



Invasive Species Monitoring and Control Report

Badger-Rapide Croche Hydroelectric Project

FERC Project No. 2677

**Lower Fox River
Outagamie County, Wisconsin**



Prepared for



Kaukauna, Wisconsin

Prepared by



www.meadhunt.com

October 2015

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1. Introduction

On May 18, 2011, the Federal Energy Regulatory Commission (FERC) issued a new license to Kaukauna Utilities (KU) for the Badger-Rapide Croche Hydroelectric Project (FERC Project No. 2677). This license required the filing of certain plans for FERC approval in consultation with the U.S. Fish and Wildlife Service (FWS) and the Wisconsin Department of Natural Resources (WDNR) under the FERC License Article 401. These plans covered a number of Section 401 Water Quality Certification conditions imposed by the WDNR, of which Condition 8 specified that KU develop an *Invasive Species Monitoring and Control Plan*.

This plan was prepared in March 2012 in consultation with the agencies and approved by the FERC on June 6, 2012. The plan included field monitoring formats for certain invasive species and this report is the third completed in compliance with License Article 401. It presents the results of 2015 fieldwork, as modified in consultation with the WDNR, and other compliance measures taken by KU.

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2. Monitoring Requirements

Table 1 presents the original invasive species monitoring requirements that were followed during 2013 and 2014 field work.

Table 1. Original Badger-Rapide Croche Invasive Species Annual Monitoring Schedule

Species	Monitoring Timeframe	Method*
a. Japanese knotweed (<i>Fallopia japonica</i>)	July	P
b. Garlic mustard (<i>Alliaria petiolata</i>)	May	P
c. Buckthorn (<i>Rhamnus cathartica</i>)	May	P
d. Purple loosestrife (<i>Lythrum salicaria</i>)	July	B
e. Reed canary grass (<i>Phalaris arundinacea</i>)	May	B,P
f. Common reed (<i>Phragmites australis</i>)	May-June	B
g. Dreissenid mussels (3 spp.)	May-July	O

* B = boat; P = pedestrian; O = other

The other method referred to in Table 1 (last row method O) is raking of the trashracks on hydroelectric plant intakes by KU personnel.

On February 12, 2015, a consultation meeting was held with WDNR staff to discuss invasive species findings to-date and refocus the field monitoring effort. The WDNR commented that places where influent drainages were entering the Fox River may present opportunities for invasive plants to enter the system. Based on the results of 2013 and 2014 monitoring, it was noted that the habitat for invasive terrestrial plants is very limited by the area of free shoreline along the river because most of the river corridor is steeply wooded. It was agreed that further mapping of buckthorn, reed canary grass and purple loosestrife was not necessary, as the river system appeared to be stable in this regard, and that a single summer tour for Japanese knotweed, flowering rush and yellow floating heart be done for 2015 and forward, focusing exclusively on shoreline areas where influent drainages are entering the Fox River.

Accordingly, Table 2 presents the new invasive species annual monitoring schedule.

Table 2. New Badger-Rapide Croche Invasive Species Annual Monitoring Schedule

Species	Monitoring Timeframe	Method*
a. Japanese knotweed (<i>Fallopia japonica</i>)	July-August	B
b. Flowering rush (<i>Butomus umbellatus</i>)	July-August	B
c. Yellow floating heart (<i>Nymphoides peltata</i>)	July-August	B
d. Common reed (<i>Phragmites australis</i>)	July-August	B
e. Dreissenid mussels (3 spp.)	May-July	O

Garlic mustard and buckthorn monitoring and control is now only associated with the Rapide Croche Park oak savannah and woodland restoration project and is being done by Prairie Nursery under separate contract with KU. An updated habitat map of the park showing garlic mustard control areas is included in this report. The WDNR agreed that this restoration is a worthwhile focus for these two invasive species

Section 2 Monitoring Requirements

that ties together land management, recreation and education and considers this work to be a valuable and meaningful substitute for continued annual mapping of the entire project shoreline.

In accordance with the FERC order approving the *Invasive Species Monitoring and Control Plan*, Eurasian Water Milfoil will be monitored every fourth year, beginning in 2017, using field procedures, tools, data analysis, and protocols of the WDNR.

