

Kentucky's Water Health Guide

Kentucky Division of Water
Nonpoint Source & Basin Team

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1. Introduction

What is the Health of Our Streams?

Kentucky's Water Health Guide is a summary of the current and historic conditions, activities, trends and impacts on the health of the rivers and streams that flow through the Commonwealth. This report describes the natural conditions of the streams and lakes in Kentucky, such as the types of rocks and soils, the land features, the types of vegetation, the quality of the water and how it moves. It also describes the human activities and influences, such as: building and maintenance of homes, businesses, and industries; raising of crops and livestock; treatment of human waste; recreational activities; timber cutting; mining; construction and maintenance of water lines, sewer lines, roads, pipelines, and other types of infrastructure that support human populations.

All of these conditions and activities have an effect on the water that moves over and through the land as it drains into the streams and rivers. This determines the quality of the water and influences the health of the waterways. This report provides information about these influences and the water quality in Kentucky.

What is a Watershed?

The boundary of a watershed, or basin, is defined by the surrounding high points and ridgelines of the landscape. All of the water that flows off the land, or soaks into the ground, within that boundary will move to the same stream. The water outside that watershed boundary will move to a different stream. If these two streams come together at some point downstream, they will create a larger stream that combines

the two watersheds into one bigger watershed. As streams combine, they become larger watersheds. Large watersheds, watersheds of major rivers, are often referred to as basins. It is important to note that watersheds do not fall within the political boundaries created by humans. Watershed/basin boundaries can cross county, state and even national boundaries.

How do Watersheds Impact Water Pollution?

Rain and snowmelt, commonly referred to as stormwater, will soak into the ground more quickly in a watershed that has not been altered by humans. Some of the stormwater will soak into the ground and will be absorbed by the plants, trees and other vegetation. As more stormwater falls and the ground has soaked up all it can hold, the water will slowly begin to flow over the surface of the ground and into nearby streams. As the stormwater runoff moves across the ground, it will pick up materials on the land surface, such as dirt, sewage, animal waste, chemicals, oils or fertilizers and carry them into local streams. The water and pollution that runs off into streams and lakes is called runoff pollution, or nonpoint source pollution.

What are Best Management Practices (BMPs)?

Because runoff pollution can come from many sources, it is complicated to manage. Since this type of water pollution is delivered by stormwater runoff, many of the strategies for dealing with it involve ways to prevent the runoff in the first place. These strategies, or best management practices (BMPs), for stormwater and runoff pollution use four common principles for effectiveness: slow it down, settle it out, spread it out and soak it in.

What is Point Source Pollution

Streams and lakes can also be polluted by chemicals, byproducts and contaminated water that are released through pipes, ditches, or other defined pathways from industrial, municipal, commercial and agricultural processes. These defined releases into streams and lakes are called point source pollution.

By law, a point source of pollution must have a permit that describes what and how much discharge can be released into the stream or lake. The permit requires the permit holder to periodically collect, analyze and report on samples from the

discharge to ensure the permit limits are met and the quality of the water is protected.

2. Water Rules

What is the Clean Water Act?

In the late 1960's and early 70's, citizens and government officials in the United States realized there was a crisis with our streams and lakes. The water was so polluted that the Cuyahoga River in Ohio was one of several that actually caught on fire – more than once! In order to address the problems, Congress made laws in 1972 to protect surface water that have come to be known as the Clean Water Act (CWA).

Point & Nonpoint Source Pollution

The major water health problems were caused by waste released through pipes into waterways from industrial processes and sewage treatment plants (point source pollution). After several years of regulation of point sources, water health began to improve. However, there were still water pollution problems across the nation.

In the late 1980's, the US Environmental Protection Agency began to focus on the effects of runoff pollution (nonpoint source pollution) that was being carried into streams and lakes by water from storms running over the land. This pollution was preventing the streams and lakes, sometimes called waterbodies from being drinkable, swimmable and fishable. Runoff pollution is discussed and dealt with in Section 319 of the Clean Water Act. The funding that is provided by the US Environmental Protection Agency to reduce runoff pollution is often called 319 funding.

Requirements of the Clean Water Act

Legal Limits of Pollution (Water Quality Standards)

To support the drinkable, swimmable and fishable goals, the Clean Water Act requires states to set legal limits of pollution in streams and lakes. These limits are used to protect and manage the streams and lakes, and to reduce or get rid of point and nonpoint source pollution. In Kentucky, the legal limits of pollution are

set for a variety of measurements such as bacteria (*E. coli*), dissolved oxygen, metals, temperature and pH. These limits are part of the state regulations.

Ways We Use Streams and Lakes (Designated Uses)

As a part of the legal limits of pollution in streams and lakes, states must designate uses for each body of water in their state. In Kentucky, the Division of Water has identified the possible uses of streams and lakes.

- Primary Contact Recreation (PCR)
 - Primary Contact Recreation (PCR) includes swimming or other activities where your head goes under water and you are likely to swallow water, or if the eyes, inside of the nose or inside of the mouth are likely to come in contact with the water.
 - If there are bacteria or other germs in the water, they can get inside your body through these areas and cause sickness.
 - Bacteria and other germs can also get inside your body through cuts and sores.
 - The higher the amount of bacteria in the water, the higher your chances of getting sick.
 - Harmful substances from rapid growths of blue-green algae in streams and lakes can cause skin rashes, breathing problems and other sickness.
- Secondary Contact Recreation (SCR)
 - Secondary Contact Recreation (SCR) involves fishing, boating, wading or other activities where parts of your skin come in contact with the water, but your head doesn't go under the water.
 - If there are bacteria or other germs in the water and you get them on your skin, touching your eyes, nose or mouth can move the bacteria and germs into your body and cause sickness.
 - Bacteria and other germs can also get into your body through cuts and sores.
 - The higher the amount of bacteria in the water, the higher your chances of getting sick.
 - Harmful substances from rapid growths of blue-green algae in streams and lakes can cause skin rashes, breathing problems and other sickness.
- Domestic Water Supply (DWS)
 - Domestic Water Supply (DWS) involves human drinking water.

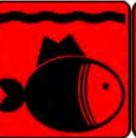
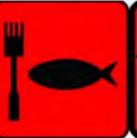
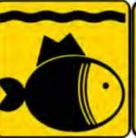
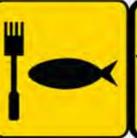
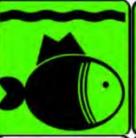
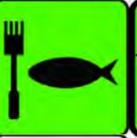
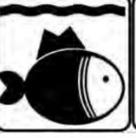
- The water quality is tested at the place where the drinking water treatment plant takes the water from the stream or lake.
 - The water must not have more pollution than can be cleaned to a level safe for humans to drink.
 - Harmful substances from rapid growths of blue-green algae in streams and lakes can cause skin rashes, breathing problems and other sickness.
- Aquatic Life (AL)
 - Aquatic Life (AL) involves the healthy variety of animals that live in water.
 - The variety of animals depends on the health of the water and the variety of healthy places to live (habitat) in the stream or lake.
 - Warm water aquatic habitat (WAH) is a type of habitat that supports a balanced community of aquatic organisms able to live within a certain temperature range.
- Fish Consumption (FC)
 - Fish Consumption (FC) determines the safety of eating fish.
 - Based on the amount of chemicals found in the flesh of the fish.
 - This is a goal of meeting the legal limits of pollution in streams and lakes to protect human health.
 - The chemicals of most common concern are mercury and polychlorinated biphenyls (PCBs), but tests are also performed for other metals and for pesticides.
 - Harmful substances from rapid growths of blue-green algae in streams and lakes can cause skin rashes, breathing problems and other sickness.
- Outstanding State Resource Water (OSRW)
 - Outstanding State Resource Water (OSRW) describes streams or lakes that have unique features that are worthy of legal protection.
 - The Division of Water identifies a stream or lake as an Outstanding State Resource Water (OSRW) if a group of animals living in the stream or lake are of a kind that has been found to be dying off or disappearing (federally endangered or threatened) in other areas but are still living in that particular stream or lake because of the high water quality.
 - Any streams that have already been identified as Kentucky Wild Rivers, Exceptional Waters or Federal Wild and Scenic Rivers are

also automatically considered for review to become an Outstanding State Resource Water (OSRW).

