OREGON
DEPARTMENT OF
AGRICULTURE

Lower Willamette Agricultural Water Quality Management Area Plan

October 2020

Developed by the

Oregon Department of Agriculture

Lower Willamette Local Advisory Committee

With support from the

East Multnomah Soil and Water Conservation District
West Multnomah Soil and Water Conservation District
Clackamas Soil and Water Conservation District

http://oda.direct/AgWQPlans

Lower Willamette Management Area Contacts:

Oregon Department of Agriculture
Natural Resource Programs
635 Capitol Street NE
Salem, OR 97301
(503)-986-4700
ODA Lower Willamette Agricultural Water Quality Specialist
Office: (503)-986-5141
Visit the website for more information and full copy of the area plan:
www.oregon.gov/ODA/programs/NaturalResources/AgWQ/Pages/AgWQPlans.aspx

East Multnomah Soil and Water Conservation District
5211 N. Williams Avenue
Portland, OR 97217
503-222-7645
www.emswcd.org

West Multnomah Soil and Water Conservation District
2701 West Vaughn Street, Suite 450
Portland, OR 97210
(503) 238-4775
www.wmswcd.org

Clackamas Soil and Water Conservation District
22055 S Beavercreek Road
Beavercreek, OR 97004
503-210-6000
www.conservationdistrict.org

Table of Contents

Acronyms and Terms

Ag Water Quality Program – Agricultural Water Quality 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
CZARA – Coastal Zone Act Reauthorization Amendments
DEQ – Oregon Department of Environmental Quality
GWMA – Groundwater Management Area
LAC – Local Advisory Committee
LMA – Local Management Agency
Management Area – Agricultural Water Quality Management Area
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
OHA – Oregon Health Authority
ORS – Oregon Revised Statute
OWEB – Oregon Watershed Enhancement Board
OWRI – Oregon Watershed Restoration Inventory
PMP – Pesticides Management Plan
PSP – Pesticides Stewardship Partnership
SIA – Strategic Implementation Area
SWCD – Soil and Water Conservation District
TMDL – Total Maximum Daily Load
USDA – United States Department of Agriculture
US EPA – United States Environmental Protection Agency
WPCF – Water Pollution Control Facility
WQPMT – Water Quality Pesticides Management Team

(This page is blank)

Foreword

This Agricultural Water Quality Area Plan (Area Plan) provides guidance for addressing water quality related to agricultural activities in the Agricultural Water Quality Management Area (Management Area). The Area Plan identifies strategies to prevent and control water pollution from agricultural lands.

The Area Plan is neither regulatory nor enforceable (Oregon Revised Statute (ORS) 568.912(1)). The Area Plan refers to associated Agricultural Water Quality Management Area Rules (Area Rules). The Area Rules are Oregon Administrative Rules (OARs) and are enforced by the Oregon Department of Agriculture (ODA).

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 federal and state law (OAR 603-090-0030(1)).

Plan Content

Chapter 1: Agricultural Water Quality Program Purpose and Background. Presents consistent and accurate information about the Ag Water Quality 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 potential practices to address water quality issues.

Chapter 3: Implementation Strategies. Presents goal(s), measurable objectives, strategic initiatives, proposed activities, and monitoring.

Chapter 4: Progress and Adaptive Management. Describes progress toward achieving the goal of the Area Plan and summarizes results of water quality and land condition monitoring.

(This page is blank)

Chapter 1: Agricultural Water Quality Program

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

As part of Oregon's Agricultural Water Quality Program (Ag Water Quality Program), the Area Plan guides landowners and partners such as Soil and Water Conservation Districts (SWCDs) in addressing water quality issues related to agricultural activities. The Area Plan identifies strategies to prevent and control "water pollution from agricultural activities and soil erosion" (ORS 568.909(2)) on agricultural and rural lands within the boundaries of this Management Area (OAR 603-090-0000(3)) and to achieve and maintain water quality standards (ORS 561.191(2)). The Area Plan has been developed and revised by ODA and the Local Advisory Committee (LAC), with support and input from the SWCD and the Oregon Department of Environmental Quality (DEQ). The Area Plan is implemented using a combination of outreach, conservation and management activities, compliance with Area Rules, monitoring, evaluation, and adaptive management.

The provisions of the Area Plan do not establish legal requirements or prohibitions (ORS 568.912(1)).

Each Area Plan is accompanied by Area 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 (OAR 603-090-0000 to 603-090-0120) and under the Area Rules for this Management Area (OAR 603-095-1300). The general regulations guide the Ag Water Quality Program, and the Area Rules for the Management Area are the regulations with which landowners must comply. Landowners are encouraged through outreach and education to implement conservation and management activities.

The Area Plan and Area Rules apply to all agricultural activities on non-federal and non-Tribal Trust land within this Management Area including:

- Farms and ranches,
- Rural residential properties grazing 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).

Water quality on federal land in Oregon is regulated by DEQ and on Tribal Trust land by the respective tribe, with oversight by the United States Environmental Protection Agency (US EPA).

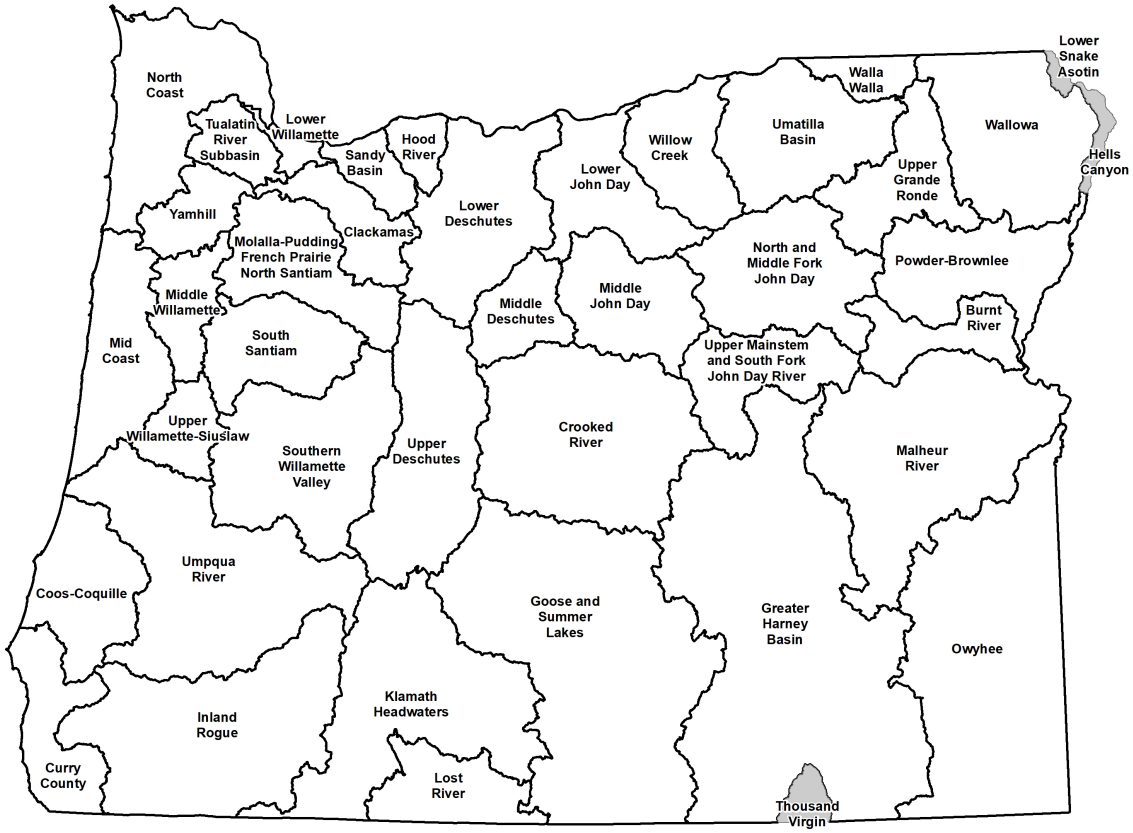
1.2 History of the Ag Water Quality Program

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). The Oregon Legislature passed additional legislation in 1995 to clarify that ODA is the lead agency for regulating agriculture with respect to water quality (ORS 561.191).

Between 1997 and 2004, ODA worked with LACs and SWCDs to develop Area Plans and Area Rules in 38 watershed-based Management Areas across Oregon (Figure 1.2). 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 Area Rules,
- Conducting biennial reviews of Area Plans and Area Rules,
- Monitoring, evaluation, and adaptive management,
- Developing partnerships with state and federal agencies, tribes, watershed councils, and others.

Figure 1.2 Map of 38 Agricultural Water Quality Management Areas*



*Gray areas are not included in Ag Water Quality Management Areas

1.3 Roles and Responsibilities

1.3.1 Oregon Department of Agriculture

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 implement water quality management plans for the prevention

and control of water pollution from agricultural activities and soil erosion. State and federal laws that drive the establishment of an Area Plan include:

- State water quality standards;
- Load allocations for agricultural or nonpoint source pollution assigned under Total Maximum Daily Loads (TMDLs) issued pursuant to the federal 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 DEQ has established a GWMA in the Management Area and an Action Plan has been developed).

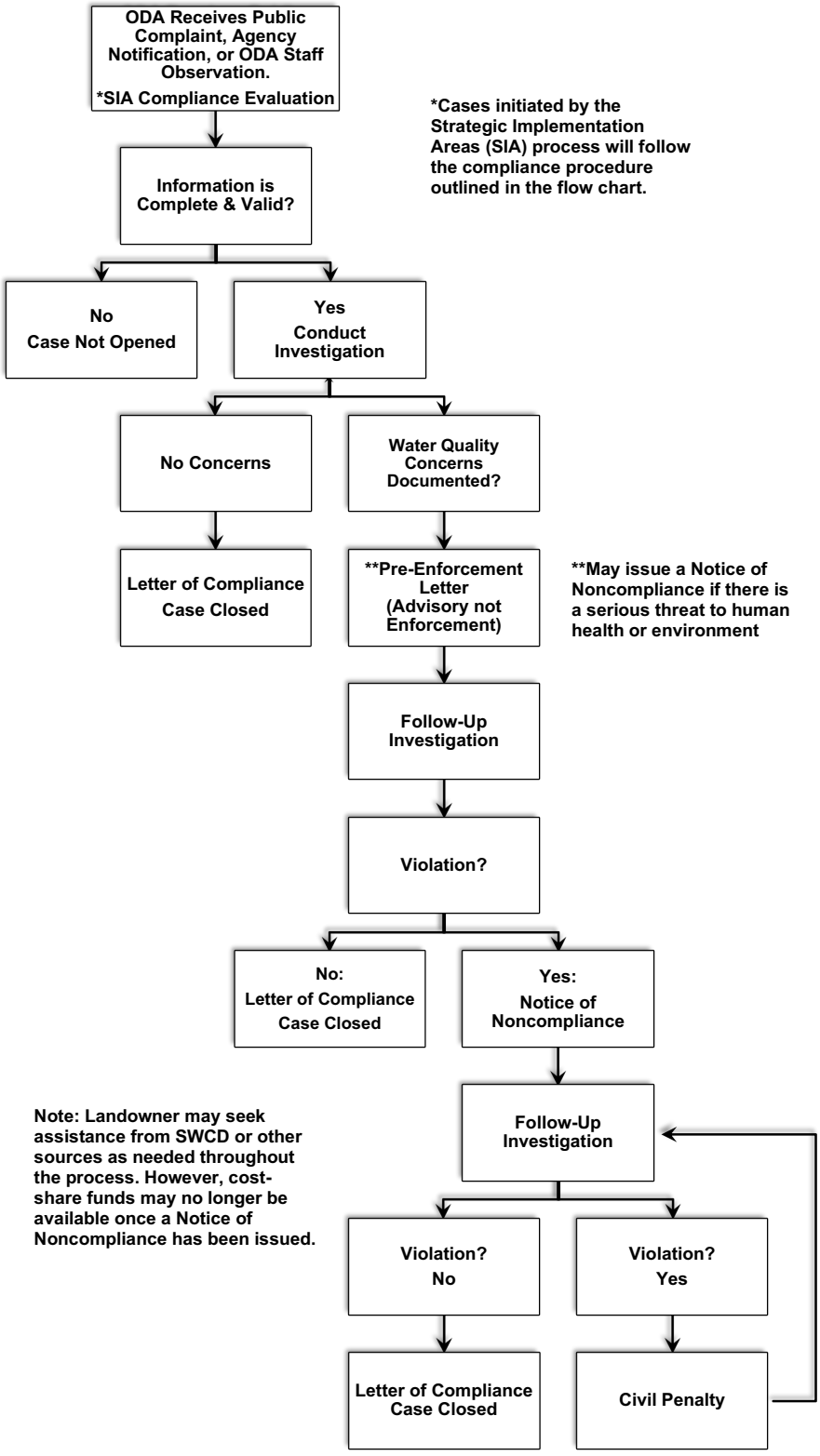
ODA bases Area Plans and Area Rules on scientific information (ORS 568.909). ODA works in partnership with SWCDs, LACs, DEQ, and other partners to implement, evaluate, and update the Area Plans and Area Rules. If and when other governmental policies, programs, or rules conflict with the Area Plan or Area Rules, ODA will consult with the appropriate agencies to resolve the conflict in a reasonable manner.

ODA is responsible 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 the authority to adopt rules that require landowners to perform actions necessary to prevent and control pollution from agricultural activities and soil erosion.

The Area Rules are a set of standards that landowners must meet on all agricultural or rural lands. “Landowner” includes any landowner, land occupier, or operator per OAR 603-95-0010(24). All landowners must comply with the Area Rules. ODA will use enforcement where appropriate and necessary to achieve compliance with Area Rules. Figure 1.3.1 outlines ODA’s compliance process. ODA will pursue enforcement action only when reasonable attempts at voluntary solutions have failed (OAR 603-090-0000(5)(e)). If a violation is documented, ODA may issue a pre-enforcement notification or an enforcement order such as a Notice of Noncompliance. If a Notice of Noncompliance is issued, ODA will direct the landowner to remedy any conditions 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, ODA may assess civil penalties for continued violation of the Area Rules.

Any member of the public may file a complaint, and any public agency may file a notification of a potential violation of the Area Rules. ODA also may initiate an investigation based on its own observation or from cases initiated through the Strategic Implementation Area process (See Figure 1.3.1).

