# Aquatic Invasive Species Monitoring Project

# Year 2014 Report

# To the

# Fox River Navigational System Authority

**By**

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## 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 (Savanna Dahl and Emily Kiehnau) were employed during the summer of 2014 to carry out the investigations.

## Sampling Design

Monitoring occurred at six sites along the lower Fox River, WI during the summer of 2014. 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). 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 19 different sampling trips on 14 days during the summer (Table 2). Each site was sampled either three or 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 2008-2014.

| 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-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 2014. 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 |
|---|---|---|---|---|---|
| 7/7 FR-A | X | X | X | X | |
| 7/9 FR-B | X | X | X | X | |
| 7/14 FR-D | X | X | X | X | |
| 7/14 FR-C | | X | X | | |
| 7/18 FR-4 | X | X | X | X | |
| 7/23 FR-3 | X | X | X | X | X |
| 7/24 FR-C | X | X | X | X | |
| 7/28 FR-A | X | X | X | X | X |
| 7/28 FR-B | X | X | X | X | X |
| 8/5 FR-4 | X | X | X | X | X |
| 8/7 FR-C | X | X | X | X | X |
| 8/7 FR-D | X | X | X | X | X |
| 8/11 FR-3 | X | X | X | X | |
| 8/13 FR-A | X | X | X | X | |
| 8/13 FR-B | X | X | X | X | |
| 8/19 FR-4 | X | X | X | X | |
| 8/20 FR-C | X | X | X | X | |
| 8/20 FR-D | X | X | X | X | |
| 8/22 FR-3 | 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 um). 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 (generally until no new taxa were obtained). 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 three (and up to five) beach seine hauls at each shoreline location on each sampling day (1/4 inch mesh, 4 foot height, 20 foot length). If possible, specimens were identified in the field to the species level and then released. Specimens of new species compared to existing records, non-native species, 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 23 species of fish were collected from the six sites during the summer of 2014 (Table 3). Sixteen species of fish were observed downstream of the Rapide Croche dam, while 18 of the total 23 species were found upstream of Rapide Croche. Only one invasive fish species, the round goby (*Neogobius melanostomus*), was documented during the summer. Round goby was found at all sites below Rapide Croche dam, and was not observed at any of the sites above the dam (up to the pool above the Cedar Lock). No sea lamprey (*Petromyzon marinus*) were collected at any sites during 2014.

Table 3. Fish species presence documented in the lower Fox River, WI upstream and downstream of the Rapide Croche dam during summer 2014. 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 round goby (highlighted) was the only invasive fish species observed.

| **Fish** | **FR-A** | **FR-B** | **FR-3** | **FR-4** | **FR-C** | **FR-D** |
|---|---|---|---|---|---|---|
| *Ambloplites rupestris* (Rock Bass) | 1 | | | | | |
| *Campostoma anomalum* (Central Stoneroller) | 1 | | | | | |
| *Catostomus commersonii* (White Sucker) | 1 | 1 | 1 | 1 | | 1 |
| *Cyprinella spiloptera* (Spotfin Shiner) | | | 1 | 1 | 1 | |
| *Dorosoma cepedianum* (Gizzard Shad) | | 1 | 1 | | 1 | 1 |
| *Esox americanus vermiculatus* (Grass Pickerel) | 1 | | | | | |
| *Etheostoma chlorosoma* (Bluntnose darter) | 1 | | | 1 | | |
| *Etheostoma nigrum* (Johnny darter) | 1 | 1 | | | | |
| *Lepisosteus osseus* (Longnose Gar) | | | | 1 | 1 | |
| *Lepomis macrochirus* (Bluegill) | | 1 | | | 1 | |
| *Micropterus dolomieu* (Smallmouth bass) | | 1 | 1 | | 1 | 1 |
| *Micropterus salmoides* (Largemouth Bass) | | 1 | 1 | | 1 | |
| *Morone chrysops (*white Bass) | 1 | | | | | |
| *Neogobius melanostomus* (Round goby) | | | | 1 | 1 | 1 |
| *Notropis heterolepis* (Blacknose Shiner) | 1 | 1 | | | | |
| *Notropis hudsonius* (Spottail Shiner) | | | 1 | 1 | | 1 |
| *Notropis nubilus* (Ozark Minnow) | | | | 1 | | |
| *Notropis sp* (Common Shiner) | | | | | 1 | 1 |
| *Notropis wickliffi* (Channel Shiner) | | | | | | 1 |
| *Perca flavescens* (Yellow Perch) | 1 | 1 | 1 | | 1 | 1 |
| *Percina shumardi* (River Darter) | | 1 | | | 1 | 1 |
| *Pomoxis annularis* (White Crappie) | 1 | 1 | | | 1 | |
| *Semotilus atromaculatus* (Creek Chub) | 1 | | | | | |
| ***TOTAL*** | **11** | **10** | **7** | **7** | **11** | **9** |