The Kentucky regulations that set the legal limits of pollution (water quality standards) and identify possible uses (designated uses) for streams and lakes are found in Title 401 of the Kentucky Administrative Regulations Chapter 10 Sections 031 and 026 (401 KAR 10:031 and 401 KAR 10:026). These regulations can be found on the [Kentucky Legislative Research Commission website](#).

How We Evaluate the Health of Streams and Lakes (Assessment)

To find out if the streams and lakes in Kentucky are below the legal limits of pollution and meeting the designated uses assigned to them, the Division of Water (DOW) collects several types of samples from the water and tests them. The Division then combines all of the information collected and uses it to provide an evaluation of the health of the stream or lake. With these health evaluations, the stream or lake receives one of the following ratings:

		Uses					
		Swimming (Primary Contact Recreation-PCR)	Fishing, Wading, Boating (Secondary Contact Recreation-SCR)	Drinking Water (Domestic Water Supply-DWS)	Animals That Live in Water Aquatic Life-AQ)	Safety of Eating Fish (Fish Consumption-FC)	Outstanding State Resource Water (OSRW)
Ratings	Nonsupport of Use (red)						
	Partial Support of Use (Yellow)						
	Full-support of Use (green)						
	Non-evaluated/ Not assessed (white)						

Is the Water Safe?

Can I swim there?

The Kentucky Division of Water and the Kentucky Division of Public Health Protection and Safety are responsible for sampling and evaluating streams and lakes to determine if they are safe for human contact. Those that are found to have high levels of bacteria can cause illness from recreational contact with the water. The ones that consistently have high levels of bacteria are identified as unsafe for swimming and/or other activities like boating and wading. Signs are placed around these streams and lakes to let the public know they are unsafe.

The bacteria come from human or other animal waste and are a sign of the presence of untreated, or poorly treated, sewage, poor farming practices, failure to pick up pet waste, etc. High amounts of bacteria and the other germs found in sewage and other waste create a higher chance of getting sick from contact with the water.

Any stream or lake is more likely to have high amounts of bacteria after heavy storms. The rain or melting snow from these storms can overwhelm sewage pipes causing untreated sewage to flow into streams and lakes. The runoff from those storms will also carry any waste on the land surface into the local streams and lakes. Streams and lakes are evaluated for two different types of recreational activity:

- Primary Contact Recreation (PCR) - swimming or other activities where your head goes under water and you are likely to swallow water, or your eyes, inside of the nose or inside of the mouth are likely to come in contact with the water.
- Secondary Contact Recreation (SCR) - fishing, boating, wading or other activities where parts of your skin come in contact with the water, but your head doesn't go under the water.

The current swimming advisories for Kentucky are available on the Division of Water's website on the [Swimming Advisories webpage](#).

Can I Eat the Fish? (Fish Consumption Advisories)

The Kentucky Division of Water, Kentucky Division of Public Health Protection and Safety and Kentucky Department for Fish and Wildlife Resources are responsible for working together to determine the safety of eating fish that are caught in the streams and lakes in the state. They jointly issue a fish consumption advisory to

the public for a stream or lake when fish flesh is found to contain chemicals above the amounts that have been determined to be safe for humans to eat. The chemicals of most common concern are mercury and polychlorinated biphenyls (PCBs), but tests are also performed for other metals and for pesticides.

An advisory cautions people about potential health problems that may result from eating fish caught from a particular area. An advisory does not mean fish can't be eaten. It is intended to provide information to guide people in making choices that reduce health risks. The advisory provides information on how often fish may be safely eaten.

Risks from eating fish from an advisory area can be reduced by the following:

- Fillet the fish, remove the skin and trim all fat.
- Do not eat fish eggs.
- Broil, grill or bake the fillets instead of frying or microwaving.
- Do not eat, or reuse, juices or fats that cook out of the fish.

Current Advisories for Safety of Eating Fish (Fish Consumption)

Statewide Advisories -

- Fish Consumption Advisory for Mercury
- A safety of eating fish (fish consumption) advisory for mercury is in effect for fish caught in any of the waters in the state.
 - Women of childbearing age and children 6 years of age or younger should eat no more than one meal per week of freshwater fish.
 - Other adults are not included in the advisory.
 - This is not an emergency situation since organic mercury can occur naturally in the environment and does not affect swimmers, skiers or boaters. It affects the fish by building up levels of mercury in their flesh when they eat small plants that have absorbed the mercury or eat the small animals that have eaten the small plants.

Individual Stream and Lake Advisories-

For information on specific streams and lakes in, or bordering, Kentucky, go to the [Division of Water's Fish Consumption webpage](#).

What is that Scum on the Water? (Harmful Algal Bloom Advisories)

Fertilizers are carried by runoff into lakes and streams from lawns, sewage, farms, etc. This causes several different types of algae to grow rapidly in the water. The common green algae are not harmful to humans or animals that come in contact with the water. When they grow rapidly, they can look like underwater moss,

stringy mats or floating scum. Blue-green algae, on the other hand, can be harmful. They can cause skin rashes, breathing problems and other sickness in humans and animals. When they grow rapidly, they can make the water look like shiny bright-green paint, but the color can also be red or brown. The rapid growth of blue-green algae that release poisons in the water is called a Harmful Algal Bloom (HAB).

In addition to the fertilizers in the water, there are other conditions that can cause a HAB. These include slow moving water, low water levels, warmer temperatures and lots of sunlight. HABs are more likely to happen between May and October. For information on HAB warnings in Kentucky, go to the [Division of Water's Harmful Algal Blooms webpage](#).

Required Reports for Stream and Lake Health

Part of the Clean Water Act (Section 305(b)) requires states to submit a report to Congress every two years on the health of the waters that have been assessed by the state. It provides a list of all of the streams and lakes in the state that have been tested and assessed and describes whether or not they are supporting their designated uses.

Another part of the Clean Water Act (Section 303(d)) requires that states also submit to Congress every two years a report of the streams and lakes that are found to be in poor health (impaired). This is a list of the streams and lakes from the Section 305(b) report that are not supporting or are partially supporting identified uses (impaired).

These two reports, the 305(b) and the 303(d), are sent by the Division of Water to Congress through the U.S. Environmental Protection Agency as one report called the Integrated Report. The Integrated Report has Volume I and Volume II. Volume I is the 305(b) report and Volume II is the 303(d) report. The reports are available on the Kentucky Division of Water's [Integrated Report website](#).

It is important to know that the Integrated Report only provides information for the waters in the state that have been tested and evaluated. Not all of the waters in the state have been tested. For an easy summary of this report, view the [Water Health Portal](#).

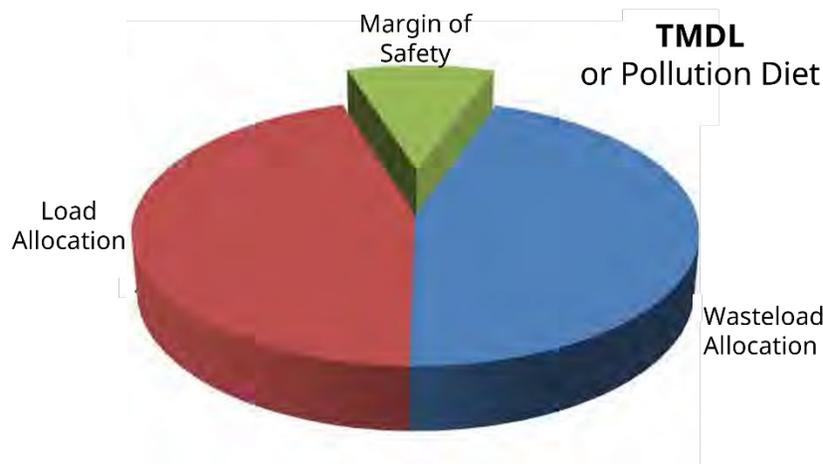
Pollution Studies and Solutions

The streams and lakes on the 303(d) list will each require a study that identifies the types and amounts of pollutants in the water and gives guidelines for how much they should be reduced. These studies are called Total Maximum Daily Loads

(TMDLs) and they determine the amount of a certain type of pollutant a stream or lake can receive and still meet its designated uses.