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3. 2015 Field Monitoring

A. Monitoring Area

The monitoring area for invasive species has been reduced to the shoreline within the immediate area of twelve drainages and stream inlets within the project boundary of the Badger-Rapide Croche Project (see Appendix A). These inlets occur over a total reach of about 5 miles of the Fox River. An intervening reach of about 1.5 miles between the Badger plant discharge and the upstream limit of the Rapide Croche impoundment is within the project boundary of the KU City Hydroelectric Project, which is not subject to this monitoring effort.

The power transmission line right-of-way from the Badger to the Rapide Croche plants, the Fox River bypass reach and Badger power canal and the discharge area downstream of Badger are no longer part of the area to be monitored.

B. Results

Invasive plant monitoring was performed on August 4 & 5, 2015. Reference maps using 1"=300' (1:3600) scaled orthophotos were used for way-finding and notation, while invasive plant locations were surveyed using a Geo Trimble XH hand-held GPS unit. Satellite reception during fieldwork was generally good, and we were able to post-process the data files to an accuracy of within 5 feet. Appendix A has map sheets showing the monitored area and the location of Rapide Croche Park, in which invasive plants are being controlled and a savanna restoration being planned. An updated habitat map for the park, showing the location of the 0.49-acre savanna restoration, is also included in Appendix A.

No invasive plants of Table 2 were documented within the monitoring limits around influent streams or drainages along the project. However, we noticed and mapped two locations outside the influent stream limits where natural or human control of loosestrife was occurring. Several loosestrife plants on map sheet 4 were dead or severely pruned (Figures 1-2 below) as a result of the black-margined loosestrife beetle (*Galerucella californiensis*). Another loosestrife plant on map sheet 5 had apparently been sprayed with herbicide and effectively killed by the adjacent landowner.



Figure 1. (Left) Example of weevil damage and purple loosestrife Aug 4th, 2015.

Figure 2. (Right) Photo of black-margined loosestrife beetle eating a purple loosestrife plant Aug 4th, 2015.

Photos comparing a beetle-killed plant and a healthy loosestrife plant are on the cover of this report. Evidence of the loosestrife beetle among such a thinly-scattered population of loosestrife is a new and encouraging development, as is the fact that at least one riparian property owner has undertaken control of this noxious weed.

Monitoring for Dreissenid mussels was done by KU personnel only at the Rapide Croche plant, since the new Badger plant was under construction. Monitoring was done by trashrack cleaning, with few occurrences noted. Zebra mussels have been noted at the project before and are common in the river. According to KU personnel, mussels usually pass through the hydroelectric units and do not accumulate on the trashracks because of intake velocity. They are usually limited to the corners of the racks, where velocity is low enough for the veligers (mussel larvae) to attach. Similarly, mussels do not affect operations because of the high water velocities within the intakes and units. KU dewater their units every other year for maintenance and mussels have never been found in these locations.

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4. Invasive Species Control

As a result of identifying a garlic mustard infestation on approximately 2.5 acres of Rapide Croche Park woodlands, KU retained Prairie Nursery of Westfield, Wisconsin, to perform garlic mustard control and evaluate the ecological health of the park's woodlands. An initial site visit on November 14, 2013, revealed a small remnant of rare Fox Valley oak savanna habitat within the park, with healthy mature white oaks and a partially intact native herb community. In light of this discovery, KU requested Prairie Nursery to identify restoration and management strategies for this habitat, as well as perform garlic mustard control. Prairie Nursery's management report is being provided to KU under separate cover as it is outside the scope of FERC license compliance.

On June 10, 2015, woodlands of Rapide Croche Park were toured by staff of KU, WDNR, Mead & Hunt and Prairie Nursery and the ecological setting and basis for the restoration was explained. The opportunity was taken on this date to refine the habitat areas and garlic mustard infestation (see Appendix A). Based on the results of early 2015 control efforts, Prairie Nursery's management strategy for controlling garlic mustard has been enhanced to include select herbicide applications as well as cutting of the pre-mature seed stalks just after flowering is complete in early June. Planning for ongoing work involving restoration of the native ground layer vegetation is continuing between KU and Prairie Nursery.

