



Oregon
Department
of Agriculture

Lower Willamette Agricultural Water Quality Management Area Plan

Developed by the:

Oregon Department of Agriculture

With support from the:

**Lower Willamette Local Advisory Committee
East Multnomah Soil and Water Conservation District
West Multnomah Soil and Water Conservation District
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Acronyms and Terms Used in this Document

Ag Water Quality Program – Agricultural Water Quality Management Program

Area Plan – Agricultural Water Quality Management Area Plan

Area Rules – Agricultural Water Quality Management Area Rules

CAFO – Confined Animal Feeding Operation

CNPCP – Coastal Nonpoint Pollution Control Program

CWA – Clean Water Act

CSWCD – Clackamas Soil and Water Conservation District

CZARA – Coastal Zone Act Reauthorization Amendments

DEQ – Oregon Department of Environmental Quality

DO – Dissolved Oxygen

EMSWCD – East Multnomah Soil and Water Conservation District

FSA – Farm Service America

GWMA – Groundwater Management Area

HUC – Hydrologic Unit Code

LAC – Local Advisory Committee

Management Area – Agricultural Water Quality Management Area

Metro – Portland Metro

MOA – Memorandum of Agreement

NPDES – National Pollution Discharge Elimination System

NRCS – Natural Resources Conservation Service

OAR – Oregon Administrative Rules

ODA – Oregon Department of Agriculture

ODF – Oregon Department of Forestry

ODFW – Oregon Department of Fish and Wildlife

ORS – Oregon Revised Statute

OWEB – Oregon Watershed Enhancement Board

PMP – Pesticides Management Plan

PSP – Pesticides Stewardship Partnership

Regulations – Agricultural Water Quality Management Area Regulations

RUSLE – Revised Universal Soil Loss Equation

SWCD – Soil and Water Conservation District

T – Soil Loss Tolerance Factor

TMDL – Total Maximum Daily Load

USDA – United States Department of Agriculture

US EPA – United States Environmental Protection Agency

WQPMT – Water Quality Pesticides Management Team

WRD – Water Resource Department

Foreword

This Agricultural Water Quality Management Area Plan (Area Plan) provides guidance for addressing water quality due to agricultural activities in the Agricultural Water Quality Management Area (Management Area). The purpose of this Area Plan is to identify strategies to prevent and control water pollution from agricultural lands through a combination of educational programs, suggested land treatments, management activities, compliance, and monitoring.

The provisions of this Area Plan do not establish legal requirements or prohibitions, as described in Oregon Revised Statute (ORS) 568.912(1).

Required Elements of Area Plans

Area Plans must describe a program to achieve the water quality goals and standards necessary to protect designated beneficial uses related to water quality, as required by state and federal law (Oregon Administrative Rule (OAR) 603-090-0030(1)). At a minimum, an Area Plan must:

- Describe the geographical area and physical setting of the Management Area.
- List water quality issues of concern.
- List impaired beneficial uses.
- State that the goal of the Area Plan is to prevent and control water pollution from agricultural activities and soil erosion and to achieve applicable water quality standards.
- Include water quality objectives.
- Describe pollution prevention and control measures deemed necessary by the Oregon Department of Agriculture (ODA) to achieve the goal.
- Include an implementation schedule for measures needed to meet applicable dates established by law.
- Include guidelines for public participation.
- Describe a strategy for ensuring that the necessary measures are implemented.

Plan Content

Chapter 1: Agricultural Water Quality Management Program Purpose and Background. The purpose is to have consistent and accurate information about the Agricultural Water Quality Management Program.

Chapter 2: Local Background. Provides the local geographic, water quality, and agricultural context for the Management Area. Describes the water quality issues, Area Rules, and available or beneficial practices to address water quality issues.

Chapter 3: Local Goals, Objectives, and Implementation Strategies. Chapter 3 presents goal(s), measurable objectives and timelines, and strategies to achieve the goal(s) and objectives.

Chapter 4: Local Implementation, Monitoring, and Adaptive Management. ODA and the Local Advisory Committee (LAC) will work knowledgeable sources to summarize land condition and water quality status. Trends are summarized to assess progress toward the goals and objectives in Chapter 3.

Chapter 1: Agricultural Water Quality Management Program Purpose and Background

1.1 Purpose of Agricultural Water Quality Management Program and Applicability of Area Plans

As part of Oregon's Agricultural Water Quality Management Program (Ag Water Quality Program), this Area Plan guides landowners and partners such as Soil and Water Conservation Districts (SWCDs) in addressing water quality issues due to agricultural activities. The purpose of this Area Plan is to identify strategies to prevent and control water pollution from agricultural activities and soil erosion (ORS 568.909(2)) on agricultural and rural lands for the area within the boundaries of the Management Area (OAR 603-090-0000(3)) and to achieve and maintain water quality standards (ORS 561.191(2)). This Area Plan has been developed and revised by ODA, the LAC, with support and input from the Clackamas, East Multnomah, and West Multnomah SWCD and the Oregon Department of Environmental Quality (DEQ). Throughout the development and revision processes, the public was invited to participate. This included public comment at meetings and public hearings during the Area Plan approval process. This Area Plan is implemented using a combination of outreach and education, conservation and management activities, compliance with rules developed to implement the Area Plan, monitoring, evaluation, and adaptive management.

The provisions of this Area Plan do not establish legal requirements or prohibitions (ORS 568.912(1)). Each Area Plan is accompanied by rules that describe local agricultural water quality regulatory requirements. ODA will exercise its regulatory authority for the prevention and control of water pollution from agricultural activities under the Ag Water Quality Program's general regulations (OARs 603-090-0000 to 603-090-0120) and under the rules for this Management Area (OARs 603-095-3700 through 603-095-3760). The Ag Water Quality Program's general rules guide the Ag Water Quality Program, and the rules for the Management Area are the regulations that landowners must follow.

This Area Plan and its associated regulations apply to all agricultural activities on non-federal and non-Tribal Trust land within the Management Area, including:

- Farms and ranches.
- Rural properties grazing a few animals or raising crops.
- Agricultural lands that lay idle or on which management has been deferred.
- Agricultural activities in urban areas.
- Agricultural activities on land subject to the Forest Practices Act (ORS 527.610).

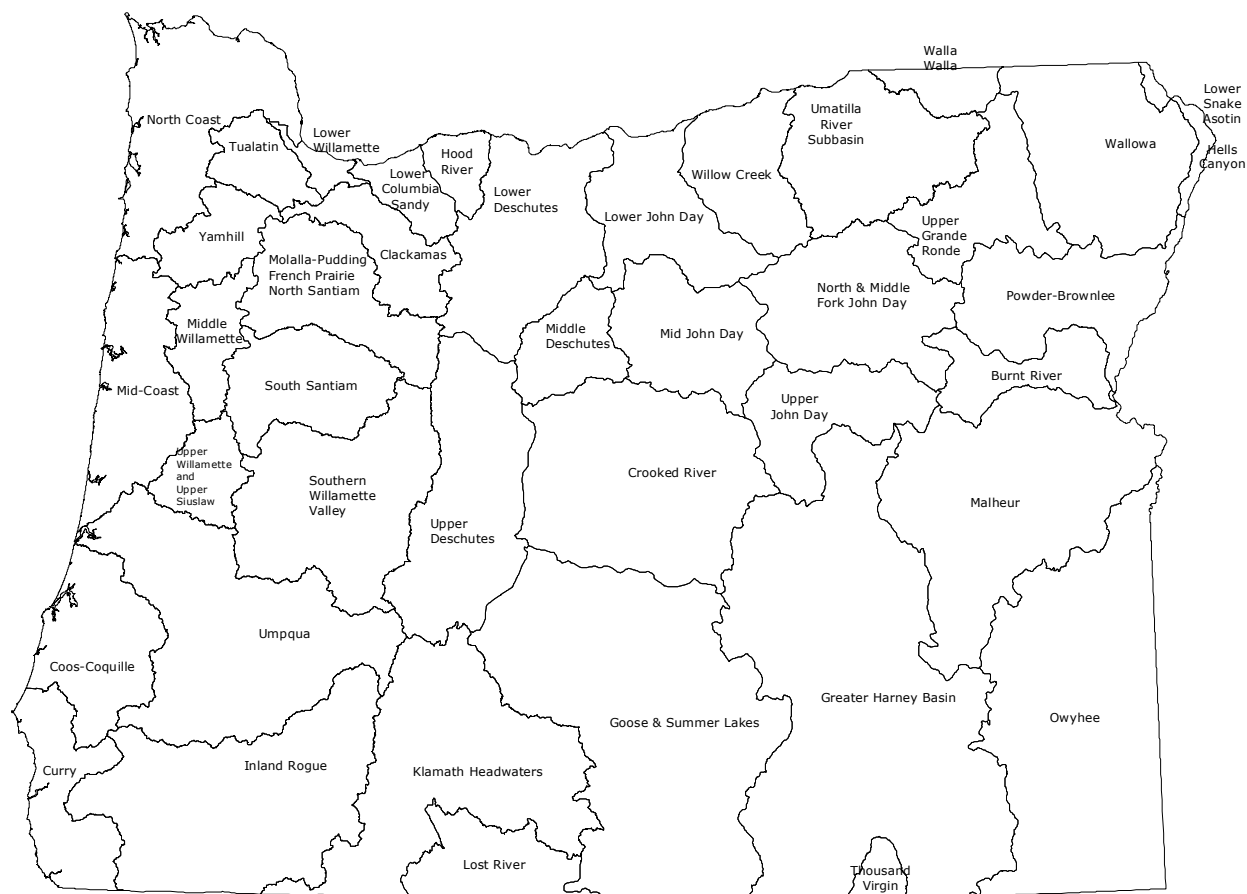
1.2 History of the Ag Water Quality Program

In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act, directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion, and to achieve water quality standards (ORS 568.900 through ORS 568.933). Senate Bill 502 was passed in 1995 to clarify that ODA regulates agriculture with respect to water quality (ORS 561.191). This Area Plan and its associated rules were developed and subsequently revised pursuant to these statutes.

Between 1997 and 2004, ODA worked with LACs and SWCDs to develop Area Plans and associated rules in 38 watershed-based Management Areas across Oregon (Figure 1). Since 2004, ODA, LACs, SWCDs, and other partners have focused on implementation, including:

- Providing education, outreach, and technical assistance to landowners.
- Implementing projects to improve agricultural water quality.
- Investigating complaints of potential violations of rules.
- Conducting biennial reviews of Area Plans and rules.
- Monitoring, evaluation, and adaptive management.
- Developing partnerships with SWCDs, state, federal, and tribal agencies, watershed councils, and others.

Figure 1: Map of 38 Agricultural Water Quality Management Areas



1.3 Roles and Responsibilities

1.3.1 Oregon Department of Agriculture (ODA)

ODA is the agency responsible for implementing the Ag Water Quality Program (ORS 568.900 to 568.933, ORS 561.191, OAR 603-090, and OAR 603-095). The Ag Water Quality Program was established to develop and carry out a water quality management plan for the prevention and control of water pollution from agricultural activities and soil erosion. State and federal laws that are drivers for establishing an Ag Water Quality Management Plan include:

- State water quality standards.
- Load allocations for agricultural nonpoint source pollution assigned under Total Maximum Daily Loads (TMDLs) issued pursuant to the Clean Water Act (CWA), Section 303(d).
- Approved management measures for Coastal Zone Act Reauthorization Amendments (CZARA).
- Agricultural activities detailed in a Groundwater Management Area (GWMA) Action Plan (if a GWMA has been established and an Action Plan developed).

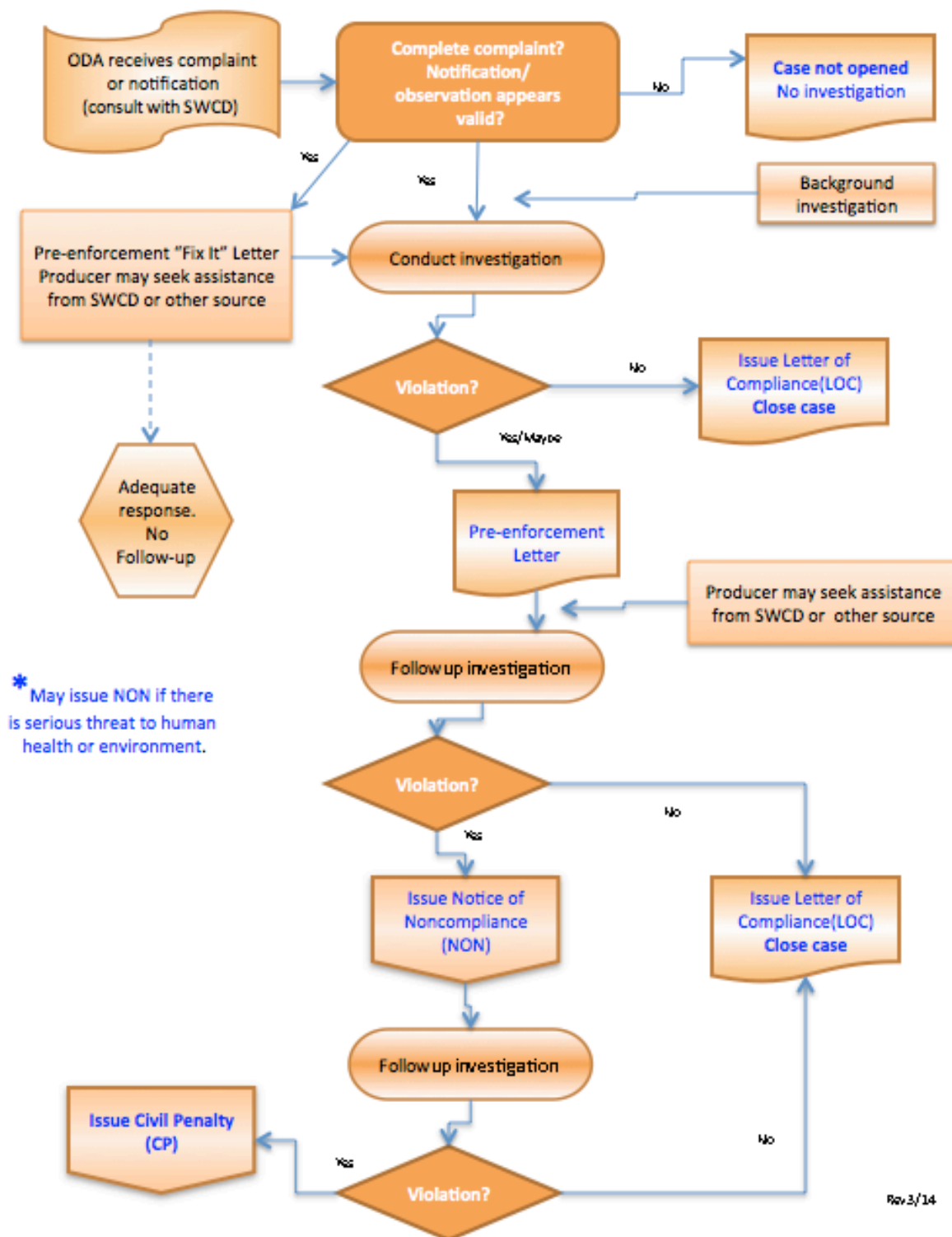
ODA has the legal authority to develop and implement Area Plans and administrative rules for the prevention and control of water pollution from agricultural activities and soil erosion, where such plans are required by state or federal law (ORS 568.909 and ORS 568.912). ODA will base Area Plans and Area Rules on scientific information (ORS 568.909). ODA works in partnership with SWCDs, LACs, DEQ, and other partners to implement, evaluate, and update the Area Plans and Area Rules. ODA has responsibility for any actions related to enforcement or determination of noncompliance with Area Rules (OAR 603-090-0080 through OAR 603-090-0120). ORS 568.912(1) and ORS 568.912(2) give ODA authority to adopt rules that require landowners to perform actions necessary to prevent and control pollution from agricultural activities and soil erosion.

The emphasis of this Area Plan is on voluntary, incentive-based, action by landowners or operators to control the factors affecting water quality in the Management Area. The Area Rules are outlined as a set of minimum standards that must be met on all agricultural or rural lands. Landowners and operators who fail to address these rules may be subject to enforcement procedures, which are outlined below.

Enforcement Action—ODA will use enforcement mechanisms where appropriate and necessary to gain compliance with water quality Area Rules. Any enforcement action will be pursued only when reasonable attempts at voluntary solutions have failed. If a violation is documented, ODA may issue a pre-enforcement notification or an Order such as a Notice of Noncompliance. If a Notice of Noncompliance is issued, the landowner or operator will be directed by ODA to remedy the condition through required corrective actions under the provisions of the enforcement procedures outlined in OAR 603-090-060 through OAR 603-090-120. If a landowner does not implement the required corrective actions, civil penalties may be assessed for continued violation of the Area Rules. See the Compliance Flow Chart for a diagram of the compliance process. If and when other governmental policies, programs, or rules conflict with this Area Plan or associated Area Rules, ODA will consult with the agency (ies) and attempt to resolve the conflict in a reasonable manner.

Compliance Flow Chart

Oregon Department of Agriculture WQ Program Compliance Protocol (2)



1.3.2 Local Management Agency (LMA)

A Local Management Agency is an organization that ODA has designated to implement an Area Plan (OAR 603-090-0010). The legislative intent is for SWCDs to be Local Management Agencies to the fullest extent practical, consistent with the timely and effective implementation of Area Plans (ORS 568.906). SWCDs have a long history of effectively assisting landowners who voluntarily address natural resource concerns. Currently, all Local Management Agencies in Oregon are SWCDs.

The day-to-day implementation of the Area Plan is accomplished through an intergovernmental agreement between ODA and each SWCD. Each SWCD implements the Area Plan by providing outreach and technical assistance to landowners. SWCDs also work with ODA and the LAC to establish implementation priorities, evaluate progress toward meeting Area Plan goals and objectives, and revise the Area Plan and associated regulations as needed.

1.3.3 Local Advisory Committee (LAC)

For each Management Area, the director of ODA appoints an LAC (OAR 603-090-0020) with up to 12 members, to assist with the development and subsequent biennial reviews of the local Area Plan and Area Rules. The LAC serves in an advisory role to the director of ODA and to the Board of Agriculture. LACs are composed primarily of landowners in the Management Area and must reflect a balance of affected persons.

The LAC may meet as frequently as necessary to carry out their responsibilities, which include, but are not limited to:

- Participate in the development and ongoing revisions of the Area Plan.
- Participate in the development and revisions of Area Rules.
- Recommend strategies necessary to achieve goals and objectives in the Area Plan.
- Participate in biennial reviews of the progress of implementation of the Area Plan and Area Rules.
- Submit written biennial reports to the Board of Agriculture and the ODA director.

1.3.4 Agriculture's Role

Each individual landowner or operator in the Management Area is required to comply with the Area Rules, which set minimum standards. However, the Area Rules alone may not be enough in every area. Each landowner and operator in the Management Area is required to comply with the Area Rules. Landowners are also encouraged to engage in restoration activities to achieve the goals and objectives of the Area Plan. Each landowner and operator's actions will contribute toward achievement of the water quality standards.

Technical and financial assistance is available to landowners who want to work with SWCDs (or with other local partners) to achieve land conditions that contribute to good water quality. Landowners may also choose to improve their land conditions without assistance.

Area Rules only address impacts that result from agricultural activities. A landowner is responsible for only those conditions caused by activities conducted on land managed by the landowner or occupier. Conditions resulting from unusual weather events (equaling or exceeding a 25-year, 24-hour storm event) or other circumstances not within the reasonable control of the landowner or operator are not regulated under the Area Rules.

Under the Area Plan and associated regulations, agricultural landowners and operators are not responsible for mitigating or addressing factors that do not result from agricultural activities, such as:

- Hot springs, glacial melt water, extreme or unforeseen weather events, and climate change.
- Septic systems and other sources of human waste.
- Public roadways, culverts, roadside ditches and shoulders.
- Dams, dam removal, hydroelectric plants, and non-agricultural impoundments.
- Housing and other development in agricultural areas.

1.3.5 Public Participation

The public was encouraged to participate when ODA, LACs, and SWCDs initially developed the Area Plans and Area Rules. ODA and the LAC in each Management Area, held public information meetings, a formal public comment period, and a formal public hearing. ODA and the LACs modified the Area Plans and Area Rules, as needed, to address comments received. The director of ODA adopted the Area Plans and Area Rules in consultation with the Board of Agriculture.

ODA, LACs, and SWCDs conduct biennial reviews of the Area Plans and Area Rules. Partners, stakeholders, and the general public are invited to participate in the process. Any future revisions to the Area Rules will include a public comment period and a public hearing.

1.4 Agricultural Water Quality

1.4.1 Point and Nonpoint Sources of Water Pollution

There are two types of water pollution. Point source water pollution emanates from clearly identifiable discharge points or pipes. Significant point sources are required to obtain permits that specify their pollutant limits. Agricultural operations regulated as point sources include permitted Confined Animal Feeding Operations (CAFOs) and pesticide applications in, over and within three feet of water. Many CAFOs are regulated under ODA's CAFO Program. Irrigation water discharges from agricultural fields may be at a defined discharge point, but do not currently require a permit.

Nonpoint water pollution originates from the general landscape and is difficult to trace to a single source. Nonpoint sources include runoff from agricultural and forest lands, urban and suburban areas, roads, and natural sources. In addition, groundwater can be impacted from nonpoint sources including agricultural amendments (fertilizers and manure).

1.4.2 Beneficial Uses and Parameters of Concern

Beneficial uses of water include: public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, hydropower, and commercial navigation and transportation. The most sensitive beneficial uses are usually fish and aquatic life, water contact recreation, and public and private domestic water supply. These uses are generally the first to be impaired as a water body is polluted, because they are affected at lower levels of pollution. While there may not be severe impacts on water quality from a single source or sector, the combined effects from all sources can contribute to the impairment of beneficial uses in the Management Area. Beneficial uses that have the potential to be impacted in this Management Area are summarized in Chapter 2.

Many water bodies throughout Oregon do not meet state water quality standards. These water bodies may or may not have established water quality management plans documenting needed reductions. The most common water quality concerns related to agricultural activities are temperature, bacteria, biological criteria, sediment and turbidity, phosphorous, algae, pH, dissolved oxygen, harmful algal blooms, nitrates, pesticides, and mercury. These parameters vary by Management Area and are summarized in Chapter 2.

1.4.3 Impaired Water Bodies and Total Maximum Daily Loads (TMDLs)

Every two years, the DEQ is required by the federal Clean Water Act (CWA) to assess water quality in Oregon. CWA Section 303(d) requires DEQ to identify a list of waters that do not meet water quality standards. The resulting list is commonly referred to as the 303(d) list. DEQ, in accordance with the CWA, is required to establish TMDLs specific to the pollutants that led to the placement of a waterbody on the 303(d) list.

A TMDL includes an assessment of water quality data and current conditions and describes a plan to achieve conditions so that water body will meet water quality standards. TMDLs specify the daily amount of pollution that a water body can receive and still meet water quality standards. Through the TMDL, point sources are allocated pollution limits as “waste load allocations” that are then incorporated in NPDES permits, while a “load allocation” is attributed to nonpoint sources (agriculture, forestry, and urban). TMDLs are legal orders issued by the DEQ, so sectors assigned waste or load allocations are legally required to meet them. The agricultural sector is responsible for meeting the pollution limit (load allocation) attributed to agriculture specifically, or to nonpoint sources in general, as applicable. TMDLs generally apply to an entire basin or subbasin, and not just to an individual water body on the 303(d) list. When data show that water quality standards have been achieved, water bodies will be identified on the list of water bodies that are attaining water quality standards.

As part of the TMDL process, DEQ identifies the Designated Management Agency or parties responsible for submitting TMDL implementation plans. TMDLs designate that the local Area Plan is the implementation plan for the agricultural component of the TMDLs that apply to this Management Area. Biennial reviews and revisions to the Area Plan and regulations must address agricultural or nonpoint source load allocations from TMDLs.

The list of impaired water bodies (303(d) list), the TMDLs, and the agricultural load allocations for the TMDLs that apply to this Management Area are summarized in Chapter 2 and Appendix H.

1.4.4 Oregon Water Pollution Control Law – ORS 468B.025 and ORS 468B.050

ODA incorporated ORS 468B into all of the Area Rules to achieve the intent of ORS 561.191(2). ORS 468B.025 states that:

“(1) ...no person shall:

- (a) Cause pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.
- (b) Discharge any wastes into the waters of the state if the discharge reduces the quality of such waters below the water quality standards established by rule for such waters by the Environmental Quality Commission.

(2) No person shall violate the conditions of any waste discharge permit issued under ORS 468B.050.”

The aspects of ORS 468B.050 that apply to the Ag Water Quality Program, state that:

“(1) Except as provided in ORS 468B.053 or 468B.215, without holding a permit from the Director of the Department of Environmental Quality or the State Department of Agriculture, which permit shall specify applicable effluent limitations, a person may not:

(a) Discharge any wastes into the waters of the state from any industrial or commercial establishment or activity or any disposal system.”

Definitions (ORS 468B.005)

“Wastes” means sewage, industrial wastes, and all other liquid, gaseous, solid, radioactive or other substances, which will or may cause pollution or tend to cause pollution of any waters of the state. Additionally, OAR 603-095-0010(53) includes but is not limited to commercial fertilizers, soil amendments, composts, animal wastes, vegetative materials, or any other wastes.

“Pollution or water pollution” means such alteration of the physical, chemical, or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state, which will or tends to, either by itself or in connection with any other substance, create a public nuisance or which will or tends to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses or to livestock, wildlife, fish or other aquatic life or the habitat thereof.

“Water” or “the waters of the state” include lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the State of Oregon and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters which do not combine or affect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction.

1.4.5 Streamside Vegetation and Agricultural Water Quality

Across Oregon, the Ag Water Quality Program emphasizes streamside vegetation protection and enhancement to prevent and control agricultural pollution from agriculture activities and to prevent and control soil erosion. Streamside vegetation can provide three primary water quality functions: shade for cooler stream temperatures, streambank stability, and filtration of pollutants. Other water quality functions from streamside vegetation include: water storage for cooler and later season flows, sediment trapping that can build streambanks and floodplains, narrowing and deepening of channels, and biological uptake of sediment, organic material, nutrients, and pesticides.

Additional reasons for the Ag Water Quality Program’s emphasis on streamside vegetation include:

- Streamside vegetation improves water quality related to multiple pollutants, including: temperature (heat), sediment, bacteria, nutrients, toxics, and pesticides.
- Streamside vegetation provides fish and wildlife habitat.
- Landowners can improve streamside vegetation in ways that are compatible with their operation.
- Streamside vegetation condition is measureable and can be used to track progress in achieving desired site conditions.

The Ag Water Quality Program uses the concept of “site-capable vegetation” to describe streamside vegetation expected under the Area Rules. Site-capable vegetation is the vegetation that can be expected to grow at a particular site, given natural site factors (e.g., elevation, soils, climate, hydrology, wildlife, fire, floods) and historic and current human influences that are outside the program’s regulatory purview

(e.g., channelization, roads, modified flows, past land management). Site-capable vegetation can be determined for a specific site based on: current streamside vegetation at the site, streamside vegetation at nearby reference sites with similar natural characteristics, NRCS soil surveys, and local or regional scientific research.

The goal for Oregon's Ag Water Quality Program is to achieve water quality functions (e.g., shade, streambank stability, and filtration of pollutants) produced by site-capable vegetation along streams associated with agricultural lands. The Area Rules for each Management Area require that agricultural activities provide water quality functions consistent with what the site would provide with site-capable vegetation.

Achieving water functions along a stream may not require mature site-capable vegetation. For example, one to three foot width streams may provide shade, protect streambanks, and filter pollutants with only grasses and shrubs that are at a less mature stage of site capable vegetation. However, on larger streams, mature vegetation is important. Limited exceptions include:

- Junipers are mature site-capable vegetation in central and eastern Oregon, but they reduce bank stability and increase erosion.
- Upland species (such as sagebrush) can be the dominant site-capable vegetation along streams with erosional down cutting, but they do not improve water quality.

1.5 Other Water Quality Programs

The following programs complement the Ag Water Quality Management Program and are described here to recognize their link to agricultural lands.

1.5.1 Confined Animal Feeding Operation (CAFO)

ODA is the lead state agency for the CAFO Program. The CAFO Program was developed to ensure that operators and producers do not contaminate ground or surface water with animal manure. Since the early 1980s, CAFOs have been registered to a general Water Pollution Control Facility permit designed to protect water quality, while allowing the operators and producers to remain economically viable. A properly maintained CAFO does not pollute ground or surface water. To assure continued protection of ground and surface water, ODA was directed by the 2001 Oregon State Legislature to convert the CAFO Program from a Water Pollution Control Facility permit program to a federal National Pollutant Discharge Elimination System (NPDES) program. ODA and DEQ jointly issued a NPDES CAFO Permit in 2003 and 2009. The 2009 permit expired in May 2014, and a new permit is under development. The NPDES CAFO Permit is compliant with all Clean Water Act requirements for CAFOs; it does allow discharge in certain circumstances as long as the discharge does not violate Water Quality Standards.

