Fact Sheet #3
March 2013

Rice Creek Assessment Project, Year Two Update

Through drought and flood, studies reveal a dynamic system

Rice Creek is the *only* trout stream in Rice County, Minnesota, but its health is threatened. Bridgewater Township, Cannon River Watershed Partnership (CRWP), St. Olaf College and other partners are sponsoring a project to study Rice Creek and recommend actions to improve and protect it. The project is funded in part by the Minnesota Pollution Control Agency.

In 2012 scientists and volunteers completed the second consecutive year of stream monitoring, while the project team launched community outreach efforts, including a new program "MN FarmWise" to engage local landowners and renters. This fact sheet provides a project update.

What is "normal" for the creek?

Flow, temperature, water-quality, biological and habitat monitoring continued. Conditions in 2012 went from drought in spring to flood in June to drought in late summer and fall, much as in 2011. These extreme events present challenges to interpreting data and describing normal conditions; however, they also provide an opportunity to document how the creek performs under stress.

Two years of data reveal that Rice Creek is a dynamic system. Within 24 hours after a rain event, samples can change from clear to nearly black to slightly tan with sediment (photo below). A follow-up trout survey showed a shift in the size distribution. Trout captured in 2012 were smaller and younger than in 2011, averaging closer to six inches than seven. A second habitat assessment showed substantial changes between the two years; some areas improved, while others worsened.

Why do trout favor Rice Creek?

Why do we find trout in Rice Creek and not neighboring Wolf and Heath Creeks? Brook trout do best in water temperatures below 68°F. On grab sampling dates during the past two summers, temperatures in Wolf and Heath Creeks were on average 7-9 degrees warmer than Rice Creek. Daytime temperatures in Wolf Creek were in the 70s or 80s for much of the summer. Warm-water species such as bass and pike generally avoid the cold waters of Rice Creek.

Why is the water colder in Rice Creek? All three creeks receive water from the surface and below ground; surface water is generally warmer than ground water in the summer. Wolf, Rice and Heath Creeks hit a geologic point where they receive increasing amounts of ground water as they near the Cannon River. Walking along the creeks, you may notice the signs as coldwater springs, rusty colored patches of iron floc or beds of watercress (photo below).

The difference is Rice Creek's smaller watershed to which ground water contributes a larger portion of water. The watersheds of Wolf and Heath Creeks contain large lakes and wetlands with warm surface waters. In winter ground water plays the opposite role in Rice Creek: it warms the water and keeps it above freezing, which is crucial for trout.

What is the source of ground water?

Evidence is mounting that the source of ground water is local and not a deep regional aquifer. Researchers measured water temperature as they walked up the creek. No downward spikes indicating large ground-water inputs occurred. Water temperatures were continuously monitored at four locations in the creek; they showed a very strong correlation to air temperature suggesting a shallow local source of ground water.

In another study, water samples were tested for tritium, an isotope of hydrogen. Nuclear-weapons testing in the 1950s and 1960s increased tritium levels in the atmosphere, peaking in 1963. Tritium reaches the earth through precipitation and serves as a tool to date water. Deep aquifers are protected from the atmosphere and

Funded in part by a Clean Water Partnership grant from the Minnesota Pollution Control Agency

contain little or no tritium, while shallow aquifers have higher levels. Tritium results for Rice Creek indicate its waters are less than 5-10 years old. The implication for management is to find ways to protect these local sources of ground water to preserve Rice Creek as a coldwater stream.

Do nitrate levels vary?

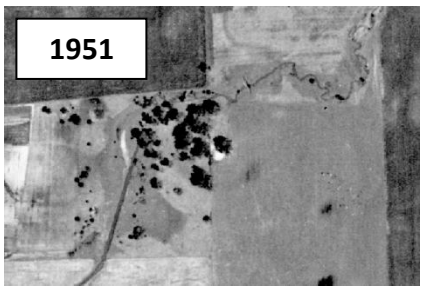
Nitrate is a form of nitrogen that at levels above a few parts per million harms aquatic life. Nitrate surveys were conducted on four dates. Volunteers were posted at specific locations along Rice Creek and instructed to collect water samples for nitrate analysis at a designated time. This snapshot in time provides a means to compare nitrate levels at different sites along the creek.

Nitrate concentrations varied with the season, location and water level. They increased in an upstream direction on May 30 but flipped to a downstream direction on August 22. Scientists are exploring possible explanations and what they imply for management.

How has land use changed?

College students compiled a history of land use and drainage in the Rice Creek watershed using historic and current aerial photographs, township records and interviews. Another team conducted a tillage survey to determine which fields were tilled and what technique was applied.

While private drainage efforts began earlier, County Ditch 22 was constructed in 1946. Extensions and maintenance followed. The ditch now represents the longest segment of the water channel. The photo below shows the ditch intersecting with the stream near 100th St and Cates Ave.



Over the years, Rice Creek has experienced a reshaped channel and altered flow. Waters formerly stored in wetlands and wet soils now drain more quickly to the creek. Wetlands, prairies and forests were converted to productive farmland. Upcoming culvert replacement at Armstrong Road will be the latest in a series of changes to the creek and watershed.

Community engagement

Efforts to engage landowners and renters of the agricultural land got a jump start with MN FarmWise, a program sponsored by The Mosaic Company Foundation in partnership with the Freshwater Society and National Park Service. In August we hosted our first gathering where community members explored what kinds of land-use protections are working and how to foster more. Participants generated a short list of practices they wanted to learn more about: controlled drainage, conservation tillage, buffer strips and bioreactors. Invited experts shared technical information on the four practices at a second meeting in November. Over the winter we conducted follow-up meetings with small groups of area farmers.

We are exploring a framework for offering student on-farm researchers to area farmers and plan to start a project this spring. Our goal is to connect students to farmers in research projects that provide science-based information about farm operations in the watershed.

Lastly, two new faces are joining the MN FarmWise efforts. Karl Hakanson is Agriculture Program Coordinator at the CRWP, and Alex Gehrig is Program Manager at the Freshwater Society. Karl and Alex will meet with landowners this spring and summer offering help to those who would like to do projects to improve both Rice Creek and their farm's bottom line.

Next steps

Field studies were completed last fall. Data analysis, modeling, mapping and writing are now underway. Models and maps are used to identify pollutant sources and target areas for management. A final report is due in June 2013. The report will contain results and specific recommendations for management practices to protect and improve Rice Creek.

Project sponsors

Bridgewater Township
Cannon River Watershed Partnership
St. Olaf College Environmental Studies
MN Department of Natural Resources
Trout Unlimited
Other participating groups

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