Assessment of Nonpoint Pollution in Washington State

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Introduction

Nonpoint pollution comes from many diffuse sources such as runoff from agricultural and urban areas. Bacteria, nutrients, sediments, and toxic chemicals that wash into surface waters and leach into groundwater can lead to significant water quality problems that affect the health of both salmon and people. While much progress has been made in addressing point source ("end of pipe") pollution in the U.S., nonpoint pollution is now regarded by the EPA as the major cause of water quality issues.

In 2000, the Washington State Department of Ecology (Ecology) developed a statewide plan entitled "Washington's Water Quality Management Plan to Control Nonpoint Source Pollution." The purpose of the plan is to protect our public health and natural resources from nonpoint pollution by (1) identifying sources and (2) setting strategies to improve water quality through nonpoint pollution reduction. Ecology is updating the plan (last updated in 2005), which will take a fresh look at Washington's nonpoint issues and solutions.

Objective & Scope

This assessment provides the science foundation to support development of the updated nonpoint plan. The objective was to synthesize existing information to identify major nonpoint issues and characterize the known status, extent, and causes of nonpoint pollution in Washington.

We focused on gathering information produced 2005 or later in Washington. Literature published before 2005 and outside Washington was collected to supplement our study.

Information spanned various pollutant types, land use categories, and regions of Washington (Central, Eastern, Northwest, Southwest). Except through the use of case studies, watershed and site-specific level evaluations—although imperative at the local level—were not performed because of the broad scope of this project.

Methods

Several different approaches were used to depict the nonpoint problem in Washington:

- Gather information from EPA guidance documents for monitoring and controlling nonpoint pollution
- Synthesize peer-reviewed literature on nonpoint pollution in Washington
- Synthesize nonpoint (load) reduction targets from 49 Total Maximum Daily Load (TMDL) studies in Washington published since 2005. This provides a "snapshot" of the types and amounts of nonpoint pollution contributing to impaired water quality across the state
- Explore TMDL load allocations in relation to general land uses, using GIS
- Analyze Clean Water Act Section 319 grants awarded to best management practice (BMP) projects that address nonpoint pollution in Washington
- Use case studies to delve deeper into nonpoint issues in individual watersheds from different regions of Washington

Information was synthesized and discussed by seven nonpoint source categories: (1) Agricultural Areas; (2) Urban & Residential Areas; (3) Hydromodification; (4) Marinas & Recreational Boating; (5) Forested Areas; (6) Atmospheric Deposition; and (7) Natural Sources & Other Sources.

Findings & Synthesis

Northwest Region

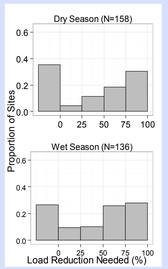

Figure 2a

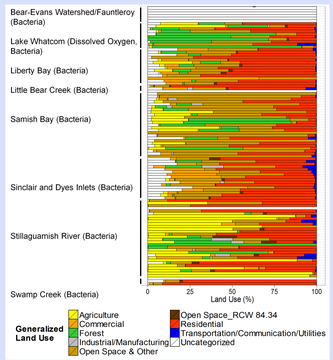

Figure 3a

Case Study. Bacterial-impairment has been an issue in the **Samish River Watershed and Bay**, particularly during the rainy season. Efforts to improve water quality have largely been coordinated through the Clean Samish Initiative.

Southwest Region

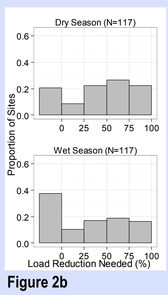

Figure 2b

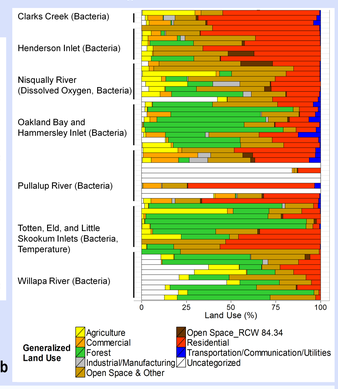

Figure 3b

Case Study. Multiple nonpoint sources (failed septics, livestock waste, domestic pet waste) have contributed to elevated bacteria levels in the **Dungeness River Watershed and Bay,** leading to shellfish closures. Efforts to improve water quality have been rewarded with conditional reopening of shellfish beds.

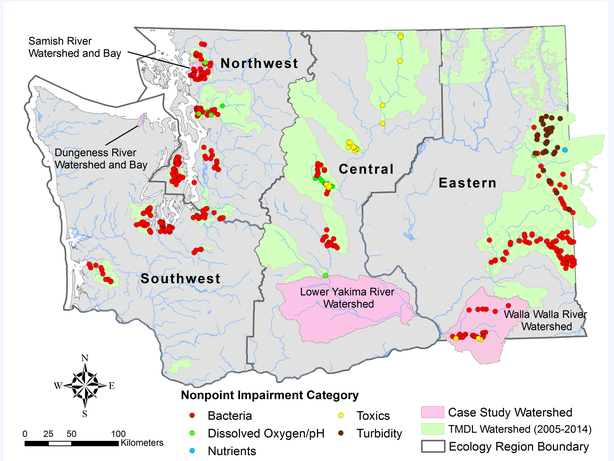

Figure 1

Figure 1. Nonpoint pollution contributed to water quality impairments across all regions of Washington. Most of the TMDLs reviewed addressed bacteria, but overall the TMDLs addressed a range of impairment categories. Temperature was included in our assessment but not shown on this map.

Figures 2a-d. In all regions of Washington, large reductions (>50%) in nonpoint pollution were often needed to attain TMDL water quality targets during both the wet (Nov-Jun) and dry (Jul-Oct) seasons.

