Tualatin Subbasin TMDL

Chapter 1
Overview and Background

August 2012

DEQ
State of Oregon
Department of
Environmental
Quality

Table of Contents

1.1 Background ... 11
1.2 Need For TMDL Amendment ... 18
1.3 Organization of this Report ... 18

Figures

Figure 1-1. Location of the Tualatin Subbasin in the State of Oregon. ... 11
Figure 1-2. Tualatin River and its major tributaries. ... 12
Figure 1-3. A schematic that shows the relative flow contributions to summer low flow in the mainstem Tualatin River from Clean Water Services flow augmentation program, and Waste Water Treatment Facility discharges. The Tualatin River is shown in dark blue; flow augmentation from Barney Reservoir in Green, Hagg Lake in light blue, and wastewater treatment effluent in medium blues. ... 13
Figure 1-4. Land Ownership in the Tualatin Subbasin. Note that publicly owned land in city limits is not depicted. O & C refers to historic Oregon and California Railroad land grant lands currently managed for forestry by the Bureau of Land Management. ... 14
Figure 1-5. Land Use (based on zoning) in the Tualatin Subbasin. ... 15
Figure 1-6. Total Phosphorus in September at Selected Sites on the Tualatin River. ... 17
Figure 1-7. Number of hours the pH Standard was exceeded each year in Lower Tualatin (1991-2011) near the Lake Oswego Diversion Dam at River Mile 3.4. Where no bar shows indicates zero hours of violations; data exist for all years. ... 18

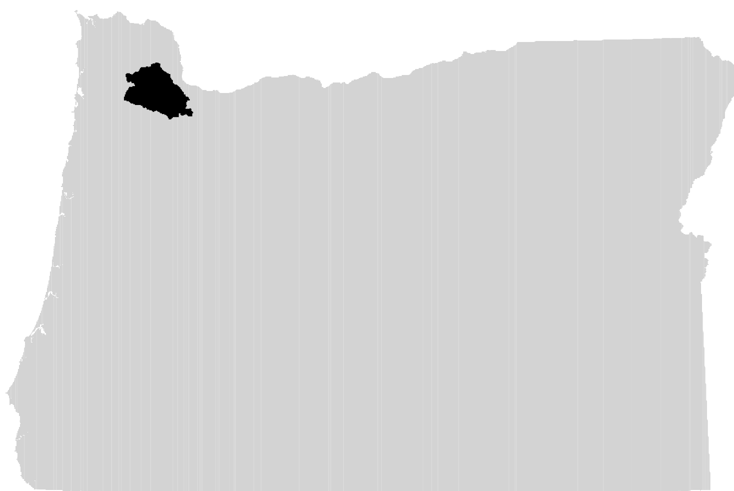
Tables

Table 1-1. Summer low-flow average depth, width and flow characteristics for the mainstem Tualatin River and selected tributaries ... 12

1.1 Background

The Tualatin River drains an area of 712 square miles and is situated in the northwest corner of Oregon **(Figure 1-1**). It is a subbasin of the Willamette River Basin. The headwaters are in the Coast Range and flow in a generally easterly direction to the confluence with the Willamette River. The subbasin lies almost entirely within Washington County. There are also small portions of the sub-basin in Multnomah, Clackamas, and Yamhill, Tillamook and Columbia counties.

Figure 1-1. Location of the Tualatin Subbasin in the State of Oregon.



The Tualatin River is approximately 83 miles in length and has a very flat gradient for most of its length. There is a reservoir-like section between River Mile (RM) 24 and 3.4. Major tributaries to the Tualatin River include: Scoggins, Gales, Dairy (including East Fork, West Fork, and McKay Creeks), Rock (including Beaverton Creek), and Fanno Creeks (**Figure 1-2)**. Summer flow is supplemented with releases of water from Hagg Lake (Scoggins Reservoir) on Scoggins Creek and from Barney Reservoir, located on the Trask River, which diverts water into the upper Tualatin River. Effluent flow from the waste water treatment plants comprises a significant percent of summer river flow. Flow is also diverted from the Tualatin River to Oswego Lake in the lower portion of the river near river mile 6.7.

Figure 1-2. Tualatin River and its major tributaries.