Figure 1.3.1 Compliance Flow Chart



1.3.2 Local Management Agency

A Local Management Agency (LMA) is an organization designated by ODA to assist with the implementation of an Area Plan (OAR 603-090-0010). The Oregon Legislature intended that SWCDs be LMAs 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 to voluntarily address natural resource concerns. Currently, all LMAs in Oregon are SWCDs.

The day-to-day implementation of the Area Plan is accomplished through an Intergovernmental Grant Agreement between ODA and each SWCD. Every two years, each SWCD submits a scope of work to ODA to receive funding to implement the Area Plan. 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 Area Rules as needed.

1.3.3 Local Advisory Committee

For each Management Area, the director of ODA appoints an LAC (OAR 603-090-0020) with up to 12 members. The LAC serves in an advisory role to the director of ODA and to the Board of Agriculture. The role of the LAC is to provide a high level of citizen involvement and support in the development, implementation, and biennial reviews of the Area Plan and Area Rules. The LAC's primary role is to advise ODA and the LMA on local agricultural water quality issues as well as evaluate the progress toward achieving the goals and objectives of the Area Plan. LACs are composed primarily of agricultural landowners in the Management Area and must reflect a balance of affected persons.

The LAC is convened at the time of the biennial review, however, the LAC may meet as frequently as necessary to carry out its responsibilities, which include but are not limited to:

- Participate in the development and subsequent revisions of the Area Plan and Area Rule;
- Recommend strategies necessary to achieve the 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 Agricultural Landowners

The emphasis of the Area Plan is on voluntary action by landowners to control the factors affecting water quality in the Management Area. In addition, each landowner in the Management Area is required to comply with the Area Rules. To achieve water quality goals or compliance, landowners may need to select and implement an appropriate suite of measures. The actions of each landowner will collectively contribute toward achievement of water quality standards.

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

Under the Area Plan and Area Rules, agricultural landowners are not responsible for mitigating or addressing factors that are caused by non-agricultural activities or sources, such as:

- Hot springs, glacial melt water, unusual 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,
- Impacts on water quality and streamside vegetation from wildlife such as waterfowl, elk, and feral horses,
- Other circumstances not within the reasonable control of the landowner.

However, agricultural landowners may be responsible for some of these impacts under other legal authorities.

1.3.5 Public Participation

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

1.4 Agricultural Water Quality

The federal CWA directs states to designate beneficial uses related to water quality, decide on parameters to measure to determine whether beneficial uses are being met, and set water quality standards based on the beneficial uses and parameters.

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. 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 all permitted CAFOs are subject to ODA's CAFO Program requirements. Irrigation return flow from agricultural fields may drain through a defined outlet, but is exempt under the CWA and does not currently require a permit.

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

1.4.2 Beneficial Uses and Parameters of Concern

Beneficial uses related to water quality are defined by DEQ for each basin. The most sensitive beneficial uses usually are fish and aquatic life, water contact recreation, and public and private domestic water supply. These uses generally are the first to be impaired 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 impaired in this Management Area are summarized in Chapter 2.

Many waterbodies throughout Oregon do not meet state water quality standards. The most common water quality concerns statewide related to agricultural activities are temperature, bacteria, biological criteria, sediment and turbidity, phosphorous, nitrates, algae, pH, dissolved oxygen, harmful algal blooms, pesticides, and mercury. Water quality impairments vary across the state; they are summarized for this Management Area in Chapter 2.

1.4.3 Impaired Waterbodies and Total Maximum Daily Loads

Every two years, DEQ is required by the CWA to assess water quality in Oregon, resulting in the "Integrated Report." CWA Section 303(d) requires DEQ to identify waters that do not meet water quality standards. The resulting list is commonly referred to as the "303(d) list" (www.oregon.gov/deq/wq/Pages/WQ-Assessment.aspx). In accordance with the CWA, DEQ must establish TMDLs for pollutants on the 303(d) list. For more information, visit www.oregon.gov/deq/wq/tmdls/Pages/default.aspx.

A TMDL includes an assessment of conditions (based on water quality data, land condition data, and/or computer modeling) and describes a plan to achieve water quality standards. TMDLs specify the daily amount of pollution a waterbody can receive and still meet water quality standards. TMDLs generally apply to an entire basin or subbasin, not just to an individual waterbody on the 303(d) list. In the TMDL, point sources are assigned waste load allocations that are then incorporated into National Pollutant Discharge Elimination System (NPDES) permits. Nonpoint sources (agriculture, forestry, and urban) are assigned a load allocation.

As part of the TMDL process, DEQ identifies Designated Management Agencies and Responsible Persons, which are parties responsible for submitting TMDL implementation plans. TMDLs designate ODA as the lead agency responsible for implementing the TMDL on agricultural lands. ODA uses the applicable Area Plan(s) as the implementation plan for the agricultural component of the TMDL. Biennial reviews and revisions to the Area Plan and Area Rules must address agricultural or nonpoint source load allocations from relevant TMDLs.

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

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

In 1995, the Oregon Legislature passed ORS 561.191. This statute states that any program or rules adopted by ODA "shall be designed to assure achievement and maintenance of water quality standards adopted by the Environmental Quality Commission."

To implement the intent of ORS 561.191, ODA incorporated ORS 468B.025 and 468B.050 into all 38 of the Area Rules in Oregon.

ORS 468B.025 (prohibited activities) states that:
"(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."

ORS 468B.050 identifies the conditions when a permit is required. A permit is required for CAFOs that meet minimum criteria for confinement periods and have large animal numbers or have wastewater facilities. The portions 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 used in ORS 468B.025 and 468B.050:

' "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.' (ORS 468B.005(5)).

' "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.' (ORS 468B.005(10)).

' "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.' (ORS 468B.005(9)). Additionally, the definition of "wastes" given in OAR 603-095-0010(53) 'includes but is not limited to commercial fertilizers, soil amendments, composts, animal wastes, vegetative materials or any other wastes.'

1.4.5 Streamside Vegetation and Agricultural Water Quality

Across Oregon, the Ag Water Quality Program emphasizes streamside vegetation protection and enhancement. Streamside vegetation can provide three primary water quality functions: shade to reduce stream temperature warming from solar radiation, streambank stability, and filtration of pollutants. Other water quality functions from streamside vegetation include: water storage in the soil 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. In addition, streamside vegetation provides habitat for numerous species of fish and wildlife. Streamside vegetation conditions can be monitored to track progress toward achieving conditions that support water quality.

Site-Capable Vegetation

The Ag Water Quality Program uses the concept of "site-capable vegetation" to describe the streamside 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 historical and current human influences that are beyond the program's statutory authority (e.g., channelization, roads, modified flows, previous 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, Natural Resources Conservation Service (NRCS) soil surveys and ecological site descriptions, and/or local or regional scientific research.

The goal for Oregon's agricultural landowners is to provide the water quality functions (e.g., shade, streambank stability, and filtration of pollutants) produced by site-capable vegetation along streams on agricultural lands. The Area Rules for each Management Area require that agricultural activities allow for the establishment and growth of streamside vegetation to provide the water quality functions equivalent to what site-capable vegetation would provide.

Occasionally, mature site-capable vegetation such as tall trees may not be needed along narrow streams. For example, shrubs and grass may provide shade, protect streambanks, and filter pollutants. However, on larger streams, mature site-capable vegetation is needed to provide the water quality functions.

In many cases, invasive, non-native plants, such as introduced varieties of blackberry and reed canarygrass, grow in streamside areas. This type of vegetation has established throughout much of Oregon due to historic and human influences and may provide some of the water quality functions of site-capable vegetation. ODA's statutory authority does not require the removal of invasive, non-native plants, however, ODA encourages landowners to remove these plants voluntarily. In addition, the Oregon State Weed Board identifies invasive plants that can impair watersheds. Public and private landowners are responsible for eliminating or intensively controlling noxious weeds, as described in state and local laws. For more information, visit www.oregon.gov/ODA/programs/weeds.

1.4.6 Soil Health and Agricultural Water Quality

An increasingly important concept in Oregon and across the United States is soil health. The Ag Water Quality Program promotes soil health to reduce erosion and keep sediment out of surface waters, thereby helping to maintain and improve water quality. Healthy soils have relatively high organic matter and well-formed soil structure. These characteristics may resist erosion and increase water infiltration, leading to less surface runoff and greater groundwater recharge; the resultant groundwater flows in some cases can help moderate stream water temperatures. According to the NRCS and others, there are four Soil Health Principles that together build highly productive and resilient soils: minimize disturbance and maximize cover, continuous living roots, and diversity above and below the surface.

Healthy soils make farms and ranches more resilient. The western United States is experiencing higher temperatures, more weather variability, and greater storm intensity. Forecasts predict continued high-intensity storms in the winter and spring, combined with more frequent droughts, which may result in more erosion, especially on bare ground. Building soil health increases resiliency to extreme weather, protects water quality, and helps keep farms and ranches viable. Incorporating soil health practices can help landowners adapt and reduce risks. For more information, visit www.nrcs.usda.gov/wps/portal/nrcs/detail/or/soils/health.

1.5 Other Water Quality Programs

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

1.5.1 Confined Animal Feeding Operation Program

ODA is the lead state agency for the CAFO Program, which was developed to ensure that operators do not contaminate ground or surface water with animal manure or process wastewater. The CAFO Program coordinates with DEQ to issue permits. These permits require the registrant to operate according to a site-specific, ODA-approved, Animal Waste Management Plan that is incorporated into the CAFO permit by reference. For more information, visit oda.direct/CAFO.

1.5.2 Groundwater Management Areas

Groundwater Management Areas (GWMAs) are designated by DEQ where groundwater is polluted from, at least in part, nonpoint sources. After designating a GWMA, DEQ forms a local groundwater management committee comprised of affected and interested parties. The committee works with and advises the state agencies that are required to develop an action plan to reduce groundwater contamination in the area.

Oregon DEQ has designated three GWMAs because of elevated nitrate concentrations in groundwater: Lower Umatilla Basin, Northern Malheur County, and Southern Willamette Valley. Each GWMA has a voluntary action plan to reduce nitrates in groundwater. After a scheduled evaluation period, if DEQ determines that voluntary efforts are not effective, mandatory requirements may become necessary.

If there is a GWMA in this Management Area, it is described in Chapter 2.

1.5.3 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 salmonids because of their great 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 Area Rules throughout Oregon.

1.5.4 Pesticide Management and Stewardship

ODA's 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, Oregon formed the interagency Water Quality Pesticide Management Team (WQPMT) to expand efforts to improve water quality in Oregon related to pesticide use. 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 federal, state, and local monitoring programs to assess the possible impact of pesticides on Oregon's water quality. Pesticide detections in Oregon's streams can be addressed through multiple programs and partners, including the PSP.

Through the PSP, state agencies and local partners work together to monitor pesticides in streams and to improve water quality (www.oregon.gov/ODA/programs/Pesticides/Water/Pages/PesticideStewardship.aspx). ODA, DEQ, 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. Since 2000, the PSPs have made noteworthy progress 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/programs/Pesticides/water/pages/AboutWaterPesticides.aspx). 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. By managing the pesticides that are approved for use by the US EPA and Oregon in agricultural and non-agricultural settings, the PMP sets forth a process for preventing and responding to pesticide detections in Oregon's ground and surface water.

1.5.5 Drinking Water Source Protection

Oregon implements its drinking water protection program through a partnership between DEQ and the Oregon Health Authority (OHA). The program provides individuals and communities with information on how to protect the quality of Oregon's drinking water. DEQ and OHA encourage preventive management strategies to ensure that all public drinking water resources are kept safe from current and future contamination. For more information, visit www.oregon.gov/deq/wq/programs/Pages/dwp.aspx.

1.6 Partner Agencies and Organizations

1.6.1 Oregon Department of Environmental Quality

The US EPA delegated authority to DEQ to implement the federal CWA in Oregon. DEQ is the lead state agency with overall authority to implement the CWA in Oregon. DEQ works with other state agencies, including ODA and the Oregon Department of Forestry (ODF), to meet the requirements of the CWA. DEQ sets water quality standards and develops TMDLs for impaired waterbodies, which ultimately are approved or disapproved by the US EPA. In addition, DEQ develops and coordinates programs to address water quality including NPDES permits for point sources, the CWA Section 319 grant program, the Source Water Protection Program (in partnership with OHA), the CWA Section 401 Water Quality Certification, and Oregon's Groundwater Management Program. DEQ also coordinates with ODA to help ensure successful implementation of Area Plans.

A Memorandum of Agreement between DEQ and ODA recognizes that ODA is the state agency responsible for implementing the Ag Water Quality Program. ODA and DEQ updated the Memorandum of Agreement in 2012 and reviewed and confirmed it in 2018

(http://www.oregon.gov/ODA/shared/Documents/Publications/NaturalResources/DEQODAmoa.pdf).

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 Area Rules. The petition must allege, with reasonable specificity, that the Area Plan or Area 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 other organizations, including: DEQ (as described above), the United States Department of Agriculture (USDA) NRCS and Farm Service Agency, watershed councils, Oregon State University Agricultural Experiment Stations and Extension Service, tribes, 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 and to achieve water quality goals.

1.7 Measuring Progress

Agricultural landowners have been implementing 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 progress toward improved water quality. ODA is working with SWCDs, LACs, and other partners to develop and implement strategies that will produce measurable outcomes. ODA is also working with partners to develop monitoring methods to document progress.

1.7.1 Measurable Objectives

A measurable objective is a numeric long-term desired outcome to achieve by a specified date. Milestones are the interim steps needed to make progress toward the measurable objective and consist of numeric short-term targets to reach by specific dates. Together, the milestones define the timeline and progress needed to achieve the measurable objective.

The Ag Water Quality Program is working throughout Oregon with SWCDs and LACs toward establishing long-term measurable objectives to achieve desired conditions. ODA, the LAC, and the SWCD will establish measurable objectives and associated milestones for each Area Plan. Many of these measurable objectives relate to land conditions and primarily are developed for focused work in small geographic areas (section 1.7.3). ODA's longer-term goal is to develop measurable objectives, milestones, and monitoring methods at the Management Area scale.

The State of Oregon continues to improve its ability to use remote-sensing technology to measure current streamside vegetation conditions and compare these to the conditions needed to meet stream shade targets. As the State's use of this technology moves forward, ODA will use the information to help LACs and LMAs set measurable objectives for streamside vegetation. These measurable objectives will be achieved through implementing the Area Plan, with an emphasis on voluntary incentive programs.

