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Muddy Creek Watershed

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In the 1960s government officials started to realize how polluted streams, rivers and lakes of the U.S. had become. In 1972, Congress passed laws, known as **The Clean Water Act** (CWA), to protect surface water. The goal of the CWA is for all waters in the U.S. to be safe for swimming, fishing and drinking (called **uses**).

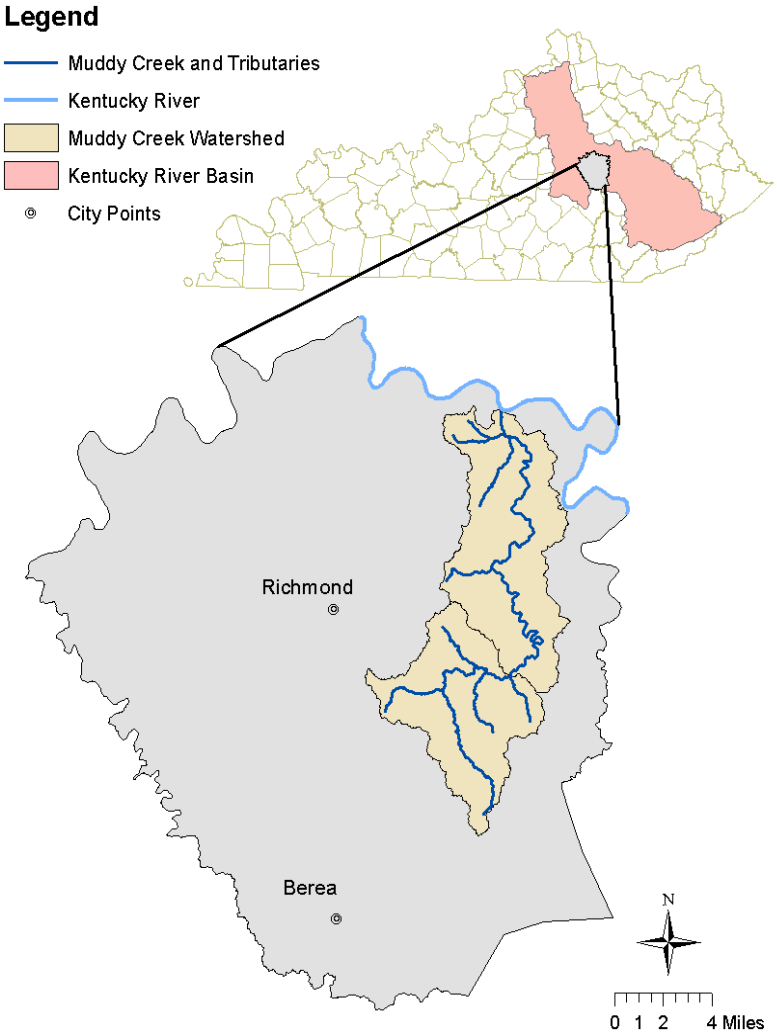
We rely on local water sources for water to drink. We pay water treatment plants to withdraw and treat water with chemicals or other processes to make it safe for drinking. The dirtier the water, the more expensive it is to clean the water, which makes drinking water more expensive. The cleanliness of water is also referred to as **water quality**.