A TMDL is often called a pollution diet. Just as eating smaller portions of food controls the amount of weight in your body, balancing or reducing the portions of chemicals and waste that get into a stream or lake from different sources controls the overall amount of pollution in it. The Division of Water performs strategic sampling to find out the amount of chemicals and waste that are going into the stream or lake, and then develops the pollution diet that describes how much of each chemical or waste must be reduced to bring the stream or lake back below the legal limits that allow it to be healthy.

The results of the studies are included in a TMDL report that describes the current condition of the stream or lake and the amount of pollutant that must be removed in order for it to support its identified use(s). The TMDL report is intended to help government officials, agencies, watershed groups and citizens make decisions and take action to improve water health. The TMDL reports for Kentucky can be found on the Division of Water's [TMDL website](#).



A TMDL or pollution diet is comprised of 3 parts: **Load Allocation** – a calculation of the maximum amount of pollutant that can be released from runoff pollution (nonpoint source pollution), **Wasteload Allocation** – a calculation of the

maximum amount of pollutant that can be released from regulated pipes or ditches (point source pollution), and a **Margin of Safety** – subtracted from the total to allow for unknown information or calculation errors.

Pollution Studies and Solutions

Total Maximum Daily Loads (TMDLs) divide up the amount of pollutant that is allowed to be released in the watershed among the users of the land. These different land users can include businesses, factories, sewage treatment plants, towns, farms and homeowners. Some land users are required to have a permit to release polluted water in the watershed. All other user activities can cause pollutants to runoff into the stream during storms; these are runoff pollution

sources. The calculation of the maximum amount of pollutant that can be released from point sources to a stream or lake so it will still meet its uses is called the Wasteload Allocation. The calculation of the maximum amount of pollutant from runoff that can be released to a stream or lake so it will still meet its uses is called the Load Allocation.

Before the maximum amounts of point source pollutant (Wasteload Allocation) and runoff pollutant (Load Allocation) are added together and finalized, a small amount is subtracted from each to allow for any unknown information and potential errors. This amount is called the Margin of Safety. To summarize, the TMDL is made up of the Margin of Safety, the Wasteload Allocation and the Load Allocation.

Protecting Streams from Additional Damage (Antidegradation)

In order to meet the legal limits of pollution that protect and support the designated uses of streams and lakes, the Clean Water Act requires protection of basic levels of health from unnecessary pollution for all streams or lakes. In addition, streams or lakes with higher levels of health are required to receive extra protection from activities that have the potential to damage that health. These protections are intended to 1) prevent any additional pollution damage and 2) keep stream and lake health at the same level and supporting the same designated uses from the time these Clean Water Act requirements went into effect on November 28, 1975. The goal of no additional pollution damage is referred to as antidegradation. To support this goal, streams and lakes are evaluated and identified for special uses based on unique characteristics they have.

Protecting What is Special

With over 90,000 miles of streams and lakes in Kentucky that run through mountains, hills, Bluegrass, coal fields and many other land features, it isn't surprising that many of these have one or more unique characteristics that deserve extra protection. The Division of Water has regulations that define several categories that are based on these characteristics. Because many of these streams and lakes have more than one unique characteristic, they may fit into more than one of the categories of Special Use Waters that are described in this section. Maps showing the streams and lakes can be found on the Division of Water's [Special Use Waters webpage](#).

- Reference Reach Waters – streams and lakes throughout the state that are the most unchanged from their natural conditions

- Used as best examples of how least altered streams are supposed to look and function in different areas of the state
 - Used when working to fix streams that have been damaged, because they can be used as a comparison for how the streams are meant to be
 - It is important to know that very few, if any, of our streams are in an untouched condition -The Reference Reach streams represent the least changed streams in each region
- Cold Water Aquatic Habitats (CAH) – streams that will support, on a year-round basis, animals that require cooler water temperatures for survival, and/or provide the cooler temperatures and surroundings needed for trout to reproduce
- Exceptional Waters (EW) – streams or lakes that have the high quality of water that is necessary for fish, shellfish and wildlife to reproduce and supports recreation in and on the water
 - this category includes Reference Reach waters, Kentucky Wild Rivers, some Outstanding State Resource Waters and some waters that have a rating of “excellent” for fish or bugs (macroinvertebrates)
- Kentucky Wild Rivers – parts of nine rivers in the state that have extraordinary beauty and clean water
 - includes all visible land for at least 2000 feet on either side of the river
 - any change in the way the land is used within the Wild River boundary requires a permit, and cutting all trees or strip mining is not allowed
- Outstanding State Resource Waters (OSRW) – streams or lakes that have unique features that are worthy of legal protection
 - The Division of Water identifies a stream as an OSRW if a group of animals living in the stream or lake are of a kind that has been found to be dying off and they are disappearing, or beginning to disappear, from the places they normally live (federally threatened or endangered)
 - Any streams that have already been identified as a Kentucky Wild Rivers, Exceptional Waters or Federal Wild and Scenic Rivers are also automatically considered for review to become an Outstanding State Resource Water
- Outstanding National Resource Waters (ONRW) – streams or lakes that meet the requirements for an Outstanding State Resource Water and also have natural or recreational importance on a national level
- Federal Wild and Scenic Rivers Act

- Federal Wild Rivers – rivers, or sections of rivers, that don't have dams, don't have developed watersheds or shorelines, don't have polluted waters, and can only be reached by trail. Federal Scenic Rivers – rivers, or sections of rivers, that meet all of the requirements of a Federal Wild River, except they can be reached by roads in some places.
- Recreational Rivers – rivers, or sections of rivers, that can be reached by road or railroad, that may have some development along their shorelines, and that may have been dammed or re-routed in the past.

Land & Water Connections

Physical Characteristics of a River Basin

Stream health is directly connected to the land in the watershed. Differences such as whether the land is covered with natural vegetation or with man-made structures have an effect on the flow of stormwater across the land and the pollution it picks up as it flows. The variety of ways humans use the land controls how the land is covered and what types of materials and substances are on the ground that can be carried with stormwater flow. When making decisions about a stream and its watershed, it is very useful to look first at the land cover and land use for a general idea about the condition of the stream.

Land Cover and Land Use

Land cover and land use are related ways to describe the landscape of the river basin, and each has a direct effect on water quality. Land cover refers to the vegetation, structures or other features that cover the land. Land cover types include forest and shrubland, agricultural, water and wetland, developed and barren land (mine lands, construction sites, etc.). Land use refers to how land is used by humans, or its economic use. Types of land use include commercial (stores, office buildings, etc.), residential (housing), industrial (factories, etc.), recreational (hiking, picnicking, etc.) and agricultural (pasture, croplands, etc.).

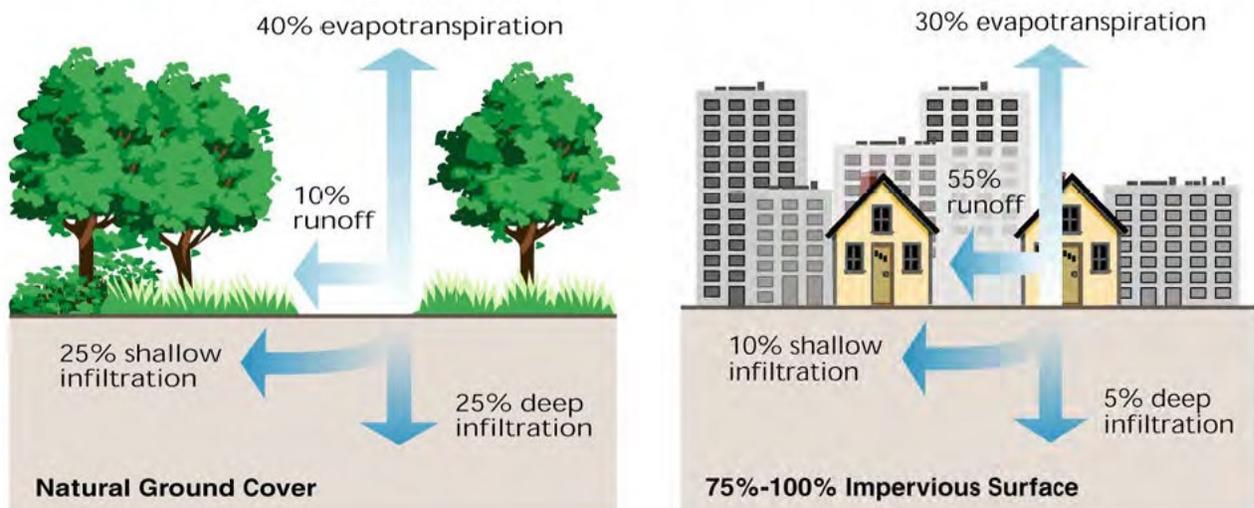
Impervious vs. Pervious Cover

In general, for land cover, greater amounts of vegetation on the land help protect the water quality in the watershed. As land is developed, vegetation may be replaced with impervious cover, which refers to all the hard surfaces that do not allow water to soak into the soil, such as rooftops, driveways, streets, parking lots,

