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## *Small Streams: Your Link to the Bay*

### Featured Article

At least 100,000 miles of streams and rivers to the Chesapeake Bay (Figure 1). Collectively, this network of small streams supplies 90% of the freshwater flow that drives our nation's largest estuary. These small streams also supply the nutrients, sediments and other pollutants that affect the health of the Bay. A good understanding of these "capillaries" of the Bay's circulation system is essential to help save the Bay.

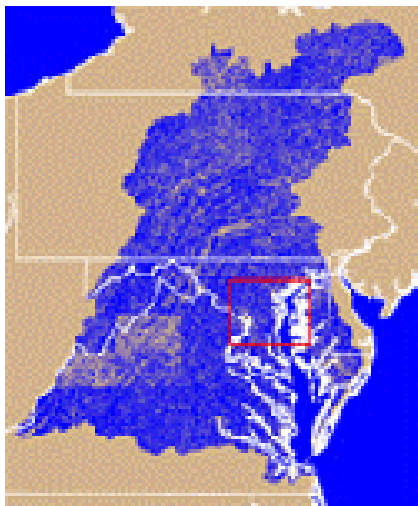
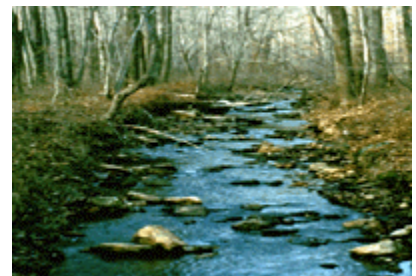


Figure 1.



Figure 2.

A network of small streams closely resembles the branching patterns of a tree (Figure 2). The smallest stems join together to form small branches, which, in turn, come together to form even larger limbs. The limbs join together to form the trunk (Figure 3). Scientists classify streams in much the same manner. A stream that has no tributaries or branches is defined as a first-order stream. These are the smallest streams and it is easy to jump across them. When two first-order streams combine together, they create a second-order stream, and when two second-order streams join together,

they form a third-order stream, and so on (Figure 4). As stream order increases, the size and length of the stream typically gets larger. Many small rivers are 4th or 5th order. The Potomac and Susquehanna rivers are considered to be 7th and 8th order streams.

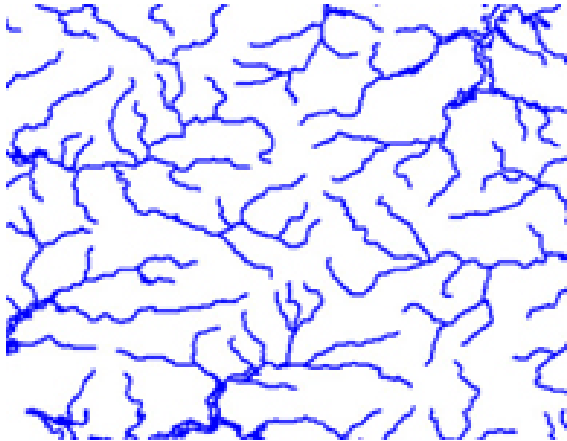


Figure 3.

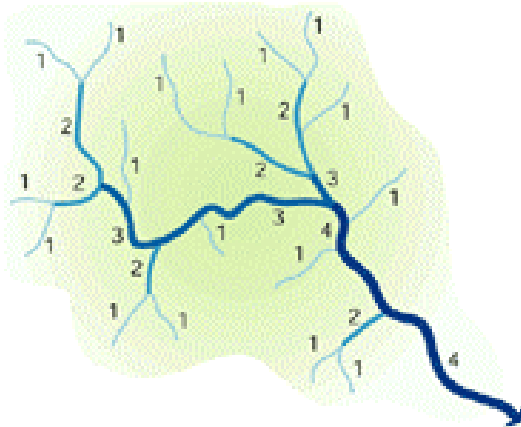


Figure 4

By convention, first and second order streams are called "headwater streams". They tend to be short in length (about a mile), and have a small watershed area (about a square mile). Their average flow is about 1 cubic foot per second (cfs), but this can drop to virtually nothing during an extended drought; during periods of heavy rainfall, the flow can quickly grow to 100 cfs. Headwater streams dominate the drainage network of the Chesapeake Bay; comprising more than 65% of the total mileage of streams and rivers that drain to the Bay.

