

WE ALL NEED WATER

2021 JIM CLAYPOOL ART & CONSERVATION WRITING CONTEST

SPONSORED BY KENTUCKY FARM BUREAU FEDERATION,
DIVISION OF CONSERVATION, AND KENTUCKY ASSOCIATION
OF CONSERVATION DISTRICTS

You have the Kool-Aid and a pitcher—just add water. You have a bathtub, soap, shampoo, and your rubber ducky—just add water. You have the garden planted with seeds and transplants are now in the ground—just add water. You have the lawn mowed and flowers planted—just add water. You just got a new puppy and have given her some puppy food—just add water. You just mixed a Duncan Hines cake mix with two eggs and oil—just add water.

Just add water. Three little words, but they mean so much. When we think of our daily lives, we cannot think of life without water. We have to have it for life. Approximately 70% of the world is covered by water from the oceans, rivers, and lakes, to small ponds and streams. We have water stored in the polar ice caps, glaciers, and snow-capped mountains. Water is even stored in the clouds that float across the sky. We even have a little bit of ice in our refrigerator freezers. Did you ever think that water is also stored in the soil and below the soil's surface? Water can be found in the ground sometimes flowing in streams and rivers through caves, or in pockets where we can get it from digging wells

Did you ever think that plants and animals also store water? Some plants may be as much as 90% water like lettuce. Even humans average about 60% water just like the Earth. We have water in our muscles, blood, brains, and even our bones and hair have water. Every cell in our bodies have water. We can go without food for several weeks (if we had to), but we could not go without water for only a few days.

The Earth relies on water for all plant and animal life. Deserts will come alive with plant growth after a rare rainfall. Rainforests get water from rain almost every day. Alligators need a lot of water in our swamps in order to survive.

Whitetail deer and turkeys will drink from ponds, streams, and lakes to get the water they need. Ducks and geese are called waterfowl for their life associated with water. Muskrats, otters, and beavers have to have water for their habitat. Don't forget the fish, frogs, salamanders, and ocean animals that need water. Even polar bears need a lot of water—a lot of frozen water.

When you get up in the morning and wash your face, use the restroom, and brush your teeth - it would all be hard to do without water. We cook our food, wash our clothes, take baths and showers, and play in swimming pools and creeks all because we have water in our homes and in our neighborhood. We wash our cars at carwashes and even give our dogs a bath. We fish in water, because we don't catch fish in trees. Water is all around us and water is very important in our daily lives.

From cleaning up in the mornings, to cooking food and making drinks throughout the day, cleaning our dishes and laundry, wiping down tables and chairs, and even growing our meats, fruits, and vegetables, we cannot do it without water. As you go through your day, think of all the ways we use and need water. We would not be able to live if we were not able to—Just add water.



**JUST
ADD
WATER**



HOW DO URBAN TREES PREVENT WATER POLLUTION?

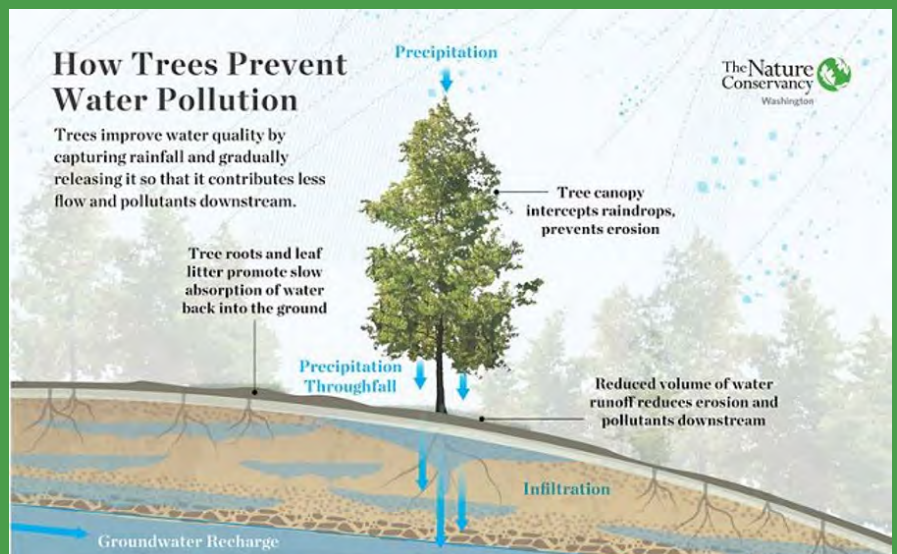
Urban forests, which encompass all of the trees growing in our cities and towns, provide a wide range of benefits. These benefits include natural beauty, noise reduction, wildlife habitat, and clean air and water. Trees growing in parks and greenways, in our yards, and along streets are more important than ever at helping slow rainfall and stormwater runoff. This runoff contains pollutants and can degrade our surrounding streams, rivers, lakes and reservoirs.

Pollutants that come from industrial areas, vehicles, waste, and other sources can be toxic to fish and wildlife, as well as humans. Urban trees help to improve water quality by capturing rainfall and gradually releasing it into surrounding streams and rivers, so it slows the water flow and contributes less pollutants downstream. This process occurs in several ways:

Through the process of interception, the rain that falls on tree leaves is detained and is gradually released through evaporation and transpiration. When rain reaches the permeable soil, tree roots and leaf litter help the water slowly absorb into the ground while

filtering out nutrients and pollution. As rain reaches impervious pavement surrounded by nearby trees, the tree canopy can reduce the temperature of the water flowing into our waterways. This process reduces the volume of water that runs off, decreases erosion, and diminishes the amount of pollutants that flow downstream.

Trees make our cities and towns better places to live, learn, work, and play. We can thank the trees for our clean drinking water!



KENTUCKY'S FORESTED ECOSYSTEMS AND WATER QUALITY

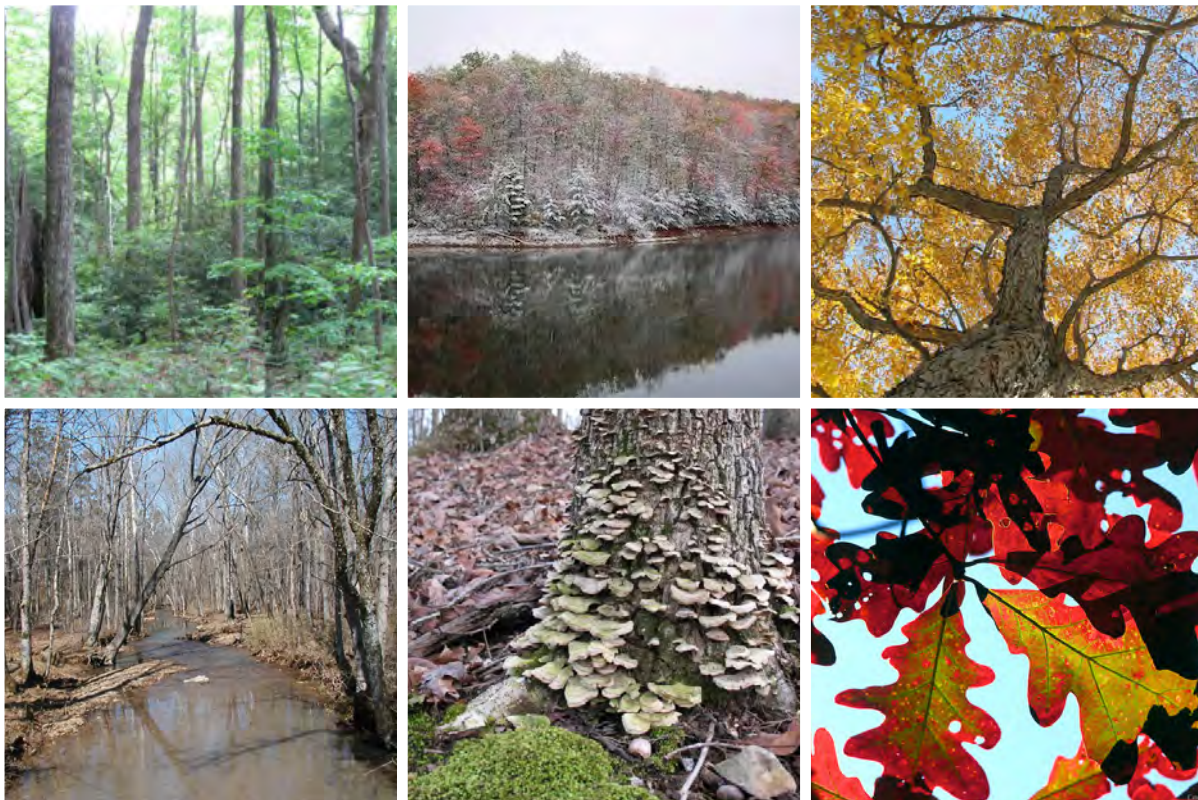
Ecosystems are dynamic interactions between plants, animals, and microorganisms, and their environment working together as a functional unit. A forest is a large ecosystem. Forests grow in a wide variety of climates. Kentucky's forests are temperate and deciduous. The word "deciduous" means exactly what the leaves on these trees do: change color in autumn, fall off in the winter, and grow back again in the spring.

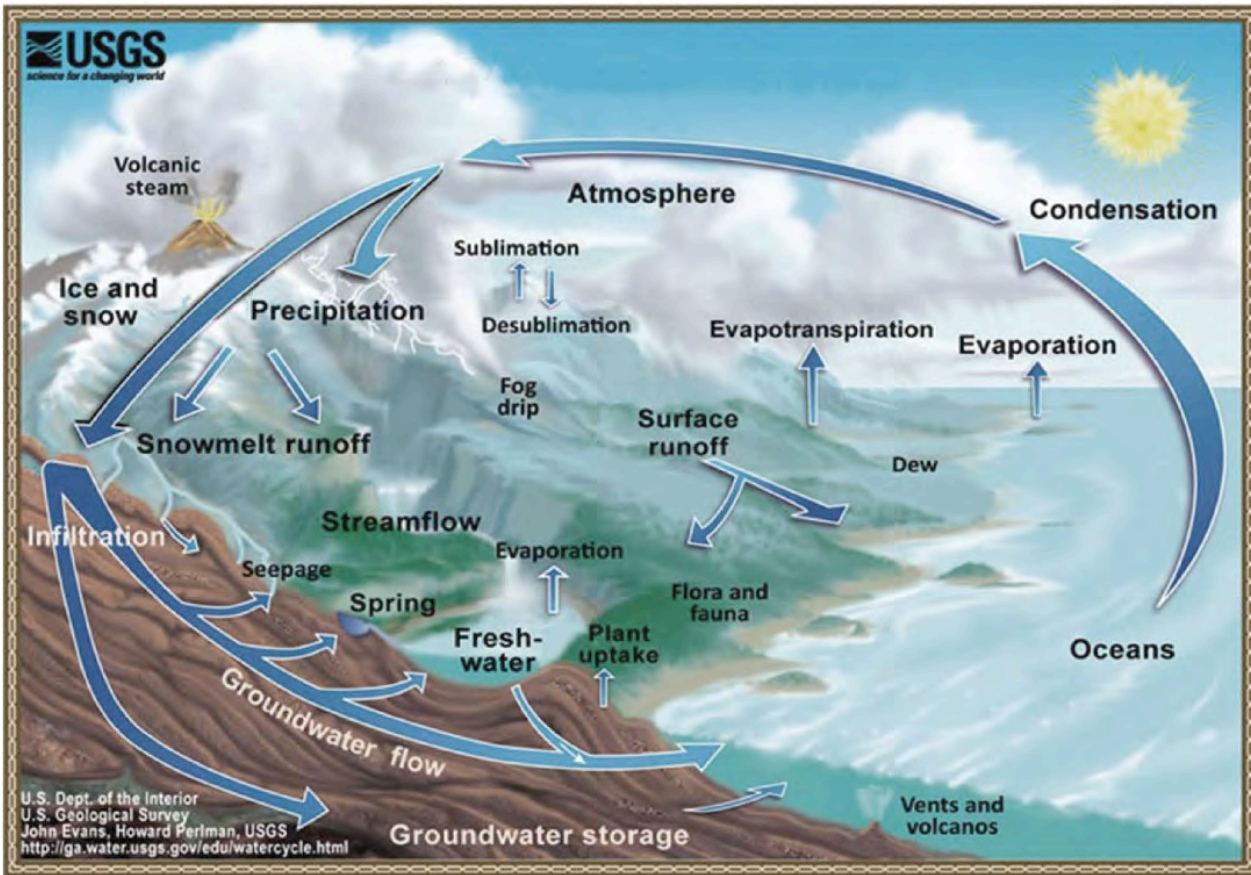
So what is a forested ecosystem? All the organisms (trees, shrubs, herbs, bacteria, fungi, and animals, including people) together with the surrounding air, soil, water, organic debris, and rocks, interacting inside a defined boundary. The term biotic means living or having lived. Examples of biotic factors would include a frog, a leaf, a dead tree, or a piece of wood. The term abiotic means non-living, or never having lived. Examples of abiotic factors would include gold, rock, bicycle, brick, and cement. Biotic and abiotic factors combine to create a biological system or more precisely, an ecosystem. This complexity of species interacting together in the ecosystem and

the abundance of each species is called biodiversity.

