An Introduction to the Beaver Creek Watershed

Land Use Affects Stream Integrity

Story and Photos by Matt Nahorn

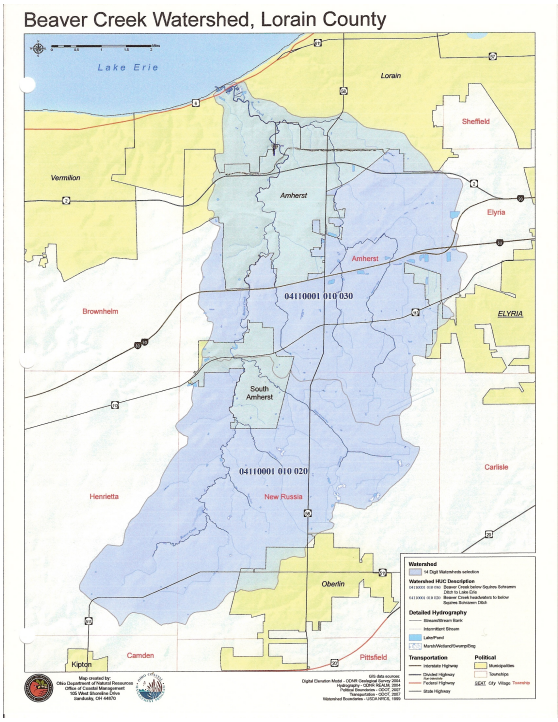
Flooding, erosion, property loss, water quality, and overall health of our local watersheds are largely determined by the manner in which you use your property. Whether you are a farmer who owns a few hundred acres, own a large parcel of land along a creek or river, or live on a small lot within the city, the activities that take place on your land will necessarily affect many aspects of the watercourse that receives the rainwater runoff from your property. Possessing and exercising private property rights are an integral part of being an American citizen. Landowners who understand and exercise all of the options of best land management available to them have the ability to still enjoy and use their land while simultaneously contributing little negative impact to the watershed as a whole.

It is imperative to understand the definition of a watershed and its role within land use. Watersheds contain all of the land that drains or "sheds" its water to a central stream, creek, or river. Watersheds such as the Beaver Creek Watershed, Black River Watershed, and Vermilion River Watershed are common ones located in Northern Ohio. As an example, the Beaver Creek Watershed contains all of the land that will eventually drain its water into the mainstem of the Beaver Creek. Understanding the features of a watershed is crucial before reviewing types of land use and how they contribute to the health of a watershed. We will focus on the Beaver Creek Watershed for this matter. However, much of the information in this article can be used to refer to any area watershed.

What is the Beaver Creek Watershed?

The Beaver Creek Watershed is the largest watershed that is located entirely within Lorain County, Ohio, draining approximately forty-four square miles of land (this is its watershed size). The watershed is sandwiched between two major river systems: the Vermilion to the west and the Black to the east. The Beaver Creek mainstem is approximately twelve miles long, drops at an average of about nineteen feet per mile, and is a direct tributary to Lake Erie. That means that whatever activities occur on land within the Beaver Creek Watershed will directly affect the water quality of Lake Erie, a major source of the area's drinking water.

Map of the Beaver Creek Watershed, highlighted in blue. The City of Oberlin is located to the south, in yellow. Map Courtesy ODNR.



In the South

Most watercourses in this area generally drain and flow south to north, with some minor exceptions. Let's explore the Beaver Creek Watershed and land use within it, in

that manner--from south to north. Water that drains into the headwater streams from the southern-most portion of the watershed comes from just north and west of Oberlin, Ohio. The land use in this portion of the watershed is characterized by light residential use, with a focus on agriculture. Agriculture greatly contributes to the area's economy. However, many common agricultural practices contribute negatively to the health of the watershed. Historically, this land was covered with natural areas referred to as upland woods and "forested wetlands." These forested wetlands are wooded areas wet enough to support many water-loving species while still providing a habitat for many traditional, drier forest plant and tree species. Lush forest floors along with mature trees filled these regions. When farming first came to the area, the land was cleared, drained, and tiled so that the water would continuously and efficiently shed from the land at an unnatural rate.

A forested wetland that exists in the northern part of the Beaver Creek Watershed is seen here. These biologically rich areas store, cleanse, and slowly release stormwater.