### **Small in Size, But Great in Value**

Headwater streams get relatively little attention, compared to the larger rivers, lakes, and estuaries to which they drain. Together, these small streams provide critical natural services that sustain and enrich our daily lives. Small streams, for example, are the ultimate source of more than two-thirds of our drinking water within the Bay watershed. They also supply the water we use to water our lawns and golf courses, irrigate our crops, and cool the power plants that keep our lights on. Streams, along with their flood plains, also serve as a safe conduit for dangerous floodwaters.

Small streams and their streamside forests are a critical habitat for both aquatic and terrestrial wildlife. Not only do streams provide the waters that sustain life, but they also create corridors that enable fish and wildlife to move through the landscape. Consequently, the stream corridor is home to many unique plant and animal species. For example, more than 100 species of fish and 45 species of reptiles and amphibians find their home in the

stream network of the Chesapeake Bay, as do dozens of birds, mammals and plant species.

Streams are also a favorite habitat for us, whether we directly experience them in a canoe, kayak, inner tube or raft, or swim, fish, or hike along their shady banks. The natural beauty of running waters is a refreshing tonic in our lives, whether we seek recreation, an encounter with wildlife, or simple solitude. Indeed, much of our local history has been written in and around small streams, whether it be the site of an ancient Indian village, an old sawmill or grist mill, a ford or bridge, or the location of a disastrous flood.

### **Fallen Leaves Power the Stream Network**

This is a big time of the year for small headwater streams. As trees lose their leaves, they provide a gift to the stream. Few people realize that fallen leaves are the single most important source of nutrients that drives the stream ecosystem. Quite simply, streams depend on autumn leaves to supply the energy needed to support stream life throughout the rest of the year. When leaves blow into the stream, they form "packs" that gradually break down over time, as they are colonized by fungi (Figure 5).

About one to two percent of the mass of leaf packs is lost each day, and enters the food chain of the stream. The fungi on leaf packs are a major food source for many aquatic insects such as caddisflies, stoneflies, and crane flies. These insects shred or collect fine leaf particles, and in turn, are eaten by small fish and other aquatic life. Thus, fallen leaves are the base of the food chain in small streams, and provide as much as 75% of the energy used in the food chain. Indeed, the pulse of fallen leaves in autumn triggers the biggest phase of growth and activity in small streams. At a time of year when terrestrial ecosystems become dormant, small streams experience a flurry of biological activity in the first few months after leaf fall.

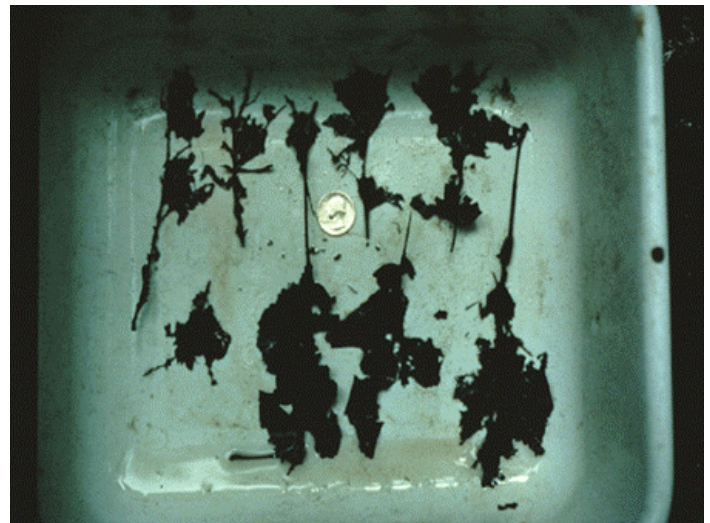


Figure 5.

Fallen leaves form "packs" that gradually break down over time as they are colonized by fungi. The fungi on leaf packs are a major food source for many aquatic insects.

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## **The Health of Our Small Streams Is In Peril**

Many of our small streams are in trouble. Researchers in Maryland have found that almost half of all small streams in the state are in poor ecological condition, as measured by their stream habitat and biological diversity. Only about 20% of Maryland streams remain in good condition. The symptoms of poor stream health involves many causes, but most are related to how we manage the land. For example, less than half of all streams in the Bay watershed have an adequate buffer of streamside forest. Nearly 20% of all streams have been ditched, channelized or otherwise modified by humans. Road crossings and small dams have created at least 1000 blockages to fish migration in the state of Maryland alone. Other causes of poor stream health include poor cropping practices, overgrazing in the stream corridor, and acid-mine drainage from coalmines.

