# PROJECT NATURE NEWSLETTER

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## JULY, 2019 ISSUE

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# Events

**Hike All The Trails**
*Blacklick Woods Metro Park - Nature Center*
6th July 9:00 am - 10:00 am
Join a naturalist for a fast-paced hike on the park's 6 miles of trails

**Going Batty**
*Blacklick Woods Metro Park - Ash Grove Picnic Area*
6th July 8:30 pm - 9:30 pm
Watch for bats flying and catching insects

**Feed The Stream**
*Battelle Darby Metro Park - Nature Center*
6th July 1:00 pm - 1:30 pm
Enjoy the fish feeding frenzy as you help feed them worms, crickets and minnows

**Steam Quality Monitoring**
*Battelle Darby Metro Park - Indian Ridge*
6th July 10:00 am - 11:00 am
Wade into the river to explore stream life and determine stream health. Wear closed-toe shoes

**Weekly Bird Hike**
*Scioto Audobon Metro Park - Grange Insurance Audobon Center*
6th, 13th, 20th, 27th July 10:00 am - 11:30 am
Hike with experienced birders to find and learn about birds (Binoculars and field guides can be provided)

**Go Creekin'**
*Highbanks Metro Park - Big Meadows Picnic Area*
6th July 2:00 pm - 3:00 pm
Explore the Olentangy river for some of the animals that live there. Wear closed toed shoes

**Bats and Lightning Bugs**
*Three Creeks Metro Park - Confluence Area*
6th July 8:30 pm - 9:30 pm
Observe hunting bats and learn how to call-in lightning bugs. Bring a small flashlight

**Canoe The Lake**
*Sharon Woods Metro Park - Schrock Lake*
6th, 7th July 9:00 am - 12:00 pm, 2:00 pm - 5:00 pm
Stop by anytime and take a canoe out for a ride on the lake. Canoes and equipment provided

**Morning Bird Hike**
*Blendon Woods Metro Park - Nature Center*
7th July 8:00 am - 9:00 am
Walk 2 miles as we look for resident birds

**Family Creeking Adventure**
*Battelle Darby Metro Park - Cedar Ridge*
7th July 3:00 pm - 4:00 pm
Get wet as we catch fish, bugs and crawdads in the creek

**Marine Mammal March**
*Shale Hollow Preservation Park*
7th July 11:00 am - 5:00 pm
Head out on the trail and discover the interesting lives of these amazing water bound animals. From 6 to 300,000 pounds, there is a lot of diversity to discover!

**10TV & Metro Parks Outdoor Adventure**
*Highbanks Metro Park - Big Meadows Picnic Area*
13th July 10:00 am - 4:00 pm
Join for this mega annual Metro Parks event in partnership with 10TV for a host of fun and educational outdoor activities and lots of food

# Events

**Nature School: Insects**
*Blacklick Woods Metro Park - Nature Center*
14th July 3:00 pm - 4:00 pm
Learn how to identify members of this diverse group and take a short walk to find some

**Off-trail Wetland Bird Hike**
*Glacier Ridge Metro Park - Honda Wetland*
14th July 8:00 am - 9:00 am
Explore uncharted areas of the wetlands to find birds on a 2 mile off trail hike!

**Discover Falconry**
*Battelle Darby Metro Park - Indian Ridge*
14th July 4:30 pm - 6:00 pm
Meet and learn about some amazing birds of prey from the Ohio School of Falconry. Learn about the ancient sport of falconry as you watch these raptors take flight

**Fireflies**
*Blacklick Woods Metro Park - Nature Center*
20th July 8:30 pm - 9:30 am
Learn about these incredible insects as we take a 2-mile walk to look for them

**Moth Mania**
*Battelle Darby Metro Park - Nature Center*
20th July 9:30 pm - 12:00 am
Check out all the cool creatures that come to our light traps