*Benthic Invertebrates*:

There were 64 groups of benthic invertebrates observed during the summer of 2014, with 54 occurring upstream and 30 downstream of the Rapide Croche dam (Table 4). Approximately twice as many taxa of invertebrates were observed at sites above compared to below the dam. Zebra mussels were observed both above and below the Rapide Croche dam while rusty crayfish again were only found above the dam. A new invasive amphipod, *Crangonyx pseudogracilis*, was found at one site above the dam this year. Zebra mussels were especially abundant in many areas, and the rusty crayfish was very abundant in some shoreline areas upstream of the barrier.

Table 4. Benthic invertebrate taxa documented upstream and downstream of the Rapide Croche dam during summer 2014 (value of 1 indicates presence). Highlighted groups are considered "invasive" species.

| **Macroinvertebrates** | | **FR-A** | **FR-B** | **FR-3** | **FR-4** | **FR-C** | **FR-D** |
|---|---|---|---|---|---|---|---|
| *Agraylea sp.* | *(caddisfly)* | | | 1 | | | |
| *Amphiagrion sp.* | *(damselfly)* | | | 1 | | | |
| *Arrenurus sp.* | *(water mite)* | 1 | 1 | 1 | | 1 | 1 |
| *Asellidae caecidotea* | *(isopod)* | 1 | 1 | | | | |
| *Asellidae lirceus* | *(isopod)* | 1 | | | | | |
| *Asellidae sp.* | *(isopod)* | | | | | 1 | 1 |
| *Baetis hiemalis* | *(mayfly)* | 1 | | | | | 1 |
| *Bittacomorpha sp.* | *(crane fly)* | 1 | | | | | |
| *Brychius sp.* | *(water beetle)* | | | 1 | | | |
| *Caecidotea sp.* | *(isopod)* | | | 1 | | | |
| *Caenis sp.* | *(mayfly)* | | 1 | 1 | 1 | | 1 |
| *Callibaetis sp.* | *(mayfly)* | | | 1 | | | |
| *Ceratopogonidae sp.* | *(midge, biting)* | | | | | | 1 |
| Chironomidae sp. | *(bloodworm)* | 1 | 1 | 1 | 1 | 1 | 1 |
| *Coenagrion sp.* | *(damselfly)* | 1 | 1 | 1 | | | |
| *Coenagrion sp.* | *(damselfly)* | | | | | | 1 |
| *Corbicula fluminea* | *(clam)* | | 1 | | 1 | | |
| *Corixidae, Juvenile* | *(waterboatman)* | 1 | 1 | 1 | 1 | 1 | 1 |
| *Crangonyx pseudogracilis* | *(amphipod)* | 1 | | | | | |
| *Curculionidae sp.* | *(aquatic beetle)* | | | 1 | | | |
| *Dannella sp.* | *(mayfly)* | | 1 | | | | |
| *Dreissena polymorpha* | *(zebra mussel)* | 1 | 1 | 1 | 1 | 1 | |
| *Elmidae sp.* | *(aquatic beetle)* | | | 1 | | | |
| *Enallagma sp.* | *(damselfly)* | 1 | 1 | 1 | 1 | 1 | 1 |
| *Ephemerellidae sp.* | *(mayfly)* | | | | 1 | | 1 |
| *Gammarus sp.* | *(amphipod)* | 1 | 1 | 1 | 1 | | 1 |
| *Glossiphoniidae sp.* | *(leech)* | 1 | 1 | 1 | | | |
| *Gyraulus sp.* | *(aquatic snail)* | 1 | 1 | | | | 1 |
| *Haliplidae sp.* | *(aquatic beetle)* | | | 1 | | | |

Table 4 (continued)

