

**Aquatic Invasive Species Monitoring Project**

**Year 2015 Report**

**To the**

**Fox River Navigational System Authority**

**By**

**Bart De Stasio, Ph.D.**

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

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## Objectives

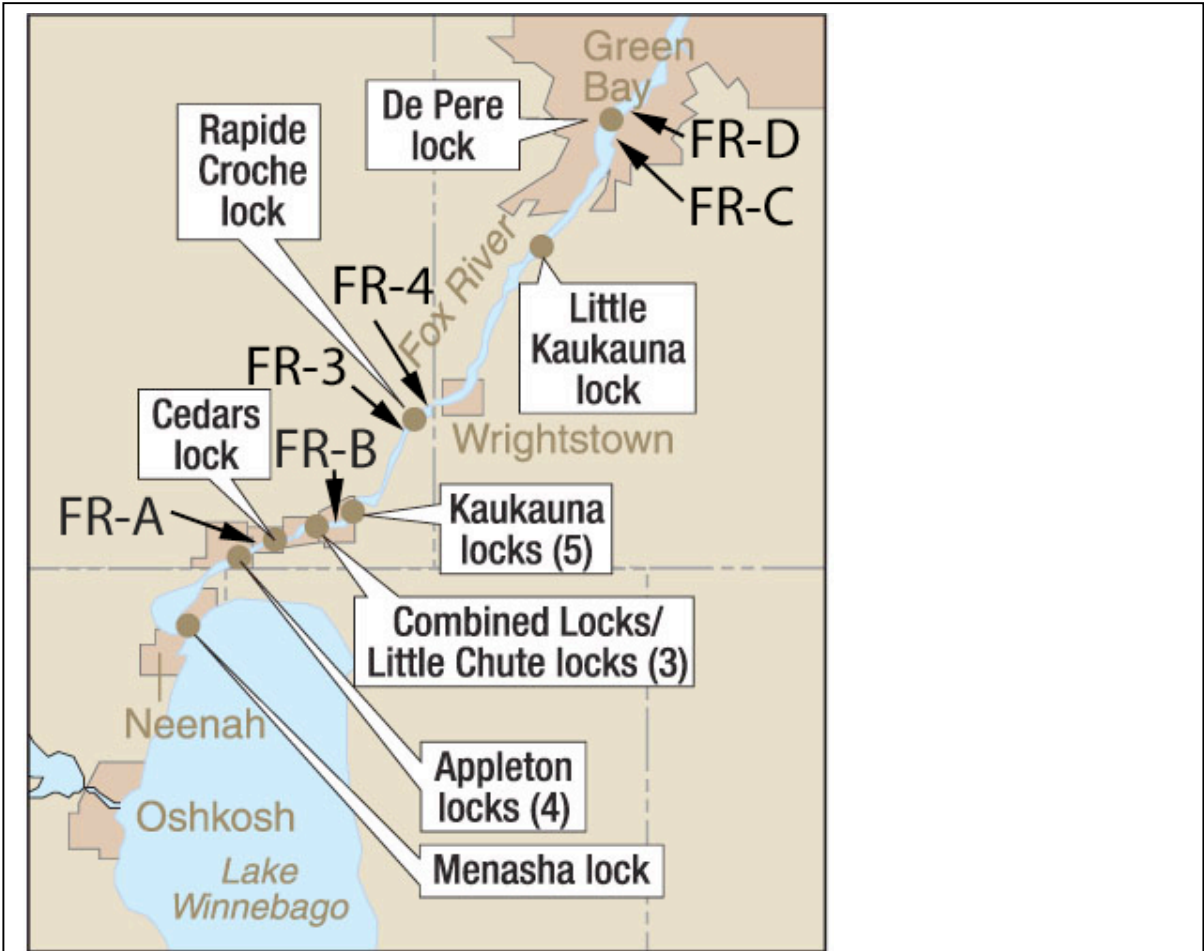
The Aquatic Invasive Species (AIS) Control and Monitoring Plan of the Fox River Navigational System Authority (FRNSA, 2009 update) has the stated objective to “Monitor the presence and map the distribution of fish and invertebrate AIS in the Fox River three navigation pools immediately up and downstream of the Rapide Croche Lock.” Under the supervision of Dr. Bart De Stasio, Ph.D., Lawrence University, two students (Katherine Ling and Annie Ela) were employed during the summer of 2015 to carry out the investigations.