**Composting for Fertility**
*Gallant Farm Preservation Park*
20th July 10:00 am
Composting is a great way to nutrify the soil and reduce the amount of waste sent to landfills. Learn about compost tea, using natural animal traits and instincts to aid in decomposition and much more

**Butterfly Pursuit**
*Highbanks Metro Park - Nature Center*
20th July 11:00 am - 12:30 pm
Take a 2.5 mile hike to find some of the most beautiful butterflies of the season and learn how to identify them

**Try it Out! - Kayaking**
*Delaware State Park - Delaware Lake southwest marina*
20th July 1:00 pm - 5:00 pm
Take a quick lesson and 30-minute paddle session provided by the American Kayak Association

**Moth Display**
*Blacklick Woods Metro Park - Nature Center*
20th - 21st July 8:00 am - 8:00 pm
View the display to learn about these nocturnal winged wonders

**Family Fun Night**
*Highbanks Metro Park - Nature Center*
20th July 6:00 pm - 8:00 pm
Enjoy a campfire and explore nature at night through a variety of activities

**National Moth Week**
*Battelle Darby Metro Park - Nature Center*
20th - 28th July 9:00 am - 8:00 pm
Celebrate National Moth Week and see a beautiful display of moths

**Edible Plant Hike**
*Clear Creek Metro Park - Barnebey-Hambelton Picnic Area*
20th July 9:00 am - 11:00 am
Take a 2-mile rugged hike to learn what wild edible plants are available in the summer. Try some samples after the hike

# Events

**Creature Feature - Amphibians**
*Highbanks Metro Park - Nature Center*
21st July 2:00 pm - 2:30 pm
Visit with live amphibians and learn how we take care of these animals

**Ranger Bike Ride**
*Blacklick Woods Metro Park - Nature Center*
21st July 3:00 pm - 4:00 pm
Join a park ranger on a 6-mile bike ride along the Blacklick Creek Greenway Trail

**Creeking the Ravine**
*Blendon Ravines (5280 Cambria Way, Westerville)*
21st July 2:00 pm - 3:00 pm
Come prepared for a 2 mile off-trail hike through the creek at the new Blendon Ravines property

**Feed The Stream**
*Battelle Darby Metro Park - Nature Center*
21st July 1:00 pm - 1:30 pm
Enjoy the fish feeding frenzy as you help feed them worms, crickets and minnows

**Sensory Night Hike**
*Highbanks Metro Park - Nature Center*
27th July 8:30 pm - 9:30 pm
Use all your senses on this 1.5-mile night hike through forest and field

**Moths and Mammals Night**
*Blacklick Woods Metro Park - Nature Center*
27th July 10:00 pm - 11:30 pm
Look for nocturnal mammals through the viewing windows and check a moth sheet for night-flying insects

**Bison**
*Battelle Darby Metro Park - Nature Center*
27th July 6:00 pm - 7:00 pm
See the bison herd on a 1-mile hike and learn all about our National Mammal

**Prairie Walk**
*Battelle Darby Metro Park - Nature Center*
27th July 8:00 am - 9:00 am
Take a two mile walk and discover native prairie wildflowers

**Wildflower Walk**
*Inniswood Gardens Metro Park - Gardens Entrance*
27th July 2:00 pm - 3:00 pm
Join an educator in the gardens as we search for summer wildflowers

**Summer Bird Walk Series**
*Blues Creek Preservation Park*
27th July 8:00 am - 9:00 am
See what birds are flitting about in the parks this summer during walks with a staff member

**Ravine Exploration**
*Highbanks Metro Park - Nature Center*
28th July 2:00 pm - 2:30 pm
Get in the water and take 1-mile hike as we look for animals

**Green Leaves Tree ID**
*Three Creeks Metro Park - Confluence Area*
28th July 2:00 pm - 3:00 pm
Learn to identify trees by their leaves on an easy 1-mile walk