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5. Public Awareness and Education

As part of this monitoring program, KU has taken measures to increase public awareness, including posting of WDNR invasive species and viral hemorrhagic septicemia (VHS) signs at the City boat landing.

KU has also provided a range of informative pamphlets and information sheets to the public at its main office on Island Street in Kaukauna. The following publications have been made available:

- *Stop Aquatic Hitchhikers*, UW Cooperative Extension CBCW brochure WT-801
- *Zebra Mussels Boaters Guide*, UW Cooperative Extension CBCW brochure WT-383
- *Regulated Aquatic Invasive Plants in WI*, UW Cooperative Extension Fact Sheet WT-960
- *Purple Loosestrife*, UW Cooperative Extension CBCW brochure WI-799
- *Japanese Knotweed*, UW Cooperative Extension CBCW brochure ER-657
- *The Facts on Eurasian Water Milfoil*, UW Cooperative Extension PUB-WT-781 2004
- *Common and Glossy Buckthorn*, DNR PUB FR-216 2007
- *Invasive Exotic Shrub Honeysuckles*, DNR PUB FR-448 2009
- NR 40 Regulated Exotic Plant List from: <http://dnr.wi.gov/topic/Invasives/documents/NR40plantlist.pdf>
- *Garlic Mustard (Alliaria petiolata)*, DNR PUB-FR-350-2006

According to KU staff who periodically re-supply the pamphlet area, the following number of pamphlets were taken by customers as of October 6, 2014:

- 9 - *Stop Aquatic Hitchhikers*, UW Cooperative Extension CBCW brochure WT-801
- 2 - *Zebra Mussels Boaters Guide*, UW Cooperative Extension CBCW brochure WT-383
- 5 - *Regulated Aquatic Invasive Plants in WI*, UW Cooperative Extension Fact Sheet WT-960
- 9 - *Purple Loosestrife*, UW Cooperative Extension CBCW brochure WI-799
- 9 - *Japanese Knotweed*, UW Cooperative Extension CBCW brochure ER-657

All publications remain available in the pamphlet area and KU staff will continue to re-stock them as needed.

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Appendix A. Field Monitoring Maps

2015 Invasive Species Monitoring Results

Badger/Rapide-Croche Dams

Monitoring Locations

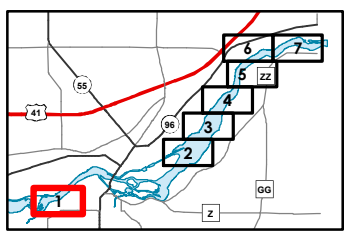


- Spot Occurrences**
- ◆ Buckthorn
 - ▲ Garlic mustard
 - Purple loosestrife
 - Reed canary grass
 - ⊕ Multiple Species Occurrences
 - ⊗ Removed/controlled

- Species Type(s)**
- Buckthorn
 - Buckthorn/purple loosestrife
 - Buckthorn/reed canary grass/purple loosestrife
 - Purple loosestrife
 - Reed canary grass
 - Reed canary grass/buckthorn
 - Reed canary grass/purple loosestrife

- Invasive Species Monitoring Areas**
- Monitoring Area
 - Non-Project Area
 - Stream (approximate)
 - Stream/River

Map Notes:
 Image base from the Wisconsin Regional Orthophotography Consortium (WROC), 2010.
 Hydrography network from National Hydrography Dataset and on-screen photo interpretation
 Field work conducted August 4 - 5, 2015.