## Sampling Design

Monitoring occurred at six sites along the lower Fox River, WI during the summer of 2015 (Table 1, Figure 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 21 different sampling trips on 19 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/topic/fishing/documents/vhs/disinfection\\_protocols.pdf](http://dnr.wi.gov/topic/fishing/documents/vhs/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



**Figure 1.** Map of sampling locations along the lower Fox River, WI.

Table 2. Sampling effort upstream and downstream of the Rapide Croche dam on the lower Fox River, WI during summer 2015. 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
6/23 FR-A	X	X	X	X	
6/26 FR-B	X	X	X	X	
6/30 FR-4	X	X	X	X	
7/2 FR-C	X	X	X	X	
7/2 FR-D	X	X	X	X	
7/7 FR-3	X	X	X	X	
7/10 FR-A	X	X	X	X	
7/14 FR-B	X	X	X	X	X
7/17 FR-4	X	X	X	X	
7/21 FR-3	X	X	X	X	
7/23 FR-C	X	X	X	X	X
7/23 FR-D	X	X	X	X	X
7/28 FR-A	X	X	X	X	X
7/30 FR-B	X	X	X	X	X
8/4 FR-4	X	X	X	X	X
8/6 FR-3	X	X	X	X	X
8/10 FR-C	X	X	X	X	X
8/11 FR-D	X	X	X	X	X
8/12 FR-3					X
8/13 FR-A					X
8/17 FR-4					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). 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 genus or 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 site using a combination of trapping, netting 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 July and August at each site (see Table 2). Netting included mid-channel as well as shoreline locations at each site using standard hoop nets (2ft diameter, 10ft length, 1in square mesh) using frozen cod as bait. We also 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, fish 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. Specimens were transported to Lawrence University in accordance with WI Administrative Code NR 40 and all applicable permitting requirements under my Scientific Collector’s permit. 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 27 species of fish were collected from the six sites during the summer of 2015 (Table 3). Sixteen species of fish were observed downstream of the Rapide Croche barrier, while 17 of the total 27 species were found upstream of Rapide Croche. As in the previous year, 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, and was not observed at any of the sites above the barrier (which extends upstream to the pool above the Cedar Lock). No sea lamprey (*Petromyzon marinus*) were collected at any sites during 2015.

Table 3. Fish species presence documented in the lower Fox River, WI upstream and downstream of the Rapide Croche dam during summer 2015. 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.

<b>Fish</b>	<b>FR-A</b>	<b>FR-B</b>	<b>FR-3</b>	<b>FR-4</b>	<b>FR-C</b>	<b>FR-D</b>
<i>Alosa chrysochloris</i> (skipjack herring)						1
<i>Alosa pseudoharengus</i> (Alewife)					1	
<i>Capoides carpio</i> (River carpsucker)				1		1
<i>Catostomus commersonii</i> (White Sucker)				1		
<i>Covesius plumbeus</i> (Lake chub)						1
<i>Culaea inconstans</i> (Brook stickelback)			1			
<i>Cyprinus carpio</i> (common carp)			1			
<i>Dorosoma cepedianum</i> (Gizzard Shad)			1			1
<i>Etheostoma chlorosoma</i> (Bluntnose darter)			1	1		
<i>Etheostoma nigrum</i> (Johnny darter)	1		1			
<i>Lepomis cyanellus</i> (green sunfish)	1					
<i>Lepomis gibbosus</i> (Pumpkin seed)			1			
<i>Lepomis macrochirus</i> (Bluegill)	1	1	1			
<i>Micropterus dolomieu</i> (Smallmouth bass)				1		
<i>Micropterus salmoides</i> (Largemouth Bass)	1	1	1		1	1
<i>Neogobius melanostomus</i> (Round goby)				1	1	1
<i>Notropis blennioides</i> (River shiner)	1					
<i>Notropis hudsonius</i> (Spottail Shiner)	1		1			
<i>Luxilus cornutus</i> (Common Shiner)	1					
<i>Notropis wickliffi</i> (Channel Shiner)						1
<i>Pimphales notatus</i> (Bluntnose minnow)	1	1		1		
<i>Pimphales promelas</i> (Fathead minnow)						1
<i>Percina caprodes</i> (log perch)			1	1		
<i>Perca flavescens</i> (Yellow Perch)	1	1	1	1		1
<i>Percopsis omiscomaycus</i> (Trout perch)				1		
<i>Pomoxis annularis</i> (White Crappie)	1	1				
<i>Semotilus atromaculatus</i> (Creek Chub)	1					
<b>TOTALS (27 species)</b>	<b>11</b>	<b>5</b>	<b>11</b>	<b>9</b>	<b>3</b>	<b>9</b>

Benthic Invertebrates:

There were 43 groups of benthic invertebrates observed during the summer of 2015, with 30 occurring upstream and 24 downstream of the Rapide Croche barrier (Table 4). Zebra mussels were observed both above and below Rapide Croche while rusty crayfish were only found below the barrier. Four invasive amphipod species (“side-swimmers”) were observed along the river this year.

Table 4. Benthic invertebrate taxa documented upstream and downstream of the Rapide Croche dam during summer 2015 (value of 1 indicates presence). Highlighted groups are considered “invasive” species.