Kentucky's diverse landscape includes the eastern Kentucky mountain ridges, the forests of central Kentucky and the bottomlands of western Kentucky. The eastern part of Kentucky has Appalachian mixed mesophytic forests. The dominant trees in this area are yellow-poplar, American beech, white oak, sugar maple, and eastern hemlock. Here you will find black bears, wood frogs, elk, and ruffed grouse associated with this forest type. The central part of Kentucky has trees species such as eastern red cedar, sassafras, hackberry, white oak, red oak, and hickory. Here you will find deer, turkey, and coyotes associated with this forest type. The western part of the state has swamp and bottomland tree species. The dominant trees are green ash, sweetgum, pin oak, and cherry bark oak. Here you will find migrating ducks, turtles, cranes, and red-tailed hawks associated with this forest type.

In nature, the organic materials needed by all organisms in a forested ecosystem are reused or recycled. Nitrogen, carbon,





water, oxygen, and other nutrients move through the forested ecosystem in a predictable pattern or cycle.

Let focus on the water cycle! The water cycle is full of those "TION" words like condensation, precipitation, evaporation, and transpiration. Transpiration occurs when trees release water vapor as part of the photosynthesis process. There are little holes underneath the leaves called stomata. The stomata allows water to escape the tree just like the pores on human skin. Transpiration acts like a big air conditioner and helps

protect our climate from changing. Trees cycle a lot of water through the water cycle.

Forested ecosystems have key functions that affect water supply and quality, such as filtering, retention, and water storage in streams, lakes, and aquifers. Forested ecosystems can provide clean drinking water and help reduce the impacts of floods from storms by blocking and slowing down the flow of runoff.




HOW EVERYONE CAN HELP WATER QUALITY

There are a lot of ways that everyone can reduce negative impacts on water resources in their communities. Homes can be a cause of nonpoint source pollution through roof runoff, improper waste management, garden or lawn management, pet waste, and septic systems. Even if you don't live on a lake or near a river, everyone lives in a watershed, and every part of the watershed can affect the water quality for everyone. There are many different actions residents can take to reduce those negative impacts.

Lush green lawns with magnolia trees and hydrangeas may be pleasing to the eye, but the chemicals we use to maintain our pretty lawns can be damaging to our waterways. It is always important to read the label on any herbicide, pesticide, and fertilizer, even if it is organic. Proper usage and storage is vital to ensuring that dangerous chemicals don't get into our ground or surface water. Checking the weather report before utilizing any chemicals is also an important step to take. If you spray your lawn the day before a major rain event, you'll likely lose the benefit of the chemical, and the chemical will be washed away into our waterways. Chemical management is an important step to maintaining a healthy lawn and water system. Planting native plants can also be vital. Native plants may require less management, which will allow you to reduce chemical and water usage.

Using proper waste management is also vital. Septic systems, pet waste, and trash dumps can majorly impact our water resources. Any waste or heavy metal getting into our water can cause serious human health issues, impact local wildlife, and negatively impact plant life. Local waste management offices and conservation districts may have programs available to help properly manage waste. This includes trash cleanups, septic checkups, water testing, and other resources. Managing your waste isn't just the responsible thing to do, but the best thing for our environment.

If you do live near a lake, river, or creek it is important to maintain a healthy riparian buffer. "Riparian" means next to rivers and streams. Buffers are not only important for the health of the



water, but can help reduce erosion and flooding events. Healthy plant life can also provide privacy for landowners. If you're rehabilitating your riparian area, make sure you use native plants. Native plants will provide the most benefit to your soil and wildlife. Plus, non-native species may look pretty, but can wreck your local ecosystem and be incredibly difficult to remove once planted. Things like kudzu, autumn olive, bush honeysuckle, and crown vetch are all invasive. The difficulty of removing these plants can cause additional runoff issues and erosion.

REDUCING WATER USAGE

Another way people can help water quality is reducing their water usage. Reducing usage can help replenish aquifers, reduce water bills, and positively impact your local watershed. There are many ways people can reduce their impact both inside and outside the house. Homes can use low flow and energy efficient appliances and water fixtures. For lawn care if you must use sprinklers, you can implement low flow sprinklers that run on a timer. This reduces your water usage and can reduce any negative lawn runoff.

Rain barrels are another popular way to reduce your water usage. A rain barrel is used to catch water drainage from your roof during rain events. This water can then be used to water your garden, wash your car, or for other outdoor activities. Collecting the rain can also reduce lawn erosion and prevent nutrients from leaving your garden. Also, you can have so much fun decorating your rain barrel! If you're living in an area of heavy rain, multiple rain barrels may benefit you. Check with your local conservation district or county extension office to see if they are offering any training events on making or using rain barrels.

THE OLDEST CONSERVATIONISTS

Farmers are the oldest, and possibly the best, conservationists that exist. Since the beginning of time, farmers have tried to make conscious decisions to help improve our natural resources. They spend countless hours adjusting their individual operations so that they make the least impact on the environment as possible.

Water is a crucial resource for farmers across the globe. It provides a source of nutrients for growing crops, hydrating livestock, and sustaining life for the farm family. Over the years, farmers have implemented several practices that prevent unwanted nutrients or pollutions from entering our water sources. One prime example of this is grid sampling their fields for fertilizer applications. Through the use of the grid, a farmer can limit the amount of fertilizer applied to crops, which prevents runoff from filling our waterways with nitrogen, phosphorus, and potassium. Fertilizer is only applied in the needed amounts for each specific area of a field, which limits any excess application.

Another management practice that livestock farmers use to conserve our water is heavy use feeding areas for animals. These specific feeding locations are set up using special fabric with a rock or concrete covering. With the durability of these constructed feed pads, animals are less likely to degrade the ground surface during feeding months, which limits the amount of erosion that can pollute a stream. Manure is scraped from these sites and applied to the farmer's fields based on their nutrient management

plan, preventing the farmer from applying more nutrients to the ground than are needed or can be utilized.

The most common practice that many farm families use to protect and conserve water is probably also the simplest concept. Limiting access of livestock into streams and waterways has definitely been a huge benefit to the water systems across the US. In today's farming world, access for livestock to water has become much less of a problem than it was in the past. With new automatic water systems that can be connected to ponds, streams, or city or county water, there are many ways to water animals without allowing them access to open bodies of water. Farmers now choose, in many situations, to fence along the banks of these streams or ponds to prevent animals from entering them.

City and county governments assist farms in keeping our water sources clean. In Kentucky many local governments offer cost reimbursement for disposing of dead animals, which helps farmers get rid of them safely. This is very obvious when strolling along the banks of local waterways or taking a canoe trip down our favorite stream, as there is no longer a presence of these dead animals as there once was about 50 years ago.

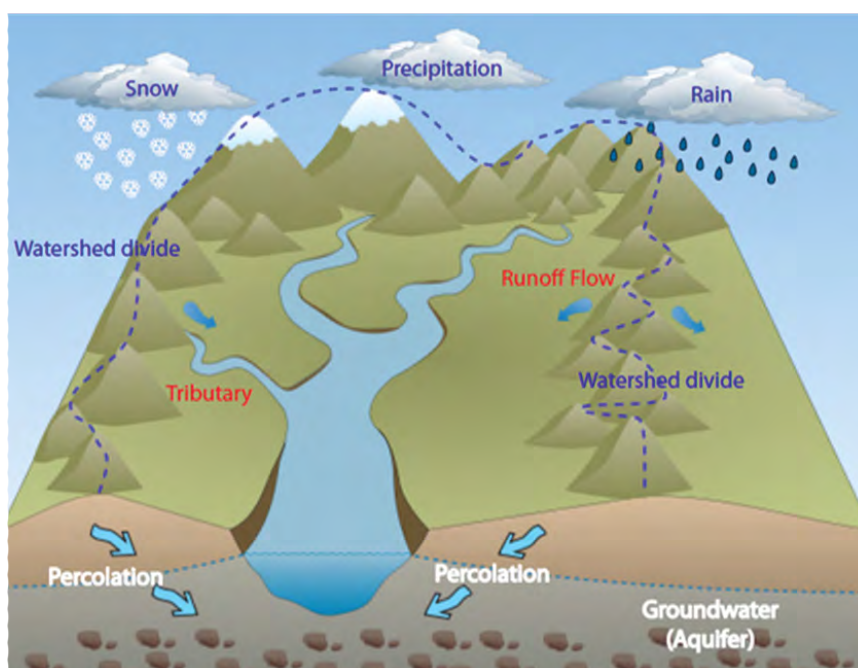
Farmers are the best and oldest conservationists in almost every case. Years of trial and error have taught them to protect not only water, but all of our natural resources. The better the environment thrives, the more productive animals and crops alike are for the average farmer.

EVERYONE LIVES IN A WATERSHED



WHAT IS A WATERSHED?

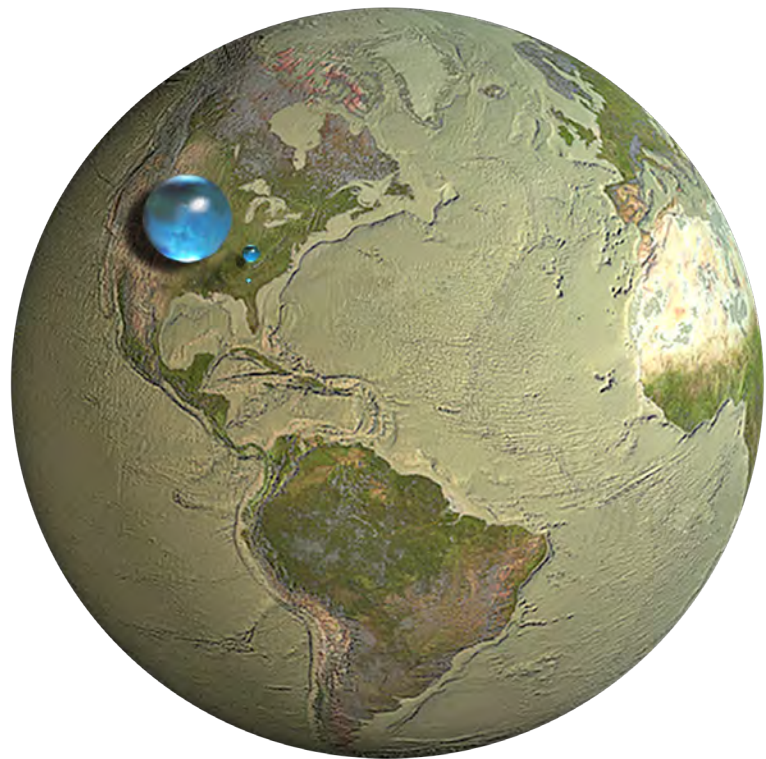
A watershed is an area of land from which all of the water drains to a common stream, river, or lake. Think of a giant funnel, directing all the water to the lowest point! The rainwater that runs across the ground (runoff) picks up pollutants as it goes. This means that anything you drop on the ground could eventually make its way to the nearest stream when it rains.








BLUE PLANET

The Earth gets its nickname “The Blue Planet” from the fact that over 70% of its surface is covered in water. All life on this planet, from humans to plants and animals, depend on water for life, but not all water is easy to get to and drinkable! Some water is deep underground, some is vapor floating in the air, and some is frozen solid! More than 96% of the world’s water is saltwater in the oceans, which humans can’t drink. So what’s left over for us to use? Let’s take a look at how much water is on this Blue Planet!