Oregon NPDES CAFO Permits require the registrant to operate according to a site-specific, ODA approved, Animal Waste Management Plan that is incorporated into the NPDES CAFO Permit by reference. CAFO NPDES Permits protect both surface and ground water resources.

1.5.2 Drinking Water Source Protection

Oregon implements its drinking water protection program through a partnership between DEQ and the Oregon Health Authority. The program provides individuals and communities with information on how to protect the quality of Oregon's drinking water. DEQ and the Oregon Health Authority encourage preventive management strategies to ensure that all public drinking water resources are kept safe from future contamination. For more information see: www.deq.state.or.us/wq/dwp/dwp.htm.

1.5.3 Groundwater Management Areas (GWMA)

Groundwater Management Areas are designated by DEQ when groundwater in an area has elevated contaminant concentrations resulting, at least in part, from nonpoint sources. Once the GWMA is declared, a local groundwater management committee comprised of affected and interested parties is formed. The committee then works with and advises the state agencies that are required to develop an action plan that will reduce groundwater contamination in the area.

Oregon has designated three GWMA because of elevated nitrate concentrations in groundwater. These include the Lower Umatilla Basin GWMA, the Northern Malheur County GWMA, and the Southern Willamette Valley GWMA. Each GWMA has a voluntary Action Plan to reduce nitrate concentrations in groundwater. If after a scheduled evaluation point DEQ determines that the voluntary approach is not effective, then mandatory requirements may become necessary.

1.5.4 Pesticide Management and Stewardship

The ODA Pesticides Program holds the primary responsibility for registering pesticides and regulating their use in Oregon, under the Federal Insecticide Fungicide Rodenticide Act. ODA's Pesticide Program administers regulations relating to pesticide sales, use, and distribution, including pesticide operator and applicator licensing, as well as proper application of pesticides, pesticide labeling, and registration.

In 2007, the interagency Water Quality Pesticide Management Team (WQPMT) was formed to expand efforts to improve water quality in Oregon related to pesticide use. The WQPMT includes representation from ODA, Oregon Department of Forestry, DEQ, and the Oregon Health Authority. The WQPMT facilitates and coordinates activities such as monitoring, analysis and interpretation of data, effective response measures, and management solutions. The WQPMT relies on monitoring data from the Pesticides Stewardship Partnership (PSP) Program and other monitoring programs to assess the possible impact of pesticides on Oregon's water quality. Pesticide detections can be addressed through multiple programs and partners, including the PSP Program described above.

Through the PSP Program, state agencies and local partners work together to monitor pesticides in streams and to improve water quality (www.deq.state.or.us/wq/pesticide/pesticide.htm). DEQ, ODA, and Oregon State University Extension Service work with landowners, SWCDs, watershed councils, and other local partners to voluntarily reduce pesticide levels while improving water quality and crop management. There has been noteworthy progress since 2000 in reducing pesticide concentrations and detections.

ODA led the development and implementation of a Pesticides Management Plan (PMP) for the state of Oregon (www.oregon.gov/ODA/PEST/water_quality.shtml). The PMP, completed in 2011, strives to protect drinking water supplies and the environment from pesticide contamination, while recognizing the important role that pesticides have in maintaining a strong state economy, managing natural resources, and preventing human disease. The PMP sets forth a process for preventing and responding to pesticide detections in Oregon's ground and surface water resources by managing the pesticides that are currently approved for use by the U.S. EPA and Oregon in both agricultural and non-agricultural settings.

1.5.5 The Oregon Plan for Salmon and Watersheds

In 1997, Oregonians began implementing the Oregon Plan for Salmon and Watersheds referred to as the Oregon Plan (www.oregon-plan.org). The Oregon Plan seeks to restore native fish populations, improve watershed health, and support communities throughout Oregon. The Oregon Plan has a strong focus on salmon, because they have cultural, economic, and recreational importance to Oregonians, and because

they are important indicators of watershed health. ODA's commitment to the Oregon Plan is to develop and implement Area Plans and associated Area Rules throughout Oregon.

1.6 Partner Agencies and Organizations

1.6.1 Oregon Department of Environmental Quality (DEQ)

Oregon has been delegated authority to implement the CWA in Oregon. DEQ is the lead state agency with overall authority to implement the CWA in Oregon. DEQ coordinates with other state agencies, including ODA and Oregon Department of Forestry, to meet the needs of the CWA. DEQ sets water quality standards and develops TMDLs for impaired waterbodies, which are ultimately approved or disapproved by the EPA. In addition, DEQ develops and coordinates programs to address water quality including National Pollution Discharge Elimination Permits (for point sources), 319 program, Source Water Protection, 401 Water Quality Certification, and GWMA. DEQ also coordinates with ODA to help ensure successful implementation of Area Plans as part of its 319 program.

A Memorandum of Agreement (MOA) between DEQ and the ODA recognizes that ODA is the agency responsible for implementing the Ag Water Quality Program established under ORS 568.900 to ORS 568.933, ORS 561.191, and OAR Chapter 603, Divisions 90 and 95. The MOA between ODA and DEQ was updated in 2012 and describes how the agencies will work together to achieve water quality goals for waterbodies associated with agricultural lands.

The MOA includes the following commitments:

- ODA will develop and implement a monitoring strategy, as resources allow, in consultation with DEQ.
- ODA will evaluate Area Plans and Area Rules effectiveness in collaboration with DEQ.
 - ODA will determine the percentage of lands achieving compliance with Management Area Rules.
 - ODA will determine whether the target percentages of lands meeting the desired land conditions, as outlined in the goals and objectives of the Area Plans, are being achieved.
- ODA and DEQ will review and evaluate existing information with the objective of determining:
 - Whether additional data are needed to conduct an adequate evaluation.
 - Whether existing strategies have been effective in achieving the goals and objectives of the Area Plan.
 - Whether the rate of progress is adequate to achieve the goals of the Area Plan.

The Environmental Quality Commission, which serves as DEQ's policy and rulemaking board, may petition ODA for a review of part or all of any Area Plan or its associated rules. The petition must allege with reasonable specificity that the Area Plan or associated rules are not adequate to achieve applicable state and federal water quality standards (ORS 568.930(3)(a)).

1.6.2 Other Partners

ODA and SWCDs work in close partnership with local, state, and federal agencies and organizations, including: DEQ (as indicated above), the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) and Farm Service Agency, watershed councils, Oregon State University Extension Service, livestock and commodity organizations, conservation organizations, and local businesses. As resources allow, SWCDs and local partners provide technical, financial, and educational assistance to individual landowners for the design, installation, and maintenance of effective management strategies to prevent and control agricultural water pollution.

1.7 Measuring Progress

Agricultural landowners and operators have implemented effective conservation projects and management activities throughout Oregon to improve water quality for many years. However, it has been challenging for ODA, SWCDs, and LACs to measure this progress. ODA is working with SWCDs, LACs, and our partners to develop and implement objectives and strategies that will produce measurable outcomes.

1.7.1 Measurable Objectives

Measurable objectives allow the Ag Water Quality Program to better evaluate progress toward meeting water quality standards and load allocations where TMDLs have been completed. Many of these measurable objectives relate to land condition and are mainly implemented through focused work in small geographic areas (section 1.7.3). The measurable objectives for this Area Plan are in Chapter 3, and progress toward achieving the objectives is summarized in Chapter 4.

At a minimum, the measurable objectives of the Ag Water Quality Program and this Area Plan are to:

- Increase the percentage of lands achieving compliance with the Area Rules.
- Increase the percentage of lands in active management that will lead to meeting desired land conditions outlined in the Area Plan.

1.7.2 Land Condition and Water Quality

Land conditions can serve as useful surrogates (indicators) for water quality parameters. For example, streamside vegetation is generally used as a surrogate for water temperature, because shade blocks solar radiation from warming the stream. In addition, sediment can be used as a surrogate for pesticides and nutrients, because many pesticides and nutrients adhere to sediment particles.

The Ag Water Quality Program focuses on land conditions, in addition to water quality data, for several reasons:

- Landowners can see land conditions and have direct control over them.
- It can be difficult to separate agriculture's influence on water quality from other land uses.
- It requires extensive monitoring of water quality at an intensive temporal scale to evaluate progress.
- Improved land conditions can be documented immediately, but there may be a significant lag time before water quality improves, or water quality impacts may be due to other sources.
- Reductions in water pollution from agricultural activities are primarily through improvements in land and management conditions.

Water quality monitoring data may help ODA and partners to measure progress and identify problem areas in implementing the Area Plan. It is necessary to show the Ag Water Quality Program is successfully meeting the intent and purpose of the Ag Water Quality Management Act.

1.7.3 Focused Implementation in Small Geographic Areas

Focus Areas

A Focus Area is a small watershed with water quality concerns that are associated with agriculture. ODA's intent in selecting Focus Areas is to deliver systematic, concentrated outreach and technical assistance in small geographic areas ("Focus Areas") through the SWCDs. A key component of this approach is measuring land conditions before and after implementation to document the progress made

with available resources. The focused implementation approach is consistent with other agencies' and organizations' efforts to work proactively in small geographic areas, and is supported by a large body of scientific research (e.g., Council for Agricultural Science and Technology, 2012).

Systematic implementation in Focus Areas can provide the following advantages:

- Measuring progress is easier in a small watershed than across an entire Management Area.
- Water quality improvement may be faster since small watersheds generally respond more rapidly.
- A proactive approach can address the most significant water quality concerns.
- Partners can coordinate and align technical and financial resources.
- Partners can coordinate and identify the appropriate source specific conservation practices and demonstrate the effectiveness of these conservation practices.
- A higher density of projects allows neighbors to learn from neighbors.
- A higher density of prioritized projects leads to greater connectivity of projects.
- Limited resources are used more effectively and efficiently.
- Work in one Focus Area, followed by other Focus Areas, will eventually cover the entire Management Area.

SWCDs choose a Focus Area in cooperation with ODA and other partners. In some cases, a Focus Area is selected because of efforts already underway or landowner relationships already established. The scale of the Focus Area matches the SWCD's capacity to deliver concentrated outreach and technical assistance, and to complete (or initiate) projects over a biennium. The current Focus Area for this Management Area is described in Chapter 3.

Working within a Focus Area is not intended to prevent implementation within the remainder of the Management Area. The remainder of the Management Area will continue to be addressed through general outreach and technical assistance.

Strategic Implementation Areas

Strategic Implementation Areas are small watersheds selected by ODA, in cooperation with partners, and after review of water quality and other available information. ODA leads the assessment of current conditions and the landowner outreach. Strategic Implementation Areas and Focus Areas are both tools to concentrate efforts in small geographic areas to achieve water quality standards. As with Focus Areas, SWCDs and partners work with landowners to improve conditions that may impact water quality in Strategic Implementation Areas. However, Strategic Implementation Areas also have a compliance evaluation and assurance process that allows ODA to proactively gain compliance with Area Rules

Results from the Strategic Implementation Area can be found in Chapter 4, Sec. 4.5.

1.8 Implementation, Monitoring, Evaluation, and Adaptive Management

Implementation of the Area Plan and associated Area Rules will be assessed by evaluating the status and trends in agricultural land conditions. Measurable objectives will be assessed on agricultural lands across the entire Management Area and within the Focus Area. ODA will utilize other agencies' and organizations' local monitoring data when available. The results and findings will be summarized in Chapter 4 for each biennial review. ODA, DEQ, SWCDs, and LACs will examine these results during the biennial review and will revise the goal(s), objectives, and strategies in Chapter 3, as needed.

1.8.1 Statewide Aerial Photo Monitoring of Streamside Vegetation

Starting in 2003, ODA began evaluating streamside vegetation conditions using aerial photos. Stream segments representing 10 to 15 percent of the agricultural lands in each Management Area were randomly selected for monitoring. ODA examines streamside vegetation at specific points in 90-foot bands along the stream from the aerial photos and assigns each sample stream segment a score based on ground cover. The score can range from 70 (all trees) to 0 (all bare ground). The same stream segments are re-photographed and re-scored every five years to evaluate changes in streamside vegetation conditions over time. Because site capable vegetation varies across the state, there is no one correct riparian index score. The main point is to measure positive or negative change. The results are summarized in Chapter 4 of the Area Plan.

1.8.2 Agricultural Ambient Water Quality Monitoring Assessment

ODA currently evaluates water quality data from monitoring sites in DEQ's water quality database that reflects agricultural influence on water quality. These data are also published in the DEQ water quality database and evaluated at the statewide level to determine trends in water quality at agricultural sites statewide. Results from monitoring sites in the Management Area, along with local water quality monitoring data, are described in Chapter 4.

1.8.3 Biennial Reviews and Adaptive Management

The Area Plan and associated Area Rules undergo biennial reviews by ODA and the LAC. As part of each biennial review, ODA, DEQ, SWCDs, and the LAC discuss and evaluate the progress on implementation of the Area Plan and Area Rules. This evaluation includes enforcement actions, landscape and water quality monitoring, and outreach efforts over the past biennium across the Management Area and for the Focus Area. In addition, progress toward achieving agricultural load allocations may be documented (if a TMDL has been established). As a result of the biennial review, the LAC submits a report to the Board of Agriculture and the director of ODA. This report describes progress and impediments to implementation, and recommendations for modifications to the Area Plan or Area Rules necessary to achieve the purpose of the Area Plan. The results of this evaluation will be used to update the goal(s), measurable objectives, and strategies in Chapter 3.

Chapter 2: Local Background and Introduction

This document is a plan to prevent and control water pollution from agricultural activities and to meet water quality goals in the Lower Willamette Management Area. The Lower Willamette Agricultural Water Quality Management Area Plan (Area Plan) was created through the joint efforts of a Local Advisory Committee (LAC) consisting predominantly of affected landowners / operators residing within the Management Area, Oregon Department of Agriculture (ODA), and the East Multnomah Soil and Water Conservation District (EMSWCD).

This Area Plan applies to all land currently in agricultural use, regardless of size, within the Management Area. For example, the Area Plan applies equally to large commercial production lands and to small rural land grazing a few animals. It also applies to all agricultural lands which lay idle or on which management has been deferred. However, urban areas and land subject to the Forest Practices Act, when they are not involved with agricultural activities, are not subject to this Area Plan.

2.1 Local Roles and Responsibilities

2.1.1 Local Advisory Committee (LAC)

This document was developed with the assistance of the Lower Willamette Local Advisory Committee (LAC) for agricultural water quality management. The director of ODA approved the Area Plan and regulations on October 22, 2003. Since approval, the LAC has met in 2006, 2009, and 2011 to review the Area Plan and regulations. The last review process included assessment of the progress of Area Plan implementation toward achievement of plan goals and objectives, a summary of impediments, recommendations for future modifications, and an overview of the compliance cases in the Lower Willamette management area. The members represent a wide variety of interests. Members are:

Name	Area	Operation	Affiliations
Dean Apostol	Gresham	Hay, organic fruits, willow stakes, vegetables, and ducks, Landscape Architect	Johnson Creek Watershed Council, Society for Ecological Restoration, Boring CPO
Chris Foster	Portland	Chestnut grower	Oregon Tilth, Western Chestnut Growers Assoc.
Kathy Taggart	Gresham	Woody ornamentals, perennials, grasses	E. Multnomah SWCD, 4-H, National Wildlife Foundation, Oregon State University Master Gardeners
Roy Iwai	Unincorporated Mult. County	Water Quality Program	Multnomah County Road Services
Gordy Webster	Boring	Nursery	J Frank Schmidt & Son Nursery
Martha Mitchell	Portland	Professional	Clear Water West

Local Advisory Committees (LACs) are described in Oregon Administrative Rule (OAR) 603-090-0020. LAC membership shall reflect a balance of affected persons. Membership shall be composed primarily of landowners in the Lower Willamette Agricultural Water Quality Management Area (Management Area). Membership may include, but is not limited to:

- State Board of Agriculture representatives

- Persons serving on local soil and water conservation districts
- Private landowners
- Representatives of local, state and federal boards, commissions, and agencies
- Members of Indian tribes
- Members of the public
- Persons associated with industry
- Members of academic, scientific, and professional communities
- Public and special interest groups

2.1.2 Local Management Agency (LMA)

Currently, all LMAs in Oregon are SWCDs. SWCDs are legal, independent subdivisions of state government, and are led locally by an elected board of directors who serve four-year terms without pay. SWCDs have a long history of effectively assisting landowners who voluntarily address natural resource concerns. If an individual SWCD chooses not to continue serving as an LMA, ODA will select another local organization.

In 2001, ODA designated the East Multnomah SWCD (EMSWCD) as the LMA for the Lower Willamette Agricultural Water Quality Area Plan. Responsibilities as the LMA include:

- Act as ODA's LMA to develop and implement the Lower Willamette Subbasin Agricultural Water Quality Management Area Plan.
- Assist ODA in the development and facilitation of the activities and responsibilities of the Local Advisory Committee (LAC) as outlined in the Agriculture Water Quality Management Program, OAR 603-090.
- Coordinate ongoing water quality programs and projects in cooperation with all agencies, groups, and interested parties.
- Carry out the tasks associated with the project work plan.
- Use all grant funds for the purposes approved by ODA.
- Provide the department with progress reports. Progress reports will be quarterly and will contain information on the activities and tasks conducted by the District in accomplishing work items and detailed financial expenditure accounting.

2.1.3 Key Message

The main message that must be delivered to the agricultural community is that the Lower Willamette Water Quality Management Plan and Rules have been adopted and the Rules must be followed. Other messages recommended by the LAC include:

- Agricultural producers take pride in land stewardship.
- Are you affected by the new Lower Willamette Agricultural Plan and Rules? Are you in compliance? Make the effort to find out! It's the right thing to do!
- Ten reasons why it's "good business" to follow the agricultural rules:
 1. Retain top soil – it's where your money grows.
 2. Protect your livestock health.
 3. Preserve the land for your grandchildren and beyond.
 4. You may qualify for potential tax breaks and financial assistance.
 5. Protect your groundwater (often a drinking water source) from contamination.
 6. Get the bull's-eye off your farm.
 7. Reduce supplemental feed costs through good pasture management.
 8. It's cheaper to install best management practices than to pay mitigation costs.
 9. Prevent more water quality standards from being violated.

- 10. Lower water temperatures are healthy for fish – and improve your fishing success!
- Be a good neighbor to downstreamers! Everyone is downstream to someone...tomorrow could be your turn. Help prevent flooding, erosion, movement of toxics, and bacteria.
- Help is out there! Technical assistance and cost share money is available to help you comply with the agricultural rules!

2.2 Geographical and Physical Setting

2.2.1 Location, Water Resources, Land Use, Land Ownership, Agriculture

The Lower Willamette Agricultural Water Quality Management Area (Management Area) is located in northwest Oregon surrounding the greater Portland Metropolitan area. See Figure 1 (page 4). The Management Area is bordered on the north by the Columbia River, Multnomah Channel, and the Columbia County line. The western border follows the Tualatin Mountains then heads east past the north side of the Lake Oswego (incorporated) city limits, to the Willamette River just north of the Forest Creek confluence. The boundary follows the Willamette River south to a point due east of Bolton then continues to the headwaters of Johnson Creek. From here, the eastern border follows a line east of the cities of Pleasant Home and Orient, skirts east and north of the city limits of Gresham, and then heads north between Wood Village and Troutdale to the Columbia River.

The Management Area is almost entirely within Multnomah County and the northwest corner of Clackamas County with a small portion in Washington County. In total, the Management Area covers 234.49 sq. miles (129.97 square miles of which are within the city limits of Portland).

In early geologic history, the area we now know as the Willamette Valley had a tropical climate and was covered by an inland sea. Once the marine waters receded and the coastal range was uplifted by activity in the subduction zone of the Juan de Fuca plate, the Willamette Valley became a separate physiographic feature. Various forms of mineral deposits from Boring Lava to silty sediment have blanketed this area.

In more recent geologic history, the area was impacted by the spectacular Missoula Floods, a series of massive floods released from ruptured ice dams in the western Montana region. Water from these floods stripped off gravel and picked up debris, steepening the walls of the Columbia Gorge. At several spots in the path of the flood, water was temporarily retained. One such location was near Rainier, Oregon and resulted in water backing up into the Willamette Valley. The Portland area was inundated up to a depth of 400 feet. As the water receded, coarse sediment was left behind in the Portland vicinity. These multiple floods had lasting impacts on the Columbia River channel and the Willamette Valley. (Orr, Elizabeth L., Orr, William N., and Baldwin Ewart M. *Geology of Oregon*. Kendall/Hunt Publishing Company, Dubuque, IA. 1992.)

Floodwater backing into the Willamette Valley from the Columbia River disrupted the normal northward flow of the Willamette River for weeks. Coarse sand and gravel quickly dropped out of the floodwaters once they backed up into the Willamette Valley. Willamette Silt carried into the impoundment by the Willamette River was also deposited in distinct layers marking numerous impounding events. (Orr, Elizabeth L., Orr, William N., and Baldwin Ewart M. *Geology of Oregon*. Kendall/Hunt Publishing Company, Dubuque, IA. 1992.)

Currently, we are experiencing a less eventful period in geologic activity. However, there has been extensive human activity in the collection of information about the area soils and their characteristics. The U.S. ODA of Agriculture Natural Resources Conservation Service (USDA NRCS) has assembled this information into a series of soil surveys for each county. According to the Soil Surveys of Multnomah and Clackamas counties, there are four soil groupings that dominate the agricultural portions

of the Lower Willamette Agricultural Water Quality Management Area. Descriptions of the four soil types are listed below.

Sauvie-Rafton-Pilchuck (along the Columbia River) These soils are characterized as deep silt loam over sandy loam or silt loam. They are located in bottomlands and have good potential for agriculture in areas protected from flooding.

Multnomah-Latourell-Urban (Gresham/Fairview area) These soils are characterized as loam and silt loam over gravelly silt loam or sandy loam. Soils in this map unit are used for urban development, farming, and wildlife habitat. The potential is good for most uses of these soils except in areas with steeper than 15 percent slopes.

Cascade-Urban land-Cornelius (Johnson Creek region) These soils are characterized as silt loam over a thick fragipan. The potential for farming is good in areas with less than eight percent slope.

Cascade-Powell (Clackamas County portion of this Management Area) These soils are characterized as silt loam underlain by a cemented layer. This region of the Management Area has rolling hills and high terraces. The soils are appropriate for cultivation with the limitation of a seasonal high water table and restricted rooting depth.

Weather conditions in the Management Area are typically mild with cool, wet winters and warm, dry summers. Temperatures are mild throughout the year, ranging from 34°F-80°F. The predominant winter precipitation is in the form of rain. The mean annual precipitation in the Management Area ranges from 37-50 inches and increases with elevation

Land Use

Portions of three counties are included within the boundary of this planning area; therefore, statistics are difficult to compile. Information can, however, be collected based on the relative size of each county's portion of the Plan area.

The Lower Willamette Management Area is a combination of:

- Multnomah County—approximately 79 percent (186.33 square miles)
- Clackamas County—approximately 18 percent (41.88 square miles)
- Washington County—approximately 3 percent (6.28 square miles)

The predominant land use in the Lower Willamette Management Area, according to Metro, is urban. The annual rate of population growth in the urban area is two percent. The remaining land is predominantly zoned as forestland. Farmland accounts for approximately five percent of the total land area within the Lower Willamette Management Area boundary.

Certain information regarding agricultural activities in this Management Area can be obtained from the 2007 Census of Agriculture. The vast majority of farms in both Multnomah and Clackamas counties are less than 50 acres in size, distributed fairly equally between two categories: 1-9 acres and 10-49 acres. Dominant agricultural land uses include commercial nursery operations, berries, vegetable, livestock, orchards, and equestrian facilities. Also included are small acreage non-commercial farms.

In both counties, crops including nursery and greenhouse plants are produced in far greater amounts than livestock. The majority of farm owners in Multnomah and Clackamas counties describe farming as their secondary occupation. These landowners work at least 200 days per year at an occupation other than farming.

The first farm in Multnomah County is believed to have been a nursery of young fruit trees on the east bank of the Willamette River just north of Milwaukie. In the mid 1800s, this nursery supplied a great deal of the orchard stock to early pioneers in Oregon. (USDA/Soil Conservation Service. *Soil Survey of Multnomah County*. 1976.)

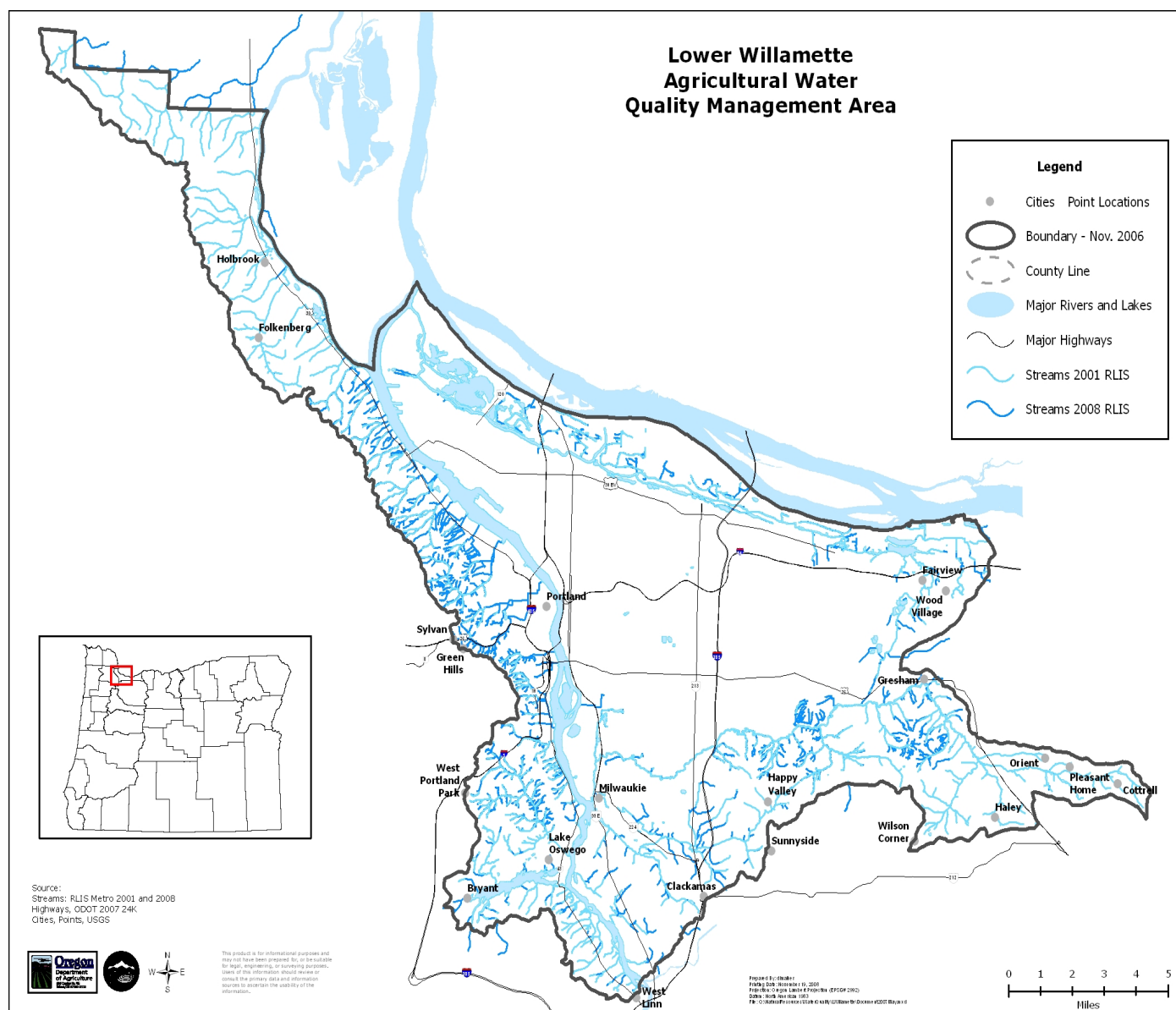
Federal Clean Water Act

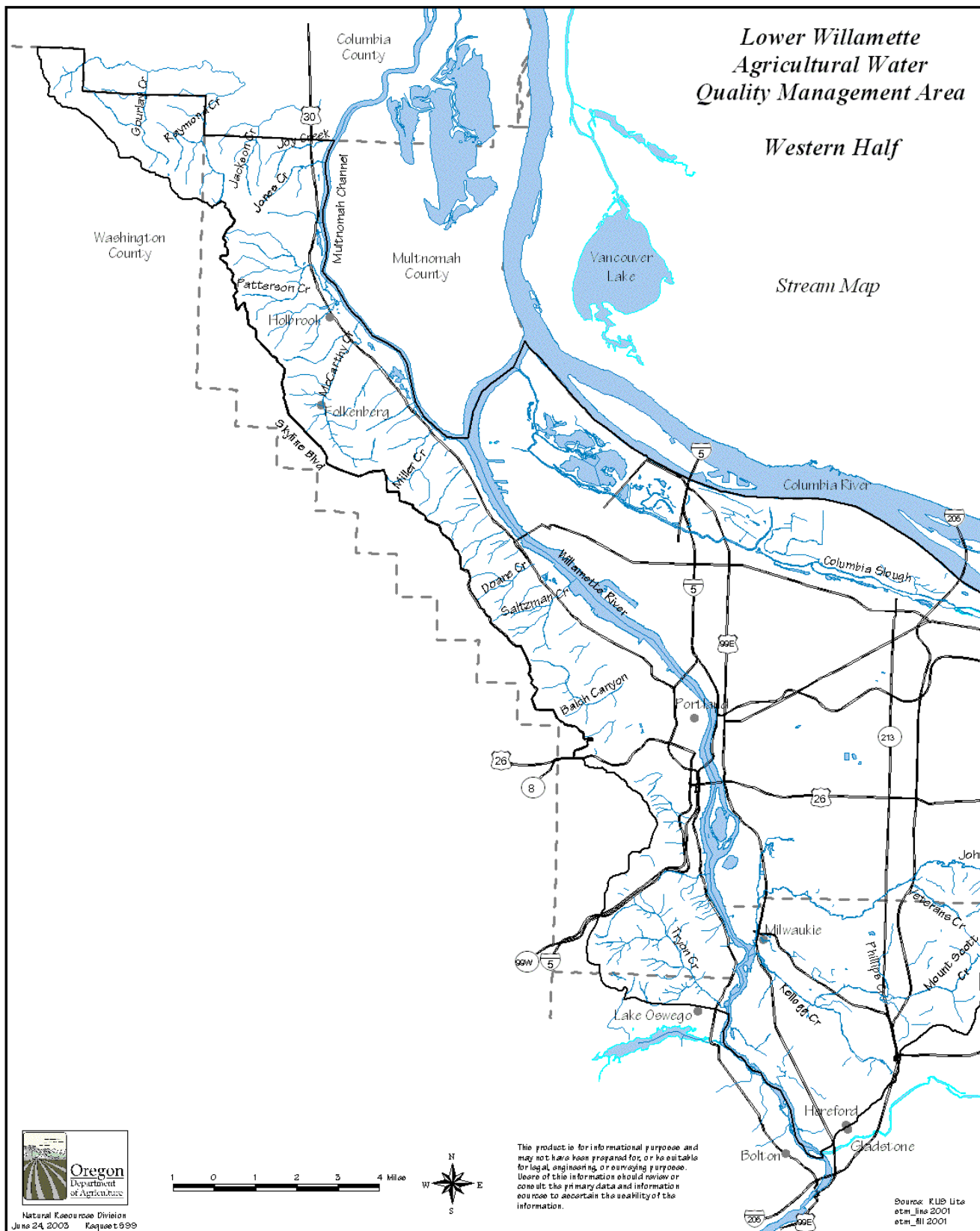
The original federal law addressing water quality problems was the Federal Water Pollution Control Act of 1948. This law focused on decreasing the pollution of interstate waters and tributaries and improving the sanitary condition of surface and groundwater. After many amendments over the years, the Clean Water Act of 1972 (CWA) was enacted in order to restore and maintain the chemical, physical, and biological integrity of the nation's water and generate a system of water quality standards, discharge limitations, and permits.

