Oregon DEQ Harmful Algal Bloom (HAB) Strategy

Appendix E
June 2011

State of Oregon
Department of
Environmental
Quality

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DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.

This report prepared by:

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January 31, 2007

Mr. Mike Gearheard
Director
Office of Water and Watersheds
U.S. Environmental Protection Agency Region 10
1200 Sixth Avenue
Seattle, WA 98101

Dear Mr. Gearheard:

This letter fulfills DEQ's commitment in Element 1.5 of the Water Quality component of DEQ and EPA's Performance Partnership Agreement (PPA) for 2007-2008. DEQ's commitment is to describe the state's process for controlling nutrients and protecting the designated uses of Oregon waters. On January 9, 2001, EPA announced the publication of recommended water quality criteria for nutrients under section 304(a) of the Clean Water Act to address the problem of cultural eutrophication of the nation's waters. In a memorandum dated November 14, 2001, EPA Office of Science and Technology Director Geoff Grubbs stated "Nitrogen and phosphorus are the primary causes of cultural eutrophication. The most recognizable manifestations of this cultural eutrophication are algal blooms that occur during the summer. Chronic symptoms of over-enrichment include low dissolved oxygen, fish kills, murky water, and depletion of desirable flora and fauna." EPA has encouraged states to adopt numeric nutrient criteria or to use other scientifically defensible methods and appropriate water quality data to develop criteria protective of designated uses.

Oregon has water quality criteria (in Oregon Administrative Rules Division 41) based on scientifically defensible methods that protect designated beneficial uses from the adverse effects of excessive nutrients. These water quality criteria focus on parameters linked directly to protection of beneficial uses. In addition, Oregon has a narrative criterion that addresses excessive algal growth (a possible consequence of excessive nutrients). The Department is concerned that, because cultural eutrophication is influenced by many factors including sunlight, temperature, type of algae, stream flow, etc., focusing just on nutrient criteria would limit or preclude the development of site-specific responses to water quality problems that the Department has successfully done with its Total Maximum Daily Load (TMDL) program. For example, some Oregon waters have naturally high levels of nutrients such as phosphorus. Implementing a statewide nutrient criteria that is independent of how nutrients may impact beneficial uses would commit the Department's scant resources to developing controls and limits where there would be of little, if any, benefit, and would divert resources away from an already successful program that addresses real nutrient problems. The Department's TMDL program has developed effective approaches to resolve problems and establish appropriate nutrient targets in many EPA-approved TMDLs.

The following TMDLs address nutrients:

Waterbody (Basin/TMDL Segments)	Water Quality Concern Addressed	TMDL Parameters [Additional details]	USEPA Approval Date
Bear Creek (Rogue/3)	Algae, DO, pH [Target in-stream 5-day total Phosphorous concentration = 0.08 mg/l]	Ammonia, BOD, Phosphorus [Excess periphyton resulting from excess nutrients, point source, NPS, irrigation return flows and stream withdrawals]	12/8/92
Clear Lake (Mid Coast/1)	Protection of Water Supply	Phosphorus [Phytoplankton]	12/8/92
Garrison Lake (South Coast/1)	Algae, Aquatic Weeds	Phosphorus [Phytoplankton]	12/8/92
Tualatin River (Willamette/12)	DO, pH, aesthetics [Target in-stream monthly median total Phosphorous concentration = 0.07 mg/l]	Ammonia, Phosphorus	12/8/92
Yamhill River (Willamette/3)	Algae, pH	Phosphorus [Phytoplankton, low stream flows, wastewater discharge]	12/8/92
Tualatin River (Willamette/12)	Algae, pH	Phosphorus [phytoplankton]	1/27/94
Coast Fork Willamette River (Willamette/2)	Algae, DO, pH	Ammonia, Phosphorus [Periphyton, elevated temperature]	5/17/96
Columbia Slough (Willamette/10)	Water Contact, DO, pH, Algae, Fish Consumption	Chlorophyll a, DO, pH, Phosphorus, Bacteria, DDE/DDT, PCBs, Pb, Dieldrin, 2,3,7,8-TCDD [phytoplankton, flow management)]	11/25/98
Upper Grande Ronde Subbasin (Grande Ronde/73)	Temperature, pH, Algae, DO, Sedimentation	Temperature, Sediment, Nitrogen, Phosphorus	5/3/00
Umatilla Basin (Umatilla/45)	Temperature, pH, Sedimentation, Turbidity, Aquatic Weeds, Algae	Temperature, pH, Sedimentation, Turbidity, Aquatic Weeds, Algae	5/9/01
Tualatin Subbasin (Willamette/101)	Temperature, Bacteria, DO, Algae, pH	Temperature, Bacteria, DO, Settleable Volatile Solids, Ammonia, Chlorophyll a, pH, Phosphorus	8/7/01

