
<i>Hespercoriza</i> sp. (waterboatman)	1	0	0	0	0	0	0
<i>Palmacorixa</i> sp. (Waterboatman)	1	1	1	1	0	1	1
<i>Sigara</i> sp. (Waterboatman)	1	0	0	0	0	0	1
<i>Trichocorixica</i> sp. (waterboatman)	1	1	1	0	0	1	1
Talitridae sp. (amphipod)	0	1	0	0	0	0	0
<i>Echinogammarus ischnus</i> (amphipod)	0	0	0	0	0	1	0

Table 4 (continued)

Macroinvertebrates	FR- A	FR- B	FR- 3	FR- 4	FR- 6	FR- C	FR- D
Hyalella azteca (amphipod)	1	0	0	0	0	0	0
Hyalella sp. (amphipod)	0	0	1	0	0	0	0
Gammarus sp. (amphipod)	0	1	1	0	0	0	0
Crangonyx sp. (amphipod)	1	0	0	0	0	0	0
Gordius sp. (horsehair worm)	0	0	0	0	0	0	1
Oligochaeta sp. (threadworm)	1	0	0	0	0	0	1
Ablabesmyia sp. (true fly)	1	1	1	1	1	1	1
Aedes (culicidae) sp. (true fly)	1	1	0	0	0	0	0
Dugesia tigrina (flatworm)	0	0	1	0	0	0	0
Cura foremanii (flatworm)	0	1	0	0	0	0	0
Helobdella stagnalis (leech)	1	1	1	0	0	1	0
Helobdella robusta (leech)	0	0	1	0	0	0	0
Caecidotea sp. (isopod)	1	0	1	0	0	0	1
Oxus sp. (water mite)	1	1	0	0	0	1	1
Prozia sp. (water mite)	1	0	0	0	0	0	1
Teutonia sp. (water mite)	0	0	0	0	0	0	1
Limnesia sp. (water mite)	1	1	1	1	0	1	1
Torrenticola sp. (water mite)	0	1	0	1	0	0	0
Lebertia sp. (water mite)	0	1	0	1	0	0	0
Arrenurus sp. (water mite)	1	1	1	0	0	1	1
Neumania sp. (water mite)	0	0	0	0	0	0	1
Wandesia sp. (water mite)	0	1	0	0	0	0	1
Hydrodroma sp. (water mite)	1	0	1	0	0	0	0
Asellus sp. (aquatic snowbug)	0	1	0	0	0	0	0
Halipus sp. (Crawling Water Beetle)	0	0	1	0	0	0	0
Brychius sp. (crawling water beetle)	0	0	1	0	0	0	0
Dibolocelus sp. (water beetle)	0	0	0	0	0	1	0
Agabus sp. (beetle)	0	0	1	1	0	0	1
Peltodytes sp. (beetle)	0	1	0	0	0	0	0
Berosus sp. (beetle)	0	0	1	0	0	0	0
Chironomidae (bloodworm larvae)	1	1	1	0	0	0	1
Culicoides sp. (biting midges)	0	0	0	0	0	1	0
Bulimus sp. (Right Handed Snail)	0	0	1	0	0	0	0
Fossaria sp. (Right Handed Snail)	0	0	0	1	0	0	0
Gyraulus sp. (Disc-Shaped Snail)	0	1	0	0	0	0	0
Helisoma sp (Snail)	0	0	0	0	0	0	1
Physella sp. (Left Handed Pond Snail)	1	1	1	1	0	1	1
Pleurocera sp. (Right Handed Snail)	1	0	0	0	0	0	0
Planorbula sp. (Aquatic Snail)	1	0	0	0	0	0	0
Placobdella sp. (Segmented worms)	1	0	0	0	0	0	0
Aplexa sp. (snail)	0	1	0	0	0	0	0
Stagnicola sp. (Snail)	0	0	0	0	1	0	0
TOTALS	31	29	31	14	6	14	23

Plankton:

A total of 19 species of zooplankton were recorded in 2013, with the majority of them occurring in both locations (Table 5). All except two of the groups occurred upstream while 15 taxa were found at sites downstream of the Rapide Croche dam. None of the groups identified are considered aquatic invasive species at this time.

Table 5. Zooplankton documented from sites upstream and downstream of the Rapide Croche dam during Summer 2013. A value of one indicates presence. None of the groups observed are considered “invasive” species.

