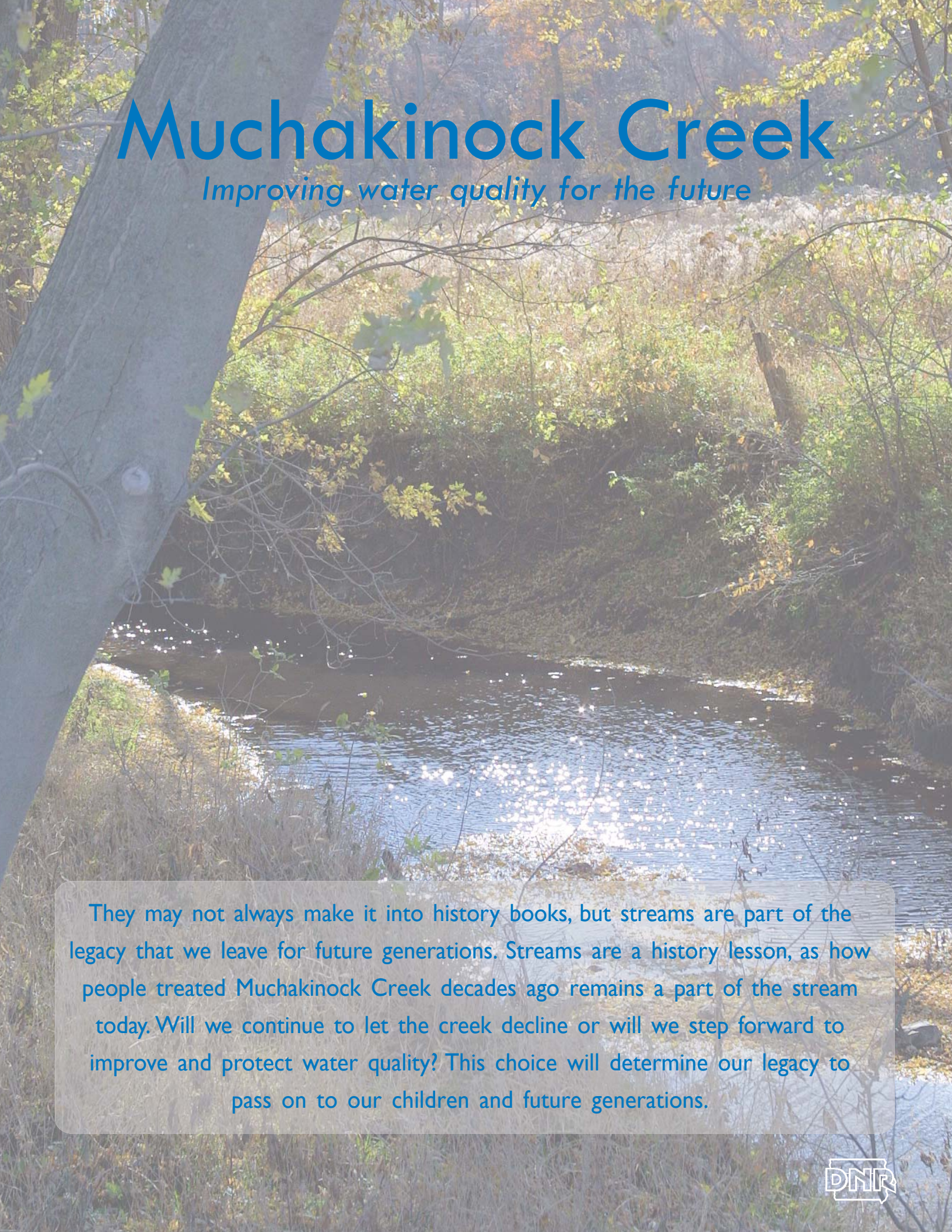
Muchakinock Creek

Improving water quality for the future



They may not always make it into history books, but streams are part of the legacy that we leave for future generations. Streams are a history lesson, as how people treated Muchakinock Creek decades ago remains a part of the stream today. Will we continue to let the creek decline or will we step forward to improve and protect water quality? This choice will determine our legacy to pass on to our children and future generations.