As required by the CWA, states must establish water quality standards for all bodies of water in the state. Additionally through section 303(d) of the CWA, each state is required to maintain a list of impaired water bodies that do not meet these water quality standards. In Oregon, DEQ is responsible for this task.

Water quality standards are designed to protect the most sensitive beneficial use within a water body. For any water body that exceeds these standards, DEQ is required to establish total maximum daily loads (TMDLs). This process involves calculating the amount of pollutants that can enter a water body and still meet water quality standards, and therefore support beneficial uses. Separate TMDLs are developed for each water quality parameter that violates a standard. Once the TMDL has been established, it is divided into allocations for each of the designated management agencies (i.e. Oregon Departments of Agriculture and Forestry, federal agencies, counties, and cities) that in turn must develop plans to meet the allocation. This responsibility is met for agricultural allocations, through the Agricultural Water Quality Management Act (AgWQMA), formally known as Senate Bill 1010. The AgWQMA was passed in 1993 and authorizes the ODA to develop and carry out plans for prevention and control of water pollution from agricultural activities and soil erosion.

2.2.2 Maps of the Management Area

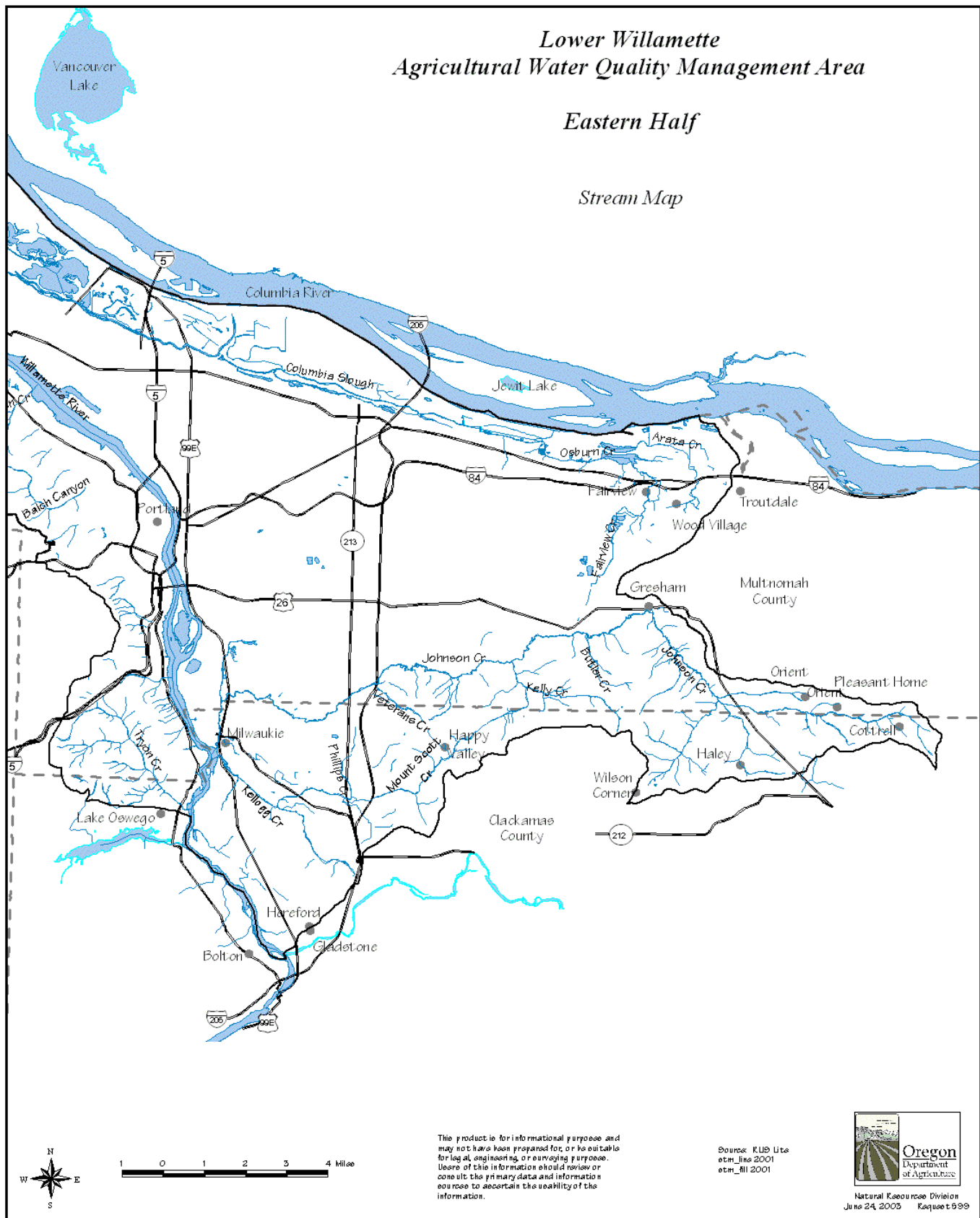




Lower Willamette Agricultural Water Quality Management Area

Eastern Half

Stream Map



2.3 Agricultural Water Quality in the Management Area

2.3.1 Local Issues of Concern

This Area Plan addresses agricultural sources of water pollution. There are two fundamental types of water pollution in the Management Area:

- Point source pollution emanates from clearly identifiable discharge points such as wastewater plants. Significant point sources are required to obtain permits that specify their pollutant limits.
- Nonpoint source pollution originates from the general landscape and is difficult to trace to a single source. Pollutants from nonpoint sources are carried to surface water or groundwater through the action of rainfall, snowmelt, irrigation runoff, and seepage. Nonpoint sources of pollution in the Management Area include erosion (from development in urban / suburban / urbanizing areas, agricultural and forest lands, streambanks, and roadsides) and contaminated runoff (from livestock and other agricultural operations, urban areas, septic systems, and natural sources).

Many of the water pollution sources cited here and in the Geographical and Physical Setting section affect water quality but are beyond the influence of agricultural landowners and operators. Under the prevention and control measures in the Area Rules (OAR 603-095-1200), agricultural landowners and operators are not responsible for mitigating or dealing with factors that do not result from agricultural activities. These factors include but are not limited to:

- Septic systems, human waste from water-based recreation, and public sewage disposal,
- Public roadways or rights of way or easements next to streams, rivers, or other bodies of water,
- Public culverts, roadside ditches, drainage, and shoulders,
- Dams, dam removal, hydroelectric plants, and non-agricultural impoundments,
- Housing and other development in agricultural land areas,
- Extreme and/or unforeseen weather events,
- Any other factor that occurs on public or private lands outside the direct control of the landowner/operator.

The urban sector of the Management Area has additional point and nonpoint water quality issues to address. A large effort has been focused on storm water and surface water runoff. Numerous programs, cooperative projects, and regulations are in place to address urban surface water issues. Efforts include proper septic disposal, erosion control, regulations for new development, public education, maintenance, water quality monitoring, disposal of vector waste, and treatment of runoff from impervious surfaces.

2.3.2 303(d) List of Impaired Water Bodies

Water bodies that do not meet one or more water quality standards are included in Oregon's 303(d) list. The Management Area water quality parameters that are not meeting state and federal standards are listed in Table 1. Also included in this table are the beneficial uses that are being detrimentally impacted.

The DEQ is the state agency responsible for developing the federal CWA TMDLs for the parameters on the 303(d) list. Currently, the TMDLs that have been developed in the Lower Willamette Management Area address chlorophyll *a*, dissolved oxygen, pH, phosphorus, bacteria, DDE/DDT, PCBs, lead, mercury, temperature, Dieldrin and 2, 3, 7, 8 TCDD

Table 1. Water Quality Standards that are not being met and either have been or will be addressed by TMDLs

Water Quality Parameter	Impacted Beneficial Uses
Ammonia	❖ Aquatic Life
Bacteria, <i>Escherichia coli</i> (<i>E. coli</i>)	❖ Water Contact Recreation
Chlorophyll <i>a</i>	❖ Water Contact Recreation ❖ Aesthetics ❖ Fishing ❖ Water Supply ❖ Livestock Watering
Dissolved Oxygen	❖ Fish and Aquatic Life ❖ Salmonid Spawning and Rearing
Iron	❖ Aquatic Life ❖ Drinking Water ❖ Fishing ❖ Human Health
Manganese	❖ Human Health ❖ Drinking Water ❖ Fishing
Nutrients, phosphorus	❖ Aesthetics
pH	❖ Fish and Aquatic Life ❖ Water Contact Recreation ❖ Anadromous Fish Passage ❖ Salmonid Fish Spawning and Rearing
Temperature	❖ Fish and Aquatic Life ❖ Salmonid Spawning and Rearing
Toxics, DDE	❖ Fish and Aquatic Life ❖ Drinking Water ❖ Human Health
Toxics, DDT	❖ Fish and Aquatic Life ❖ Drinking Water ❖ Human Health ❖ Anadromous Fish Passage
Toxics, Dieldrin	❖ Aquatic Life ❖ Drinking Water ❖ Fishing ❖ Human Health
Toxics, Lead (not attributed to agricultural sources)	❖ Fish and Aquatic Life ❖ Drinking Water ❖ Human Health
Toxics, PCB	❖ Aquatic Life ❖ Drinking Water ❖ Fishing ❖ Human Health

Oregon's 2004/2006 303(d) List of Water Quality Limited Waterbodies, 2006. Oregon Department of Environmental Quality

DEQ submitted Oregon's 2012 Integrated Report and 303(d) list to EPA in November 2014. EPA will review and either approve or disapprove the 2012 303(d) list as submitted. After EPA has taken final action, the 2012 303(d) list will become effective for Clean Water Act purposes.

The following criteria correspond to the water quality parameters in Table 1.

Bacteria

Criteria: *E. coli* levels may not exceed a 30-day log mean of 126 *E. coli* organisms/100 mL, based on a minimum of five samples. No single sample may exceed 406 *E. coli* organisms/100 mL.

Temperature

Criteria: For all temperature 303(d) listed waterbodies in the Lower Willamette Subbasin, Oregon's temperature standard specifies that sources of anthropogenic heating may result in no more than a 0.3° C increase in stream temperature. Since stream temperature results from cumulative interactions between upstream and local sources, the Lower Willamette Temperature TMDL considers all surface waters that affect the temperatures of 303(d) listed waterbodies. For example, only the mainstem of Johnson Creek is 303(d) listed for temperature, but to address this listing the TMDL will assign allocations for all surface tributaries in the watershed. This concept applies throughout the Subbasin.

Nutrients and pH

Criteria: Chlorophyll *a* action level is 15 µg/L based on a three month average with a minimum of three samples. The Total Phosphorus interim target for the TMDLs in Columbia Slough and Fairview Creek is 0.1 mg/L, ortho-phosphate interim target is 0.02 mg/L based on EPA guidelines and DEQ best professional judgment. Measurements for pH must fall between 6.5 and 8.5.

Toxics

Criteria: Toxic substances shall not be introduced above natural background levels in the waters of the state:

- In amounts, concentrations, or combinations which may be harmful;
- That may chemically change to harmful forms in the environment;
- That may accumulate in sediments or bio-accumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare; aquatic life; wildlife; or other designated beneficial uses.

Criteria and lethal concentrations for 303(d) organics:

- DDT criterion of 0.024 ng/L from Table 20
- DDE criterion of 0.000022 ug/L from Table 33B
- Dieldrin criterion 0.071 ng/L from Table 20

Dissolved Oxygen (DO)

Beneficial Uses Affected: Fish and Aquatic Life, Salmonid Spawning and Rearing

Criteria: Dissolved oxygen must not be less than 6.5 mg/L except during spawning. During spawning, DO must not be less than 11 mg/L unless conditions of barometric pressure, altitude, and temperature preclude attainment of the 11 mg/L. In such cases, DO levels shall not be less than 95 percent of saturation.

For streams providing for cold-water aquatic life, DO must not be less than 8 mg/L, unless conditions of barometric pressure, altitude, and temperature preclude attainment of the 8 mg/L. In such cases, DO shall not be less than 90 percent of saturation.

Table 2. 303(d) Listed Waterbodies in the Lower Willamette Subbasin (not including the mainstem Willamette and Columbia Rivers)

Water Body	River Miles	Parameter
Arata Creek/Blue Lake	0 to 0.9	Ammonia
Arata Creek/Blue Lake	0 to 0.9	Aquatic Weeds Or Algae
Arata Creek/Blue Lake	0 to 0.9	Chlorophyll a
Arata Creek/Blue Lake	0 to 0.9	Dissolved Oxygen
Arata Creek/Blue Lake	0 to 0.9	pH
Arata Creek/Blue Lake	0 to 0.9	pH
Columbia Slough	0 to 8.5	Iron
Columbia Slough	0 to 9.8	Biological Criteria
Columbia Slough	0 to 9.8	Dissolved Oxygen
Columbia Slough	0 to 9.8	Iron
Falling Creek	0 to 0.9	Biological Criteria
Johnson Creek	0 to 23.7	Biological Criteria
Johnson Creek	0 to 23.7	DDE 4,4
Johnson Creek	0 to 10.5	Dissolved Oxygen
Johnson Creek	0 to 23.7	Endosulfan
Johnson Creek	0 to 23.7	Endrin aldehyde
Johnson Creek	0 to 23.7	Lead
Johnson Creek	0 to 23.7	pH
Johnson Creek	0 to 23.7	Polychlorinated Biphenyls (PCBs)
Johnson Creek	0 to 23.7	Polynuclear Aromatic Hydrocarbons
Kellogg Creek	0 to 1	Dissolved Oxygen
McNulty Creek	0 to 5.8	Biological Criteria
Miller Creek	0 to 1.8	Biological Criteria
Multnomah Channel	0 to 21.7	Dissolved Oxygen
Multnomah Channel	0 to 21.7	Mercury
Osburn Creek	0 to 5.8	Biological Criteria
Osburn Creek/Fairview Lake	2 to 2.8	Aquatic Weeds Or Algae
Oswego Creek/Lake Oswego	0 to 3	Dissolved Oxygen
Scappoose Creek	0 to 5.8	Dissolved Oxygen
South Columbia Slough	0 to 3.2	Iron
Tryon Creek	0 to 5	Biological Criteria
Tryon Creek	0 to 2.5	Dissolved Oxygen
Unnamed Stream	0 to 1.4	Biological Criteria
Unnamed Stream	0 to 1.2	Biological Criteria
Unnamed Stream	0 to 2	Biological Criteria
Unnamed Stream	0 to 1.8	Biological Criteria
Unnamed Stream	0 to 1.5	Biological Criteria
Unnamed Stream/Bybee Lake	0.5 to 1.7	Aquatic Weeds Or Algae
Unnamed Stream/Bybee Lake	0.5 to 1.7	pH
Unnamed Stream/Smith Lake	1.7 to 3	Aquatic Weeds Or Algae
Unnamed Stream/Smith Lake	1.7 to 3	pH

For streams providing for cool-water aquatic life, DO shall not be less than 6.5 mg/L as an absolute minimum.

2.3.3 Sources of Impairment

Agricultural Waste

The aim of agricultural waste prevention and control is to minimize the transport of bacteria, nutrients, pesticides, pathogens, irrigation tailwater, and sediment into waters of the state. Because agricultural waste includes a broad range of substances, there are numerous conservation activities and strategies that may be taken to minimize waste inputs into waters of the state. A discussion of these strategies, broken down by pollutant, follows.

Livestock Waste: Nutrients and Bacteria

Manure is an important nutrient source for crop and pasture production. Proper livestock waste management can decrease nutrient and bacteria contamination of water resulting from agricultural activities. Livestock waste management includes providing for livestock crossing and water access such that livestock do not loiter in streamside areas or waterways. Examples of techniques to achieve this include off-stream watering, seasonal grazing, and exclusion (temporary or permanent).

There are many different conservation strategies a landowner or operator can take to help minimize animal waste reaching waters of the state. Vegetative buffer strips can minimize the effects of runoff by catching pollutants before they reach a stream. Some examples of waste management systems are clean water diversions; waste collection, storage, and utilization; and facilities operation and maintenance.

If applying manure to cropland, it is important to apply at rates that do not exceed agronomic needs for nitrogen and phosphorus based on soil and/or tissue tests for the crop to be grown. It is also important to ensure that the storage or application of manure does not contaminate drinking water wells. Pasture management and/or prescribed grazing can help maintain the integrity of pastures, thus decreasing waste runoff.

Crop Nutrients

Crop nutrients are elements taken in by a plant that are essential to its growth, and which are used by the plant in the production of its food and tissue. These elements include: carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, zinc, iron, manganese, copper, boron, molybdenum, and chlorine. Sources of crop nutrients include, but are not limited to: irrigation water, chemical fertilizers, animal manure, compost, bio-solids, and leguminous and non-leguminous crop residues.

Over-application of crop nutrients may result in nutrients runoff to surface water or leaching into groundwater. This may cause nuisance algal growth, high pH, bacterial contamination, and a decrease in dissolved oxygen. Landowners and operators are encouraged to adopt sound agronomic strategies to guide crop nutrient applications, and to ensure that nutrient applications do not lead to contamination of drinking water wells.

Sound agronomic strategies include: use of fertilizer at agronomic rates; setting realistic yield goals; regular calibration of fertilizer application equipment; appropriate application timing; use of weather reports and crop growth stage to guide application timing; periodic soil testing and plant tissue analysis; periodic nutrient analysis of manure and/or compost products that are applied; managing irrigation to

prevent nutrient loss through leaching and/or surface runoff; carefully managing nutrient applications; and accounting for “non-fertilizer” sources of nutrients such as manure, compost bio-solids, and leguminous and non-leguminous crop residues.

Pesticide Use

As required by law, always apply chemicals in accordance with the label requirements in order to minimize crop damage, potential runoff, and leaching into groundwater. Read the label, and as required by ORS 634.372(2) and (4), follow label recommendations for both restricted use and general use pesticides. DEQ now requires a permit for pesticide applications in, over, or within three feet of water. This permit provides coverage for pesticide applications to control mosquitoes and other flying insect pests, weeds, algae, nuisance animals, and area-wide pest control (www.deq.state.or.us/wq/wqpermit/pesticides.htm).

Calibrate, maintain, and correctly operate application equipment. Spray rigs need to be calibrated each time there is a change in product and/or application rate. Nozzles should be replaced often, particularly if an abrasive pesticide formulation (such as a wettable powder) is used. Sprayers need to be operated in the correct pressure range (dictated by the material and nozzle combination used), to prevent excess drift to non-target areas (e.g. waters of the state).

When feasible, adopt integrated pest management (IPM) strategies. IPM promotes a diverse, multi-faceted approach to pest control. This strategy establishes an economic threshold for control actions, to guide the manager to use a variety of field/orchard sanitation and cultural practices, field scouting, beneficial insects, and other biological controls, and the use of properly selected chemical pesticides. While IPM does not exclude the use of chemical pesticides, it does seek to optimize their use and minimize off-target movement into the environment.

Store and handle pesticide materials correctly. Storage and handling facilities should be secure and include a leak-proof pad with curbing for mixing and loading. An alternative to a permanent, concrete pad is to always mix pesticides in the field, frequently moving sites to prevent chemical buildup. Wash/rinse water should be directly applied to the appropriate crop. Empty liquid pesticide containers should be triple rinsed, then punctured and disposed of in an approved manner. Dry chemical bags should be emptied completely. Bundle and store paper bags until they can be disposed of in an approved manner.

Establish appropriate vegetative buffer strips as may be indicated on some pesticide labels. Buffer strips will help to retain soil (which may include pesticides) and surface runoff (which may have dissolved pesticides) from making contact with waters of the state.

Watch for a pesticide waste collection day in your area. These events allow individuals to safely and anonymously drop off unwanted, unused, or out of date agricultural pesticides, along with some empty containers. Waste collection events are effective ways to collect and properly dispose of pesticides that are no longer in use, or “legacy” pesticides.

Legacy pesticides continue to be detected in water quality monitoring data both in the Lower Willamette Management Area and statewide. Legacy pesticides typically bind with soil particles and are transported into streams and rivers during rain events. Conservation practices addressing erosion are also effective management strategies for preventing legacy pesticides from entering into waters of the state. Contact your local Soil and Water Conservation District for technical advice to prevent soil erosion and pesticides from reaching Oregon’s streams and rivers.

Irrigation Tailwater

Over application of irrigation water, resulting in tailwater entering waters of the state, can adversely impact waterbodies by contributing warm water, nutrients, pesticides, and sediment to waters of the state.

Irrigation scheduling decisions based on arbitrary considerations, such as calendar flood irrigation, should be avoided. Irrigation scheduling decisions should be based on site-specific factors that influence crop growth, such as:

- Evapotranspiration (crop type, stage of growth, percentage ground shade, weather conditions)
- Soil conditions (moisture, infiltration rate, water holding capacity)
- Irrigation system performance (uniformity, efficiency, application rate)
- Recent applications of crop nutrients and/or farm chemicals and other cultural practices (harvesting, cultivation, etc.)

Management strategies a landowner or operator can take to help minimize irrigation tailwater reaching waters of the state include: adopting an irrigation water management plan, using irrigation soil moisture monitoring, planting and irrigating crops on a contour, planting sloping field edges to grasses, installing sediment basins at field edges in swales, using drip irrigation, recycling return flows, and using minimum or no till.

Sediment

While soil erosion is a natural process, poorly managed tillage operations and poorly managed streambanks can accelerate erosion rates to unacceptable levels. Erosion that results in sediment entering waters of the state could lead to excessively turbid water, sediment deposition in the water body, and reduced water quality. If soil is moving off the land and into waters of the state, pesticides, bacteria, mercury, and nutrients will likely accompany it. The sediment will also act to fill and widen streams, resulting in temperature increases and filled-in gravel spawning grounds for fish. Sediment entering waters of the state can disrupt a fish's respiratory process after entering a fish's gills.

Activities and strategies that landowners and operators can use to minimize the mobilization of sediment into waters of the state include:

- Erosion prevention
- Sediment control
- Proper construction and maintenance of farm roads
- Irrigation water management (described above)

Erosion prevention starts at the "top" of the hill, by keeping soil particles from detaching and moving with water, wind, ice, or gravity. Sediment control is implemented at the "bottom" of the hill, after the erosion has occurred; for example, by placing straw bales in a swale to catch sediment. Landowners and operators are encouraged to use erosion prevention techniques first, and follow up with sediment control techniques if needed.

Strategies that may help prevent erosion include: switching from conventional tillage to no till, using contour planting, planting a cover crop, deep ripping a field to improve water infiltration, controlling the timing and location of livestock grazing, or any practice that reduces the detachment and movement of soil. Strategies that may help control sediment include: strip cropping, catch basins, grass-lined waterways, vegetative filter strips, and straw bales. Sediment control strategies need to be well designed and maintained.

Roads and related structures (staging areas, stream crossings, bridge abutments, cut slopes, etc.) have been identified in many watersheds as significant sources of sediment input to streams. A single poorly maintained farm road could comprise the vast majority of one farm's sediment output. Landowners and operators are encouraged to obtain advice on road construction and maintenance, especially for roads built on steeper terrain, close to streams, or crossing streams. Many management methods are available for constructing and maintaining roads to increase their stability and to reduce erosion. Landowners may be held liable for water pollution from any road on their property and should carefully review the wording of any easement agreements.

Warning Signs That Agricultural Waste May Be Reaching Water

Landowners often want to know what they need to do, or not do, to be in compliance with a rule or law. Some likely potential indicators of non-compliance with the Agricultural Waste Rule (OAR 603-095-1240(3)) include:

- Visible erosion scars in natural stream areas that would discharge soil into waterways.
- Visible sloughing from drainage ways in conjunction with livestock grazing, tillage, or other human destruction of riparian vegetation.
- Eroding road ditches, drainage ways, and field borders.
- Underground drainage tile outlets either improperly installed or maintained, allowing bank erosion to occur.
- Surface runoff from roads and staging areas that pick up contaminants and flow to waters of the state.
- Irrigation application that creates surface runoff entering the waters of the state.
- Nutrients applied to open water.
- Visible trail of manure, compost, ash, or bio-solids to waters of the state.
- Pesticide product applied to open water unless labeled for such use and permitted.
- Chemigated waters flowing into surface waters, or flowing into or ponding around wells, cisterns, or other direct conduits to ground water.
- Runoff flowing through areas of high livestock usage and into waters of the state.
- Livestock waste located in drainage ditches or areas of flooding.

2.3.4 Beneficial Uses

When a water quality standard is established, the first step is to identify the beneficial uses sensitive to the parameter. Then a numeric or narrative criterion is established based on the levels needed to protect the sensitive uses. For example, the uses typically most sensitive to dissolved oxygen are fish and aquatic life. Fish and other aquatic organisms need an adequate supply of oxygen in the water to be healthy and productive. The dissolved oxygen criteria identify the minimum amount of dissolved oxygen needed in the water to protect fish. For other pollutants, such as many of the toxic pollutants or bacteria, criteria identify the maximum amount that may be in the water without risk to the aquatic biota or to human health.