Waterbody (Basin/TMDL Segments)	Water Quality Concern Addressed	TMDL Parameters [Additional details]	USEPA Approval Date
Little River Watershed (North Umpqua/16)	Temperature, pH, Sedimentation	Temperature, pH, Sediment	1/29/02
Upper Klamath Lake Drainage (Klamath/32)	Temperature, pH, DO, Chlorophyll a	Temperature, pH, DO, Chlorophyll a	8/7/02
Alvord Lake Subbasin (Malheur Lake/7)	Temperature, DO	Temperature, DO	2/11/04
South Umpqua	Temperature, ph, DO, excess periphyton	Phosporus, temperature. Excess periphyton	Submitted, approval pending
Snake River-Hells Canyon Reach (Snake River/5)	Phosphorus, Sediment, DO	Temperature, Sediment, DO	9/9/04

Oregon's TMDL process begins with the Department's water quality assessment that considers current monitoring data in developing the Section 303(d) list of impaired waters. Once a waterbody is listed as impaired, it is placed in the cue for TMDL development. The first step in TMDL development is an assessment to determine cause and effect of the impairment. If the assessment indicates that the cause is anthropogenic (i.e. not natural) and that a beneficial use is impaired, then the Department employs analytical methods, such as models, to develop a solution for the problem. The models are used to develop and review alternative control strategies. This represents an effective approach for addressing cultural eutrophication. Through this approach, the Department has implemented both point source and nonpoint source nutrient load reduction efforts. As in the case of the Tualatin River, the TMDL efforts provided the basic science behind the control strategies which also supported innovative approaches such as pollution trading alternatives.

DEQ's confidence in the capacity of the TMDL program to address nutrient issues is borne out in the Tualatin TMDL. The Environmental Quality Commission adopted the initial TMDL for the Tualatin in 1988 and since that time, water quality has improved dramatically. Figure 1, below, depicts the levels of total phosphorus at Boone's Ferry within the Tualatin subbasin, and shows that significant progress has been made at improving water quality. Figure 2, below, demonstrates the improvement in Dissolved Oxygen (DO), which indicates nutrient concentrations are decreasing. More nutrients could potentially mean more algae. Excessive levels of algae can cause drastic fluctuations in DO levels through photosynthesis and respiration. Additionally, large amounts of dying algae can create a significant oxygen demand when the algae is being broken down by in stream bacteria. Finally, Figure 3 demonstrates the decrease in *Chlorophyll a*, which is an indicator of algal growth.

Figure 1. Mean (± SD) total phosphorus in the Tualatin River at Boones Ferry before and after implementation of the first Tualatin River TMDL (adopted by the Oregon Environmental Quality Commission in 1988). Each mean includes grab samples taken between May and October of the indicated year.