A living history: Creating a new future for Muchakinock Creek

History has taken its toll on Muchakinock Creek. A number of problems over the years have led to the stream's current state, one that's landed it on Iowa's list of impaired waters. However, the stream is also full of opportunity. The opportunity to improve water quality not only for the aquatic life and wildlife that live there, but also to pass along clean water to future generations of Iowans. But to act on this opportunity, we need your help.

What's wrong with the water?

Water quality in Muchakinock Creek has fallen below standards set by the state for maintaining aquatic life. Because of this, the stream was added to Iowa's impaired waters list in 2002.

Streambank erosion sends sediment into Muchakinock Creek.

To understand the stream's problems, we first need to understand the area surrounding Muchakinock Creek. The stream starts near Pella and flows southeast past Leighton, Oskaloosa, Beacon and Eddyville before joining with the Des Moines River. The watershed, or land that drains into the creek, covers 49,200 acres.

Historically, the stream meandered its way along this path. Today, more than half of the main channel of Muchakinock Creek has been straightened, or channelized, beginning in its headwaters. This has sped up water flow, and in turn, sped up erosion. It's also led to increased flooding in the area. These problems are explained on the following pages.

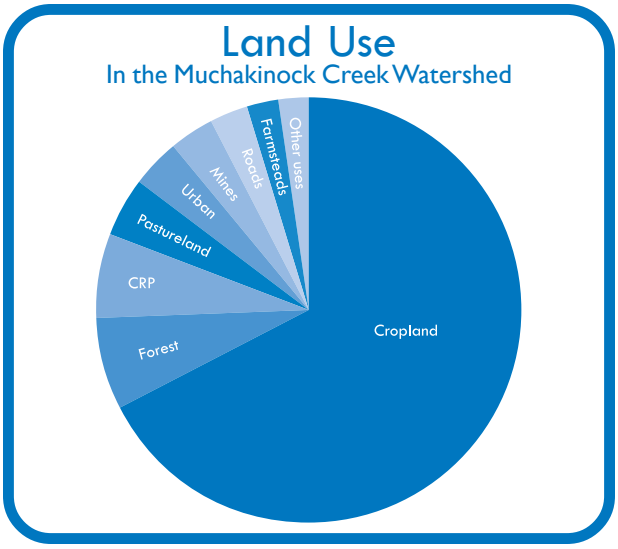
Making improvements for the future

Improving water quality is the main goal of the Muchakinock Creek Watershed Project, which plans to target the most erosion-prone areas in the watershed. The project will use GIS (Geographic Information Systems) mapping to identify areas in the watershed that need the most help.

While the creek is not used for drinking water, the City of Eddyville has drinking water wells located a mile downstream of where Muchakinock Creek joins the Des Moines River. Improving water quality in Muchakinock Creek will then improve the water entering the Des Moines River and the water that enters Eddyville's wells.

How can you help?

Landowners can help by considering installing conservation practices, like the ones shown on pages 6 and 7. Other residents can help by volunteering with IOWATER to monitor water quality in the watershed or by joining a community group focused on improving Muchakinock Creek.



Mining leaves its mark on Muchakinock

In the late 1800s, Muchakinock was one of Iowa's first booming coal mining towns, boasting around 2,500 residents at its peak. But as the mines dried up, so did the town.

Miners moved on to other Mahaska County mines, like Buxton, Excelsior and Lost Creek. An article from the *Oskaloosa Herald* in 1900 painted the picture of a "great exodus" from the town, and by 1904, Muchakinock was practically vacant. But the creek bearing its name has lived on, along with pollution from the abandoned mines.

A former mining site, located south of Oskaloosa in the Muchakinock watershed. Sediment and acid drainage from abandoned mines hurt the creek's water quality.

Acid drainage and sediment from the mines continue to pollute Muchakinock Creek today. Two former mine sites cover 135 acres and send an estimated 6,300 tons of sediment to the stream every year. Another 90-acre site delivers an estimated 2,800 tons of sediment annually. These three sites are located within two miles of the creek and all have tributaries of the creek running through them.