# Macroinvertebrates & Water Quality

Natural water bodies such as streams, rivers, lakes, ponds and wetlands are home to a wide variety of flora and fauna, including lots of tiny organisms called **macroinvertebrates**. Macroinvertebrates are organisms that are large enough to be observed without the aid of a microscope (hence '**macro**') and lack a backbone (hence '**invertebrate**'). These include insects (mayflies, stoneflies, dragonflies, damselflies), crustaceans (crayfish, scuds), mollusks (clams, mussels, snails), isopods (sow bugs) and hirundinea (leeches). While some macroinvertebrates such as crayfish could be fairly large (4"-6"), most are very small. Invertebrates that can be retained on a 0.25 mm mesh net are generally referred to as macroinvertebrates. Some macroinvertebrates spend their entire life in water, while others such as most insects only spend the larval stage of their life cycle as aquatic - yet that stage is often the majority of their lifespan.

Macroinvertebrates are affected by the physical, chemical and biological conditions of water they live in. Different macroinvertebrates have varying degree of tolerance to pollutants. For example stonefly and dobsonfly larvae are extremely sensitive to pollutants and can only survive in relatively clean water, whereas others such as aquatic worms can thrive in the poorest water conditions. Hence, these aquatic creatures also serve as indicators of the water quality. In other words, their presence (or absence) indicates the health of the water body.

To study the water quality through these biological indicators, scientists particularly focus on the macroinvertebrates in *benthic* habitat. The term benthic refers to the ecological region at the lowest level of a body of water. The aquatic animals and plants that live in the bottom level are also known as '*benthos*'.

# Functional Groups

Macroinvertebrates are extremely diverse and have different feeding habitats, based on which they can be placed into different functional feeding groups. Individuals are categorized based on their mechanism for obtaining food and the particle size of the food, and not specifically on what they are eating.

**Shredders:** These mainly consume organic matter such as leaf litter, and help convert it into finer particles. They require vegetation growing along a slow moving water body, such that the organic matter falling into the water doesn't get swept away. Examples include crayfish and some species of caddisfly larvae. Some shredders receive more sustenance from the biofilm (connected layer of bacteria, fungi, algae etc.) that they ingest along with the decaying matter, than from the plant material itself.

**Collectors:** Also called *Filter Feeders*, they collect or gather very fine organic matter, produced by the shredders, from the stream bottom or water column. Certain species of mayfly and caddisfly larvae, mussels and aquatic worms are examples of collectors.

**Scrapers:** These are grazers that consume algae and associated material attached to rocks and plants. Examples of scrapers are snails, water penny beetle larvae, and some species of mayfly larvae.

**Preadators:** These feed on live prey and can be found wherever shredders and collectors exist. Examples include dragonfly and damselfly larvae, water beetles, and some midge and stonefly larvae.

The benefit of this method of classification is that instead of hundreds of different taxa to be studied, a small number of groups of organisms can be studied collectively based on the way they function and process energy in the stream ecosystem.

## Taxonomy and Taxonomic Rank

*Taxonomy (in biology) is the of science of naming, defining and classifying groups of biological organisms on the basis of shared characteristics. The principal taxonomic ranks are*

| **Kingdom** → | **Phylum** → | **Class** → | **Order** → | **Family** → | **Genus** → | **Species** |
|---|---|---|---|---|---|---|
| *King* | *Phillip* | *Came* | *Over* | *For* | *Good* | *Soup* |

*For example, the taxonomic rank of a human is*

**Animalia → Chordata → Mammalia → Primates → Hominidae → Homo → Sapiens**

# Role in the Ecosystem

**Autotrophs**, or primary producers, capture the sun's energy and draw nutrients from the water column and soil to produce organic matter. These producers can be the algae, cyanobacteria and diatoms in the stream, or the riparian vegetation growing next to the stream channel. They are the start of the food chain and critical for a healthy ecosystem. Macroinvertebrates are the primary consumers or processors of these primary producers, and play a key role in nutrient cycling of the aquatic ecosystem. In addition to consuming the primary producers, some macroinvertebrates are also ***detritivores***, i.e., they consume decomposing organic matter. Finally, macroinvertebrates are also a food for a variety of other animals such as fish, amphibians, reptiles, aquatic birds and mammals, hence form an important link in the food chain in the aquatic ecosystem.