Map 1 of 7



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2015 Invasive Species Monitoring Results

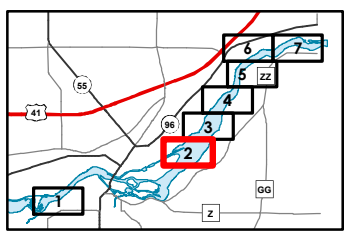
Badger/Rapide-Croche Dams

Monitoring Locations



Spot Occurrences	Species Type(s)	Invasive Species Monitoring Areas
Buckthorn	Buckthorn	Monitoring Area
Garlic mustard	Buckthorn/purple loosestrife	Non-Project Area
Purple loosestrife	Buckthorn/reed canary grass/purple loosestrife	Stream (approximate)
Reed canary grass	Purple loosestrife	Stream/River
Multiple Species Occurrences	Reed canary grass	
Removed/controlled	Reed canary grass/buckthorn	
	Reed canary grass/purple loosestrife	

Map Notes:
 Image base from the Wisconsin Regional Orthophotography Consortium (WROC), 2010.
 Hydrography network from National Hydrography Dataset and on-screen photo interpretation
 Field work conducted August 4 - 5, 2015.



Map 2 of 7



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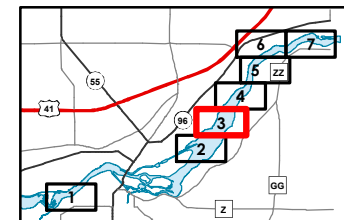
2015 Invasive Species Monitoring Results

Badger/Rapide-Croche Dams
Monitoring Locations



- | Spot Occurrences | Species Type(s) | Invasive Species Monitoring Areas |
|------------------------------|--|-----------------------------------|
| Buckthorn | Buckthorn | Monitoring Area |
| Garlic mustard | Buckthorn/purple loosestrife | Non-Project Area |
| Purple loosestrife | Buckthorn/reed canary grass/purple loosestrife | Stream (approximate) |
| Reed canary grass | Purple loosestrife | Stream/River |
| Multiple Species Occurrences | Reed canary grass | |
| Removed/controlled | Reed canary grass/buckthorn | |
| | Reed canary grass/purple loosestrife | |

Map Notes:
Image base from the Wisconsin Regional Orthophotography Consortium (WROC), 2010.
Hydrography network from National Hydrography Dataset and on-screen photo interpretation
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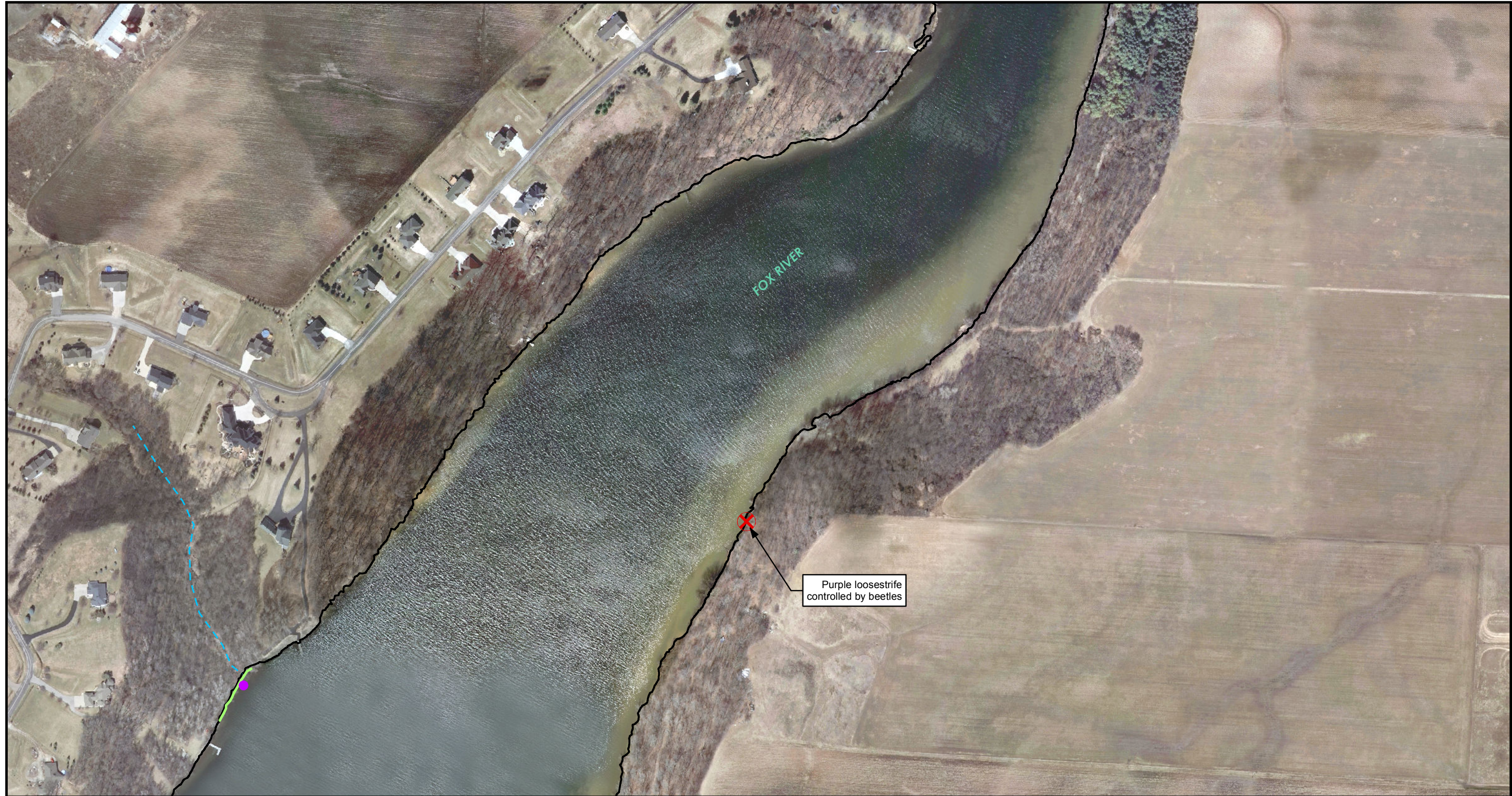