2.4 Prevention and Control Measures

The focus of the Agricultural Water Quality Management Program is on voluntary and cooperative efforts by landowners, SWCDs, ODA, and others to protect water quality. However, the AgWQMA authorizes ODA, in cooperation with a local advisory committee, to develop Agricultural Water Quality Management Area Rules (Area Rules) that can be enforced to ensure prevention and control of water pollution from agricultural sources. Area Rules are goal-oriented and describe conditions that should be achieved or avoided on agricultural lands, rather than practices that must be implemented.

The Area Plan contains voluntary, incentive based approaches to water quality management and is not enforceable. The Area Rules are the only enforceable provision of the agricultural water quality program. Any actions related to determination of noncompliance with the Area Rules or enforcement will be taken up directly by ODA, as outlined in OARs 603-090-0080 through 603-090-0120.

In this section, there are four Prevention and Control Measures that appear with a border around the text. These measures are the enforceable Area Rules for the Lower Willamette.

The Prevention and Control Measures relate directly to water quality issues identified on the 303(d) list in the Management Area. The issues addressed are:

- Temperature
- Bacteria
- Dissolved Oxygen
- Nutrients
- Toxics

Agricultural landowners (commercial and noncommercial) should review the Area Rules--cited in the boxes--and evaluate their operations to determine if they are in compliance. Indicators of non-compliance are included to describe landscape conditions that should be avoided on agricultural land. A review of the information provided in this document may provide ideas on how to improve water quality through management activities.

Based upon this self-evaluation, landowners should develop or seek assistance to develop their own site-specific adaptive management strategy to meet required conditions. The Prevention and Control Measures are intended to be flexible enough for landowners to develop feasible and affordable approaches to meet water quality standards. Landowners are encouraged to seek technical assistance and management plans from their local SWCD, USDA NRCS or cooperative extension service. (see Appendix A for contact information)

2.4.1 Waste Management

603-095-3740(2)

Waste Management

Effective upon rule adoption, no person subject to these rules shall violate any provision of ORS 468B.025 or ORS468B.050.

ORS 468B.025 Prohibited activities. (1) Except as provided in ORS 468B.050 or 468B.053, no person shall:

- (a) Cause pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.
 - (b) Discharge any wastes into the waters of the state if the discharge reduces the quality of such waters below the water quality standards established by rule for such waters by the Environmental Quality Commission.
- (2) No person shall violate the conditions of any waste discharge permit issued under ORS 468B.050.
- (3) Violation of subsection (1) or (2) of this section is a public nuisance. [Formerly 449.079 and then 468.720; 1997 c.286§5].

ORS 468B.050 when permit required. (1) Except as provided in ORS 468B.053 or 468B.215, without first obtaining a permit from the Director of the Department of Environmental Quality or the Oregon Department of Agriculture, which permit shall specify applicable effluent limitations, no person shall:

- (a) Discharge any wastes into the waters of the state from any industrial or commercial establishment or activity or any disposal system.
- (b) Construct, install, modify or operate any disposal system or part thereof or any extension or addition thereto.
- (c) Increase in volume or strength any wastes in excess of the permissive discharges specified under an existing permit.
- (d) Construct, install, operate or conduct any industrial, commercial, confined animal feeding operation or other establishment or activity or any extension or modification thereof or addition thereto, the operation or conduct of which would cause an increase in the discharge of wastes into the waters of the state or which would otherwise alter the physical, chemical or biological properties of any waters of the state in any manner not already lawfully authorized.
- (e) Construct or use any new outlet for the discharge of any wastes into the waters of the state.

(2) As used in this section, "confined animal feeding operation" has the meaning given that term in rules adopted by the Oregon Department of Agriculture or the Department of Environmental Quality.
[Formerly 449.083 and then 468.740; 1997 c.286 §6; 2001-c.248 §4]

Intent

The LAC understands that not all situations resulting in impacts to the state waters are possible to foresee. Therefore, this Prevention and Control Measure was included to address circumstances that result in threats to the quality of waters of the state and are not categorized by other Prevention and Control Measures.

Potentially impacted 303(d) list parameters:

Water quality parameters on the 303(d) list for this Management Area that may be positively impacted by this rule include bacteria, nutrients, dissolved oxygen, and toxics.

Other water quality parameters that may be impacted:

Additional water quality parameters that may be positively impacted by this rule include chlorophyll *a*, pH, aquatic weeds and algae, and turbidity.

2.4.2 Nutrient Management

603-095-3740(3)

Nutrient Management

Effective upon rule adoption, no person subject to these rules shall violate any provision of ORS 468B.025 or ORS 468B.050. Effective upon rule adoption (a) Landowners and operators shall prevent the runoff or leaching of contaminated water from feed and manure storage piles into waters of the state, including but not limited to groundwater. (b) Landowners or operators shall store, use, and apply crop nutrients in a manner that prevents transport into the waters of the state.

Intent

The judicious application of crop nutrients is a necessary and beneficial cultural practice. The misapplication of crop nutrients is often financially costly to the grower and can be costly to the environment as well. The nutrient Prevention and Control Measure encourages growers to adopt sound agronomic practices to guide their crop nutrient applications, rather than relying on arbitrary methods (apply what the neighbors apply, do what was done last year, etc.) that can limit potential crop yields and maximizes the potential for off-site movement of nutrients.

Sound agronomic practices related to nutrient management include:

- Balancing yield with correct fertilization rates (more is not always better),
- Regular calibration of fertilizer application equipment,
- Timely soil testing and/or plant tissue analysis,
- Periodic nutrient analysis of manure and/or compost products that will be applied,
- Managing irrigation to prevent nutrient loss through leaching and/or surface runoff,
- Carefully managing nutrient applications in periods of potentially high rainfall,
- Accounting for “non-commercial” sources of nutrients such as manure, compost, sewage sludge and leguminous and non-leguminous crop residues.

Indicators of non-compliance

The following indicators will assist landowners in evaluating their property and agricultural operation to determine if they are meeting the above Prevention and Control Measure.

Clear non-compliance:

- Fertilizer product applied to, or remaining in surface water,
- Visible trail of manure, soil, or compost to surface water,
- Fall soil tests show excess of 30 ppm Nitrate (NO_3^-) in the first 12” of soil,
- Runoff water flowing through accumulated waste or areas of high animal usage.

Likely non-compliance, requires further investigation:

- Excess depth of manure or compost applied to fields,
- Manure piles stored on permeable surfaces,
- Animal confinement areas located in close proximity to waterbodies,
- Indicators that runoff from confinement areas could easily flow into waters of the state,
- Waste (manure) accumulations that are not covered.

Potentially impacted 303(d) list parameters:

Water quality parameters on the 303(d) list for this Management Area that may be positively impacted by this rule include bacteria, dissolved oxygen, and nutrients.

Other water quality parameters that may be impacted:

Additional water quality parameters that may be positively impacted by this rule include chlorophyll *a*, pH, aquatic weeds and algae, and sedimentation.

*Marx, E.S., J. Hart and R.G. Stevens. 1998. Soil Test Interpretation Guide. Oregon State University Extension Service Bulletin EC 1478

2.4.3 Erosion Management

603-095-3740(4)

Erosion Management

Effective upon rule adoption, there shall be no visible evidence of erosion resulting from agricultural activities in a location where erosion contributes, or may contribute, sediment to waters of the state.

- (a) Visible evidence of erosion consists of one or more of the following features:
 - (A) Sheet wash, noted by visible pedestalling, surface undulations, and/or flute marks on bare or sparsely-vegetated ground; or
 - (B) Visibly active gullies, as defined by OAR 603-095-0010 (1); or
 - (C) Multiple rills, which have the form of gullies, but are smaller in cross sectional area than one square foot; or
 - (D) Visible soil deposition that could enter natural stream areas; or
 - (E) Streambanks breaking down, eroding, tension-cracking, shearing or slumping beyond the level that would be anticipated from natural disturbances given natural hydrologic characteristics; or
 - (F) Underground drainage tile outlets either improperly installed or maintained allowing soil or bank erosion to actively occur.
- (b) Private roads used for agricultural activities shall be constructed and maintained such that road surfaces, fill, ditch lines, and associated structures are designed and maintained to prevent and control contributing sediment to waters of the state. All private roads not subject to the Oregon Forest Practices Act are subject to this regulation.
- (c) Drainage and irrigation ditch construction and maintenance must be done such that:
 - (A) Ditch slope and ditch cross section are designed for the local soils and minimize erosion;
 - (B) Placement of disposed soils is done in a manner that prevents reintroduction to waters of the state; and
 - (C) Other appropriate best management practices are employed when necessary so that sediment delivery is consistent with water quality standards.

Intent

Tillage is a cultural practice that can be very crop and farm specific. A particular combination of tillage operations that works well for one grower may not work for a neighbor down the road who is growing the same crop. Therefore, it is not the intent of this Prevention and Control Measure to dictate to growers what tillage practices they may or may not employ. This Prevention and Control Measure does however, require growers to look at their entire cropping operation in terms of erosion prevention and sediment control.

This Prevention and Control Measure is also intended to address non-cropped areas that may be sources of sediment or contaminant input to streams. These include roads, staging areas, barn lots, stream crossings, and bridge abutments. Many management methods are available for constructing and maintaining roads to increase their stability and reduce erosion. A single poorly maintained road can comprise the vast majority of one farm's sediment output.

Practices that may be used to prevent sediment input to streams from roads and staging areas include:

- Water bars
- Surface crowning

- Filter strips
- Water and sediment control basins
- Road maintenance (maintaining gravel or grass cover)
- Rolling dips
- Out sloping road bench

Many pesticides that are no longer permitted for application may remain adsorbed to soil particles. If soil is moving off the property, pesticides may be going along for the ride. Limiting erosion removes this transportation mode of pesticides and will help address the DDT and Dieldrin TMDL allocation.

Many practices that prevent or control erosion also slow the rate of water flowing across the land surface. The process of slowing and infiltrating water also slows the rate at which the water eventually reaches a stream during and immediately after a rainstorm. If water reaches a stream too quickly, it may cause streams to become “flashy” or rise quickly. This may cause two problems associated with pesticides:

- Re-suspension of sediment in the stream that may contain pesticides,
- Greater erosive action on streambanks bringing more sediment that may contain pesticides into the stream.

Erosion Prevention - Erosion prevention starts at the “top” of the hill. This process focuses on ways to prevent soil particles from detaching and moving with water or wind. Erosion prevention is NOT placing straw bales at the bottom of a swale to catch sediment - the erosion has already occurred.

Examples of erosion prevention include:

- Switching from conventional tillage to no-till,
- Planting a cover crop,
- Contour cropping,
- Deep ripping a field to improve water infiltration,
- Any practice that reduces the detachment and movement of soil.

Sediment Control - Sediment control deals with what happens at the “bottom” of the hill. This process focuses on the techniques used to prevent already detached soil from entering waters of the state. While soil erosion is a natural process, poorly managed tillage operations have the potential to accelerate erosion rates to phenomenal levels.

Examples of sediment control measures include:

- Strip cropping
- Catch basins
- Grass lined waterways
- Vegetative filter strips
- Straw bales (temporary measure)
- Sediment fence (temporary measure)

The above Best Management Practices (BMPs) can be very effective in retaining sediment, IF they are properly designed and maintained. Grass lined waterways and vegetative filter strips can be incorporated into many management practices, creating an integrated system to protect waters of the state.

Indicators of non-compliance for soil erosion:

Clear non-compliance -

- Visible soil deposition in natural stream areas,
- Visible sloughing from drainage ways, road ditches, and field borders as a result of livestock grazing, tillage, or the destruction of riparian vegetation by the landowner or occupier,
- Underground drainage tile outlets either improperly installed or maintained allowing soil or bank erosion to actively occur,
- Visible sheet and rill erosion leading to waters of the state,
- Streambanks breaking down, eroding, tension cracking, shearing or slumping beyond the level that would be anticipated from natural disturbances given natural hydrologic characteristics.

Likely non-compliance, requires further investigation -

- A drainage way that is growing deeper or wider in response to increased flows,
- Field swales with high water flow and without crop residues, grass cover, or sediment control structures,
- Steep slopes with minimal cover,
- Sediment deposits left from flowing water that are visible away from the ditch or channel,
- Lack of vegetation in and around drainage ditches.

Indicators of non-compliance for erosion on private roads used for agricultural activities:

Clear non-compliance -

- Surface runoff of water from farmsteads, roads, and staging areas that pick up contaminants and flow to waters of the state,
- Visible gully erosion in roads or staging areas.

Likely non-compliance -

- Inadequate culverts and water bars to keep runoff in natural channel.

Potentially impacted 303(d) list parameters

Water quality parameters on the 303(d) list for this Management Area that may be positively impacted by this rule includes: sediment, turbidity, nutrients, toxics, and dissolved oxygen.

2.4.4 Riparian Management

603-095-3740(5)

Riparian Management. Effective upon rule adoption.

(a) Agricultural activities in Riparian Management Areas will allow for the development of riparian vegetation along streams to provide:

- (A) shade for minimizing solar heating of the stream;
- (B) streambank stability from flows at or below those expected to occur during or following a 25-year, 24-hour storm event;
- (C) filtration, settlement, and biological uptake of sediment, organic material, nutrients, and pesticides in surface runoff by intercepting or slowing overland flow;
- (D) improvement to water storage capacity of the riparian zone; and
- (E) protection of streams from flashy flows by infiltrating runoff and overland flow.

(b) The Riparian Management Area is defined by that area needed to achieve OAR 603-095-3740(5)(a)(A to E).

(c) Streams as used in OAR 603-095-3740(5)(a) are those that are identified in the 2001 Metro stream map Regional Land Information System (RLIS) lite stm_line.shp and stm_fill.shp.

(d) Riparian vegetation in OAR 603-095-3740(5) includes grasses, sedges, shrubs, and trees that are consistent with site capability.

(e) Riparian area development can be through allowing natural processes to occur or through active management to accelerate achieving OAR 603-095-3740(5)(a)(A to E).

(f) Sufficient Riparian Management Area width will be site specific, and may vary by soil type, hydrology, climate, geology, man-made limitations, and other factors.

(g) Within the entire Riparian Management Area the technical criteria to determine compliance with OAR 603-095-3740(5)(a) are:

- (A) Ongoing renewal or establishment of riparian vegetation, especially native.
- (B) Where sufficient functions required in OAR 603-095-3740(5)(a) have not been met, at least 50% of each year's new growth of woody vegetation, both trees and shrubs, is maintained.

(h) Management activities within the Riparian Management Area are allowed provided they do not compromise achieving the conditions described in 603-095-3740(4) and 603-095-3740(5)(a).

(i) Drainage and irrigation ditches are not subject to the riparian management provisions cited above but are subject to OAR 603-095-3740(4).

Intent

This Prevention and Control Measure is anticipated to allow landowners to develop a flexible riparian area management strategy while providing adequate vegetation to trap sediment, prevent flood debris from depositing on fields, and protect pasture and cropland from bank erosion. Vegetation along smaller streams provides wildlife habitat and helps reduce solar radiation reaching the water which impacts water temperature. This Prevention and Control Measure is also anticipated to minimize the impact of livestock on riparian vegetation. Streams that are regulated by this riparian rule are defined as those shown on the map that was created using the RLIS lite stm_line.shp and stm_fill.shp 2001 created by Metro. (See Figure 2 or for an enlarged view see Appendix H) During the biennial review of the plan and rules, the LAC will consider Metro's updates to their stream data for inclusion into our stream map.

Indicators of non-compliance

Clear non-compliance -

- Active streambank sloughing/erosion as a result of tillage, grazing, or destruction of vegetation by the landowner or occupier,

- Streambank sloughing/erosion caused by drain tile outlets.

Likely non-compliance, requires further investigation -

- Stream not protected by appropriate vegetation.

Potentially impacted 303(d) list parameters

Water quality parameters on the 303(d) list for this Management Area that may be positively impacted by this Rule include aquatic weeds or algae, bacteria, biological criteria, dissolved oxygen, nutrients, sediment, temperature, total dissolved gas, toxics, and turbidity.

Healthy riparian areas provide several important ecological functions. These include:

- Slowing stream flow when water spreads over riparian areas – allowing the sediment in the water to fall out and be deposited on land rather than being carried downstream,
- Retaining floodwater and recharging groundwater,
- Stabilizing streambanks through plant root mass,
- Developing diverse channel characteristics providing pool depth, cover, and variations in water velocity necessary for fish habitat,
- Supporting a diversity of species,
- Shading for minimization of heating from sunlight,
- Providing a source of large woody debris for aquatic habitat,
- Providing a source of fine and coarse organic matter for the stream,
- Buffering to filter sediment, organic material, nutrients, and pesticides in surface water runoff before it enters the stream,
- Providing an area for overbank flows and flood storage during high flow events.

Factors used to evaluate improvement of the riparian area condition could include:

- Increase in the numbers of desirable riparian plant species including grasses, sedges, rushes, trees and shrubs,
- Reduction in the amount of bare ground,
- Increase in the amount of fallen debris including leaves and wood,
- Maintenance of established beneficial vegetation,
- Maintenance or establishment of woody vegetation -- both trees and shrubs,
- Establishment of streambank integrity capable of withstanding 25-year, 24-hour rain events,
- Composition of the plant community reflecting decreases in noxious plant species,
- Shade provided that is consistent with site capability to reduce solar radiation (sunlight) reaching the water,
- Increased stubble height of herbaceous species and continued growth of shrubs and trees.

Stream temperature is an important measurement of the quality of water present in our streams. Cool water holds more dissolved oxygen and benefits aquatic life forms that are native to the Pacific Northwest.

One way of ensuring cool water is to promote water infiltration into the soil before it reaches the stream. As water moves through the soil, it cools to ground temperature so when it seeps back into streams during low flow conditions it helps moderate stream temperatures.

A second method to control water temperatures is to prevent solar heating by providing shade along waterbodies. The fewer opportunities there are to heat water the easier it will be to satisfy the temperature requirements established by the temperature TMDL.

A third method to prevent increased water temperature is to minimize expansion of stream surface area through artificial impoundments that cause water to slow or stand still. In the case of in-stream ponds, water is slowed by a small dam in the stream. This detention allows solar radiation to heat the water before it is released downstream. The water is usually not deep enough to establish temperature stratification. If there is no layer of cold water at the bottom of the pond, it is not possible to mitigate the temperature increases by releasing water from the bottom of the pond. The Lower Willamette LAC discourages the construction of new dams on streams in the Management Area and encourages landowners who have ponds, and wish to assist in improving water quality, to contact their local natural resource agencies for technical advice on the best way to remove or improve dams. Modifying an existing pond to allow stream flow to pass around the pond rather than through it can provide substantial benefits to water quality, especially water temperature.

Example Conservation Practices for Prevention and Control Measures

Many practices that landowners may implement will address several resource issues. For instance, vegetation along a stream will reduce streambank erosion as well as enhance a riparian area. This strip of vegetation will also capture sediment from overland water flow before it reaches a waterbody. In doing so, pollutants associated with soil such as phosphorus and pesticides (eg. Dieldrin) are kept from contaminating the stream.

In Appendix C, you will find tables listing BMPs for riparian areas and streams, nutrient and manure management, and erosion and sediment control. These BMPs are intended as suggestions for landowners who want ideas on how to meet area rules and generally maintain and enhance natural resources on their property. The tables provide some idea of the water quality benefits of each practice as well as potential costs and benefits to landowners. The tables are organized by resource, such as riparian areas, or erosion control.

2.4.5 Resolution of Complaints and Enforcement Actions

The ODA will investigate complaints against landowners or occupiers who are alleged to be out of compliance with OAR 603-95-3740(1) through 603-095-3740(5). The complaint must relate to a specific site and contain a thorough description of the problem. The complaint must be filed with the ODA in writing and be signed by the complainant.

The ODA will determine if a violation of a Prevention and Control Measure exists using both professional judgment and the "indicators regarding compliance" outlined for each Prevention and Control Measure in this Plan or the Rules. Based on this determination, appropriate action will be taken by the ODA to assure that the condition is remedied.

The ODA will use enforcement mechanisms where appropriate and necessary to gain compliance with the Area Rules. Any enforcement action will be pursued only when reasonable attempts at voluntary solutions have failed.

A land occupier shall be responsible for only those conditions caused by activities conducted on land managed by the landowner or occupier. Area Rules do not apply to conditions resulting from unusual weather events or other exceptional circumstances that could not have been reasonably anticipated, such as fire, natural disaster, or extreme weather conditions. The ODA recognizes that every farm and situation is different and will take into account each individual situation when enforcing the Rules.

Where violations exist, the occupier and/or landowner may be issued a Notice of Noncompliance (NON) by ODA. Under a (NON), the occupier and/or landowner will be directed by the ODA to remedy the condition under the provisions of the enforcement procedures outlined in OAR 603-090-060 through 603-090-120. Authority for any enforcement action pertaining to OAR 603-095-3740(1) through 603-095-3740(5) rests solely with the ODA. If and where other governmental policies, programs, or regulations conflict with this Plan or its Rules, ODA will consult with the agency(ies) and attempt to resolve the conflict in a reasonable manner.

Implementation of this Plan began upon adoption of the Administrative Rules. The effective date of the Prevention and Control Measure was upon adoption.

ODA recognizes that every farm and situation is different and will take into account individual circumstances when conducting investigations and enforcing the Area Rules. A landowner or operator will be responsible for only those conditions caused by activities conducted on land managed by the landowner or operator. The Area Rules do not apply to conditions resulting from exceptional circumstances that could not have been reasonably anticipated, such as fire, natural disaster, or extreme weather conditions such as flooding.

2.4.6 Upland Management

Role of Upland Vegetation to Prevent and Control Pollution

Upland areas are the rangelands, forests, and croplands located upslope from streamside areas. Upland areas extend to the ridge-tops of watersheds. With a protective cover of crops and crop residue, grass (herbs), shrubs, or trees, these areas will capture, store, and safely release precipitation, thereby reducing the potential of excessive soil erosion or delivery of soil or pollutants to the receiving stream or other body of water.

Healthy upland areas provide several important ecological functions, including:

- Capture, storage, and moderate release of precipitation reflective of natural conditions.
- Plant health and diversity that support cover and forage for wildlife and livestock.
- Filtration of sediment.
- Filtration of polluted runoff.
- Plant growth that increases root mass, utilizes nutrients, and stabilizes soil to prevent erosion.

Chapter 3: Goals, Objectives, and Strategies

Mission

The mission of the Lower Willamette Local Advisory Committee (LAC) is to promote agricultural management conditions that protect and improve water quality in the Lower Willamette Agricultural Water Quality Management Area, while maintaining agricultural viability.

3.1 Goals of the Area Plan

The goals set forth the aspirational goals of the Area Plan, which will be achieved through voluntary, incentive-based work undertaken by landowners in cooperation with the SWCD and other partners.

Goals

The goals of the Area Plan are to:

- Prevent and control runoff, water pollution, and soil erosion from agricultural activities for the purpose of improving water quality.
- Prevent and control water pollution from agricultural activities and soil erosion and achieve applicable water quality standards.
- Achieve the following land conditions on agricultural lands throughout the management area that contribute to good water quality (modify as applicable depending on the management area):
 - Streamside vegetation provides streambank stability, filtration of overland flow, and moderation of solar heating, consistent with site capability.
 - No visible sediment loss from cropland through precipitation or irrigation induced erosion.
 - No significant bare areas within 50 feet of streams on pasturelands and/or rangelands.
 - Active gullies have healed or do not exist on pasturelands.
 - Livestock manure is stored under cover during the winter and in a location that minimizes risk to surface and groundwater.

To reach these goals, the LAC and ODA developed Prevention and Control Measures. The area Rules were developed based on these measures. The Prevention and Control Measures focus on the following issues:

- Controlling nutrients from manure pile leachate, from overland runoff, and by using appropriate fertilizer application rates.
- Preventing conditions already prohibited under ORS 468B.025 and 468B.050 (Water Pollution Control).
- Controlling erosion so that there is no visible evidence of erosion resulting from agricultural activities contributing, or having the likelihood of contributing, sediment to waters of the state.
- Promoting natural or managed development of riparian vegetation appropriate to site capability that provides riparian function over time.

Consult the Prevention and Control Measures in Section 2.5, especially the boxed text, for more detailed information on the above strategies.

3.2 Strategic Initiatives and Measurable Objectives

3.2.1 Measurable Objectives

Measurable Objectives are being developed to measure progress and effectiveness of Oregon's efforts to protect and improve agricultural water quality. The intent is to show that Oregon agriculture is improving water quality and the state and federal financial investment in agricultural water quality improvements are paying off and showing measurable results. Measurable Objectives need to be specific, measurable, achievable, relevant, and time-bound.

ODA, the Lower Willamette LAC, and the EMSWCD will develop measurable objectives over the next biennium. At future biennial reviews, ODA, EMSWCD, and the Lower Willamette LAC will evaluate progress towards the Measurable Objective (and associated Milestones and Timelines) and use an adaptive management approach to modify the milestones and objectives, if needed.

3.2.2 Strategies for Working in a Focus Area

SWCDs around the state are focusing efforts in small geographic areas with water quality concerns associated with agriculture. Concentrating outreach and technical assistance in a "focus area" is the systematic approach to achieving water quality standards on agricultural land.

The following steps outline the general process for implementing the Area Plan in a Focus Area and for documenting effectiveness:

- Identify water quality parameter(s) of concern and a possible land condition surrogate (e.g. streamside vegetation as a surrogate for temperature);
- Compile and map available baseline land condition and water quality data;
- Conduct outreach to promote awareness of water quality issues and their solutions;
- Conduct systematic, active outreach to meet with landowners, assess land conditions, and offer voluntary technical assistance;
- Seek to secure necessary resources to help landowners achieve land conditions that contribute to good water quality;
- Map land conditions after two years of implementation and quantify changes from the baseline;
- Compile updated available water quality data and provide to ODA for the purpose of quantifying changes from the baseline;
- Evaluate and discuss program effectiveness at each biennial review of the Area Plan.

3.2.3 Previous ODA Sponsored Focus Area

Johnson Creek is a tributary to the Willamette River in the Lower Willamette sub-basin; HUC 170900120101. The upper portion of the Johnson Creek watershed is in both Multnomah and Clackamas Counties and the main agricultural use is nursery crops with small areas of pasture for livestock and horses. Other land uses include commercial, forest, and rural residential.

The goal in the CSWCD Focus Area was to reduce stream temperature by increasing woody plant cover on riparian areas, providing technical and financial assistance as needed and available, and by partnering with other organizations active in promoting stream shading in this area. The goal in the EMSWCD Focus Area was to reduce the amount of sediment in the creek. Since 2009, the EMSWCD has worked with landowners in upper Johnson Creek on riparian re-vegetation.

Implementation Activities in the Johnson Creek Watershed Focus Area

CSWCD Focus Area: Funding was provided to the Johnson Creek Watershed Council to conduct outreach and identify landowners interested in having their riparian area planted. CSWCD developed riparian planting plans for these sites.

EMSWCD Focus Area: The initial assessment of the Focus Area was developed by mapping HEL soils and determining the percentage of highly erodible land on agricultural properties. Areas were prioritized based on this assessment. A mailing explaining the focus area, goals, and financial assistance available was mailed to all agricultural landowners in the focus area. Landowners were asked to call or email if they were interested. Getting no response, follow up letters, phone calls, and/or emails were used to identify interest.

Results

CSWCD Focus Area: Planting plans were developed for nine sites. The funding provided to the Johnson Creek Watershed Council resulted in riparian plantings along 1.3 linear miles on 12.2 acres.

EMSWCD Focus Area: No erosion prevention plans were developed or implemented in the focus area despite extensive outreach via mail, email, and phone. EMSWCD is currently exploring the utility of a focus group or survey to help identify barriers and develop incentives that would lead to implementation.

3.2.4 Future Focus Areas

The EMSWCD is moving their ODA sponsored Focus Area to Beaver Creek located in the Sandy Sub-basin Water Quality Management Area. Since Johnson Creek is the main agricultural area in the Lower Willamette AgWQ Management Area, it will not have an active focus area for the next biennium. ODA is conducting the regulatory Strategic Implementation Area (SIA) in the Upper Johnson Creek agricultural areas.

3.2.5 Strategic Implementation Areas (SIA)

Oregon Department of Agriculture (ODA) has worked over the last two years to develop the SIA approach. The SIA approach will concentrate technical and financial resources into specific geographic areas to address water quality concerns. The SIA approach includes a pre-evaluation; outreach, technical assistance, on the ground projects, and enforcement if necessary; and a post-evaluation. This approach will allow ODA and partners to be able to ‘tell the story’ of how Agriculture is taking action to protect water quality and also correct problems that may exist.