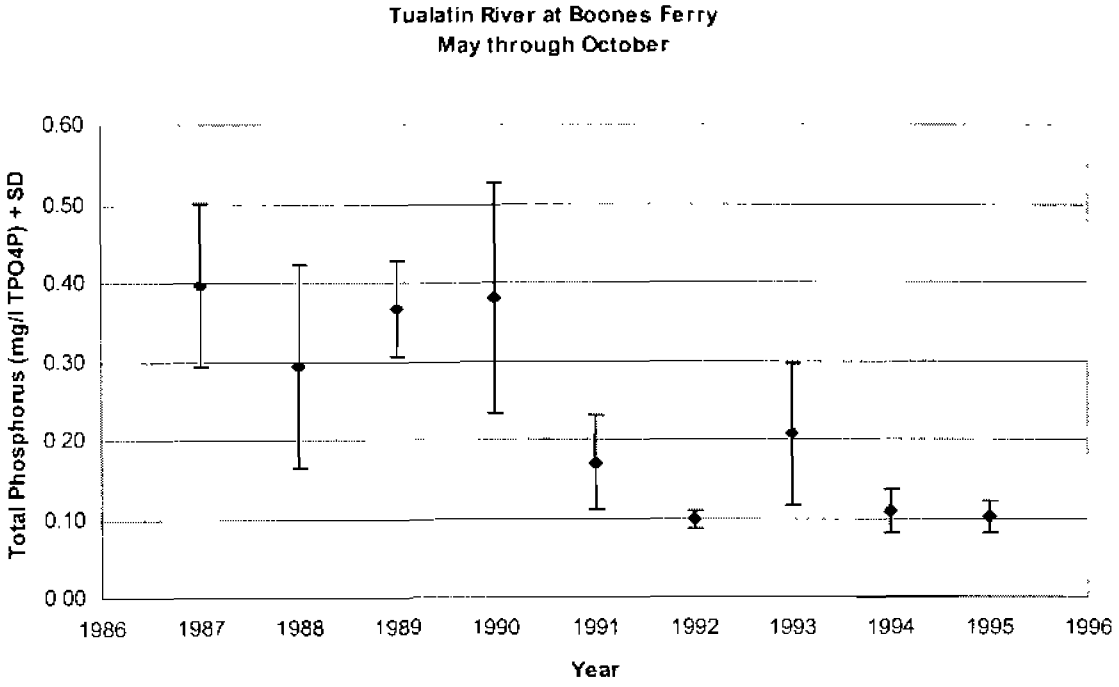


Figure 2.