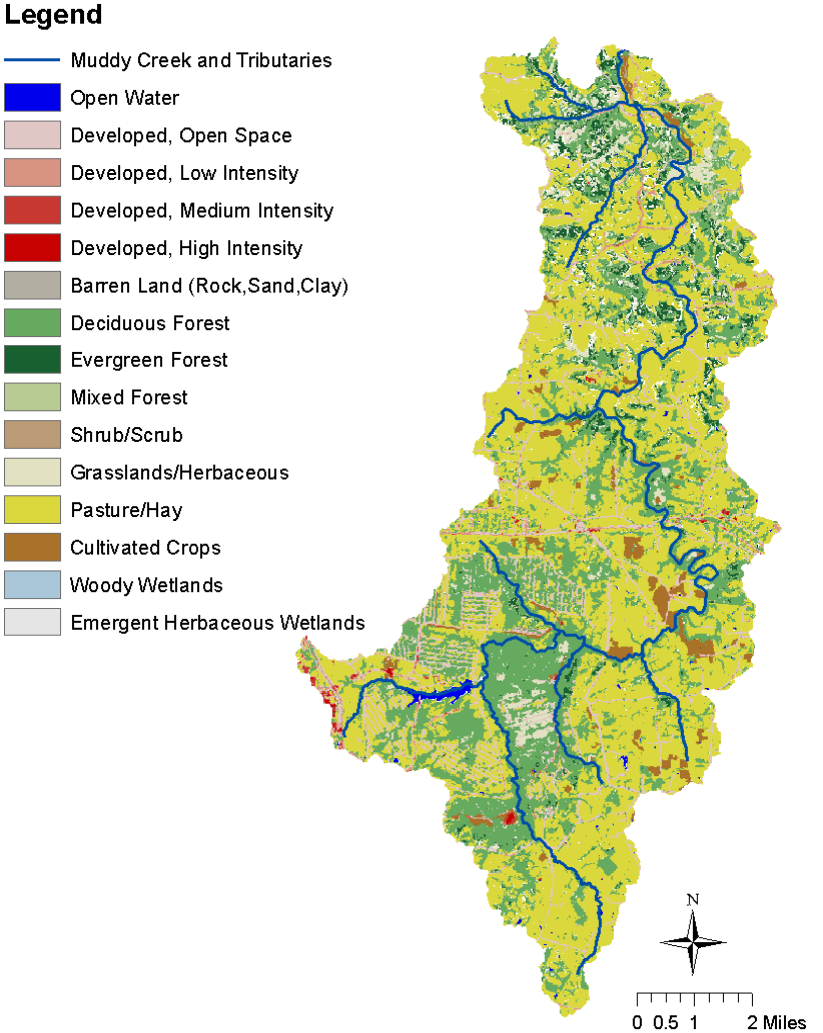
We all affect water quality because we all live in a watershed. A **watershed** is an area of land where runoff flows to a common stream. When streams come together, the two streams' watersheds combine to make a larger watershed. The **Muddy Creek** Watershed (see map below, left) is a small watershed within a much larger watershed called the Kentucky River Basin.

There are two types of pollution that can affect a watershed: **point sources** and **nonpoint sources.** Point sources are any distinct points from which pollutants are or may be discharged. Examples include any pipe, ditch, channel, tunnel, well or concentrated animal feeding operation. Nonpoint sources are pollutants originating from the land surface that have no well-defined source. The pollutants are generally carried off the land by storm water.

Land use is the best way to understand how humans may potentially pollute the watershed in which they live. Cities and towns tend to have more point sources due to the number of facilities required to clean the water used in households and businesses, and may also have an increase in nonpoint sources due to impervious surfaces such as roads, parking lots and sidewalks. Rural areas tend to have more nonpoint source pollution associated with agriculture. Animal waste, fertilizers, pesticides and loose soil, which is exposed when trees are cut down, may enter the stream during rain events.

The map below (right) shows the land use for the **Muddy Creek** Watershed. Much of the watershed is yellow, demonstrating that the major land use is pasture/hay. However, green also dominates the land use map, demonstrating that forest is a major feature of the landscape.





How is a waterbody used?