At each biennial review, ODA and its partners will evaluate progress toward measurable objectives and milestone(s) and why they were or were not achieved. ODA, the LAC, and LMA

will evaluate whether changes are needed to continue making progress toward the measurable objective(s) and will revise strategies to address obstacles and challenges.

The measurable objective(s) and associated milestone(s) within the Management Area are in Chapter 3 and progress toward achieving the measurable objective(s) and milestone(s) is summarized in Chapter 4.

1.7.2 Land Conditions and Water Quality

Land conditions can serve as useful surrogates (indicators) for water quality parameters. For example, because shade blocks solar radiation from warming the stream, streamside vegetation, or its associated shade, generally is used as a surrogate for water temperature. In some cases, sediment can be used as a surrogate for pesticides or phosphorus, which often 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,
- Improved land conditions can be documented immediately,
- Water quality impairments from agricultural activities are primarily due to changes in land conditions and management activities,
- It can be difficult to separate agriculture's influence on water quality from other land uses,
- There is generally a lag time between changes on the landscape and the resulting improvements in water quality,
- Extensive monitoring of water quality would be needed to evaluate progress, which would be expensive and may not demonstrate improvements in the short term.

Water quality monitoring data will help ODA and partners to measure progress or identify problem areas in implementing Area Plans. However, as described above, water quality monitoring may be slower to document changes than land condition monitoring.

1.7.3 Focused Implementation in Small Geographic Areas

Focus Areas

A Focus Area is a small watershed with water quality concerns associated with agriculture. The Focus Area process is SWCD-led, with ODA oversight. The SWCD delivers systematic, concentrated outreach and technical assistance. A key component is measuring conditions before and after implementation to document the progress made with available resources. The Focus Area approach is consistent with other agencies' and organizations' efforts to work proactively in small watersheds.

Focus Areas have the following advantages: a proactive approach that addresses the most significant water quality concerns, multiple partners that coordinate and align technical and financial resources, a higher density of projects that may lead to increased connectivity of projects, and a more effective and efficient use of limited resources.

The current Focus Area for this Management Area is described in Chapter 3.

Strategic Implementation Areas

Strategic Implementation Areas (SIAs) are small watersheds selected by ODA, in consultation with partners, based on a statewide review of water quality data and other available information. ODA conducts an evaluation of likely compliance with Area Rules and contacts landowners with the results and next steps. The Oregon Watershed Enhancement Board (OWEB) and other partners make funding and technical assistance available to support conservation and restoration projects. These efforts should result in greater ecological benefit than relying solely on compliance and enforcement. Landowners have the option of working with the SWCD or other partners to voluntarily address water quality concerns. ODA follows up, as needed, to enforce the Area Rules. Finally, ODA completes a post-evaluation to document progress in the SIA.

Any SIAs in this Management Area are described in Chapter 3.

1.8 Progress and Adaptive Management

1.8.1 Biennial Reviews

The ODA, LAC, LMA, and partners evaluate progress of Area Plan implementation through the biennial review process. At each biennial review, they discuss: 1) progress toward meeting measurable objectives and implementing strategies, 2) local monitoring data from other agencies and organizations, including agricultural land conditions and water quality, and 3) ODA compliance activities. As a result of these discussions, ODA and partners revise implementation strategies and measurable objectives in Chapter 3 as needed.

ODA provides information from the Oregon Watershed Restoration Inventory (OWRI) on restoration project funding and accomplishments at biennial reviews and uses the information for statewide reporting. The majority of OWRI entries represent voluntary actions of private landowners who have worked in partnership with federal, state, and local groups to improve aquatic habitat and water quality conditions. OWRI is the single largest restoration information database in the western United States. For more information, visit www.oregon.gov/oweb/data-reporting/Pages/owri.aspx.

1.8.2 Water Quality Monitoring

In addition to monitoring landscape conditions, ODA relies on water quality monitoring data where available. These data may be provided by other state or federal agencies or local entities; ODA seldom collects water quality samples outside of compliance cases.

As part of monitoring water quality status and trends, DEQ regularly collects water samples every other month throughout the year at over 130 sites on more than 50 rivers and streams across the state. Sites are located across the major land uses (forestry, agriculture, rural residential, and urban/suburban). Parameters measured include alkalinity, biochemical oxygen demand (BOD), chlorophyll a, specific conductance, dissolved oxygen (DO), DO percent saturation, bacteria (*E. coli)*, ammonia, nitrate and nitrite, pH, total phosphorus, total solids, temperature, and turbidity.

DEQ provides status and trends reports for selected parameters in relation to water quality standards. ODA will continue to work with DEQ to summarize the data results and how they apply to agricultural activities. Water quality monitoring efforts in this Management Area are described in Chapter 3, and the data are summarized in Chapter 4.

Chapter 2: Local Background

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).

2.1 Local Roles and Responsibilities

2.1.1 Local Advisory Committee

For each Management Area, the director of ODA appoints a LAC (OAR 603-090-0020) with as many as twelve 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 agricultural landowners in the Management Area and must reflect a balance of affected persons.

The Lower Willamette LAC was formed in 2001 to assist with the development of this Area Plan and Area Rules. The Local Advisory Committee members are involved in a wide variety of operations including row crops, nursery, livestock, vegetables, hay, and orchards. Recreational and environmental interests are also represented. Table 2.1.1 lists the current members of the LAC.

Table 2.1.1 Current LAC members

Name	Geographic Representation	Agricultural Product or Interest Representation
(Chair)-Vacant		
(Vice-Chair)-Vacant		
Dean Apostol	Gresham	Hay, organic fruits, vegetables, ducks. Landscape architect.
Chris Foster	Portland	Chestnut grower
Kathy Taggart	Gresham	Woody ornamentals, perennials, grasses
Roy Iwai	Multnomah County	Water Quality Specialist
Martha Mitchell	Portland	Professional
Vacant		Nursery
Vacant		Livestock/ Equine
Vacant		Small Farm
Vacant		

2.1.2 Local Management Agency

The implementation of this Area Plan is accomplished through an Intergovernmental Grant Agreement between ODA and the East Multnomah, Clackamas and West Multnomah SWCD(s). This Intergovernmental Grant Agreement defines the SWCD(s) as the Local Management Agencies (LMA) for implementation of the Area Plan. The SWCD(s) were also involved in development of the Area Plan and associated Area Rules.

2.2 Area Plan and Rules: Development and History

The Director of ODA approved the Area Plan and Area Rules in October of 2003. Since the Area Plan was approved and the Area Rules were adopted, the LAC has convened for several biennial reviews since 2006 to evaluate progress and update the Area Plan.

2.3 Geographical and Physical Setting

2.3.1 Location and Land Use

The Lower Willamette Agricultural Water Quality Management Area (Management Area) is located in northwest Oregon surrounding the greater Portland Metropolitan area (Figure 2.3). The Columbia River, Multnomah Channel, and the Columbia County line border the Management Area on the north. 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). Multnomah County is the smallest county in acreage but has the highest population in Oregon.

The predominant land use in the Lower Willamette Management Area is urban. Portland is the largest city in the state with 2.2 million people living in the greater Portland area (US Census 2010). The annual rate of population growth in the urban area is two percent. Other urban centers include Gresham, Fairview, Wood Village, Troutdale, Johnson City, Happy Valley, Gladstone, Lake Oswego, Maywood Park, Milwaukie, and West Linn.

Table 2.3.1 Land Use in the *Lower Willamette Management Area by State Zoning (Acres)

Data: 2017 - Oregon Department of Land Conservation and Development
See Figure 3: Map of the Lower Willamette Management Area

Zones	Washington County	** Multnomah County	Clackamas County	MA Total
Farm Use	0	4,685	2,460	**7,145 acres**
Mixed Farm Forest	0	0	57	**57**
Forest Private and Federal	3,848	12,160	951	**16,959**
Rural Residential	0	1,527	3,295	**4,822**
Commercial	0	1,973	524	**2,497**
Industrial	0	23,580	894	**24,474**
Public Use/ Parks/ Open Space	0	17,198	535	**17,733**
Low-Very High Density Residential	0	61,932	4,253	**66,185**

* Acreage is only of those zones inside the Lower Willamette Management Area found in Clackamas, Multnomah, and Washington counties. ** Multnomah includes Metro-city of Portland.

2.3.2 Agriculture

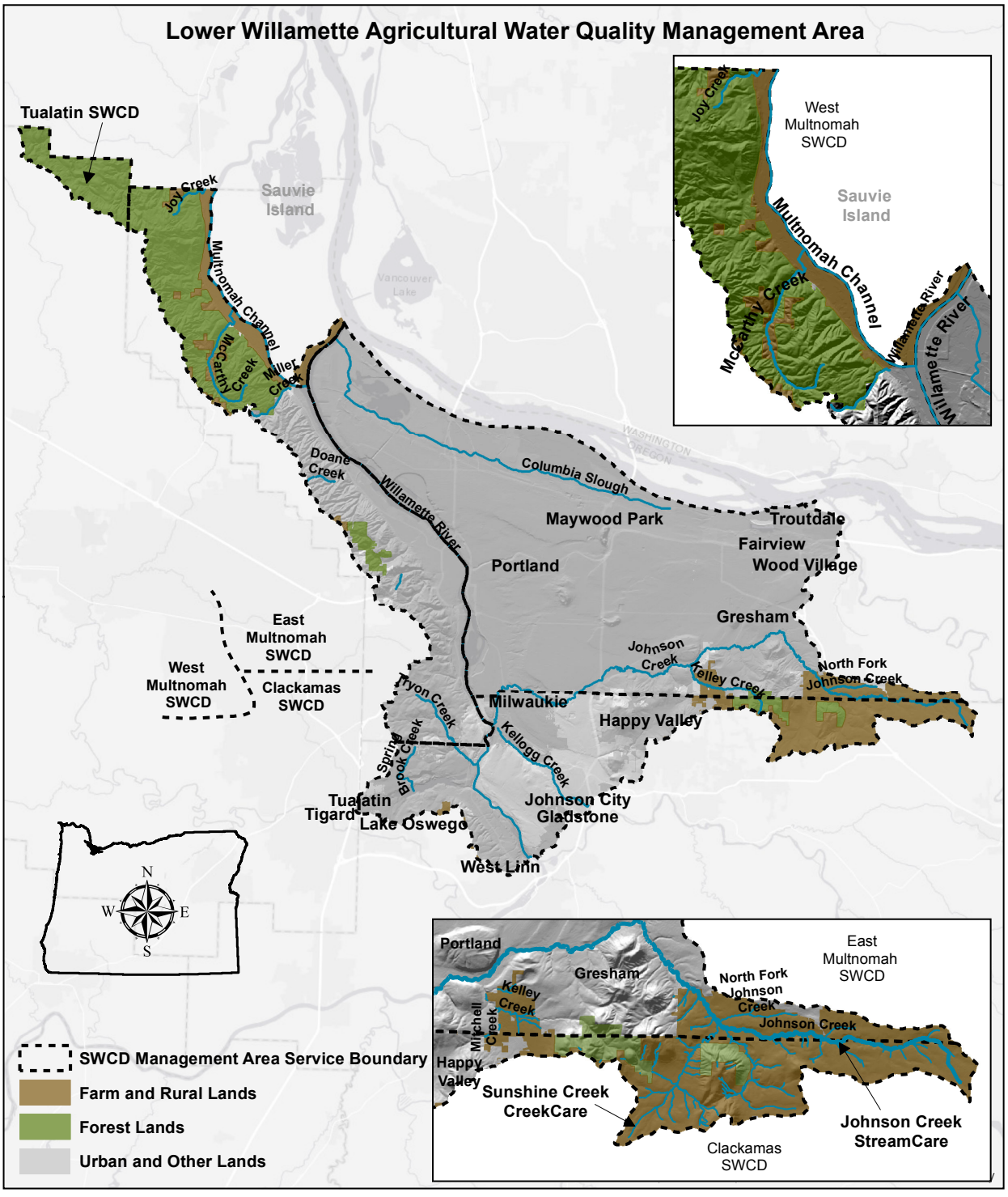
Farmland accounts for approximately five percent of the total land area within the Management Area boundary. Johnson Creek Watershed has the highest density of agricultural activities in the Management Area and occupies approximately 24 percent of the watershed, mostly in the upper portions of the watershed.

Nathanial Wyeth (1802-1856) is credited with introducing the first cattle, sheep, goats, and hogs into Multnomah County which were brought from the Hawaiian Islands. He also planted the first crops, including wheat, potatoes, beans, peas and turnips, and planted the first fruit trees and grafts. (Multnomah County 1990). Today agriculture is still very productive in Multnomah County. Greenhouse and nursery production are common and small family farms are prevalent in the Lower Willamette MA. See Table 2.3.2 for agricultural production in Multnomah County.

Table 2.3.2 Agricultural Production in Multnomah County

2017 US Census of Agriculture **NOTE**: This data is for discussion purposes only. It is not likely that the census results include all operations that meet the definition of a farm or that all those that do meet the definition of a farm respond to the census inquiry. Information could be missing or inaccurate and is a report for all of Multnomah County not just the Lower Willamette Management Area. https://www.nass.usda.gov/Publications/AgCensus/2017/index.php	
Production	**Multnomah County**
Total Land in Agricultural Production (acres)	25,435
Number of Farms	653
Land in Pasture-All Types (acres)	2,998
*Permitted Confined Animal Feeding Operations	1
# Farms in the USDA National Organic Program	27
# Farms in USDA ** Conservation Programs	0
Livestock (# farms with)	
# farms: with Beef and Milk Cows	121
Equine: Horses, Ponies, Mules, and Donkeys	88
Layers/ Poultry/ Turkey	199
Goats, Sheep and Lambs	115
Hogs and Pigs	12
Llamas and Alpacas	19
Total Bee Colonies in Multnomah County	1,305
Crops (acres)	
Field Seeds, Grass Seeds, Hay, Forage, Silage	3,775
Vegetable Row Crops	2,589
Orchards and Berries (acres)	
Land in Orchards	304
Land in Christmas Trees	272
Land in Berries	1,087
Greenhouse/ Nurseries (in growing square footage)	
All Nursery and Greenhouse Types	1,288,964 (~30 acres)
* Data from Oregon Department of Agriculture, Confined Animal Feeding Operation Program 2020 ** Conservation Reserve, Wetlands Reserve, Farmable Wetlands, and CREP	

Figure 2.3 Map of Lower Willamette Ag WQ Management Area



This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

Prepared By: B. Sanchez
Date Saved: 1/11/2019
Date Printed: 9/23/2020
Scale: 1:280,000
Projection: NAD 1983 Oregon Statewide Lambert Feet Intl
Path: V:\NRPA\WaterQuality\BrendaSanchez\Lower Willamette\Lower Willamette Area Plan

OREGON DEPARTMENT OF AGRICULTURE
635 Capitol St NE
Salem, OR 97301-2532 USA

2.3.3 Water Resources

The Willamette River and its principal tributaries drain 11,478 square miles (12 percent of Oregon), with the basin's runoff fluctuating between the heavy precipitation of the winter months and the low precipitation of summer. The Willamette River Basin is approximately 180 miles in length and nearly 100 miles wide. The riverbed is approximately 450 feet above sea level at the southern end of the valley and ten feet above sea level at its confluence with the Columbia River. (Oregon Encyclopedia Robbins 2018). Weather conditions in the Willamette Basin 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 Willamette Basin ranges from 37-50 inches and increases with elevation.