These sites are on a priority cleanup list with the Iowa Department of Agriculture - Division of Soil Conservation (DSC), and other former mines in the area have already been reclaimed and cleaned up.

The DSC plans to reclaim additional mine sites in the next three years, which will help reduce the delivery of sediment and acid mine drainage to Muchakinock Creek.

To reduce sediment delivery and acid mine drainage, the bare pile slopes left after the mining process will be reduced and seeded with vegetation. The new vegetation and shorter slopes will help reduce erosion and neutralize the soil, reducing acid mine drainage.

A former mining site north of Eddyville sends sediment and shale into Muchakinock Creek.

The practices of mining 100 years ago still have an effect on Muchakinock Creek today. By cleaning up these sites and improving water quality, we can have a positive effect on the creek's future.

– Historical information courtesy of Mahaska County Historical Society

The Muchakinock Creek Watershed Project is a project of the Mahaska County Soil and Water Conservation District that has been supported by the Iowa Department of Agriculture and Land Stewardship, Division of Soil Conservation, with funds from the Iowa Department of Natural Resources through a grant from the U.S. Environmental Protection Agency. Technical assistance is provided by the U.S. Department of Agriculture, Natural Resources Conservation Service.

What's a watershed?

A watershed is an area of land that drains water into the lowest point – a body of water, such as a stream, lake or marsh.

Watersheds can be as small as a city block, draining into a creek, or very large.

The Muchakinock Creek watershed covers 49,200 acres, mostly in Mahaska County, but also includes small portions of Marion, Wapello and Monroe Counties.

During a rainfall, water either travels over the surface or seeps into the ground. Water traveling over the surface or through groundwater may pick up contaminants like sediment, chemicals and waste and deposit them in a body of water.

This map shows where the Muchakinock Creek watershed lies in the Mahaska County area of southeast Iowa.

Erosion and channelization:

Problems threaten Muchakinock Creek

Erosion hurts water quality

When rain falls on the Muchakinock Creek watershed, it erodes valuable topsoil from crop fields and picks up drainage from mines in the area, depositing both into the creek.

Excess sediment can:

- Reduce water depth and clarity
- Harm habitat of aquatic life
- Make water more vulnerable to problems caused by nutrients, like algae
- Clog drainageways

Erosion is the main problem affecting water quality in the Muchakinock watershed. To reduce erosion, it's important to first know the causes and sources of erosion in the watershed.

Sediment fills in the streambed of Muchakinock Creek. Erosion throughout the watershed sends excess sediment to the creek, causing a number of problems.

The following are the most serious erosion threats in the Muchakinock watershed:

Sheet and rill erosion

- Sheet erosion occurs when rainfall and runoff remove a thin layer of soil from the surface of the land.
- Rill erosion forms small channels with a concentrated flow of water on sloping fields.
- An estimated 121,914 tons of sediment will be eroded due to sheet and rill erosion every year in the Muchakinock watershed.

Gully erosion

- Gully erosion happens after heavy rains or snowmelts and the concentrated runoff creates channels in the soil.
- Ephemeral gully erosion is typically found in low areas between hills.
- Ephemeral gullies tend to be recurring series of channels that form in crop fields in the spring or fall.
- Large amounts of sediment are lost due to ephemeral gullies, despite farmers' attempts to smooth over the gullies.
- An estimated 72,900 tons of sediment is eroded in the watershed each year due to ephemeral gully erosion.
- Classic gully erosion is similar, but the gullies tend to cut deeply into fields, preventing tillage and causing the loss of farming acres.

Streambank erosion

- Streambank erosion is a natural and necessary process where water in streams removes soil from the streambank.
- Problems start when the water flow speeds up or water levels rise, increasing the rate of erosion.
- Channelization has sped up water flow in Muchakinock Creek.
- An estimated 33,100 tons of soil each year is eroded due to combined streambank erosion and classic gully erosion.