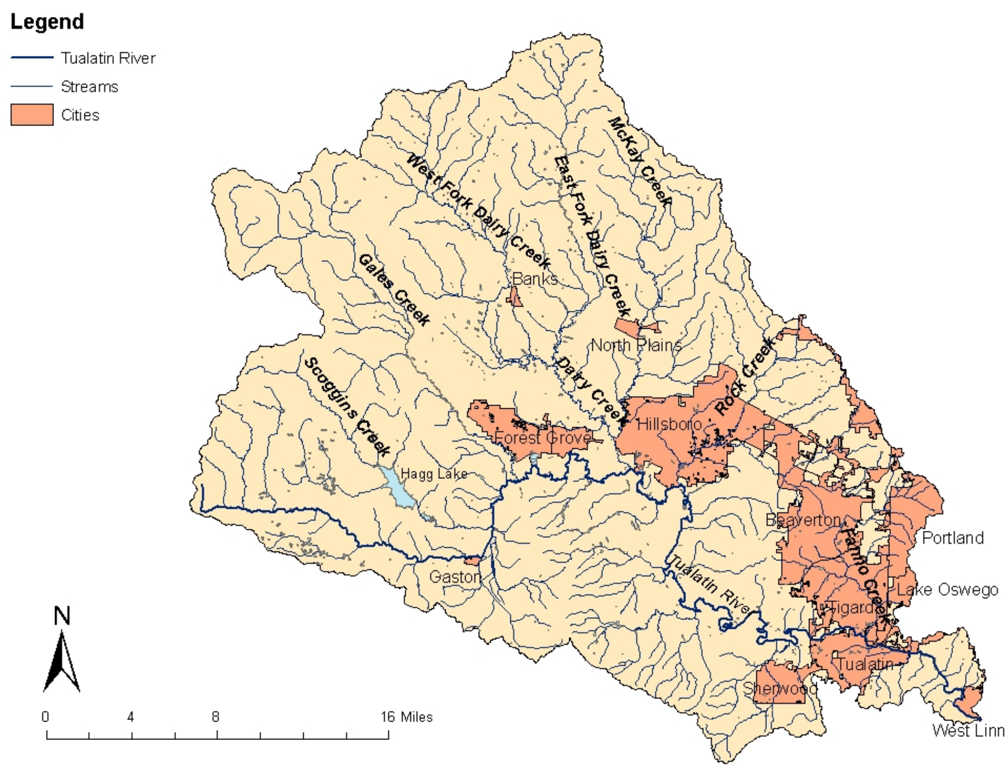


Table 1-1 shows the average summer flow, the wetted width, and the approximate depth of the Tualatin River at several points in the basin and the major tributaries at their mouths. These data were obtained from a water quality model that was used as the basis for a new temperature TMDL (DEQ is awaiting resolution of a legal challenge to the temperature standard and is not issuing a temperature TMDL revision at this time). The river characteristics are included here to provide a rough impression of the size and character of the Tualatin River.