ODA will complete a process to identify agricultural properties that may be polluting waters of the state and violating local area Agricultural Water Quality Rules using remote and field evaluation. The remote and field evaluations will document concern levels and then respond to landowners according to concern level. Aerial photos, topographic maps, stream and drainage locations, property boundaries, soils, and well logs are evaluated for the remote evaluation. The presence of agricultural activity (livestock or cropping), slope, proximity to the water body, size of the water body, and type (ephemeral, seasonal, or perennial) of water body are considered for potential surface water impacts. After the remote evaluation, a field evaluation is completed to verify the concerns from the remote evaluation and also any additional observed concerns. Results from the SIA process will be added to Section 4.5 of this Area Plan once completed.

It is very important landowners understand that the EMSWCD and CSWCD are not involved with the regulatory SIA process and are not regulatory agencies. SWCDs work in Focus Areas and

ODA works in SIAs. However, SWCDs will be able to provide landowners technical and, potentially, financial assistance with implementation as a result of the SIA evaluation. SWCDs concentrate their efforts in Focus Areas and ODA is leading the SIAs. More information on the SIA evaluation can be found in Section 3.2.5.

Implementation Process and Timeframe:

1. Coordination and Planning Meetings: (July 2015 to July 2016)

Throughout the SIA process, ODA meets with the local SWCDs, and other key partners (Watershed Councils, NRCS, etc.).

2. Compliance Pre-Evaluation: (July 2015 to September 2015)

Riparian vegetation, bare ground, and manure piles are visually evaluated for each parcel using aerial photographs and field verification from public viewpoints to identifying potential for agricultural activities to impact surface or ground water.

3. Outreach and Compliance:

- ODA sends the owners of all evaluated properties introductory letters and SIA outreach materials, and invites them to an open house. (September 2015)
- ODA plans and hosts an open house. (October 2015 to December 2015)
- ODA conducts escalating outreach and on-site visits dependent on concern level. (January 2016, April 2016, and July 2016)
- If a compliance investigation is opened, ODA's normal compliance process is followed. (ongoing after January 2016)
- SWCD responds to landowners that contact them during the outreach and compliance phase. (ongoing after January 2016)

4. Compliance Post-Evaluation:

The post-evaluation re-categorizes the concern level after the producer works with the local SWCD, ODA, or other partner to address any potential water quality issues. (ongoing after January 2016)

Strategic Implementation Area Description:

The Upper Johnson Creek watershed (approximately 17,000 acres; approximately 2,700 agricultural) is partially in Multnomah and Clackamas counties. The majority of the agricultural area of Upper Johnson Creek is east of Highway 26. Agricultural areas of the watershed consist mostly of nurseries, and small acreage livestock facilities. Water quality concerns in the watershed are for bacteria, nutrients, and temperature. Results from the SIA will be added into Section 4.4 once completed.

3.3 Strategies for Area Plan Implementation

To protect or improve water quality, an effective strategy must increase awareness of the problems and the range of potential solutions, motivate appropriate voluntary action, and provide for technical and financial assistance to plan and implement effective water pollution prevention and control measures. The SWCDs and other partners will cooperate to implement the following strategies at the local level with landowners:

- Prevent runoff of agricultural wastes: agricultural activities will not discharge any wastes or place waste where it is likely to run off into waters of the state.
- Prevent and control upland and cropland soil erosion using practical and available methods.
- Control active channel erosion to protect against sediment delivery to streams.

- Prevent bare areas due to livestock overgrazing near streams.
- Establish streamside vegetation along streams on agricultural properties to provide streambank stability, filtration of overland flow, and moderation of solar heating.

3.3.1 Outreach and Implementation Strategy

To develop the outreach and implementation strategy for the Lower Willamette Area Plan, the LAC decided to take action to:

1. Determine the target audience for outreach.
2. Determine the beliefs and actions of the target group concerning water quality.
3. Determine the desired behavior changes from each group.
4. Determine the key messages.
5. Determine the tools to deliver the key messages.
6. Determine how to evaluate success.

Adaptation is necessary throughout the process and it is important to make sure the messages are pertinent and delivered in a manner that reaches the intended audience. The LAC determined that their priority for outreach is streamside landowners engaging in agricultural activities on their property. Further prioritization narrowed these activities down to:

Large Acreage (>20 acres)

- Nurseries
- Row Crops

Small Acreage (<20 acres)

- Nurseries
- Livestock

The goal of outreach activities offered to these groups is to encourage agricultural practices that protect water quality. This may require changes in particular behaviors or ways of thinking and acting. These changes should be reflected in improvements on the landscape or in management of the operation, and those in turn would translate into a reduction of negative impacts on water quality in the Lower Willamette.

Large Acreage Farms

The Lower Willamette LAC identified large acreage farms as the main priority due to their visibility and influence in the agricultural communities. It is the hope of the LAC that large acreage producers can set the example and be the leaders in the community for conservation efforts and outreach.

For both the large acreage nurseries and row crops, the focus is closely aligned. The following five necessary results are sought from both groups:

1. **Increased riparian cover** – Benefits from this change include improved streambank stability, increased shade for streams and other waterbodies, improved filtration of soil and other contaminants in overland water flow, and increased opportunity for water to infiltrate into the soil.
2. **Reduction in the amount of bare soil** – This recommendation is especially important during the rainy season. The benefit of reducing areas of bare soil is to lessen erosion and the possibility of losing valuable topsoil to ditches or streams. From both a production and long-term sustainability standpoint, any practices that keep soil in place will save landowners money in soil amendments and fertilizers. The erosion potential of fields should be considered when determining the timing

of initial and final plantings. This strategy should result in the most erosion prone fields having the highest amount of protection.

3. **Improved road construction and maintenance** – The benefit of this recommendation is reduced sediment run off from roads or road embankments. Roads are often a major source of sediment to ditches and streams, so proper construction and maintenance is an important part of good operation management and would benefit water quality.
4. **Slowing the rate of overland water flow** – Slowing overland water flow may occur as a result of many of the best management practices implemented to accomplish other goals in an agricultural producer's operation. Any improvement to soil infiltration or increased vegetation on a property would slow down the rate of run-off reducing the ability to carry soil and contaminants. Allowing water to soak into the ground and recharge the groundwater system reduces the amount of erosion of streambanks from high flows.
5. **Improved fertilizer and pesticide use and storage** – The LAC is promoting an improved awareness of proper storage and application of agricultural chemicals and nutrients. Avoiding an opportunity for these compounds to be carried into surface water either by washing off a crop or transport attached to soil particles will reduce toxics and nutrient input. Best Management Practices may be employed to determine appropriate application rates for nutrients and other standards for constructing proper storage facilities.

An additional method that helps to reduce sheet and rill erosion and reduce transport of sediment and other contaminants to surface water is contour farming. This method is highly effective, but may have limited application in this Management Area. For additional recommended practices, see Appendix C.

Small Acreage Farms

The outreach focus for small acreage landowners will concentrate on nurseries and livestock owners. The behavior changes that are desired from small acreage nursery growers are the same as those from the large acreage nursery growers, but also include **improved water conservation practices and awareness of water rights**.

There is a different focus for the outreach efforts directed at the small acreage livestock owners. For this group, the LAC wants to emphasize the following six objectives:

1. **Improved manure management** – Storage and disposal of animal waste may be a serious issue for landowners with limited land on which to spread manure as a soil amendment and fertilizer. The LAC encourages the use of environmentally friendly, practical options to be presented to landowners in an attempt to help them solve these problems.
2. **Increased riparian cover** – Benefits from this change include improved streambank stability, increased shade for streams and other waterbodies, improved filtration of soil and other contaminants in overland water flow and increased opportunity for water infiltration into the soil.
3. **Improved pasture management** – This recommendation includes proper grazing practices and improving or maintaining the health and vigor of pasture plant communities. Benefits of this recommendation are numerous, including reduced soil erosion, improved soil condition, increased forage production and improved animal health.
4. **Installation of off-stream livestock watering troughs** – Benefits of this practice include cleaner water for livestock consumption, reduced input of animal waste to streams, and protection of streambanks and riparian vegetation.
5. **Installation of sacrifice areas** – This practice provides an area for animals to spend the winter, protecting pastures from damage during the rainy season. Removing animals from pastures in the winter reduces compaction of the soils when they are wet and protects the health of pasture grasses. These benefits translate to reduced soil erosion and runoff of sediment-laden water.
6. **Appropriate stocking rates** – Appropriate animal numbers per acre is beneficial for animal health as well as improved forage production thus reducing the cost of animal feed. In cases

where too many animals are kept on too few acres, animal waste storage and disposal can become a “mountainous” problem. The LAC recommends that small acreage landowners carefully consider the capacity of their property for sustaining healthy livestock conditions before animals are brought onto the land.

Outreach Tools

The LAC identified several categories of outreach tools that they would like to have employed in the implementation phase of this agricultural plan. The LMA will coordinate with their conservation partners to use as many of these tools as possible to deliver the key messages and promote the implementation of BMPs on agricultural land. Details of outreach tools are found in Appendix B.

Evaluation of Outreach

Evaluation and adjustment is crucial to good outreach. The LAC has recommended the following types of assessment be used by the LMA to determine which outreach tools are effective and make adjustments:

- Develop a survey to be used during workshops to determine effectiveness of the presentation,
- Track attendance at outreach events.

Determine if stream stewardship is increasing in the rural community by tracking the following:

- Requests for assistance,
- Number of voluntary conservation plans developed,
- Implementation of projects and management changes,
- Number of complaints.

Outreach also depends on available funding to provide staff and materials needed to implement an effective outreach program. The LMA will work with conservation partners including ODA, USDA NRCS, neighboring SWCDs, Oregon State University (OSU) Extension Service, watershed councils, etc. to seek grants and share resources to implement the Area Plan.

3.3.2 Conservation Planning and Conservation Activities

Effective water quality management depends on activities and structural measures that are the most effective, practical means of controlling and preventing pollution from agricultural activities. Appropriate management activities for individual farms may vary with the specific cropping, topographical, environmental, and economic conditions at a given site. Due to these variables, it is difficult to recommend any specific, uniform set of management activities in this document to improve agricultural water quality.

Management activities and land management changes are most effective when selected and installed as parts of a comprehensive resource management plan based on natural resource inventories and assessment of management activities.

A detailed list of specific measures that can be used to address agricultural pollution are contained in other documents such as the NRCS Field Office Technical Guide, available for reference at the local NRCS office. Landowners and operators have flexibility in choosing management approaches to address water quality issues on their lands.

Voluntary conservation plans describe the management systems and schedule of conservation activities that the landowner will use to conserve soil, water, and related plant and animal resources on all or part of

a farm unit. Landowners, operators, consultants, or technicians available through a SWCD or the NRCS may develop voluntary conservation plans. A conservation plan can be used to outline specific measures necessary to address the “Prevention and Control Measures” outlined in this Area Plan.

Conservation activities should:

- Identify priorities for management activities, including reasonable timelines.
- Control pollution as close to the source as possible.
- Improve irrigation water use and conveyance efficiency to reduce the potential of polluted return flows.
- Show reduction in potential sources of pollution through scientifically valid monitoring and periodic surveys of stream reaches and associated lands.
- Be flexible to adjust management based on feedback, or monitoring and changing environmental and economic conditions.

3.3.3 Financial and Technical Assistance

Landowners who want more information on any of the practices mentioned in Appendix A, or who are looking for other ideas for water quality improvement and conservation on their lands, may contact several agencies and organizations that provide technical assistance, including the East Multnomah SWCD, the West Multnomah SWCD, the Clackamas County SWCD, the USDA NRCS, and the OSU Extension Service. A list of contact information may be found in Appendix A. Also, please consult Appendix D for a list of publications describing water quality improvement practices for agricultural landowners.

Financial assistance is available to individual landowners for implementing practices necessary to be in compliance with the Lower Willamette Area Plan. Appendix E has a list of opportunities available at the time of Area Plan approval. This is not a comprehensive list. The reader is cautioned to inquire about the programs prior to implementing practices if interested in obtaining financial assistance, as many of the programs are not retroactive.

3.3.4 Monitoring and Evaluation of Area Plan Progress

ODA, the LMA, and the LAC will evaluate and document the effectiveness of the Area Plan by assessing improvement of land conditions in the focus area during each biennial review. Comparing baseline and post-implementation land conditions (along with available water quality data) will allow these partners to determine whether the land condition measures have improved. These partners and other stakeholders will also be able to evaluate progress in implementing the Area Plan more readily than from reports of efforts scattered throughout a Management Area.

ODA anticipates that the focus area process will help answer several questions about the effectiveness of the Oregon Agricultural Water Quality Program, including:

- How much can we improve land conditions through focused outreach and voluntary technical assistance in two years?
- If we see significant improvements in land conditions in the focus areas, does this correlate with a significant improvement in water quality parameters?

The LMA participates in water quality monitoring efforts related to the Area Plan, in consultation with ODA, DEQ, watershed councils, OSU Extension, the U.S. Geological Survey, and the U.S. Forest Service. Many of these agencies and partners have also monitored water quality in the past. ODA and the LMA are responsible for monitoring land conditions that influence water quality in agricultural areas.

For each Management Area, ODA currently evaluates other agencies' and organizations' water quality data to answer several questions. Data are reviewed every two years and summarized to the LAC and LMA during the biennial review process. Questions include:

- What water quality and land condition data from agricultural watersheds are available?
- What are the trends in available water quality and land condition data in agricultural watersheds since Area Plan and Area Rule adoption?
- What are the trends in available water quality and land condition data in agricultural watersheds since the last biennial review?

Implementation Activities Assessment

During the biennial review process, ODA, the LMA, and the LAC assess the effectiveness of activities implemented to achieve the Area Plan's goals and objectives. This assessment of implementation includes the following:

- Outreach and education conducted to promote awareness of water quality issues and encourage agricultural land conditions that protect water quality, and the level of participation in these activities.
- Voluntary conservation projects installed by agricultural landowners and managers in cooperation with the LMA and other agencies and organizations.
- Number of complaint investigations, the result of each complaint investigation, and corrections of violations.

For a description of monitoring and evaluation activities, see Chapter 4 Section 4.2.

Chapter 4: Implementation, Monitoring, and Adaptive Management

4.1 Implementation and Accomplishments

The Lower Willamette Agricultural Management Area contains three SWCDs implementing conservation practices and engaging with landowners. These SWCDs include the East Multnomah, Clackamas, and West Multnomah SWCD. Below is a summary of what each SWCD accomplished in the management area since the last biennial review in 2011.

East Multnomah SWCD

Goal	Progress
1. Control nutrients from manure pile leachate, from overland runoff, and by using appropriate fertilizer rates	Our technical assistance to landowners that have livestock always includes a conversation about proper manure storage and the importance of keeping runoff from carrying manure leachate into ditches and surface water. Implementation in the Lower Willamette to address this goal included: • 5 landowners installed gutters and downspouts to direct clean roof water away from animal areas and manure piles • 3 landowners installed manure storage sheds • 2 landowners installed fencing along 195 feet of riparian area to restrict livestock access
2. Prevent conditions already prohibited under ORS 468B.025 and .050	All of our outreach includes information about nonpoint source pollution and agricultural water quality. Outreach included: • 11 displays with over 200 visitors • A rural living handbook was developed for the Multnomah County area; content from this document was also added to our web page Technical assistance and implementation in the Lower Willamette Plan Area included: • 39 site visits • 13 water quality projects implemented • 4 cost share projects implemented
3. Control erosion so that there is no visible evidence of erosion resulting from agricultural activities contributing, or having the likelihood to contribute, sediment to waters of the state	Outreach about erosion prevention • 1 soil health and erosion prevention workshop with 17 attendees in partnership with CCSWCD • A soil health calendar was developed in partnership with CCSWCD, TSWCD, and NRCS. EMSWCD mailed the calendar to all 93 landowners in the Focus Area • Mailings, emails, and phone calls to promote erosion prevention in our Focus Area of upper Johnson Creek Implementation to address erosion included assistance to: • 2 farmers installed conservation cover, grassed waterways, and filter strips on their farms to reduce erosion • 2 landowners installed heavy use areas to keep livestock off of wet pastures • 195 feet of fencing was installed on 2 properties to keep livestock out of the creek; watering troughs were also installed
4. Promote natural or managed development of riparian vegetation appropriate to site capability that provides riparian function over time	Through our StreamCare program, EMSWCD worked on 33 sites in the Johnson Creek watershed to plant 84 acres of riparian buffers along 4.3 miles of streams. Half of the sites are agricultural properties.

Clackamas SWCD

CSWCD staff made 615 contacts in Upper Johnson Creek since 2011. Site visits totaled 81, not including field-work conducted by our invasive weed management department. CSWCD staff wrote fifteen conservation plans, for a total of 119 acres.

Practices Installed in the Johnson Creek Watershed

Date	HUC	Practice	Practice Code	Acres/number	Funding source
Jan 2012	170900120101	Site Prep	490	3 ac	CreekCare
Jan 2012	170900120101	Tree and Shrub Establishment	612	3 ac	CreekCare
Jan 2012	170900120101	Riparian Forest Buffer	391	3 ac	CreekCare
June 2012	170900120101	Site Prep	490	2 ac	CreekCare
Oct 2012	170900120101	Site Prep	490	0.25 ac	CreekCare
Oct 2012	170900120101	Site Prep	490	1 ac	CreekCare
Oct 2012	170900120101	Site Prep	490	0.5 ac	CreekCare
Feb 2012	170900120101	Tree and Shrub Establishment	612	0.25 ac	CreekCare
Feb 2012	170900120101	Tree and Shrub Establishment	612	1 ac	CreekCare
Feb 2012	170900120101	Tree and Shrub Establishment	612	0.5 ac	CreekCare
Sept 2013	170900120101	Site Prep	490	3 ac	District
Oct 2013	170900120101	Site Prep	490	3 ac	District
Oct 2013	170900120101	Site Prep	490	1.5 ac	District
Oct 2013	170900120101	Site Prep	490	6 ac	District
Oct 2013	170900120101	Site Prep	490	1.5 ac	District
Oct 2013	170900120101	Site Prep	490	4 ac	District
Jan 2014	170900120101	Pipeline	430DD	495 ft	District loan
Feb 2014	170900120101	Tree and Shrub Establishment	612	3 ac	District
Feb 2014	170900120101	Tree and Shrub Establishment	612	3 ac	District
Feb 2014	170900120101	Tree and Shrub Establishment	612	1.5 ac	District
Feb 2014	170900120101	Tree and Shrub Establishment	612	6 ac	District
Feb 2014	170900120101	Tree and Shrub Establishment	612	1.5 ac	District
Feb 2014	170900120101	Tree and Shrub Establishment	612	4 ac	District
April 2014	170900120101	Pipeline	430DD	8,500 ft	District loan
April 2014	170900120101	Drip Irrigation	441	184,800 ft	District loan
April 2014	170900120101	Irrigation Water Mgmt.	449	65 ac	District loan

Pesticide collection events:

October 22, 2011 - 48 participants, 21,166 lbs. of agricultural pesticide waste collected.

June 1, 2013 - 25 participants, 18,627 lbs. of agricultural pesticide waste was collected.

March 8, 2014 - event held in Washington County, 15,822 lbs. of agricultural pesticide waste was collected from Washington and Clackamas counties. Clackamas SWCD paid for disposal of chemicals that Clackamas County producers brought to the event. Outreach for the collection events included newspaper articles, postcards, e-mails, flyers, and partners posts and tweets on social media.

Soil Health Calendar:

2014 - Soil health calendar was developed and distributed to producers at the NW Ag show, at workshops and by direct mail. The calendar had facts and suggestions each month about improving soil health.

Publications:

Pasture Management information sheet - developed for 2014 Clackamas County Fair
Holding Your Ground in Christmas Tree Production June 2011 – Erosion control practices

Newsletters:

Agriculture for Clean Water Newsletter – May 2014 sent to Johnson Creek producers

Workshops offered:

- Reduce Waste and Save Money Maximizing Pesticide Use Efficiency in Nurseries
February 20, 2014 – J Frank Schmidt Nursery 46 attendees
- Unlocking Secrets in the Soil for Perennial Crop – soil health workshop
June 26, 2014 US Forest Service Office, Sandy 17 attendees
- COVERING YOUR ASSETS Hands-on Workshop on Sprayer Calibration and Application
Assessment
Aug 13, 2014 Hans Nelson Nursery 41 attendees
- Streambank Erosion –a Landowner Workshop
September 20, 2014 – Oregon Trail Museum 28 attendees
- Combining Effective IPM and Pesticide Risk Management in Nurseries
Feb 3, 2015 Damascus-Boring Grange - 33 attendees plus 8 agency folks attended.
- Nozzle Technology Workshop
June 18, 2015 GK Machine in Donald 15 attendees

Windsocks Program:

To help agricultural producers apply pesticides without losing chemicals to drift from wind, Clackamas County Soil and Water Conservation District in partnership with Clackamas River Water Providers, is offering calibrated windsocks. These windsocks are calibrated to indicate wind speed from 2 to 12 miles per hour. Windsocks attach directly to the tractor for real time information to make quick, more accurate spraying decisions in the field for reducing drift.

West Multnomah SWCD

- 850 landowners contacted
- 4 workshops/presentations
- 150 workshop/presentation attendees
- 2 conservation tours
- 25 conservation tour attendees
- 3 display booths
- 175 display booth visitors
- 540 acres in approved conservation plans
- 8 sites monitored
- 2 presentations to partners
- 4,000 newsletters distributed
- 15 newspaper articles
- 56 landowners provided with technical assistance
- 60 onsite evaluations/site visits
- 1 fund application submitted for landowner projects

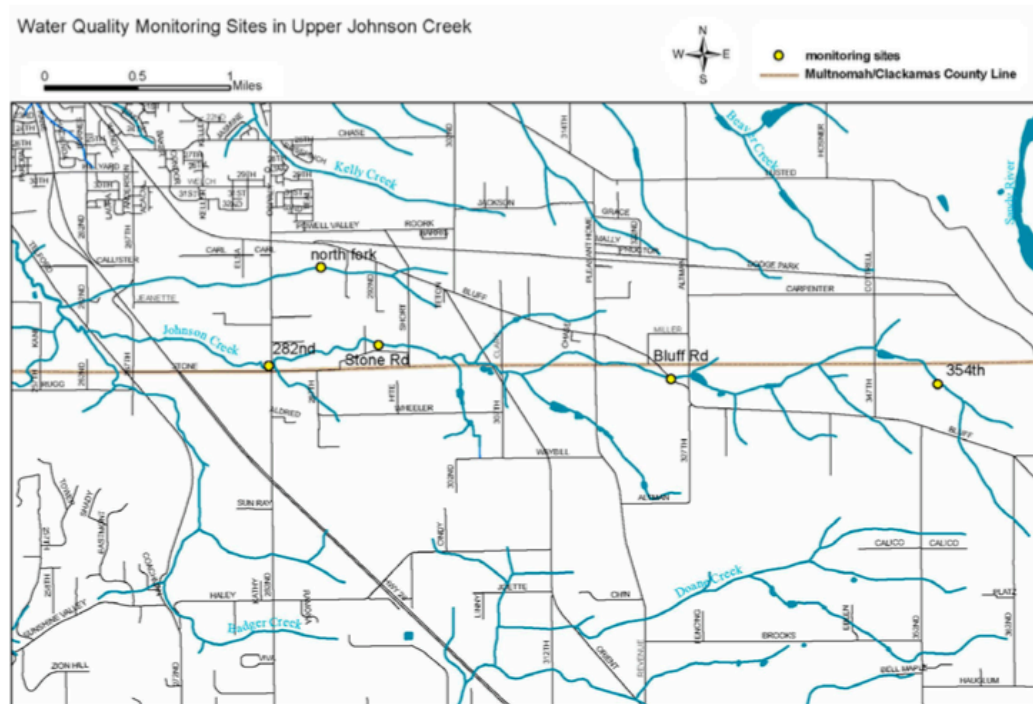
- 12 water quality projects implemented
- 410 acres implemented water quality projects
- 9 conservation plans approved
- 8 student events/classes
- 155 student at events/classes

4.2 Water Quality Monitoring—Status and Trends

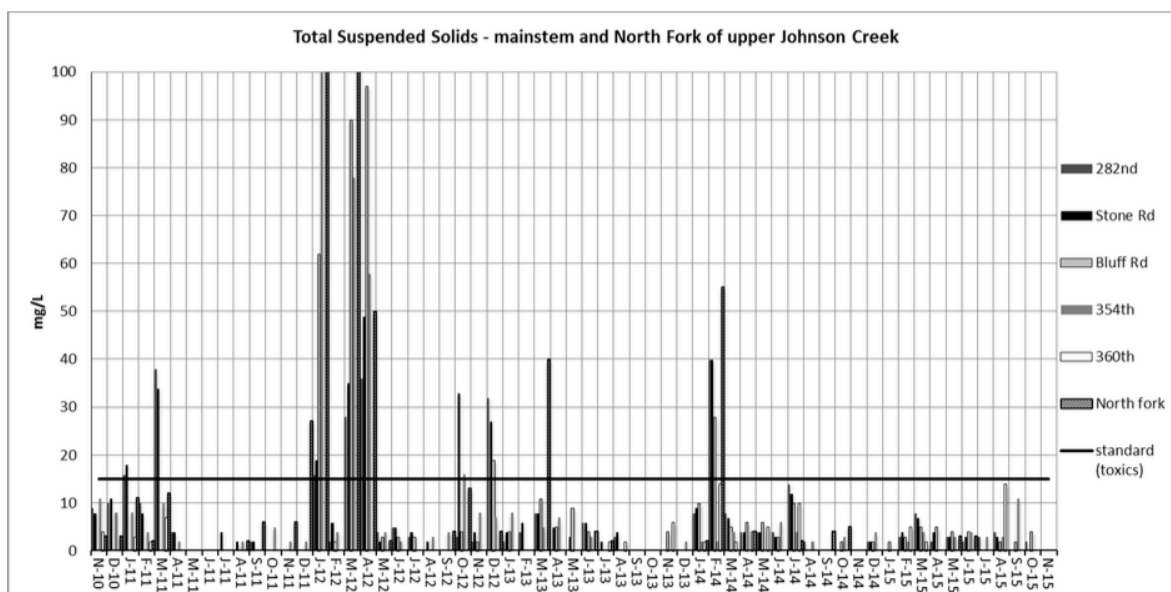
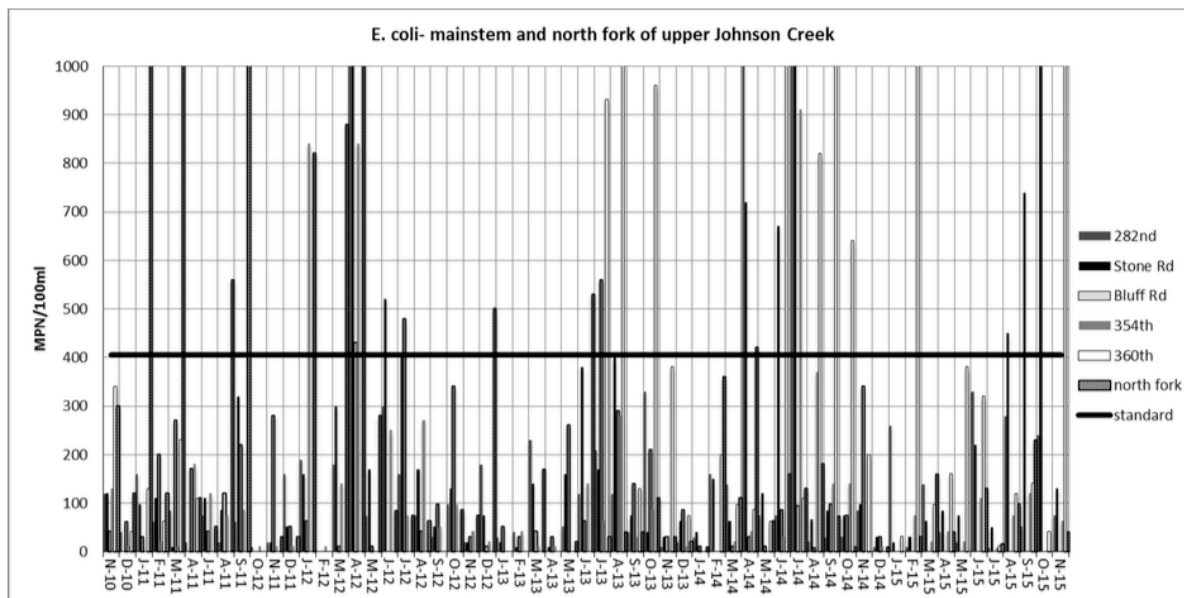
East Multnomah Soil and Water Conservation District

Summary of Water Quality Data from upper Johnson Creek, 2011-2015

East Multnomah SWCD began collecting water samples after the Lower Willamette Agricultural Water Quality Local Advisory Committee identified a need for baseline data. We collect samples once per month at 6 locations shown on the map below.