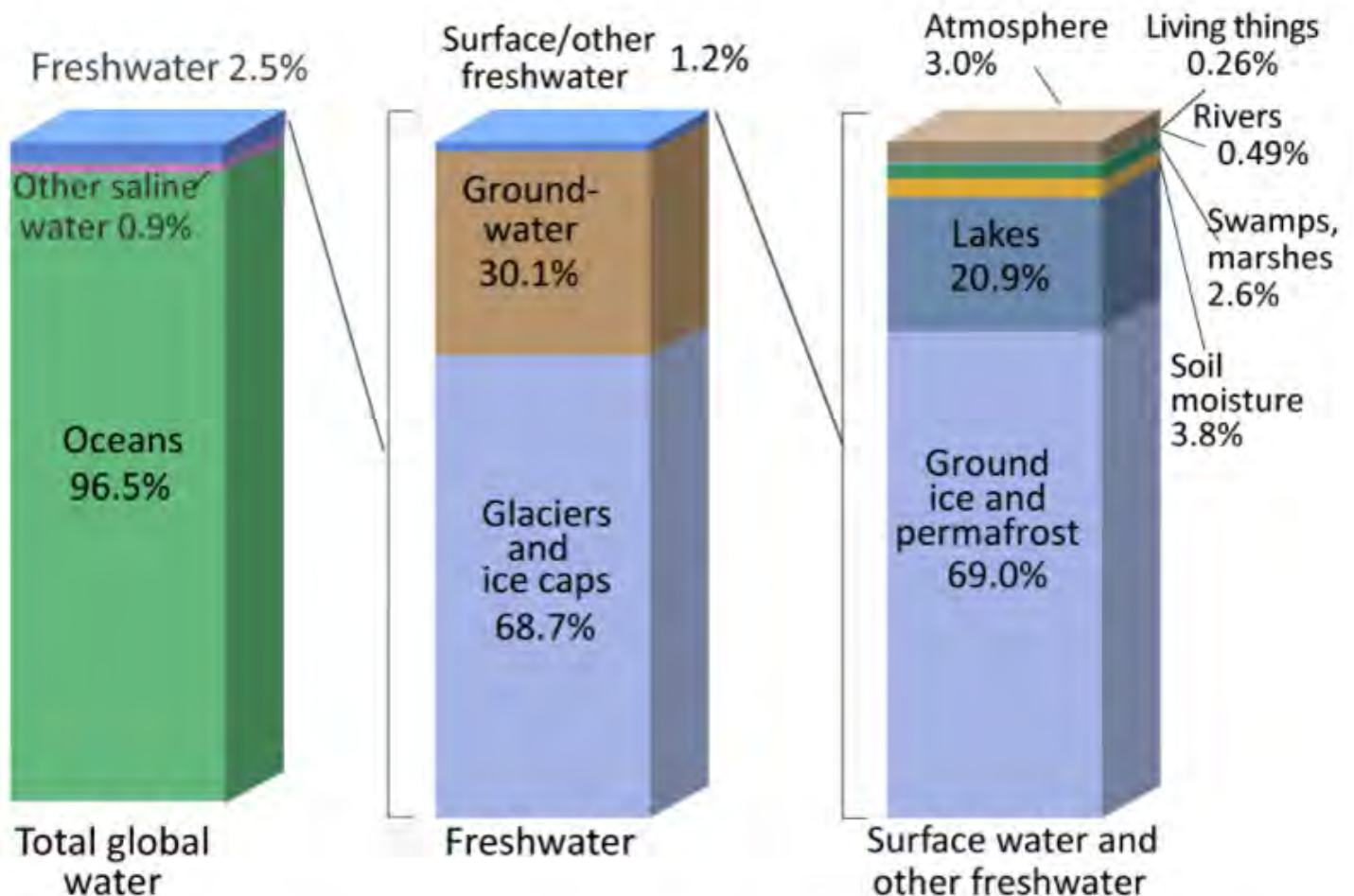
-  All water on, in and above the Earth
-  Liquid fresh water
-  Fresh water lakes and rivers

Howard Periman, USGS,
Jack Cook, Woods Hole Oceanographic Institution,
Adam Nieman
Data source: Igor Shiklomanov
<http://ga.water.usgs.gov/edu/earthhowmuch.html>

WHERE'S THE WATER?

Only 2.5% of the planet's water is drinkable

And of that water, less than 1% is readily accessible for humans to use!



Source: Igor Shiklomanov's chapter "World fresh water resources" in Peter H. Gleick (editor), 1993, *Water in Crisis: A Guide to the World's Fresh Water Resources*. (Numbers are rounded).

COOL CRITTERS NEED CLEAN WATER

MUSSELS

Freshwater mussels are soft-bodied animals enclosed in a shell. These animals live buried in gravel, sand, or mud at the bottom of lakes, ponds, streams, and rivers. Mussels feed by filtering out bacteria, plankton, etc.

There are **103 SPECIES** of mussels native to Kentucky.

We know of **20 SPECIES** that have gone extinct.

36 SPECIES are considered rare or endangered.

Mussels have a very unique life cycle that relies on fish. Mussels attract fish with a lure and then launch their young into the fish's gills where they grow and eventually detach. Each mussel species is adapted to use only a few fish species, and if the fish goes extinct, so does the mussel!

SALAMANDERS

Salamanders are amphibians. Kentucky has 35 species of salamander, 25 of which live part or all of their lives in water. Kentucky is home to one of the largest species of salamander in the world: The Hellbender. This salamander can grow up to 2 feet long!



SOURCE: Kentucky Fish and Wildlife



Long Tail Salamander
SOURCE: Photo by Jake Hutton



Hellbender Salamander
SOURCE: Kentucky Fish and Wildlife

GULF OF MEXICO HYPOXIC ZONE

The Gulf of Mexico Hypoxic Zone is an area in the Northern Gulf of Mexico along the Louisiana continental shelf that experiences a “dead zone” where the oxygen levels in the ocean between 10 – 30 meters deep are below 1 mg/L. The Gulf of Mexico Hypoxic Zone was first observed in 1985 and occurs throughout the months of February – November each year.

WHAT CAUSES IT?

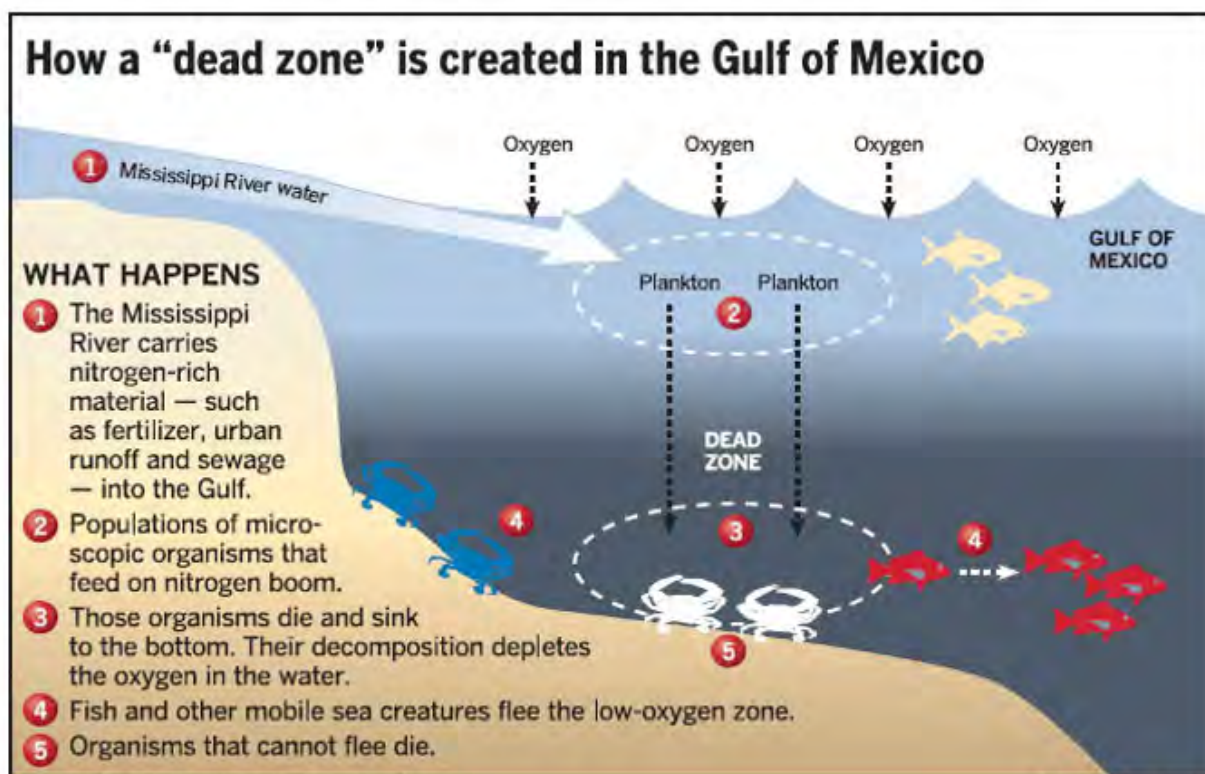
The hypoxic zone is caused by high levels of nitrogen and phosphorus entering the Gulf of Mexico from the Mississippi River as a result of human activities in cities and agricultural land in the Mississippi River watershed. The high levels of nutrients increase productivity at the surface, which results in dead organic matter falling to the ocean floor and being decomposed by microorganisms that use oxygen.

HOW BIG IS IT?

The gulf hypoxic zone is the second largest human-caused hypoxic zone found in coastal waters in the world. The size of the hypoxic zone depends on the amount of nitrogen coming from the Mississippi River. In years where there is little rain the zone is smaller than years with more rain. The average size of the hypoxic zone is 5400 square miles, but in 2017 the largest recorded hypoxic zone ever was recorded at 8776 square miles (that’s larger than the state of Massachusetts!).

IS THE “DEAD ZONE” REALLY DEAD?

Fishes and many other species of aquatic wildlife can not survive in the Gulf Hypoxic zone as the oxygen levels are too low. This results in either the wildlife dying or being forced to move into another habitat with higher oxygen levels. Although the Gulf Hypoxic zone is referred to as a “dead zone” because most wildlife can not survive in it, it is not completely dead. There are microbial communities that thrive in areas with low oxygen and can survive in this zone.



Source: U.S. Environmental Protection Agency

Advocate graphic

RUNOFF POLLUTION

Rainwater and snowmelt run off hard surfaces such as roads, sidewalks and roofs, instead of soaking into the ground, which can cause many problems. Too much stormwater can cause flooding and erosion. It can also carry pollutants like trash, oil, sediment, bacteria, and nutrients into our rivers and streams.

WHERE ARE SOME PLACES POLLUTANTS COME FROM?



Homeowners often overuse fertilizers, herbicides, and pesticides, and improperly dispose of yard waste, oil, and chemicals.



Animal waste (poop!) from livestock and pets can introduce bacteria and nutrients to streams.



Trash is not just ugly, it can impact health of plants and animals in the water.



Runoff from improperly managed crops introduces fertilizers, herbicides, pesticides, and dirt to streams.



Poorly maintained or failing septic systems add to bacteria problems and also introduce nutrients.



Logging and construction expose dirt, and if not properly managed, this dirt runs off into nearby streams, burying habitat and introducing nutrients.

WAYS TO PREVENT NUTRIENTS FROM GETTING INTO STREAMS

1. FOLLOW DIRECTIONS WHEN USING FERTILIZERS AND DON'T USE MORE THAN YOU NEED

2. CAPTURE AND FILTER RUNOFF IN RAIN GARDENS

3. MAKE A RAIN BARREL

4. PLANT RIPARIAN BUFFERS

5. PICK UP AFTER YOUR PETS

6. PLANT TREES AND NATIVE PLANTS IN THE WATERSHED

7. KEEP YARD WASTE OUT OF STREAMS

8. PREVENT SOIL EROSION

9. MAINTAIN SEPTIC SYSTEMS

10. KEEP LIVESTOCK OUT OF STREAMS





MORE WAYS TO HELP: LET'S CLEAN OUR STREAMS!

TRASH IS POLLUTION WE CAN SEE

Despite environmental regulations that protect the quality of streams, lakes, and wetlands, trash often ends up in these waters. Trash can enter the water through stormwater runoff or by illegal dumping. Plastics can be especially hazardous to wildlife if eaten. Plastics also can cause strangulation.

REDUCE, REUSE, RECYCLE AND REBUY

- Bring reusable bags and containers for shopping, traveling, or packing lunches. Choose products that are returnable, reusable, or refillable.
- Start your own compost bin for food scraps and yard waste.
- Shop at second-hand stores.
- Buy items made of recycled content.
- Buy in bulk rather than individual packages.
- Recycle items like glass, aluminum, steel, paper, plastic, and electronics.

HOW LONG DOES IT TAKE FOR TRASH TO DECOMPOSE?



