

# Rain and snow – where do they go and what do they take with them?

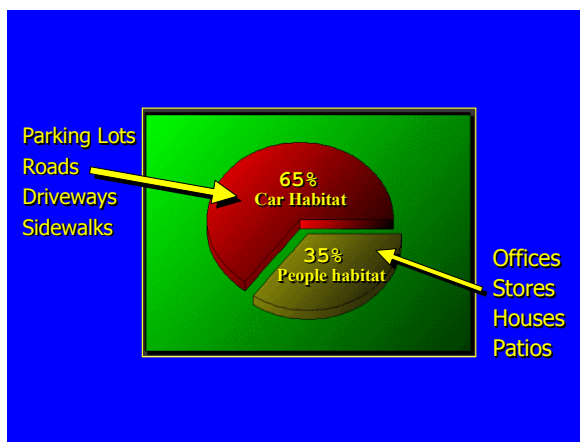


Do you know how the new subdivision in town affects local water resources that you use for fishing, swimming and drinking? It all depends on the route that rainwater and snowmelt take to the lakes, streams and groundwater in your community.

Subdivisions and other types of development include impervious surfaces, such as roads, rooftops, driveways, sidewalks and parking lots that prevent rainwater and snowmelt from soaking into the ground. The gradual addition of impervious surfaces is a cumulative process where one house doesn't make a big difference, but the new houses, roads and parking lots built over time have a big impact on local waters by increasing the volume of runoff. In fact, one investigator has estimated that when a one-acre meadow is paved, the amount of runoff from a one-inch rainstorm increases 16-fold (Schueler 1994). Increases in the amount of runoff result in more erosion, greater delivery of pollutants to lakes and streams, and less water to recharge groundwater aquifers.

Impervious surfaces can be separated into two components as shown in Figure 1: *people habitat* where we live and work, and *car habitat* where we drive and park our vehicles. Studies from across the country show that 55-75% of impervious surfaces are car habitat (Cappiella 2001; City of Olympia 1994).

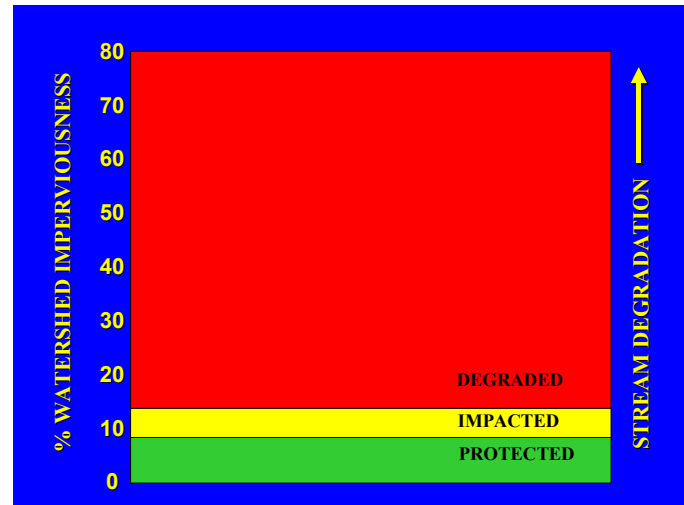
Figure 1. Impervious Surface Components



Source: City of Olympia, ISRS Field Report, 1994

As shown in Figure 2, the amount of impervious surface is a key indicator of the health of local streams. **Research consistently shows that as the amount of impervious surface increases in the watershed, the health of its streams decreases** (Schueler 1994).

Figure 2. Cumulative Impacts to Streams



Source: Wang & others, 2000 and 2001

For example, in the Milwaukee metropolitan area in southeast Wisconsin, studies have found that fish and insect populations in warm water streams decline dramatically when impervious surfaces exceed about 8-10% of the watershed. Streams with more than 12% imperviousness have consistently poor fish communities (Wang and others 2000 and 2001).

### How do impervious surfaces affect your community?

As Figure 3 illustrates, in a natural system approximately 10% of rainwater flows over the land surface directly to lakes and rivers while 50% of rainwater filters into the ground and is stored as groundwater or slowly makes its way back into rivers and lakes. An unintended result of development is that impervious surfaces cause more water to run off the landscape and less to infiltrate to groundwater. For example a neighborhood with 1-acre lots with 10-20% impervious surface could expect the amount of runoff to double after development (EPA 1993). Unfortunately, this water bypasses the natural water filter provided by soil, microbial action and vegetation and carries additional pollutants directly to surface waters.