*Mayfly Larva*


*Stonefly Larvae*

# River Continuum Concept

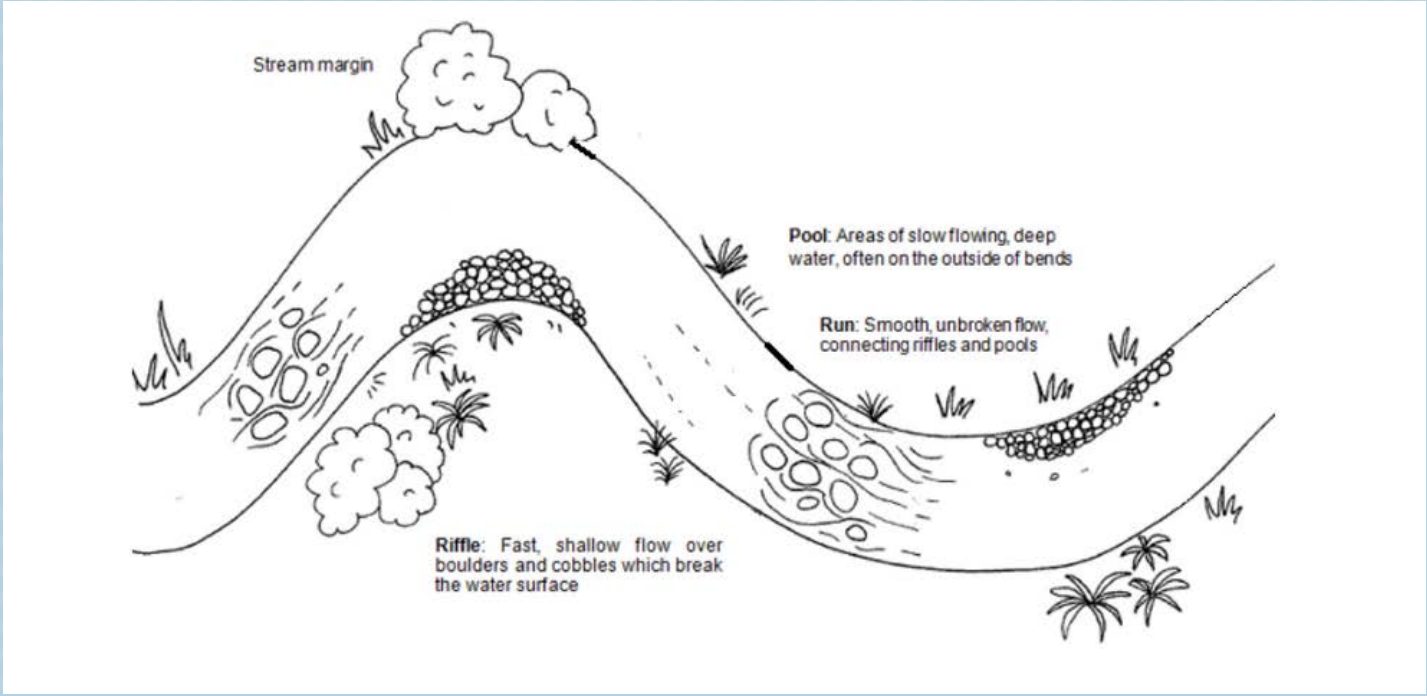
According to the River Continuum Concept, the presence (or absence) of these functional groups can be predicted by the type of riparian vegetation in that part of the stream as well as the processes that formed the streambed. Macroinvertebrate communities change in functional groups as one moves downstream. For example, close to the headwaters, the stream is narrow and dominated by dense vegetation along the banks, shading the stream and limiting the amount of sunlight reaching the stream surface. This results in a reduced growth of algae, and hence close to headwaters, the source of carbon is not autotrophs, but decaying matter. Consequently, the most abundant groups in this part of the stream are predators and shredders. As one moves downstream from the headwaters, the stream widens, canopy opens and the riparian vegetation doesn't shade the entire stream, allowing sunlight to reach the water surface. This is the mid-level stream. Shredders decrease, and scrapers and collectors become more abundant in this part of the stream. Further downstream, the river widens even more and the water becomes turbid. Here even though the canopy is wide open, the increased turbidity reduces the sunlight reaching the streambed, hence preventing primary productivity. Thus, the carbon source is again from outside the stream. Macroinvertebrates dominating this part of the stream are collectors.