APPLE CORE

2 months



NEWSPAPER

6 weeks



WOOL SOCK

1-5 years



FOAMED PLASTIC CUP

50 years



PLASTIC BAG

10-20 years



PLASTIC BOTTLE

450 years



RUBBER BOOT SOLE

50-80 years



CIGARETTE BUTT

1-5 years



FISHING LINE

600 years



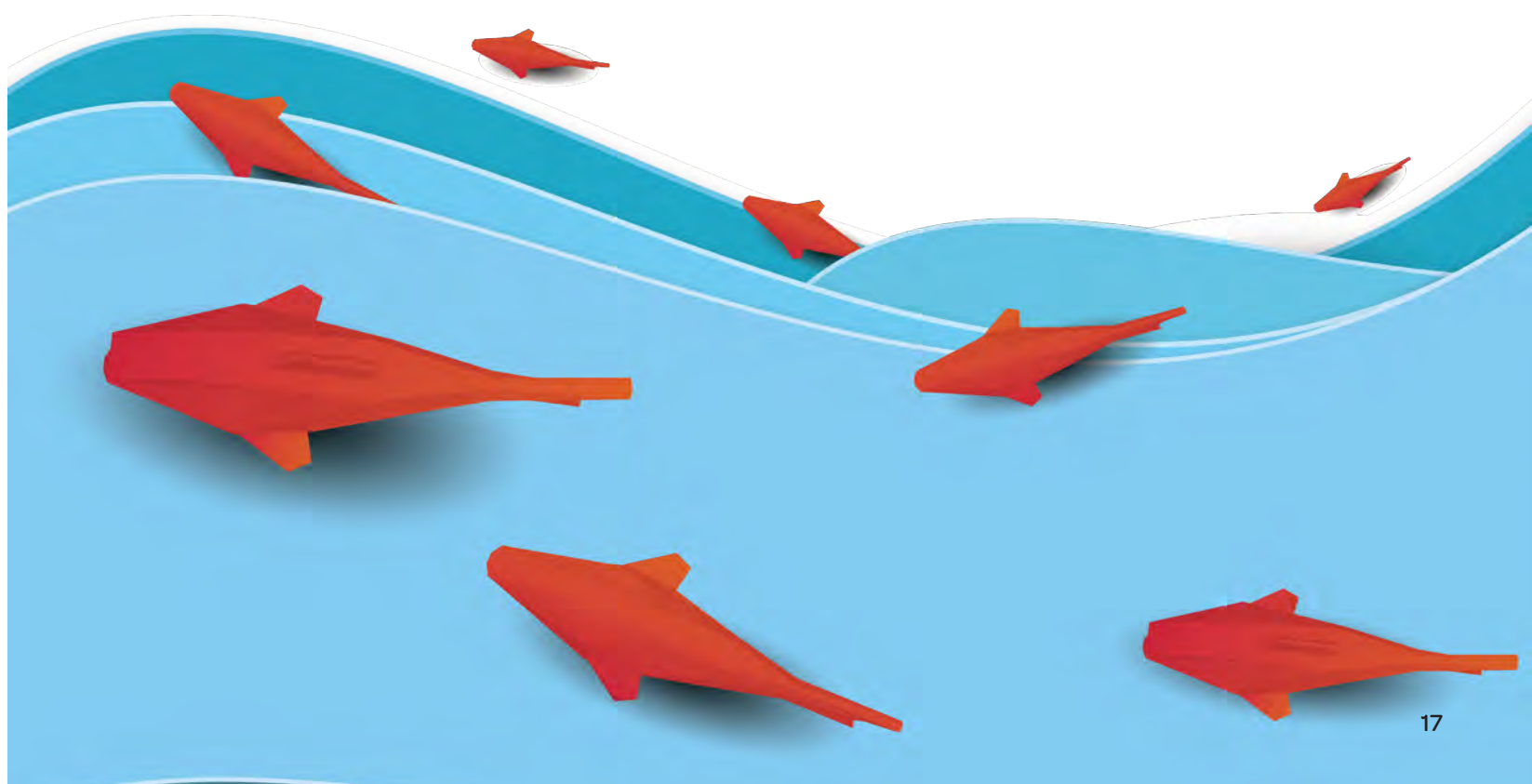
PAPER TOWEL

2-4 weeks



WAXED MILK CARTON

3 months



HOW NUTRIENTS AFFECT OUR WATER

Nutrients, such as nitrogen and phosphorus, are found naturally in the environment and are essential for all plant growth. When excess (too much!) nutrients get into our water, they become pollutants.

We learned in "Runoff Pollution" (page 14) that nutrients can come from a lot of sources: pet and livestock waste, overuse of fertilizer, human wastewater, and erosion. When it rains, the nutrients from these sources are washed into our streams.

When too much nitrogen and phosphorus are available in a stream, an algal bloom may occur, in which algae multiply quickly and may continue to grow until the nutrients are used up. During these blooms, the levels of oxygen in the water (dissolved oxygen) during daylight hours can be very high from the abundance of algae producing oxygen during photosynthesis. However, oxygen production stops at night and the oxygen levels in the stream may drop to lethal levels due to algae, bacteria, and animals using it up. In severe cases, algal blooms can kill fish and other aquatic organisms. This process is called **EUTROPHICATION**.

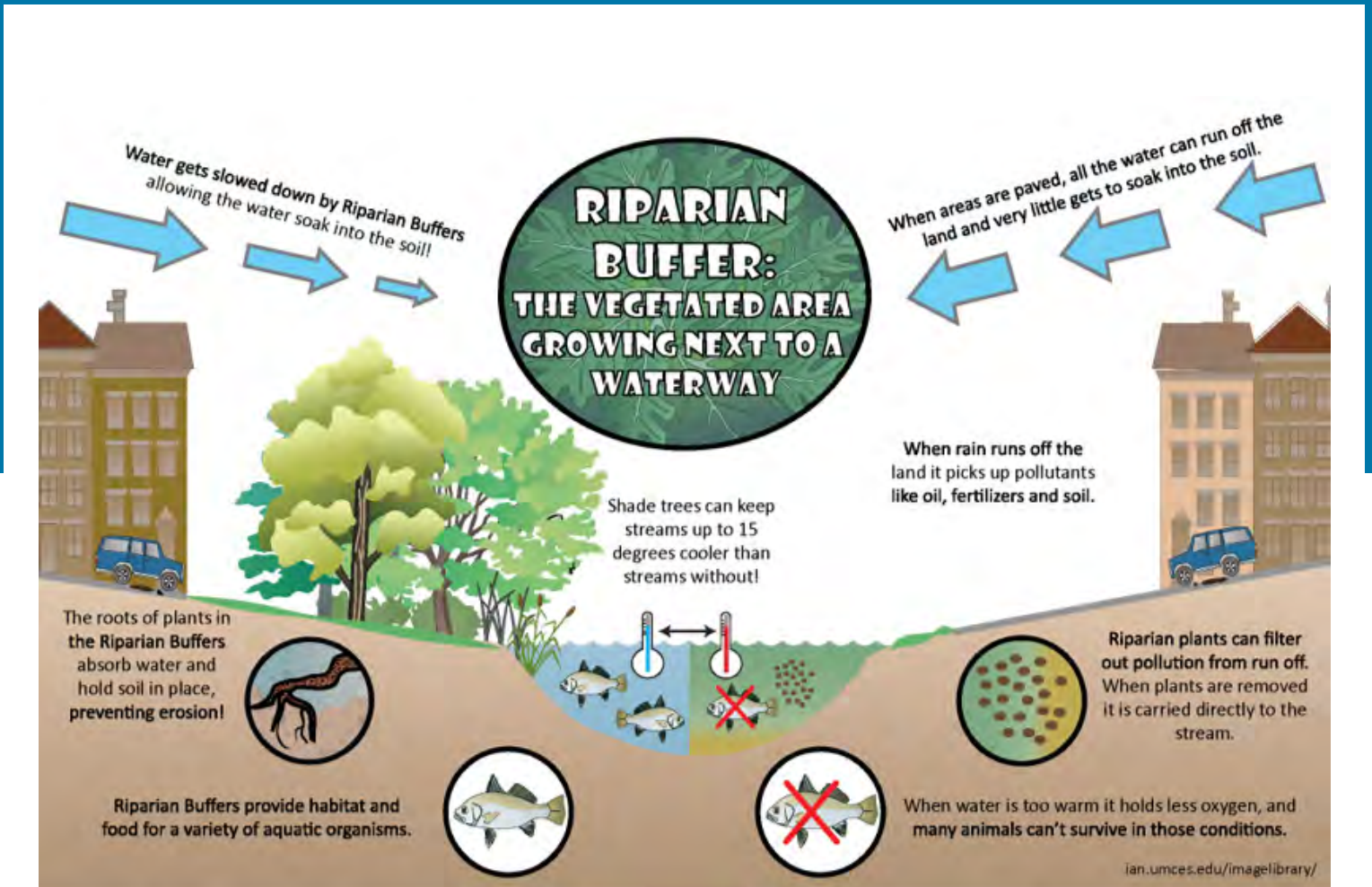


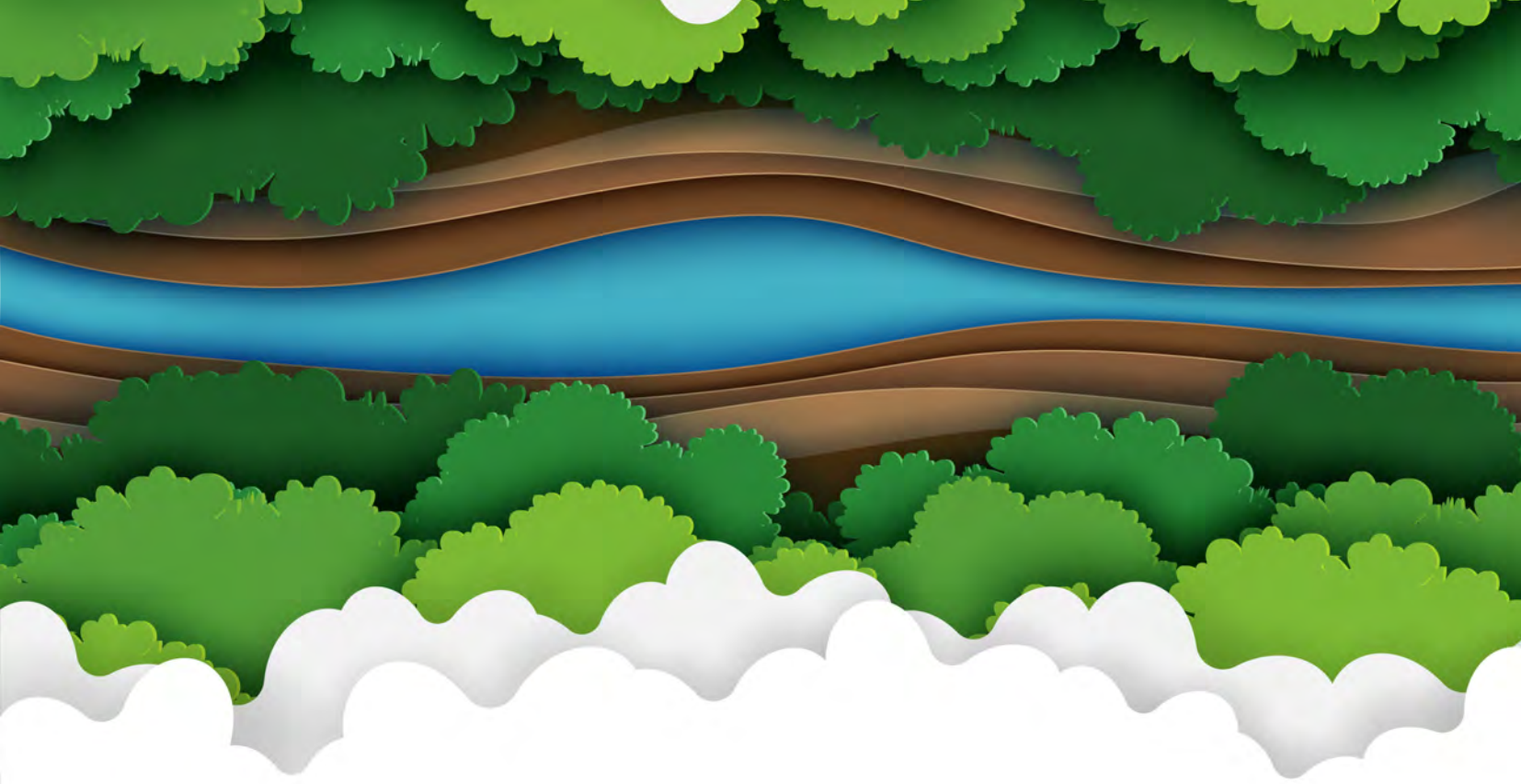
LEFT SOURCE: <https://www.michiganseagrant.org/lessons/lessons/by-broad-concept/physical-science/dead-zones/>
RIGHT SOURCE: USGS: Michael Hooper

SLOW IT DOWN : SOAK IT UP!