The Willamette River system contributes fifteen percent of the average annual flow of the Columbia River. The south-to-north-flowing Willamette is the thirteenth largest river in the contiguous United States, with an average annual discharge of 32,000 cubic feet per second (cfs) at its confluence with the Columbia River northwest of Portland. (Oregon Encyclopedia Robbins 2018).

The Willamette Basin discharges more runoff per acre than any other large river in the United States, with most of it occurring during the winter rainy season. Summer rainfall in the basin averages around five percent of the yearly total. The peak river flow during the floods of January 1996 was estimated at about 460,000 cfs at Portland. In contrast, officials recorded a low flow for Portland of 4,200 cfs on July 10, 1978. (Oregon Encyclopedia Robbins 2018).

The Cascade Range to the east has an equally significant seasonal precipitation. Most of it, however, occurs as snowfall and there are large snowfields and some permanent glaciers. The Cascades also provide a buffer from continental climatic influences, creating a unique blend of topographic relationships that shape the regional climate. (Oregon Encyclopedia Robbins 2018).

The Lower Willamette Management Area is located in the northern most portion of the Willamette River Basin and is drained by the Willamette River, Multnomah Channel, and tributaries. Major tributaries to the Willamette River in the Lower Willamette Management Area are the Columbia Slough and Kellogg, Springbrook, Tyron, and Johnson creeks. Nine perennial streams travel through lands zoned as farm use: Multnomah Channel, lower Willamette River mainstem, and Ennis, Johnson, North Fork Johnson, Jones, Joy, Kelley, McCarthy, and Miller creeks. Figure 3.

Johnson Creek Watershed has the highest density of agricultural activities in the Management Area. Johnson Creek is composed of 25 river miles and drains nearly 54 square miles and is considered to have a “flashy” hydrological response during rain events. This means Johnson Creek’s streamflow responds quickly to precipitation events and quickly reaches bank full, which has provided Johnson Creek with a long history of serious flooding events. In the 1930s, Johnson Creek was straightened, widened, deepened, and lined with rock to control flooding. These actions disconnected the creek from its floodplain and still major flooding occurs. From 1941-2006 Johnson Creek flooded 37 times. The largest of these occurred in 1964. (BES 2001). According to the OWRD there are 41 active surface water withdrawal rights in the Johnson Creek watershed. Johnson Creek has a significant impact on water quality during both low and high stream flows. A substantial portion of summer stream flow comes from Crystal Springs through Crystal Creek.

Box 2.3.3 Soils of the Lower Willamette Management Area

Listed below are four soil groups composed of soil mapping units found most often in the Lower Willamette Management Area. (USDA Multnomah and Clackamas County Soil Surveys 1993). For detailed information about soil in the Lower Willamette Management Area, refer to USDA NRCS Web Soil Survey at https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

Sauvie-Rafton-Pilchuck (along the Columbia River): Excessively drained to very poorly drained silt loams, silty clay loams, and sands found on bottomlands. These soils are generally underlain by coarse or moderately coarse alluvium to below a depth of 60 inches. Rafton soils are subject to frequent flooding from December – July, and in some places, ponding occurring into July. These soils are used for farming, urban development, and wildlife habitat.

Multnomah-Latourell-Urban (Gresham/Fairview area): These soils are characterized as very deep, well-drained loams and silt loams over gravelly silt loam or sandy loam formed from alluvium. There are no major limitations, however, some uses are limited in areas that have slopes of more than 15 percent. Septic tank absorption fields in areas of Multnomah soils can contaminate ground water sources because of very rapid permeability in the underlying gravel. Soils in this map unit are used for urban development, farming, and wildlife habitat.

Cascade-Urban Land-Cornelius (Johnson Creek Watershed): Moderately deep and deep, moderately well drained and somewhat poorly drained silt loams. Cascade and Cornelius soils are characterized as a silt loam over a thick fragipan found at a depth of 20-30 inches. Fragipan is a sub-surface soil layer that restricts water flow and root penetration and is formed under immense compaction from natural events such as glaciers. The soils in this map unit are used for farming, timber production, urban development, and wildlife habitat. If these soils are drained, most commonly grown crops are suited. The potential for farming is good in areas that have slopes of less than 8 percent. The potential for timber production and wildlife habitat is good.

Cascade-Powell (Clackamas County portion of this Management Area): Powell soils are somewhat poorly drained silt loams over a thick fragipan found at a depth of 20-30 inches with low permeability. These soils formed from silt materials and are subject to a seasonal water table above a depth of 20 inches from December – April. 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.

2.3.4 Geology and Soil

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. 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 et al. 1992)

The US Department of Agriculture and the Natural Resources Conservation Service completed soil surveys across Oregon and published soil surveys by county. Each survey has a detailed report of soils in the area as well as maps, soil boundaries, and soil properties. Box 2.3 is a summary of soil types found in the Management Area. For detailed information about soil in the Lower Willamette Management Area, refer to USDA NRCS Web Soil Survey at https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

2.3.5 Biological Resources

Streams in the Lower Willamette Management Area, including Johnson Creek, support a wide range of native fish and amphibians. A diversity of wildlife in the Management Area depends on these species, including many species birds and mammals, such as mink, otter, owls, heron, and beaver. Several species are listed as "threatened" on the federal Endangered Species Act list, including steelhead trout and Chinook and Coho salmon. Other species are designated as "sensitive" species in Oregon, including the Pacific lamprey, northern red-legged frog and Oregon slender salamander.

The ecological functions of the streams, wetlands, and riparian habitat have been impacted as a result of multiple land uses, including agriculture. During winter, high flows from land runoff can cause bank instability, stream channel widening, and decrease the amount of large wood found in streams that wildlife needs for habitat. Agricultural runoff contains a mix of current and legacy pesticides, which can impact the health of fish, amphibians, and streambed insects. During

summer, throughout the Management Area, the lack of riparian shade and discharge from inline ponds cause the low flow to exceed water quality standard for temperature. Some stream reaches exceed the temperature standard for nearly four months during the year. As a result of these different seasonal regimes, habitat diversity and quality reduced. Summer cold water refuges (areas that are colder than the main river temperature) to protect aquatic species are limited, as are winter high flow refugia, and thus an overall decrease in species population is expected.

Key Species

Salmonids – Coho salmon

Coho salmon are an anadromous fish with a complex life history that includes spawning and juvenile rearing in freshwater, and an adult life stage in saltwater before returning to freshwater to spawn. Coho normally migrate between November and February when the water temperature is in the range of 45-60°F (7.2-15.6° C), and the water velocity does not exceed 2.44 m/s (Reiser and Bjornn, 1979). This allow the fish to return to small headwater tributaries to spawn and rear. Warmer temperature can result in delayed migration (Bell, 1986).

Coho juveniles are unique because they rear in freshwater for up to 15-months, utilizing in slow moving habitat, such as back eddies, undercut banks, log jams, and beaver ponds. These juveniles are prone to disease, stress, and reduced competitive behavior during summer months in streams with high temperatures (Carter, 2005). Temperatures above 75.2° F (24° C) may totally eliminate Coho from a stream (EPA, 2001).

Juvenile Coho tend to move upstream into smaller tributaries during winter. Pesticide residues in urban and agricultural runoff may act as neurotoxins on juvenile Coho reducing feeding behavior, growth, and size at migration (Baldwin, 2009). Chronic exposure to suspended sediment by juvenile Coho can lead to reduced tolerance to pathogens (Redding, 2011) and effects on growth (Sigler, 1984).

Coho adults return to their natal streams in October through January. Returning adult Coho are prone to succumb pre-spawn mortality, ranging from 20% - 90% regionally, as a result of exposure to toxins in storm water runoff (Spromberg, 2011). Coho females need clean gravel on or near a riffle to successfully build their egg sacs. Scour and siltation from high turbid flows can suffocate eggs or displace eggs from egg sacs.

Amphibians – Red-legged frog

Red-legged frogs are large, semi-aquatic frogs that live throughout our ponds, streams, and forest. They were once the most common frog throughout Oregon but their populations have declined substantially due to changes in the availability and health of their habitat (IUCN 2015). Fortunately, like most of our amphibians, they are often found throughout agricultural land when certain key features are present.

The frogs lay their eggs in ponds in the late winter and spend the spring as tadpoles in those ponds. They only use ponds that have plants in the water, especially plants that root in shallow areas of ponds with about 1-3 feet of deep water and that grow up above the water surface, such as cattails, grasses, sedges, and rushes. When irrigation ponds start to draw down in early summer they can strand tadpoles. In order to have enough time to go through metamorphosis and turn into adult frogs, the ponds need to hold some water through the end of June (Holzer, 2014).

In the heat of the summer, red-legged frogs spend their time on the cool banks of streams and creeks. They do best when there is lots of shade from trees along the banks and shrubby vegetation to hide from predators (Lanoo, 2005).

The ponds and streams that the frogs use can be impacted by pesticides. Some pesticides can have direct impacts on the frogs through toxicity, hormone disruption, and making it difficult to breathe and drink through their sensitive skin (Relyea, 2008; Mann et al., 2009; Baker et al., 2013). Additionally, frogs rely on insects as their main food source, and aquatic insect populations can decrease substantially when insecticides make their way into the water (Carpenter et al., 2016). When ponds and streams are vegetated, and pesticides are limited, red-legged frogs and other amphibians can thrive in the agricultural areas of the Lower Willamette Management Area.

Table 2.3.5 Lower Willamette Native Fish Species w/ Federal or State Conservation Status and Salmonid Habitat Requirements for Oregon Streams

Native Fish Species with Federal or State Conservation Status National Marine Fisheries Service: ESA Status of West Coast Salmon and Steelhead (2011) Oregon Department of Fish and Wildlife: Sensitive Species List (2008)			
Species	**Population**	**Federal Status ESA**	**Oregon State Status**
Steelhead Trout-winter run	Lower Columbia River	Threatened	Critical
Chinook Salmon-fall & spring runs	Lower Columbia River	Threatened	Critical
Coho Salmon	Lower Columbia River	Threatened	Endangered
Chum Salmon	Columbia River	Threatened	Critical
Pacific Lamprey	Oregon	-	Vulnerable

Salmonid Habitat Requirements *Adapted from Salmon Habitat Requirements for Northern Oregon Coastal Streams Tillamook Bay National Estuary Project 1997; Updated 2018 ODFW.* *This information is general and will vary throughout the Lower Willamette Subbasin*							
Species	**Life Cycle**	**Location**	**Water Temperature**			**Fry Habitat**	**Juvenile Habitat**
			Spawning	Incubation	Rearing		
Chinook Spring	Migration Apr-Jun Spawning Sep-Oct	Upper mainstem streams	42°F – 57°F (5.5°C – 13.8°C)	32°F – 68°F (0°C – 20°C)	45°F-58°F; growth stops @ 69°F/ 20°C lethal @ 77°F/ 25°C	Stream; river edges	Deeper water in main river channel
Chinook Fall	Migration Sep-Dec Spawning Oct-Jan	Mainstem & large tributaries	42°F – 57°F (5.5°C – 13.8°C)	32°F – 68°F (0°C – 20°C)	45°F-58°F; growth stops @ 69°F/ 20°C lethal @ 77°F/ 25°C	Stream; river edges	Deeper water in main river channel
Chum	Migration Nov-Dec Spawning Nov-Dec	Lower mainstem and tributaries	45°F – 55°F (7.2°C – 12.7°C)	40°F – 56°F (4.4°C – 13.3°C)	44°F-48°F; growth stops @ 69°F/ 20°C lethal @ 77°F/ 25°C	Move directly to estuary	High sediment will kill
Coho	Migration Sep-Jan Spawning Oct-Jan	Small tributaries	40°F – 57°F (4.4°C – 13.8°C)	40°F – 56°F (4.4°C – 13.3°C)	53°F-48°F; growth stops @ 69°F/ 20°C lethal @ 78°F/ 25.5°C	Backwater pools & stream edges	Pools, off channel alcoves
Steelhead Winter	Migration Nov- May Spawning Jan-May	Small tributaries	39°F – 49°F (3.8°C – 9.4°C)	40°F – 56°F (4.4°C – 13.3°C)	45°F-58°F; growth stops @ 69°F/ 20°C lethal @ 78°F/25.5°C	Stream edges	Pools, rifles, & runs of tributary streams, large woody debris

2.4 Agricultural Water Quality

2.4.1 Water Quality Issues

Streamflow in the Willamette River is highly modified by dam and reservoir operations. The US Congress passed 15 flood control acts between 1938 and 1974 that affect the Willamette Basin. The purpose of the USACE dams is to provide flood control, navigation, hydroelectric power, and water in summer for irrigation and recreation. Not only are stream temperatures affected by reservoir stratification and bottom release of stored water, but also the timing of when high and low stream temperatures occur.

2.4.1.1 Beneficial Uses

Water quality standards are established to protect beneficial uses of the state's waters. Table 2.4.1.1 displays the State of Oregon's designated beneficial uses for the Lower Willamette Subbasin.

