

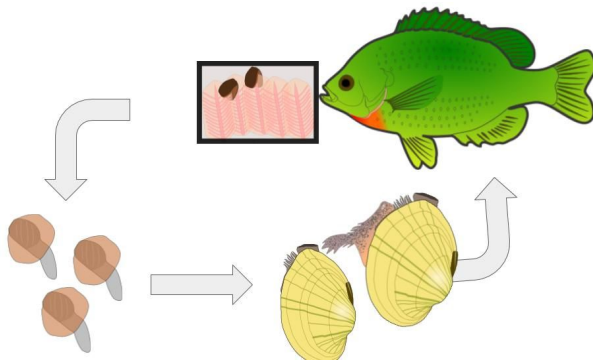
Development of a Research Framework to Aid in Mussel Management and Conservation in the Fox River Watershed

Todd Levine and Lisie Kitchel

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Bivalves of the Unionoida are distinct from other, well-known bivalves, such as the zebra mussel. The biodiversity of freshwater pearly mussels is highest in North America (300 species of roughly 900 globally, by some estimates). This fauna has experienced significant (up to 70% of species). Ongoing changes in freshwater environments continue to increase the threat to these unique animals, that exhibit a complex life history that is both well known and understudied. Heavy, historical harvests for buttons and, later, seed pearls likely overharvested the once-plentiful mussel resources. Habitat alteration, especially the creation of dams and channelization have exacerbated conservation problems with mussels, by modifying and destroying habitats. Invasive species have also had negative impacts on unionid mussels. Zebra mussels, for example, colonize freshwater mussels and harm or kill them.



Unionid mussels require fish hosts to successfully complete a parasitic phase on fishes. Therefore, changes in the fish community are likely to affect freshwater mussels. Mussels create a variety of lures, parts of their body or packaging for larvae, that attract fishes. This part of their lifecycle is often the most engaging for public outreach, but requires more study to effect conservation outcomes.

Current Goal: Develop a detailed strategic research approach that addresses immediate and long-term needs for mussel conservation for the Fox River in both states of WI and IL.

We propose to follow the recent article to effect conservation of mussels in southeastern Wisconsin and northeastern Illinois in the Fox River watershed:

Bouska, KL, Rosenberger, A, McMurray, SE, Lindner, GA, and Key, KN. 2018. State-Level Freshwater Mussel Programs: Current Status and a Research Framework to Aid in Mussel Management and Conservation. *Fisheries*. 48(3): 345-360.

Available: <https://afspubs.onlinelibrary.wiley.com/doi/pdf/10.1002/fsh.10106>

Bouska et al (2019) recommend 5 basic steps to institute regionally effective mussel conservation:

1. Define the conservation unit

Watershed concept is essential
Unite geopolitical boundaries

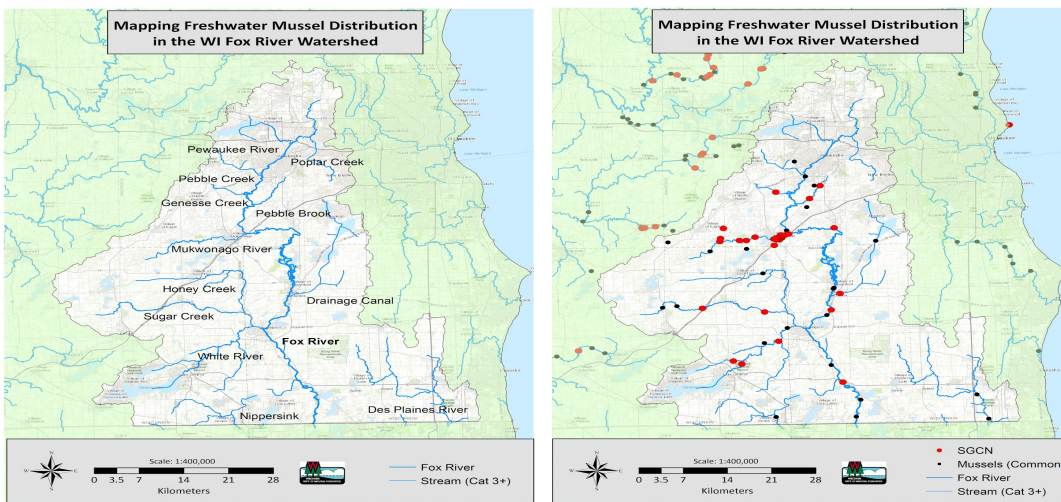
Needs:

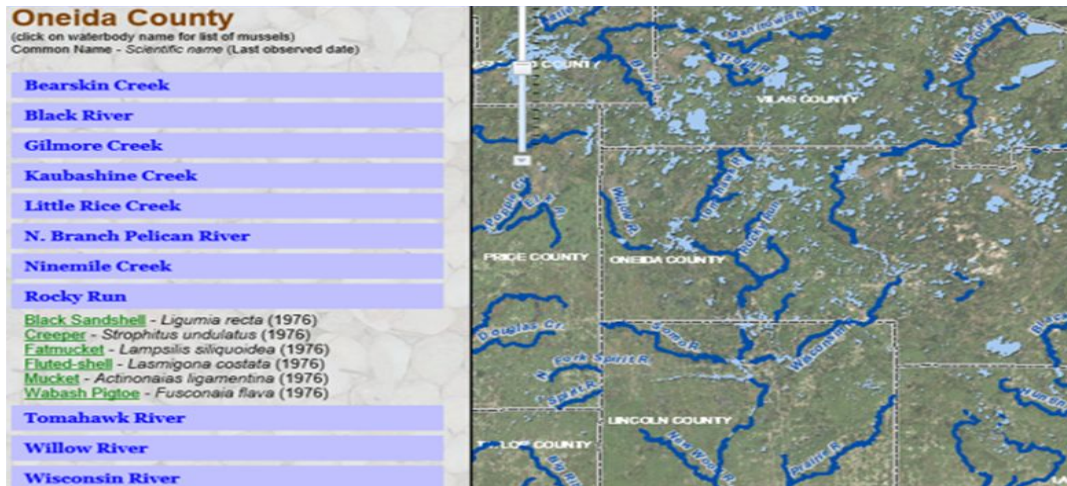
Extant mussel communities
Fish (host) community assessment
Adult habitat suitability