and packed down soils. As the amount of hard surfaces increases in a watershed, less water can soak into the underground water supply or be absorbed by plant roots. Instead, water runs quickly over the surface and directly into the nearest stream, picking up a variety of pollution along the way and increasing the levels of pollution in the stream.

As the amount of hard surfaces increases in a watershed, less water soaks into the ground and more runs off into the nearest stream. This increased runoff leads to:

- Increased erosion (due to increased speed and amount of water)
- Reduced underground water supplies
- Increased flooding
- Increased stormwater pollution and sediment entering streams
- Overall worsening of stream health



Current Land Cover and Use

Human land use is tied very closely to water pollution and, in many ways, is one of the greatest predictors of water pollution in a region. The main land use activities in a watershed are good indicators of the potential water pollution types that may be found there. For example, land used for industrial purposes may contribute toxic chemicals or metals, depending on the type of product being manufactured. Similarly, land that is converted to residential neighborhoods may be contributing litter, bacteria and viruses that can cause disease, fertilizers, or automobile fluids. Land used for crop production may contribute sediment or soil from tilled land, fertilizers, pesticides, or bacteria and viruses that can cause disease from manure applications. The impacts to streams from all land uses can be minimized by using appropriate management practices. When trying to visually describe different land uses, they are often described in terms of the type of land cover present. The

National Land Cover Database (NLCD) provides a very good visual representation of different classes of land covers for the nation. In Kentucky, the major land cover types include:

Developed

Developed areas have the potential to contribute road salt, soil/ sediment, fertilizers and nutrients, automotive fluids and pesticides to stormwater runoff. Bacteria from pet waste, failing/absent septic systems, or leaky sewer lines can also be picked up in the flow of stormwater over surfaces. Most stormwater flows into storm sewers, passes through un-treated and runs directly into local streams. In addition, because of the loss of greenspace in developed areas, less water soaks into the ground which increases the speed and the amount of water flowing off these areas. This can lead to larger and more frequent flooding events, increased streambank erosion, and decreased groundwater replenishment. The resulting reduced levels of groundwater cause lower amounts of water in streams in summer months. The loss of trees, shrubs and grasses along streambanks contributes to further streambank instability and erosion, resulting in increased sediment in the stream and decreased habitat, where plants and animals live, for aquatic life.

Barren

These areas have the potential to contribute chemicals, heavy metals, dust, sediment, acid mine drainage (can alter the pH of surrounding streams) and minerals (can increase conductivity of surrounding streams) to the watershed. In addition, these activities have the potential to increase runoff in the watershed because of the removal of vegetation and can cause changes in stream and groundwater flow.

Forest and Shrubland

Generally, forests help prevent stream pollution by minimizing soil erosion, filtering pollutants, and capturing sediment before runoff reaches streams. Areas along streambanks are referred to as riparian zones and play a critical role in bank stability, habitat, and clean water. Forested areas are extremely important in terms of watershed protection, erosion control, flood protection and groundwater replenishment. Some studies have shown that increases in the amount of forest cover in drinking water supply watershed areas can greatly reduce the amount and cost of treatment required for drinking water. Certain activities in forests, such as logging, have the potential to introduce pollution such as sediment, fuels, and lubricants but, with additional care, this can be avoided.

Agriculture

Farming utilizes nutrients, fertilizers, herbicides and insecticides that can be carried into a stream by stormwater runoff. Other potential pollution from agriculture includes sediment, from increased soil erosion, and bacteria and nutrients from animal wastes. The removal of trees, shrubs and grasses along streambanks to create additional cropland contributes to streambank instability and erosion, resulting in increased sediment in the stream and decreased habitat for aquatic life. Through the implementation of BMPs, many of these effects from agricultural uses can be reduced.

Water & Wetlands

Wetlands are areas where soil is waterlogged year-round or during various times of the year. Wetlands include swamps, marshes and bogs. There is a large variety in how wetlands look and function because of differences in soils, the lay of the land, climate, water flow, water chemistry, vegetation, and other factors. The wet conditions determine how the soil develops in the wetland and the types of plant and animal communities it can support. Wetlands provide homes for more species of water and land plants and animals per area than any other habitat type. Wetlands are often found alongside streams, lakes or oceans and in floodplains. However, some wetlands are not connected to streams, or other bodies of water, and are formed by a groundwater connection. Wetlands are extremely important for flood control. Wetland soils act like sponges that soak up runoff. They store this water and release it slowly which prevents or reduces quick rises in flood waters. A one acre wetland can typically soak up and store about one million gallons of water. The process of soaking up stormwater also makes wetlands extremely important areas for clean water. As the stormwater is held in the wetlands, sediment and other types of pollution, including fertilizers, pesticides and chemicals, are trapped and filtered out. This cleans the water before it is released.

Groundwater & Karst

Of all the water on earth, only 3% is fresh water available for human use. Almost a third of this fresh water on our planet is in the form of groundwater. Groundwater is the water that flows or is stored within the rocks, soils and pore spaces beneath the surface. Groundwater is added when rain and melting snow from storms soak into the soil and move downward through the rock and soil. The underground layers of rock or soil that hold groundwater are called an aquifer.

Some pollution is removed from water as it moves slowly downward through soils and sediments through a process of natural filtration. However, as the groundwater moves through the soil, it can react with the natural materials in the soil and become slightly acid. In areas where the bedrock is mostly made up of

limestone, the acidic groundwater will very slowly dissolve the limestone. This process forms openings and channels in the bedrock. Some of these openings and channels keep dissolving until they are large enough to become caves. Areas where this process takes place are called karst. Groundwater aquifers in karst areas are at high risk of being polluted because water easily and quickly flows underground through the channels and cracks in the limestone bedrock without being filtered through the soil. Anything on the ground is carried along as the stormwater flows over the surface and can flow directly into the groundwater through sinkholes and crevices. Sinkholes are depressions on the landscape that can be closed like a bowl or have an opening in the bottom. They appear when rock collapses underground due to removal of underlying support. Sometimes collapses occur very quickly and form sinkholes that can cause significant damage to roads and buildings.

Under natural conditions groundwater moves underground in the down hill direction towards streams and rivers where the aquifer comes to the land surface and the groundwater seeps out. This seepage point is often in or near a stream. Seeps that have larger amounts of groundwater coming to the surface are called springs. Springs and seeps flow over land and eventually into streams. Sometimes the springs and seeps are located in the stream and the groundwater directly enters the stream. In these ways, groundwater contributes to the water in streams and is important for keeping streams flowing during times of low rainfall amounts. Sometimes streams will flow into a sinkhole and disappear underground. These are called sinking streams. These streams may join with underground streams flowing through caves and crevices, which often come to the surface in another location and join the flow of a surface stream.

Much of Kentucky has karst aquifers, which results in some unique problems with groundwater pollution. Karst aquifers are present in about half of the state, from northeastern Kentucky through the Bluegrass Region and across south central into western parts of the state. The most famous example in Kentucky, is Mammoth Cave in south central Kentucky, which is the longest known cave system in the entire world with more than 390 miles of mapped cave.

Special methods are required to test water for pollution in these areas and pollution prevention practices must take the karst features into consideration.

