

removed. However, the removal of the bends shortens the length of the channel, making it steeper. Water then flows faster causing the banks and bottom to erode. Additional erosion will result as the stream takes years to re-establish its natural meandering pattern.

Pushing gravel against eroding banks is a short-lived solution because flood waters will eventually move the gravel downstream and the bank will again be exposed to erosion. Fish are impacted by sediment that clogs their gills and destroys their spawning habitat. The stable stream bottom is also

disrupted and left exposed to erosion.

Too much gravel in streams can cause problems, but in most cases it is not possible to remove enough to have a meaningful effect on stream stability. Efforts should be directed at good watershed management to stop the influx of gravel.

Car bodies and other debris dumped on the stream bank do not work to stabilize the bank. Unlike tree roots, junk cannot hold the soil. Nor can junk armor the soil like a blanket of large stone. Aside from being ineffective, this method is ugly and causes pollution.

Understanding Streams is written about the need to protect our streams and the reasons for including the watershed, floodplain, and stream corridor in this effort. But how do we do this? Where do we start and who is responsible for properly managing the components of a stream system?

First, remember we *all* live in a watershed so we are all responsible. Whether we are city dwellers, suburbanites, or farmers, we can all change things by the way we manage the land. We can change the land we own, and we can ask our local governments to require good land management by the public, developers, and their own employees.



Missouri Department of Conservation

Understanding Streams

by Bill Turner



*A stream is the product of its watershed.
Good land use in the watershed will be reflected in the stream.*

Many people enjoy the captivating qualities of flowing water. But streams are more than enjoyable places to visit. We rely upon them to drain the land, as water supplies and to irrigate our crops, as well as for fishing and other recreation.

The careful management of our streams is essential. To protect them we must understand how they work and what we can do to ensure they continue to function properly.

Understanding begins with the realization that a stream is not just flowing water in an earthen channel; it also includes the watershed which is comprised of several key landforms.

Much like the parts of a clock, each of these land forms plays a role and all must work together for the stream to function properly. Protection and management of each is vital to a healthy stream.

The Watershed

The watershed is an area of land that drains into a stream. This includes both the surface runoff and groundwater. Because a stream receives surface water, it is a reflection of the land above it.

Although simple, the most important concept in stream management is that *every stream is the product of its watershed and each of us lives in a watershed*. Each one of us is linked to a stream regardless of our occupation or way of life. How we use the land is ultimately reflected in the condition of the stream. If the land is mismanaged or pollutants are spilled, the receiving stream will be degraded.

Watershed management includes all of the land uses and activities of rural and urban living. Each watershed has its own runoff patterns which are dependent upon the types of vegetation and the natural slope of the land.

A forested or native grass watershed delivers its runoff slowly over a long period of time. Watersheds with a lot of timber clearing or many paved streets and parking lots allow water to run off quickly, resulting in larger, more frequent floods. Faster runoff increases erosion both on the land

and in the stream channels.

Many watershed land uses increase the speed of runoff, but conservation efforts can reduce their negative effects. Some landowners build terraces and use strip cropping. Towns use stormwater control measures, such as retention basins, to help slow runoff.

A natural watershed delivers some nutrients and sediment such as soil, sand, and gravel to the stream. But some watershed practices increase these amounts to harmful levels. Row cropping of erodible land, careless handling of household and industrial chemicals, construction sites with uncontrolled erosion, and strip mining pollute runoff waters and degrade the receiving stream.

Some Missouri farmers are maintaining runoff water quality by removing erodible land from production, but agriculture is still a major pollution source. Reclamation of strip-mined lands has also been effective, and homeowners are becoming more conscious of the need for careful use and disposal of chemicals. Continued efforts to stop poor land use and other polluting activities will result in healthier streams.

The Stream Channel

Most Missouri streams meander as they move down the valley. They have two basic habitat types: pools and riffles. Good pools are deep, slow moving, and provide fish with cover and resting areas. Riffles are shallow with a faster flow. They are feeding and spawning areas. This is the natural way in which water flows through Missouri streams.

Meanders, which are often called bends, are constantly changing. The force of the water moving around the bends removes soil and gravel from the bank and deposits it downstream on an inside bend. Channels develop over a long period of time, and relatively small amounts of bank erosion occur during each flood.

But when a major change is made to any part of the stream system, the channel must adjust and becomes unstable. We often see these adjustments in the form of severe bank erosion, large deposits of gravel, or erosion of bottomland fields.

Reshaping stream channels is often seen as a solution to bank erosion, but usually causes more problems than it solves. Straightening stream channels, pushing gravel against eroding banks, and dumping old cars and debris on banks are some other ineffective methods.

Channelization, or stream straightening, seems logical because the eroding bends are totally



Stream channels should be protected in their natural condition. This is the Little Niangua River in south-central Missouri.