Table 2.4.1.1 Designated Beneficial Uses for the Lower Willamette Subbasin

Adapted from the 2005 Table 340A Willamette Basin at: https://www.oregon.gov/deq/Rulemaking%20Docs/table340a.pdf		
Beneficial Use	**Willamette Mainstem from Mouth to Willamette Falls including Multnomah Channel**	**All Lower Willamette Tributaries**
(1) Public Domestic Water Supply[1]	X	X
(1) Private Domestic Water Supply[1]	X	X
Industrial Water Supply	X	X
Irrigation	X	X
Livestock watering	X	X
(2) Fish and Aquatic Life	X	X
Wildlife and Hunting	X	X
Fishing	X	X
Boating	X	X
Water Contact Recreation	X	X
Aesthetic Quality	X	X
Hydro Power	X	X
Commercial Navigation & Transportation	X	
(1) With adequate pretreatment (filtration and disinfection) and natural quality to meet drinking water standards. (2) Numeric and narrative water quality standards are designed to protect the most sensitive beneficial uses. Resident fish and aquatic life and salmonid spawning, rearing and migration are the most sensitive temperature-related beneficial uses occurring in the watershed.		

2.4.1.2 WQ Parameters and 303(d)List

A number of waterbodies within the Management Area are impaired (do not meet state water quality standards) for one or more water quality pollutants (Appendix D). The "303(d) list" is made available online through DEQ's 2012 Integrated Report Assessment Database and 303(d) List. Go online to see the full list of impaired waterbodies: https://www.deq.state.or.us/wq/assessment/rpt2012/search.asp

2.4.1.3 TMDLs and Agricultural Load Allocations

Through the TMDL, nonpoint sources (including agriculture, forestry, and urban) are assigned "load allocations," while point sources are assigned "waste load allocations" in their permits. Non-point source (agricultural) load allocations apply all year-round to all perennial and fish-bearing intermittent waters within the Lower Willamette Management Area.

See Table 2.4.1.3 for TMDLs and agricultural load allocations in the Lower Willamette MA.

Table 2.4.1.3 Pollutants with TMDLs and Load Allocations Applicable to Agriculture for the Lower Willamette Management Area

Cat 4A: Water quality limited, TMDL approved - See Appendix D for description of pollutants
Bacteria: Applies to all waterbodies in the Willamette Basin ***Load Allocation*:** Allocations to lower Willamette River are for urban and agricultural runoff. • Johnson Creek: 78% reduction • Fairview Creek: 66% • Springbrook Creek: 80% • Willamette River: 78%
Temperature: Applies to all waterbodies in the Willamette Basin ***Load Allocation*:** Johnson Creek: a 51% increase above system potential shade conditions; Columbia Slough: a 25% increase above system potential shade conditions. The temperature TMDL for the Lower Willamette establishes site-specific shade targets for the mainstem of Johnson Creek and the Columbia Slough as well as subbasin-wide "shade curves" that can be used to establish shade targets for all streams in the Lower Willamette Subbasin. Modeling results indicate that improved stream shading through the establishment of mature riparian vegetation will result in a significant reduction of Johnson Creek water temperatures and that a combination of improved shading and hydrologic improvements will result in significantly cooler water temperatures within the Columbia Slough.
Mercury: Covers all State of Oregon perennial and intermittent streams in the Willamette Basin ***Load Allocation*:** Applies to general nonpoint source sectors, including agriculture and water conveyance entities. A 97 percent reduction of total mercury is needed in the Lower Willamette Subbasin (17090012) to protect aquatic life and consumers of fish and shellfish. The total mercury water column target is 0.14 ng/L. Note: The load allocation is based on EPA's TMDL that was issued in December 2019 and is currently effective. Note that EPA is revising its TMDL based on public comment and expects to issue the final TMDL in late 2020.
DDT, DDE, and Dieldrin: Although these pesticides have since been banned in the U.S., they can still be found in the environment. Both the Johnson Creek Watershed and the Columbia Slough TMDLs have established allocations for DDT (and DDE for the Columbia Slough) and dieldrin. For the Johnson Creek Watershed, the allocation is a 94% reduction of DDT and dieldrin from nonpoint sources, or alternatively, a target of 15 mg/L of total suspended solids (TSS) as a surrogate measure. For the Columbia Slough, DEQ developed separate DDT/DDE and dieldrin allocations for storm water and sediment sources
Nutrients and pH: 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: Applies to Johnson Creek. 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.

TMDL Documents for the Lower Willamette Management Area:

- Willamette Basin - Bacteria, Temperature, and Mercury: Approved 2006
- Willamette Basin: Chapter 5 - Lower Willamette Subbasin: Approved 2006
- Columbia Slough: Approved 1998.

Available online: https://www.oregon.gov/deq/wq/tmdls/Pages/TMDLs-Willamette-Basin.aspx.

While this Area Plan applies to all agricultural water pollution, the objectives and strategies currently emphasize parameters on the 303(d) list with an approved TMDL for pollutants on the list of impaired water bodies.

It is recognized that, despite the best and most earnest efforts, natural events may interfere with or delay attainment of the TMDL and/ or its associated surrogates. Such events could be but are not limited to flood, fire, insect infestations, and drought. Under the prevention and control measures in the Area Rules (OAR 603-095-3740), landowners and operators are not responsible for mitigating or dealing with factors that do not result from agricultural practices.

2.4.1.4 Drinking Water

Thirty-nine active public water systems obtain domestic drinking water from groundwater sources in the Management Area. Drinking water is an important beneficial use under the federal Clean Water Act. When Clean Water Act standards are met in source waters, a drinking water treatment plant using standard technology can generate water meeting the Safe Drinking Water Act maximum contaminant limits (MCLs).

There are 20 active Community public water systems in the Management Area using only groundwater wells to serve approximately 760,017 people on a regular basis. Several of the community public water systems in the management area have recent alerts for detections of bacteria.

Agricultural land uses (orchards, nurseries, irrigated crops, hay/pasture, and livestock) are present near many of the public water system wells and springs in the management area. Agricultural lands are dispersed throughout the management area and tend to be smaller farms and parcels. Contaminants in water supplies potentially related to agriculture co-occur with human populations, agricultural land uses, and aquifers susceptible to contaminant infiltration.

The private wells for which data are available in the Management Area, showed slightly elevated nitrate levels, three exceeding the alert level of 5 mg/L. No wells exceeded the nitrate MCL for drinking water standards. Many of the wells are in high and medium leaching potential soils. Nitrate from fertilizers and septic systems can readily penetrate to the aquifers used for drinking water when leaching potential is high or very high, and bacteria removal through soil filtration can be less effective in sandy soils. Other contaminants found in public water systems that are not related to agriculture include: arsenic, sodium, lead, and tetrachloroethylene.

The OHA rated some of the public water system wells in the Management Area for contaminant susceptibility for land use impacts to drinking water sources based on Source Water Assessments, aquifer characteristics, and well locations and construction. The Management Area has a mix of low, moderate, and high susceptibility wells. The nitrate and other contamination issues described above and the ready movement of nitrogen into aquifers in the area verify this susceptibility. Measures to reduce leachable nitrate in soils would reduce risk to groundwater sources of drinking water.

2.4.2 Sources of Impairment

The sources of water pollution can be divided into two general categories: point sources and non-point sources. Point sources of pollution within this Management Area consist mainly of municipal wastewater discharge and Confined Animal Feeding Operations (CAFOs). These point sources are required to obtain a permit from DEQ in order to discharge waste.

Non-point source pollution is normally considered the result of various activities throughout a watershed. Non-point sources of pollution may include:

- Eroding agricultural and forest lands,

- Eroding stream banks and roadways,
- Erosion from development,
- Lack of riparian shade producing vegetation,
- Contaminated runoff from livestock and other agricultural operations,
- Contaminated runoff from urban uses,
- In-line ponds (stream side).

The pollutants from these sources are carried to the surface water or groundwater through the action of rainfall, irrigation runoff, and seepage. While there may not be severe impacts on water quality from a single non-point source or activity, the combined effects from all sources contribute, along with impacts from other land uses and activities, to the impairment of the beneficial uses of the water in the area.

2.5 Regulatory and Voluntary 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. The Area Plan contains voluntary, incentive-based approaches to water quality management and is not enforceable. However, the AgWQMA authorized ODA, in cooperation with the LAC to develop Agricultural Water Quality Management Area Rules that can be enforced to ensure prevention and control of water pollution from agricultural sources.

Prevention and Control Measures (PCM) are a set of minimum regulatory standards that must be met on all lands in agricultural use, and are defined in the OARs for the Lower Willamette Management Area (OAR 603-095-3740). Producers who fail to address PCMs may be subject to enforcement procedures based upon the Area Rules. Enforcement procedures are outlined in Section 1.3.1 and in Figure 1.3.1. The Area Rules were developed based on the PCMs outlined in the sections below.

The PCMs relate directly to water quality issues identified in the Management Area and 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.

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

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 PCMs 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.

Under the PCMs 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 waterbodies,
- 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.

2.5.1 Waste Management

The aim of agricultural waste prevention and control is to minimize the transport of nutrients, pesticides, pathogens, irrigation tail-water, and sediment into waters of the state (Refer to Definitions Section 1.4.4). Because agricultural waste includes a broad range of substances, there are numerous voluntary conservation strategies that may be taken to minimize waste inputs into waters of the state.

Intent
The LAC understands that not all situations resulting in impacts to 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.

Warning Signs That Agricultural Waste May Be Reaching Water
Landowners often want ideas about what conditions or situations they should watch for on their land that could cause water quality problems or violations. Some things to watch for 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,

OAR 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 ORS 468B.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]

- Underground drainage tile outlets either improperly installed or maintained, allowing bank erosion to occur,
- Irrigation application that creates surface runoff entering the waters of the state,
- Visible trail of 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 waters of the state,
- Runoff flowing through areas of high livestock usage and being deposited in waters of the state,
- Livestock waste located in drainage ditches or areas of flooding.

2.5.2 Nutrient Management

OAR 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 ORS468B.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.

Over application of crop nutrients may result in nutrients running off or leaching into waters of the state. This may cause nuisance algal growth, high pH, bacterial contamination, and a decrease in dissolved oxygen.

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.

Intent
The nutrient PCM 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.

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 PCMs.

Clear Non-Compliance:
- Fertilizer product applied to, or remaining on surface water,
- Visible trail of manure, soil, or compost to surface water,
- Fall soil tests show excess of 30 ppm Nitrate (NO_3^{1-}) 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 such as, 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. Additional water quality

parameters that may be positively impacted by this rule include chlorophyll *a*, pH, aquatic weeds and algae, and sedimentation.
Sound agronomic practices related to nutrient management include:

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

2.5.3 Erosion Management

OAR 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, 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 PCM to dictate to growers what tillage practices they may or may not employ. This PCM does however, require growers to look at their entire cropping operation in terms of erosion prevention and sediment control.

This PCM 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.

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 streamside 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.

Erosion that results in sediment entering waters of the state could lead to excessively turbid water, sedimentation of the water body, and an increase in toxins due to the fact that many pesticide materials and pathogens attach to soil particles. 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 could potentially disrupt a fish's respiratory process by way of entering a fish's gills.

Once applied, certain pesticide and nutrient materials attach to soil particles. If soil is moving off the property and into waters of the state, pesticides, bacteria, and nutrients will likely accompany it. 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.

There will always be erosion and unstable streambanks. The point is to try to achieve normal/natural disturbance levels, not eliminate them. Limit sediment movement off the property.

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.

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.

1) **Use Erosion Prevention and Sediment Control Techniques.**
    a. Consider switching from conventional tillage to conservation tillage or no till. While soil erosion is a natural process, poorly managed tillage operations have the potential to accelerate erosion rates to unacceptable levels.
    b. Plant or till perpendicular to slope following elevation contour lines.
    c. Utilize soil health principles and avoid leaving your soil bare or uncovered. Plant a cover crop. www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health/.
    d. Under certain farming conditions sub-soiling or deep ripping a field can improve water infiltration.
    e. Controlling the timing and location of livestock grazing.
    f. Properly designed and maintained conservation strategies such as strip cropping, catch basins, grass-lined waterways, vegetative filter strips, straw bales and other methods can be very effective in retaining sediment.

2) **Construct and Maintain Agricultural Access Roads.** Roads and road-related structures (e.g. stream crossings, culverts, bridge abutments, cut slopes, etc.) have been identified in many watersheds as being significant sources of sediment input to streams. Many management methods are available for constructing and maintaining roads to increase their stability and reduce erosion. Some conservation strategies that can be used to minimize runoff from roads and staging areas are to design and construct an appropriate culvert, maintain a grass cover where appropriate such as along ditch banks, and construct water bars and/or grading roads.

While agricultural operations do not always have extensive road networks, a single poorly maintained road can comprise the vast majority of one farm's sediment output. Consultation on conservation measures for road construction and maintenance is encouraged, especially for roads built on steeper terrain, and for roads close to or crossing streams. Landowners may be held liable for water pollution from roads constructed on their property and therefore should review the wording of any easement agreements.

3) **Implement Irrigation Water Management** (Described in section 2.5.7).

2.5.4 Riparian Management

OAR 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 PCM is anticipated to allow landowners to develop a flexible streamside 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 aquatic and wildlife habitat and helps reduce solar radiation reaching

the water which impacts water temperature. This PCM is also anticipated to minimize the impact of livestock on streamside vegetation.

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 Area Rule include aquatic weeds or algae, bacteria, biological criteria, dissolved oxygen, nutrients, sediment, temperature, total dissolved gas, toxics, and turbidity.

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.

Healthy Streamside Areas Provide Several Important Water Quality Functions:

- 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;
- Infiltration of water into the soil profile;
- Stabilizing streambanks through plant root mass. Sediment trapping that builds streambanks and floodplains;
- Developing diverse channel characteristics providing pool depth, cover, and variations in water velocity necessary for fish habitat;
- Shading for minimization of heating from sunlight;
- Providing a source of large woody debris for aquatic habitat;
- Providing a source of fine and course 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;
- Water storage that provides cooler and longer duration late season flows;
- Biological uptake of sediment, organic material, nutrients, and pesticides.

The Ag Water Quality Program uses the concept of “site-capable vegetation” to describe the vegetation that agricultural streamside’s need to provide the functions that prevent and control water pollution. 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, wildlife, fire, floods) and

historical and current human influences that are beyond the program's statutory authority (e.g., channelization, roads, invasive species, past land management).

With appropriate information, time, and hard work, landowners have the authority and ability to develop flexible streamside vegetation management strategies while also providing the important functions required. Management strategies shall allow the establishment, growth, control, and maintenance of riparian vegetation appropriate to the site that is sufficient to provide shade and protection to the streamside area. Practices related to streamside management include:

- Rotational grazing in streamside areas; timed when growth is palatable to animals and when riparian areas are not saturated;
- Livestock exclusion from streamside area Establishing off-stream watering facilities;
- Planting perennial vegetation in streamside area.