Zooplankton	FR- A	FR- B	FR- 3	FR- 4	FR- 6	FR- C	FR- D
Acanthocyclops vernalis	1	1	1	1	0	1	1
Alona sp.	1	1	1	1	0	1	1
Bosmina longirostris	0	0	0	1	0	0	1
Ceriodaphnia dubia	1	1	0	0	0	0	1
Chydorus sp.	1	0	0	0	0	0	0
Daphnia mendotae	1	0	0	0	0	0	1
Daphnia pulicaria	1	1	1	1	1	0	1
Diacyclops thomasi	1	1	1	1	1	1	1
Diaphanosoma birgei	0	1	1	1	0	1	1
Eubosmina coregoni	0	1	1	0	0	1	1
Hydra sp.	1	1	0	0	0	0	0
Latona setifera	0	0	0	1	0	0	0
Leptodiaptomus siciloides	1	1	1	1	1	0	1
Leptodora kindti	1	1	0	0	0	0	0
Mesocyclops edax	1	1	1	1	0	0	1
Candona sp.	1	1	1	1	1	1	1
Scapholeberis aurita	0	1	0	0	0	1	0
Senecella calanoides	0	1	0	0	0	0	0
Skistodiaptomus oregonesis	1	1	1	0	0	1	1
TOTAL	13	15	10	10	4	8	13

References Cited

- Balcer, M.D., N.L. Korda, and S.I. Dodson. 1984. Zooplankton of the Great Lakes: A Guide to the Identification and Ecology of the Common Crustacean Species. The University of Wisconsin Press, Madison, WI.
- Cochran, P.A. 1994. Occurrence and significance of the sea lamprey (*Petromyzon marinus*) in the lower Fox River, Wisconsin. Transactions of the Wisconsin Academy of Sciences, Arts and Letters. 82:17-21.
- Edmonson, W.T. (ed.) 1965. Fresh-water Biology, 2nd edit. John Wiley and Sons, Inc. New York, NY.
- Fox River Navigational System Authority. 2006. AIS Control and Monitoring Plan for the Rapide Croche Boat Transfer Station, Appendix B: Aquatic Invasive Species Control and Monitoring Plan. (June 2006).
- Hilsenhoff, W.L. 1995. Aquatic Insects of Wisconsin. Natural History Museums Council, University of Wisconsin Press, Madison, WI.
- Hopkins, G.J. 1990. The Zebra Mussel, *Dreissena polymorpha*: A Photographic Guide to the Identification of Microscopic Veligers. Queen's Printer for Ontario, Canada.
- Hubbs, C.L. and K.F. Lagler. 2004. Fishes of the Great Lakes Region, Revised Edition (Revised by G.R. Smith). University of Michigan Press, Ann Arbor, MI.
- Lyons, J., P.A. Cochran, and D. Fago. 2000. Wisconsin Fishes 2000: Status and Distribution, University of Wisconsin Press, Sea Grant Institute, Madison, WI.
- Merritt, R.W., K.W. Cummins, and M.B. Berg. 2008. An Introduction to the Aquatic Insects of North America, 4th edit. Kendall/Hunt Publishing, Iowa.
- Pecharsky, B.L., P.R. Fraissinet, M.A. Penton and D.J. Conklin 1990. Freshwater macroinvertebrates of northeastern North America. Cornell University Press, Ithaca.
- Pennak, R.W. 1989. Fresh-water Invertebrates of the United States: Protozoa to Mollusca, 3rd edit. John Wiley and Sons, Inc. New York, NY.
- ThermoRetec. 2001. Fox River Food (FRFood) Model Documentation Memorandum: Lower Fox River, Wisconsin Remedial Investigation and Feasibility Study. ThermoRetec Consulting Organization. Seattle, Washington.
- Thorp, J.H. and A.P. Covich (eds.) 1991. Ecology and Classification of North American Freshwater Invertebrates. Academic Press, Inc. San Diego, CA.

Wisconsin Department of Natural Resources. 2001. Lower Fox River Basin Integrated Management Plan. WI DNR Report PUBL WT-666-2001.

Wisconsin Fish ID Software. 2005. Software for Identifying Fishes of Wisconsin. University of Wisconsin Center for Limnology, Sea Grant Institute, and Wisconsin Department of Natural Resources. <http://www.wiscfish.org/fishid/>.