When trees, shrubs and grasses are replaced with impervious surfaces, the following community benefits are threatened:

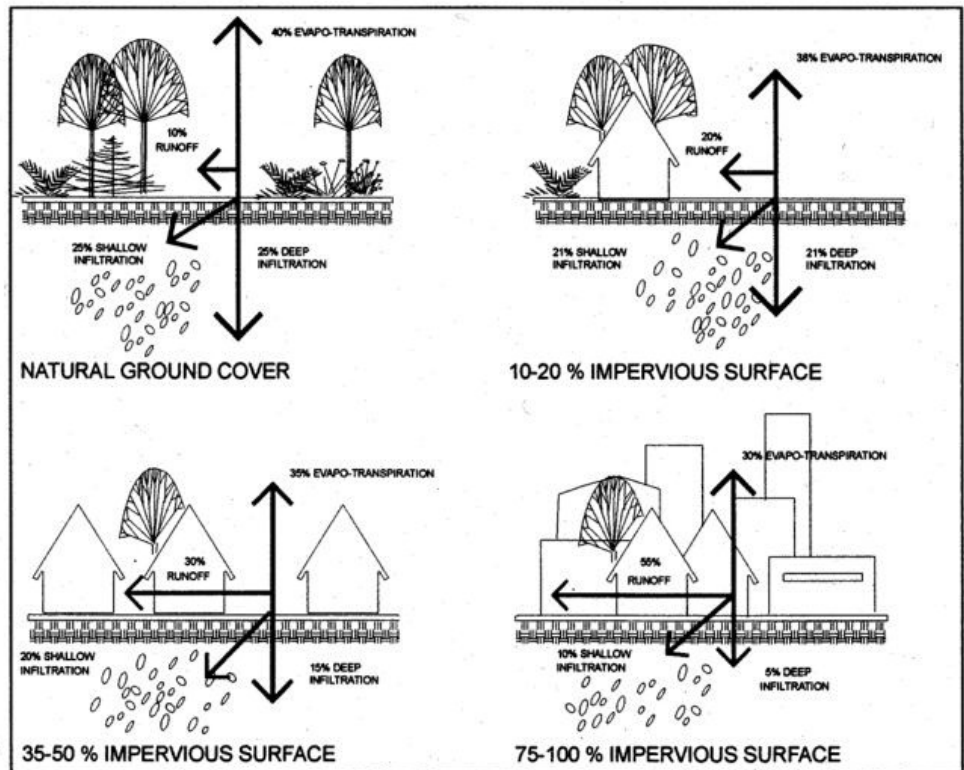
- Safe drinking water filtered by the natural soils and plants
- Sufficient groundwater for drinking, irrigation and industry
- Water storage capacity to protect homes from flooding

- Healthy streams with fish spawning areas, flows and stable banks
- Cool, shady water for a diversity of fish
- Food and habitat for songbirds and other animals
- Natural scenery for relaxation and privacy

### What can you do?

The first step is to share this information with citizens and local officials in your community and to help them understand the effects of impervious surfaces on water resources. Remember, prevention is less costly than remediation and collaboration is more productive than confrontation.

Figure 3. *Water cycle changes associated with impervious surfaces*



Source: Environmental Protection Agency, 1993

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### Sources.

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- City of Olympia, 1994. Impervious Surface Reduction Study: Technical and Policy Analysis – Final Report. Public Works Department, Olympia, Washington. 83 pp.
- Schueler, T.R. 1992. Mitigating the Adverse Impacts of Urbanization on Streams: A Comprehensive Strategy for Local Government. In *Watershed Restoration Sourcebook*. Publication #92701 of the Metropolitan Washington Council of Governments, edited by P. Kumble and T. Schueler.
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- Wang, L., J. Lyons, P. Kanehl, R. Bannerman, and E. Emmons 2000. Watershed Urbanization and Changes in Fish Communities in Southeastern Wisconsin Streams. *Journal of the American Water Resources Association*. 36:5(1173-1187).
- Wang, L., J. Lyons, and P. Kanehl 2001. Impacts of Urbanization on Stream Habitat and Fish Across Multiple Spatial Scales. *Environmental Management*. 28(2):255-266.

### Additional resources:

- Center for Watershed Protection (CWP). Ellicott City, MD, (410) 461-8323, <http://www.cwp.org>
- Environmental Protection Agency. To learn which watershed you live in check <http://www.epa.gov/surf>
- Nonpoint Education for Municipal Officials (NEMO), an educational program for local land use officials that addresses the relationship of land use to natural resource protection. Haddam, CT, 860-345-4511, <http://nemo.uconn.edu>
- A Storm on the Horizon: An Educational Video on the Effects of Stormwater on Our Rivers. 14 minutes. Produced by Kiap-TU-Wish Chapter of Trout Unlimited, demonstrates the impact of stormwater and outlines actions to allow development while protecting water resources, 715-386-7568, <http://www.lambcom.net/kiaptuwish/video.html>