Figures 3a-d. In areas where load allocations were established (represented by single horizontal bars), relative general land uses were calculated to depict patterns within and among watersheds and also among regions. For example, one pattern depicted is the dominance of agriculture in watersheds of the eastern region and greater amounts of mixed land uses in other regions.

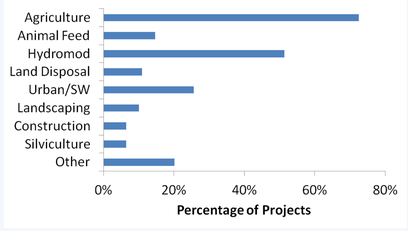

Figure 4

Figure 4. Section 319 BMP projects in Washington from 2005-2013 largely addressed nonpoint pollution related to agriculture, hydromodification, and urban areas/stormwater—typical major nonpoint pollution sources found in Washington and nationwide.

Central Region

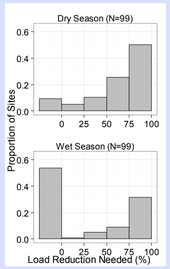

Figure 2c

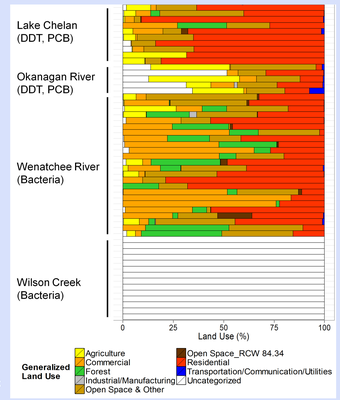

Figure 3c

Case Study. In the **Lower Yakima River Watershed**, agricultural BMPs have largely been effective in reducing erosion of sediments and legacy pesticides into freshwaters.

Eastern Region

Figure 2d

Figure 3d

Case Study. In the **Walla Walla River Watershed**, riparian restoration and protection has been a key strategy for addressing water quality issues caused by nonpoint pollution, including temperature, dissolved oxygen, pH, pesticides, PCBs, and bacteria.

How can nonpoint pollution affect salmon habitat?

From headwater to sea, salmon depend on cold, clean water to thrive. Human activities throughout a watershed can impact water quality in crucial salmon habitat. Land-use activities that contribute heavily to surface runoff of pollutants, loss of riparian areas, and direct discharge of pollutants into surface waters can impair water quality and affect the health and survival of salmon.

1. **Atmospheric deposition** of toxic chemicals and nutrients in surface waters can occur from fallout of industrial, vehicle, agricultural, and residential emissions.
2. Pesticides and fertilizers used for **lawn care** can wash into surface waters, especially after rain events.
3. **Impervious surfaces** contribute elevated runoff of various pollutants into surface waters, especially after rain events. Concentration of toxic chemicals can lead to fish mortality. Excess nutrients can eventually deplete oxygen levels in the water through the process of eutrophication.
4. **Transportation systems** including roads and vehicles contribute pollutants such as heavy metals, petroleum hydrocarbons, and oil and grease. This can create a toxic environment for fish.
5. **Livestock with access to streams** can impact water quality directly (e.g., elevated bacteria and nutrients from manure), or indirectly (e.g., increased sediment erosion from grazing or trampling of riparian vegetation).
6. **Hydromodification**, such as streambank or shoreline armoring, can reduce both physical habitat and water quality for salmon. For example, loss of riparian and shoreline ecological functions can create conditions of elevated turbidity and pollutant loading, as well as decreased cover and shade.
7. **Failed septic tanks** can lead to elevated bacteria and nutrients in surface waters.
8. Antifouling chemicals, fuel and oil spills/drips, direct sewage discharges, and soaps can build up in **marinas.**
9. In **forested areas**, logging activities, skid trails, and high density of roads can contribute to increased sediment and nutrient loading, and decreased shade in streams. This can be problematic for salmon migrants who need these areas for rearing or spawning.
10. In **agricultural areas**, irrigation return flows can contribute elevated sediments from eroded fields, and nutrients and toxic chemicals from fertilizers and pesticides, into downstream surface waters. Excessive application or improper timing of manure spreading operations can lead to elevated groundwater nitrate in shallow aquifers.
11. Unmanaged **pet waste** can lead to elevated bacteria levels in surface waters.

Conclusions

Nonpoint pollution is still a pervasive problem in Washington. Major issues identified in this assessment included:

- Sediment, pesticide, temperature, and nutrient impairments in agricultural areas.
- Runoff of toxic chemicals, bacteria, nutrients, and sediments from urban/residential areas.
- Bacterial impairments from livestock, manure applications, septics, and domestic animals.
- Nitrate contamination of groundwater.
- Elevated temperatures and sediment loading from forest practices.
- Multiple water quality impacts from hydromodification.

Recommendations included:

- Improve the identification, quantification, and prioritization of nonpoint sources as part of TMDLs.
- Explore GIS methods that relate land uses, nonpoint pollution, and BMPs.
- Continue studying the effectiveness of TMDLs and BMPs in reducing nonpoint pollution.
- Explore ways to communicate more effectively to the general public about nonpoint pollution.
- Provide clear and organized guidance on BMPs to address nonpoint issues for different land uses and pollutants, including consideration of site-specific conditions.

Next Steps

A draft of the nonpoint plan was completed in May 2015 and is available online:

https://fortress.wa.gov/ecy/publications/publications/1510015.pdf

Public comment on the draft is open **May 5-June 5, 2015**. The updated plan is expected to be finalized and submitted to EPA in summer 2015.

More information about the process is available on Ecology's website:

http://www.ecy.wa.gov/programs/wq/nonpoint/NPSplan.html

References

A complete list of references compiled for this study can be found in the report:

https://fortress.wa.gov/ecy/publications/publications/1403028.pdf

Acknowledgments

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