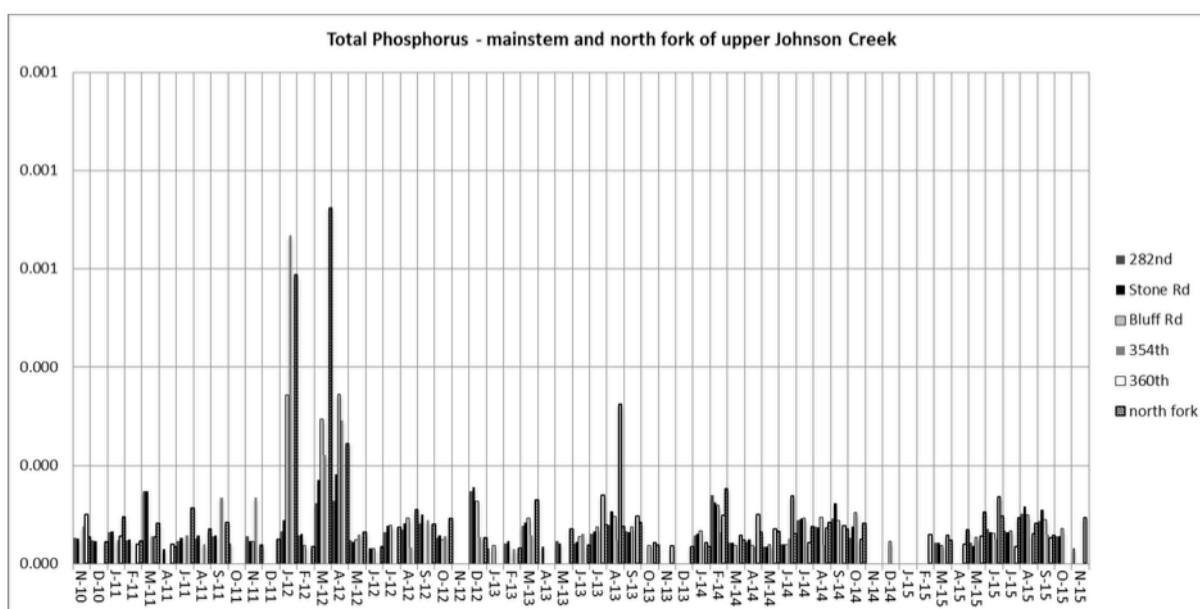
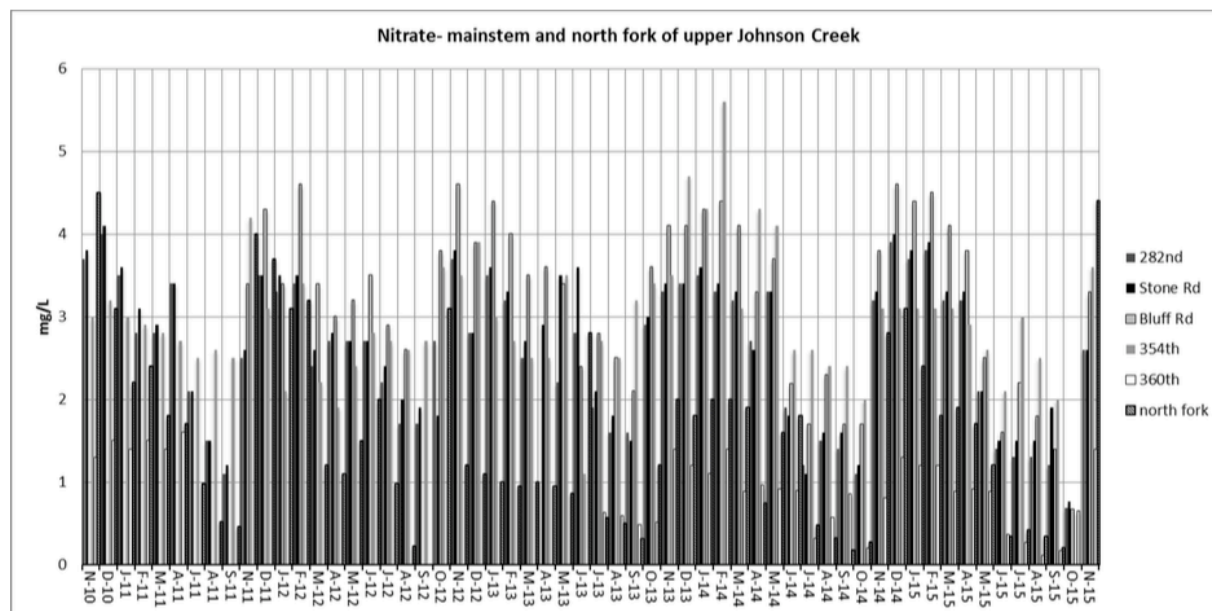


A laboratory determines the levels of bacteria (*E. coli*), suspended sediment, Phosphorous, and Nitrate. The following graphs show sampling results since 2011.



The Oregon Department of Environmental Quality assigned total suspended sediment as a surrogate for toxics, legacy pesticides in this case. The standard of 15 mg/L is shown on the graph. Generally, Johnson Creek exceeds this standard after large rain events, but the data is not consistent enough to allow us to identify the specific amount of rainfall that triggers the exceedance.

Johnson Creek is not listed as having water quality issues due to high levels of Nitrate or Phosphorous so the Oregon Department of Environmental Quality has not set a standard for these parameters.



The Johnson Creek Inter-jurisdictional Committee partners to monitor summer water temperatures throughout the Johnson Creek Watershed. The water quality standard is for the 7-day mean to be below 18 degrees Celsius. In general, upper Johnson Creek comes close to exceeding or exceeds the standard during July, August, and September.

West Multnomah Soil and Water Conservation District

Introduction: Since 2011, West Multnomah Soil & Water Conservation District (WMSWCD) water quality monitoring efforts have been focused on perennial streams in the rural part of western Multnomah County that flow directly into the Multnomah Channel. This area was chosen due to the lack of preceding monitoring data as well as the presence of WMSWCD and Portland Metro restoration activities in these watersheds. For 2013, six monitoring stations were set up on two streams (McCarthy and Crabapple). Additional probes were deployed on Miller Creek and the middle reach of McCarthy Creek but were lost during the monitoring season.

While most of McCarthy Creek is listed as Essential Salmonid Habitat by the Oregon Department of Fish and Wildlife, none of these streams are listed on the Oregon Department of Environmental Quality (DEQ) 303(d) list. However, DEQ lists them all as "salmon and trout rearing and migration habitat" while McCarthy is additionally listed for spawning habitat for salmon and steelhead (DEQ, 2003). Thus they are subject to the following water quality standard: **the seven-day average daily maximum (7dAM) should not exceed 18°C (64.4° F)**. DEQ uses 7dAM temperature criteria for tracking and reporting *continuous temperature monitoring* in streams – which is the approach WMSWCD employs.

The criteria was established because temperatures above 18°C reduce the beneficial uses of salmonid spawning and rearing, as listed in the Oregon Administrative Rules (OAR 340-41-442). The temperature standard is 12.8°C (55°F) in periods of time when salmonid spawning occurs (October to May). Most streams in western Oregon meet the spawning standard. The temperature criterion for "salmon rearing and migration" is the largest concern due to the presence of inline ponds and alterations to the riparian zones in many county streams, which influence summer in-stream temperatures.

McCarthy Creek – Data collected by Multnomah County (MCRS, 2010) and WMSWCD (WMSWCD, 2011; WMSWCD, November 2011 & WMSWCD, 2012) have shown that McCarthy Creek has elevated levels of both temperature and sediment with temperature being the greatest concern. Summer temperatures exceeded the 7 day average daily maximum (7dAM) temperature criteria (18° C/64° F) for 45, 52 and 57 days in 2009, 2010, and 2011 respectively. In 2012, two more probes were deployed in the upper watershed to isolate areas that may be contributing to the heating of the creek. In 2013, 3 more probes were deployed (though one was lost) which brought to the total number of probes in McCarthy Creek to six (Appendix figure A4). 2012 data indicated that while temperatures in the upper reaches of the watershed were elevated, most of the warming is occurring in the lower reaches. The additional probes deployed in 2013 in McCarthy Creek were meant to further isolate the areas of greatest temperature increases.

Crabapple Creek – A single probe has been deployed on Crabapple Creek just downstream of Highway 30 and the railroad tracks since 2011 (figure A4). Past data had shown similar temperature fulgurations as McCarthy Creek. As Crabapple Creek watershed is the second most significant in the study area, further monitoring was deemed appropriate. Several spikes in temperature were observed in 2012 and theorized to be human induced (figure A3).

Miller Creek – In order to offset yearly variability a probe has been deployed on Miller Creek (Figure A4) since 2011. Miller Creek was selected due to its proximity (3 miles), equivalent aspect and relatively similar land use to McCarthy. According to past water quality data (WMSWCD, 2011 & BES, 2010) Miller Creek has the least degraded water quality for perennial streams in the West Hills. Since 2011 and 2012 the 7dAM never rose above 18°C. Unfortunately the data for 2013 was lost.



Method: One HOBO® Tidbit® v2 Submersible Temperature Logger was placed at each of the eight sites (six in McCarthy and one each in Miller and Crabapple Creeks) on May 16th, 2013. All probes were recalled between October 22nd and 24th, 2013. One probe on the lower reach of McCarthy and the one in Miller were lost along with the data (see Figure A4). Data was downloaded to Microsoft Excel worksheets and was run through DEQ's HYDROSTATS Simple where the 7 day average daily maximum (7dAM) was calculated.

Results:

Of the six locations where data was collected, four exceeded the rearing 7dAM criteria (18°C) during the summer of 2013 (table 1). While the lowest McCarthy Creek Probe (McL2) exceeded the criteria for an additional 27 days in 2013, 84 in 2013 versus 57 in 2012, the other two probes, "Upper McCarthy" and "Sheltered Nook" went from 3 and four days respectively to 0 days in 2013 (Table 1). The two newest McCarthy Creek probes with data, McF2 and McL1, had exceedances of 16 and 14 days respectively. Crabapple Creek had a relatively similar exceedance rate in 2013 with 57 days over the 7 day maximum average versus 52 in 2012.

Table 1: Summary by location of days in which 7 dAM was greater than 18°C and the highest daily maximum temperature

Gauge Site	Days over Criteria (2013)	Days over Criteria (2012)
Crabapple	58	52
Upper McCarthy (McU)	0	3
Sheltered Nook (McSH)	0	4
McCarthy @ Folkenburg (McF2)	16	NA
McCarthy @ Metro (McL1)	14	NA
McCarthy @ Highway 30 (McL2)	84	57

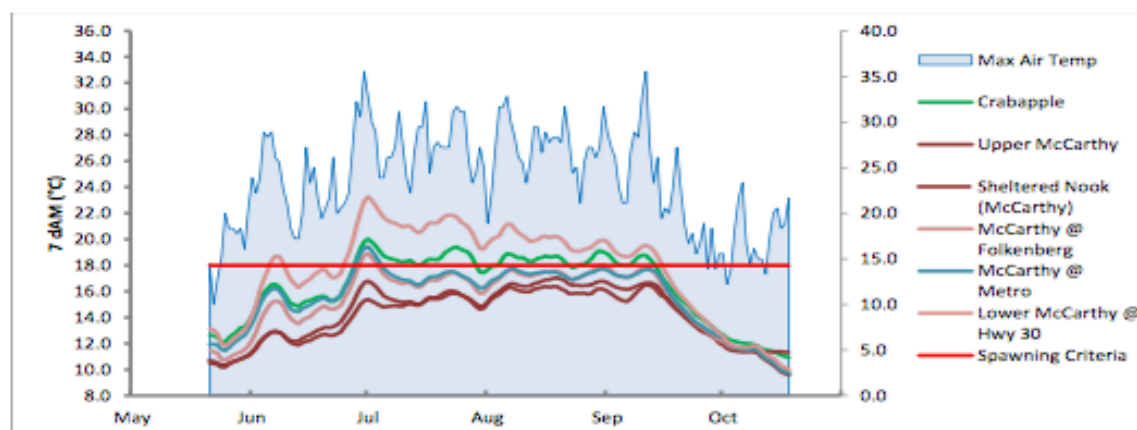


Figure 1: Seven-day average maximum summer temperatures for all sites in 2013

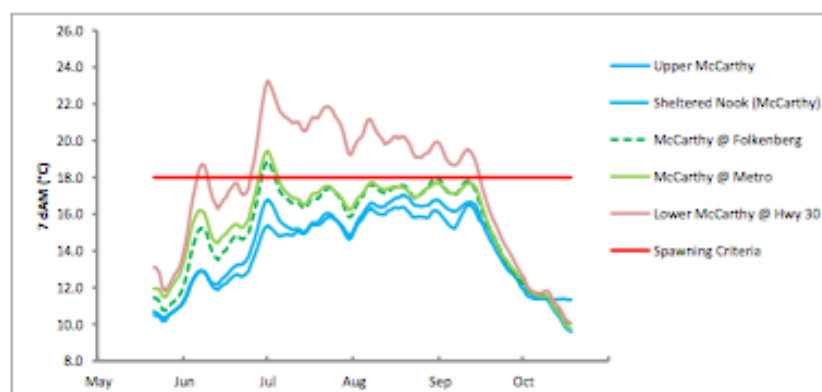


Figure 2: Seven-day average daily maximum summer temperatures for McCarthy Creek sites in 2013

Conclusion: Three years of data in lower McCarthy Creek show a relatively similar pattern (Figure 3). Exceedances of temperature standards for rearing salmonids occur between the early part of July and the end of August. Data from the upper watershed seem to indicate that the cause of heating occurs in the lowest reaches (figure 4).

It is most likely that the majority of the heating in McCarthy Creek is occurring after the stream transitions from a higher gradient, low-meander to a low-gradient, higher-meander stream type. While there has been no official comprehensive analysis of any of the characteristics of McCarthy, observations

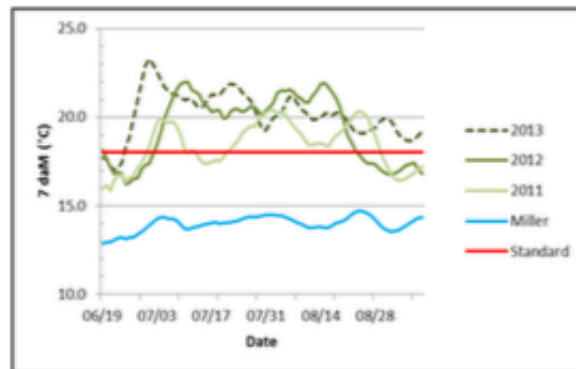


Figure 3: Seven-day average daily maximum summer temperature data for lowest McCarthy Creek temperature probe 2001-2013. (Miller Creek 2011 data shown for reference)



Figure 4: Map of McCarthy Creek showing days above seven-day average daily rearing standard for reaches and tributaries of McCarthy Creek above data collection locations.

by WMSWCD staff support the concept of differing stream types between the upper and lower reaches of McCarthy Creek. The placement of the probe McL1, located on Portland Metro property, was such that it was within the transition zone. For that probe, the number of days over standard was very similar to the next highest probe (McF2) – 14 days and 16 days respectively. The number of days increases significantly once the stream reaches Highway 30 and the lowest probe, 82 days. This indicates that the majoring of heating occurs between those two probes, McL1 and McL2.

The Crabapple Creek watershed is approximately the same size as McCarthy Creek with the majority of the acreage in well managed timber land with adequate riparian cover. However, the middle portion of the basin just upstream of Highway 30 is dominated by a golf course with little to no riparian cover and several ponds. This area is likely

contributing to the elevated water temperatures. Observations in 2012 point to either irrigation withdrawals or pond drainage from the golf course causing major spikes in stream temperature (See appendix figure A3). Observations in Crabapple Creek in 2012 were higher than any other observation on any creek in the study area. However, these spikes in temperature were not observed in 2013. WMSWCD has had little contact with the course owner, so it is unclear what changed. Nevertheless, temperatures in Crabapple Creek continue to be elevated and are similar to those observed on McCarthy Creek.

Monitoring will continue at least through 2014 and likely beyond. Additional probes will also likely be deployed in the Crabapple Creek in a similar fashion to the effort in McCarthy Creek. The intent is to further pinpoint the locations where heating is occurring. In addition, WMSWCD plans to work with Metro to extend water quality monitoring through their site at the bottom of the watershed.

For more information please contact Scott Gall (scott@wmswcd.org).

References:

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Appendix:

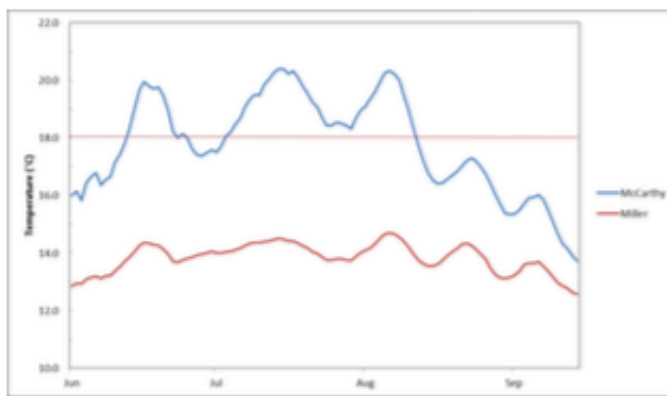


Figure A1: Seven-day average maximum summer temperature data for McCarthy and Miller Creeks gathered by WMSWCD in 2011

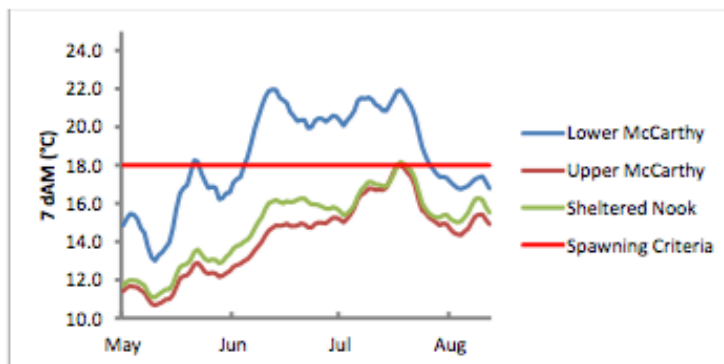


Figure A2: Seven-day average maximum summer temperature data for McCarthy Creeks gathered by WMSWCD in 2012

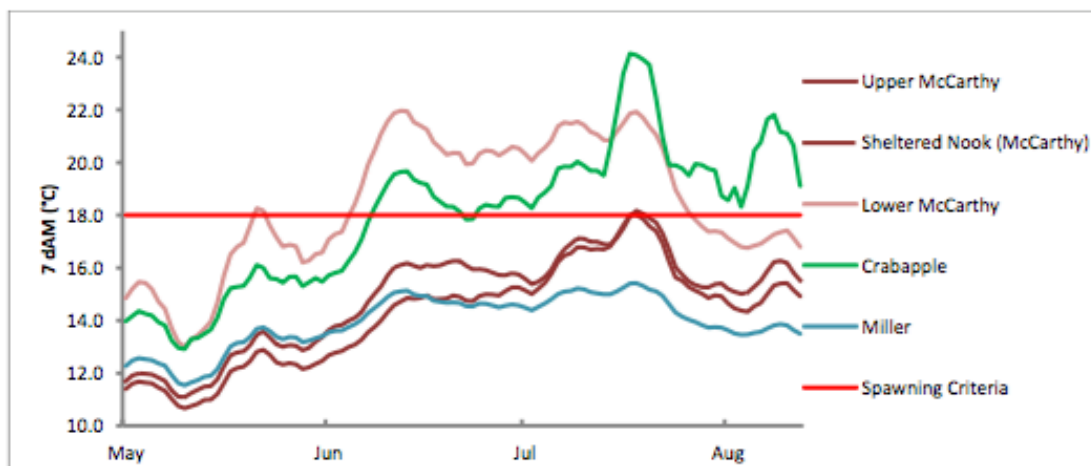
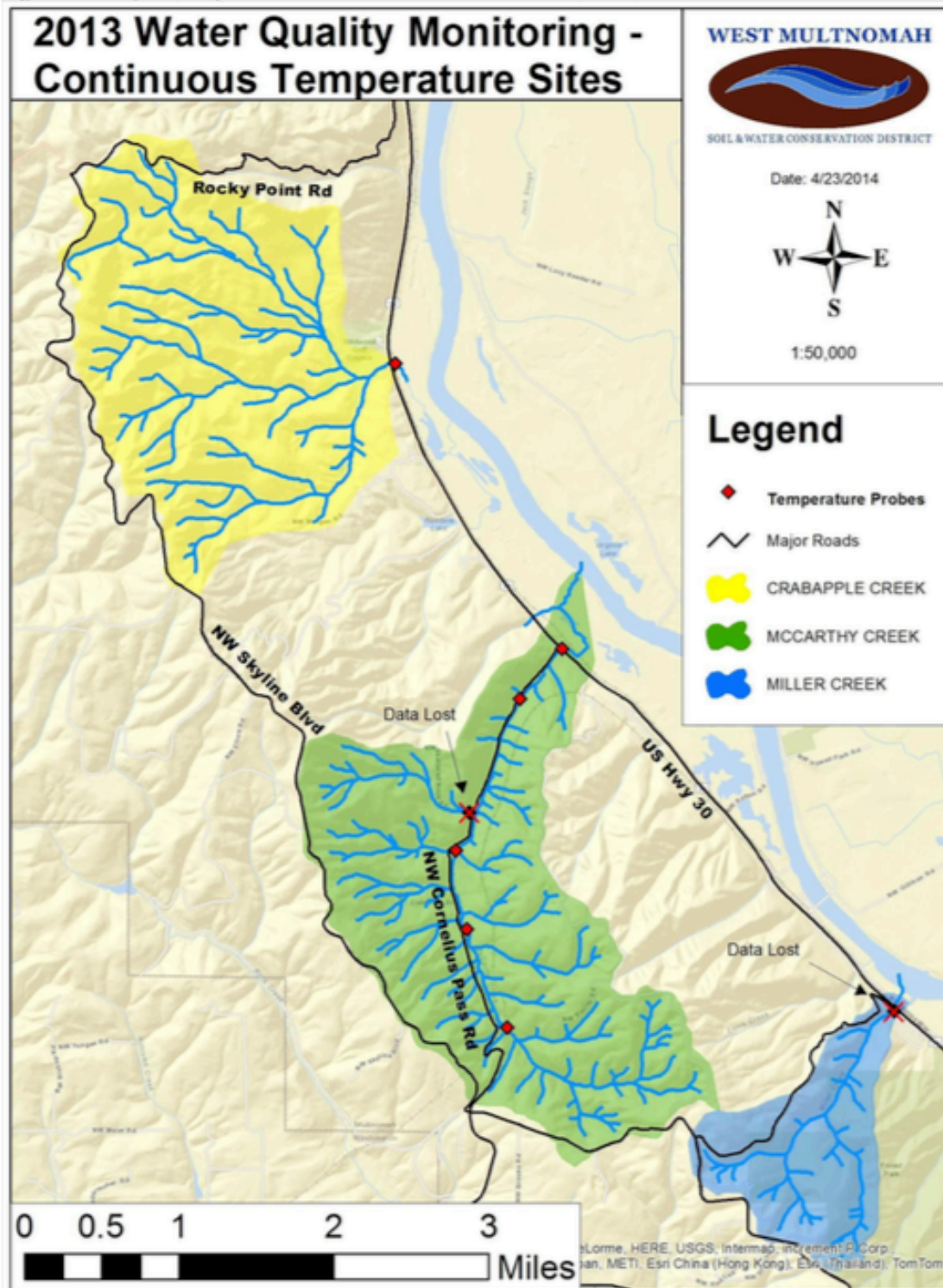


Figure A3: Seven-day average maximum summer temperature data for McCarthy, Crabapple, and Miller Creeks gathered by WMSWCD in 2012

Figure A4: Map of Temperature Probe locations



4.3 Adaptive Management Results from the Johnson Creek Focus Area.

ODA and the LMA will report back to the LAC on the status of land conditions, water quality data (if available) and outreach and technical assistance efforts in the area, at the 2017 biennial review.

- An action plan describing the timeline and objectives in the Focus Area is located in Section 3.2.3. Focus Area results could not be addressed during the biennial review. The 2015 review focused on the organization and formatting of the new Area Plan.

By November 1, 2013, the LMA will complete an assessment in the area that determines the percentage of highly erodible lands in the Focus Area.

- The Highly Erodible Lands (HEL) assessment was completed by the EMSWCD. This data was used to target landowners most critical to preventing sediment from entering into Upper Johnson Creek.

By November 1, 2013, the LMA will have offered technical assistance to all landowners in the Focus Area where agricultural activities appear to be causing erosion and sedimentation on HEL. By the 2015 biennial review, the LMA will report back to the LAC and ODA on the amount of lands where landowners accept voluntary assistance to allow streamside vegetation to establish and develop.

- The EMSWCD has offered technical assistance to all landowners in the Focus Area where agricultural activities appear to be causing erosion and sedimentation. Results from the outreach efforts will be presented to the LAC during the next biennial review.

By June 30, 2015, the LMA will complete a follow-up assessment in the area and evaluate land condition changes over the two-year period.

- The EMSWCD has completed the HEL post-implementation assessment. Unfortunately, landowner participation in the Focus Area was not good and projects were difficult to implement.

By the 2015 biennial review, the LMA in coordination with ODA will identify a future Focus Area.

- The EMSWCD is moving their Focus Area to Beaver Creek located in the Sandy Sub-Basin Agricultural Management Area because ODA is beginning the SIA process in Upper Johnson Creek. It is critical to ODA that landowners understand that the EMSWCD is available for help, but they are not associated with the regulatory SIA process.

4.4 Strategic Implementation Area (SIA)

The results from the SIA will be added into this section after the initial compliance evaluation and site visits are completed during the summer of 2016.

4.5 Biennial Reviews and Adaptive Management

The 2015 biennial review of the Lower Willamette Agricultural Water Quality Management Area Plan was completed on November 10, 2015, at the Multnomah County East building in Gresham, OR from 6 to 9pm. Local Advisory Committee members in attendance include:

- Roy Iwai
- Martha Mitchell
- Gordy Webster
- Kathy Taggart
- Chris Foster

Representatives from ODA (Ryan Beyer, Mike Powers), EMSWCD (Julie DiLeone), and DEQ (Doug Drake) were also in attendance. ODA staff provided updates to the water quality program, changes to the Area Plan, and reviewed past compliance cases. The advisory committee also provided recommendations for modifications and discussed impediments to achieving water quality on agricultural land. These include:

- Create a more user-friendly addition of the Area Plan specifically for the agricultural community (“Growers Edition”).
- New science is needed to better understand agricultural influences to channel conditions.
- Large commercial farms need to be the leaders in conservation since they are typically more visible in the community. Large farms need to lead “farmer-to-farmer” outreach as opposed to government agency contacts and actions.

APPENDIX A: Technical Assistance Contact Information

Sources of information and technical assistance are available from many sources. This list is a good representation of local assistance available, but is not all-inclusive.

Soil and Water Conservation Districts (SWCDs)

Prepares management plans and helps implement them by coordinating with other technical experts in natural resources.

East Multnomah SWCD:	503-222-7645
West Multnomah SWCD:	503-238-4775
Clackamas County SWCD:	503-655-3144

USDA – Natural Resources Conservation Service (NRCS)

Provides information on soil types, soils mapping, and interpretation. Administers and provides assistance in developing plans for CRP, EQIP, WRP, and other cost share programs. Makes technical determinations on wetlands and highly erodible land.

Multnomah County:	503-326-3941
Clackamas County:	503-655-3144

Oregon State University Extension Service (OSU)

Offers educational programs, seminars, classes, tours, and publications to guide landowners in managing their resources.

Clackamas County:	503-655-8631
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Oregon Department of Agriculture (ODA)

Oversees the AgWQM program, issues permits and helps producers comply with confined animal feeding water management programs, provides support to Soil and Water Conservation Districts.

Natural Resources Division (Salem):	503-986-4700
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Department of Environmental Quality (DEQ)

Responsible for protecting and enhancing Oregon's water and air quality, cleaning up spills and releases of hazardous materials, and managing the proper disposal of solid and hazardous wastes. Maintains a list of water quality limited streams, sets total maximum daily load (TMDL) allocations.

Portland:	800-452-4011
Northwest Region Office, Portland:	503-229-5696

USDA – Farm Service Agency (FSA)

Maintains agricultural program records and administers various cost share programs. Their offices also provide up-to-date aerial photography of farm and forestland.

Multnomah County:	503-655-3144
Clackamas County:	503-655-3144

Division of State Lands (DSL)

Administers state removal/fill law and provides technical assistance.

Salem:	503-378-3805 x221
Multnomah County:	503-378-3805 x320
Clackamas County:	503-378-3805 x255

Oregon Water Resources Department (WRD)

Provides technical and educational assistance and water rights permits and information.