| Macroinvertebrates | | FR-A | FR-B | FR-3 | FR-4 | FR-C | FR-D |
|---|---|---|---|---|---|---|---|
| *Helisoma sp.* | *(aquatic snail)* | 1 | 1 | 1 | 1 | | |
| *Hyalella azteca* | *(amphipod)* | 1 | 1 | 1 | | | |
| *Hydrachna sp.* | *(water mite)* | 1 | 1 | | | | |
| Hydropsychidae sp. | *(caddisfly)* | 1 | | | | | |
| *Koenikea sp.* | *(water mite)* | | 1 | 1 | | | |
| *Laccophilus sp.* | *(aquatic beetle)* | 1 | | | | | |
| *Lebertia sp.* | *(water mite)* | | 1 | | 1 | 1 | 1 |
| *Limnesia sp.* | *(water mite)* | | | 1 | 1 | 1 | 1 |
| *Macronema sp.* | *(caddisfly)* | | | 1 | | | |
| *Mesovelia sp.* | *(water treader)* | | | | | 1 | |
| *Metrobates sp.* | *(water strider)* | | | 1 | | | |
| *Mideopsis sp.* | *(water mite)* | | 1 | | | | |
| *Monoporeia sp.* | *(amphipod)* | 1 | 1 | | 1 | | |
| *Nehalennia sp.* | *(damselfly)* | | 1 | 1 | | | |
| *Neumania sp.* | *(water mite)* | | | 1 | | | |
| *Oligochaeta sp.* | *(threadworm)* | | 1 | | | | 1 |
| *Orconectes rusticus* | *(rusty crayfish)* | 1 | 1 | | | | |
| *Oreodytes sp.* | *(aquatic beetle)* | 1 | | | | | |
| *Oxus sp.* | *(water mite)* | | | 1 | | | |
| *Palmacorixa sp.* | *(waterboatman)* | 1 | 1 | 1 | 1 | 1 | 1 |
| *Physella sp.* | *(aquatic snail)* | 1 | 1 | 1 | | | 1 |
| *Pleurocera sp.* | *(aquatic snail)* | 1 | 1 | 1 | 1 | | |
| *Polycentropodidae sp.* | *(caddisfly)* | | | | | 1 | |
| *Pseudiron sp.* | *(mayfly)* | | | | 1 | | |
| *Pseudohydrophantes sp.* | *(water mite)* | | 1 | | | | |
| *Ranatra sp.* | *(water scorpion)* | 1 | | 1 | | | |
| Sialis sp. | (alderfly) | | 1 | | | | |
| *Sigara sp.* | *(waterboatman)* | 1 | | 1 | 1 | | 1 |
| Sphaeriidae sp. | (clam) | | | | 1 | | 1 |
| *Tabanidae sp.* | *(fly)* | | 1 | | | 1 | |
| *Tanypodinae* sp. | (midge) | 1 | | | | | |
| *Trepobates sp.* | *(water strider)* | | | | | 1 | |
| *Trichocorixica sp.* | *(waterboatman)* | 1 | | 1 | | | |
| *Tricorythodes sp.* | *(mayfly)* | 1 | | | | | |
| *Viviparus sp.* | *(aquatic snail)* | | | | | 1 | |
| | ***TOTAL*** | **30** | **29** | **32** | **17** | **14** | **19** |

*Plankton*:

A total of 21 species of zooplankton were recorded in 2014, with the majority of them occurring in both locations (Table 5). All except two of the groups occurred upstream while 14 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 2014. 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-C** | **FR-D** |
|---|---|---|---|---|---|---|
| *Acanthocyclops vernalis* | 1 | 1 | 1 | 1 | 1 | 1 |
| *Alona sp.* | 1 | | | | | |
| *Anchistropus minor* | 1 | 1 | 1 | 1 | 1 | 1 |
| *Bosmina longirostris* | 1 | 1 | 1 | 1 | 1 | 1 |
| *Candona sp.*(Ostracod) | 1 | 1 | 1 | 1 | 1 | 1 |
| *Chydorus sp.* | 1 | | | | | |
| *Daphnia longiremis* | 1 | | | | | |
| *Daphnia mendotae* | 1 | | | | | |
| *Daphnia pulicaria* | 1 | | | | | 1 |
| *Dapnia retrocurva* | | | | 1 | | |
| *Diacyclops nanus* | | | | 1 | | |
| *Diacyclops thomasi* | 1 | 1 | 1 | 1 | 1 | 1 |
| *Diaphanosoma birgei* | 1 | 1 | 1 | 1 | 1 | 1 |
| *Epischura lacustris* | | | 1 | 1 | 1 | 1 |
| *Eubosmina coregoni* | 1 | 1 | 1 | 1 | 1 | |
| *Leptodiaptomus ashlandi* | 1 | | | | | |
| *Leptodiaptomus siciloides* | 1 | | | | | |
| *Leptodora kindti* | | 1 | | | | 1 |
| *Macrocyclops albidus* | | 1 | | | | |
| *Mesocyclops edax* | 1 | 1 | 1 | 1 | 1 | 1 |
| *Skistodiaptomus oregonesis* | 1 | 1 | 1 | 1 | 1 | 1 |
| ***TOTAL*** | **16** | **11** | **10** | **12** | **10** | **11** |

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