Slowing down runoff and allowing it to soak into the soil helps reduce erosion and prevent pollutants from entering our water!

Trees and other native plants act as a sponge, soaking up water and slowing it down, while filtering out nutrients, sediment, and other harmful pollutants that can damage the health of your stream!



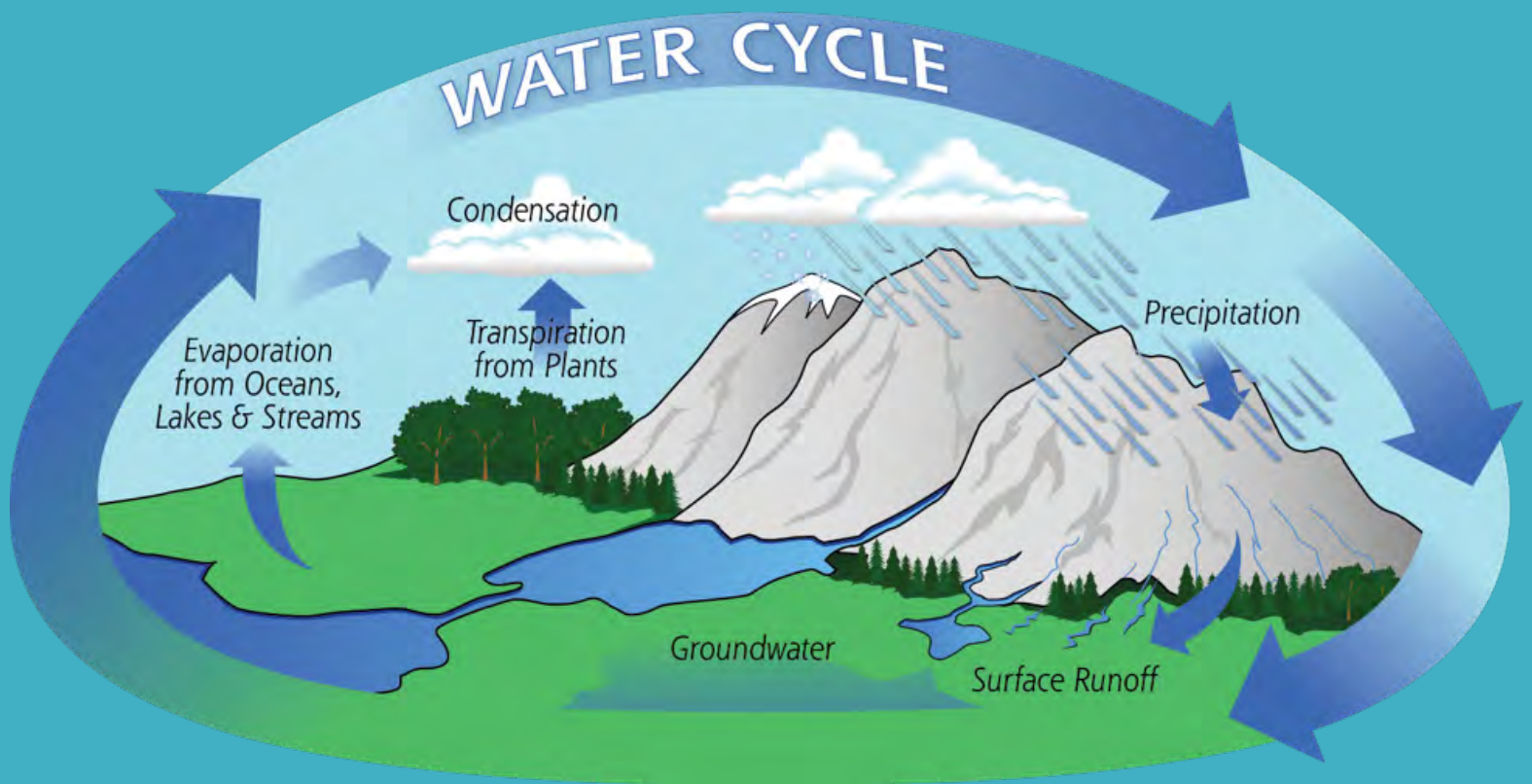


THE FOREST-WATER CONNECTION

Healthy, managed forests provide natural filtration of precipitation and storm runoff, resulting in cleaner water reaching drinking water treatment plants. Having healthy forests in key areas within a watershed can reduce sediment and contaminants reaching drinking water supplies, lowering treatment costs. Maintaining forest cover in key areas of a drinking water source watershed ensures safe, reliable drinking water for current and future generations. Healthy watersheds have many benefits including safe and reliable drinking water, forest resiliency, recreation, fish & wildlife, and strong economies and forest markets.

HOW DO FORESTS HELP WATER?

- 1.** Forests keep water cool by acting as an umbrella. Forests keep stream temperatures cool by blocking sunlight from striking the water's surface. This provides habitat for aquatic species that need cool water to survive. Forest canopies also protect the soil surface from erosion during severe storms, which keeps sediment out of streams.
- 2.** Forests keep water clean by acting as a filter. Forests have naturally stable soils and contribute relatively tiny level of nutrients. Riparian buffers, or trees planted next to a disturbed area of land, can filter contaminants out of the groundwater before they reach a stream. When a watershed contains more forest cover, costs to treat drinking water tend to be lower. While urban stream water often has higher turbidity (more cloudy water), it is also likely contains more of what we can't see -- pollutants such as pesticides, metals, and nutrients.
- 3.** Forests control the delivery of water by acting as a sponge. Trees cause water from precipitation to gradually enter the ground, delivering a steady supply of water downstream and preventing extreme floods. This water is also used by a number of hydropower dams, an important source of renewable electricity.



SOURCE: <https://gpm.nasa.gov/education/water-cycle>

THE WATER CYCLE

DID YOU KNOW THAT THE WATER YOU DRINK TODAY IS THE SAME WATER THAT THE DINOSAURS WERE DRINKING?

Like, exactly the same! All the water that exists in the world is all there has ever been, or is ever going to be!

Water is recycled, over and over, in a system we call the Water Cycle. In the natural water cycle, water evaporates from oceans, lakes, and streams and rises into the atmosphere to form clouds. Another way water can enter the atmosphere is called transpiration, from the breathing of plants. Clouds move across the sky, and eventually the water precipitates, falling out of the air as rain or snow. The water hits the ground and gravity pulls it over the surface of the land (runoff) to the lowest point in the watershed, into a stream, lake, or deep underground.

WE ALL LIVE DOWNSTREAM

In a watershed, we all live downstream. This means that the quality of water available to us is determined by our upstream neighbors. That is why it is important that we serve as environmental stewards of our watersheds, protecting the quality of that water for those who live downstream.

Watersheds Connect! Watersheds can be small, like all the land draining to your local pond, or huge, like all the land area draining into the Mississippi River.

Kentucky is part of the Ohio River Watershed (sometimes called a Basin), which flows into the Mississippi River, which in turn flows all the way down to the Gulf of Mexico.



WHAT ARE ALGAE?

Algae are simple, aquatic, plant-like organisms that do not have true roots, stems, and leaves. Many are single-celled so can only be seen using a microscope, while others grow in filaments or mats that are quite conspicuous. Algae have chlorophyll and can make their own food through the process of photosynthesis.

PLANKTONIC ALGAE:

Millions of floating plants that color pond water green to blue and even brown or red. Many species are involved in algae blooms and these species change over time based on temperature, light, nutrients, and other factors.



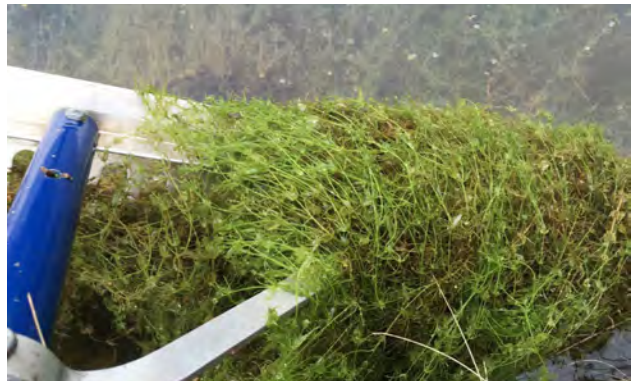
FILAMENTOUS ALGAE:

Single algae cells that form filaments that intertwine creating a mat that resembles wet wool. Filamentous algae starts growing along the bottom in shallow water or attached to structures in the water (like rocks or other aquatic plants). Often filamentous algae float to the surface forming large mats, which are commonly referred to as Pond scum or moss.



BRANCHED ALGAE:

Branched multicellular algae that are often confused with submerged flowering plants. However, branched algae have no flower, do not extend above the water surface, and often have a grainy or crunchy texture.



WHO IS AFFECTED BY WATER POLLUTION?

ANIMALS

All animals need water to live and most critters that live in the streams can't survive in dirty water. Fish and macroinvertebrate populations drop and become less diverse when water is polluted.

PLANTS

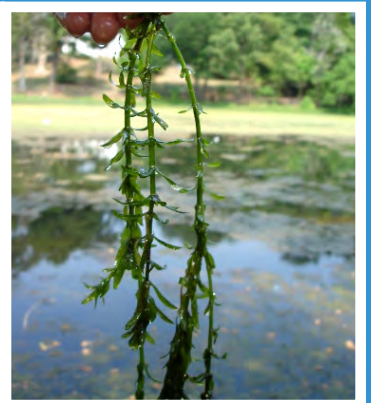
Underwater aquatic plants need clear water to collect sunlight for photosynthesis. Toxins in the water like herbicides can hurt plant growth

ALGAE

To much nutrient pollution in the streams can lead to rapid algae growth that is bad for stream health.

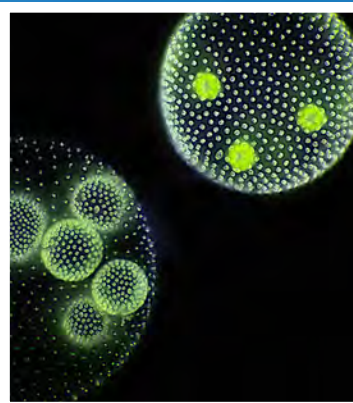
HUMANS

We need clean water for drinking, bathing, swimming, fishing and much more.



Freshwater mussels and many species of fish, like the Kentucky Arrow Darter depend on clean water
SOURCE: Kentucky Fish and Wildlife

Aquatic plants have roots shoots and flowers, just like terrestrial plants.
SOURCE: https://fw.ky.gov/Fish/Pages/FPM_Veg_Submerged.aspx



Aquatic algae can be microscopic or can form filamentous threadlike and branching structures visible with the naked eye
PHOTO CREDIT: R.G. Lovell, Alabama Department of Conservation & Natural Resources
SOURCE: https://fw.ky.gov/Fish/Pages/FPM_Veg_Filamentous_Algae.aspx

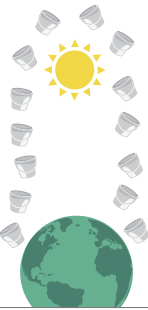
Clean water grows on these trees.

Okay, not technically, but forests do provide the cleanest water of any land use to keep drinking water safe and reliable.

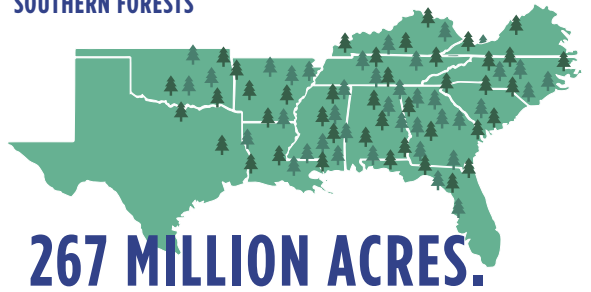
TOTAL SOUTHERN WATER SUPPLY

State & Private forests provide **44.3%** of the total water supply.

That's equal to **97.8 trillion gallons.**
HOW MUCH LIQUID IS THAT?
That's enough water to fill a stack of five gallon buckets that would extend all the way to the sun & back **24 TIMES.**



SOUTHERN FORESTS



POPULATION SERVED

ALL FORESTS **113 MILLION PEOPLE**



STATE AND PRIVATE FORESTS **57 MILLION PEOPLE**



FEDERAL FORESTS **56 MILLION PEOPLE**



THE CHALLENGE

Population is expected to increase more than **30%** over the next **40 years** compared to 2012 levels.



