Streams in the City
It's a hard (surface) life

Close your eyes and imagine a cool, running stream. What comes to mind? Green forests? Leaping trout? Warm breezes? If you're like most people, you probably don't envision sky-scrapers, business suits, or city buses. Walden comes to mind, not Wal-Mart.

Streams are an important part of every landscape, no matter whether that landscape is a forest, a city, or a suburb. Often they lie low when people, buildings, and streets are around. But rest assured, streams are there, flowing under sidewalks, meandering past ball fields, and rippling by shopping centers.

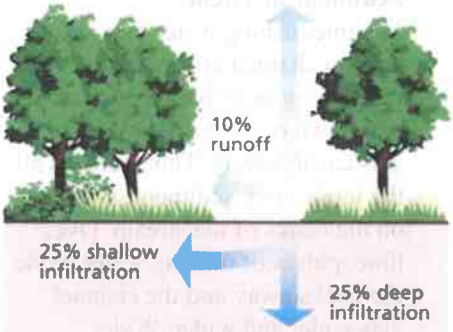
Streams, stream banks, and the low lands around them provide important habitat for animals and plants that share the urban/suburban landscape with us. They are also part of the network of channels that drains rain and melting snow off our streets, parks, and yards.

The Difference Between Streams in Forests and Streams in Urban Areas

Streams in a town or suburb are usually very different from streams in a forest or other natural area. Urban streams tend to carry more water at a faster speed after a storm than their country cousins. The reason for this has to do with what happens to rain after it hits the earth's surface. In forests, meadows, and other natural areas, about half the water that falls to earth soaks into or *infiltrates* the soil. Most of what remains on the ground and in the grass, tree leaves, and other plants gets returned to the atmosphere by *evapotranspiration*, a combination of *evaporation* and *transpiration* (loss of water vapor by plants). Only a small portion of rainfall (about 10 percent) travels across the land as runoff and drains into a stream, lake, or pond.

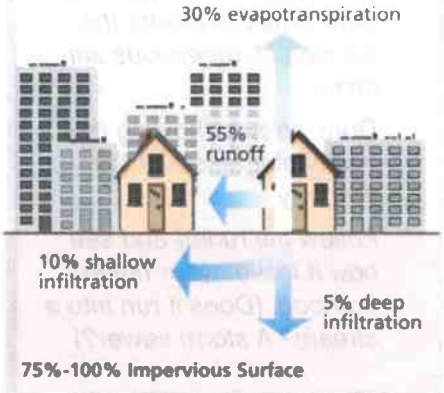
When people move into an area, they build houses, buildings, streets, and parking lots. When rain falls in urban areas it doesn't land on nice soft ground and plants. Instead it hits impervious surfaces like hard pavement and rooftops and has no chance to infiltrate the soil. Storm water has no choice but to flow downhill into street drains and ditches and then into streams. The panels below illustrates how the fate of rainwater changes as cities grow.

Scientist use *percent imperviousness* to describe how much of a given area is covered by hard surfaces.



In a natural landscape, about half the precipitation that falls soaks into the soil.

The land is more impervious in cities. Instead of soaking into the soil, most of the precipitation runs off hard surfaces into storm sewers, which empty into streams, lakes, and ponds.



Many cities have areas that are 75 to 95 percent impervious. This means that most of the rain that falls will not infiltrate into the soil and instead will flow off streets and parking lots. If all this extra water is diverted directly into a stream channel, several important changes will occur.

- **More Flooding During Rainstorms** Streams that used to carry only a small portion of rain that falls are now asked to carry most of it. Natural channels easily become overwhelmed when a big storm hits. The extra water overflows the banks and floods the surrounding land.
- **Less Flow During Dry Times** Where do you think the water that infiltrates into the ground goes? Some of it moves slowly under-

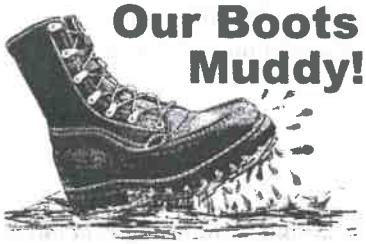
Let's Go Surfing Now!

Learn about your urban streams at...

wwwga.usgs.gov/edu/urbaneffects.html

The USGS has developed a web site that shows how urbanization affects the local water system.

* *Do you see any of the land use changes listed at the web site occurring in your neighborhood?*



Let's Get Our Boots Muddy!

Shower sleuthing

It's raining!—a perfect time to observe impervious surfaces and runoff in action.

* *Walk around your yard and draw a map showing the location of impervious surfaces.*
* *Draw arrows showing the path water takes off the property.*
* *Follow the runoff and see how it leaves your neighborhood. (Does it run into a stream? A storm sewer?)*

Storm water in a city is usually collected in storm sewers and transported to a stream in large pipes. This photo shows water exiting a pipe into a stream.

ground and empties into stream channels days and even months after soaking into the soil. This groundwater provides flowing water in the channel even during dry times. When impervious surfaces prevent infiltration of rainwater, there is less groundwater to move into the channel.

- **Wider Channels with More Sediment in Them**
  Imagine rushing water moving down a channel after a rainstorm. Everything in its path that is not tied down or too heavy to move gets carried away. This includes all the loose sand, sediment, and dirt on the banks of the stream. Over time, pulses of rushing water erode the banks away and the channel gets wider and wider. Wider channels also allow large volumes of water to heat up from the sun, raising temperatures higher than what fish can tolerate.
- **More Sand and Sediment on the Channel Bottom**
  City slicker streams have more sand and sediment at the bottom of their channels than their country cousins. Part of this material comes from eroding stream banks. A large fraction, however, is carried by runoff water washing the pavement and land clean. When runoff reaches the stream it drops its load of sediment on the bottom of the channel.

Career Corner

A *planner* develops long- and short-term land use plans for local governments to provide for growth and revitalization of urban, suburban, and rural communities. Planners promote the best use of a community's land and resources for residential, commercial, institutional, and recreational purposes.

A *landscape architect* designs residential areas, public parks, college campuses, shopping centers, golf courses, and other areas so that they are functional, beautiful, and compatible with the natural environment.

A *civil engineer* designs and supervises the construction of roads, buildings, airports, tunnels, dams, bridges, and water supply and sewage systems.