

Upsetting the balance

Many factors can adversely affect water quality

Extremes in water flow

When rain hits unpaved surfaces, it soaks into the ground. Much of this water is absorbed by plant roots and is stored in soil. Some of the water gradually seeps from the soil and enters streams and creeks. Stream flow increases slowly and later decreases slowly.

When rain hits pavement and other impervious surfaces, the water does not get a chance to filter through the soil; it instantly becomes runoff. The runoff rapidly moves across land surfaces to streams and rivers, picking up sediment and pollutants as it travels. Once it reaches the streams and rivers, this runoff causes a rapid increase in flow, which can flush fish, insects and other creatures away before they have time to retreat to safe areas.



Pages 2 and 3:

An eroded stream bank illustrates the damage caused by rapid increases in water flow.

Particles transported by the rapidly moving water can act as a sandblaster, a process called scouring. Scouring can undercut root systems and destroy aquatic vegetation and aquatic animals. In addition, it can destroy microscopic organisms that larger animals, such as fish, feed on.

The rapid increase in flow also can cause habitat loss by eroding stream banks, adding sediment to streams and washing away vegetation and objects such as rocks and logs that provide shelter for animals living in the stream.

As a result of development, more water moves across the land surface and less water soaks into the ground, with little water being stored in soil. Water that was once gradually released from soil is no longer available to maintain stream flow during drier periods. This decrease in flow causes stream temperatures to increase, and this increase lowers the water's ability to carry oxygen. Low oxygen levels can kill fish. In addition, sometimes flow is so low that there is simply not enough water to support aquatic organisms.

Sediment

When too much sediment is washed into streams, it causes several problems. It can smother organisms that other creatures depend on for food. It can clog the gills of fish and other aquatic life. It can cover what had been suitable habitat. And chemicals in the sediment can deplete the oxygen that aquatic life needs.

Bacteria

Fecal coliform bacteria are found in the intestines and feces of warm-blooded animals, and the presence of these bacteria in water can indicate contamination from sewage. High levels of these bacteria can indicate the presence of organisms that cause contagious diseases, including hepatitis. According to the Kentucky Division of Water, high levels of these bacteria have made 15 segments of Jefferson County streams unfit for recreation involving contact with the water. The Jefferson County Board of Health recommends avoiding all contact recreation in all Jefferson County streams.



Chemicals

High levels of many chemicals can kill aquatic life or cause mutations in it. Similarly, extreme acidity or alkalinity can have a negative impact on aquatic life. Streams can become too acidic if too much organic matter is dumped into them during low flows. Conversely, they can become too alkaline when lime washes into them from chemically treated croplands, golf courses or lawns.

A similar problem involves high nutrient levels. Nitrogen and phosphorus found in streams are generally referred to as nutrients. Although the term nutrients usually has a positive connotation, high nutrient levels can harm or kill aquatic communities. High nutrient levels can be caused by a variety of factors, including discharge from small wastewater treatment plants, septic tank seepage, overflows from sanitary or combined sewers, fertilizer runoff or animal waste. Also, when people over-fertilize their lawns, the excess chemicals are washed into streams during rainfall. High nutrient levels can increase the growth of algae, which can deplete oxygen levels, suffocating fish and other aquatic life.

In winter, salt applied to parking lots and roads washes into streambeds, producing conditions unsuitable for life in the streams. Likewise, high levels of metals in waterways can be toxic to stream organisms. MSD tests for a wide range of metals, including mercury, arsenic, lead and cadmium, and has found unacceptable levels of one or more metals in every stream sampled in Jefferson County. However, metals violations can be the result of natural geology. For example, the shales in this area have a high metals content and may contribute to metals violations in Jefferson County streams.

Like metals, pesticides and herbicides can produce toxic effects in streams. Pesticides and herbicides are often found in streams after spring storms, when they are washed off the surrounding land. Area residents can reduce their dependence on pesticides and herbicides by planting more native plants, which are more pest- and disease-resistant than non-native plants; by mulching and using compost rather than using commercial fertilizers; and by planting trees and shrubs on some parts of their property now covered by lawn.

Habitat Loss

Riparian areas are important to the health of streams. A riparian area is land located along a body of water. A healthy riparian area has four features: a canopy of tall trees, an understory of smaller trees, a shrub layer and a layer of groundcover. Riparian vegetation helps to filter pollutants and debris, as well as to stabilize stream banks. Riparian areas also regulate water temperatures by shading the stream, which increases the stream's ability to hold oxygen.

Riparian plants provide leaf litter to streams, and aquatic insects utilize this litter as a food source. When streams lose their riparian buffers, they become more prone to erosion, pollution and a decline in the number and diversity of aquatic communities.