Wetlands

Wetlands are important features in the landscape that provide many beneficial services for people, as well as for fish and wildlife. The amount of water present and the time of year determine, in part, the functions the wetland provides and its role in the environment. Even wetlands that appear dry for large parts of the year

can provide critical habitat for wildlife that can breed only in these areas. The beneficial services that wetlands provide are the result of their unique natural characteristics. To learn more about wetlands visit the [EPA's wetlands website](#).

Over half of the wetlands in the lower 48 states in the U.S. have been destroyed and over 80% of the wetlands in Kentucky are gone. Humans often want to live near streams, lakes and oceans. These bodies of water are also used to ship materials and products, so industries often locate near them. And in some areas, the only flat land is along or near streams. All of these factors lead people to fill in valuable wetlands to create space to build roads, homes, and businesses, resulting in devastating loss of wetlands.

Losses of our wetlands have caused increases in downstream flood events and water pollution problems. There have also been dramatic decreases in wildlife populations that depend on wetlands at some stage in their life. Over 60,000 acres of wetlands are lost in the U.S. each year, so the effects of these problems will continue to rise.

Wetland benefits include:

- Water Pollution Treatment and Increased Flow
 - Filter out pollution from runoff by slowing down flow and allowing stream-clogging sediment to settle out
 - Wetland plants take up some pollution as food – this filtering function prevents some pollution from entering our streams, which saves money that would otherwise be spent to remove the pollution to make the water usable.
 - Many wetlands allow water to soak into the ground and replenish groundwater
 - Allow water to slowly move into streams and maintain stream flow during dry periods
- Reduced Flooding
 - When located along streams, wetlands function as natural sponges that trap and store rain and snowmelt and then slowly release it – this reduces the amount and strength of flood waters around a wetland, reducing flood impacts
- Fish and Wildlife Habitat
 - Provide a variety of habitats for fish and wildlife, making wetlands some of the most productive natural areas in the world
 - Support valuable commercial fish and shellfish industries
 - Provide a unique environment for many types of plants to grow
- Recreation

- Support a variety of recreational activities, including hiking, boating, hunting, fishing, bird watching and photography

Human Impacts

Contamination and Waste Sites

All communities in Kentucky have businesses, industries, and individuals that use potentially toxic chemicals and materials. While most of these chemicals and materials are made or used on top of the land, some are stored underground. Any of these products that are not stored correctly, or are spilled, leaked or dumped, on or under the ground could pollute streams, lakes and groundwater. The Kentucky Division of Waste Management (DWM) oversees the use of these chemicals and materials, trash, construction and demolition debris, and sewage sludge. DWM also investigates places where these products have been made, used, stored or disposed of. If a location is identified as incorrectly storing, dumping, spilling, or leaking these products, it will be given a Notice of Violation (NOV). This requires that the owners perform a study to identify what could be done to clean up the products. An NOV could also lead to fines and legal action. Go to the [Division of Waste's website](#) or call 502-564-6716 for more information.

Sewage Treatment Plants

In areas where many people live closely together, such as cities, towns and subdivisions, there is usually a sewer system to deal with the large amount of sewage created. The system includes all of the collection pipes that carry the sewage to the treatment plant. The treatment plants vary in size according to the number of households and businesses being served. The basic function of a sewage treatment plant of any size is to remove solids from the liquid portion of the sewage and then treat the liquid in some manner that cleans it to the point that it is safe to release to a stream or lake.

Large public sewage treatment plants use a combination of different processes to clean sewage. Because these large plants receive sewage from a wide variety of sources, they must use multiple treatment processes to clean all of the types of pollution released into the system. Many of the larger systems continuously check incoming sewage to detect changes in pollution types and levels. They then adjust the treatment process to effectively clean the sewage they are receiving at that time.

Smaller plants (package plants) are usually used to treat only human body waste from a facility, cluster of homes, or small communities. These plants are designed

to treat sewage with a set process that can't change to deal with different types of pollution in the way that a larger plant can. If substances other than human body waste are released into the system, the treatment process can be harmed. These plants are required to be inspected by a licensed operator on a regular basis to ensure that the plant is running correctly.

The pipes that release treated water from sewage treatment plants of all sizes are considered "point source discharges" and require a permit from the Kentucky Division of Water. This permit describes the allowable levels of pollution that can be released from the plant.

How Does Sewage Treatment Plant Size Affect Operation?

Plant size is determined by the volume of sewage the plant is expected to treat, both now and in the foreseeable future. If a plant is too small, it can become overwhelmed and unable to provide adequate treatment. On the other hand, if the plant is too large for its current sewage load, it can also fail to operate efficiently. The maximum amount of sewage that a plant can treat daily is called its capacity. The Kentucky Division of Water keeps track of the amount of sewage that plants are treating to ensure that plants are operating efficiently for their design. The capacity information is also used to determine when it is time to redesign a system to meet current and future demands on the treatment system.

Sometimes redesigning the treatment system can be postponed by reducing the amount of water that is coming into the plant. Because most of the system is made up of the underground piping, sewer systems are difficult to maintain and repair. Often the pipes are old and beginning to break down. This leads to a situation where storm water that collects in the soil around the pipes during heavy rain and snowfall is able to leak into the pipes through cracks and holes and overwhelm the system. It also can allow sewage to leak out of the pipes and pollute streams. The amount of water from these outside sources can be large and greatly increase the amount of sewage that must be treated. This increases the costs of sewage treatment and can result in the need for a costly redesign and expansion of the treatment plant. Usually, the cost of repairing and replacing the pipes to prevent the stormwater from getting into the system can be far cheaper than expanding the treatment when a sewage treatment plant approaches the point where it is operating near its capacity, the Division of Water must begin imposing restrictions on the growth of the community. These restrictions remain in effect until the plant's capacity is increased or the amount of sewage being treated is reduced to an acceptable level. To avoid this situation, communities need to plan ahead to be prepared for future growth and to address sewer maintenance before it affects ongoing public services, investments, and/or development.

Septic Systems

Almost 95% of Kentucky is served by public water systems. However, it is estimated that over 40% of Kentucky homes have a septic system. ([University of Kentucky Cooperative Extension Publication, HENV-502](#)).

Septic systems are wastewater treatment systems for individual homes and businesses that are not served by a sewer system and treatment plant. All of the human body waste, along with water used in sinks, showers, washers, etc., that is released from the home flows into a buried septic tank. It is held there to allow the solids to settle out and the liquid is then released into perforated pipes in a drain field. The liquid slowly flows into the surrounding soil, where the soil filtration process occurs.

The low level of oxygen in the tank promotes the breakdown of the sewage by bacteria as it is held there. When the liquid seeps into the soil in the drain field, the good bacteria in the soil destroy most of the disease-causing bacteria and the rest are filtered out as the liquid moves through the soil and bedrock. These processes provide the treatment that cleans the sewage and prevents it from polluting groundwater sources. Septic tanks do require some general maintenance, including the removal of accumulated solid material, called a pump out. The pump out schedule for a tank depends on the tank size and the number of people using the system. If a septic tank is not regularly pumped out and it becomes too full with solids, the treatment process can fail. This causes the sewage to flow straight through the tank with little or no settling or treatment.

Straightpipes

A straightpipe is a pipe that carries wastewater straight from a home or business to a drainage or body of water without any approved treatment. Because of the disease-causing organisms that can be present in wastewater, as well as other chemicals that can make streams unhealthy, straightpipes pollute water that may be used for drinking water, animal watering, irrigation, fishing or recreation. For these reasons, straightpipes are illegal.

Drinking Water

People who live in Kentucky get their drinking water from a variety of sources that include streams, reservoirs, springs and wells. To have a steady supply of clean water to drink, users must pay for water treatment plants to withdraw water from these sources and use chemicals and other processes to make it clean and safe for use. The more polluted the water, the more it costs to clean it, and the more users have to pay for drinking water. Also, water can be so polluted that it isn't possible to make it clean enough for drinking water. The amount of chemicals needed to

clean extremely polluted water can create other pollution products that are dangerous to human health. Drinking water that is not treated, or that travels through poorly maintained water lines after treatment, can contain pollution that causes sickness and disease.

