Nitrogen in surface water runoff to Puget Sound

In our state's effort to restore and recover Puget Sound, the Washington State Department of Ecology (Ecology) and other organizations are evaluating the loadings, pathways, and sources of toxic chemicals (toxics) and nutrients released into the Puget Sound ecosystem. These studies will help guide decisions about how to most effectively direct resources to reduce toxic and nutrient contamination in Puget Sound.

The 2009-2010 study, *Toxics in Surface Runoff to Puget Sound: Phase 3 Data and Load Estimates*, www.ecy.wa.gov/biblio/1103010.html, is focused on toxics. This focus sheet summarizes the patterns of nitrogen loading by land-cover type. While not necessarily a toxic chemical, nitrogen is studied to assess nutrient contributions.

Study Design

The purpose of this surface runoff study is to determine the relative contributions of pollutants from four land-cover types: commercial/industrial, residential, agriculture, and forest/field/other undeveloped lands.

From August 2009 through July 2010, water samples were collected from 16 small streams within the Puyallup River and Snohomish River watersheds.

Monitoring took place before and during six storm events distributed over the fall, winter, and spring and during two periods of baseflow. Baseflow is the water in a stream or river before it rains and comes from underground sources called groundwater.

Monitoring also included measuring the streamflows in these two watersheds continuously during the 2009-10 study period.

Refer to the full surface runoff study for information on the study design, methodology, and conclusion.

Why do we care about nitrogen in water?

Fish need oxygen like humans do. Low levels of oxygen can be unhealthy or lethal. Nutrients such as nitrogen fuel plant growth (algae) in Puget Sound. When the algae die and decay, they use up dissolved oxygen. Human nitrogen sources can lead to excess algae growth and lower dissolved oxygen levels than would occur naturally.

Nitrogen and dissolved oxygen studies

Ecology is conducting many activities to address nitrogen impacts in Puget Sound.

The *South Puget Sound Dissolved Oxygen Study* (in draft) will help determine how human sources of nitrogen, along with natural factors, affect low dissolved oxygen levels in South Puget Sound. For more information, visit www.ecy.wa.gov/puget_sound/dissolved_oxygen_study.html

Ecology is also funding a Puget Sound-wide effort to understand low dissolved oxygen levels. For information on the Puget Sound Dissolved Oxygen Model, visit www.ecy.wa.gov/programs/wq/PugetSound/DOModel.html.

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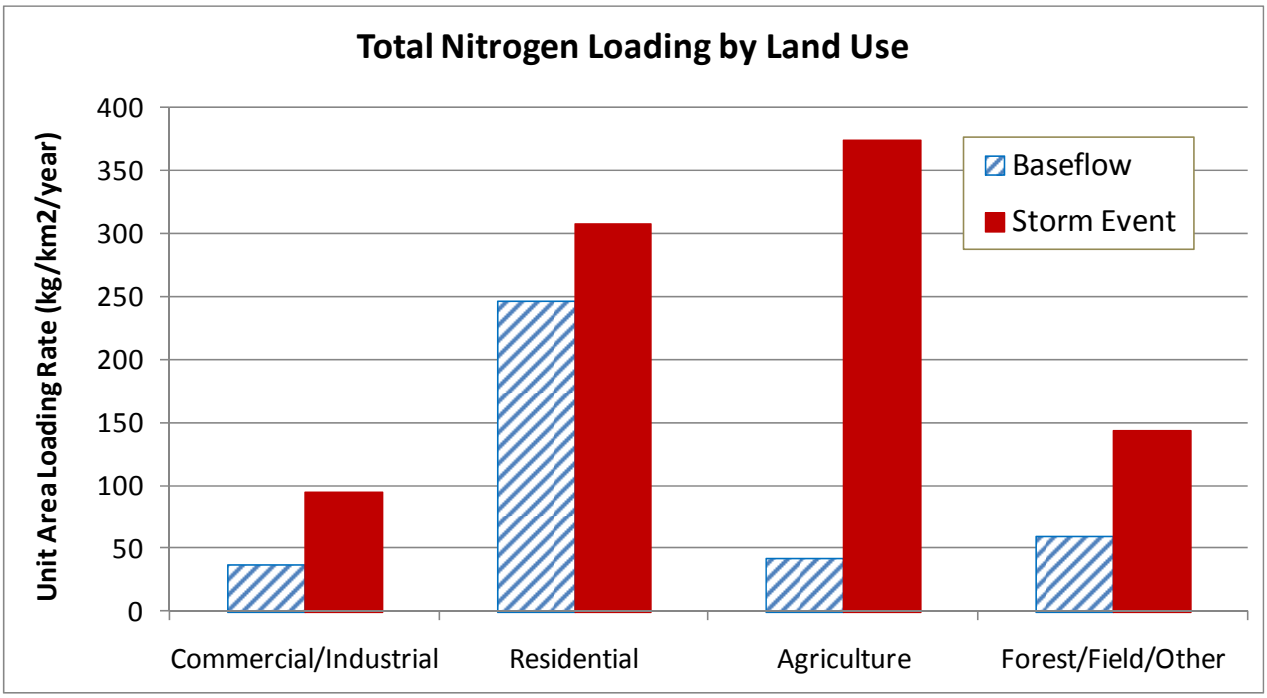
Summary of Findings

- For baseflow samples, total nitrogen concentrations were highest in the residential subbasins relative to the other three land-cover types.
- For storm-event samples, the median total nitrogen concentrations were higher in both the residential and agricultural subbasins relative to the commercial/industrial and forested subbasins.
- Agricultural subbasins had the highest concentrations of ammonia during storm events.
- Unit-area loading rates of total nitrogen were generally higher during storm events than during baseflow. This is especially true for agricultural subbasins where the median nitrogen loading rate was nine-fold higher during storm events compared to baseflow.
- Contributions from forested subbasins dominate the total nitrogen loading to Puget Sound because forests comprise 83% of the total land area.



Glossary: For definitions of terms used in this focus sheet, see the surface runoff study.

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