Likewise, wetlands are important to the health of watersheds. Wetlands contain plants and microorganisms that help to filter excess nutrients and toxins before they can reach streams. Wetlands also function as sponges, absorbing floodwaters that otherwise could cause problems in residential or commercial areas. Wetland communities include riparian forests, swamps, wet meadows and hardwood bottomlands.

Biologically, wetlands are rich and diverse ecosystems, teeming with migratory birds, fish, amphibians and plants. Yet wetlands are often under-appreciated and are often filled or drained for development. Watersheds can be enhanced by preserving these vital ecosystems and by restoring them wherever appropriate sites are available.

The big picture

Collecting the fecal data

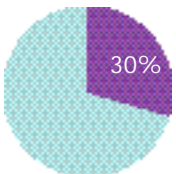
The findings in the graph below are based on water samples collected year-round for eight years and analyzed for fecal coliform. According to state standards, a minimum of five samples should be collected from a site each month from May to October. Because of limited resources, MSD collected samples from each site approximately once every four to six weeks.

For more detailed information, see "Water Quality in Jefferson County, Kentucky: A Watershed Synthesis Report, 1991-1998."

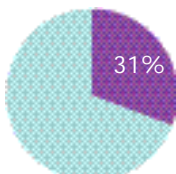
Legend

- Watershed Boundary Lines
- Water Quality Sampling Site
- Stream Monitoring Site
- Rain Gauge

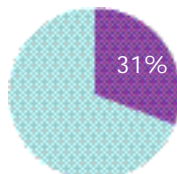
Fecal Bacteria Levels Exceeding Recreational Standards