Clean Drinking Water

Clean drinking water is necessary for our survival, yet many of our daily activities pollute our water supply. These activities include:

- Improper disposal and handling of human and animal waste that contain viruses and bacteria
- Improper disposal of household chemicals and prescription drugs
- Improper application of pesticides and herbicides
- Failure to maintain vehicles to prevent fluid leak
- Improper trash disposal
- Removal of trees and plants growing along streams
- Failure to use erosion controls when soil is left exposed

As water runs off land surfaces or underground, it can pick up pollution from these activities and carry it to streams. This accumulated runoff pollution is a major threat to drinking water supplies and can be lessened if everyone makes the effort to change the way we perform our activities each day.

In Kentucky, drinking water systems can be publicly or privately owned systems. The publicly owned systems are regulated by the Division of Water through the Safe Drinking Water Act, which is a federal law designed to protect public health by regulating the nation's public drinking water supply. Under this law, public water systems are required to provide reports to their customers describing where the water is withdrawn and any pollution found in it.

Private Wells

Many homes and businesses use wells as their source of drinking water. These wells are easily polluted by land use practices. For example, improperly maintained septic systems or animal feed lots have the potential to introduce disease causing bacteria and viruses to groundwater. Fertilizers and failing septic systems can introduce nitrates to groundwater, which can cause shortness of breath and blue baby syndrome. Private well systems are not regulated by the state or EPA, and it is the responsibility of the landowner to test and maintain these systems. Kentuckians interested in having a well tested for drinking water pollution should contact the local health department.

Stormwater

Stormwater is simply the water runoff that is created from a storm, whether the water falls as rain, snow, hail or another form. Stormwater flows off of hard surfaces, such as roofs, roads, driveways, parking lots and sidewalks. It also flows across the surface of natural areas, such as fields, forests, lawns and gardens, that have soaked up all of the water they can hold. Stormwater runoff picks up pollution as it flows across all of these types of surfaces.

As stormwater moves over the surface of the land, it flows into gullies and ditches that carry it directly into nearby streams without any filtering or treatment. However, in most cities, towns and subdivisions, there is a system of gutters, storm drains and underground pipes that carry stormwater. This system is called a storm sewer. Because most people associate the word sewer with a sewage treatment plant, it is commonly thought that the stormwater that travels through a storm sewer is also treated at the sewage treatment plant. Unfortunately, this isn't true. The runoff in most storm sewers enters streams and lakes directly without being treated.

When areas of land are developed and the numbers of hard surfaces are increased, the amount of stormwater runoff also increases and causes more flooding. Flooding increases the power of the stormwater as it flows into ditches, storm sewers and streams. The increasing power of the flowing stormwater begins to eat away at any bare soil and stream banks. This process can cause stream banks to cave in and destroy property along the stream. It also causes large amounts of dirt and soil to enter the stream and eventually settle on the bottom of the stream. This pollutes the stream and kills fish and other animals that live there.

Groundwater

The increased runoff in developed areas also creates another important problem. Because the stormwater is quickly removed from an area through ditches, storm sewers, and streams, there is a huge reduction in the water that would normally soak into the ground and replenish the groundwater supply. This causes problems for communities and individuals who rely on well water as their source of drinking water.

Because many streams are fed by groundwater, it also causes streams to dry up more quickly during times of drought. Some storm sewers do carry stormwater into dry detention ponds or wet retention ponds where the power of the flow of the water is slowed down and settling and filtering take place to remove some pollution from the water. A dry detention pond fills with stormwater and then releases it slowly over a few days allowing some pollution to settle out. It isn't designed to hold water all of the time. A wet retention pond fills with stormwater

and holds it until a flood overflows the pond and carries in new stormwater. It is designed to hold water all of the time and it allows water to seep into and replenish the groundwater, pollution to settle out, and pollution to be filtered by plants growing in the pond.

What are overflows?

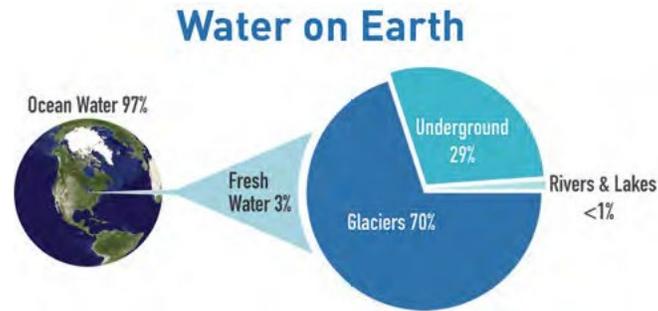
In many older cities, storm sewers were originally built to connect with the pipes that carry sewage. However, as the cities expanded and more hard surfaces were built, the amount of stormwater entering the combined sewer system increased and began to flood the system. This has caused large amounts of water mixed with sewage to bypass the sewage treatment plant and flow directly into streams without any treatment. Sometimes the flood of stormwater and sewage in the system is so large that it flows out of sewage manholes into streets, yards, streams, etc. These combined sewer overflows (CSOs) cause human health problems and polluted streams. For these reasons new combined sewers aren't allowed to be built and cities are required to reduce, or eliminate, the overflows from their combined systems.

In cities with sanitary sewer systems built to carry only sewage, stormwater can still cause problems. Because sewer pipes are mostly underground, it is difficult to see any weakening or wear and tear that occurs. Identification and maintenance of these problems is expensive and often neglected. The pipes can develop leaks and cracks that let sewage flow out during dry times and stormwater flow in during wet times. During heavy storms, the amount of stormwater entering the pipes floods the system and can cause untreated sewage bypasses or sanitary sewer overflows (SSOs) from manholes. These sewer overflows also cause human health problems and polluted streams.

Water Quantity & Availability

Even though most of Earth is covered with water, only 3% of it is fresh water (as opposed to saline (salty) water). Most of this small amount of fresh water is frozen in ice caps and glaciers or trapped underground. Only a very tiny amount of it is available for human use and we have polluted much of it. From this tiny amount of fresh water, the billions of people on Earth have to get all of the water that is needed for humans to drink and survive. In addition, large amounts of water are used everyday to grow food, to make electricity, to water lawns, and to make

products like furniture, cars, appliances, lumber, paint, etc. Unfortunately, a lot of this water is wasted, too.



Kentuckians get the water they need to survive in several ways. Some people get drinking water from a local or regional water utility. The utility pumps water from a stream, lake or reservoir or from a groundwater well and move it through pipes to a water treatment plant to be treated. From there it is sent through more pipes to homes, businesses and industries as clean drinking water. People who don't have a way to connect to a water treatment system must rely on private wells, springs or streams that provide untreated water for their use. Some people aren't able to use either of these sources of drinking water and must rely on cisterns that collect rainwater or buy and haul the water they use to fill their cistern.

However, as the number of humans on the planet increases, more food must be grown, more stuff must be manufactured, and more water is required to meet these increased needs. In addition, more humans result in more hard surfaces such as rooftops, driveways, sidewalks, roads, etc. These hard surfaces prevent rain and melting snow from soaking into the ground to replenish groundwater. This reduces the amount of water available to meet the increased needs.

Droughts

As weather patterns change and droughts become more frequent, there are more changes in the amount of water available in streams, lakes and groundwater. If less water is being returned in the water cycle than is being withdrawn, this throws off the balance of the cycle and results in water shortages in some areas. Certain water suppliers in Kentucky are required to get water withdrawal permits from the Kentucky Division of Water. The permits identify the amount of water the supplier can withdraw from a stream, lake or well. The amount in the permit is based on the needs of the community, the amount of water available and the effects on other users and wildlife. During times of drought, there is less water available, both in the streams and in the groundwater reserves. A water system's permitted withdrawal amount may be reduced until water availability improves.

Working farms, home water users and steam generated electrical power plants, are not required to get a withdrawal permit. After the drought in Kentucky in 1988, the state legislature created the water supply planning program in the Division of Water. The purpose of this planning process is to determine current and future water needs for each county and to develop water supply alternatives so that water needs will be met and water service provided to all unserved areas by 2020.