THE THREAT

UP TO 23 MILLION ACRES of our forests are forecasted to be converted to other uses by **2060.**



HEALTHY FORESTS ARE CRITICAL TO DRINKING WATER

Healthy, managed forests provide the cleanest water of any land use, and help keep drinking water safe, reliable, and affordable.



FOREST STEWARDSHIP AND BMPs

Foresters work with landowners to develop forest stewardship plans and implement Best Management Practices that protect soil and water resources.



“Our investments in healthy forests today lead to higher quality drinking water in our communities tomorrow.”

David LaFrance, CEO of American Water Works Association
Learn more by watching our video: <https://bit.ly/316jTK0>

DRINKING WATER DEPENDS ON HEALTHY FORESTS

Contact for more information
Wib Owen | wib@southernforests.org
Kitty Weisman | kitty.weisman@icloud.com



Liu, Ning; Dobbs, G. Rebecca; Caldwell, Peter V.; Miniat, Chely; Fort, Bolstad, Paul V.; Nelson, Stacy; Sun, Ge. 2020. Quantifying the role of State and private forest lands in providing surface drinking water supply for the Southern United States. Gen. Tech. Rep. SRS-248. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 405 p. Caldwell, P., Muldoon, C., Ford-Miniat, C., Cohen, E., Krieger, S., Sun, G., McNulty, S., and Bolstad, P.V. 2014. Quantifying the role of National Forest system lands in providing surface drinking water supply for the Southern United States. General Technical Report SRS-191. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 135 p.

STILL STRONG

Kentucky, Barkley lakes remain bass and crappie factories

By Lee McClellan | Reprint from Kentucky Afield

For years, Bassmaster magazine consistently rated Kentucky and Barkley lakes among the best in the region for bass fishing. Anglers drove across several states and the length of Kentucky to fish the noted crappie spawn in spring.

Then, around 2010, anglers began tracking large schools of an unknown fish on their electronics. Word spread about encounters with strange-looking creatures pulled from the water.

These were the leading edge of an influx of Asian carp, which had moved upstream from the Ohio River to begin their invasion of Kentucky Lake and Lake Barkley.

Kentucky's first commercial fishing tournament, held in 2013 and specifically targeting Asian carp, opened eyes as boats returned from the lakes riding almost to the gunnels from the weight of the fish caught. Anglers netted nearly 83,000 pounds of fish during the two-day Carp Madness Tournament.

A video shot by "Kentucky Afield" television in 2019 gained

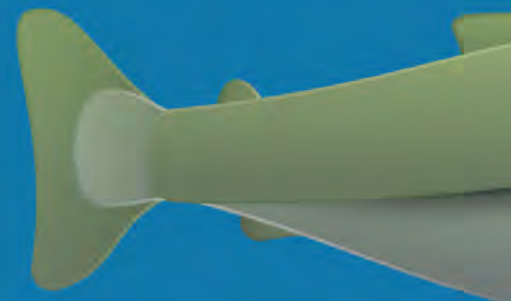
worldwide attention. It showed thousands of silver carp jumping out of the water at the base of Barkley Dam. The video went viral. CNN and major media outlets in Europe and Asia helped the video generate millions of views.

Many anglers believed the exploding number of Asian carp would destroy the world-class black bass and crappie populations in the lakes.

All is not lost, however. Rays of light are breaking through the dark clouds of the Asian carp invasion. New practices and positive developments give hope to those who love fishing or make a living from these two lakes.

"Commercial anglers removed more than 6 million pounds of Asian carp in 2019, with more set for this year," said Paul Wilkes, former acting director of Fisheries for the Kentucky Department of Fish and Wildlife Resources. "We are not eradicating them, but we are putting a dent in their numbers."

Efforts to control Asian carp include the completion of the Bio



Acoustic Fish Fence just below the lock at Barkley Dam. This system uses light, sound and bubbles to haze Asian carp away from the lock chamber and entry into the lake.

The utilization of the Modified/Unified method of netting Asian carp employed in early 2020 showed promising results. This system, developed in China to capture great numbers of Asian carp, uses a maze of blocking nets to herd carp into a restricted space. This makes it easier to remove more Asian carp in less time.

While these efforts are still in their infancy, the results are promising.

"The Asian carp are a negative for sure, but there are still plenty of sportfish in these lakes," said Ryan Oster, a biologist for the United States Fish and Wildlife Service who lives in Murray. "You have to be willing to fish a little differently than you used to fish. Asian carp are an excuse for a bad day. It used to be the weather, now it is Asian carp."

DON'T FISH THE HISTORY

Professional bass anglers fish a lake with no preconceived notions of bass location, lure preference or time of day when the fish bite best. They catch fish where they are, not where the anglers want them to be.

Some of the numbers show the bass fishery in the lakes remains strong despite the presence of Asian carp.

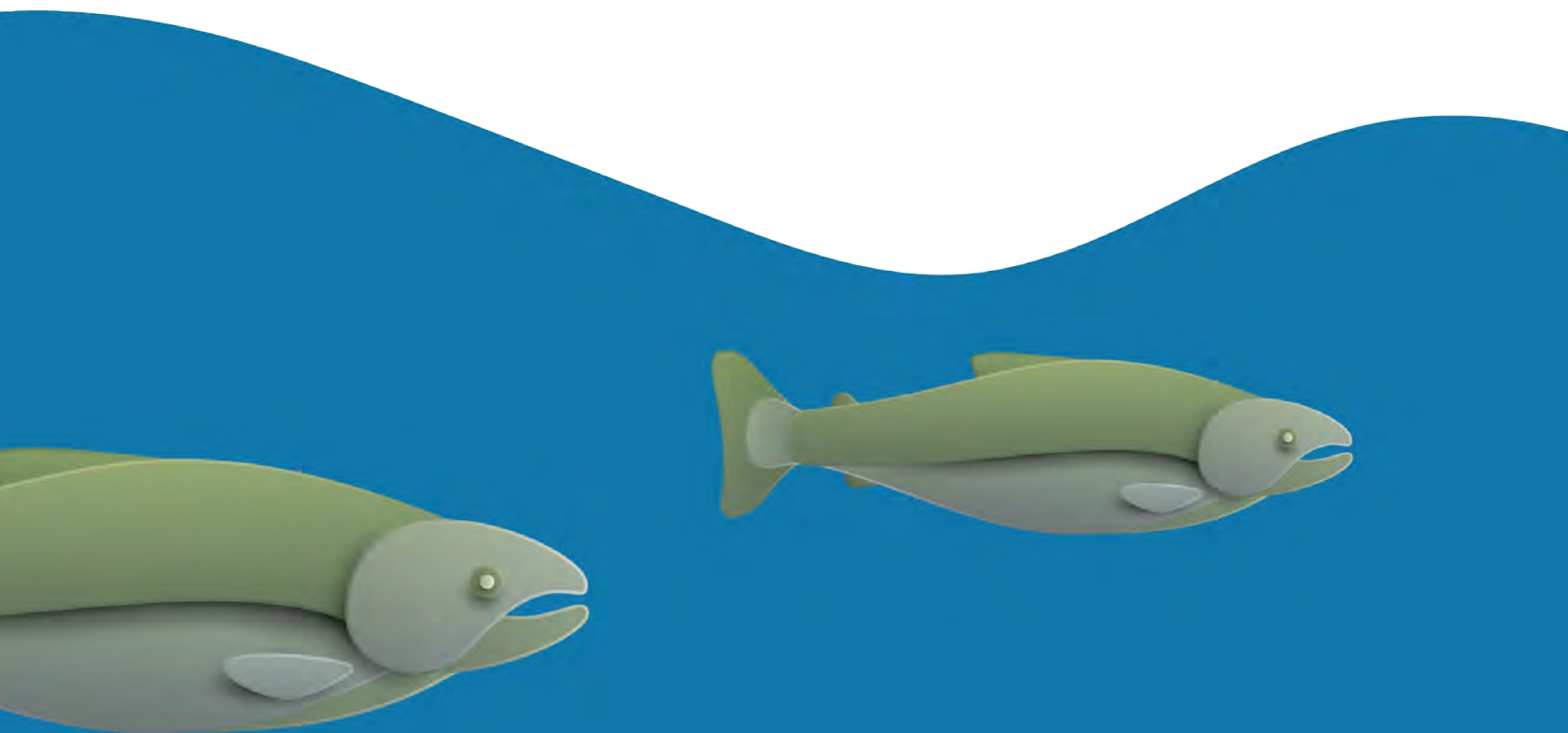
For example, at a Fishing League Worldwide (FLW) tournament on Kentucky Lake in May 2018, the winning weight was 101 pounds, 9 ounces. It was the heaviest FLW winning weight at Kentucky Lake ever - and the 10th heaviest in FLW history.

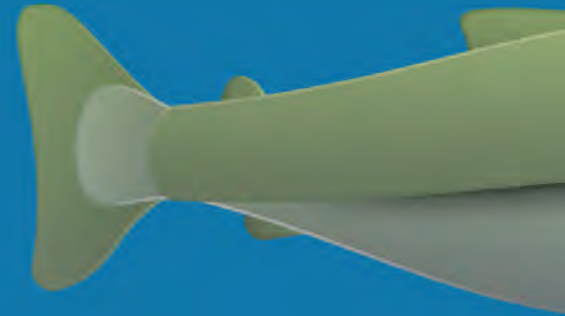
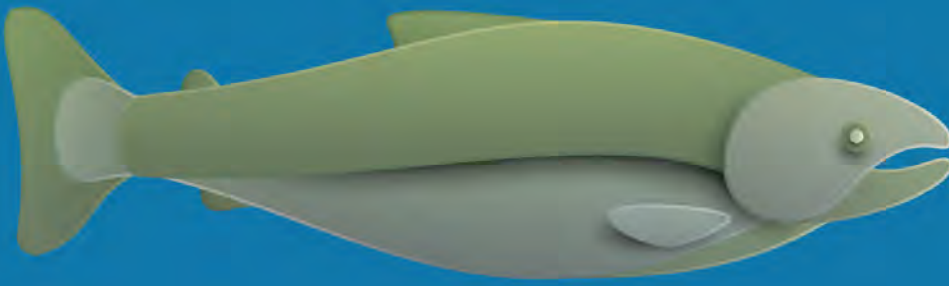
"The pros fish the moment," Oster said. "They don't fish history. It is nearly an 80-year old lake. Just because you caught them in a specific spot a few years ago doesn't mean they are there now."

Oster is living this statement; he is slaying crappie this summer by not fishing history. "I am catching many 13- to 14-inch crappie, both white crappie and black crappie, but mainly whites," he said. "We also have a good group of 7- to 8½-inch crappie in these lakes that I am excited about. We should have good fishing in the future."

Patience and preparation put Oster, who once worked the lakes as a Kentucky Fish and Wildlife biologist, onto the fish. "The fish I am catching are very healthy," he said. "There is an explosion of bait everywhere in the lakes. I think, why are they biting my lures when there is so much bait in the lake?"

Oster is on the lake at first light in summer and into early fall.





He begins his search on shallow main lake flats at dawn, and doesn't begin to fish until he sees balls of bait on his boat's electronics. "As the sun comes up, I drop down deeper," he said. "I follow the bait as the bait goes deep. I look for ledges or deep flats as the sun gets higher in the sky."

Oster recalled a glory day in June, where he caught his 20-fish limit within the first three hours of the day. "They were all good crappie," he said.

In summer and early fall, Oster prefers trolling small crankbaits designed for crappie. "When you troll crankbaits, you select for larger fish," he said. "This time of year the bait is moving. You can cover a lot of water and get your bait in front of as many fish as possible by trolling."

SPAWNING HABITAT IMPROVEMENTS

Adam Martin and his crew in the Western Fisheries District are working to bolster sportfish populations and help mitigate the damage created by Asian carp. "Beginning in 2019, the Western Fisheries District began placing artificial spawning beds in shallow water in Kentucky Lake and Lake Barkley," Martin explained. "Beds are placed 30 feet apart to prevent hostile behavior between nesting male bass."