## **Urban and Suburban Streams Are at Greatest Risk**

The greatest single cause of poor stream health in the Bay watershed is land development. As small watersheds are developed into residential subdivisions, roads and shopping centers, they create hard surfaces that are impermeable to rainfall. These are referred to as impervious cover. When the amount of impervious cover in a small watershed reaches ten percent, stream health is seldom, if ever, is good. When impervious cover exceeds 25% in a small watershed, stream health is consistently poor. Given the rapid growth and development that is occurring in many parts of the Bay watershed, many of our streams are exceptionally vulnerable to damage. Indeed, at current rates of land conversion in the Chesapeake Bay watershed, more than 200 miles of streams are being degraded each year due to land development.

### [CWP Slide Show on IC/Stream Quality](#)

In our most urban areas, we are literally seeing streams disappear due to extensive land development. Many small streams have been enclosed in pipes, concrete channels and culverts to accommodate development, literally creating "buried streams". The disappearance of headwater streams can be striking as shown in the accompanying graphic of the Four Mile Run watershed in Arlington County, VA (Figure 6). The alarming loss of streams due to urban and suburban development can be sharply curtailed through better environmental regulations and improved land stewardship. Many Bay communities are now working hard to find ways to protect and restore our priceless resource of headwater streams.

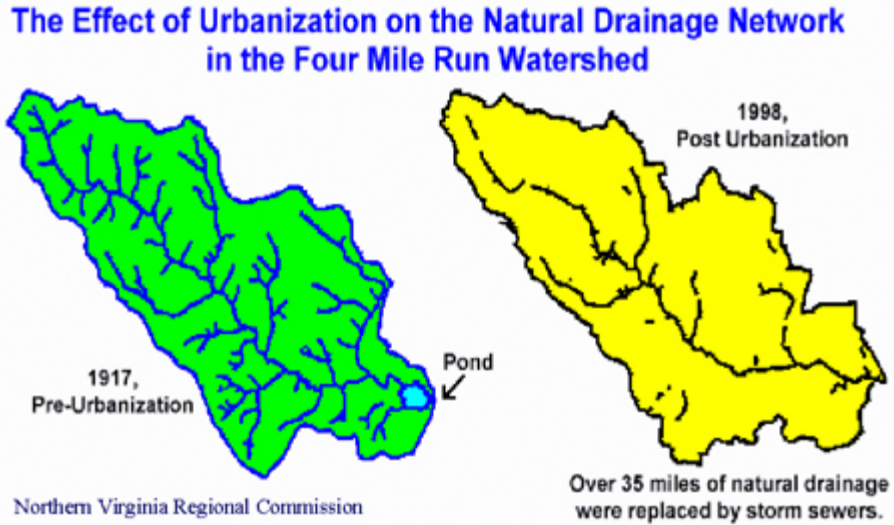


Figure 6.

The alarming loss of streams due to sprawl is illustrated by the change in stream conditions over time in the Four Mile Run watershed in Arlington County, VA.

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## How You Can Help Save Small Streams

Don't worry; just follow the direction of flow downhill and look for the low point in the landscape. You may see a ribbon of trees in the valley that is usually the beginning of a stream. Keep on walking downstream and enjoy your local stream. Be careful, though, especially if it is wet, there are lots of leaves, and/or the slope is steep.

If you feel more like a couch potato, you can still find out about your local watersheds over the Internet. Simply go to the [Surf-Your-Watershed website](#) and enter your zip code; a wealth of local watershed information will quickly arrive at your screen.

Once you learn more about your local streams, there are many resources available to help you protect them. You can stencil your storm drains, organize a stream cleanup, monitor water quality, perform species counts,

## How You Can Help Save Small Streams

No matter where you stand, you are rarely more than a half-mile from a stream in the Chesapeake Bay watershed. Now that the leaves are off the trees, it is easier to find your own small stream. From your house, follow the path of flow down hill. Normally, flow from your yard moves through in a gutter or ditch along the street, and then may disappear into a storm drain. Don't worry; just follow the direction of flow downhill and look for the low point in the landscape. You may see a ribbon of trees in the valley that is usually the beginning of a stream. Keep on walking downstream and enjoy your local stream. Be careful, though, especially if it is wet, there are lots of leaves, and/or the slope is steep.

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Once you learn more about your local streams, there are many resources available to help you protect them. You can stencil your storm drains, organize a stream cleanup, monitor water quality, perform species counts, and help plant streamside forests. For a detailed list of organizations that can help you adopt-a-stream, check out this month's tips for the Bay section.



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