# Physical Adaptaions

Macroinvertebrates live in different kinds of habitats - surface of water, in water, in the sediment at the bottom, or on submerged rocks, logs and leaf litter. Each type of habitat provides suitable conditions for different kinds of macroinvertebrates. These organisms have developed adaptations according to the habitat they live in. For example, in fast flowing water, the macroinvertebrates are equipped with powerful suckers or gripping legs. In slow moving water, the organisms have legs that are more suited for swimming rather than holding. Filter feeders such as mayfly larvae have hairy legs to trap drifting food particles. Some macroinvertebrates breathe underwater and hence have appropriate apparatus such as gills for the purpose. Others, such as the diving beetles and water boatmen, come to the surface, trap air under their exoskeleton and then dive back.

# Stream Anatomy

A stream could be broadly classified into three different kinds of habitats - ***riffles***, ***runs***, and ***pools***.




***Source: Arizona Geological Survey, http://repository.azgs.az.gov***

When a stream encounters a large rock or boulder, the water flows over the rocks. The falling water on the other side of the rock creates a **pool** in the stream by the sheer force of gravity. The

water in the pool flows relatively slower and is a preferred habitat for several groups of macroinvertebrates such as mollusks (clams and snails) and worms as well as certain fishes such as trouts. Since water moves slow in the pools, organic debris settles out, and abundant food is available for shredders and collectors. Another advantage for inhabitants of pools is that since pools are relatively deeper than other parts of the stream, during droughts, these areas become a refuge for the organisms.

**Riffles** are shallow parts of the stream characterized by fast moving and agitated or turbulent water. They occur where there is sufficient slope or gradient in the stream bed to allow for a constant flow of water over the substrate making the water surface visibly broken. Riffles are highly oxygenated because the broken water surface mixes atmospheric oxygen into the stream. Stream substrates are the materials that form the stream bed such as boulders, cobbles, gravel, sand and sediment. Only the functional group of macroinvertebrates with necessary adaptations to cling well to substrates live in riffles.

Close to any pool or riffle, there is likely to be a **run**. Run is simply the main body of water that flows smoothly downstream at moderate speed. Small fishes such as minnows prefer runs as they are too small to compete in the pools.


*Dobsonfly Larva*


*Damselfly Larva*

# Ohio Scenic Rivers Program

Ohio is blessed with over 60,000 miles of streams and rivers, some of which possess outstanding water quality and support a healthy biodiversity of both flora and fauna. Such rivers can be designated as 'Scenic' under Ohio's Scenic River Law. The Ohio Scenic Rivers Program, administered by the Ohio Department Natural Resources' (ODNR) Division of Parks & Watercraft, works with local partners to identify and protect these Scenic rivers. There are four Scenic River Districts in Ohio - Northwest, Southwest, Northeast, and Central.


Ohio pioneered the river preservation movement in 1968 and passed the nation's first Scenic Rivers Act in February of 1968. The National Scenic Rivers Act followed in October, 1968. This legislation created the Scenic Rivers Program to protect some of Ohio's remaining high quality rivers and streams if the local community requests designation and the stream meets certain biotic and landscape standards. The first of these rivers designated, and the impetus for the Act, was the the Little Miami River on April 23, 1969.