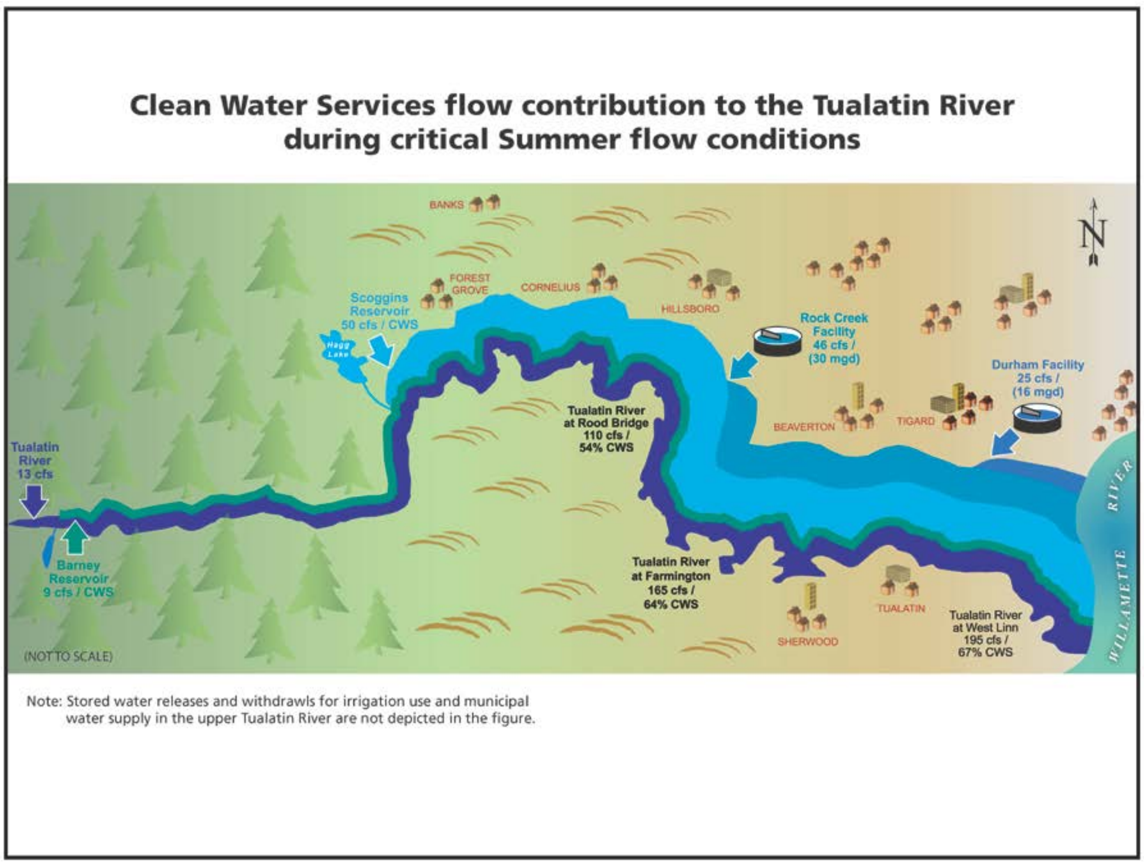
Table 1-1. Summer low-flow average depth, width and flow characteristics for the mainstem Tualatin River and selected tributaries

	River Mile of the Tualatin mainstem	Average Flow, (cfs)	Average Wetted Width, ft	Average Depth, ft
Scoggins Creek, at mouth	60.0	155.6	32.3	4.8
Tualatin River downstream of Scoggins Cr.	60.0	199.7	43.1	6.7
Gales Creek, at mouth	56.8	10.4	43.5	0.3
Tualatin River at Forest Grove WWTF[1]	53.8	101.5	52.6	4.7
Dairy Creek (West Fork & Mainstem) at mouth	44.7	18.2	41.0	2.0
Tualatin River at Hillsboro WWTF	43.3	119.1	58.4	9.3
Rock Creek at mouth	38.1	7.6	34.7	0.6
Tualatin River at Farmington Bridge	33.3	163.8	61.1	4.5
Tualatin River upstream of Durham WWTF	9.2	162.8	90.0	4.8
Fanno Creek at Mouth	9.0	6.6	34.3	1.1
Tualatin River at Oswego Dam	3.4	214.2	180.5	15.8

[1] Water released from Barney Reservoir and Hagg Lake for drinking water and irrigation are withdrawn upstream of this location. This explains the sudden decrease in flow at this site.