Stream Corridors

The strip of land bordering a stream channel is called a stream corridor or riparian corridor. It is actually a part of the floodplain but, because it is so important to the stream system, it deserves special consideration. A well-functioning stream corridor is typically at least 100 feet wide and forested.

This wooded border benefits the stream and neighboring landowners by controlling erosion, filtering sediment and nutrients, producing wood products, and enhancing fish and wildlife habitat.

Healthy stream corridors control erosion and sediment in several ways. During a flood, the streamside trees and brushy vegetation slow the water as it passes. This reduces erosion on bottomland fields.

Because water is slowed within the stream corridor, it drops much of its sediment, gravel, and sand within the corridor, rather than on bottomland fields or in backwater areas downstream. This corridor of trees also traps woody debris that would otherwise end up in fields. The tree canopy and underlying leaf layer of healthy stream corridors protect the soil from

the direct force of falling rain, and the forest floor acts as a sponge to slow runoff and reduce erosion.

The root systems of trees growing near the water's edge are vital in controlling bank erosion. A wide corridor of trees will ensure that banks are protected even when an unusually large flood has removed some streamside trees.

Fish and wildlife habitat are improved by forested stream corridors. These corridors provide many species with food, protection, travel lanes, and nesting cover. Every part of the tree is important, both when it is living and after it has died. Tree leaves shade the stream and keep it cool, and after falling they become an important part of the food chain. Branches produce nuts, berries, and other foods and provide den cavities for birds and other wildlife. If a tree falls into the stream, it provides cover for fish.

Stream corridors also contain some of Missouri's richest soil, which is good for growing valuable hardwood trees. A planned timber harvest in the corridor can result in income for the landowner and a healthier forest.



Each stream should have a functioning stream corridor that is forested and at least 100 feet wide.

The Floodplain

The floodplain is the relatively level area on both sides of the stream channel that stores flood waters the channel cannot handle. During a flood, the floodplain does much of the work for the channel. If a floodplain is not allowed to work properly and the channel is forced to handle more of the flow, the stream will erode its banks and increase in size. Missouri streams use their floodplains frequently.

Intact floodplains are important but, because they do not function continuously, people tend to forget about them. Poorly designed roads and levees that block floodwaters are often the result. These can speed up the flow by constricting the stream, which causes erosion within the channel.

In urban areas, floodplains often make good locations for parks, baseball diamonds, football and soccer fields, and industries which can withstand periodic flooding. In rural Missouri, floodplains make good pastures or areas for growing timber products such as pecans and walnuts. Row cropping can be acceptable if the stream channel, and other channels that carry water during floods, are protected with a corridor of trees on both sides.

Houses and businesses constructed in floodplains are subject to flood damage. These may not alter the functioning of the floodplain but sizeable changes that do affect the floodplain, such as levees and dams, are often constructed to protect them.



Each one of us is linked to a stream, regardless of our occupation or way of life. During a flood the floodplain does much of the work for the channel.



Stream Checklist

Use the following checklist to gauge your past involvement in stream protection and as a way to identify those things you can do in the future:

Watershed Practices

- Control erosion from construction sites.
- Control urban stormwater runoff.
- Use only approved landfill sites and practice recycling.
- Use herbicides, pesticides and other chemicals only when absolutely necessary and only in the proper amounts.
- Dispose of unwanted chemicals at authorized dump sites. You may have to work with the Department of Natural Resources to establish such a site in your area.
- Report any suspicious dumping in streams or on land.
- Use best management practices such as strip cropping, terracing, contour farming, and minimum tillage on agricultural lands.
- Participate in and support erosion control programs such as the Conservation Reserve Program.
- Protect forested lands and do not graze them.

Floodplain Practices

- Any channel in the floodplain that carries water during floods should be kept in natural vegetation.
- Use wide, forested stream corridors to reduce the impacts of floods instead of building levees.
- Develop floodplains only with structures that can withstand periodic flooding. This may require the use of zoning laws.
- Build bridges designed for the specific stream and floodplain and do not require channelization.
- Allow floodplains to function properly by not building levees.

Stream Corridor Practices

- Establish and protect a 100-foot wide strip of trees on each side of the stream.
- Avoid using heavy equipment within the corridor.
- Harvest stream corridor trees with the advice of a forester.
- Fence this area from livestock.

- Support and participate in programs aimed at protecting stream corridors. Examples are:
 - ◆ Natural Resources Conservation Service's Continuous Conservation Reserve Program (CCRP).
 - ◆ Missouri Stream Team Program.

Stream Channel Practices

The overriding guideline to follow on stream channels is simple: protect them in their natural condition by keeping heavy equipment out of the stream and addressing stream-bank erosion when possible.

These are some of the ways we can all become involved in protecting our valuable Missouri streams. The Conservation Department will assist anyone who wants more information on stream management. For help please contact your nearest Missouri Department of Conservation Regional Office.