Salem:	503-986-0900
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Oregon Department of Fish and Wildlife (ODFW)

Works with landowners to balance protection of fish and wildlife with economic, social, and recreational needs. Advises on habitat protection. Offers technical and educational assistance for habitat and restoration projects. Provides plan review for special property tax assessment for wildlife habitat projects.

North Willamette Watershed District: 503-947-6000 or 800-720-6339

Oregon Department of Forestry (ODF)

Technical assistance with state and federal cost sharing, Oregon property tax programs, Forest Resource Trust, forestry practices, and forest management plans.

Salem: 503-945-7200

Oregon Watershed Councils

Johnson Creek Watershed Council	503-652-7477
Columbia Slough Watershed Council	503-281-1132
Tryon Creek Watershed Council	503-636-4398 x121

APPENDIX B: Outreach Tools

Possible media types that the LAC considered effective include:

- Newspaper
- Public radio
- Local newsletters from watershed councils, OSU Extension Service, and Farm Bureau
- Trade journals (i.e. Digger)
- Direct mailings
- Public access television

Some local events that may provide opportunities for landowner interaction include:

- County fairs
- Horse symposium

Other outlets for distribution of information include agri-businesses such as:

- Feed stores
- Agricultural vendors- wholesale and retail
- Farm implement dealers
- Large animal veterinarians
- Retail garden centers
- Horse stables

Agricultural groups that may hold meetings or events that would be good conduits for presenting information include:

- Oregon Equestrian Trails
- School students/associations (i.e. 4-H, Future Farmers of America)
- Oregon Recreation and Parks Association
- Oregon Association of Nurserymen
- Granges
- Farm Bureau

Activities and techniques that may be used to educate landowners and promote BMP implementation may include:

- Demonstration projects
- Example photos before and after conservation practices have been implemented
- Workshops with a varied topic that would include information on the Lower Willamette Area Plan and Rules (i.e. weed control, wells/septic systems, livestock health)
- Marketing techniques to draw landowners to workshops such as contests, drawings, children's activities
- Tax incentive or other assistance programs (i.e. conservation easements, cost share)
- Focus groups to target the best vehicle to deliver pertinent information
- Conservation curriculum development or promotion to schools
- Tours to environmentally progressive operations or demonstration sites
- Promotion of BMPs by agricultural producers to other producers

APPENDIX C: Best Management Practices

Riparian Areas and Streams

Practice	Resource Concerns Addressed	Potential Benefits of Practice to Producer	Potential Costs of Practice to Producer
a. Rotational grazing in riparian area; timed when growth is palatable to animals and when riparian areas are not saturated.	Helps establish desirable riparian vegetation, promotes streambank integrity; helps filter nutrients and sediment from runoff; promotes channel narrowing.	May lessen streambank erosion and loss of pastures; allows limited use of riparian area for grazing when grass is most nutritious, controls weeds and improves wildlife habitat.	May require time and financial investment for livestock control and off-stream watering facilities.
b. Livestock exclusion from riparian area Establishing off-stream watering facilities.	Helps promote desirable riparian vegetation; promotes streambank integrity; helps filter nutrients and sediment from runoff; may help narrow channel and reduce erosion in channel.	May lessen streambank erosion and loss of pastures; less time involved in managing livestock grazing in riparian area, improves wildlife habitat.	May require higher weed control costs than seasonal riparian grazing. May require financial investment for livestock control and off-stream watering facilities.
c. Planting perennial vegetation in riparian area.	Helps establish perennial riparian vegetation rapidly; promotes streambank integrity; may help narrow channel and reduce erosion in channel.	May lessen streambank erosion and loss of pastures. If livestock are excluded from riparian area, are may be eligible for federal cost-share programs. Some alternative perennial agricultural products may be harvested from riparian areas.	Costs of vegetation and weed control. May require financial investment for riparian fencing and off-stream watering facilities while vegetation establishes.

Nutrient and Manure Management

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
a. Apply nutrients according to soil test results.	Helps prevent nutrient runoff into waters of the state.	May help reduce fertilizer costs; ensures that plants receive needed nutrients for growth; makes plants more competitive against weeds.	Costs of soil testing; time associated with taking soil samples.
b. Establish sacrifice areas. Sacrifice areas are small pastures where animals are confined during the winter to protect other pastures from trampling and compaction. Limit livestock access to pastures when soils are saturated; cover sacrifice areas with rock, hog fuel, and/or geotextile.	Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.	Protects pastures from compaction during the winter, improving growth. May improve animal health by covering sacrifice areas with material so animals are not wading in mud.	Cost of fencing sacrifice area; cost of feeding hay during the winter; cost of materials for protecting sacrifice area.
c. Site barns and sacrifice areas away	Helps prevent sediment, nutrient, and bacteria	Helps prevent flooding in barns and sacrifice areas.	Need either off-stream watering facility or other

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
from streams.	runoff into waters of the state. Helps protect streamside areas.		source of water for livestock.
d. Prevent silage leaching and/or store and manage leachate from silage and other vegetative materials.	Helps prevent nutrient runoff into waters of the state.	Preventing leaching maintains higher nutrient content of ensiled feed material.	May require cost of facility development and purchase of moisture-absorbing materials.
e. Installing gutters and downspouts in areas with high livestock use.	Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.	May improve animal health by lessening mud during the winter, so animals are not wading in mud.	Cost of installation and maintenance of gutters and downspouts.
f. Cover manure storage piles.	Helps prevent sediment, nutrient, and bacteria runoff into waters of the state.	Do not lose the nutrients in manure that can be spread on pastures or crops.	Cost of installation and maintenance of cover.

Erosion and Sediment Control

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
a. Grazing management: graze pasture plants to appropriate heights, rotate animals between several pastures; provide access to water in each pasture.	Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.	May improve pasture production; easy access to water may increase livestock production as well. May improve composition of pasture plants and help prevent weed problems.	Cost of installing fencing, watering facilities for rotational grazing system; time involved in moving animals through pastures.
b. Farm road construction: construct fords appropriately, install water bars to divert runoff to roadside ditches and catch-basins	Helps prevent sediment runoff to waters of the state.	May help prevent water damage on farm roads.	Cost of installation and maintenance.
c. Plant appropriate vegetation along drainage ditches; seed ditches following construction.	Helps prevent sediment runoff into waters of the state.	May help prevent ditch bank erosion and slumping.	Costs of establishing vegetation.
d. Plant cover crops on erosion-sensitive areas.	Helps prevent sediment runoff into waters of the state; helps filter nutrients and slow runoff.	May reduce weed problems; prevents loss of applied nutrients.	Costs of establishing cover crops; cover crops may compromise primary crop.
e. Irrigate pasture or crops according to soil moisture and plant water needs.	Helps prevent irrigation return flow and associated nutrients and sediment to waters of the state.	May reduce costs of irrigation; may help crop or pasture production.	Installation/ maintenance cost. Monitoring time.
f. Install/maintain diversions or French	Helps prevent nutrient runoff into waters of the	Decreases muddiness and shortens saturation period in	Cost of installation.

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
drains to prevent unwanted drainage into barnyards and sacrifice areas.	state.	protected areas.	
g. Implement contour farming.	Farming sloping land in such a way that preparing land, planting, and cultivating are done on the contour.	Reduced runoff and erosion. Increased infiltration to soil profile. Reduced sediment transport.	Cost of a new cropping system.

APPENDIX D: Water Quality References for Agricultural Landowners

Oregon Small Acreage Fact Sheets—including publications on erosion, buffers, pasture management, stock water, fencing, mud and manure management, nutrients, irrigation, forestry, wildlife, ponds, wells, septic, and permits. Available from your local SWCD or online at <http://www.oacd.org/fs00safs.htm>

Nursery

Water Quality Handbook for Nurseries Oklahoma State University, E-951. Available online at http://www.okstate.edu/OSU_Ag/agedcm4h/pearl/e951/

Oregon State University Extension and Experiment Station Communications publish the following documents. These and many other publications are available online at <http://eesc.orst.edu/agcomwebfile/edmat/default.html> or from your county extension office.

Nutrients, cover crops, and irrigation

EM 8646 Nutrient Management for Dairy Production: Assessing Your Manure Management for Water Quality Risk

EM 8649 Manure Management in Small Farm Livestock Operations: Protecting Surface and Groundwater (html)

FS 281 Manure Management Practices to Reduce Water Pollution (html)

EM 8825 Composting: An Alternative for Livestock Manure Management and Disposal of Dead Animals

EC 1492 Gardening and Water Quality Protection: Understanding Nitrogen Fertilizers

EC 1493 Gardening and Water Quality Protection: Using Nitrogen Fertilizers Wisely

EM 8704 Using Cover Crops in Oregon (pdf)

M 8716 Simple Irrigation Scheduling Using the ‘Look and Feel’ Method (includes soil appearance cards in English and Spanish)

Horses

C 1558 Managing Small-acreage Horse Farms for Green Pastures, Clean Water, and Healthy Horses (Available only online)

Streams

EM 8636 The Water Quality Limited Stream Segments List--What does it mean? (Available only online. Cannot be ordered)

EM 8761 Stream*A*Syst: A Tool To Help You Examine Stream Conditions on Your Property

PNW 552 Taking Care of Streams in Western Washington, Western Oregon, and Coastal Alaska: A Homeowner's Guide to Riparian Areas

Groundwater

EC 1374 Rural Domestic Water Supply (html)

EM 8559 How Soil Properties Affect Groundwater Vulnerability to Pesticide Contamination

EM 8560 Site Assessment for Groundwater Vulnerability to Pesticide Contamination

EM 8561 Understanding Pesticide Persistence and Mobility for Groundwater and Surface Water Protection

EM 8596 Assessing the Risk of Groundwater Contamination from Livestock Manure Management Worksheet

EM 8597 Reducing the Risk of Groundwater Contamination from Livestock Manure Management

APPENDIX E: Funding Sources

Conservation Reserve Enhancement Program (CREP)

This program, administered by Farm Service Agency (FSA), focuses on anadromous fish bearing streams and provides cost share money for the implementation of riparian fencing and planting on a specified buffer. A rental payment on the riparian buffer, based on the USDA soil rental rate, is dispersed annually for 10-15 years.

Contact the Washington County SWCD or NRCS for information.

Conservation Reserve Program (CRP)

This program, administered by the USDA NRCS and Farm Service Agency, includes streams whether or not they are habitat for anadromous fish. This program also provides cost share to landowners willing to establish an appropriate riparian buffer. A rental payment is also dispersed annually over a 10-15 year period.

Contact the NRCS for information.

Environmental Quality Incentives Program (EQIP)

This program, administered by the USDA NRCS, provides assistance to farmers and ranchers in complying with federal, state, and tribal environmental laws, and encourages environmental enhancement. Through this program a conservation plan that includes structural, vegetative, and land management practices on eligible land is implemented. Cost-share payments may be made to implement eligible structural or vegetative practices. Five- to ten-year contracts are made with eligible producers.

Contact the NRCS for information.

Wildlife Habitat Incentives Program (WHIP)

This program, administered by the USDA NRCS, provides financial incentives to develop habitat for fish and wildlife on private lands.

Contact the Natural Resources Conservation Service for information.

Oregon Watershed Enhancement Board Small Grant Program

The local SWCD and the Watershed Councils administer this program jointly. Funds are available for specific practices. Landowners may be responsible for a certain percentage of the total cost.

Contact Clackamas County SWCD, East Multnomah SWCD, or West Multnomah SWCD for details.

Oregon Riparian Tax Incentive Program

This program, administered by the Oregon Department of Fish and Wildlife (ODFW), offers a property tax incentive to property owners for improving or maintaining qualifying riparian lands. Under this program, property owners receive complete property tax exemption for their riparian property. This can include land up to 100 feet from a stream. For riparian land to qualify for this program, it must be

planned and zoned as forest or agricultural lands (including rangeland), or must have met these criteria as of July 1, 1997. If a riparian area is already in good shape it may also qualify for the program.

Contact your local ODFW office for more information or visit their website (<http://www.dfw.state.or.us/ODFWhtml/InfoCntrHbt.html>).

Oregon Wildlife Habitat Conservation and Management Program

This program, administered by ODFW, is specifically for property zoned exclusive farm use, mixed farm and forest use, or land designated as forestland that are managed for wildlife habitat. The landowner who qualifies and successfully completes the required steps will receive a tax benefit.

Contact your local ODFW office for more information or visit their website (<http://www.dfw.state.or.us/ODFWhtml/InfoCntrHbt.html>).

Nonpoint Source Pollution Control Facilities Tax Credit

This program, administered by the Oregon DEQ, is intended to cover expenditures for “on-the-ground” management practices and improvements. Possible eligible practices must be consistent with the implementation of any of a number of state approved plans including the local agricultural water quality Management Area plan and the TMDL implementation plan.

Contact the Portland DEQ office for more information or visit their website (<http://www.deq.state.or.us>).

APPENDIX F: The Conservation Planning Process

The USDA – NRCS has developed, and the Local Management Agency may choose to use the following nine-step process to develop a voluntary plan.

1. Identify Problems—Identify resource problems, opportunities, and concerns in the planning area.
2. Determine Objectives—Identify, agree on, and document the client's objectives.
3. Inventory Resources—Inventory the natural resources and their condition, and the economic and social considerations. This includes on-site and related off-site conditions.
4. Analyze Resource Data—Analyze the resource information gathered in planning step 3 to clearly define the natural resource conditions, along with economic and social issues. This includes problems and opportunities.
5. Formulate Alternatives—Formulate alternatives that will achieve the client's objectives, solve natural resource problems, and take advantage of opportunities to improve or protect resource conditions.
6. Evaluate Alternatives—Evaluate the alternatives to determine their effects in addressing the client's objectives and the natural resource problems and opportunities. Evaluate the projected effects on social, economic, and ecological issues. Special attention must be given to those ecological values protected by law or Executive Order.
7. Make Decisions—The client selects the alternative(s) and works with the planner to schedule conservation system and practice implementation. The planner prepares the necessary documentation.
8. Implement the Plan—Implement the selected alternative(s). The planner provides encouragement to the client for continued implementation.
9. Evaluate Plan—Evaluate the effectiveness of the plan as it is implemented and make adjustments as needed.

APPENDIX G: Guidelines for a Voluntary Conservation Plan

To comply with the Ag WQMA, a landowner/operator needs to ensure that no violations of the prevention and control measures outlined in the administrative rules OAR 603-095-3740(1) through 603-095-3740(5) occur on their property.

A landowner or operator is NOT required to have a Voluntary Conservation Plan. The LMA does, however, promote the conservation planning process as the best method for landowners to use to improve the health of their resources and ensure that they are addressing all pertinent area rules (seen in the area plan as Prevention and Control Measures).

The plan should address all of the area rules adopted for the Lower Willamette and provide an action strategy for the improvement or maintenance of those resources that are a part of the landowner's management objectives.

Landowners with a Voluntary Conservation Plan that was approved prior to the development of the Lower Willamette area plan are encouraged to review and modify it as necessary to ensure that it is consistent with the area rules.

Format for a Voluntary Conservation Plan:

1. Cover Page

List the landowner's name and address, location of the property described in the plan; the name, address, title and phone number of the person completing the plan; and the date the plan is completed.

2. Table of contents

Landowner objectives

Physical site description

Map

A map or maps at 8" = 1 mile or larger scale showing:

- Legend
- Property boundary
- Soil types
- Field divisions and numbers
- Streams / ponds
- 303(d) listed stream segments highlighted

Field inventory data:

- Soil types
- Acres
- Erosion estimates
- Crops/land use/rotations
- Livestock enterprises
- Forage inventories
- Fertilizer/pesticide information
- Results of analysis and alternative development

Best Management Practices

Provide a narrative that describes how each Prevention and Control Measure is being addressed on the property. List the Conservation Practices that are currently being implemented or will be in the future to address the Prevention and Control Measures. For the plan to be approved, practices must meet the Natural Resources Conservation Service technical guidelines. Include practice specifications (if applicable) and operation and maintenance requirements.

Schedule

Schedule for the implementation of the Conservation Practices outlined in the plan.

Other information

Photos, soil tests, alternatives, or supporting data.

Signature Page (Included)

For additional guidance in developing a Voluntary Conservation Plan, contact the East Multnomah, West Multnomah or Clackamas Soil and Water Conservation District.

APPENDIX H: Full 303(d) and TMDL List

Water Body (Stream/Lake)	River Miles	Segment Length	Parameter
Columbia River	0 to 98	98	pH
Columbia River	35.2 to 98	62.8	Aldrin
Columbia River	35.2 to 98	62.8	Alpha-BNC
Columbia River	35.2 to 98	62.8	Aluminum
Columbia River	35.2 to 98	62.8	Antimony
Columbia River	35.2 to 98	62.8	Antimony
Columbia River	35.2 to 98	62.8	Arsenic
Columbia River	35.2 to 98	62.8	Arsenic
Columbia River	35.2 to 98	62.8	Arsenic
Columbia River	35.2 to 98	62.8	Atrazine
Columbia River	35.2 to 98	62.8	Benzo[a]anthracene
Columbia River	35.2 to 98	62.8	Benzo[g,h,i]perylene
Columbia River	35.2 to 98	62.8	BHC delta
Columbia River	35.2 to 98	62.8	BHC gamma (Lindane)
Columbia River	35.2 to 98	62.8	Cadmium
Columbia River	35.2 to 98	62.8	Cadmium
Columbia River	35.2 to 98	62.8	Chrysene
Columbia River	35.2 to 98	62.8	Copper
Columbia River	35.2 to 98	62.8	Copper
Columbia River	35.2 to 98	62.8	Cyanide
Columbia River	35.2 to 98	62.8	DDD 4,4
Columbia River	35.2 to 98	62.8	DDE 4,4
Columbia River	35.2 to 98	62.8	DDE 4,4
Columbia River	35.2 to 98	62.8	DDT 4,4
Columbia River	35.2 to 98	62.8	Deethylatrazine
Columbia River	35.2 to 98	62.8	Dieldrin
Columbia River	35.2 to 98	62.8	Diethyl phthalate
Columbia River	35.2 to 98	62.8	Dioxin (2,3,7,8-TCDD)
Columbia River	35.2 to 98	62.8	Dioxin (2,3,7,8-TCDD)
Columbia River	35.2 to 98	62.8	Dioxins/Furans
Columbia River	35.2 to 98	62.8	E. Coli
Columbia River	35.2 to 98	62.8	E. Coli
Columbia River	35.2 to 98	62.8	Endrin
Columbia River	35.2 to 98	62.8	Eptam
Columbia River	35.2 to 98	62.8	Fecal Coliform
Columbia River	35.2 to 98	62.8	Iron
Columbia River	35.2 to 98	62.8	Lead
Columbia River	35.2 to 98	62.8	Lead
Columbia River	35.2 to 98	62.8	Mercury
Columbia River	35.2 to 98	62.8	Mercury
Columbia River	35.2 to 98	62.8	Metolachlor
Columbia River	35.2 to 98	62.8	Napropamide
Columbia River	35.2 to 98	62.8	Nickel
Columbia River	35.2 to 98	62.8	pH
Columbia River	35.2 to 98	62.8	Phenol
Columbia River	35.2 to 98	62.8	Polychlorinated Biphenyls (PCBs)
Columbia River	35.2 to 98	62.8	Polynuclear Aromatic Hydrocarbons
Columbia River	35.2 to 98	62.8	Pyrene

Columbia River	35.2 to 98	62.8	Pyrene
Columbia River	35.2 to 98	62.8	Radionuclides
Columbia River	35.2 to 98	62.8	Silver
Columbia River	35.2 to 98	62.8	Silver
Columbia River	35.2 to 98	62.8	Simazine
Columbia River	35.2 to 98	62.8	Total Dissolved Gas
Columbia River	35.2 to 98	62.8	Tributyltin
Columbia River	35.2 to 98	62.8	Zinc
Columbia River	75.5 to 137.1	61.6	Manganese
Columbia River	98 to 142	44	Aldrin
Columbia River	98 to 142	44	Alpha-BNC
Columbia River	98 to 142	44	Aluminum
Columbia River	98 to 142	44	Antimony
Columbia River	98 to 142	44	Antimony
Columbia River	98 to 142	44	Arsenic
Columbia River	98 to 142	44	Arsenic
Columbia River	98 to 142	44	Atrazine
Columbia River	98 to 142	44	Benzo[a]anthracene
Columbia River	98 to 142	44	Benzo[g,h,i]perylene
Columbia River	98 to 142	44	BHC delta
Columbia River	98 to 142	44	BHC gamma (Lindane)
Columbia River	98 to 142	44	Cadmium
Columbia River	98 to 142	44	Cadmium
Columbia River	98 to 142	44	Chrysene
Columbia River	98 to 142	44	Copper
Columbia River	98 to 142	44	Copper
Columbia River	98 to 142	44	Cyanide
Columbia River	98 to 142	44	DDD 4,4
Columbia River	98 to 142	44	DDE 4,4
Columbia River	98 to 142	44	DDE 4,4
Columbia River	98 to 142	44	DDT 4,4
Columbia River	98 to 142	44	Deethylatrazine
Columbia River	98 to 142	44	Dieldrin
Columbia River	98 to 142	44	Diethyl phthalate
Columbia River	98 to 142	44	Dioxin (2,3,7,8-TCDD)
Columbia River	98 to 142	44	Dioxin (2,3,7,8-TCDD)
Columbia River	98 to 142	44	Dioxins/Furans
Columbia River	98 to 142	44	E. Coli
Columbia River	98 to 142	44	E. Coli
Columbia River	98 to 142	44	Endrin
Columbia River	98 to 142	44	Eptam
Columbia River	98 to 142	44	Fecal Coliform
Columbia River	98 to 142	44	Iron
Columbia River	98 to 142	44	Lead
Columbia River	98 to 142	44	Lead
Columbia River	98 to 142	44	Mercury
Columbia River	98 to 142	44	Mercury
Columbia River	98 to 142	44	Metolachlor
Columbia River	98 to 142	44	Napropamide
Columbia River	98 to 142	44	Nickel
Columbia River	98 to 142	44	pH
Columbia River	98 to 142	44	pH

Columbia River	98 to 142	44	Phenol
Columbia River	98 to 142	44	Polychlorinated Biphenyls (PCBs)
Columbia River	98 to 142	44	Polynuclear Aromatic Hydrocarbons
Columbia River	98 to 142	44	Polynuclear Aromatic Hydrocarbons
Columbia River	98 to 142	44	Pyrene
Columbia River	98 to 142	44	Pyrene
Columbia River	98 to 142	44	Radionuclides
Columbia River	98 to 142	44	Silver
Columbia River	98 to 142	44	Silver
Columbia River	98 to 142	44	Simazine
Columbia River	98 to 142	44	Total Dissolved Gas
Columbia River	98 to 142	44	Tributyltin
Columbia River	98 to 142	44	Zinc
Columbia River	0 to 303.9	303.9	Ammonia
Columbia River	0 to 303.9	303.9	Barium
Columbia River	0 to 303.9	303.9	Chloride
Columbia River	0 to 303.9	303.9	Chlorophyll a
Columbia River	0 to 303.9	303.9	Chlorophyll a
Columbia River	0 to 303.9	303.9	Chromium
Columbia River	0 to 303.9	303.9	Copper
Columbia River	0 to 303.9	303.9	Dissolved Oxygen
Columbia River	0 to 303.9	303.9	Nickel
Columbia River	0 to 303.9	303.9	Nitrates
Columbia River	0 to 303.9	303.9	Phosphate Phosphorus
Columbia River	0 to 303.9	303.9	Selenium
Columbia River	0 to 303.9	303.9	Temperature
Columbia River	0 to 303.9	303.9	Thallium
Columbia River	0 to 303.9	303.9	Zinc
Columbia River	34.5 to 303.9	269.4	Alkalinity
Arata Creek/Blue Lake	0 to 0.9	0.9	Alkalinity
Arata Creek/Blue Lake	0 to 0.9	0.9	Ammonia
Arata Creek/Blue Lake	0 to 0.9	0.9	Aquatic Weeds Or Algae
Arata Creek/Blue Lake	0 to 0.9	0.9	Chloride
Arata Creek/Blue Lake	0 to 0.9	0.9	Chlorophyll a
Arata Creek/Blue Lake	0 to 0.9	0.9	Chlorophyll a
Arata Creek/Blue Lake	0 to 0.9	0.9	Dissolved Oxygen
Arata Creek/Blue Lake	0 to 0.9	0.9	Dissolved Oxygen
Arata Creek/Blue Lake	0 to 0.9	0.9	Fecal Coliform
Arata Creek/Blue Lake	0 to 0.9	0.9	Iron
Arata Creek/Blue Lake	0 to 0.9	0.9	Manganese
Arata Creek/Blue Lake	0 to 0.9	0.9	Nutrients
Arata Creek/Blue Lake	0 to 0.9	0.9	pH
Arata Creek/Blue Lake	0 to 0.9	0.9	pH
Arata Creek/Blue Lake	0 to 0.9	0.9	pH
Arata Creek/Blue Lake	0 to 0.9	0.9	Phosphate Phosphorus
Balch Canyon	0 to 3.1	3.1	Dissolved Oxygen
Balch Canyon	0 to 3.1	3.1	Flow Modification
Balch Canyon	0 to 3.1	3.1	pH
Balch Canyon	0 to 3.1	3.1	Sedimentation
Blue Heron Canal	0 to 1	1	Dissolved Oxygen
Cedar Creek	0 to 3.7	3.7	Alkalinity
Cedar Creek	0 to 3.7	3.7	Ammonia

Cedar Creek	0 to 3.7	3.7	Chloride
Cedar Creek	0 to 3.7	3.7	Dissolved Oxygen
Cedar Creek	0 to 3.7	3.7	pH
Cedar Creek	0 to 3.7	3.7	Phosphate Phosphorus
Columbia Slough	0 to 8.5	8.5	Acenaphthene
Columbia Slough	0 to 8.7	8.7	Alkalinity
Columbia Slough	0 to 8.7	8.7	Ammonia
Columbia Slough	0 to 8.7	8.7	Antimony
Columbia Slough	0 to 8.7	8.7	Arsenic
Columbia Slough	0 to 8.7	8.7	Barium
Columbia Slough	0 to 8.5	8.5	Cadmium
Columbia Slough	0 to 8.7	8.7	Cadmium
Columbia Slough	0 to 8.5	8.5	Chlordane
Columbia Slough	0 to 8.5	8.5	Chlorophyll a
Columbia Slough	0 to 8.5	8.5	Chromium
Columbia Slough	0 to 8.7	8.7	Chromium
Columbia Slough	0 to 8.7	8.7	Copper
Columbia Slough	0 to 8.5	8.5	DDE 4,4
Columbia Slough	0 to 8.5	8.5	Dioxin (2,3,7,8-TCDD)
Columbia Slough	0 to 8.5	8.5	Dissolved Oxygen
Columbia Slough	0 to 8.5	8.5	E. Coli
Columbia Slough	0 to 8.5	8.5	Fecal Coliform
Columbia Slough	0 to 8.5	8.5	Fecal Coliform
Columbia Slough	0 to 8.5	8.5	Flow Modification
Columbia Slough	0 to 8.5	8.5	Heptachlor
Columbia Slough	0 to 8.5	8.5	Iron
Columbia Slough	0 to 8.5	8.5	Isophorone
Columbia Slough	0 to 8.7	8.7	Lead
Columbia Slough	0 to 8.5	8.5	Manganese
Columbia Slough	0 to 8.5	8.5	Naphthalene
Columbia Slough	0 to 8.7	8.7	Nickel
Columbia Slough	0 to 8.5	8.5	Pesticides
Columbia Slough	0 to 8.5	8.5	pH
Columbia Slough	0 to 8.5	8.5	pH
Columbia Slough	0 to 8.5	8.5	pH
Columbia Slough	0 to 8.5	8.5	phenanthrene
Columbia Slough	0 to 8.5	8.5	Phosphorus
Columbia Slough	0 to 8.5	8.5	Polychlorinated Biphenyls (PCBs)
Columbia Slough	0 to 8.5	8.5	Pyrene
Columbia Slough	0 to 8.5	8.5	Sedimentation
Columbia Slough	0 to 8.7	8.7	Selenium
Columbia Slough	0 to 8.7	8.7	Silver
Columbia Slough	0 to 8.5	8.5	Temperature
Columbia Slough	0 to 8.7	8.7	Thallium
Columbia Slough	0 to 8.7	8.7	Zinc
Columbia Slough	0 to 9.8	9.8	Alkalinity
Columbia Slough	0 to 4.1	4.1	Ammonia
Columbia Slough	4.1 to 9.8	5.7	Ammonia
Columbia Slough	0 to 9.8	9.8	Antimony
Columbia Slough	0 to 9.8	9.8	Arsenic
Columbia Slough	0 to 9.8	9.8	Barium
Columbia Slough	0 to 9.8	9.8	Biological Criteria