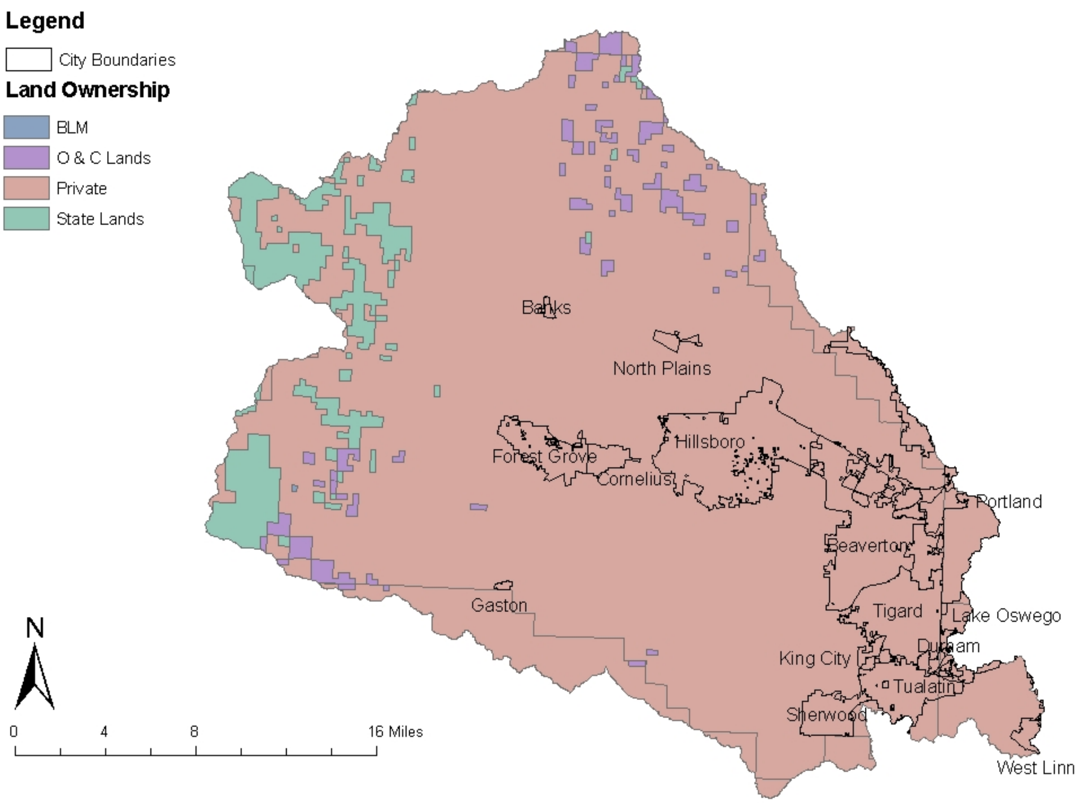
Figure 1-3 is not drawn to scale, but instead provides a schematic diagram of Clean Water Services contributions of water to the mainstem Tualatin River during the low flow summer season. Flow is increased by both flow augmentation of stored water, and discharge from the waste water treatment facilities (WWTF) in the basin. During summer, at the mouth of the river, 67% of the river flow is attributed to Clean Water Services. About 40% of the additional flow originates from stored water in Barney Reservoir and Hagg Lake, and about 60% of the increased flow comes from WWTF discharge. This schematic does not include stored water releases for irrigation and drinking water. The Tualatin Valley Irrigation District releases water from Hagg Lake for irrigation, and withdraws that water downstream near Forest Grove. The Joint Water Commission has stored water rights in both Barney and Hagg Lake, and releases water for municipal water supplies from both these locations. Water is withdrawn at the drinking water treatment plant near Forest Grove. While these releases provide additional water in the upper Tualatin River, the benefits of increased flow cease to occur at the points of diversion near Forest Grove in the upper basin.

Figure 1-3. A schematic that shows the relative flow contributions to summer low flow in the mainstem Tualatin River from Clean Water Services flow augmentation program, and Waste Water Treatment Facility discharges. The Tualatin River is shown in dark blue; flow augmentation from Barney Reservoir in Green, Hagg Lake in light blue, and wastewater treatment effluent in medium blues.



The subbasin supports a wide range of forest, agriculture and urban related activities The urban area, which makes up approximately 26% of the basin, is rapidly growing and includes the cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Gaston, Hillsboro, King City, Lake Oswego, North Plains, Sherwood, Tigard, Tualatin, West Linn and portions of Portland. The urban area is served by four wastewater treatment plants (WWTPs), which are operated by Clean Water Services (CWS). Agricultural land use makes up approximately 35% of the basin with forestry land use making up the remaining 39%. Approximately 92% of the basin is in private ownership with state and federal lands making up the remaining 8% **(Figures 1-4 and 1-5)**.

Figure 1-4. Land Ownership in the Tualatin Subbasin. Note that publicly owned land in city limits is not depicted. O & C refers to historic Oregon and California Railroad land grant lands currently managed for forestry by the Bureau of Land Management.