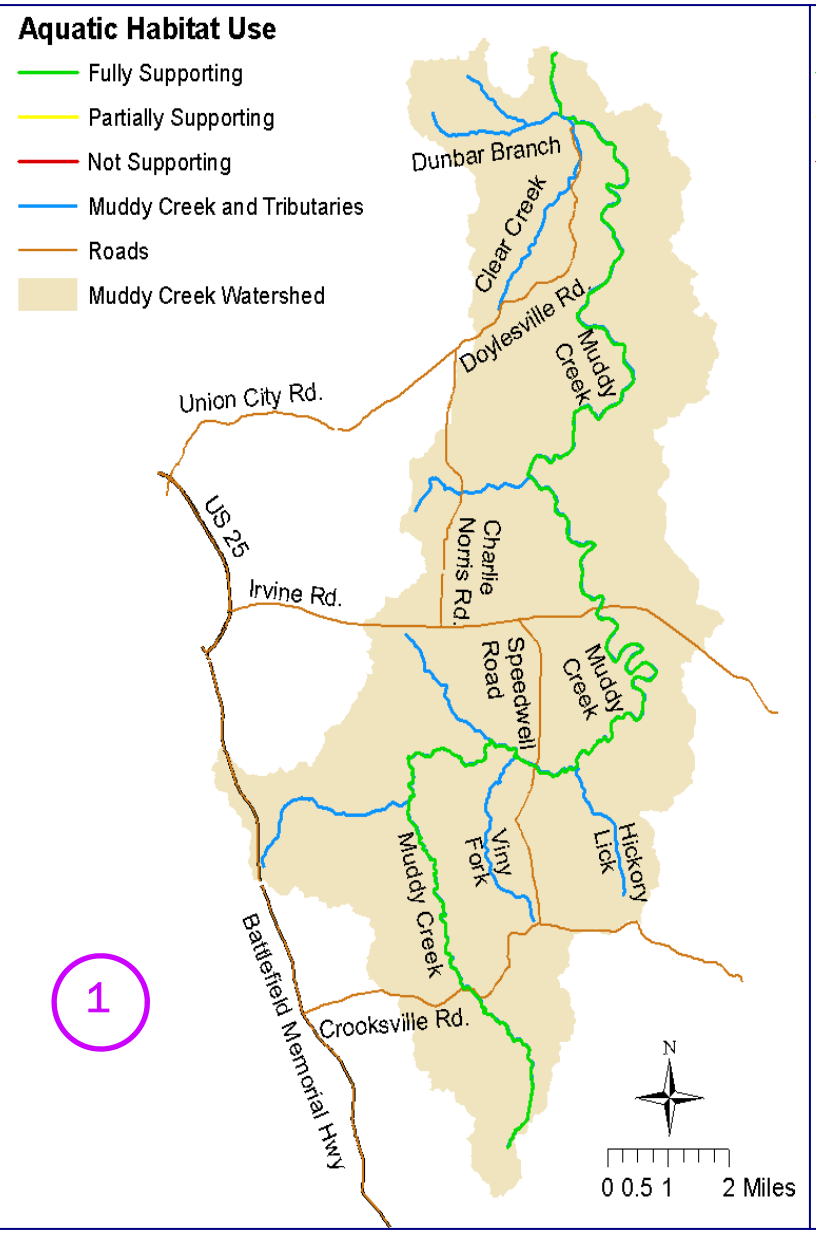
The Clean Water Act (CWA) requires states to submit a report to congress, called the 305 (b) list, which reports the water quality of streams, rivers and lakes within the state that have been assessed. To prepare this report, the Kentucky Division of Water (DOW) identifies the designated uses of a waterbody and then assess the waterbody to see if the water is clean enough to meet these uses.

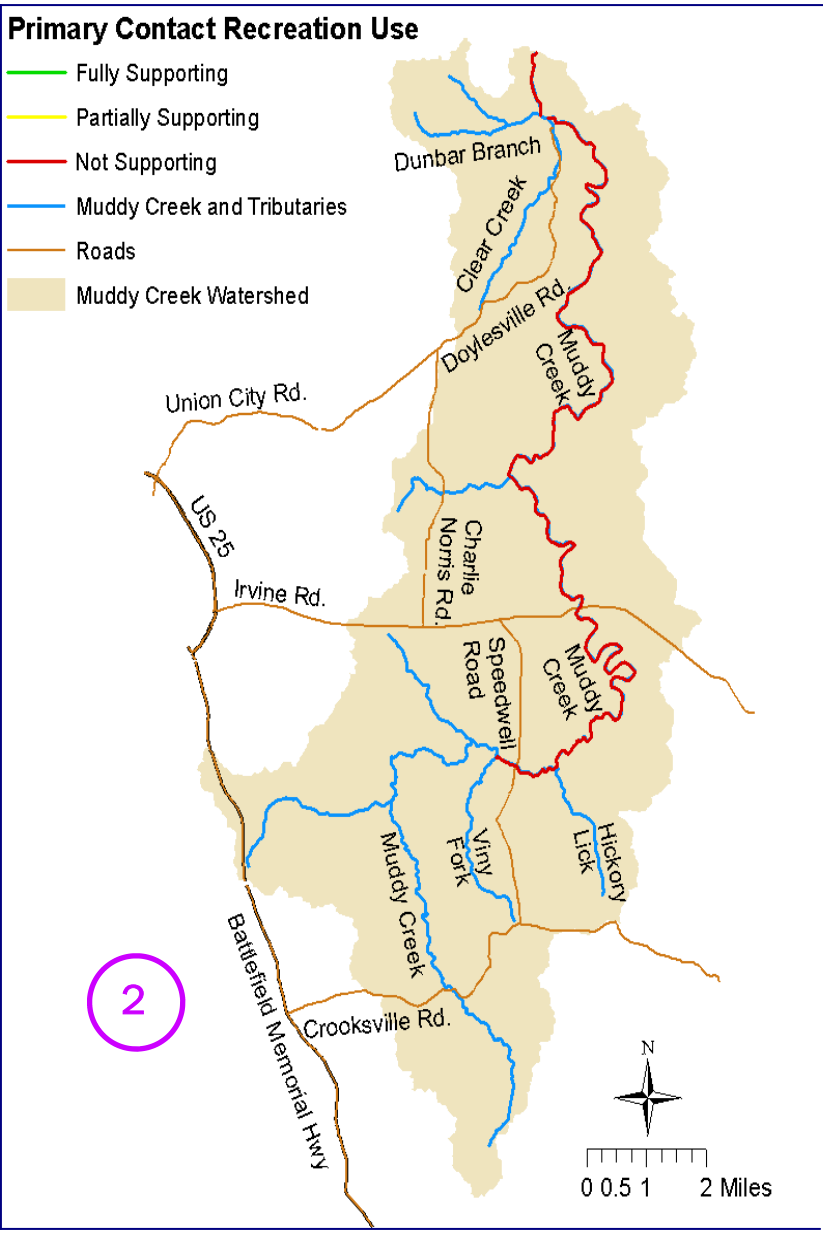
Designated uses for Muddy Creek are:

- Aquatic Habitat (map 1) - water quality promotes a healthy population of plants and animals that live in the water
- Primary Contact Recreation (map 2) - water is safe for human swimming.

Upon assessment, it was determined that Muddy Creek fully supports the Aquatic Habitat Use. Therefore, its entire length is highlighted green in map 1. Conversely, it was found that Muddy Creek does not support the Primary Contact Recreation Use. Therefore, river miles 0—20.2 are highlighted red in map 2. Since Muddy Creek does not meet its Primary Contact Recreation Use, it is considered impaired.

For a stream to be listed as impaired for Primary Contact Recreation, *E. coli* concentrations exceeded the level considered safe for swimming at least 20 percent of the time when the assessment was completed. When *E. coli* concentrations are elevated, there is a risk of gastrointestinal illness if the water is swallowed or infection if contact is made with an open sore or wound.





Another requirement of the CWA is the **303 (d) list of impaired waters.** This report lists all of the assessed waters from the 305(b) list that partially support or do not support their uses and identifies the pollutant that is causing the impairment.

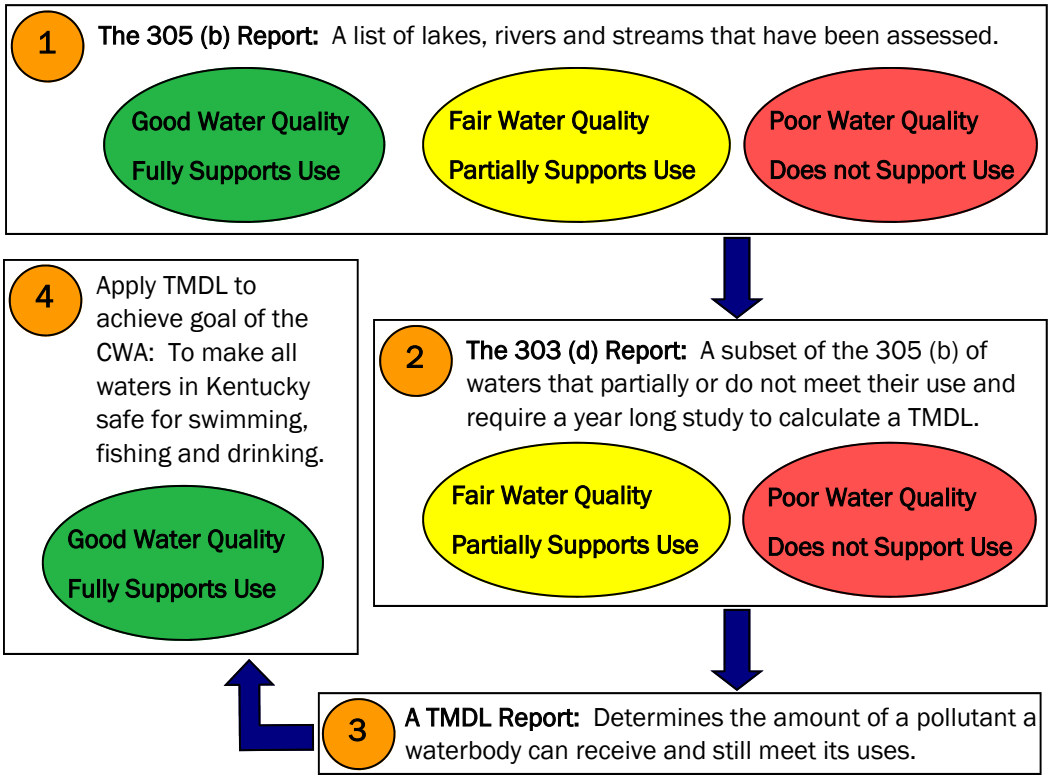
Impaired waters on the 303(d) list are required to have a **Total Maximum Daily Load** (TMDL) calculated for each pollutant. A TMDL calculation is the total amount of pollutant(s) a waterbody can receive and still meet its designated use(s).