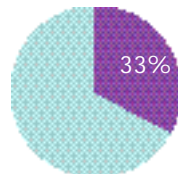
Cedar Creek



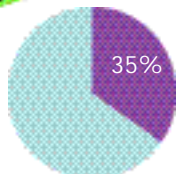
Harrods Creek



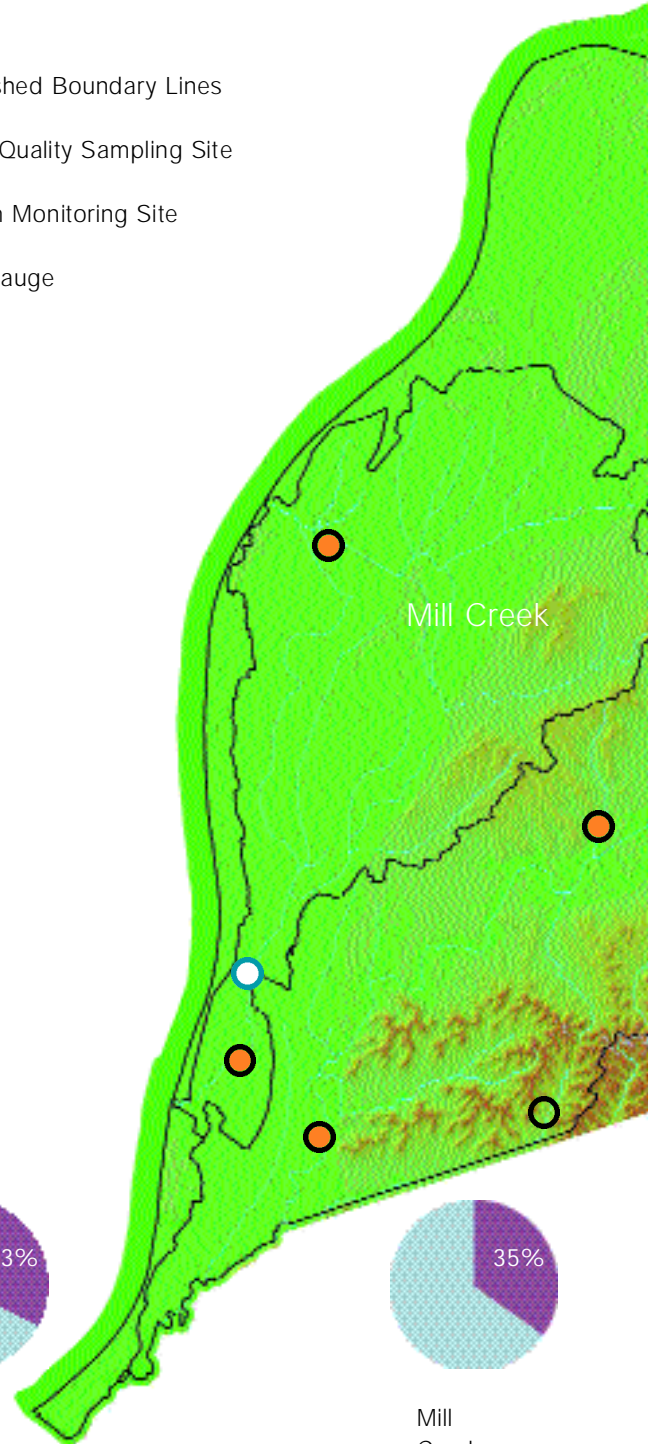
Beargrass Creek
Muddy Fork

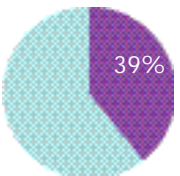
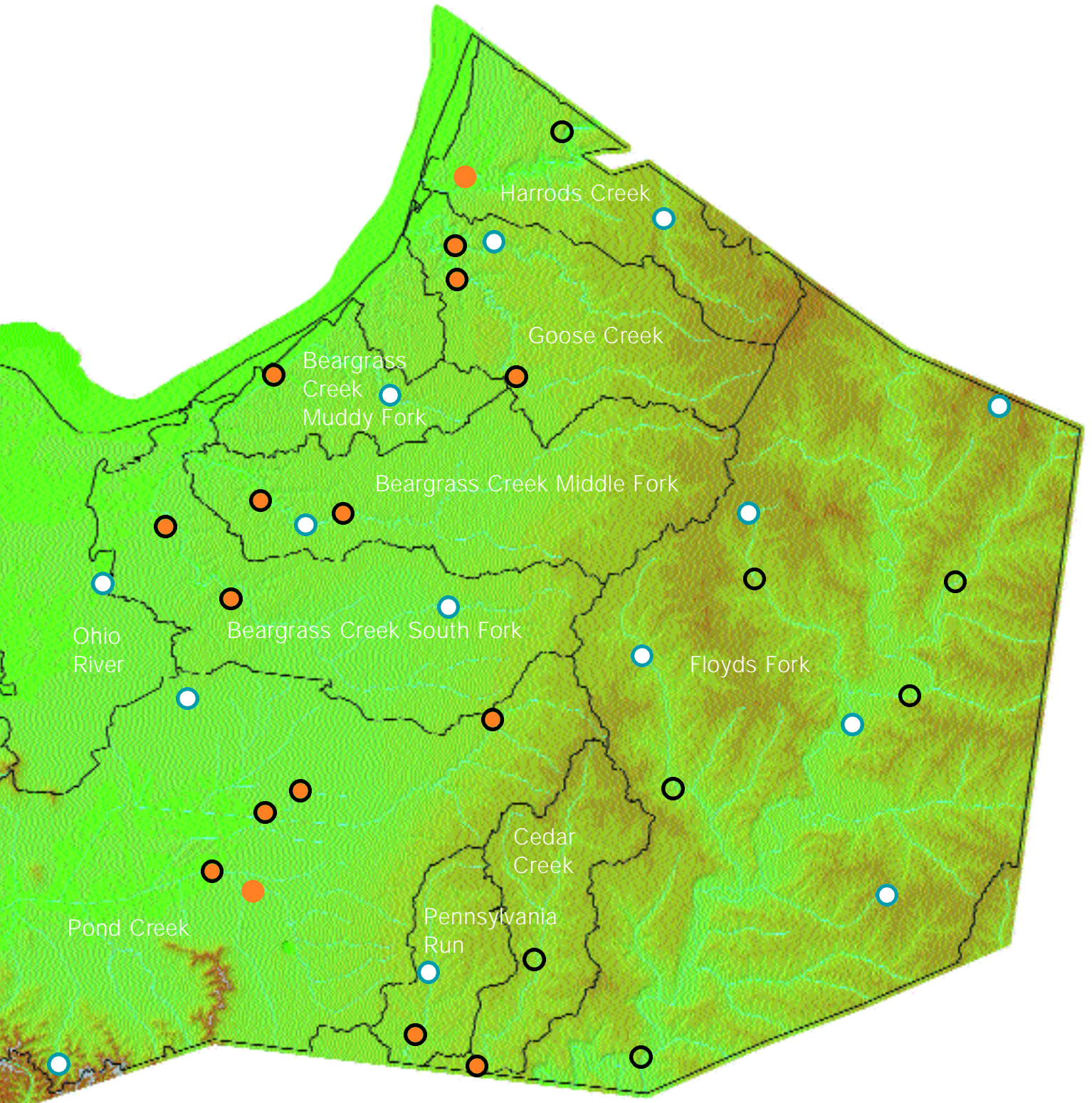


Goose Creek

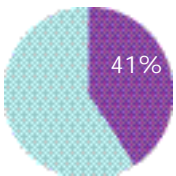


Mill Creek

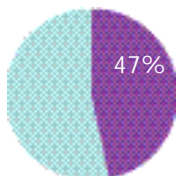




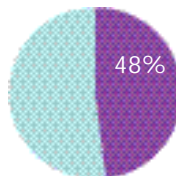
Floyds Fork



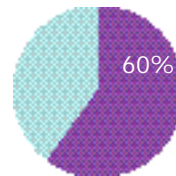
Pennsylvania Run



Beargrass Creek Middle Fork



Pond Creek



Beargrass Creek South Fork