The Kentucky Fish and Wildlife crews use an all-concrete design to improve longevity. "Once the concrete is cured, we

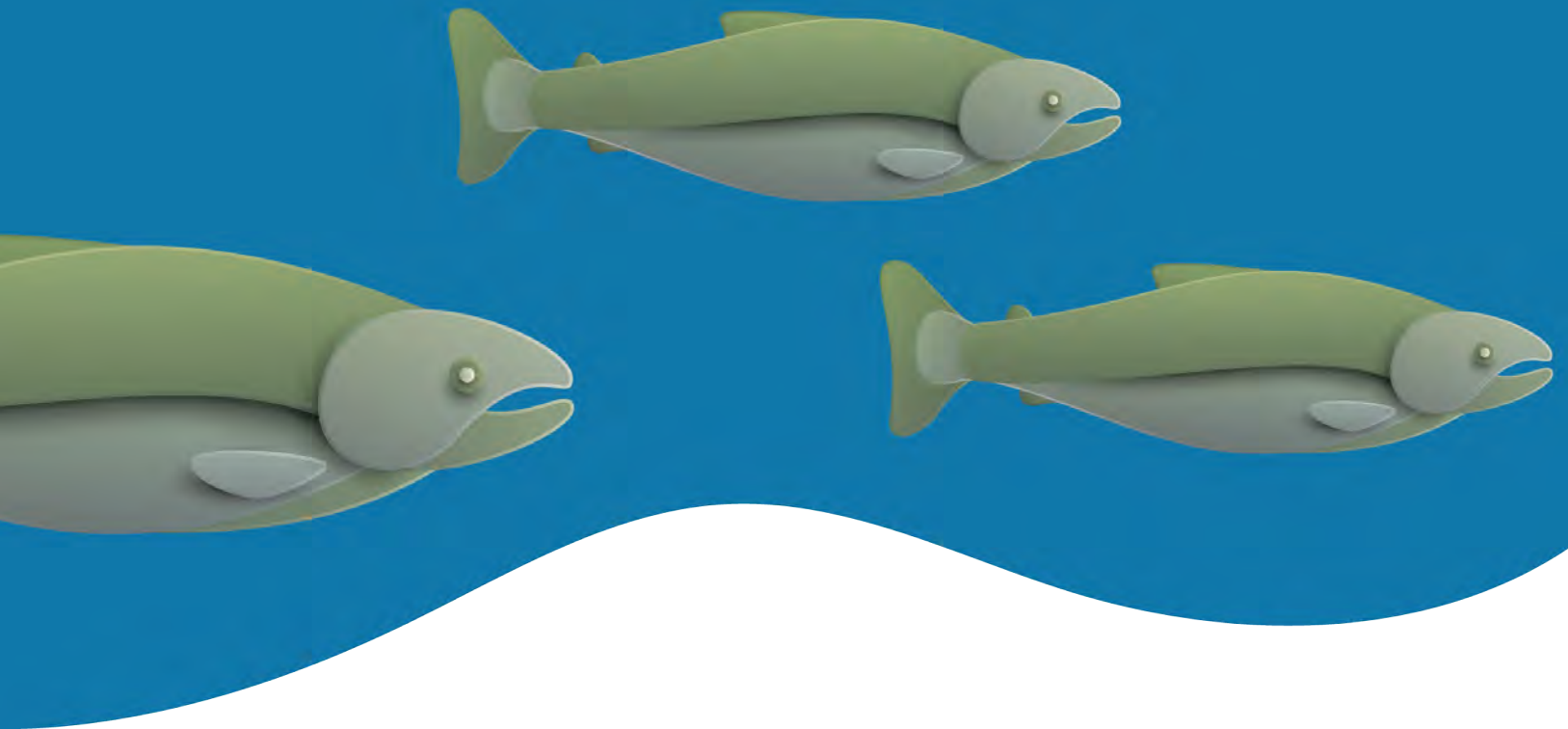
remove the plastic mold and roll the artificial spawning bed into the water," Martin said. The final step is filling the bottom of the artificial beds with a few inches of loose gravel, as black bass prefer to spawn on a gravel substrate.

Crews place the artificial beds deep enough to offset the spring water level fluctuations that could cause fish to abandon their nests. Crews supplement the spawning beds with additional habitat created by laying cut hardwood trees in shallow water. Trees are placed perpendicular to the shore, then anchored into place with concrete blocks.

Research shows that black bass prefer to spawn near cover. "We typically place these trees in the backs of bays and small pockets in areas with mostly gravel substrate," Martin said. He explained that even if the trees are not used for spawning activities, they provide important shallow cover for young bass.

"Habitat improvement has the most potential to improve sport fisheries over the long haul," said Wilkes. "It gives us the most bang for our buck. Stocking largemouth bass is expensive and rarely successful in large lakes."

Martin and staff conducted weekly snorkel surveys on 68 artificial beds during the spawn. They confirmed that fish are using them. "In 2020, 60 percent of our test sites contained bass fry or eggs at least once, and several nests were used more than once," he said. "We kept monitoring each site



throughout the spawn of our sunfish species like redear sunfish, bluegill and longear sunfish.”

Sunfish used more than 96 percent of the artificial beds at least once. Martin thought since the beds were 30 feet apart, they would not see as much use by sunfish, as they are colony spawners. “However, these artificial beds seem to be encouraging them to create small clusters of nests, as we routinely observed sunfish making natural nests just outside of our artificial beds,” he said.

Crews have placed 500 artificial beds in the lakes so far. A \$30,000 federal grant from the Reservoir Fisheries Habitat Partnership helped fund this project. This grant and work is in collaboration with the U.S. Forest Service, Tennessee Wildlife Resources Agency, Kentucky B.A.S.S. Nation, Kentucky B.A.S.S. High School Trail West, the Murray State University and McCracken County High School bass teams, Wired2Fish and Akridge Farm Supply.

“Local residents truly love these lakes,” Martin said. “We intend to use all of the volunteer help we can get to place more of this habitat in the water.”

BASS BOOMING

Martin said anglers around Kentucky Lake noticed an unusually high number of 14- to 15-inch bass this year, resulting

from a fantastic spawn in 2016. “This was the most successful largemouth spawn ever recorded in Kentucky Lake,” he said.

Martin’s research indicates water temperature has a greater impact on successful bass spawning than the presence of Asian carp. “Some of our latest research points to a direct relationship between the success of the bass spawn and the number of days when water temperatures are between 57 and 64 degrees in the spring time,” he said.

The spring of 2016 had 34 days inside that temperature window. “The incredible bass spawn of 2007 had 36 days, which led to those memorable offshore schools of 2 pounders back in 2012,” Martin said.

This trend dates to 2005, when Murray State University researchers began collecting daily water temperature data.

“It is certainly more complicated than just water temperature, but if you’re looking for the earliest indicator of how good the bass spawn was this year, there were 37 days in that temperature window in 2020,” Martin said.

Yes, the presence of Asian carp is unwelcome among anglers. However, for those willing to change a bit and rethink how they fish for bass and crappie, the two huge twin lakes of western Kentucky still hold bountiful populations of bass, crappie and sunfish, with a brighter future on the horizon.



HEALING WATERS

Kentucky's Stream Team as a force for nature

By Ciara Knisely

Reprint from Kentucky Afield

The Red River Gorge brings in visitors both local and nationwide, to explore and see its 45 square miles of sandstone cliffs, sparkling blue fishing holes and rare, native plant species.

More than a half century ago, this nook within the Daniel Boone National Forest was the scene of a major environmental battle as local proponents advocated damming the Red River to prevent the kind of devastating floods which struck Clay City in 1962.

The need for balance arose as the conundrum divided the community, state and country between wanting to protect its natural beauty and wanting to boost economic wellness by controlling the river. In hindsight, the river's destructive habits were largely the results of logging, unsustainable farming and erosion.

President Bill Clinton finally ended the debate when he declared the gorge federally protected under the National Wild and Scenic River Act in 1993. There would be no dam.

There is, however, another path to resolving water issues.

The Kentucky Department of Fish and Wildlife Resources offers a solution other than restricting stream flows. The effort seeks to recover what has been lost over generations through highly scientific means. Its focus: water.

The department, in collaboration with the U.S. Army Corps of Engineers and the United States Fish and Wildlife Service, launched the Kentucky Fish and Wildlife Stream and Wetland Mitigation Program in 2000. The program puts a specialized team of environmental consultants to work by restoring a great natural resource. Namely, the wetlands and creeks that sustain the lifeblood of Kentucky's great outdoors.

Officially, the department group is the Fees In-Lieu program, or FILO. Around the office, they call themselves the Stream Team.

FINDING THE BALANCE

When thinking about the power of water, hurricanes, tsunamis and riptides are what typically come to mind... not sidewalk cracks or an eroded hill. That creek across the hay field may not have the current or depth to pull someone under or destroy roads, but the fact remains that water is both a source of life and a source of destruction.

Stream Team members, who number just under a dozen, traverse these disfigured wetlands, sampling the local aquatic wildlife, engineering blueprint construction plans and coordinating with other agencies.

The team's origin dates back two decades, when the Kentucky General Assembly established a fund to meet the wetland repair requirements of the Clean Water Act. Through this fund, Kentucky Fish and Wildlife receives credits that act like currency. Credits are based upon wetland areas impacted by human development, like the creation of a shopping mall or cattle pasture. This funds the effort to repair streams and wetlands at no cost to private landowners.

Wetlands can absorb extra water that otherwise could wind up flooding areas downstream. Recreating natural stream beds slows the rush of water downstream as well.

Kentucky writer Wendell Berry describes water's effect on the earth, in the Gorge specifically, as a great tree forcing room for its branches as the Red River steadily carves away into the outline of the land.

"It's easy to forget that nature remains at work during every rain, drought, freeze, thaw or change in temperature, and the results take generations to begin showing," said Rob Lewis, program coordinator for the Stream Team.

Nature can be destructive itself, but the predominant problems in Kentucky wetlands stem from human activity, such as logging or intensive farming. Clearing wetlands to build shopping centers and neighborhoods also means water runs off from parking lots and roads instead of soaking into the ground.

The need for balance is a constant factor. "Historically, some ecology has been erased due to us using land," said Lewis. "But buildings also need to serve people."

Stream Team members look for projects with the lowest risks and highest rewards. It can take several years to finalize

agreements and meet all regulatory requirements before construction begins.

RESTORING WETLANDS, RECREATING STREAMS

An important part of the Stream Team's job involves reimagining the original landscape.

Accuracy in restoring Kentucky's wetlands involves not just the individual creek or stream itself, but the intricate drainage systems that carry rainwater downhill. Kentucky's settlers often rerouted drainage systems away from their natural paths to make room for farmland, livestock pastures, roads and housing.

Rerouted drainages can cause damage like soil erosion and loss of sustainable aquatic habitat. Even logging miles away from a creek or stream will impact the environment, loosening sediment that may eventually wash into the water. When sediment builds up, water quality decreases as flows become restricted and the stream loses oxygen. The more sediment found in creeks or streams, the less room there is for spawning grounds, native aquatic plants and habitat for the important creatures that complete a Kentucky wetland ecosystem.

Most of the physical signs of wear and tear on Kentucky's wetlands are relatively simple to notice. Eroded banks that sit high above water level, mucky and slow-moving water, lack of aquatic life and straight, narrow creek beds are common symptoms of subpar waters that could benefit from restoration work.

The process begins with a landowner looking to restore a wetland area. Like a science project brought to life, the Stream Team then plans all stages of wetland reconstruction and rehabilitation. They survey each site and map drainage routes – including where they are now, and ideally, where they should be. The team assesses the quality of water and its oxygen content, notes the condition of stream banks and flood plains and plans any other steps needed to bring the stream back to prime health, including invasive plant removal.

Only economic and environmentally smart locations make the cut. The land itself must be physically able to support the restoration process and meet all of the qualifications outlined by the Stream Team. This ensures that the team's resources only

go toward decisions that benefit the wetland and everything it affects long-term.

Once project sites have the green light, the team breaks the process down into specialized stages.

Stream Team environmentalist Kristy Stroud can often be found – if one looks hard enough – among the ancient trees and whispering creeks of Kentucky’s outdoors, backpack slung off one shoulder and a turtle shell or shed antler in hand. Stroud, who surveys properties in the initial stages, familiarizes herself with the smallest details of the land while walking its hills and valleys.

The rest of the crew sometimes refers to her as the “momma bear” of the team. Stroud applies a motherly dedication and perseverance toward identifying the problems of the damaged waterways around her. “Mother Nature needs to recover, and that means removing obstacles in the way,” she says.

Stroud draws upon her education and years of experience to read the landscape and document an area’s challenges.

It’s a job that holds heavy connotations and demands tedious labor, but she doesn’t shy away from the work. “We want to figure out what should be here, and how to get it back,” she said. “We’re basically starting from scratch.”

Essentially, this means trying to predict the forces of nature – Kentucky nature, at that – and plan around obstacles with the intention of providing a long-lasting fix.