Map 3 of 7



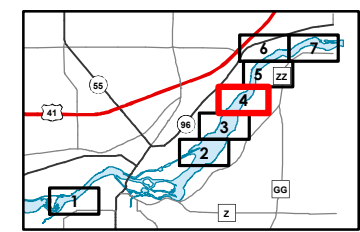
2015 Invasive Species Monitoring Results

Badger/Rapide-Croche Dams
Monitoring Locations



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Removed/controlled	Reed canary grass/buckthorn	
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Map 4 of 7



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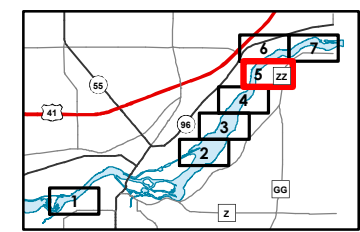
2015 Invasive Species Monitoring Results

Badger/Rapide-Croche Dams
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Multiple Species Occurrences	Reed canary grass	
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	Reed canary grass/purple loosestrife	

Map Notes:
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Hydrography network from National Hydrography Dataset and on-screen photo interpretation
Field work conducted August 4 - 5, 2015.



Map 5 of 7



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2015 Invasive Species Monitoring Results

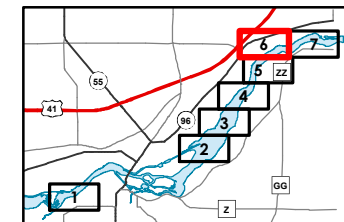
Badger/Rapide-Croche Dams

Monitoring Locations



- | Spot Occurrences | Species Type(s) | Invasive Species Monitoring Areas |
|------------------------------|--|-----------------------------------|
| Buckthorn | Buckthorn | Monitoring Area |
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| Reed canary grass | Purple loosestrife | Stream/River |
| Multiple Species Occurrences | Reed canary grass | |
| Removed/controlled | Reed canary grass/buckthorn | |
| | Reed canary grass/purple loosestrife | |