<b>Macroinvertebrates</b>	<b>FR-A</b>	<b>FR-B</b>	<b>FR-3</b>	<b>FR-4</b>	<b>FR-C</b>	<b>FR-D</b>
(amphipod) <i>Gammarus sp.</i>	1		1	1		
(amphipod) <i>Gammarus tigrinus</i>				1		
(amphipod) <i>Gammarus fasciatus</i>	1					
(amphipod) <i>Crangonyctidae crangonyx</i>		1				
(amphipod) <i>Echinogammarus ischnus</i>		1	1	1	1	
(amphipod) <i>Hyalella azteca</i>	1	1	1	1		
(amphipod) <i>Monoporeia sp.</i>	1					
(aquatic beetle) <i>Coleoptera noteridae</i>		1				
(aquatic beetle) <i>Elmidae sp.</i>				1		
(aquatic whirligig beetle) <i>Gyrinidae dineutus</i>				1		
(aquatic snail, right handed) <i>Pleurocera sp.</i>				1		
(aquatic snail) <i>Lymnaea sp.</i>	1					
(bloodworm larvae) <i>Chironomidae sp.</i>					1	
(caddisfly) <i>Hydropsychidae sp.</i>	1		1			
(caddisfly) <i>Trichoptera hesperophylax</i>			1	1		
(caddisfly) <i>Trichoptera limnephilus</i>				1		
(damselfly) <i>Anisoptera</i>	1					
(damselfly) <i>Coenagrion sp.</i>	1			1		
(damselfly) <i>Odonata lestidae</i>	1	1	1			
(isopod) <i>Asellidae sp.</i>				1		
(isopod) <i>Asellidae caecidotea</i>	1	1				
(isopod) <i>Asellidae lirceus</i>	1					
(isopod) <i>Caecidotea sp.</i>		1				
(leech) <i>Glossiphoniidae sp.</i>		1	1			
(mayfly) <i>Callibaetis sp.</i>						1
(mayfly) <i>Dannella sp.</i>	1		1			
(mayfly) <i>Ephemerellidae sp.</i>				1		1
(mayfly) <i>Ephemeroptera metretopodidae</i>			1			
(mayfly) <i>Potamanthidae sp.</i>	1					

Table 4 (continued)

<b>Macroinvertebrates</b>	<b>FR-A</b>	<b>FR-B</b>	<b>FR-3</b>	<b>FR-4</b>	<b>FR-C</b>	<b>FR-D</b>
(midge) <i>Chironomidae</i> family	1	1		1	1	1
(midge) <i>Hesperophylax</i>		1		1		
(mollusk) <i>Bithynia</i>	1	1	1	1		
(mollusk) <i>Campeloma</i>	1		1			
(mollusk) <i>Goniobasis</i>	1	1				
(mollusk) <i>Hydrobia</i>				1		
(mollusk) <i>Physa</i>						1
(devil crayfish) <i>Cambarus diogenes</i>	1	1	1			1
(rusty crayfish) <i>Orconectes rusticus</i>				1		
(mystery snail) <i>Viviparidae</i>	1					
(water scorpion) <i>Ranatra</i> sp.			1			
(waterboatman) <i>Corixidae</i>	1	1	1	1	1	1
(worm) <i>Tubifex</i>					1	
(zebra mussel) <i>Dreissena polymorpha</i>	1	1	1		1	
<b>TOTALS (43 species)</b>	<b>21</b>	<b>15</b>	<b>15</b>	<b>18</b>	<b>6</b>	<b>6</b>

Plankton:

A total of 12 species of zooplankton were recorded in 2015, with the majority of them occurring in both locations (Table 5). Of the 10 species that occurred upstream two did not occur downstream; similarly, two of the 10 taxa that were found at sites downstream of the Rapide Croche barrier did not occur upstream. 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 2015. A value of one indicates presence. None of the groups observed are considered “invasive” species.

<b>Zooplankton</b>	<b>FR-A</b>	<b>FR-B</b>	<b>FR-3</b>	<b>FR-4</b>	<b>FR-C</b>	<b>FR-D</b>
<i>Acanthocyclops vernalis</i>	1	1	1	1	1	1
<i>Anchistropus minor</i>		1				
<i>Bosmina longirostris</i>	1	1	1	1	1	1
<i>Canthocamptus sp.</i>		1				
<i>Daphnia pulicaria</i>					1	1
<i>Diacyclops thomasi</i>	1	1	1	1	1	1
<i>Diaphanosoma birgei</i>	1		1	1	1	1
<i>Eubbranchipus</i>						1
<i>Leptodiptomus siciloides</i>		1	1	1	1	
<i>Leptodora kindti</i>		1	1			1
<i>Mesocyclops edax</i>	1		1	1	1	1
<i>Skistodiptomus oregonesis</i>	1	1	1	1	1	
<b>TOTALS (12 species)</b>	<b>6</b>	<b>8</b>	<b>8</b>	<b>7</b>	<b>8</b>	<b>8</b>

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