The Stream Team’s logistical side manages many factors for each project, like legal agreements, account balances, site locations, permits, design contracts, construction contracts, monitoring, repairs and maintenance.

With Kentucky divided into 11 service areas, the regulation system also ensures that restoration funding stays within the same service area. “It’s a system of protection for Kentucky’s wetlands,” Stroud said.

NEW LIFE FOR EAST FORK

While the Stream Team’s efforts span the state, some projects, such as the restoration of the East Fork of Indian Creek, are more visible than others. The East Fork, located within the Red River Gorge, is a popular destination for campers and anglers hoping to enjoy clear, blue pools and riffles alongside

impressive sandstone overhangs.

The gorge’s sandstone bluffs make cool shadows for the stocked rainbow and brown trout below, and stand out as reminders of centuries past. On another bank, young tulip trees flaunt new heights that hint at skyscraper potential. Seemingly plucked straight out of a classic prairie fairytale, the fledgling trees, native grasses and wildflowers that currently grow along the East Fork are reminiscent of what the first settlers to brave life within the Gorge may have seen growing outside their homes.

The East Fork of Indian Creek highlights the Steam Team’s critical efforts toward restoring natural resources and preserving them for generations to come.

The area’s early settlers shifted portions of the creek to make room for their own means of survival, including farming and logging. The modern creek suffered from heavy erosion. Two low-head dams and two concrete plank crossings blocked the passage of fish.

In 2015, the Stream Team got to work on the site. By project’s end, 4,500 feet of the historical East Fork had been restored.

Generations of history rest imbedded deep in Kentucky soil, and those who study the land can decipher some of its clues and revive what has been left behind. For the Stream Team, that means bringing wetlands back to their most natural state.

Visitors today can hike and fish along the banks of Indian Creek to experience the outcome up close, just a handful of miles north of Nada Tunnel by taking Forest Service Road 9B within the Daniel Boone National Forest.

There, one might follow the same creek that the first Kentucky explorers once did, but some details may have changed. Mesh rope holds some sections of the bank upright and wooden stakes add stability, preventing the current from moving sediment into vital habitat. Rocks placed strategically across the creek, ranging from boulders to pebbles, help create the riffles vital to many of Kentucky’s native fish and aquatic species.

Steam Team members monitor restoration areas for at least five years, recording results of sampling and noting any problems.

Results will take generations to reveal themselves, the same way it took generations to see the effects of things like logging and creek rerouting. However, the Stream Team’s September

2019 discovery of the stargazing minnow in Goose Creek in the upper Green River drainage, is a recent uplifting sign. The minnow, classified as a regional species of greatest conservation need by the Southeastern Association of Fish and Wildlife Agencies, had never been documented before in the creek,

HEALING WATERS

When early settlers began clearing land to provide for a steadily rising population, the miles upon miles of pristine forest, filled with enticing game to hunt, were endless. As time progressed, Kentucky's pioneers left behind traditions deeply rooted in nature, such as hunting, trapping, fishing and hiking.

Daily life in 2021 looks a bit different. Wild game is no longer a primary food source, but more of a treat, and instead of heading into the wilderness, the family shopper might head to the local grocery store or farmer's market for everyday meals. Housing, stores and businesses have been constructed to maintain a quality of life capable of supporting growing communities over the years, but this also means that somewhere, undeveloped land was altered from its natural state. A change in the environment is sometimes unavoidable for survival.

The scales may never be perfectly balanced, but bringing Kentucky's nature closer and closer to optimal health - benefitting not just fish but other wildlife along the way - is a tedious job. The Stream Team stays focused on producing high-quality results that Kentuckians can enjoy themselves. Many of these finished sites have become part of wildlife management areas throughout the state, graciously donated - and recently restored - land now open to public enjoyment.

Providing clean, healthy water sources for Kentucky's game, fish and general environment, and subsequently for Kentucky hunters, anglers and fans of the outdoors, is a service, but one that requires integrity and must be done right, says Stroud.

Her motherly instincts toward Kentucky's land are ingenious, genuine and intuitive. "The stream never says the same thing," Stroud said. "It speaks when you listen. You have to ask, is it healing?"

THE HUNT FOR NEW AND MISSING SPECIES

Researchers still discovering hidden pearls

By Ciara Knisely | Reprint from Kentucky Afield

Deep in the woodlands, within the Kentucky River tributaries of the upper Bluegrass, grows a type of clover found only in Kentucky. Luck or not, biologist Joe Lacefield first noticed this previously unknown plant on a limestone slope while hunting with his brother.

Discoveries of new species aren't limited to only the exotic or remote parts of the world. In fact, biologists at the Kentucky Department of Fish and Wildlife Resources have made several new finds in the last 15 years alone.

It's even possible that many Kentuckians have seen unidentified or recently discovered aquatic and plant species themselves, said department at-risk species biologist Zack Couch, but the differences are subtle and often overlooked.

For department biologists, time and resources are essential to making such historical finds. The department's documentation of new species generally consists of unidentified species formerly thought to be another. Improvements to DNA technology also allows researchers to study species more in-depth.

In 2006, Couch made the unintentional discovery of a new species of crayfish while in graduate school at Eastern Kentucky University. He had intended to study the crayfish population of Pond Creek in Louisville, but wound up realizing he had uncovered something different.

Research from the 1960s referenced the new crayfish as slightly different from the known Louisville crayfish. However, researchers at the time believed it was still the same species. Couch's work proved that wrong, when he

realized the species he'd documented in Pond Creek was morphologically and genetically different.

Couch's crayfish is endemic to Kentucky – meaning it's only found here. He then had to figure out what to call it.

"Species discoveries and descriptions aren't really taught in college," he said. "So I had to spend a lot of time trying to figure out how the process of getting a new species recognized works."

Naming rights to this new species were auctioned off by Kentucky Wild, a Kentucky Fish and Wildlife program which supports research on the state's rare and nongame species. The review process for the new name is still ongoing.

Discovering new species also requires persistence and patience. Lacefield, as a private lands biologist, was naturally on the lookout for the endangered running buffalo clover.

One day, while turkey hunting with his brother in Woodford County in 2010, he noticed a plant that resembled the endangered clover. However, it didn't look quite right.

"I returned later to photograph it and share the images with some botanists for their opinion," he recalled. "I got differing responses, and continued to insist that this was something unique."

It wasn't until 2013 that a botanist at Miami University in Ohio confirmed Lacefield's discovery of a new species of clover. This added the aptly named Kentucky clover to the state's list of endemic species. The plant's only known

populations are near the Kentucky River in Woodford and Franklin counties.

Department ichthyologists Matt Thomas and Stephanie Brandt made another discovery while conducting fish surveys in the Buck Creek drainage of Pulaski County in 2010. They collected specimens of a small species of fish previously identified as striped darters. Genetic testing, however, revealed that Thomas and Brandt had discovered a distinct and undescribed species found only in the Buck Creek drainage.

“While there are subtle differences in appearance between the buck darter and striped darter, the two are very similar,” Thomas said. “The same applies to the new crayfish.”

Department researchers suspect there exists even more hidden diversity among the lesser-studied species, waiting to be discovered. For example, Couch believes there are probably several more unidentified species of crayfish found in Kentucky as well – there are just too few resources to keep pace with the work.

Sometimes the discoveries are not a new species, but a species in a place where it’s never been documented. This was the case in Goose Creek, a tributary of the Green River.

Members of the Kentucky Fish and Wildlife Stream and Wetland Mitigation Program – the Stream Team - sampled Goose Creek three times between 2014 and 2017. They documented 24 species in the creek.

In 2019, after finishing a stream restoration project there, new sampling conducted in September documented the rare stargazing minnow in Goose Creek for the first time. No one had seen a stargazing minnow in any of the tributary streams above Green River Lake since at least 1985. Kentucky’s Wildlife Action Plan lists the minnow as a species of greatest conservation need.

The stargazing minnow only lives in high quality riffle habitats of the upper Green River drainage. Prior to the restoration project, Goose Creek’s problems included a

lack of vegetation, severe bank erosion and livestock in the water. Restoration included improvements for water quality and construction of more riffles in the creek.

The smaller an organism is, the less attention it typically gets. Biologists must balance time and resources between wild game, at-risk species and newly discovered species.

Funds from the Kentucky Wild crayfish naming rights auction in January 2020 will head straight into championing Kentucky’s nongame species like the stargazing minnow and buck darter. With ever-advancing technology and growing resources to spread between game and nongame species, biologists will be able to better determine which new species are at-risk, and which are simply small populations of hidden gems thriving in Kentucky’s wilderness.

Figuring out the specifics involves paying attention to what signs Kentucky’s ecosystems give, which is a big focus for the department’s Stream Team. None of it would be possible without supporters of Kentucky Fish and Wildlife.

Regardless of the obstacles, discoveries like these will continue to aid researchers in learning about Kentucky’s outdoors and the interaction between its species. Many relationships in nature remain unknown.

Couch describes it as a game of Jenga, but one where it’s not possible to simply see how each piece fits perfectly together. Biologists do know that all the pieces intertwine, though, from wild game to tiny, aquatic critters.

“What seems to be an insignificant species could be the cornerstone that holds the system together in the manner in which we currently see it,” Couch said.

Kentucky Fish and Wildlife’s many biologists are more than eager to share what the state’s wilderness shows them. After all, any adventurer throughout the state can find discoveries, too. Like an oyster, Kentucky will present its pearls when found.

WE ALL NEED WATER

2021 JIM CLAYPOOL ART & CONSERVATION WRITING CONTEST

STATE WINNERS: First: \$250; Second: \$150; Third: \$50

REGIONAL WINNERS: \$50

COUNTY LEVEL WINNERS: \$25

* State/Regional winners will receive a personalized certificate. County winners that win regional or state awards will only receive one check for the top prize.

RULES

1. Kentucky students grades 6-12 are eligible to compete in the writing contest. Students up to grade 5 may compete in the art contest.
2. A student may not enter both the art contest and the writing contest during the same contest.
3. An entry must be created by one and only one student. Any entry submitted by more than one student will be disqualified.
4. All entries become the property of the contest sponsors. The decisions of the judges at all levels of competition are final.
5. Top three writing entries and/or artworks from your school must be submitted to your local county conservation district by Dec. 1, 2021.
6. The entry form below must be completed and secured to the back of your entry.

Artwork: Student entries shall be 8 ½" X 11". Entries may be submitted on any color or thickness of art board (poster board, mat board, etc.) or may be on art paper, which is firmly affixed to art board. All artwork must be two-dimensional (2-D). Three-dimensional (3-D) artwork will not be accepted. Artwork may be rendered in any medium: pencil, ink, charcoal, pastel, crayon, paint, photography, digital, etc. Mixed media and collage work is acceptable as long as all pieces are securely glued to the surface of the work. Entries should not be laminated. All entries must convey at a glance the theme of the competition to persuade the viewer to take action toward good water conservation practices. All entries must be the original work of the student.

Writing: Entry may not exceed 1,000 words printed single sided. No photographs or artwork may be included with the written work. It is suggested that the written entry take the form of persuasive or informative/explanatory. Students should write from the perspective of an informed writer to a less informed reader and may be in the form of a letter, article, editorial or speech. It should persuade the reader to take action toward good water conservation practices. The work should be from the student author and avoid plagiarism from this source or other sources. Sources should be cited. Do not use the Conservation Writing and Jim Claypool Art tabloid as your only source.

POINT SYSTEM FOR ART

- 50 points: Purpose/Audience (appropriate communicate style, establishes and maintains a purpose, hold to subject in community, theme is clearly conveyed)
- 30 points: Composition/Creativity/Craftsmanship (layout, originality, and quality of work, such as neatness)
- 20 points: Language/Correctness (word choice, usage, spelling, punctuation, capitalization)

POINT SYSTEM FOR WRITING

- 30 points: Purpose/Audience (establishes and maintains a purpose, communicates with audience, employs a suitable tone)
- 20 points: Organization (logical order, coherence, transition organizational signals)
- 20 points: Idea Development/Support and Evidence of Research (student's original work shows sources of research)
- 30 points: Language/Correctness/Sentences (word choice, usage, spelling, punctuation, capitalization, sentences varied in structure and length and constructed effectively)

Conservation Writing and Jim Claypool Art Contest Entry

Student Name _____

Home Address _____

City _____ Zip _____

Home Phone () _____

Age ____ Grade ____ Teacher _____

County _____

School _____

School Phone () _____

Parent(s) Name _____

Tshirt Size ____

I hereby certify that I have read the rules and this entry is the original work of:

Student Signature

Parent/Guardian Signature (required)

Teacher or Principal's Signature (required)