Map Notes:
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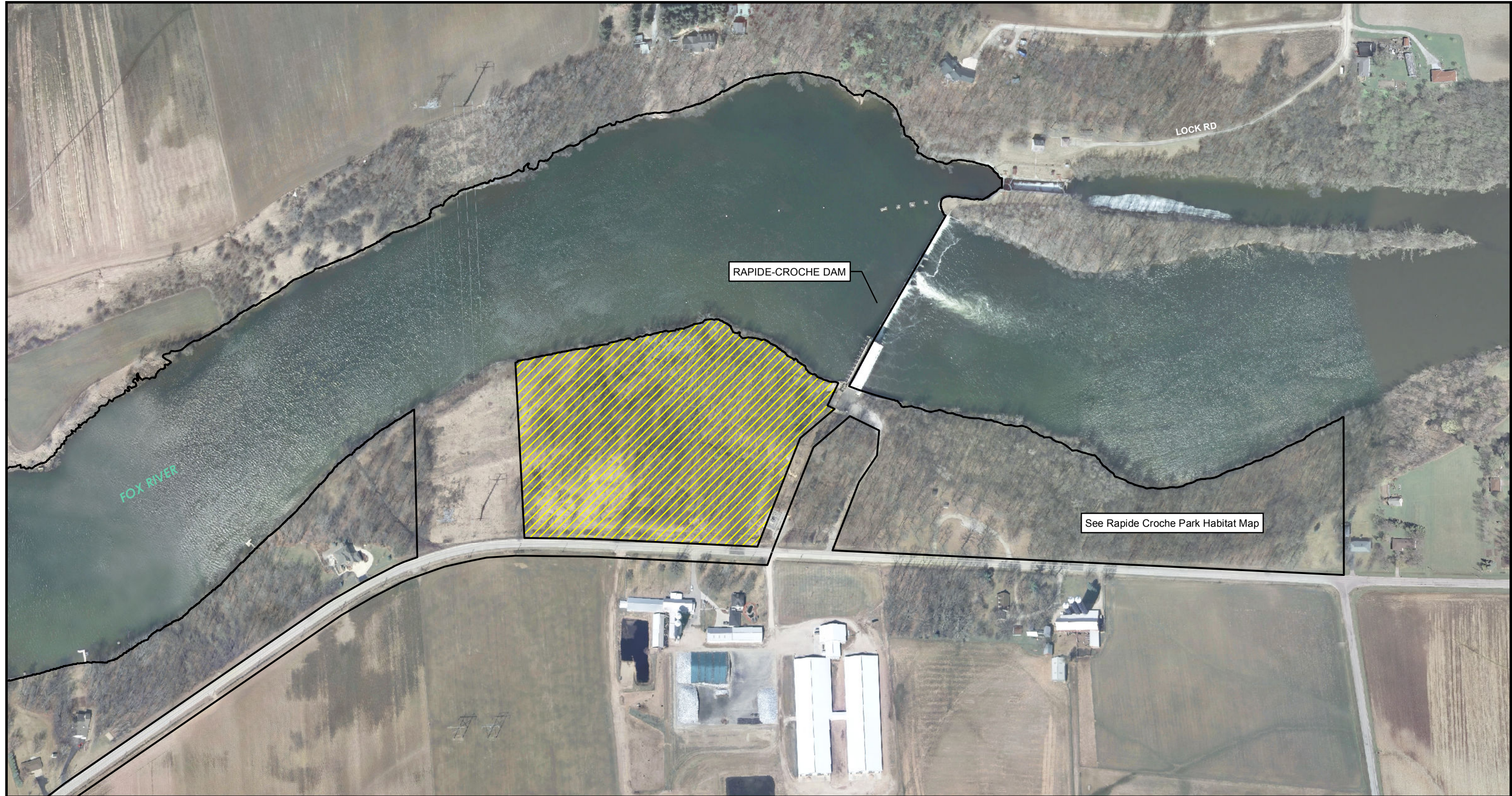
Map 6 of 7



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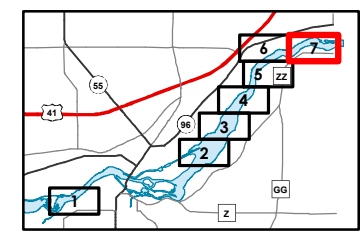
2015 Invasive Species Monitoring Results