Today, there are a total of 15 designated rivers in Ohio that comprise over 830 river miles. The entire length of the river may not qualify to get the designated status. Instead, section or sections of a river that meet the required criteria are designated. For example, the Olentangy river is designated a state scenic river for a 22-mile section between Delaware County and northern Franklin County. The Olentangy was the third river designated in Ohio in 1973. Criteria for designating a river include the stream length, adjacent forest cover, biological characteristics, water quality, present use and natural conditions.

The Scenic Rivers Act provides three categories for river classification: **wild**, **scenic** and **recreational**.


**Wild River** designation is awarded to rivers that are mostly free flowing, surrounded by at least 75% of forested corridor for a width of at least 300 ft and with mostly undeveloped floodplain.

**Scenic River** designation is awarded to rivers that include at least 25% of forested corridor for a width of at least 300 ft. While Scenic Rivers may exhibit some signs of human activity, the river still retains a majority of its natural characteristics.

**Recreational River** designation is awarded to rivers that are 60 percent free flowing in the segment, with connectivity to natural floodplain along a majority of its length, and include native forest or wetland outward from the river to a depth of at least 120 ft. Recreational Rivers, unlike Wild and Scenic Rivers, are primarily preserved for their cultural and historic attributes rather than their degree of naturalness. The recreation factor, however, is not a qualifying attribute for "recreational" designation.

Typically, all three categories of designation are simply referred to as "**scenic rivers**" and receive the same level of protection. Scenic river designation is a cooperative effort among state and local government, citizen groups and local communities. The designation process and maintaining the designation ultimately depends on the support and protection of local governments and citizens!

# Stream Quality Monitoring

Any modification to the environmental conditions could affect the macroinvertebrates, and with them, the related ecosystem. Instead of taking water samples and chemically analyzing it in the lab to check for the quality, monitoring the macroinvertebrates is an indirect and an extremely convenient as well as effective way to assess the health of a water body. Normally abundant in healthy and unpolluted streams, they can be easily collected. Macroinvertebrate populations respond to any changes in the water conditions, with the degree of response depending on the species. Hence, they are excellent biological indicators to any change in the aquatic ecosystem. Because of their limited mobility, they are unable to escape pollutants or move away from adverse conditions, which makes it very helpful in pinpointing the locations of chronic sources of pollution. By consistently monitoring macroinvertebrate populations at specific points in a stream, any changes to the stream can be easily detected.

***Volunteers and ODNR scientists sampling the macroinvertebrates in a stream***
***Photo provided by Ohio Scenic Rivers Program***

Stream Quality Monitoring (SQM) is a project of the Ohio Scenic Rivers Program to monitor the health of Ohio's Scenic Rivers. The SQM Volunteer Monitoring Project started in 1983 and since its inception, more than 160,000 citizen scientists have contributed to the project. SQM is one of the largest citizen science programs in Ohio, providing the public with the opportunity to actively engage in protecting and maintaining the rivers and streams in their area. Data collected by volunteers serves as the 'first alert' system in the assessment of water quality. If there are any deviations in the data from the typical quality for that site, the ODNR scientists will then further investigate.

Volunteers are trained on identifying the macroinvertebrates as well as the sampling methods and protocols by the ODNR staff. The procedures and protocols were developed with volunteers in mind and hence are designed to be simple and effective in obtaining a relative water quality assessment. A net or seine is used to collect the macroinvertebrates. Monitoring sites are strategically selected along a stream such that it presents a statistically good representation of a larger section of the stream in that region. These sites, called **Reference Stations**, are permanent sites so that a consistent record of scientific data can be established. The reference stations are located where there is a riffle in the stream. Each monitoring consists of taking three samples in the riffle.

