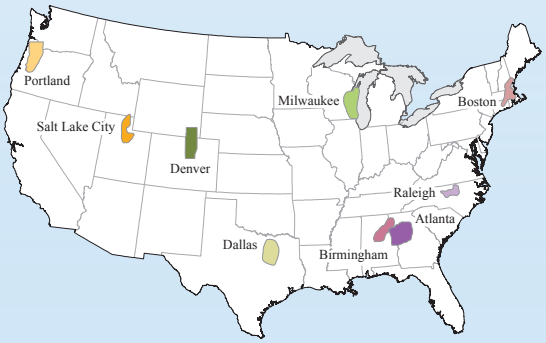
Portland, Salem and Eugene Metropolitan Areas

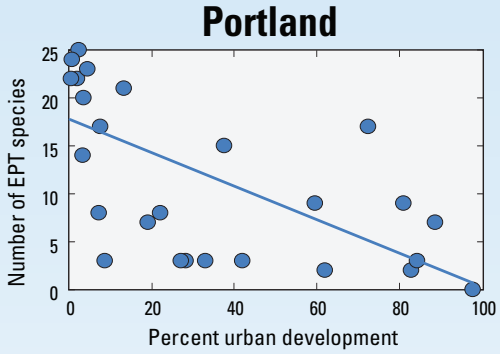
This information sheet highlights selected findings of a comprehensive assessment by the National Water-Quality Assessment Program of the U.S. Geological Survey of the effects of urban development on stream ecosystems in nine metropolitan study areas. These are a few of the findings from the study for the Portland, Salem and Eugene Metropolitan Areas.

Concentrations of Contaminants in Water Increased With Urban Development



Concentrations of contaminants, including nitrogen, phosphorus, pesticides, and toxicity associated with "legacy"organochlorine pesticides and other potentially toxic organic compounds, increased with urban development. The concentrations of nitrogen and phosphorus increased with urban development in Portland likely due to lawn care nutrient application in residential areas. The potentially toxic organic compounds that are usually found in the streambed sediments also increased with urban development. The actual effects of these compounds on organisms, such as fish, often are not directly observed. Exposure to toxic compounds need not be lethal, but the health of organisms can still be affected to the extent that the species composition of the biological community is altered.

Loss of Sensitive Species Was the Most Consistent Biological Response to Urban Development



Urban development generally results in a shift in the species composition of the algal, invertebrate, and fish communities. However, the most consistent change in any of the biological communities was the loss of sensitive invertebrate species and a shift to species that are more tolerant to physical and chemical stressors. A loss in the numbers (richness) of sensitive species, which is related to a decrease in Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) invertebrate species (typically abbreviated as EPT), was a common response in all study areas where urban development occurred in forested watersheds. The number of EPT species is a biological condition metric that is used in many biomonitoring programs across the country because it is sensitive to environmental degradation. A reduction of more than 50 percent of EPT species was observed in Portland as urban development increased in the watersheds.

Urban Development Leads to Increased Variability in Streamflow

Urban development typically increases the amount of water entering a stream after a storm and decreases the time that it takes for the water to travel over altered land surfaces before entering the stream. Efforts to reduce flooding by draining water quickly from roads and parking lots can result in increased amounts of water reaching a stream within a short period of time, which can lead to stream flashiness and altered stream channels. Additionally, rapid runoff reduces the amount of water available to infiltrate the soil and recharge the aquifers, which often results in lower sustained streamflows, especially during summer. Furthermore, when the hydrology of a stream is altered, the physical habitat of a stream often becomes degraded from channel erosion or lower summer flows that reduce spawning, feeding, and living spaces of the aquatic biota.

Urban development can alter stream habitat directly. These are photos of Johnson Creek near Gresham, OR. The top image shows the channel was with rock to control flooding in the 1930s; whereas, the bottom picture is of a section of the stream that has gone through restoration in an attempt to replicate a more natural channel and riparian area.

Streams that were sampled in the Portland, Salem and Eugene Metropolitan Areas

Figure Number	USGS Station Name
1	Nate Creek near Colton, Oreg.
2	East Fork Dairy Creek near Meacham Corner, Oreg.
3	Rock Creek at Quatama Road near Hillsboro, Oreg.
4	Beaverton Creek at SW 216th Ave, near Orenco, Oreg.
5	Chicken Creek near Sherwood, Oreg.
6	Fanno Creek at Durham, Oreg.
7	Tryon Creek below Nettle Creek, near Lake Oswego, Oreg.
8	Silk Creek near Cottage Grove, Oreg.
9	Lost Creek near Dexter, Oreg.
10	Amazon Creek near Danebo Road at Eugene, Oreg.
11	Oak Creek at Corvallis, Oreg.
12	Battle Creek near Turner, Oreg.
13	Pringle Creek at Salem, Oreg.
14	Claggett Creek at Keizer, Oreg.
15	Milk Creek at Camp Adams, Oreg.
16	Chehalem Creek at Newberg, Oreg.
17	North Yamhill Creek near Yamhill, Oreg.
18	Deep Creek near Sandy, Oreg.
19	North Fork Deep Creek at Barton, Oreg.
20	Tickle Creek near Boring, Oreg.
21	Kellogg Creek at Milwaukie, Oreg.
22	Johnson Creek at Circle Ave, Oreg.
23	Iler Creek near Forest Grove, Oreg.
24	Curtin Creek near Vancouver, Wash.
25	Whipple Creek near Salmon Creek, Wash.
26	South Scappose Creek at Scappose, Oreg.
27	Salmon Creek near Battleground, Wash.
28	Rock Creek near Battleground, Wash.

Information on the effects of urban development on stream ecosystems is available in the following publications:

Coles, J.F., and others, 2012, Effects of urban development on stream ecosystems across the United States. (Available at *http://pubs.usgs.gov/circ/1373/*.)

Cappiella, Karen, and others, 2012, Strategies for managing the effects of urban development on stream. (Available at *http://pubs.usgs.gov/circ/1378/*.)

Videos, podcasts, articles, and fact sheets describing the USGS assessment of the effects of urban development on stream ecosystems in nine metropolitan areas of the United States are available at *http://water.usgs.gov/nawqa/urban/*.

For additional information contact:

Chief, National Water-Quality Assessment Program
U.S. Geological Survey
413 National Center
Reston, VA 20192

or

James Coles
USGS New Hampshire-Vermont Water Science Center
331 Commerce Way, Suite 2
Pembroke, NH 03275
jcoles@usgs.gov