Flooding

Flooding is Kentucky's most common natural disaster, and has high financial and emotional costs. More powerful weather systems coupled with increasing human effects as the world population grows contribute to larger floods that happen more often and in more areas. Although the weather can't be controlled, damages resulting from floods can be limited through proper land management. Any increases in hard surfaces, such as parking lots, rooftops, sidewalks and driveways, reduce the amount of rain and melting snow that soak into the ground. This, in turn, increases the runoff that enters the streams and lakes in the watershed. This increases the likelihood of flooding and associated flooding damage. In addition to manmade hard surfaces, other human influences that increase flooding are the removal of plants, shrubs and trees along the banks of streams, soil compaction by many activities such as overgrazing by livestock, and the filling of wetlands in the area that drains to the stream. These areas soak up water during storms and then release it slowly after the storm is over. This helps reduce the size and duration of the flood. Also, straightening and dredging streams increases the speed and amount of water flowing through them during a flood, which increases the damage from flooding.

Managing construction and other activities that damage or destroy natural areas on the land that drains to a stream or lake (watershed) will reduce the size and number of floods that occur. The Kentucky Division of Water's Floodplain Management Section has the responsibility for the approval or denial of proposed construction and other activities that occur in the floodplain of all streams in the state. A permit is issued for any approved activity. Typical floodplain activities requiring permits are the construction of dams, bridges, culverts, residential and commercial buildings, placement of fill, stream changes, small man-made lakes or reservoirs and water and sewage treatment plants.

Flood maps have been created to identify areas that are likely to flood and are used by the Division of Water when permit applications are reviewed. The flood maps for a community should be available for review at the local county courthouse, city hall, local planning and zoning or city/county engineer office.

Copies of flood maps are also available from the [Federal Emergency Management Agency \(FEMA\) Map Service Center](#).

Protect your Land

Plants, Animals & Natural Areas

The plant and animal life of Kentucky, from the swamps in the western part of the state to the rich Appalachian forests in the east, is extraordinary as well as beautiful. Forests, wetlands, rivers, prairies and caves form a web of life that is unique to the state. These areas are home to a large variety of plants and animals that are native to Kentucky, and some of those are not found anywhere else in the world. The streams in the state are especially distinctive. They are home to rainbow darters, ghost crayfish, salamander mussels and many other kinds of animals. The variety of plants and animals in some of our streams is greater than most other freshwater streams on Earth. This variety depends upon clean water to survive.

What is a State Nature Preserve?

A state nature preserve is a legally dedicated area that has been recognized for its natural significance and is protected by law for scientific and educational purposes. These areas are managed by the Kentucky State Nature Preserves Commission (KSNPC) and are established to protect and preserve rare species and the natural environment. Public visits are encouraged, but are closely regulated to protect the natural features of the preserve. This ensures the preserve can be passed on in a healthy condition to future generations. For more information about rules for visiting state nature preserves, go to [State Nature Preserves' website](#) or call 502-573-2886.

What is a State Natural Area?

A state natural area is a site jointly managed by the Kentucky State Nature Preserves Commission and the Kentucky Department of Fish and Wildlife Resources (KDFWR). These areas are also dedicated to permanently protect rare species and the natural environment, but they are different from state nature preserves in that regulated hunting is allowed. For more information about rules for visiting and hunting in these areas, go to the [State Nature Preserves' website](#) or call 502-573-2886.

What is a State Park?

Kentucky supports more than 50 state parks. The parks highlight the natural features throughout the state. Through the work of state park naturalists,

Kentucky State Parks protect and preserve these features. The Parks have numerous events planned for each season to provide visitors with opportunities to learn about and enjoy the natural wonders our state has to offer. For more information, visit the [State Park's website](#) or call 800-255-PARK (7275).

What is a Wildlife Management Area?

Wildlife Management Areas in Kentucky are areas that are owned, leased or managed by the Kentucky Department of Fish & Wildlife Resources (KDFWR). Wildlife management practices on these areas provide food, cover and water for a wide variety of species. Plantings and farm crops left standing in the field are important food sources for wildlife. Brushy areas, non-mowed fields and woods provide natural foods and shelter for wildlife. Ponds and watering holes supply additional sources of water for animals and provide homes for species that live in the water or use it for part of their life cycle. The KDFWR works to conserve and enhance fish and wildlife resources and provide opportunities for hunting, fishing, trapping, boating and other wildlife related activities. For more information, go to the [Department of Fish and Wildlife's website](#) or call 800-858-1549.

What is the Kentucky Wild Rivers Program?

The Kentucky Division of Water is preserving the state's most unspoiled rivers through the Wild Rivers Program. Sections of nine rivers have been designated as Kentucky Wild Rivers because of their exceptional water quality and natural beauty. Each Wild River includes all visible land on each side of the river up to a distance of 2,000 feet. The Wild Rivers system recognizes those rivers that still have many of their natural qualities and protects them from unwise use and development. Some activities are illegal within a Wild River area, such as surface mining, clear-cutting of timber and construction of dams or other in-stream disturbances. Existing residential and agricultural uses continue, but activities that might damage the river's clean water or natural condition are regulated through a permit system. For more information, go to the [Division of Water's Wild Rivers webpage](#) or call 502-564-3410.

What is the Kentucky Heritage Land Conservation Fund?

The Kentucky Heritage Land Conservation Fund provides funding for preserving and conserving natural areas that have unique features related to rare and endangered species, bird migration and natural functions. The Fund helps state agencies, local governments, colleges, universities, and other public agencies protect natural resources by purchasing land. This land is open to the public for hiking, paddling, and enjoying nature. When you buy a "Nature's Finest" license plate, the money from that sale goes into the Fund. The purpose of the Fund is to buy natural areas that are to be left as protected places, held in trust for future

generations to enjoy. For more information, go to the [Kentucky Heritage Land Conservation Fund webpage](#) or call 502-564-2320.

What is the "Partners for Fish and Wildlife" Program?

The U.S. Fish and Wildlife Service's Partners for Fish and Wildlife Program (Partners) assists with the restoration and improvement of areas in Kentucky that support threatened and endangered species and birds that migrate, such as waterfowl, songbirds and shorebirds. Approximately 94% of Kentucky is privately owned, and the goals of the Partners Program can't be met without conservation efforts on private lands. Many private landowners in Kentucky want to restore and conserve areas for fish and wildlife, but often don't have the money or expertise to accomplish this. The U.S. Fish and Wildlife Service uses the Partners Program and, along with its other conservation partners, works with private landowners to provide the funding and knowledge needed to ensure critical areas are healthy and protected for the future. For more information, visit the [U.S. Fish & Wildlife Service website](#) or call 502- 695-0468.

What are Threatened and Endangered Species?

The human impact on the places where plants and animals live can cause a decline in the numbers of some, or all, species in the area affected. Those groups that have been reduced to the point that they are on their way to disappearing from these areas are identified as endangered. If the group is close to the point of being endangered, they are identified as threatened. A species can be endangered or threatened in one area, in a state, in the nation or in the world. Because streams are so easily polluted by human activities and stormwater runoff, many species that live in streams for all, or part, of their life cycle are considered threatened or endangered. A list of state or federal endangered or threatened species in Kentucky is published by the Kentucky State Nature Preserves Commission. The lists can be found on the [State Nature Preserves' website](#) or by calling 502-573-2886.

What are Invasive Species?

An invasive species, also called a nuisance or exotic species, refers to plants or animals that are introduced to a new environment, often from another country. Since the introduced species did not develop in the new environment, it often does not have any natural enemies that eat it and control its numbers. This means the new species can take over and crowd out the native species that are normally found there. In Kentucky, there are several examples of invasive plants that have taken over streambank vegetation, including:

- Winter Creeper (*Euonymus fortunei*)

- Bush Honeysuckle (*Lonicera maackii*)
- Japanese Knotweed (*Fallopia japonica*)

Zebra mussels are an example of an invasive animal that has become a nuisance in waters of Kentucky and crowded out native mussel species.