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

- Increase in the numbers of desirable streamside 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.

2.5.4.1 Agricultural Pond Management

Agricultural ponds and surrounding land should be managed to minimize pollutant entry into waterways (e.g. runoff of pesticides, nutrients, and bacteria) and in accordance with WRD regulations. 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.

Consider the following measures and strategies when managing agricultural ponds for water quality:

- Outflow from agricultural ponds should be monitored periodically to identify potential water quality impairments;
- Manage soil erosion from berms. Be sure that berms are stable;
- Outflow from agricultural ponds should be timed to prevent water quality impairment;
- Avoid emptying pond water to streams or ditches year-round and apply pond water to areas of vegetation such as adjacent croplands or pasturelands;

- Taking care to ensure that nursery ponds are proactively maintained and operating at peak efficiency not only prevents negative water quality impacts, but also helps protect the bottom line by eliminating costly repairs.

Another 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.

2.5.5 Livestock Management

Appropriate livestock and grazing management can benefit landowners through developing healthy and vigorous pasture forage. Utilizing grazing management alternatives can protect and improve riparian habitat, stabilize streambanks and reduce sedimentation, and minimize nutrient and bacteria access to waterways. There are many different conservation strategies a landowner or operator can take such as:

- Vegetative buffer strips, which minimize the effects of runoff by catching pollutants before reaching a stream;
- Waste management systems including: clean water diversions (gutters, downspouts, and drainage channels), waste collection, storage, and utilization; and facilities operation and maintenance. Composting waste;
- 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;
- Pasture management and/or prescribed grazing can help maintain groundcover and the soil health of pastures, thus decreasing waste runoff;
- Through the management of livestock access to riparian areas, the effects of animal waste can be reduced. Some examples of techniques to achieve this may be off-stream watering, seasonal grazing, and exclusion (temporary or permanent). It is also important to ensure that the storage or application of manure does not contaminate drinking water wells.

2.5.6 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.

2.5.7 Pesticides

Always apply chemicals in accordance with the label requirements in order to minimize crop damage, buildup of chemicals in the soil, 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 non-restricted use pesticides.

- 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 need to be replaced often, particularly if an abrasive pesticide formulation (such as wettable powders) 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).
- 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.
- Establish appropriate vegetative buffer strips. Buffer strips will help to retain soil and stabilize streambanks (many legacy pesticides persist in the environment and adhere to soil particles) and surface runoff (which may have dissolved pesticides) from making contact with waters of the state.
- Control erosion to minimize sediment entry into waterways.
- 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.
- 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.

2.5.8 Irrigation Tail-Water

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

Landowners and operators are encouraged to have an irrigation water management plan. The type of irrigation system chosen should be appropriate for factors such as field slope, soil infiltration rates, water supply, and the type of crop. Irrigation water management should consider how long and how often the water is applied, plus how often wearable components (such as sprinkler nozzles, filter media, pump impellers, etc.) are replaced or serviced. Costly or complex irrigation systems are not a guarantee of success, particularly if they are managed or maintained incorrectly.

Irrigation scheduling decisions based on arbitrary considerations, such as calendar flood irrigation, should be avoided. 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 tail-water reaching waters of the state.

- Adopting an irrigation water management plan with irrigation soil moisture monitoring;
- Planting and irrigating crops on a contour;
- Planting sloping field edges to grasses;
- Installing sediment basins at field edges and in swales;
- Using drip irrigation when appropriate to crop type;
- Recycling return flows;
- Conservation tillage.

Chapter 3: Implementation Strategies

Goal
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.

LAC Mission
The mission of the Lower Willamette Local Advisory Committee is to promote agricultural management conditions that protect and improve water quality in the Lower Willamette Subbasin, while maintaining agricultural viability.

3.1 Measurable Objectives and Strategic Initiatives

3.1.1 Management Area

ODA is working with SWCDs and LACs throughout Oregon toward establishing long-term measurable objectives to achieve desired conditions. Currently, there is not a Management Area wide measurable objective (MO). Research and development of MOs related to the Area Plan strategies may occur overtime as new data, information, and methods become available. For this Management Area, ODA and the East Multnomah SWCD are using water quality sampling for bacteria at one station on Johnson Creek to monitor water quality conditions in a small watershed. See section 3.1.2.1.

3.1.2 Focused Efforts in Small Watersheds

3.1.2.1 Johnson Creek Bacteria Baseline Monitoring

The East Multnomah SWCD began collecting monthly water samples in 2010 after the Lower Willamette LAC identified a need for baseline data. East Multnomah collects samples once per month at six locations along Johnson Creek in agricultural lands. Samples are analyzed for pH, conductivity, total dissolved solids, total suspended solids, bacteria (*E.coli*), nitrate, and phosphorus.

Of the monitored parameters, bacteria data was selected to determine a baseline and to initiate a way to monitor the baseline. The baseline for bacteria was established by using data collected from November 2010 through December 2018 at one monitoring station; Johnson Creek at SE 282nd Avenue (Chapter 4, Figure 4.3). The baseline was determined by comparing the proportion of observations that measured above 406 *E.coli* organisms per 100ml to the number of observations that measured below 406 *E.coli* organisms per 100ml; establishing a baseline for the sampling station at 93.5%.

Strategy: Prevent runoff of agricultural waste: Manure from livestock and horse operations.
Water Quality Concern: Bacteria (*E. coli*). Johnson Creek is listed as an impaired stream for bacteria and has an approved TMDL.
Water Quality Sampling Station: Johnson Creek at SE 282nd Avenue (Figure 4.3). One sample taken monthly 12 times a year. Data provided by the East Multnomah SWCD. The sampling site was chosen because of its location in agricultural lands. Note that bacteria samples need to be collected more often at this monitoring station in order to directly compare results to the bacteria water quality standard.

A MO with milestones was developed to monitor changes in the baseline:

2018 Baseline Condition: Water samples collected from Johnson Creek at SE 282nd Avenue and SE Stone Road from November 2010 to September 2018 resulted in 93.5% (87/93) of the observations measuring below 406 *E.coli* organisms per 100ml.

Measurable Objective: Water samples collected from Johnson Creek at SE 282nd Avenue and SE Stone Road from November 2010 to September 2028 will measure below 406 *E.coli* organisms per 100ml for at least 97% of the observations.

Milestone 1: By 2020, increase the percentage of observations measuring below 406 *E.coli* organisms per 100ml to more than 93.5% of the observations.
Milestone 2: By 2024, increase the percentage of observations measuring below 406 *E.coli* organisms per 100ml to more than 95% of the observations.
Milestone 3: By 2028, increase the percentage of observations measuring below 406 *E.coli* organisms per 100ml to more than 97% of the observations.

Achieving the milestone indicates that samples measuring below 406 *E.coli* organisms are increasing and a probable indicator that bacteria at that station is declining. If the milestone is not achieved, it could indicate that there may be a water quality concern related to bacteria at that station.

Recommended activities for bacteria reduction from agricultural activities:

- Livestock operators and horse owners are responsible for implementing agricultural practices that prevent and control water pollution from livestock and horse operations.
- The LMA and other partners can provide technical assistance to agricultural landowners and operators in the Johnson Creek Subbasin regarding the prevention and control of water pollution from livestock and horse operations.

Note:

- MO and applicable water quality data is to be used for making informed decisions regarding adaptive management;
- Bacteria found in Johnson Creek water samples are from unknown source;
- An exceedance of an observation only indicates that bacteria is present in the water sample in an amount that is above the water quality standard;
- Each sample represents a single snapshot in time;
- During biennial reviews of the Area Plan, the MO and milestones can be modified as needed and are to be adapted and updated to reflect new data, information, and methods as they come about;
- Data at these sites can be variable and interpretation of results will require knowledge of local conditions known to affect the observed water quality conditions at individual sites;
- *E.coli* bacteria live in soil or vegetation and in the gastrointestinal tract of animals such as humans, wildlife, and livestock. *E.coli* enters surface water from the direct disposal of waste into streams or lakes. Bacteria could be in runoff from wooded areas, pastures, feedlots, septic tanks, manure piles, dog runs, and sewage plant;
- Bacteria samples need to be collected more often at this monitoring station in order to directly compare results to the bacteria water quality standard.

3.2 Proposed Activities

3.2.1 Activities

The activities and added guidance provided in the following sections were determined by the ODA, the LAC, and the LMA as a means to achieving the goal, mission of the LAC, and strategies of the Area Plan. The activities outlined are to be carried out typically by the ODA and the LMAs (SWCDs). In the Management Area, the East Multnomah, West Multnomah, and Clackamas Soil and Water Conservation Districts are the LMAs and local experts. They work in collaboration with ODA in achieving the goal of the Lower Willamette Area Plan. Agricultural landowners and operators are highly encouraged to participate in the listed activities on their own farms or in collaboration with the SWCDs, watershed councils, and Management Area partners or through their different grower groups or agribusiness associations. See Appendix A for contact information.

Every two years, with recommendations from the LAC (provided during biennial reviews) and in consultation with ODA, the LMA will select from the activities that best suit the capability, priorities, and resources of the LMA (SWCD). The LMA details the specific tasks they will implement in their Scope of Work and Focus Area Action Plan, which are submitted to the ODA every two years to receive funding for Area Plan implementation. It is also important that the ODA, the LMA, and Management Area partners consider working together to implement the activities in the Area Plan as opportunities, funding, and resources allow. See Chapter 4 accomplishments and progress towards implementing these activities.

3.2.1.1 Community and Landowner Engagement

A key component to achieving the objectives of the Area Plan is working to engage the agricultural community. It is recommended that the ODA, the LMA, and Management Area partners develop, promote, and conduct events and activities that directly connect with the agricultural community. Activities should include a range of opportunities for agricultural landowners and operators to strengthen their knowledge and capacity to prevent and control water pollution from agricultural activities as well as provide information about specific agricultural water quality issues that are of concern in the Lower Willamette MA.

Engaging the agricultural community should be considered at all levels from small to large-scale growers to family farms, nurseries, equine facilities, and livestock operations. Events and activities should be structured to address the diverse agricultural systems and related water quality concerns found in the Lower Willamette Management Area (Table 2 - Chapter 2).

Focus of Community and Landowner Engagement Activities

1. The Area Plan has identified bacteria, stream temperature, mercury, nutrients, and toxics as priority water quality parameters of concern. Events and activities related to water quality should have a focus on these water quality concerns whenever possible.
2. The Area Rules (PCMs in section 2.5) specify fundamental conditions for the management of livestock management, nutrients, soil erosion, and riparian areas. Emphasis, when conducting events and activities related to agricultural water quality management, should include information regarding these management objectives whenever possible.

The following activities are recommended at the local level and should be conducted in a manner that encourages cooperative efforts and promotes voluntary participation:

a. Develop an outreach strategy to inform the agricultural community of issues and events related to agricultural water quality prevention and control. This includes but is not limited to the distribution of informational material, interactions on social media, hosting a web page, creating a quarterly newsletter, and submitting public service announcements to local sources of news and communications.

b. Develop, promote, and conduct events or activities (connect, inform, and engage) that function to:
- Increase awareness of agricultural water quality concerns related to the Lower Willamette MA;
- Inform agricultural landowners and operators of the availability of technical assistance and farm planning public services available in the Management Area;
- Inform agricultural landowners and operators of the availability of funding opportunities available in the Management Area.

c. Develop, promote, and conduct events or activities (instruct and educate) that function to strengthen the knowledge and capacity of agricultural landowners and operators to:
- Prevent and control water pollution from agricultural activities;
- Prevent and control soil erosion from agricultural activities;
- Self-evaluate their agricultural operation and their impacts to water quality from agricultural activities.

d. Produce and or distribute informational material such as brochures, videos, and fact sheets related to the prevention and control of water pollution from agricultural activities.

e. Increase awareness of the agricultural community's accomplishments in water quality management and demonstrate successful and innovative efforts toward preventing and controlling water pollution from agricultural activities such as, but not limited to, conducting farm tours or writing success articles.

3.2.1.2 Technical Assistance

ODA can provide technical assistance, however, the LMA (SWCD) is a non-regulatory partner and a local source of expert knowledge and are more capable to serve the Management Area's agricultural community in this capacity. ODA, the LMA, and Management Area partners should work together whenever possible to provide a strong foundation of technical support and site-specific evaluations that work to strengthen the ability and capacity of agricultural landowners and operators to solve water quality management challenges.

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 and should fit within a framework of economic profitability and agricultural viability. Technical assistance should be carried out in a manner that encourages the agricultural landowner or operator to participate in the voluntary efforts necessary to accomplish the Area Plan's goal.

Agricultural landowners and operators are encouraged to participate in the activities outlined in section 3.2 as well as provide guidance and direction on local agricultural water quality concerns and solutions. Serving as a LAC member, or on an SWCD, or watershed council board, and participating in local grower groups and agribusiness associations, are ways to contribute. It is crucial to the success of the Area Plan that agricultural landowners and operators implement practices that prevent and control water pollution from agricultural activities.

The Lower Willamette agricultural community is the best resource for local and specialized technical information related to agricultural management practices. Agricultural landowners and operators are encouraged to share their working knowledge of farming practices that work toward the prevention and control of water pollution. Sections 2.5 provide basic guidelines for preventing and controlling water pollution from agricultural activities. Appendix A provides contact information for educational and technical guidance related to natural resources and farm management.

Scope of Technical Assistance
The scope of technical assistance, specifically provided by the LMA, should include a range of information applicable to the local agricultural systems found in the Management Area and should be:

- Flexible to provide options for the landowner or operator to choose from or adapt to,
- Tailored and scaled to the agricultural operation or activity,
- Technically sound,
- Planned for operational efficiency,
- Emphasizes long-term solutions,
- Economically feasible to implement successfully, and
- Strengthens the ability for agricultural landowners and operators to self-evaluate their agricultural operation and their impacts to water quality from agricultural activities.

Listed below are recommendations for technical assistance activities.