Channelization

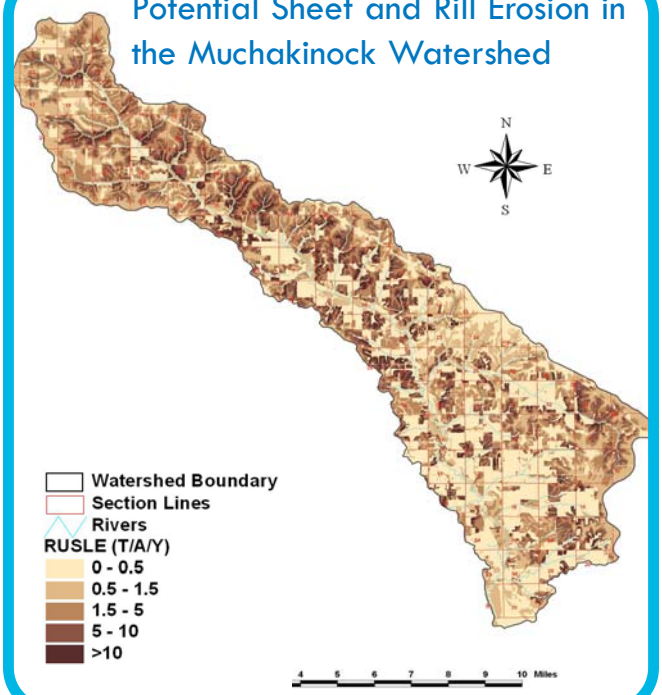
Muchakinock's streambank has eroded faster than normal because more than half of the creek has been channelized, or straightened, beginning at its headwaters.

When a stream is channelized, it no longer has meanders, or turns, to slow down the flow of water. Water flows faster in a straightened stream, so it pushes harder on the streambanks, eroding them.

Channelization has also led to increased flooding in a number of towns in the watershed. Oxbows, small arc-shaped water bodies near streams, would normally catch overflows from the stream, but many have been removed over time for agricultural purposes.

The GIS map to the right estimates that potentially 121,914 tons of sediment will be eroded due to sheet and rill erosion in the Muchakinock watershed every year. That's 2.37 tons of sediment per acre. See the map on page 7 to see how much of this sediment reaches the creek.

Potential Sheet and Rill Erosion in the Muchakinock Watershed



Fish: the key to coming off the impaired waters list

There's something missing in Muchakinock Creek. Fish.

DNR water sampling showed low numbers of fish from a small number of species in the creek. Key species that would indicate good water quality are missing, and the fish that are there may not be healthy.

Improving poor water quality in the creek (above) can improve fish habitat and remove impairments.

Along a stretch of the creek just a little longer than a football field, only 47 fish were found in a sample taken in 2000. Only six species of fish were identified, and this stretch of stream — located near Evans — received a Fish Index of Biotic Integrity (FIBI) score of only 5.

This low score classified the stretch of stream as poor, which meant lower than average numbers of fish were present and sensitive species were absent or rare. Fish collected at poor sites often have external physical differences associated with disease or stress.

"This is a very low score," said Tom Wilton, a DNR environmental specialist. "The FIBI is a barometer of a stream's biological health. Compared to healthy streams in the same region, the numbers and types of fish in Muchakinock aren't meeting expectations."

Another stretch of Muchakinock Creek north of Eddyville was also tested one day later, this segment just a little shorter than two football fields. That stretch received an FIBI score of 14, as more fish (92) from more species (15) were found. However, the score still classified the stream segment as poor. FIBI scores range from zero to 100, with scores between zero and 25 considered poor.

These low FIBI scores indicated that Muchakinock Creek was not meeting its state-designated use of maintaining aquatic life. For that reason, the creek was placed on the state's list of impaired waters.

Many improvements need to be made to get Muchakinock off the impaired waters list. Making these changes (see pages 6 and 7) will improve water quality. As water quality improves, it is assumed that fish species missing now will return to the creek, if there are no other barriers to keep fish from moving into the stream. As the fish population grows and diversifies, FIBI scores should improve, leading to Muchakinock coming off the impaired list.

