

Worlds Apart? An Early Look at Two Oxbow Types

Sam Leberg, Iowa State University

When natural rivers meander and cut off, they form curved lakes known as oxbows. Oxbows provide a necessary refuge for many species and are an important part of many species' ecology as they disconnect and reconnect to the main river. Additionally, oxbows provide water quality benefits by intercepting runoff and groundwater before it enters rivers. The straightening of rivers and streams have resulted in these habitats becoming quite scarce. The restoration of oxbows to provide habitat for the endangered Topeka shiner minnow and other species has been a marked success. More recently, restored oxbows have been used to intercept tile drainage and reduce nutrient export to the Mississippi River. Differences in the fish, plant, and invertebrate communities of tile-fed and non-tiled oxbows were recently assessed in ten restored oxbows within the Boone River Watershed (6 tile-fed and 4 non-tiled) as part of a concerted effort by the United States Geological Survey Iowa Cooperative Fish and Wildlife Research Unit and graduate students from Iowa State University.

Sampling began in July of 2019 and continued through August of 2020. We sampled the fishes, as well as the plants and invertebrates at each oxbow. In 2019, we collected 30 species of fish found in both oxbow types

but observed that fish density in non-tiled oxbows was 2X higher than in tiled oxbows! Plant cover was similar between sites with an average of 31.24% coverage in non-tiled sites and 32.78% coverage in tile-fed sites. Overall, we found 14 and 16 plant species in non-tiled and tile-fed sites, respectively. We collected an average of 22,604 invertebrates per m² in non-tiled sites and 18,932 invertebrates per m² in tile-fed sites. Also, non-tiled sites held an average of 17.3 invertebrate species per m² and tile-fed sites held an average of 15.3 species per m².

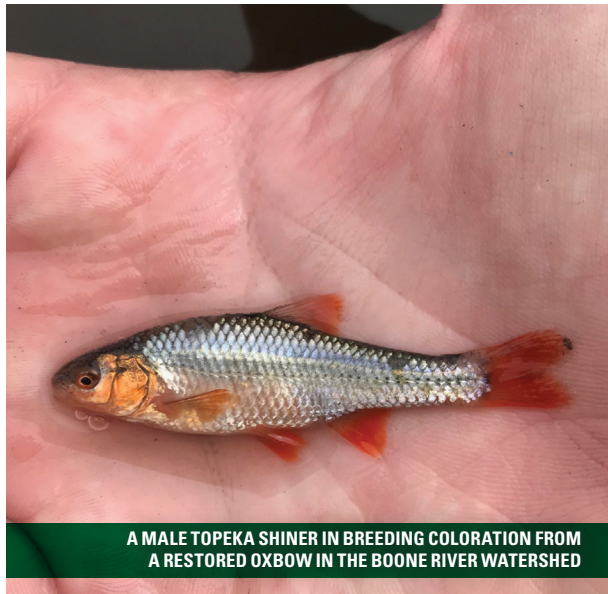
Though research is ongoing, none of the differences between oxbow types have been big enough to be considered significant. It seems possible that tile drainage is only a small part of the story, and that other conditions like oxbow size and localized streamflow have a much bigger impact. If we find no community differences between the two oxbow types it could be a potential win-win scenario for conservation, providing both habitat for endangered species and a method of filtering out nutrients before it enters the Mississippi River Basin, while having very few ecological consequences. On the other hand, if we do find that tile drainage influences fish community composition, there would need to be serious consideration about the intention of specific oxbow restorations going forward.



A GIANT WATER BUG ATTACKING A TADPOLE IN ONE OF OUR SAMPLED OXBOWS



COLLECTING DISSOLVED OXYGEN IN AN OXBOW AFTER ICE-OUT



A MALE TOPEKA SHINER IN BREEDING COLORATION FROM A RESTORED OXBOW IN THE BOONE RIVER WATERSHED



SEINING A RESTORED OXBOW IN THE BOONE RIVER WATERSHED

Defining Success

Dylan Osterhaus, Iowa State University

During spring 2019, the U. S. Geological Survey’s Iowa Cooperative Fish and Wildlife Research Unit and graduate students from Iowa State University, with support from many other collaborators, launched a new research project in the Boone River Watershed (BRW). The project focuses on creating a tool that will be used to assess the quality of an oxbow restoration in terms of the benefit to Topeka Shiner population. The Topeka Shiner is a federally endangered minnow that relies on oxbows for healthy populations. Due to loss of oxbows, Topeka Shiner populations have declined. Now, a large effort is taking place to restore oxbows to recover Topeka Shiner populations. Other than Topeka Shiner recovery, restored oxbows provide many benefits to the local ecosystem and landowners in the form of wildlife habitat, recreation opportunities, and lowering nutrient runoff. Ten oxbows were restored within the BRW during 2017–2019 that were then included in the project. Before sampling, all ten oxbows connected to their adjacent stream during floods in spring 2019, which allowed for fishes to populate the oxbows.

Sampling during 2019 resulted in the collection of 328 Topeka Shiner for an average of ≈ 33 per oxbow. Successful reproduction for Topeka Shiner was evident as juvenile Topeka Shiner were collected. Throughout the summer, water levels dropped at each oxbow, but all held sufficient water to support fish at summer’s end.

During summer 2020 the same oxbows were sampled and 3,385 Topeka Shiner were collected for an average of ≈ 339 per oxbow, a ten-fold increase from 2019! As was true in 2019, evidence for Topeka Shiner reproduction was present at several oxbows. However, unlike the 2019, reconnection of the oxbows to their associated streams did not occur before the field season. Furthermore, water levels at the beginning of the 2020 field season were lower than the beginning of the 2019 season and dropped throughout the summer as drought conditions were in place across the watershed.

While it may seem troubling that some oxbows with Topeka Shiner may be near drying by the end of the summer, it is not a major cause for concern. Oxbows are dynamic systems that experience changing water levels from flooding (like that of spring 2019) to drying (late summer 2020). These are natural processes to which Topeka Shiner have adapted over time. During years of plentiful water, Topeka Shiner may spawn and generate significant population growth (i.e. the ten-fold increase between 2019 and 2020). In the event of flooding following a year of strong Topeka Shiner reproduction, the young Topeka Shiner would be able to escape from the oxbow where they were spawned and then disperse throughout the watershed and perhaps establish a population in a new area. During years of drying, while Topeka Shiner numbers may decline in some places, the restored oxbows with sufficient water will serve as refugia and ensure the continued existence of Topeka Shiner in the area. In summary, the oxbows sampled during our study appear to be highly beneficial habitats for Topeka Shiner populations and are contributing to the recovery of the species.



4R Plus Program Helps Farmers and Ag Advisors with Conservation

Paige Frautschy, The Nature Conservancy

The 4R Plus Program is a soil health and water quality initiative backed by over 50 partners including ag retailers, state and federal agencies, farm organizations and more. The goal is to provide consistent messaging, educational materials and resources to help farmers and ag advisors determine which conservation practices are best matched for each individual farm. “4R” refers to the importance of following the 4Rs of nutrient stewardship: applying nutrients at the Right place, Right time, Right rate, and Right source. “Plus” recognizes the need for in-field and edge-of-field conservation practices, such as cover crops, reduced tillage, and wetlands, to meet our water quality and conservation goals. Implementing 4R Plus practices will help safeguard and improve the health of Iowa soil and water for generations to come.

Visit 4RPlus.org for a one-stop-shop to learn about soil and water conservation practices, statewide funding opportunities, experiences other farmers have had utilizing 4R Plus practices, free certified crop advisor courses, and more.

4R Plus



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