- Provide one-on-one technical assistance and consultation to agricultural landowners and operators regarding the prevention and control of water pollution and soil erosion from agricultural activities;
- Provide on-site evaluations for agricultural landowners and operators to identify potential water quality concerns and recommend solutions that prevent and control water pollution and soil erosion from agricultural activities;
- Aid agricultural landowners and operators who would like to develop and implement a conservation farm or ranch plan that may include, but not limited, to nutrient management plans, pasture management plans, soil health management, and irrigation water management;
- Provide technical assistance for the development, implementation, and maintenance of on-the-ground projects that prevent and control water pollution and soil erosion from agricultural activities;
- Assist agricultural landowners and operators by providing information on funding opportunities as well as assistance in applying and enrolling in cost-share programs as needed;
- Develop, promote, and conduct events or activities (educational/ training) that function to strengthen the knowledge and capacity of agricultural landowners and operators to:
    - Prevent and control water pollution from agricultural activities;
    - Prevent and control soil erosion from agricultural activities;
    - Self-evaluate their agricultural operation and their impacts to water quality from agricultural activities.

3.2.1.3 Partnerships
The Area Plan can only achieve its goal through the cooperative and voluntary efforts of the agricultural community, the ODA, the LMA, the LAC, and Management Area partners. An essential activity to achieving the goal of the Area Plan is for ODA and the LMA to work in association with Management Area partners, local agencies, stakeholders, grower groups, and

agribusiness associations as well as encourage individual agricultural landowners and operators to engage in local partnerships and efforts that work toward similar goals and objectives described in the Area Plan. There are several benefits to bringing together individuals and groups to participate in common efforts and mutual activities such as collective resources, diverse expertise, and shared funding. It is recommended as time, opportunities, and funding allow, that ODA, the LMA and agricultural landowners collaborate and participate in partner efforts to improve and protect water quality in agricultural and rural lands of the Lower Willamette.

The LMA and ODA should facilitate and collaborate with Management Area partners to conduct activities such as landowner and community engagement events, provide technical assistance, attend the biennial review of the Area Plan, assist with strategic initiatives, and collaborate in water quality monitoring.

ODA, the LAC, and the LMA have identified the following priority activities, described in Table 3.2, to track progress toward meeting the goal and objectives of the Area Plan.

Table 3.2 Planned Activities for 2020-2023.

Activity	4-Year Targets (All SWCDs)
Community and Landowner Engagement	
# active events that target landowners/managers (workshops, demonstrations, tours)	11 Soil school, Soil Health FAAP, Outreach events. Webinars/ videos that are promoted to producers or landowners in the MA.
# landowners/managers participating in active events	295
Technical Assistance (TA)	
# landowners/managers provided with TA (via phone/walk-in/email/site visit)	53
# site visits	110
# conservation plans written*	8
On-the-ground Project Funding	
# funding applications submitted	7
* Definition: any written management plan to address agricultural water quality. Can include NRCS-level plans. Can include: nutrients, soil health, grazing, riparian planting, forest thinning to improve upland pastures to reduce livestock pressure on riparian areas, etc. Cannot include projects with no or weak connection to agricultural water quality (weed eradication not for riparian restoration, fuels reduction, alternative energy, rain gardens/rain harvesting, non-agricultural culvert replacement, and instream habitat enhancement that does not also improve water quality)	

3.2.1.4 East Multnomah SWCD StreamCare Program

East Multnomah SWCD has been focusing outreach and restoration in the Lower Willamette through the District's StreamCare program. The StreamCare program provides eligible landowners with five years of weed control, native tree and shrub plantings, and maintenance free of charge. The benefits to the landowner include:

- Free weed control,
- Increased shade along the creek,
- Reduced risk of erosion and flooding,
- Increased property value,
- EMSWCD will pay for permits, labor, plants, materials, and maintenance.

Currently, the StreamCare program is offered in the Johnson Creek watershed in the Lower Willamette (fig. 2.3). Chapter 4, Table 4.2.1 displays work completed on agricultural properties under the StreamCare riparian re-vegetation program since they began planting. For more information, go online at: **https://emswcd.org/on-your-land/streamcare/.**

3.2.1.5 Clackamas SWCD and Johnson Creek WC CreekCare Program

The Johnson Creek Watershed Council in collaboration with the Clackamas SWCD have been working with private landowners in the Sunshine Creek sub-watershed (fig. 2.3) and have planted 7,974 native trees and shrubs, restoring over 11 acres, along 1.6 stream miles since 2010. In Chapter 4, Table 4.2.2 displays work completed under the CreekCare riparian planting. For more information, go online at: **http://www.jcwc.org/creekcare/.**

3.3 Water Quality and Land Condition Monitoring

Monitoring is an essential activity to tracking the status and trend of water quality in the Lower Willamette as well as understanding the influences landscape conditions have on water quality. Data collected from monitoring efforts can be useful in developing measurable objectives that measure changes in environmental conditions. Data can also be utilized in software applications that model landscape conditions. Additionally, data analysis and results can be informative in determining if goals and objectives of the Area Plan are being achieved.

Water quality monitoring must be performed using quality assurance procedures and specialized equipment that takes funding, time, and resources to accomplish. Monitoring water quality and landscape conditions, for the purposes of the Area Plan, is recommended as an activity to be carried out and collaborated on by the ODA, the LMA and Management Area partners. Currently, water quality monitoring is occurring throughout the Lower Willamette Basin. Refer to section 4.3 for a description of monitoring and evaluation results for the Lower Willamette Management Area.

Listed below are recommendations for monitoring activities that may be completed as opportunities, funding, and resources allow:

a) Develop a water quality-monitoring plan that works to achieve long-term baseline data collection and allows for ease in sharing data with partners and collaborating with other monitoring efforts;
b) Develop quality control plans to guarantee that data collected can be used for the intended purposes and analysis with confidence;
c) Perform water quality monitoring for a set of selected water quality parameters to establish a baseline of water quality data;
d) Evaluate Light Detection and Ranging (LiDAR) information to understand vegetative conditions along streams in agricultural areas;
e) Identify data gaps that are needed to fully understand influences and changes in water quality;
f) Consider applying for grants or partnering with others to fund and implement monitoring efforts;
g) Consider a monitoring project that seeks to innovate or sample new approaches to measuring water quality conditions or generates new technology or software to monitor environmental changes related to water quality.

3.3.1 Water Quality

Water quality is monitored by DEQ at six locations in the Management Area as part of their ambient monitoring network Parameters include temperature, pH, dissolved oxygen, total suspended solids, total phosphorus, and bacteria. One DEQ station (Kelley Creek at SE 159th Fig. 4.3), was selected to summarize based on the correlation and or proximity to agricultural lands. Table 4.3.1.

The USGS has several monitoring stations for stream temperature in the Management Area as part of their National Water Information System. Two USGS stations were selected based on the correlation and or proximity to agricultural lands: Johnson Creek at Regner and Johnson Creek at Sycamore (Fig. 4.3). Table 4.3.1.

The East Multnomah SWCD began collecting monthly water samples in 2010 after the LAC identified a need for baseline data. East Multnomah collects samples once per month at six locations. Samples are analyzed for pH, conductivity, total dissolved solids, total suspended solids, bacteria, nitrate, and phosphorus. Section 4.3.2.

Since 2009, the West Multnomah SWCD has been monitoring stream temperature at eight monitoring stations (Fig. 4.3) in the western rural part of the Management Area. The stations are located at perennial streams that flow directly into the Multnomah Channel. Data was collected between May 2011 and October 2019. Section 4.3.3.

Chapter 4: Progress and Adaptive Management

4.1 Progress Toward Measurable Objectives

4.1.1 Management Area

Currently, there is not a Management Area wide measurable objective (MO).

4.1.2 Focused Efforts in Small Watersheds

4.1.2.1 Johnson Creek Bacteria Baseline Monitoring

Table 4.1.2.1 Johnson Creek Bacteria Baseline Monitoring

2018 Condition: Refer to 3.1.2.1 for background information.
Water samples taken from Johnson Creek at SE 282nd Avenue and SE Stone Road from November 2010 to September 2018 resulted in 93.5% (87/93) of the observations measuring below 406 *E.coli* organisms per 100ml.
Measurable Objective:
Water samples collected from Johnson Creek at SE 282nd Avenue and SE Stone Road from November 2010 to September 2028 will measure below 406 *E.coli* organisms per 100ml for at least 97% of the observations. See Figure 4.3 for sampling station location.
Milestone 1
By 2020, increase the percentage of samples measuring below 406 *E.coli* organisms per 100ml to more than 93.5% of the observations.
2020 Current Condition
Monitoring samples taken from Johnson Creek at SE 282nd Avenue and SE Stone Road from September 2018 to February 2020 resulted in 97.2% (105/108) of the observations measuring below 406 *E.coli* organisms per 100ml.
Adaptive Management Discussion
Progress Discussion: Milestone 1 was achieved. 97.2% of water quality samples measured below 406 *E.coli* organisms per 100ml. A 3.7% increase from the baseline of 93.5%. This indicates that samples measuring below 406 *E.coli* organisms are increasing and a probable indicator that bacteria at that station is declining. **Adaptive Management:** The LAC did not suggest any modifications to the measurable objective. It was decided to continue working toward Milestone 2. The LAC thought it would be good to develop additional baseline monitoring objectives. ODA will work with EMSWCD to develop additional objectives at other stations and with other pollutants for review at the next biennial review in 2022. DEQ suggested that bacteria samples are needed more often at this monitoring station in order to directly compare results to the bacteria water quality standard. The EMSWCD replied that a revised sampling schedule could be considered but funding and staff time is limited for this project. It was not possible at this time to attribute sampling results to any particular activity or project completed in the Johnson Creek watershed.

4.2 Activities and Accomplishments

ODA, the LAC, the LMA, and other partners identified the following priority activities to track progress toward meeting the goal and strategies of the Area Plan.

Table 4.2a Activities Conducted in 2016-2019 by Clackamas, East Multnomah, and West Multnomah SWCDs

Activity	4-Year Results (All SWCDs)
Community and Landowner Engagement	
# active events that target landowners/ managers (workshops, demonstrations, tours) 43: *Clackamas County Fair (soil health), Far West Show (erosion control), North Willamette Horticulture Society (soil health), Tree School (streamside vegetation), Focus on soil health and pollinators: Lavender Festival, Spring Garden Festival, Clackamas County Sustainability Fair WMSWCD Soil School, Oregon Wine Symposium (soil health).*	
# landowners/managers participating in active events	1,435
Technical Assistance (TA)	
# landowners/managers provided with TA	169
# site visits	239
# conservation plans written*	11
On-the-ground Project Funding	
# funding applications submitted	8

Table 4.2b and 4.2c summarize information from the OWRI on restoration project funding and accomplishments on agricultural lands in the Management Area. The majority of OWRI entries represent voluntary actions of private landowners who have worked in partnership with federal, state, and local groups to improve aquatic habitat and water quality conditions. OWRI results are provided annually in January after a year of proofing and GIS management.

Table 4.2b Implementation Funding (cash and in-kind) for Projects on Agricultural Lands Reported 1997-2018
(OWRI data include most, but not all projects, implemented in the Management Area).

Landowners	OWEB	Watershed Council	OWRI TOTAL
$15,105	$37,235	$10,065	$62,405
Not Included in OWRI Report: East Multnomah SWCD (2018 & 2019): $206,347 Nursery erosion and runoff management, conservation cover, sediment basin, exclusion fencing, farm road repair, and underground outlet.			

Table 4.2c Miles and Acres Treated on Agricultural Lands Reported 1997-2018
(OWRI data include most, but not all projects, implemented in the Management Area).

Activity Type	Miles	Acres	Count*	Activity Description
Riparian	1	2	-	Johnson Creek - Riparian area treated for non-native or noxious plant species.
Fish Passage	-	-	-	-
Instream	-	-	-	-
Wetland	-	-	-	-
Road	-	-	-	-
Upland	-	20	-	Livestock manure management, mud management / heavy use area protection, livestock exclusion fencing,
TOTAL	1	22	-	

* # of hardened crossings, culverts, etc.

4.2.1 East Multnomah SWCD StreamCare

See 3.2.1.4 for background information and Figure 2.3 for location. Johnson Creek mainstem and tributary StreamCare sites were recently modeled using Shade-a-Lator. Results indicate when plantings are 20 years old there will be a predicted reduction of 54.7 million kcal/day reaching the stream surface.

Table 4.2.1 StreamCare Accomplishments: Agricultural Lands Along Johnson Creek

StreamCare Riparian Treatments	As of September, 2018	As of December, 2019
Total Number of Trees and Shrubs Planted	54,135	30,763
Total Acres of Buffer	56	56
Total Stream Miles Treated	2.76	2.76

4.2.2 Clackamas SWCD and Johnson Creek Watershed Council CreekCare

See 3.2.1.5 for background information. Figure 2.3 for location.

Table 4.2.2 CreekCare Report for Sunshine Creek

Total Number of Landowners	Total Number of Project Acres	Total Planted Stream Miles (both sides of the stream)
28	11.631	1.6431
Total Number of Trees & Shrubs Planted : 1,713 trees & 6,261 shrubs		

4.3 Water Quality and Land Condition Monitoring

4.3.1 Water Quality

DEQ assesses the status and trends of water quality in relation to water quality standards. Analysts retrieved data from DEQ, EPA, and USGS databases. Three stations were selected to summarize based on their correlation and or proximity to agricultural lands. Status and trends reported represent all land uses in the watershed, not just agriculture. Temperature data (at all three sites) and bacteria data (at one site) was the only available data for 2020 status and trend analysis.

Results are that stream temperature, at all three sites, is not attaining water quality standards and all sites have a degrading trend. Bacteria sampling at Kelley Creek and SE 159th indicates that the water quality standard was not attained; not enough data to determine trend. pH and dissolved oxygen data was not available to determine status or trends at any of the sites. Temperature and bacteria Impacts to water quality are non-point sources attributed to a mixed use watershed that includes agriculture. Water quality data Table 4.3.1. Figure 4.3. For further information, view water quality status and trends in your area using the Results Mapper: https://deq15.deq.state.or.us/SC/WQWebReporting/wqst_map/map_locator.html.

Table 4.3.1 Water Quality Status and Trends in the Lower Willamette Management Area at Three Selected Monitoring Stations

DEQ's 2020 Lower Willamette Water Quality Status and Trends Analysis. Data Years 2000 to 2020.

Status: Each four-year period has been assessed (over a 20-year period) to determine whether stations are attaining water quality standards or TMDL targets, if applicable. Data collection at sites below: DEQ, USGS
Trends: Improving, degrading, or not consistent trends assessed over a 20-year period. Must have results in same month for eight or more years. Stations with insufficient data could not be assessed for trends.

