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Boone River's Mussel Renaissance

By Jen Kurth, Iowa Department of Natural Resources

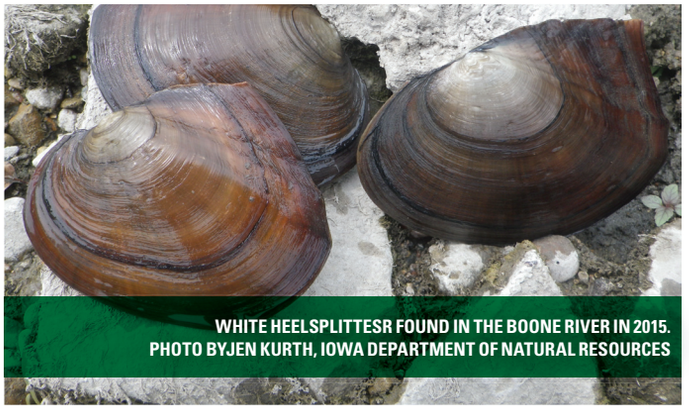
A canary in a coal mine? In Iowa, we have the mussel in the stream.

Freshwater mussels are valuable components of freshwater biodiversity and healthy ecosystems. They are dependent on good water quality and physical habitat conditions, as well as an environment that will support populations of host fish. Mussels clean the water by removing a variety of materials from the water, such as suspended sediment, organic matter, bacteria and phytoplankton. Individual mussels can typically filter 0.5–1.0 gallons of water per hour. Additionally, burrowing behavior of mussels mixes sediment pore water, releasing nutrients and oxygenating substrates. Dense mussel beds influence substrate stability and streambed hydraulics and provide nutrients and habitat for benthic life.

Historically, mussels were harvested in Iowa in the 19th and 20th centuries for freshwater pearls, the button industry and most recently, the cultured pearl industry. Over-harvesting due to these activities seriously depleted the mussel populations in Iowa. In the early 20th century, as harvesting was declining, other threats to mussel populations emerged, including habitat alteration and water pollution. Destruction of mussel habitat has ranged from the obvious – dams, dredging and channelization – to the more subtle – siltation and contamination. Dams change the physical, chemical and biological environment of streams, both upstream and downstream of the structure, to the point that 30–60 percent of the mussel fauna is destroyed.

Erosion, caused in part historically by deforestation, agricultural practices and destruction of riparian zones, has led to increased silt loads and shifting, unstable stream bottoms composed primarily of silt and sand. The majority of freshwater mussel species prefer a stable, heterogeneous substrate composed of sand, gravel and cobble. Siltation and contaminants, such as heavy metals, ammonia and pesticides, have long been recognized as threats to mussels. Recent toxicology tests have shown that freshwater mussels are among the most sensitive of all species tested to many pollutants found in our waters.

So the number and types of mussels in an area – or the lack thereof – can tell you a lot about the health of a stream or river. In the Boone River, they've told us a lot.



WHITE HEELSPLITTESR FOUND IN THE BOONE RIVER IN 2015.
PHOTO BYJEN KURTH, IOWA DEPARTMENT OF NATURAL RESOURCES

A Department of Natural Resources (DNR) freshwater mussel survey, which ran from 2011 to 2017, found a significant increase in populations in the Boone River over previous surveys, including three species of mussel that are on Iowa's threatened species list. Surveys at seven sites in the early 1980s found a total of 10 species of mussels in the Boone River, but no more than four species were found at any one site. More recently, that number had dropped to only four species found alive in the Boone River.

In 2015, 14 sites were sampled as part of the state-wide mussel survey, including those that had been surveyed previously. A total of 16 live species of mussels were found, and several sites had more than 10 species at each site.

Species found living were:

- Mucket (Actinonaias ligamentina)
- Threeridge (Amblema plicata)
- Cylindrical papershell (Anodontoides ferussacianus) – threatened in Iowa
- Wabash pigtoe (Fusconaia flava)
- Plain pocketbook (Lampsilis cardium)
- Fatmucket (Lampsilis siliquoidea)
- White heelsplitter (Lasmigona complanata)
- Creek heelsplitter (Lasmigona compressa) – threatened in Iowa
- Fragile papershell (Leptodea fragilis)
- Black sandshell (Ligumia recta)
- Pink papershell (Potamilus ohioensis)
- Giant floater (Pyganodon grandis)
- Pimpleback (Quadrula pustulosa)
- Mapleleaf (Quadrula quadrula)
- Creeper (Strophitus undulatus) – threatened in Iowa
- Lilliput (Toxolasma parvus)

This would seem to indicate that conservation activities that have been ongoing in the Boone River Watershed are having a positive impact on the freshwater mussel populations and the river itself, so keep up the good work.

CREP SITE
PHOTO BY JOSEPH L. MURPHY, IOWA SOYBEAN ASSOCIATION

Consider Edge-of-Field Practices for Nutrient Reduction

By Carol Brown, Iowa Soybean Association

"Fix it and Forget It" is a popular cookbook of recipes for the slow cooker. The Crock-Pot spends the day stewing a good meal while the cook is away from the kitchen. Like that slow cooker, there are practices farmers can use to reduce nitrogen loss that don't require continuous oversight – they can essentially "fix it and forget it."

Bioreactors, saturated buffers and wetlands act a little like a slow cooker. They hold water long enough to fix nitrate-N into nitrogen gas and release it into the atmosphere. All the practices are designed to work with a farm's drainage system.