Conservation practices help water quality

Photo by USDA NRCS

Terraces

Terraces are embankments built around a hillside, usually on the contour. Terraces either slow runoff and guide it to the bottom of the hill, or collect runoff and store it until the runoff can be absorbed by the ground. Approximately 34,000 feet of terraces are planned for the Muchakinock Creek watershed.

Water and sediment control basins

While they work in a similar way, these basins work where terraces might not. Water and sediment control basins are embankments, located in areas with concentrated runoff. The basins trap runoff water and sediment before they can reach a stream. There are 189 basins planned for the Muchakinock watershed project.

Photo by USDA NRCS

Conservation tillage

Conservation tillage uses last year's crop residue to provide ground cover, protecting against soil erosion from wind and water. Minimum tillage is already used in the watershed on some corn and soybean fields. No-till methods are used on approximately one-third of cropped fields, and soybeans currently are the preferred crop to use no-till methods on in the watershed. Conservation tillage will be encouraged along with other practices in the watershed.

Grade stabilization structures

A grade stabilization structure is usually a dam, embankment or other structure that reduces water flow. The structures are built across a grass waterway or other gully erosion control to slow water. About 10 structures are planned for the Muchakinock Creek watershed.

Financial incentives for conservation practices

Assistance with a number of cost-share, low-interest loan and other programs is available to landowners considering installing conservation practices and management techniques on their land.

For more information on these programs, contact the Mahaska County NRCS/FSA office in Oskaloosa at (641) 673-3476.

Contouring

Contour farming, or planting rows around hills rather than up and down hills, reduces erosion from water runoff and conserves soil and water resources.

Farming straight up and down hills can greatly increase soil erosion, while contour farming helps reduce runoff by absorbing more water into the soil rather than allowing it to run off. Contouring prevents gullies from forming and conserves soil.

Contouring will be encouraged along with other practices in the watershed.

Photo by USDA NRCS

Grassed waterways

Grassed waterways are shaped and placed in areas with concentrated water flow to slow water, guide it off the field and reduce gully erosion. Grassed waterways help disperse water, preventing small streams from forming. They can also trap nutrients and sediment.

The practice can also help prevent ephemeral gullying, which is a type of erosion created by concentrated water and found in low areas between hills.

The Muchakinock Creek watershed project plans to install 15 acres of grassed waterways in the watershed.

Photo by USDA NRCS

Conservation buffers

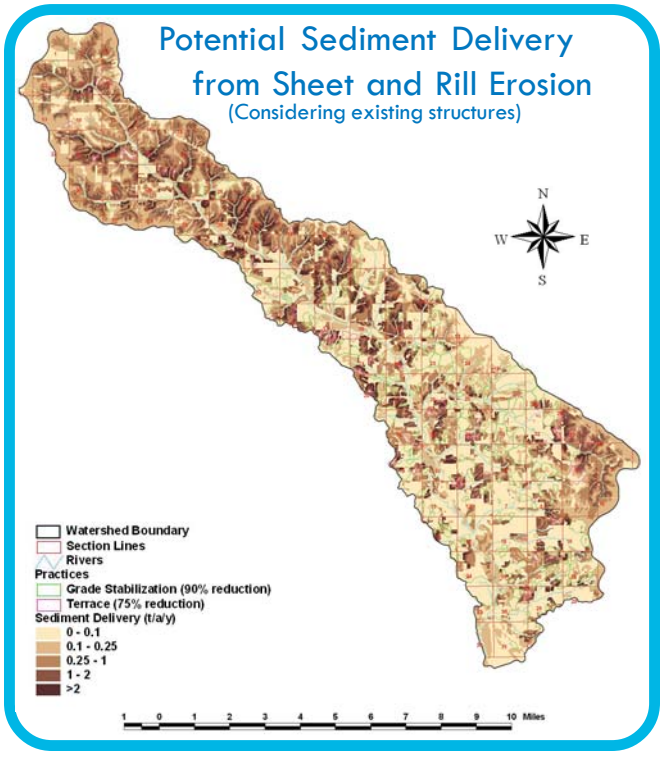
Conservation buffers slow sediment and filter runoff water before it reaches a stream. In addition, buffers reduce erosion from wind and provide habitat for wildlife. The Muchakinock Creek watershed project plans to install 120 acres of conservation buffers.