This unnatural rate of drainage can contribute to flooding in many other areas of the watershed. Quick drainage leads to higher creek levels during times of rain and unnaturally lower creek levels during drier times. But, we must understand that farmers

need dry fields to grow crops. There is a fine line between productively efficient fields and fields that contribute to increased flooding. Drier and more "efficiently" drained fields mean that this land will shed its water more quickly, not allowing it to slowly percolate into the ground, naturally recharging ground water and thereby recharging the creek's water levels. Slow percolation of water through soil also acts as a natural filter, sorting out any pollutants.

Other farm practices such as plowing directly to the edge of a creek or river can also negatively affect water quality while simultaneously contributing to erosion and loss of land from the farm field. When a "riparian area" or buffer strip along any watercourse is not left in its natural state or is nonexistent, water can quickly rush over the banks and enter the stream. Riparian areas (of at least twenty-five feet) should be left in their natural state or planted with trees and grasses having strong root systems. These vegetated buffers act to slow down water entering the adjacent stream, while simultaneously strengthening the bank against erosion.

Stream bank erosion as a result of nonexistent well-vegetated riparian buffers along the Beaver Creek stream bank.

Dredging is another technique that many farm operations use in order to efficiently drain their fields. The Beaver Creek Watershed has sustained dredging operations

throughout its recent past. Dredging works well to drain farm fields, but it destroys the important habitats that the slow-moving, "inefficient," headwater streams provide for certain organisms. This activity will also promote more flooding and erosion in the northern reaches of the watershed, as the water is quickly whisked from the southern portion of the landscape.

A dredged channel that is a main feeder stream to the Beaver Creek. Dredging destroys stream integrity and increases flooding.

Moving North

As we travel northward in the Beaver Creek Watershed, denser residential land use with some commercial venues will be encountered, along with less dense agricultural land use practices. Many similar problems will be found here, but they are caused by other factors. Here, impervious surfaces, such as rooftops, parking lots, and roadways will lead to more flooding. Impervious surfaces include any material that does not allow water to soak through but rather forces water to quickly run off of its surface. These include concrete, asphalt, and rooftops of buildings. Also, property owners along a

stream will many times mow directly to the edge of the creek. This action will once again eliminate those important riparian areas referenced in the farm section. Without these preserved areas, water will rush off the landscape into the watercourse. The absence of a well-vegetated riparian buffer will lead to a destabilized stream bank that will promote increased erosion.

A well-vegetated riparian area is shown preserved here along the Beaver Creek mainstem. These areas not only help to fight against erosion but also shade the stream from intense heat. Cooler water allows more oxygen and other gases to dissolve into the water, providing for a healthier habitat.

We all Contribute

Property owners along any watercourse must understand that the process of erosion is natural. Creeks and rivers will move, over the course of hundreds of years, from side to side within the confines of their floodplain (or low-lying area that is prone to frequent flooding). However, the rate at which erosion is taking place can be accelerated by the aforementioned human activities. Accelerated erosion results in loss of land along the watercourse. Erosion will also result in increased turbidity and an increase in the scouring action of the stream beds. Turbidity simply is a measure of the total amount of suspended solids that are present in the creek's water at a specific point in time. When

excess amounts of dirt (sediment) enter the water, levels of turbidity increase as the water becomes very brown and dirty looking. This sediment-laden water can affect aquatic life by clogging fish gills and clouding the water making it more difficult for organisms to photosynthesize. Higher than normal levels of turbidity can result from numerous aspects, including soil entering the creek from stream bank erosion or stormwater runoff from construction sites having bare ground.

The Beaver Creek with a high level of turbidity during a major flood event.

Increases in flooding can also allow for an increase in the "scouring" action of the floor of a watercourse. This scouring action will negatively impact the integrity of the stream channel's banks and its bed. Healthy creeks and rivers are naturally divided into sections. These sections include: riffle, run, and deep pools. There are aquatic organisms that maintain specific niches (lifestyles) and will only inhabit one of these areas of the stream. A riffle is an area where the water tumbles over rocks, providing fast water action and acting as a natural aerator, bubbling and dissolving oxygen into the water for use by aquatic organisms. Runs are shallower strips of the stream that are slower moving and usually unobstructed by rocks, exposing the shale floor below. Finally, deep pools are just that--they are pools of water that are slow moving and are the deepest portions of the watercourse. All of these portions of a stream are important in providing specific

habitats for certain life forms. With increased severe flooding, these areas are "jumbled" and often destroyed, as the floods basically clear out the floor of the stream, creating a single environment.