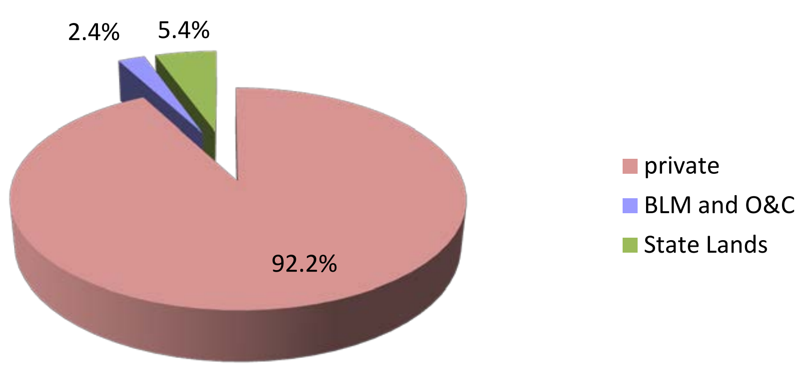
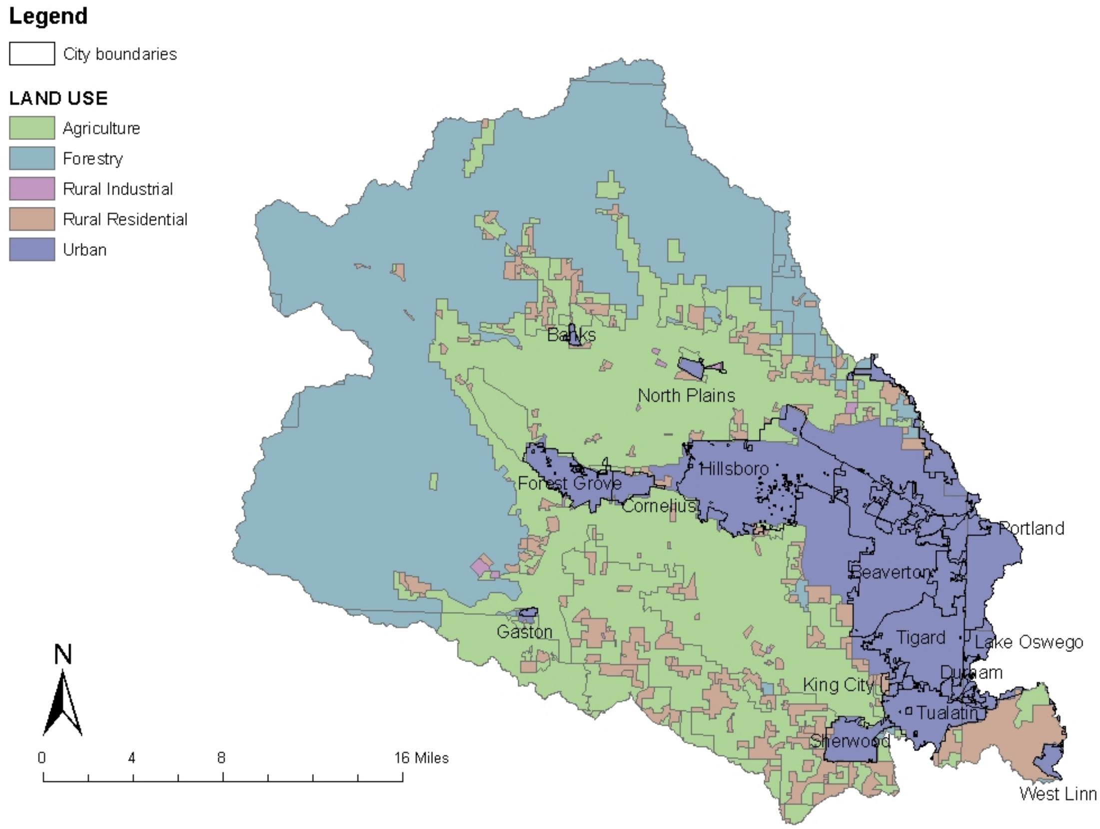
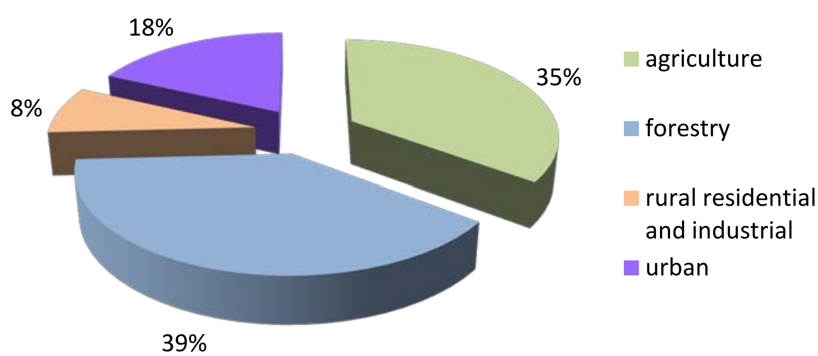