***Oh what fun it is!***
***ODNR scientist, Christine Szymanski, demonstrating sampling techniques***
***Photo provided by Ohio Scenic Rivers Program***

*As mentioned above, water is most oxygenated in a riffle. Since the sensitive organisms need high oxygen, the absence of sensitive organisms in a riffle is a good indicator that something is "wrong"!*



***Volunteers and ODNR scientists sampling the* Olentangy river in Delaware County**

Additionally, the turbidity of the water at the sampling site is also recorded. Turbidity can be caused by a number of suspended materials within the water column including inorganic and organic matter such as soil particles, algae, plankton, microbes, organic debris and other materials. Excessive suspended solids may affect the aquatic organisms in several ways. These materials stick to the gills of the organisms, reducing their ability to extract oxygen from water. Excessive turbidity can also reduce the visibility of many animals, reducing their ability to locate food,

which in turn may lower their growth rates. Finally, as the suspended particles settle down to the stream bottom, they may destroy the organisms' habitat.

To estimate the water turbidity, *Ohio sediment stick* is used to measure the **Total Suspended Solids** (TSS). A very easy-to-use device, the Ohio sediment stick is calibrated to predict mg/l of TSS for Ohio streams with 90 percent accuracy.

A tally sheet is used to record the number of macroinvertebrates sampled for different Taxa groups. For SQM data collection, the macros are divided into 3 groups, with each group carrying a different score. A **Cumulative Index Value** (CIV) is computed by adding the score from each group. A score of 23 is considered "excellent", whereas a score below 11 is considered "poor".

Through consistent monitoring of the streams, long term data can be used to draw trends and help the Ohio Scenic Rivers Program detect and address negative impacts and changes in stream ecology over time. Scenic Rivers Program staff and volunteers regularly sample reference stations along scenic rivers from May to October annually. By sampling the reference stations multiple times a year, a general characterization of the water quality of the entire scenic river can be made!

*For more information about Stream Quality Monitoring or to become an SQM Volunteer, visit* http://watercraft.ohiodnr.gov/sqm

**Three of the Ohio scenic rivers are designated as National Scenic Rivers! The National Scenic Rivers in Ohio are the Big & Little Darby Creek, Little Beaver Creek and Little Miami River.**

# Human Impact

Rivers and streams are one of Ohio's most valuable natural resources and have been providing us with many uses and benefits such as drinking water, transportation, recreation and several other related benefits. Over 1,400 species of wildlife also depend on these streams!

While our streams and rivers have undergone great changes as the glaciers advanced and retreated several times over the last 2 million years, in just the past 200 years, human activity has dramatically impacted the physical, chemical and biological systems of many streams. As the European settlement increased, forests were cleared, swamps were drained, numerous mill dams were constructed and wastewater mismanaged, all of which cumulatively contributed towards worsening the quality of the streams. Rivers were freely used as sewage systems, which was the reason that the wealthy settled upstream along a river while the less fortunate would find their homes in more polluted waters. By the late 1800's, many urban rivers had become seriously polluted, resulting in outbreaks of diphtheria.

But just like human activity can negatively impact the natural resources, we also possess the ability to restore the damaged systems! In 1893, Ohio's first water pollution law was passed. But it was the State Scenic Rivers Act in 1968 that resulted in greatly improving the water quality of many of the streams and rivers in the state. Ohio set an example with Scenic Rivers Act for the rest of the country. Federal laws like the Clean Water Act were passed soon after, and states were required to establish water quality standards and chemical limits to maintain and restore "*the chemical, physical and biological integrity of the surface waters of the United States*."

Restoring and maintaining quality of Ohio streams has largely been a community-based effort, which is the reason for its success and effectiveness. No government policy or law can alone solve the problems we helped create. It is ultimately up to the citizens to decide what kind of an environment we want to live in and accordingly take action!

*Project Nature logo designed by Sushil Narsian, Indus Design*
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