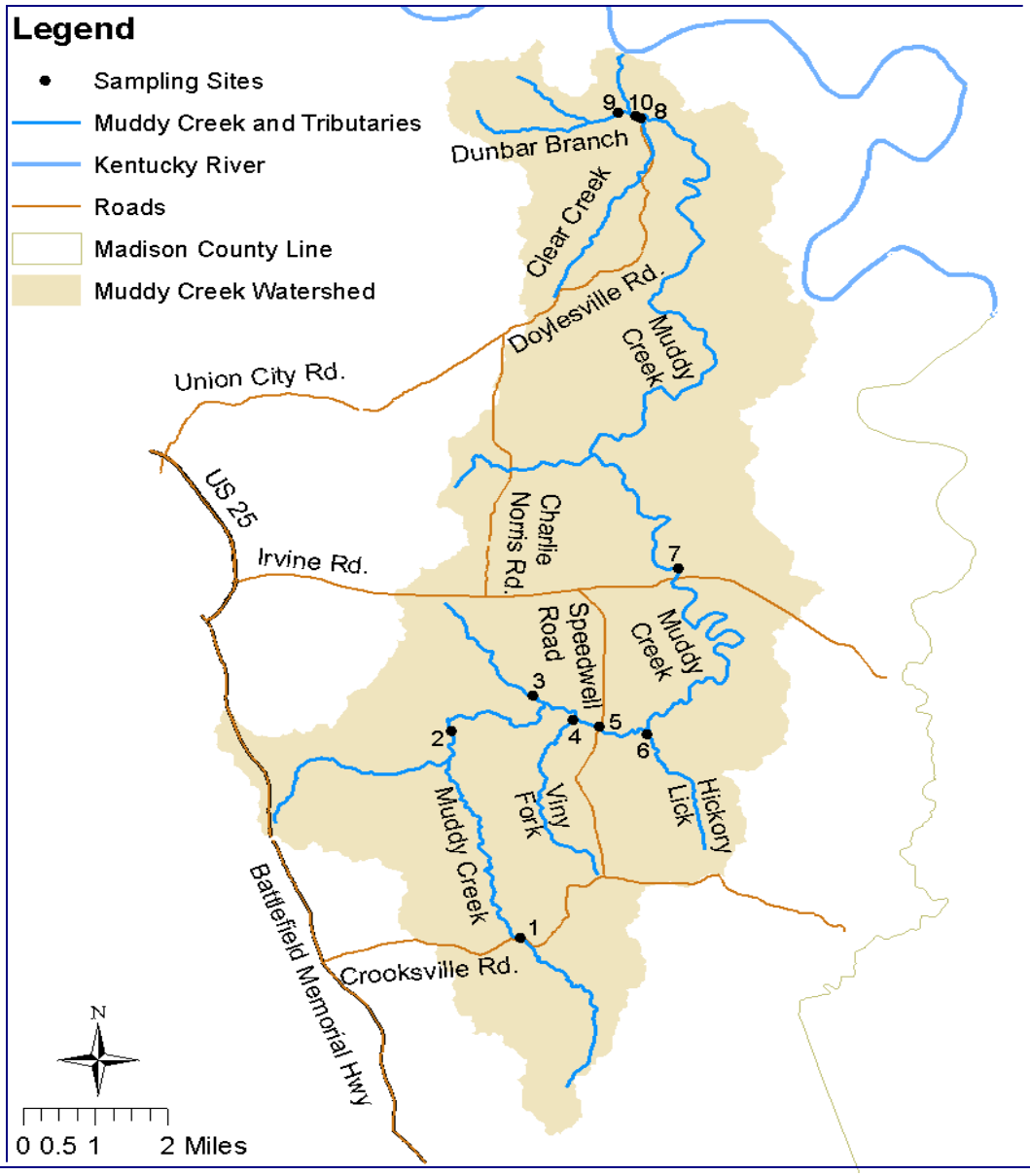
Muddy Creek is on the 303 (d) list and will be studied from November 2010 through October 2011 by the Kentucky DOW, TMDL Section. A TMDL report for Muddy Creek will be written as a result of the year long study, which will be made available to the public with the goal of improving water quality.