Figure 1-5. Land Use (based on zoning) in the Tualatin Subbasin.





The Tualatin River is home to winter steelhead, coho salmon, and resident cutthroat Trout. Winter steelhead are currently listed as threatened by the National Marine Fishery Service under the Endangered Species Act. These fish are generally in decline in the subbasin and have been lost from some tributaries due to a variety of factors that also include changes in habitat and water quality. In addition, the Tualatin River is receiving increasing use for water contact recreation (e.g. canoeing, fishing, and swimming) as the nearby population increases and access to the river through parks and boat ramps has increased.

The Tualatin River has experienced water quality problems over the years as human activity increased in the subbasin. The WWTPs in the subbasin were upgraded and were complying with their technology-based permits in the late 1970's. Flow augmentation from Hagg Lake first occurred in June 1975, after the completion of Scoggins Dam. However, in the early 1980's, it was clear that the Tualatin River was still experiencing water quality problems resulting from population growth in the subbasin.

When technology-based controls are not sufficient to meet water quality standards and support the beneficial uses of a water body, the Federal Clean Water Act requires Total Maximum Daily Loads (TMDLs) to be developed for the pollutant(s) causing the impairment. Simply put, a TMDL is the total amount of pollutant that can be added to a waterbody without violating water quality standards or impairing beneficial uses. This daily load is then allocated into background loads, loads from non-point sources, waste loads, reserve capacity for future safety, and a margin of safety to ensure that water quality is protected. Waste Load Allocations (WLA) and Load Allocations (LA) are assigned to each source in the basin. TMDLs are generically described by the following equation **(Equation 1-1)**:

Equation 1-1.

$$TMDL = LC = \Sigma WLA + \Sigma LA + RC + MOS$$

Where:

LC = loading capacity or the greatest loading a waterbody can receive without exceeding water quality standards;
WLA = wasteload allocation, or the portion of the TMDL allocated to existing or future point sources;
LA = load allocation, or the portion of the TMDL allocated to existing or future nonpoint sources and natural background;
RC= Load Capacity reserved for future sources, and
MOS = margin of safety, or an accounting of uncertainty about the relationship between pollutant loads and receiving water quality.

In 1988, DEQ developed an ammonia TMDL to address problems with low dissolved oxygen (DO) and a total phosphorus TMDL to address problems with high pH and nuisance algal growth in the reservoir-like section of the Tualatin River. In 2001, the TMDLs for ammonia and total phosphorus were revised and additional TMDLs were developed for temperature and bacteria (to address elevated levels basin-wide) and for settleable volatile solids (to address low dissolved oxygen in the tributaries).

The goal of the ammonia TMDL was to meet the DO criteria that are necessary to support the beneficial use of "resident fish and aquatic life." The ammonia TMDL focused mainly on the discharge from the WWTPs, which were the major sources of ammonia to the river during the period between May to mid-November. After ammonia removal processes were added to the WWTPs, the levels of ammonia have dropped dramatically and DO has improved in the Tualatin River.