Badger/Rapide-Croche Dams
Monitoring Locations

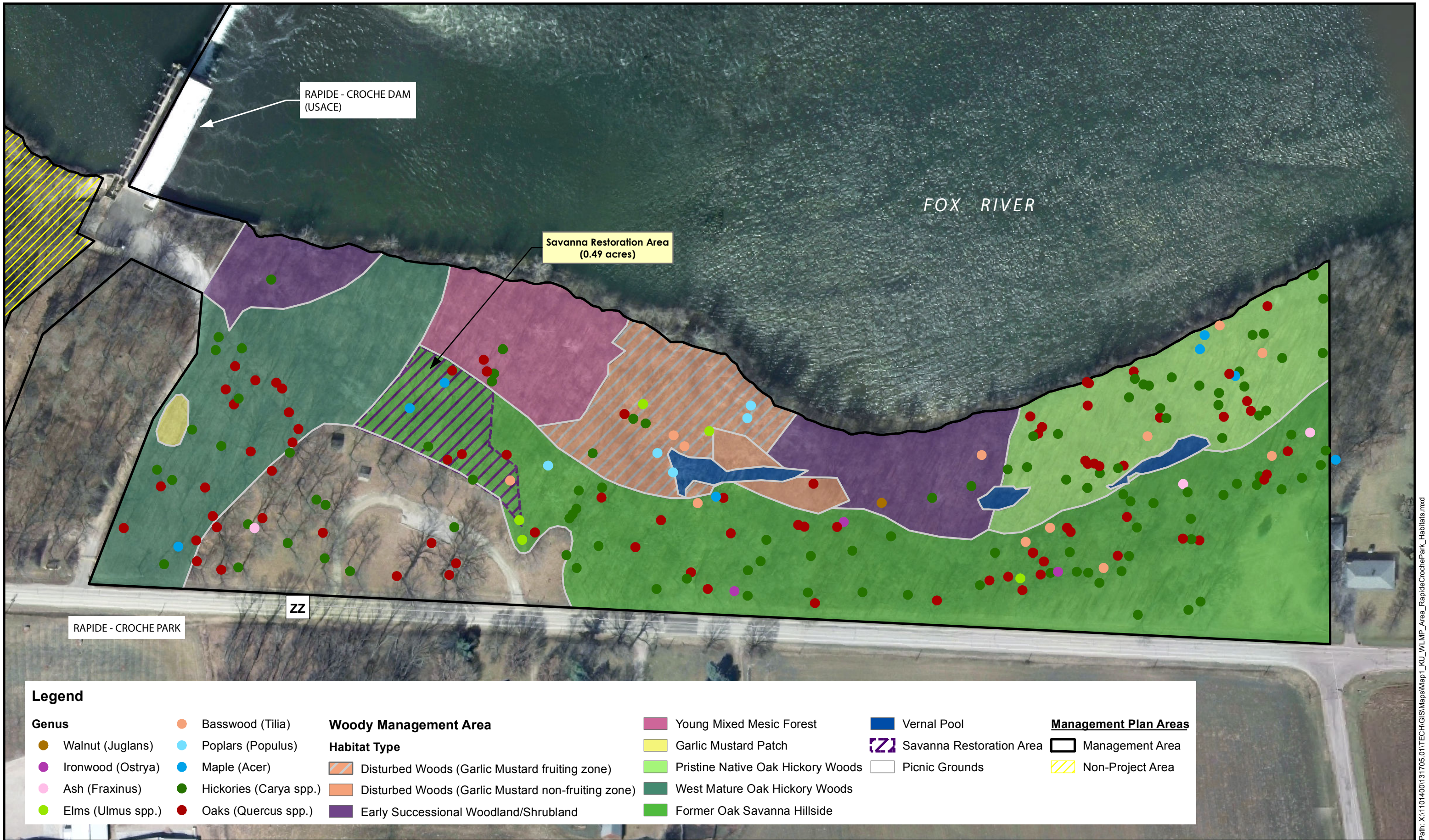


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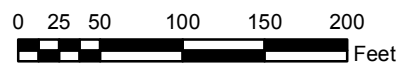


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Rapide Croche Park Habitat Map

Rapide - Croche Park Management Area



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