According to the Iowa Nutrient Reduction Strategy (INRS), these structures remove 32–90 percent of nitrate-N, depending on the structure. Developed in 2012, the INRS lists on-farm practices that reduce nitrogen and phosphorus entering Iowa waterways.

"In addition to in-field management like nitrogen application rates or cover crops, these structures can stack on top of each other for more nutrient reduction," said Keegan Kult, an Iowa Soybean Association (ISA) environmental scientist working with the Boone River watershed project. "Cover crops are known to reduce nitrogen by 30 percent. Adding a bioreactor to the edge of that field could reduce nitrogen in tile drainage up to another 40 percent."

Bioreactors

Bioreactors are underground shallow pits of woodchips at a field's edge. Tiles divert water to the bioreactor, allowing the microorganisms on the woodchips to convert the nitrates into nitrogen gas before the water exits. It is topped with perennial grasses or pollinator plants. Bioreactors last approximately 10 years but can be recharged with new woodchips.

Buffers and Saturated Buffers

Buffers are areas of permanent vegetation separating a stream from farm fields. The buffer plants intercept the nutrients coming off the field, taking up nitrogen and slowing the water. The minimum width of a buffer or saturated buffer is 30 feet.

Saturated buffers are these same streambank areas with additional drainage tile running parallel to the stream. The water enters the buffer through the tile and spreads out through the filter strip, saturating the sub-soil, creating more opportunity for plants to use the nutrients.

Targeted Wetlands

Targeted wetlands are strategically placed to intercept surface runoff and subsurface drainage from small watersheds. They can remove nitrate-N up to 50 percent and retain water to help mitigate flooding.

Costs and Funding

These structures have larger up-front costs, but after installation not much is needed beyond some monitoring to ensure things are working. For residents of the Boone River watershed, there are funding sources that could cover up to 100 percent of the installation costs.

For more information on these and other conservation practices, contact Boone River Project Coordinator Karen Wilke at kwilke@tnc.org, or Keegan Kult at kkult@iasoybeans.com.

Farmers and Partners Develop Long-Term Watershed Plans

By Karl Gesch, Iowa Soybean Association

In 2017, farmers, landowners and additional partners developed new watershed plans. The watershed plans are for the Prairie Creek Watershed (Kossuth and Humboldt Counties) and the Eagle Creek Watershed (Wright County), which are sub-watersheds of the Boone River Watershed. The Prairie Creek and Eagle Creek Watershed plans were developed to support the ongoing Boone River Watershed Nutrient Management Initiative (NMI), a project funded by the Iowa Water Quality Initiative (WQI).

A watershed plan is like a long-term roadmap that identifies goals and recommends actions to achieve them. Partnerships and local leadership are key ingredients of successful watershed projects. Watershed planning helps to support those pieces and build a foundation for success.

At a series of planning meetings, farmers, landowners and partner organizations established local goals and identified priority conservation practices to address them. Planning partners included local soil and water conservation districts, the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), the Iowa Department of Agriculture and Land Stewardship, the Iowa Department of Natural Resources (DNR), The Nature Conservancy in Iowa and the Iowa Soybean Association (ISA).

Watershed assessments were conducted to gather detailed information about the watersheds. These assessments included kayaking the stream corridors, driving the watersheds to survey land use practices and inventorying existing conservation practices based on remote sensing, local input and ground truthing. The watershed assessments provided valuable data around which to build recommendations.

With detailed watershed information at the ready, the farmer advisory groups and their planning partners worked to answer three primary questions for their watersheds:

What should we do?
How much should we do?
Where should we focus our efforts?

Farmers and landowners established their own goals at watershed planning meetings. Both watershed groups set goals of meeting Iowa Nutrient Reduction Strategy (INRS) water quality targets along with additional goals to improve soil health, agricultural sustainability, habitat and flood mitigation.

Additionally, many conservation practices were considered based on their likeliness to be broadly adopted along with their potential to impact natural resources. Based on this exercise, a priority of list conservation activities was developed. Local conservation priorities include managing nutrients, minimizing tillage and planting cover crops within agricultural fields, along with installing bioreactors and saturated buffers, restoring oxbows and constructing wetlands. These practices answer the “What?” question.

Long-term historical water quality monitoring data collected by Agriculture’s Clean Water Alliance (ACWA) – a group of agricultural cooperatives that jointly fund water monitoring and research – was assembled to establish baseline conditions for the Prairie Creek and Eagle Creek Watersheds. This information was incorporated into water quality models based on the INRS Science Assessment. For each watershed’s list of priority conservation practices, these water quality models were used to determine the adoption levels needed to achieve watershed goals, including the INRS targets of 41 percent nitrogen and 29 percent phosphorus loss reductions. This information addresses the “How much?” question.

Both the Prairie Creek Watershed and the Eagle Creek Watershed were analyzed with a watershed planning software tool called the Agricultural Conservation Planning Framework (ACPF). The software was deployed to evaluate topographic, soils and land-use data. The results of this analysis were a set of maps that identified potential locations for many of the priority practices in both watersheds. These outputs help to answer the “Where?” question.

With clearly defined goals, quantitative practice adoption objectives and priority locations, watershed project partners, farmers and landowners in the Prairie Creek and Eagle Creek Watersheds are well-equipped to build on their successes and continue to scale up implementation of conservation practices that improve water quality, sustain agricultural productivity and soil resources, enhance habitat and reduce flood risk.

For more information about the watershed plans and the priority conservation practices, please contact Karl Gesch at 515-334-1047 or kgesch@iasoybeans.com.

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