Project Goals

- Reduce soil erosion, sediment delivery and acid mine drainage to Muchakinock Creek in order to improve water quality.

- These results will be accomplished by implementing Best Management Practices (BMPs) that will reduce sediment delivered to the stream by 25,000 tons every year of the project.

The GIS map to the right shows the estimated amount of sediment from sheet and rill erosion that reaches Muchakinock Creek, taking into account existing conservation practices. Currently, 21,525 tons of sediment from sheet and rill erosion make it into Muchakinock Creek per year. Additional sediment from mines and streambank erosion accounts for another 42,200 tons of sediment reaching the creek every year (not shown on this map). Installing additional conservation practices would reduce those numbers even more.



One landowner's duty: Saving the soil for the next generation

Jerry Bruxvoort has accepted his call to duty, and he hopes others will also step forward.

The Muchakinock Creek farmer uses conservation practices to improve water in the creek and save valuable Iowa topsoil.

Jerry Bruxvoort

"We're put on this land to take care of it, and not to waste it. It's your duty," Bruxvoort said. "We're all stewards of the land, and the next generation needs it just as much as we do."

> "We're all stewards of the land, and the next generation needs it just as much as we do."
> ~Jerry Bruxvoort

Bruxvoort grew up near Oskaloosa and began farming in the Muchakinock watershed in 1962. Five years later, he purchased his father's farm and adjoining land near Eddyville, just two miles from where the creek joins with the Des Moines River. He raises corn, beans and cattle.

Ten years as a Mahaska Soil and Water Conservation District (SWCD) commissioner made Bruxvoort aware of problems in the watershed.

In response, Bruxvoort has enrolled land in the Conservation Reserve Program, practices minimum tillage and contour farming, and has installed a pond, buffers and about three miles of terraces. He added that using a plan for highly erodible soil from the Natural Resources Conservation Service (NRCS) has helped as well.

"It saves the soil for the next generation, and we all like to have better water," he said.

The largest benefit from his conservation practices is soil retention, especially where he's installed terraces, he said. However, his pond also attracts wildlife like geese, with a handful that spend the winter there.

About 20 acres of old mines on Bruxvoort's property add an extra challenge for soil conservation. He once worked for five years as a stripminer; today, he works to keep shale and sediment from the old mines out of his pond and Muchakinock Creek.

He's installed a buffer around the pond and would like to do mine reclamation work when funding becomes available.

Bruxvoort would also like to install another pond and continues serving the watershed as an assistant SWCD commissioner.

Jerry Bruxvoort's pond catches excess sediment from nearby farm fields and abandoned mines.

A publication of the Iowa Department of Natural Resources 2005

Produced by:
Jessie Rolph Brown,
DNR Information Specialist

Photography:
Clay Smith, DNR

Contributors:
Nikki Guillot, IDALS
Kate McGhee Bussanmas, DNR GIS Specialist
Tom Wilton, DNR Environmental Specialist

For more information

Nikki Guillot
Watershed Coordinator
IDALS
(641) 673-3476
Nikki.Guillot@ia.nacdnet.net

Ubbo Agena
DNR Nonpoint Program Coordinator
(515) 281-6402
Ubbo.Agena@dnr.state.ia.us

For additional copies of this publication, please contact:
Iowa Department of Natural Resources
Wallace State Office Building
502 E. 9th St.
Des Moines, IA 50319-0034
(515) 281-5918
www.iowadnr.com

The publication of this document has been funded by the Iowa Department of Natural Resources through a grant from the U.S. Environmental Protection Agency under the Federal Nonpoint Source Management Program (Section 319 of the Clean Water Act). Federal regulations prohibit discrimination on the basis of race, color, national origin, sex or handicap. If you believe you have been discriminated against in any program, activity or facility as described above, or if you desire further information, please write to the address to the above right.

PRINTED ON RECYCLED PAPER