Columbia Slough	0 to 9.8	9.8	Cadmium
Columbia Slough	0 to 9.8	9.8	Chloride
Columbia Slough	0 to 9.8	9.8	Chlorophyll a
Columbia Slough	0 to 9.8	9.8	Chlorophyll a
Columbia Slough	0 to 9.8	9.8	Chromium
Columbia Slough	0 to 9.8	9.8	Copper
Columbia Slough	0 to 9.8	9.8	Dissolved Oxygen
Columbia Slough	0 to 9.8	9.8	Dissolved Oxygen
Columbia Slough	0 to 9.8	9.8	E. Coli
Columbia Slough	0 to 9.8	9.8	E. Coli
Columbia Slough	0 to 9.8	9.8	Iron
Columbia Slough	0 to 9.8	9.8	Lead
Columbia Slough	0 to 9.8	9.8	Manganese
Columbia Slough	0 to 9.8	9.8	Nickel
Columbia Slough	0 to 9.8	9.8	pH
Columbia Slough	0 to 9.8	9.8	pH
Columbia Slough	0 to 9.8	9.8	Phosphate Phosphorus
Columbia Slough	0 to 9.8	9.8	Selenium
Columbia Slough	0 to 9.8	9.8	Silver
Columbia Slough	0 to 9.8	9.8	Thallium
Columbia Slough	0 to 9.8	9.8	Zinc
Cox Creek	0 to 4.5	4.5	Sedimentation
Crystal Springs Creek	0 to 2.2	2.2	Nutrients
Crystal Springs Creek	0 to 2.2	2.2	Temperature
Dairy Creek	0 to 2.2	2.2	Habitat Modification
Dairy Creek	0 to 2.2	2.2	Sedimentation
Dart Creek	0 to 3.5	3.5	Alkalinity
Dart Creek	0 to 3.5	3.5	Ammonia
Dart Creek	0 to 3.5	3.5	Antimony
Dart Creek	0 to 3.5	3.5	Arsenic
Dart Creek	0 to 3.5	3.5	Barium
Dart Creek	0 to 3.4	3.4	Biological Criteria
Dart Creek	0 to 3.5	3.5	Cadmium
Dart Creek	0 to 3.5	3.5	Chloride
Dart Creek	0 to 3.5	3.5	Chromium
Dart Creek	0 to 3.5	3.5	Copper
Dart Creek	0 to 3.4	3.4	Dissolved Oxygen
Dart Creek	0 to 3.5	3.5	Iron
Dart Creek	0 to 3.5	3.5	Lead
Dart Creek	0 to 3.5	3.5	Manganese
Dart Creek	0 to 3.5	3.5	Nickel
Dart Creek	0 to 3.5	3.5	pH
Dart Creek	0 to 3.4	3.4	Phosphate Phosphorus
Dart Creek	0 to 3.5	3.5	Selenium
Dart Creek	0 to 3.5	3.5	Silver
Dart Creek	0 to 3.5	3.5	Thallium
Dart Creek	0 to 3.5	3.5	Zinc
Fairview Creek	0 to 1.7	1.7	Copper
Fairview Creek	0 to 1.7	1.7	E. Coli
Fairview Creek	0 to 1.7	1.7	Lead
Fairview Creek	0 to 1.7	1.7	Mercury
Fairview Creek	0 to 1.7	1.7	Nickel

Fairview Creek	0 to 1.7	1.7	Nitrates
Fairview Creek	0 to 1.7	1.7	pH
Fairview Creek	0 to 1.7	1.7	Phosphorus
Fairview Creek	0 to 1.7	1.7	Temperature
Fairview Creek	0 to 1.7	1.7	Zinc
Falling Creek	0 to 0.9	0.9	Biological Criteria
Johnson Creek	0 to 23.7	23.7	Acenaphthene
Johnson Creek	0 to 23.7	23.7	Aldrin
Johnson Creek	0 to 23.7	23.7	Alkalinity
Johnson Creek	0 to 23.7	23.7	Ammonia
Johnson Creek	0 to 23.7	23.7	Anthracene
Johnson Creek	0 to 23.7	23.7	Arsenic
Johnson Creek	0 to 23.7	23.7	Atrazine
Johnson Creek	0 to 23.7	23.7	Benzo[a]anthracene
Johnson Creek	0 to 23.7	23.7	Benzo[a]pyrene
Johnson Creek	0 to 23.7	23.7	Benzo[g,h,i]perylene
Johnson Creek	0 to 23.7	23.7	BHC alpha
Johnson Creek	0 to 23.7	23.7	BHC beta
Johnson Creek	0 to 23.7	23.7	BHC gamma (Lindane)
Johnson Creek	0 to 23.7	23.7	Biological Criteria
Johnson Creek	0 to 23.7	23.7	Cadmium
Johnson Creek	0 to 23.7	23.7	Carbaryl
Johnson Creek	0 to 23.7	23.7	Carbofuran
Johnson Creek	0 to 23.7	23.7	Chlordane
Johnson Creek	0 to 23.7	23.7	Chloride
Johnson Creek	0 to 23.7	23.7	Chlorinated Benzenes
Johnson Creek	0 to 23.7	23.7	Chlorophenoxy Herbicide (2,4-D)
Johnson Creek	0 to 23.7	23.7	Chlorophyll a
Johnson Creek	0 to 23.7	23.7	Chlorophyll a
Johnson Creek	0 to 23.7	23.7	Chlorpyrifos
Johnson Creek	0 to 23.7	23.7	Chromium
Johnson Creek	0 to 23.7	23.7	Chrysene
Johnson Creek	0 to 23.7	23.7	Copper
Johnson Creek	0 to 23.7	23.7	DDD 4,4
Johnson Creek	0 to 23.7	23.7	DDD 4,4
Johnson Creek	0 to 23.7	23.7	DDE 4,4
Johnson Creek	0 to 23.7	23.7	DDT 4,4
Johnson Creek	0 to 23.7	23.7	Desethylatrazine
Johnson Creek	0 to 23.7	23.7	Desisoproylatrazine
Johnson Creek	0 to 23.7	23.7	Diazinon
Johnson Creek	0 to 23.7	23.7	Dibutylphthalate
Johnson Creek	0 to 23.7	23.7	Dichlobenil
Johnson Creek	0 to 23.7	23.7	Dieldrin
Johnson Creek	0 to 23.7	23.7	Diethyl phthalate
Johnson Creek	0 to 23.7	23.7	Dioxin (2,3,7,8-TCDD)
Johnson Creek	0 to 23.7	23.7	Dioxin (2,3,7,8-TCDD)
Johnson Creek	0 to 23.7	23.7	Dioxins/Furans
Johnson Creek	0 to 23.7	23.7	Dioxins/Furans
Johnson Creek	0 to 23.7	23.7	Diphenamid
Johnson Creek	0 to 10.5	10.5	Dissolved Oxygen
Johnson Creek	0 to 12.7	12.7	Dissolved Oxygen
Johnson Creek	10.5 to 23.7	13.2	Dissolved Oxygen

Johnson Creek	12.7 to 23.7	11	Dissolved Oxygen
Johnson Creek	0 to 23.7	23.7	Diuron
Johnson Creek	0 to 23.7	23.7	E. Coli
Johnson Creek	0 to 23.7	23.7	E. Coli
Johnson Creek	0 to 23.7	23.7	Endosulfan
Johnson Creek	0 to 23.7	23.7	Endrin
Johnson Creek	0 to 23.7	23.7	Endrin aldehyde
Johnson Creek	0 to 23.7	23.7	Ethylhexyl phthalate bis 2
Johnson Creek	0 to 23.7	23.7	Ethylhexyl phthalate bis 2
Johnson Creek	0 to 23.7	23.7	Flow Modification
Johnson Creek	0 to 23.7	23.7	Fluoranthene
Johnson Creek	0 to 23.7	23.7	Heptachlor
Johnson Creek	0 to 23.7	23.7	Hexachlorobenzene
Johnson Creek	0 to 23.7	23.7	Hexazinone
Johnson Creek	0 to 23.7	23.7	Iron
Johnson Creek	0 to 23.7	23.7	Lead
Johnson Creek	0 to 23.7	23.7	Malathion
Johnson Creek	0 to 23.7	23.7	Manganese
Johnson Creek	0 to 23.7	23.7	Manganese
Johnson Creek	0 to 23.7	23.7	Mercury
Johnson Creek	0 to 23.7	23.7	Methoxychlor
Johnson Creek	0 to 23.7	23.7	Metolachlor
Johnson Creek	0 to 23.7	23.7	Metribuzin
Johnson Creek	0 to 23.7	23.7	N-butylbenzylphthalate
Johnson Creek	0 to 23.7	23.7	Napropamide
Johnson Creek	0 to 23.7	23.7	Nickel
Johnson Creek	0 to 23.7	23.7	Nitrates
Johnson Creek	0 to 23.7	23.7	Nutrients
Johnson Creek	0 to 23.7	23.7	Oryzalin
Johnson Creek	0 to 23.7	23.7	Pebulate
Johnson Creek	0 to 23.7	23.7	pH
Johnson Creek	0 to 23.7	23.7	pH
Johnson Creek	0 to 23.7	23.7	Phenol
Johnson Creek	0 to 23.7	23.7	Phosphate Phosphorus
Johnson Creek	0 to 23.7	23.7	Polychlorinated Biphenyls (PCBs)
Johnson Creek	0 to 23.7	23.7	Polynuclear Aromatic Hydrocarbons
Johnson Creek	0 to 23.7	23.7	Prometon
Johnson Creek	0 to 23.7	23.7	Pronamide
Johnson Creek	0 to 23.7	23.7	Propazine
Johnson Creek	0 to 23.7	23.7	Pyrene
Johnson Creek	0 to 23.7	23.7	Sedimentation
Johnson Creek	0 to 23.7	23.7	Selenium
Johnson Creek	0 to 23.7	23.7	Silver
Johnson Creek	0 to 23.7	23.7	Simazine
Johnson Creek	0 to 23.7	23.7	Temperature
Johnson Creek	0.2 to 10.5	10.3	Temperature
Johnson Creek	0 to 23.7	23.7	Terbacil
Johnson Creek	0 to 23.7	23.7	Toxaphene
Johnson Creek	0 to 23.7	23.7	Toxaphene
Johnson Creek	0 to 23.7	23.7	Triclopyr
Johnson Creek	0 to 23.7	23.7	Trifluralin
Kellogg Creek	0 to 5	5	Alkalinity

Kellogg Creek	0 to 5	5	Ammonia
Kellogg Creek	0 to 5	5	Chlorpyrifos
Kellogg Creek	0 to 1	1	Dissolved Oxygen
Kellogg Creek	0 to 5	5	Dissolved Oxygen
Kellogg Creek	1 to 4.5	3.5	Dissolved Oxygen
Kellogg Creek	0 to 5	5	E. Coli
Kellogg Creek	0 to 5	5	E. Coli
Kellogg Creek	0 to 5	5	Malathion
Kellogg Creek	0 to 5	5	Temperature
Kellogg Creek	0 to 5	5	Temperature
Kelly Creek	0 to 3.6	3.6	Aldrin
Kelly Creek	0 to 3.6	3.6	BHC alpha
Kelly Creek	0 to 3.6	3.6	BHC beta
Kelly Creek	0 to 3.6	3.6	BHC gamma (Lindane)
Kelly Creek	0 to 3.6	3.6	Chlordane
Kelly Creek	0 to 3.6	3.6	Chlorinated Benzenes
Kelly Creek	0 to 3.6	3.6	Copper
Kelly Creek	0 to 3.6	3.6	DDT 4,4
Kelly Creek	0 to 3.6	3.6	Dieldrin
Kelly Creek	0 to 3.6	3.6	Endosulfan
Kelly Creek	0 to 3.6	3.6	Endrin
Kelly Creek	0 to 3.6	3.6	Heptachlor
Kelly Creek	0 to 3.6	3.6	Hexachlorobenzene
Kelly Creek	0 to 3.6	3.6	Lead
Kelly Creek	0 to 3.6	3.6	Mercury
Kelly Creek	0 to 3.6	3.6	Methoxychlor
Kelly Creek	0 to 3.6	3.6	Nickel
Kelly Creek	0 to 3.6	3.6	Nitrates
Kelly Creek	0 to 3.6	3.6	Toxaphene
Kelly Creek	0 to 3.6	3.6	Zinc
McNulty Creek	0 to 5.8	5.8	Arsenic
McNulty Creek	0 to 5.8	5.8	Biological Criteria
McNulty Creek	0 to 5.8	5.8	Dissolved Oxygen
McNulty Creek	0 to 5.8	5.8	Sedimentation
Miller Creek	0 to 1.8	1.8	Arsenic
Miller Creek	0 to 1.8	1.8	Biological Criteria
Miller Creek	0 to 1.8	1.8	Dissolved Oxygen
Milton Creek	0 to 19.9	19.9	Biological Criteria
Milton Creek	0.1 to 19.9	19.8	Dissolved Oxygen
Milton Creek	0 to 19.9	19.9	Nutrients
Milton Creek	0 to 19.9	19.9	Sedimentation
Mitchell Creek	0 to 1.4	1.4	Alkalinity
Mitchell Creek	0 to 1.4	1.4	Ammonia
Mitchell Creek	0 to 1.4	1.4	Dissolved Oxygen
Mitchell Creek	0 to 1.4	1.4	E. Coli
Mitchell Creek	0 to 1.4	1.4	pH
Mitchell Creek	0 to 1.4	1.4	Phosphate Phosphorus
Mount Scott Creek	0 to 6.1	6.1	Alkalinity
Mount Scott Creek	0 to 6.1	6.1	E. Coli
Mount Scott Creek	0 to 6.1	6.1	E. Coli
Mount Scott Creek	0 to 6.1	6.1	Nutrients
Mount Scott Creek	0 to 6.1	6.1	Sedimentation

Mount Scott Creek	0 to 6.1	6.1	Temperature
Multnomah Channel	0 to 21.7	21.7	Alkalinity
Multnomah Channel	0 to 21.7	21.7	Ammonia
Multnomah Channel	0 to 21.7	21.7	Dissolved Oxygen
Multnomah Channel	0 to 21.7	21.7	Dissolved Oxygen
Multnomah Channel	0 to 21.7	21.7	E. Coli
Multnomah Channel	0 to 21.7	21.7	Mercury
Multnomah Channel	0 to 21.7	21.7	pH
Multnomah Channel	0 to 21.7	21.7	Phosphate Phosphorus
Multnomah Channel	0 to 1.6	1.6	Sedimentation
Multnomah Channel	0 to 21.7	21.7	Temperature
Multnomah Channel Trib	0 to 1.5	1.5	Alkalinity
Multnomah Channel Trib	0 to 1.5	1.5	Ammonia
Multnomah Channel Trib	0 to 1.5	1.5	Chloride
Multnomah Channel Trib	0 to 1.5	1.5	Dissolved Oxygen
Multnomah Channel Trib	0 to 1.5	1.5	pH
Multnomah Channel Trib	0 to 1.5	1.5	Phosphate Phosphorus
North Fork Johnson Creek	0 to 2.1	2.1	E. Coli
Osburn Creek	0 to 5.8	5.8	Arsenic
Osburn Creek	0 to 5.8	5.8	Biological Criteria
Osburn Creek	0 to 5.8	5.8	Copper
Osburn Creek	0 to 5.8	5.8	Dissolved Oxygen
Osburn Creek	0 to 5.8	5.8	Lead
Osburn Creek	0 to 5.8	5.8	Mercury
Osburn Creek	0 to 5.8	5.8	Nickel
Osburn Creek	0 to 5.8	5.8	Nitrates
Osburn Creek	0 to 5.8	5.8	Zinc
Osburn Creek/Fairview Lake	2 to 2.8	0.8	Aquatic Weeds Or Algae
Osburn Creek/Fairview Lake	2 to 2.8	0.8	pH
Osburn Creek/Fairview Lake	2 to 2.8	0.8	Phosphorus
Osburn Creek/Fairview Lake	2 to 2.8	0.8	Turbidity
Oswego Canal	0 to 0.7	0.7	Dissolved Oxygen
Oswego Creek	0 to 0.5	0.5	Dissolved Oxygen
Oswego Creek/Lake Oswego	0 to 3	3	Ammonia
Oswego Creek/Lake Oswego	0.5 to 3	2.5	Aquatic Weeds Or Algae
Oswego Creek/Lake Oswego	0 to 3	3	Chlorophyll a
Oswego Creek/Lake Oswego	0 to 3	3	Dissolved Oxygen
Oswego Creek/Lake Oswego	0.5 to 3	2.5	Dissolved Oxygen
Oswego Creek/Lake Oswego	0 to 3	3	E. Coli
Oswego Creek/Lake Oswego	0.5 to 3	2.5	Fecal Coliform
Oswego Creek/Lake Oswego	0 to 3	3	Iron
Oswego Creek/Lake Oswego	0 to 3	3	Manganese
Oswego Creek/Lake Oswego	0.5 to 3	2.5	pH
Oswego Creek/Lake Oswego	0.5 to 3	2.5	pH
Oswego Creek/Lake Oswego	3 to 3.1	0.1	pH
Oswego Creek/Lake Oswego	0.5 to 3	2.5	Phosphorus
Phillips Creek	0 to 1.2	1.2	Alkalinity
Phillips Creek	0 to 1.2	1.2	E. Coli
Phillips Creek	0 to 1.2	1.2	E. Coli
Phillips Creek	0 to 1.2	1.2	Temperature
Phillips Creek	0 to 1.2	1.2	Temperature
Raymond Creek	0 to 3.9	3.9	Sedimentation

Saltzman Creek	0 to 2.4	2.4	Alkalinity
Saltzman Creek	0 to 2.4	2.4	Ammonia
Saltzman Creek	0 to 2.4	2.4	Biological Criteria
Saltzman Creek	0 to 2.4	2.4	Chloride
Saltzman Creek	0 to 2.4	2.4	Dissolved Oxygen
Saltzman Creek	0 to 2.4	2.4	pH
Saltzman Creek	0 to 2.4	2.4	Phosphate Phosphorus
Scappoose Creek	0 to 5.8	5.8	Dissolved Oxygen
Scappoose Creek	0 to 5.8	5.8	Dissolved Oxygen
Scappoose Creek	0 to 5.8	5.8	Sedimentation
South Columbia Slough	0 to 3.2	3.2	Alkalinity
South Columbia Slough	0 to 3.2	3.2	Ammonia
South Columbia Slough	0 to 3.2	3.2	Antimony
South Columbia Slough	0 to 3.2	3.2	Arsenic
South Columbia Slough	0 to 3.2	3.2	Barium
South Columbia Slough	0 to 3.2	3.2	Cadmium
South Columbia Slough	0 to 3.2	3.2	Chromium
South Columbia Slough	0 to 3.2	3.2	Copper
South Columbia Slough	0 to 3.2	3.2	E. Coli
South Columbia Slough	0 to 3.2	3.2	Iron
South Columbia Slough	0 to 3.2	3.2	Lead
South Columbia Slough	0 to 3.2	3.2	Manganese
South Columbia Slough	0 to 3.2	3.2	Nickel
South Columbia Slough	0 to 3.2	3.2	pH
South Columbia Slough	0 to 3.2	3.2	Selenium
South Columbia Slough	0 to 3.2	3.2	Silver
South Columbia Slough	0 to 3.2	3.2	Thallium
South Columbia Slough	0 to 3.2	3.2	Zinc
South Scappoose Creek	0 to 11.9	11.9	Ammonia
South Scappoose Creek	0 to 11.9	11.9	Chlorpyrifos
South Scappoose Creek	0 to 1.9	1.9	Dissolved Oxygen
South Scappoose Creek	0 to 1.9	1.9	Dissolved Oxygen
South Scappoose Creek	0 to 11.9	11.9	Malathion
South Scappoose Creek	0 to 11.9	11.9	Sedimentation
Spring Brook Creek	0 to 2.3	2.3	Fecal Coliform
Spring Brook Creek	0 to 2.3	2.3	Fecal Coliform
Spring Brook Creek	0 to 2.3	2.3	pH
Spring Brook Creek	0 to 2.3	2.3	Phosphorus
Sturgeon Lake/Sturgeon Lake	0 to 5.4	5.4	Aquatic Weeds Or Algae
Sturgeon Lake/Sturgeon Lake	0 to 5.4	5.4	Fecal Coliform
Sturgeon Lake/Sturgeon Lake	0 to 5.4	5.4	Flow Modification
Sturgeon Lake/Sturgeon Lake	0 to 5.4	5.4	Nutrients
Sturgeon Lake/Sturgeon Lake	0 to 5.4	5.4	Sedimentation
Sturgeon Lake/Sturgeon Lake	0 to 5.4	5.4	Temperature
Teal Creek	0 to 1.2	1.2	Dissolved Oxygen
Tryon Creek	0 to 5.1	5.1	Alkalinity
Tryon Creek	0 to 5.1	5.1	Ammonia
Tryon Creek	0 to 5	5	Biological Criteria
Tryon Creek	0 to 5.1	5.1	Chloride
Tryon Creek	0 to 5	5	Chlorpyrifos
Tryon Creek	0 to 2.5	2.5	Dissolved Oxygen
Tryon Creek	0 to 5	5	Dissolved Oxygen

Tryon Creek	0 to 5	5	Malathion
Tryon Creek	0 to 5.1	5.1	pH
Tryon Creek	0 to 5	5	Phosphate Phosphorus
Tryon Creek	0 to 5	5	Temperature
Unnamed Lake (Laurelhurst Pond)	0 to 0	0	Aquatic Weeds Or Algae
Unnamed Stream	0 to 3.1	3.1	Dissolved Oxygen
Unnamed Stream	0 to 3.1	3.1	Dissolved Oxygen
Unnamed Stream	0 to 3.1	3.1	E. Coli
Unnamed Stream	0 to 2.8	2.8	Dissolved Oxygen
Unnamed Stream	0 to 2.8	2.8	Dissolved Oxygen
Unnamed Stream	0 to 2.1	2.1	Dissolved Oxygen
Unnamed Stream	0 to 2.1	2.1	Dissolved Oxygen
Unnamed Stream	0 to 1.4	1.4	Biological Criteria
Unnamed Stream	0 to 1.4	1.4	Dissolved Oxygen
Unnamed Stream	0 to 1.2	1.2	Arsenic
Unnamed Stream	0 to 1.2	1.2	Biological Criteria
Unnamed Stream	0 to 1.2	1.2	Dissolved Oxygen
Unnamed Stream	0 to 2	2	Biological Criteria
Unnamed Stream	0 to 1.8	1.8	Biological Criteria
Unnamed Stream	0 to 1.5	1.5	Biological Criteria
Unnamed Stream/Bybee Lake	0.5 to 1.7	1.2	Aquatic Weeds Or Algae
Unnamed Stream/Bybee Lake	0.5 to 1.7	1.2	Dissolved Oxygen
Unnamed Stream/Bybee Lake	0.5 to 1.7	1.2	Fecal Coliform
Unnamed Stream/Bybee Lake	0.5 to 1.7	1.2	Flow Modification
Unnamed Stream/Bybee Lake	0.5 to 1.7	1.2	Habitat Modification
Unnamed Stream/Bybee Lake	0.5 to 1.7	1.2	Nutrients
Unnamed Stream/Bybee Lake	0.5 to 1.7	1.2	pH
Unnamed Stream/Bybee Lake	0.5 to 1.7	1.2	Toxics
Unnamed Stream/Smith Lake	1.7 to 3	1.3	Aquatic Weeds Or Algae
Unnamed Stream/Smith Lake	1.7 to 3	1.3	Dissolved Oxygen
Unnamed Stream/Smith Lake	1.7 to 3	1.3	Fecal Coliform
Unnamed Stream/Smith Lake	1.7 to 3	1.3	Flow Modification
Unnamed Stream/Smith Lake	1.7 to 3	1.3	Habitat Modification
Unnamed Stream/Smith Lake	1.7 to 3	1.3	Nutrients
Unnamed Stream/Smith Lake	1.7 to 3	1.3	pH
Unnamed Stream/Smith Lake	1.7 to 3	1.3	Toxics
Willamette River	0 to 24.8	24.8	Aldrin
Willamette River	0 to 24.8	24.8	Arsenic
Willamette River	0 to 24.8	24.8	Benzo[a]anthracene
Willamette River	0 to 24.8	24.8	Benzo[a]pyrene
Willamette River	0 to 24.8	24.8	BHC gamma (Lindane)
Willamette River	0 to 24.8	24.8	Biological Criteria
Willamette River	0 to 24.8	24.8	Chlordane
Willamette River	0 to 24.8	24.8	Chlorophenoxy Herbicide (2,4,5-TP) - Silvex
Willamette River	0 to 24.8	24.8	Chlorophenoxy Herbicide (2,4-D)
Willamette River	0 to 24.8	24.8	Chlorophyll a
Willamette River	0 to 24.8	24.8	Chlorophyll a
Willamette River	0 to 24.8	24.8	Chlorpyrifos
Willamette River	0 to 24.8	24.8	Chrysene
Willamette River	0 to 24.8	24.8	Copper
Willamette River	0 to 24.8	24.8	Copper
Willamette River	0 to 24.8	24.8	Cyanide

Willamette River	0 to 24.8	24.8	DDD 4,4
Willamette River	0 to 24.8	24.8	DDE 4,4
Willamette River	0 to 24.8	24.8	DDE 4,4
Willamette River	0 to 24.8	24.8	DDT 4,4
Willamette River	0 to 24.8	24.8	DDT 4,4
Willamette River	0 to 24.8	24.8	DDT 4,4
Willamette River	0 to 24.8	24.8	Dieldrin
Willamette River	0 to 24.8	24.8	Dioxin (2,3,7,8-TCDD)
Willamette River	0 to 24.8	24.8	Dioxin (2,3,7,8-TCDD)
Willamette River	0 to 24.8	24.8	Dioxins/Furans
Willamette River	0 to 24.8	24.8	Endosulfan
Willamette River	0 to 24.8	24.8	Endrin
Willamette River	0 to 24.8	24.8	Fecal Coliform
Willamette River	0 to 24.8	24.8	Guthion
Willamette River	0 to 24.8	24.8	Hexachlorobenzene
Willamette River	0 to 24.8	24.8	Iron
Willamette River	0 to 24.8	24.8	Lead
Willamette River	0 to 24.8	24.8	Lead
Willamette River	0 to 24.8	24.8	Malathion
Willamette River	0 to 24.8	24.8	Malathion
Willamette River	0 to 24.8	24.8	Manganese
Willamette River	0 to 24.8	24.8	Manganese
Willamette River	0 to 24.8	24.8	Methoxychlor
Willamette River	0 to 24.8	24.8	Nickel
Willamette River	0 to 24.8	24.8	Nickel
Willamette River	0 to 24.8	24.8	Nutrients
Willamette River	0 to 24.8	24.8	Parathion
Willamette River	0 to 24.8	24.8	Parathion
Willamette River	0 to 24.8	24.8	Pentachlorophenol
Willamette River	0 to 24.8	24.8	pH
Willamette River	0 to 24.8	24.8	pH
Willamette River	0 to 24.8	24.8	Polychlorinated Biphenyls (PCBs)
Willamette River	0 to 24.8	24.8	Polynuclear Aromatic Hydrocarbons
Willamette River	0 to 24.8	24.8	Pyrene
Willamette River	0 to 24.8	24.8	Sedimentation
Willamette River	0 to 24.8	24.8	Selenium
Willamette River	0 to 24.8	24.8	Zinc
Willamette River	0 to 24.8	24.8	Zinc
Willamette River	0 to 54.8	54.8	Chlorophyll a
Willamette River	0 to 50.6	50.6	Dissolved Oxygen
Willamette River	0 to 50.6	50.6	Temperature
Willamette River	0 to 186.6	186.6	Alkalinity
Willamette River	0 to 186.6	186.6	Ammonia
Willamette River	0 to 186.4	186.4	Anthracene
Willamette River	0 to 186.6	186.6	Antimony
Willamette River	0 to 186.6	186.6	Barium
Willamette River	0 to 186.6	186.6	Cadmium
Willamette River	0 to 186.6	186.6	Chloride
Willamette River	0 to 186.4	186.4	Chromium
Willamette River	0 to 186.4	186.4	DDE 4,4
Willamette River	0 to 186.4	186.4	E. Coli
Willamette River	0 to 186.4	186.4	E. Coli

Willamette River	0 to 186.4	186.4	Fluoranthene
Willamette River	0 to 186.6	186.6	Mercury
Willamette River	0 to 186.6	186.6	Mercury
Willamette River	0 to 186.5	186.5	Phosphate Phosphorus
Willamette River	0 to 186.6	186.6	Silver
Willamette River	0 to 186.6	186.6	Thallium