The goal of the total phosphorus TMDL was to reduce the nuisance algal growth and resultant high pH levels in the reservoir-like section of the Tualatin River. In addition, the goal was to reduce the phosphorus loading to Lake Oswego which also experiences nuisance algal growth and high pH levels. This was necessary to support the beneficial use of "resident fish and aquatic life" and "aesthetics." This

TMDL had both a point source and non-point source component. The WWTPs upgraded their capacity to remove total phosphorus to meet the TMDL requirements. The Designated Management Agencies (DMAs), which include the Unified Sewerage Agency of Washington County (now known as Clean Water Services, CWS), Clackamas County, Washington County, Multnomah County, City of Lake Oswego, City of West Linn, City of Portland, Oregon Department of Agriculture (ODA) and the Oregon Department of Forestry (ODF) are implementing best management practices (BMPs) to reduce the total phosphorus from non-point sources and urban runoff. The levels of total phosphorus have dropped dramatically in the Tualatin River since the WWTPs enhanced their total phosphorus removal capabilities (**Figure 1-6**). The BMPs, such as water quality facilities for storm water runoff, street sweeping and educational programs have been implemented and have been successful in reducing total phosphorus in the tributaries. As a result, in recent years, the peaks of the nuisance algal blooms have been reduced and pH values in the lower mainstem are being met (**Figure 1-7)**.

The 2001 TMDLs add three additional parameters to be addressed by management agencies in the Tualatin. The temperature and settleable volatile solids TMDLs were targeted to meet the temperature and dissolved oxygen standards respectively that support resident fish and aquatic life. The bacteria TMDL targeted the bacteria standard that protects water contact recreation. The focus was again basin wide but water quality problems were particularly noted in the tributaries to the Tualatin. Programs are underway to address these three parameters.

Figure 1-6. Total Phosphorus in September at Selected Sites on the Tualatin River.

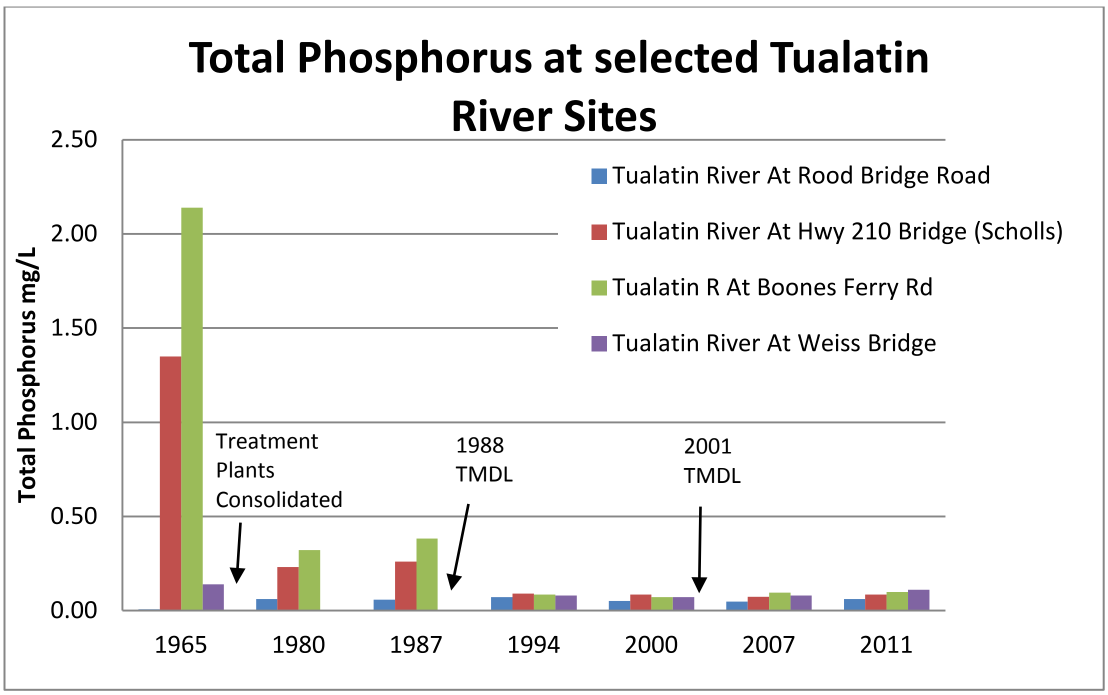
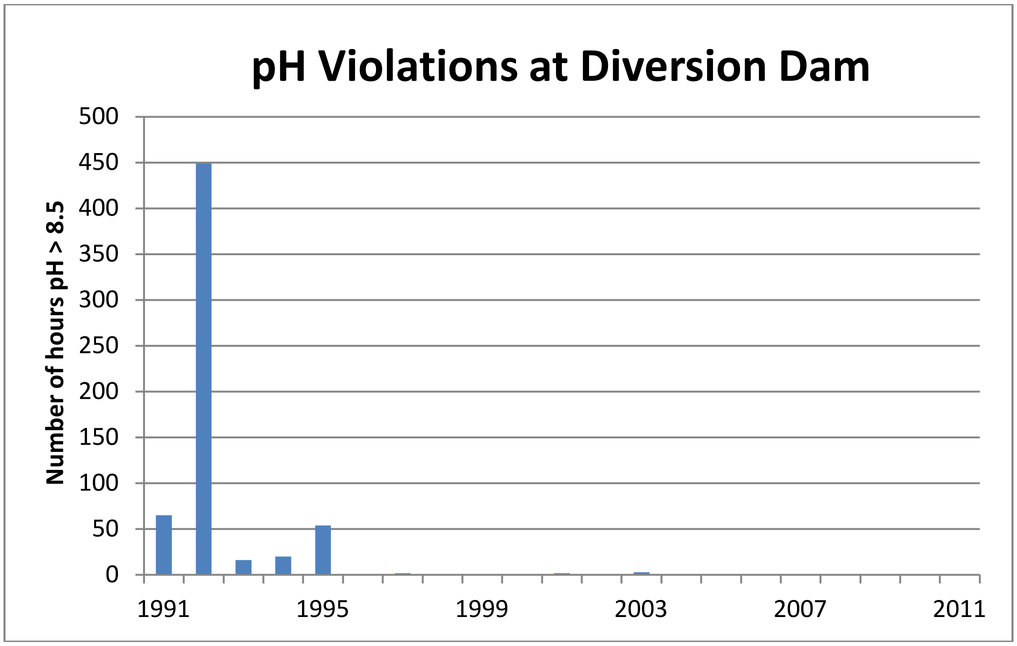