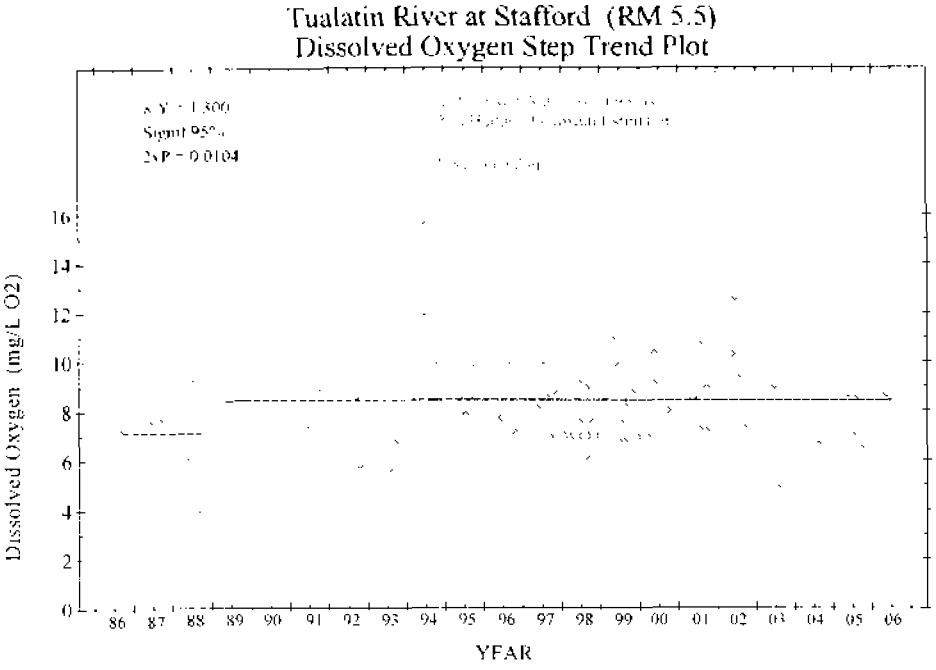
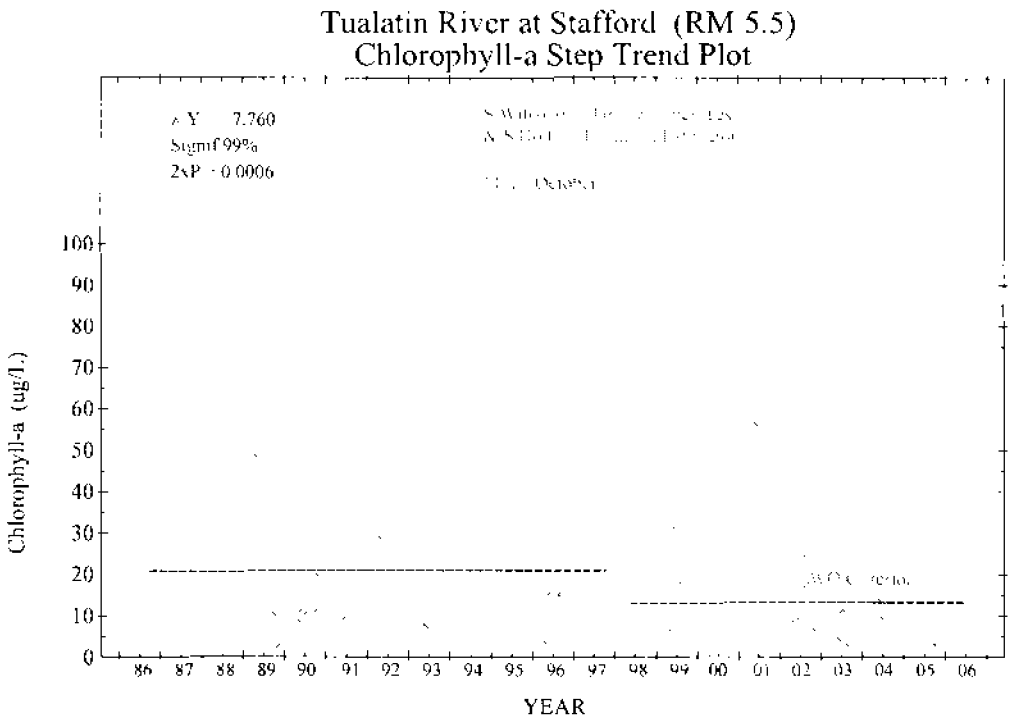


Figure 3.

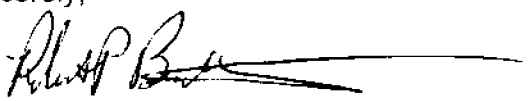


The Tualatin River demonstrates that water quality improvements can be made without numerical nutrient criteria—in fact, in some basins such as the Umatilla River, TMDL work revealed that nutrients were not the driver for excessive algal growth. Instead, elevated temperatures increased algal growth in the naturally high phosphorus waters the Umatilla River. Thus, DEQ's efforts are focused on reducing solar radiation and or temperature reduction targets in the TMDL. Another example is the Columbia slough, where a combination of flow modification and nutrient control strategies were used to control eutrophication and improve water quality. The Umatilla River and Columbia Slough serve as good examples of why site specific monitoring data and the modeling associated with DEQ's TMDLs have been effective in addressing site specific nutrient concerns.

DEQ believes that it has water quality standards already in place to address nutrient issues. The impacts to beneficial uses from nutrients may take the form of excessive algal growth, low DO and/or low or high pH. The Department has criteria for DO and p and a chlorophyll-a action level, as well as a narrative criterion related to algal and wee growth. In addition, the Department has an ammonia criterion to prevent toxicity. The Department's performance in crafting effective TMDLs that address nutrient issues proves its commitment and competency. The Department plans to continue these effor to deal with nutrient-related water quality issues and look for EPA Region 10's support this strategy.

If you have any questions, please contact me or Jordan Palmeri (503-229-6766) of my staff.

Sincerely,



Robert P. Baumgartner
Manager
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