DOW biologists will sample 10 sites throughout the Muddy Creek watershed once a month from November 2010 through April 2011, and then two or three times a month from May through October 2011 at the locations shown in the map to the right.

Even though Muddy Creek is only listed as impaired for Primary Contact Recreation, which relates to *E. coli* levels, many other parameters will be measured to better understand the current state of Muddy Creek's water quality. At each site the following will be measured or collected:

- Dissolved oxygen
- Specific conductivity
- Nutrients
- *E. coli*
- Bugs
- Algae
- Habitat





Each measurement made or sample collected is considered a sign of Water Quality or a sign of Biological Health. These signs demonstrate how pollution entering the stream impacts the overall health of the **Muddy Creek Watershed.** Below, each sign of watershed health that the DOW will measure or collect is defined.

Signs of Water Quality

Dissolved Oxygen: Concentration of oxygen dissolved in water and readily available to fish and other aquatic organisms.

Specific Conductivity: A measure of the ability of water to conduct an electrical current, which is used for estimating the total dissolved solids content of water. Low specific conductivity is desired, and increasing specific conductivity negatively impacts fish and aquatic bugs.

Nitrogen and Phosphorus (Nutrients): Although natural sources of nutrients exist, major sources of nutrient pollution are typically caused by man's activities and include municipal sewage-treatment plants, industrial outflows, commercial fertilizers and animal waste.

E. Coli: A type of bacteria that lives in the intestinal tract of man and other warm-blooded animals.

Signs of Biological Health

Total Habitat: Stream habitat is assessed by scoring 10 habitat signs, which are both living and nonliving parts of the surroundings that support an organism, population or community.

Aquatic Macroinvertebrates (bugs): An animal without a backbone, large enough to be seen with the naked eye. They are often the immature forms of insects that live on land as adults and are an important food source for fish. Different species prefer different habitats, and some are more tolerant of pollution than others.

Riparian Zone: A component of total habitat that is defined by the land adjacent to a stream that has distinct soil types and plant communities, which aid in absorbing water and shading the stream. An ideal riparian zone is at least 18 yards wide on each side of the stream.

Available Cover: A component of total habitat, which looks at the quantity and variety of structures in the creek that provide fish and bugs a place to hide, feed, reproduce and raise young. Examples include cobble and boulders, fallen trees, logs, branches, root mats, undercut banks and aquatic vegetation.

Algae: (singular form is alga) A simple, rootless plant that is an important source of food and produces oxygen via photosynthesis. However, when excess nutrients enter the stream and there is enough sunlight due to a lack of trees, algae can bloom. During a bloom, algae can lower the dissolved oxygen as they die and decay, which negatively affects bugs and fish.

What can you expect?

* Within the **next year**, DOW biologists will begin collecting water and biological samples in the watershed every month. If you see them, feel free to ask questions about their work.

* Within the **next two years**, DOW will distribute an informal "health report" of the Muddy Creek Watershed to share results of the study and explain ways the community can help improve water quality.

* Within the next **five years**, DOW will write a TMDL for the Muddy Creek Watershed and release it for public comment before submitting it to the U.S. Environmental Protection Agency for approval. The TMDL will outline which pollutants need to be reduced and by how much for the watershed to meet its designated uses.

* Within the **decade**, TMDL implementation and community efforts will help improve water quality and biological health of the Muddy Creek Watershed.