Another Important Feature

When you observe naturally occurring watercourses, they almost always contain meanders and do not flow straight in a certain direction. These meanders are able to hold more water than a straight channel. Also, they slow water down: imagine a straight pipe transporting water compared to a pipe with a series of obstructions forcing the water to flow back and forth and not straight ahead. The pipe that forces the water to take a longer route will hold more water and decrease the speed at which it flows through the channel.

A meander in the Beaver Creek at the Amherst Beaver Creek MetroParks is seen here.

Often, over many years, these meanders are naturally changed and cut through, as seen in the photos. This allows for the creation of what are called "ox-bow wetlands." These are areas where the creek once flowed but still contain a depression in the ground. Wetlands form in these areas as a result of this depression.


An ox-bow wetland in the Beaver Creek watershed in the northern portion of the watershed. To the right is a photo of an old ox-bow that did not form into a wetland.

At the Mouth

Creeks and rivers in Northern Ohio flow into Lake Erie. Naturally and historically, the "mouths" of these watercourses were rich and biologically diverse, containing many streamside wetlands. Over the years, many major river systems, and even the Beaver Creek, has experienced extreme degradation at their mouths. This degradation often is a result of dredging and the construction of marinas and other boat venues. The dredging and marina construction eliminates many species of plants and animals, while effectively scouring the substrate of the watercourse. Furthermore, as the mouth is cleared out and boat slips are dug into the banks of the watercourse, the area is not only degraded biologically, but this also allows more water to flow out of the creek or river much more "efficiently" than before these activities have taken place.

Often these areas can contain important coastal wetlands. Wetlands will occur all throughout the watershed and act as the landscape's "kidneys," storing, cleansing, and slowly releasing water. When these wetlands are destroyed or degraded, this is yet

another factor that leads to decreased creek levels during drier times and increased flooding during rain events.

Why Care?

In addition to allowing for more dirt to enter the stream and increase flooding, the lack of a well-vegetated riparian area can allow excess levels of nutrients to enter the water, also degrading the stream quality. Excess amounts of chemicals applied to lawns, especially those close to watercourses can easily enter the streams, acting as more-than-natural nutrient levels in the water. Nutrients from farm fields will act in the same way. These nutrients can result in an increase in the growth of algae. As these large algal blooms die, their decomposition requires oxygen. A limited amount of oxygen is naturally contained within the water and is used by many organisms. Decreasing levels of oxygen in the water can lead to stagnant, anoxic (without oxygen) water and stinking cesspools that no one wants to have in their backyard. The process of adding excess nutrients to the water system, leading to anoxic conditions is called eutrophication.

Algae is seen in the Beaver Creek where the Creek is exposed having little or no well-vegetated riparian areas along its banks. Increased sunlight penetration will also aid in the growth of algae.

So what can you do?

-Maintain a well-vegetated riparian area (at least twenty-five feet or as much as possible) along all watercourses on your property.

-Reduce use of lawn fertilizer/farm field fertilizer.

-Install a rain barrel at your house to collect stormwater runoff from your roof.

-Install brick pavers instead of a concrete driveway to reduce runoff.

-Work to preserve natural areas in your community, especially those near watercourses.

-Do not build in floodplains, which are lands along creeks or rivers that are prone to flooding. These areas are naturally designed to flood as there is a low and high wall to all naturally designed watercourses. The low wall always leads to the floodplain where the creek will naturally spread out, allowing flood waters to collect and be stored there while slowly percolating back into the creek or river.

-Keep the "bends" in rivers and creeks--do not straighten or channelize streams. Bends or meanders of streams act to hold more water than a straight-lined stream.

Research Material used in this Article

(*and highly recommended for further reading*)

Living in the Vermilion River Watershed Jan Cooper and Mary Garvin, Editors (2008).

Erie Streams and Rivers: Owner's Operating Manual--Operating and Maintaining Beaver Creek and its Tributaries Jennifer Wasilk and Matthew Nahorn (2008).

Ohio Environmental Protection Agency. (1992). *Beaver Creek Survey* (Division of Surface Water/1992-12-8). Twinsburg, Ohio: OEPA Division of Surface Water.

Lorain County MetroParks District. (n.d.). *Amherst Beaver Creek Reservation*. Amherst, OH: Lorain County MetroParks.