Figure 1-7. Number of hours the pH Standard was exceeded each year in Lower Tualatin (1991-2011) near the Lake Oswego Diversion Dam at River Mile 3.4. Where no bar shows indicates zero hours of violations; data exist for all years.



1.2 Need For TMDL Amendment

This TMDL action includes amendments for two of the TMDLs issued in 2001; total phosphorus and ammonia. These amendments specifically provide waste load allocations for two new upstream summer time discharges. In addition, the total phosphorus amendment includes changes of dates when the TMDL applies. The Water Quality Management Plan has also been revised and updated to reflect DEQ rule changes adopted in 2002 (OAR 340-0042).

The area covered by the Tualatin River Subbasin TMDLs corresponds to the fourth field hydrologic unit code (HUC) 17090010, which includes all lands that drain to the Tualatin River. The Tualatin River Subbasin drains urban, agricultural, and forested lands. These TMDLs are applicable to all areas and land uses in the Tualatin River Subbasin. The phosphorus TMDL is also applicable to the Oswego Lake Watershed.

1.3 Organization of this Report

This report is structured to address the required elements for DEQ to issue an for EPA approval of the TMDL. The TMDL amendments for both total phosphorus and ammonia are being modified to accommodate changes discharge sources.

Chapter 2 presents an amendment to the 2001 TMDL for pH and Chlorophyll.
Chapter 3 presents an amendment to the 2001 TMDL for Dissolved Oxygen
Chapter 4 describes the reasonable assurance of implementation, provides an overview to the Water Quality Management Plans, and describes pollutant trading.

The appendices contain more detailed technical or policy related material.

As this TMDL builds on earlier TMDLs, specifically the 2001 TMDL Documents, it does not repeat all the information contained therein but focuses on the required elements needed for review and approval of the TMDL modification or amendment. The interested reader should reference the earlier documents – especially for more background regarding the subbasin and the impact of the pollutants.

This page intentionally left blank.