2. Delineate fundamentally suitable habitat

Hydrogeomorphic features
Water quality tolerances
e.g. ammonia near sewage treatment plants
Substrate characters
Host presence and number

Some basic data are available for the Fox River, e.g.:





Mussel Monitoring Website

wiatri.net/inventory/mussels

Pick a County->Pick a River or Lake

3. Identify threats

These are addressed above, however in assembling regional mussel data, threats to current mussel populations should be addressed and catalogued.

4. Use validated and strategic monitoring

- Informal data collection & citizen science
 - GOAL: General distribution, direct efforts
- Timed searches/CPUE
 - GOAL: General community description
- Gridded searches
 - GOAL: Community and Density
- Mark-and-Recapture and other in-depth methods
 - GOAL: Population trends & Status

Must collect and link disparate data sources

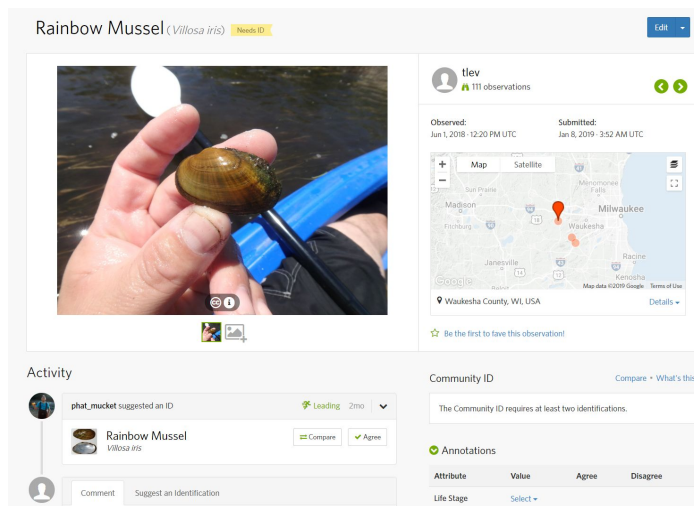
WI GIS well underway (TS)

Some habitat data (heterogeneous)

Mussel data are scattered

We propose to centralize data into a shared repository and to use a few established data collection methods, including:

iNaturalist is a good starting point for informal element occurrence data:



Standardized survey methods used in Wisconsin have been published in:
 Piette, R. 2015. Guidelines for Sampling Freshwater Mussels in Wadeable Streams. WI DNR.
 Available:

https://molluskconservation.org/Library/Protocol+PDFs/WI+Wadable+Mussel+Protocol_8-18-15.pdf

Basic techniques in Piette (2015) include:

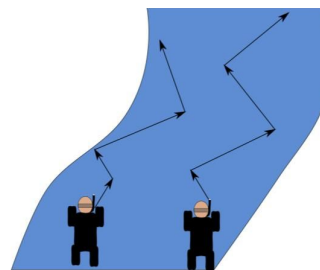
Catch Per Unit Effort timed searches:

<15 m width

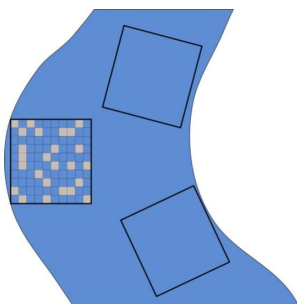
4 people hours or 200 m

>15 m width

8 people hours or 300 m



Complete sampling of quadrats within grid system $\frac{1}{4}$ m²



For more detailed sampling that can effectively estimate changes in density, a series of grids are created and quadrats within the grids are selected to be completely excavated. This method is very time consuming, but also better represents hard-to-sample mussel species.

Stream size	Grid size	N. of grids	Grid sequence	Quads/grid	Total quads	Area sampled
<7 m	2.5 m	14	L-R	8	112	28 m ²
7-14 m	5.0 m	10	L-R	25	250	62.5 m ²
15-24 m	5.0 m	15	L-R-M	25	375	93.75 m ²
>25 m	5.0 m	20	L-M ¹ -R-M ²	25	500	125 m ²

5. Create a regional conservation assessment

We have a list of short term goals for which we want to solicit partners and support.

Short-term goals-

- Assemble inventory of historic and current mussel observations

- Create historic and current mussel distribution maps

- Choose sites to sample in Summer 2019

- Solicit partners & volunteers to assist

Ultimately, we will create a regional assessment of the mussel fauna of the Fox River and will create a conservation plan, implemented, supported and maintained by agencies, governments and not-for-profits of the Fox River tributary of the Illinois River.