



Willamette River TMDL Status

Aspects of the Science for the Non-Scientist

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Troutdale, OR

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What It Is

Definition

Total Maximum Daily Loads (TMDLs) are a regulatory management strategy to partition waste load allocations (WLAs) among various dischargers to keep concentrations within limits in the receiving water body.



Why TMDLs

- They go beyond the NPDES (point source) permitting system to gain broader perspective.
- Water quality management might be improved with watershed approach reflecting cumulative effects of activities.

What Is Covered

- Most recent TMDL draft for the Willamette River:
 - Bacteria
 - Mercury
 - Temperature
- First effort at whole-basin TMDL; subbasins eventually incorporated.

Principal Scientific Issues

- Data quantity limited by basin size, streams and river lengths, budget amount, and personnel availability.
- Data quality affected by limited quantity; therefore, analytical resolution very coarse.
- Numerical modeling proposed to fill data gaps.
 - General model coarsely fits entire basin, but not any local reach or specific site.
 - Site-specific model cannot be extrapolated to entire basin.
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Bacteria: Science Concerns

There are four science concerns with the bacteria TMDL proposed in the draft document:

- 1 Violation locations and timing.
- 2 Data adequacy.
- 3 Determination of waste load allocations.
- 4 Suitability of QUAL2E as a model for the entire Willamette River system.

Criteria

- Threshold: single sample: 406 organisms/100 ml water; geometric mean: 126 organisms/100 ml of water threshold for human recreational contact.
- Sources include multiple point and nonpoint areas during runoff and non-runoff events, including agricultural run-off.

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Violations

- All water quality limited streams based on pre-1996 criteria.
- City of Portland (< *RM18*) in violation because of combined sewer/storm water overflows.
- Page 2-2: “Violations are **common** in creeks that drain urban and agricultural land and discharge to the Willamette River.”
- The “2002 303(d) list identified river miles 0 to about 149 [Long Tom River] . . . as **not attaining** the applicable bacteria criteria . . . during fall-winter-spring months.”

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Violations

- Page 2-5: “Violations near the mouth of the river occurred in approximately 30 to 40% of samples, while violations decreased to 12% of samples at RM 131 near Corvallis.”

Contradictions

- “Only one summer sample approached the single sample maximum value of 406 *E. coli*/100 ml. The entire main stem of the Willamette River has met the *E. coli* criterion during the summer months (June 1–September 30).”
- “Data (1996–2003) indicate outright attainment of the *E. coli* criterion in much of the Willamette River during the fall, winter and spring (October 1–May 31).”
- “Observed fall-winter-spring water quality violations . . . above Willamette Falls are **very subtle**, and are **limited to rare** violations of the single-sample maximum concentration at **a few** sites.”

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Contradictions

- Are bacterial concentrations in violation of the criteria common or rare?
- Are violations along the length of the river system or infrequently at a few sites?
- Is a 12% violation occurrence subtle, limited, rare?



What Does This Mean?

These inconsistencies and subjective language weaken rationale that there is a bacteriological problem in the Willamette River.

Data Adequacy

- Page 2-9: Bacteria samples have been collected at only 10 stations along the mainstem Willamette River since 1996. Usually monthly.
- Bacterial sampling locations located upriver from municipal STP outfalls; exception: RM 161.2 (Harrisburg).
- Except for RM 165.3 sampling locations also capture urban runoff and water transported down river along the main channel.

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Waste Load Allocations

- Point sources throughout the basin required to meet effluent limits prior to discharge.
- Combined sewer overflows in the Portland Metro area receive an allocation reduced from existing loads. But . . .
- “There were no reported violations in ODEQ data during summer in the entire river through the period beginning in 1996 to present. ODEQ data indicate rare violations of the single sample maximum criterion . . . and **no violations of the geometric mean criterion** . . . in recent years in the fall-winter-spring period above Willamette Falls.”

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Waste Load Allocations

- How can we allocate waste loads when the only apparent violations are isolated in space and time? What does this accomplish?

QUAL2E Model Suitability

- One-dimensional; assumes the channel is well-mixed both vertically and laterally.
- Segments the river system into equal-sized reaches.
- Reach calculations do not account for changes in slope, sinuosity, width, tributary inflow or other fluvial geomorphic variables.

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- DEQ should justify why water quality limited streams based on 10 year old criteria.
- 46% reduction in nonpoint sources to allow lower river to meet criteria.

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Mercury: Current Sampling

- From scientific and technical perspective there are serious difficulties associated with sampling metallic and organic mercury.
- Particularly true when concentrations are near the lower detection limits.
- Difficulties with partitioning total amounts by their particular sources or locations.
- Therefore, DEQ's caution in developing controls or numeric criteria is both warranted and technically sound.

Mercury: Future Sampling

- Defining sources, pathways, and methylation processes within entire Willamette River basin is very difficult to do. Therefore, . . .
- Identification of sampling locations and frequency in Chapter 3 need be better defined.
- DEQ should consider adding additional sampling locations to improve spatial resolution of data. And, . . .

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Temperature: Characterizing Entire River System

- Used CE-QUAL-W2 model.
- DEQ staff invested much time and effort in defining variables and locating input data.
- Revisions made early 2006 because of comments to first draft:
 - Use of different flow data to determine river's capacity for assimilating heat.
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Temperature TMDL Deficiencies

- Major scientific deficiencies of the temperature TMDL are:
 - Lack of linking measurements and model outcomes to salmonid fish distribution and behaviors.
 - Exceptional difficulties in relating fractional-degree changes of a 7-day average of maximum daily water temperatures to aquatic biota.
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What Was Modeled

- Serious problem in use of complex numeric models is output for factors that do not matter.
- Example: discussion of channel complexity (pages 4-80 ff).
- Section begins with the statement that any relationship between channel complexity and surface water temperature is only a hypothesis. Therefore, why it is included in the draft TMDL?
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To Correct These Deficiencies

- Incorporate knowledge from qualified fish biologists, stream ecologists, and fluvial geomorphologists as the document is revised during the next three years.
- Remember that statistical significance does not always reflect biological significance.
- Water temperature may not be a limiting factor for salmonid populations in the Willamette River.
- A numeric standard might be exceeded but have no influence on the number of fish nor their vigor individually or as populations.

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Lowering Water Temperatures

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