Watershed Management

Kentucky Division of Water Regulatory Programs

The Clean Water Act requires all waters of the nation to be drinkable, swimmable and fishable. To support this goal, states must develop legal requirements and programs to protect streams, lakes and groundwater from direct releases of polluted water (point source pollution), and from runoff pollution (nonpoint source pollution). In Kentucky, some of these programs that are run by the Division of Water include:

- Kentucky Pollutant Discharge Elimination System (KPDES) Program – this program sets water pollution by setting limits on the amount of pollution that can be released into streams and lakes in Kentucky from pipes and ditches that carry polluted water from sewage treatment plants, industries and other processes.
- Municipal Separate Storm Sewer System (MS4) – this is a KPDES permit that requires some cities and towns to manage runoff from storms to reduce runoff pollution in streams and lakes.
- Floodplain Management Program – this program reviews activities to be conducted on the land along the stream that has the potential to flood. Construction and associated activities, such as dredging, placing fill material, and stabilizing streambanks, are reviewed to rule out activities that increase flood damage.
 - Anyone who plans to do any of these activities in a floodplain must get a Floodplain Construction Permit before any activities are started. To determine if you are in the identified areas of a floodplain, visit FEMA's Map Service Center.
- Water Withdrawal Program – this program oversees any withdrawal of more than 10,000 gallons of water per day from any stream, river, spring or groundwater source – this makes sure the water taken out doesn't affect the ability of the water to support the animals that live there and meet its identified uses.

- Removed water that is used for household purposes, agriculture (including irrigation), steam-powered electrical generating plants, or injection underground (oil and gas operations) is not covered by the rules of this program.
- Groundwater Protection Plan Program – through this program, anyone engaged in activities that could possibly pollute groundwater must develop and use a Groundwater Protection Plan to protect groundwater.
 - The plan identifies any activities at a business or property that could release pollution that could get into the groundwater – it also describes the ways to reduce or prevent that pollution.
- Well Drillers Certification Program – through this program, certificates are issued by the Division of Water to well drillers who pass the test on Kentucky’s requirements for putting in water supply wells and monitoring wells.
 - The test covers the information needed to make sure the wells are installed properly so they don’t allow pollution to get into the groundwater. Well drillers must have the certificate to be licensed to put in wells in Kentucky.
- Wellhead Protection Program – through this program, any county with a public water system that gets its water from groundwater is required to develop a county or regional water supply plan that describes the amount of water used by their public water system. Protection areas include all the land where rain soaks into the ground and is drawn by the public water system. The plan also requires the identification of potential sources of pollution, and the activities needed to prevent them from entering the groundwater. In most counties, the local Area Development District (ADD) develops a regional wellhead protection plan.

Ways we manage watersheds

After the Clean Water Act requirements were established, governments, water protection groups and citizens began working on projects to improve stream and lake health. As time passed, they began to realize that many projects didn’t bring the improvements they expected. After taking a close look at the way they decided where and what types of projects were needed, it became clear that a more detailed study of stream and lake health problems and causes would be necessary to successfully fix them.

In the 1990s, a new approach to improving water health was developed and is used by many states, including Kentucky. This approach focuses on taking a detailed look at all of the ways the land in a watershed is being used, as well as the conditions of the water and the stream channel in different areas of the streams or lakes. The evaluation of these details identifies many of the possible sources of pollution in a watershed. When the locations of the possible sources of pollution and the locations of the healthy and unhealthy parts of the stream are looked at together, it is possible to determine which parts of the streams need work and which parts need protection. With this information, the areas of the stream needing improvement can be considered and put in order of importance. This allows repair or protection projects to be focused on the areas with the biggest need and results in more success in keeping streams and lakes healthy, or fixing problems and making them healthy again. Using these steps to evaluate problems and base decisions for protecting or fixing water health on detailed information collected in the watershed is called watershed management.

Because watersheds can have different causes of pollution and different water health problems, and these can change over time, watershed management methods can be changed as new information becomes available. Watershed management is also meant to include a variety of partners that have an interest in the watershed, such as local governments, home and business owners in the watershed, citizens who want to take care of natural resources, student groups, and others.

Effective watershed management involves organizing a group of partners who are interested in protecting or fixing the stream or lake problems, developing a watershed management plan that identifies problems and recommends solutions, and putting into practice the solution activities recommended in the plan.

[Healthy watersheds](#) provide many benefits that are necessary for our social and economic well-being, and they provide them much more cheaply than manmade projects that are intended to provide the same benefits. By protecting healthy watersheds, we can:

- Lower drinking water treatment costs
- Avoid expensive activities needed to fix watershed problems
- Allow continued recreation and tourism opportunities that add dollars to the economy
- Reduce the effects and damage from natural disasters
- Increase property values

It is proven and well-documented that preventing watershed damage is much cheaper and more successful than trying to fix things after the damage has happened. Trying to fix a damaged watershed and its polluted stream or lake is a challenge that requires a big investment of time and money. Improvements often take a long time to appear and some activities intended to fix things can actually make them worse.

Watershed Planning

Watershed planning is a group approach that can be used to improve a variety of water-related problems, and to protect healthy streams and lakes. It allows people with an interest in the watershed to share information, effectively use limited money, and find solutions to common water-related challenges, including:

- Improving stream and lake health
- Protecting groundwater
- Collecting or slowing down stormwater to allow it to soak into the ground and be released slowly into streams or lakes
- Reducing the washing away of soil and flood damage
- Using open spaces, such as parks, properly
- Protecting places where wildlife live
- Providing safe recreational opportunities
- Supporting opportunities for economic development
- Improving construction and farming practices

In Kentucky, the [Watershed Planning Guidebook for Kentucky Communities](#) (KDOW, 2010) was created to outline a step-by-step process for developing an effective watershed plan.

Basin Coordinators

To more effectively work to improve water health, the Division of Water divides the state into seven major river watersheds (also called basins). The Division, or a partner organization, employs a person in each of the major river basins to assist local governments and groups with watershed management activities and local watershed projects. These employees are called Basin Coordinators and they are the contact between the Division of Water and concerned citizens, other government offices, universities, and other organizations that work on watershed/basin problems. They provide assistance needed to understand the information available about the river basin, as well as help to develop and implement watershed plans.

Technical Assistance

Name of group or organization	What they do	How to contact
Basin Coordinators	Assist with forming watershed groups, organizing and running meetings, identifying possible partners, and locating possible sources of money for projects	Visit the Kentucky Division of Water Basin Coordinator website page or call 502-564-3410 for more information about the Basin Coordinator in your region.
Watershed Watch	Volunteer water sampling group. This organization can provide past and current sampling results for your stream.	Visit the Kentucky Division of Water website to find the Watershed Watch group in your area or call 502-564-3410 for additional information.
Kentucky Water Research Institute	This center at the University of Kentucky can provide groups with advice and/or a list of possible partners.	Visit the Kentucky Water Research Institute webpage .
Kentucky Department for Public Health	Protect the health and welfare of our citizens. The Environmental Management Branch assists with Septic Systems and Wastewater Treatment programs.	To learn more visit Kentucky Department for Public Health Environmental Management Branch .
Kentucky Division of Conservation	Provide assistance to develop, administer and implement sound conservation programs across the state. Assistance includes solving soil and water resource problems.	Visit the Kentucky Division of Conservation
Kentucky's Area Development Districts (ADDs)	Provide planning and other services for regional counties, including assistance with needs related to water and sewer lines	To find the Area Development District in your region, please visit Kentucky Area Development Districts web page .

Assistance Finding Money for Projects

The Division of Water manages a grant program that can provide money for a group to get organized and develop a watershed plan. This program is the Section 319(h) Nonpoint Source Grant. Once a watershed plan has been developed and approved, the Section 319 grant money can be used to complete the projects and activities identified in the plan to improve water health and reduce runoff pollution.

- Low interest loans are available to complete the some of the projects and activities identified in an approved watershed plan to improve drinking water sources, or for wastewater projects. These loans are from the [State Revolving Fund \(SRF\)](#).
- Cost share programs are available from the [Natural Resources Conservation Service](#) to install or build best management practices (BMPs) for farms.
- Money is available for stream and wetland repair projects. This money is managed by the Kentucky Department for Fish and Wildlife Resources and is called the [“Fees in Lieu of” \(FILO\) restoration fund](#).
- Grant programs that can improve stream health are available from the US Fish and Wildlife Service, including:
 - [Partners for Fish and Wildlife Program](#) - provides money to private landowners who want to fix or protect the natural places where animals can safely live on their property.