Monitoring Stations	Johnson Ck. at Regner		Johnson Ck. at Sycamore		Kelley Creek at SE 159th	
Status Assessment Years	2012-2015	2016-2020	2012-2015	2016-2020	2012-2015	2016-2020
+ Temperature	↓	↓	↓	↓	↓	↓
Bacteria: *E. coli*	●	-	●	-	●	●
pH	-	-	-	-	●	-
Dissolved Oxygen	-	-	-	-	●	-

Key: ● **Attaining** ● **Not Attaining** ↓ **Not Attaining and Degrading Trend** **(-) No Data Available**

+ Temperature: Data collected is continuous over time. Exceedance represents the number of seven-day average daily max values above the criteria. The number of observations is all samples taken throughout the data collection timeframe. See Appendix D for description of water quality parameters.

Note: This report is best used as a summary and statistical analysis of the status and trends in water quality data collected throughout the Lower Willamette Management Area. Interpretation of results will require knowledge of local conditions known to affect the observed water quality conditions at individual sites. View the status and trends analysis and the Results Mapper Interactive Map at: www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx

4.3.2 East Multnomah Water Quality Monitoring

The East Multnomah SWCD began collecting monthly water samples in 2010 after the Lower Willamette Agricultural Water Quality LAC identified a need for baseline data in agricultural lands. East Multnomah collects samples once per month at six locations in the Johnson Creek watershed, which are analyzed for pH, conductivity, total dissolved solids, total suspended solids, bacteria, nitrate, and phosphorus. The SWCD is working to provide the data to the state's water quality database for status and trends analysis by the next full biennial review in 2023. Bacteria data from this sampling project was analyzed for the Johnson Creek Bacteria Baseline Monitoring (Section 3.1.2.1). Tables 4.3.2a, 4.3.2b, and Graph 4.3.2 provided by East Multnomah SWCD.

Table 4.3.2a Samples Exceeding the Water Quality Standard for Bacteria at Monitoring Stations in Johnson Creek

Sampling Locations	2011	2012	2013	2014	2015	2016	2017	2018	2019
282nd	0	1	0	2	0	1	2	0	1
Stone	0	3	0	3	3	3	2	1	2
Bluff	-	0	2	1	0	1	1	0	1
354th	0	2	0	1	0	2	3	0	2

Figure 4.3 Lower Willamette Monitoring Stations

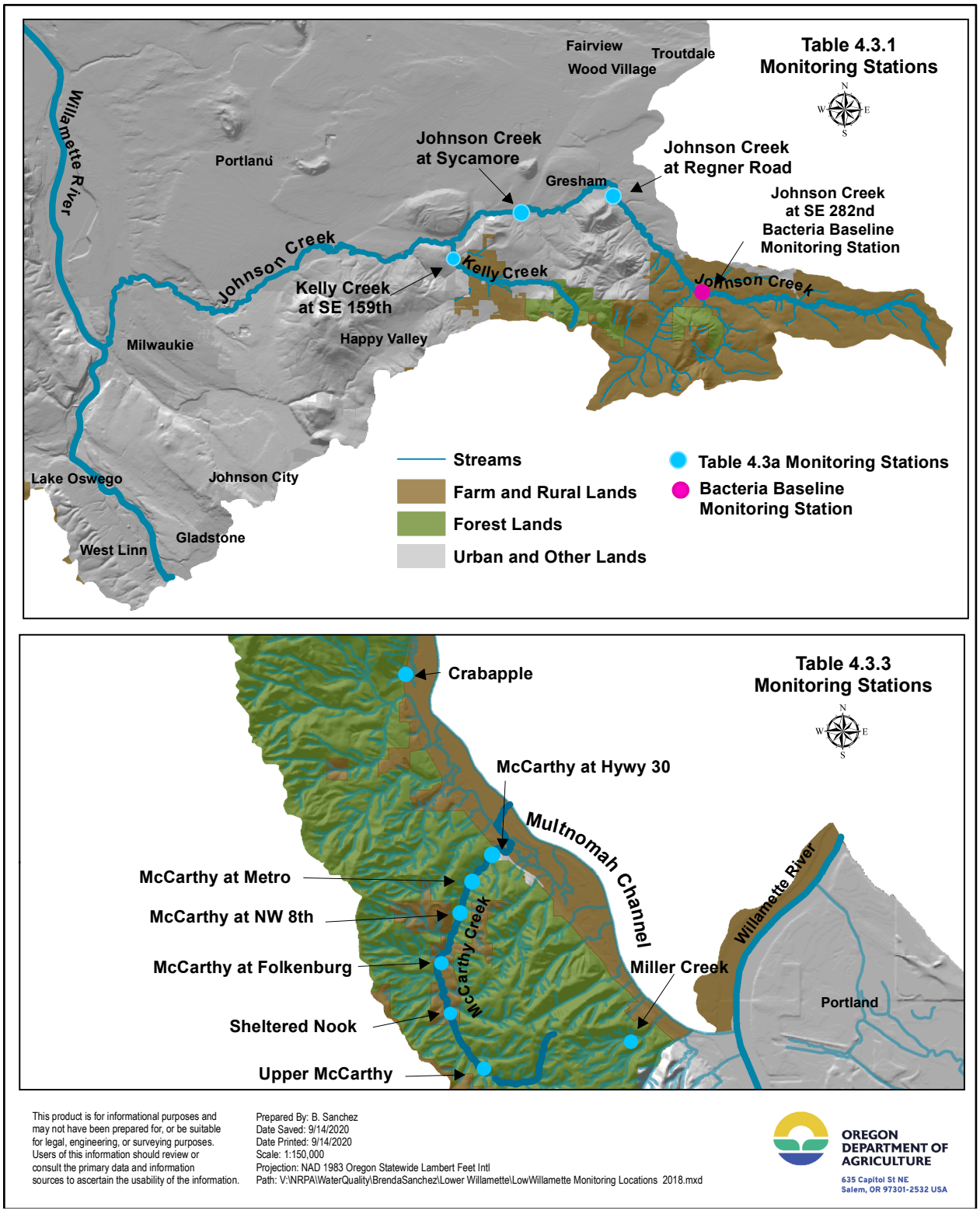
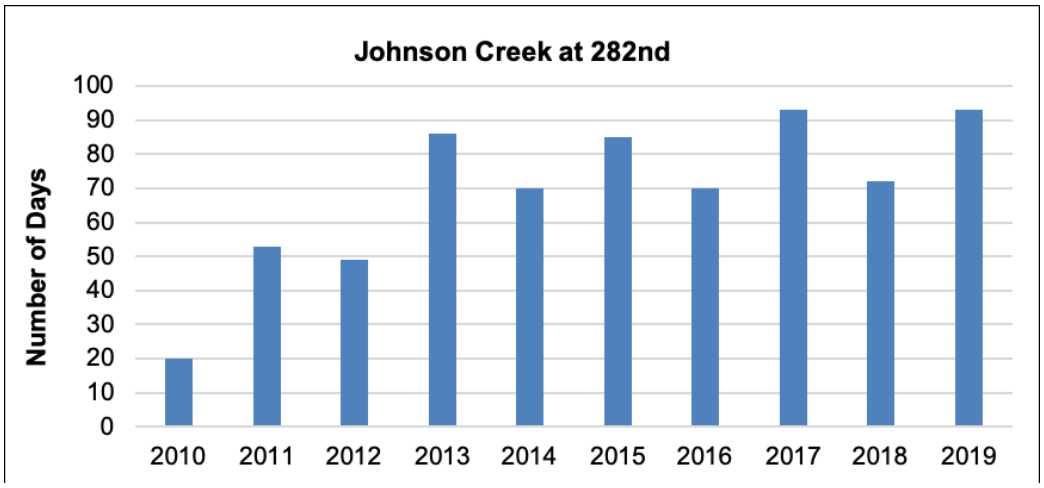


Table 4.3.2b Samples Exceeding the Water Quality Standard for Total Suspended Solids at Monitoring Stations in Johnson Creek

Sampling Locations	2011	2012	2013	2014	2015	2016	2017	2018	2019
282nd	2	4	0	1	0	3	4	2	1
Stone	2	5	0	1	0	2	4	3	1
Bluff	-	4	0	1	0	4	6	1	2
354th	0	4	0	0	0	3	3	2	1

Graph 4.3.2 Number of Days the Weekly Mean Temperature Exceeds the Observations Exceeding the Water Quality Standard for Temperature



4.3.3 Multnomah Channel Water Quality Monitoring 2018 Report

Since 2009, the West Multnomah Soil & Water Conservation District's (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 (Figure 4.3).
For a full report, go online to: https://wmswcd.org/programs/water-quality-monitoring.

Table 4.3.3 WMSWCD Water Quality Monitoring Results - Multnomah Channel Tributaries

Number of Days Temperature Exceeded Rearing Criteria (18°Celsius/ 64.4°Fahrenheit)										
Monitoring Stations	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**Average**
Crabapple	NA	52	58	67	NA	60	**87**	**74**	**-**	**67.2**
Miller	0	0	NA	NA	0	0	0	0	**-**	**0**
Upper McCarthy	NA	3	0	0	0	6	**15**	**0**	**-**	**3.2**
Sheltered Nook (McSH)	NA	4	0	3	18	18	**27**	**34**	**-**	**11.3**
McCarthy at Folkenburg	NA	NA	16	0	6	0	**0**	**42**	**-**	**4.4**
McCarthy at NW 8th	NA	NA	NA	62	79	37	**62**	**2**	**-**	**60.0**
McCarthy at Metro	NA	NA	14	43	NA	0	**79**	**47**	**-**	**34.0**
McCarthy at Highway 30	52	57	84	60	75	71	**NA**	**52**	**-**	**63.4**

4.4 Biennial Reviews and Adaptive Management

ODA, the LAC, the LMA, and other partners met on October 7, 2020 to review implementation of the Area Plan and provided recommendations for the future (Tables 4.4a and 4.4b).

Table 4.4a Summary of Biennial Review Discussion

Summary of Progress and Impediments
The LAC were pleased to see continued work in the Management Area by SWCDs and the watershed council. The LAC had a discussion regarding in-line ponds (in-stream). The LAC is concerned about recent monitoring that indicates in-line ponds may have an impact on Johnson Creek stream temperature.
Recommended Modifications and Adaptive Management
The LAC suggested that a focused outreach to landowners regarding the management of in-line ponds to reduce impacts on stream temperature be considered. Alternatives to riparian vegetation shading (i.e., engineered solutions) may be needed to reduce temperature in ponds.

Table 4.4b Number of ODA Compliance Actions in 2016-2019.

Location	Pre-Enforcement Notification	Letter of Compliance	Notice of Noncompliance	Civil Penalty
Lower Willamette MA	1	1	0	0

References

- Bureau of Environmental Services et al. June 2001. Johnson Creek Restoration Plan. City of Portland, Oregon.
- Baker, N.J., Bancroft, B.A., Garcia, T.S. 2013. A meta-analysis of the effects of pesticides and fertilizers on survival and growth of amphibians. Science of the Total Environment. Vol. 449 150-156 pp.
- Baldwin, D.H., Spromberg, J.A., Collier, T.K., and N.L. Scholz. 2009. A fish of many scales: extrapolating sublethal pesticide exposures to the productivity of wild salmon populations. Publications, Agencies and Staff of the U.S. Department of Commerce. 215p.
- Bell, M.C. 1986. Fisheries handbook of engineering requirements and biological criteria. Fish Passage Development and Evaluation Program. U.S. Army Corps of Engineers. 209pp.
- Carpenter, K.D., Kuivila, K.M., Hladik, M.L., Haluska, T., and M.B. Cole. 2016. Storm-event-transport of urban use pesticides to streams likely impairs invertebrate assemblages. Environmental Monitoring and Assessment. Vol. 118 DOI https://doi.org/10.1007/s10661-016-5215-5.
- Carter, K. 2005. The effects of temperature on steelhead trout, Coho salmon, and Chinook salmon biology and function by life stage. California Regional Water Quality Control Board North Coast Region.
- Gerig, A.J. 1985. Soil Survey of Clackamas County, Oregon. United States Department of Agriculture-Soil Conservation Service, Washington D.C.
- Green, G.L. 1983. Soil Survey of Multnomah County, Oregon. United States Department of Agriculture – Soil Conservation Service, Washington D.C.
- Hayes, T.B. 2002. Hermaphroditic, demasculinized frogs after exposure to the herbicide atrazine at low ecologically relevant doses. Proceedings of the National Academy of Sciences. Vol. 99:8, 5476-5480 pp.
- Holzer, K. 2014. Amphibian use of constructed and remnant wetlands in an urban landscape. Urban Ecosystems. Vol. 17 955-968 pp.
- IUCN SSC Amphibian Specialist Group, 2015. Rana aurora. The IUCN Red List of Threatened Species.
- Lanoo, M. 2005. Amphibian Declines: The Conservation Status of United States Species. University of California Press. 1115 pp.
- Lower Willamette River Basin Watershed Council. 1999. Phase 1 Watershed Assessment and Action Plan for the Lower Willamette River Basin. Lower Willamette River Basin Watershed Council, Lower Willamette, OR.
- Mann, R.M., Hyne, R.V., Choung, C.B., and S.P. Wilson. 2009. Amphibians and agricultural chemicals: Review of the risks in a complex environment. Environmental Pollution. Vol. 157, 2903-2927 pp.
- Multnomah County. 1990. Historic Context Statement. Historic Overview.
- National Marine Fisheries Service (2001). ESA Status of West Coast Salmon and Steelhead. Seattle, WA.
- Redding, J.M., Schreck, C.B., and F.H. Everest. 1987. Physiological Effects on Coho Salmon and Steelhead of Exposure to Suspended Solids, Transactions of the American Fisheries Society, 116:5, 737-744
- Reiser, D.W., and T.C. Bjornn. 1979. Influence of forest and rangeland management of anadromous fish habitat in the western United States and Canada. 1. Habitat requirements of anadromous salmonids. U.S. Forest Service Gen. Tech. Rep. PNW. 96:54p.

- Relyea, R.A. 2008. A cocktail of contaminants: How mixtures of pesticides at low concentrations affect aquatic communities. Oecologia. DOI 10.1007/s00442-008-1213-9.
- Sigler, J.W., Bjornn, T.C., and F.H. Everest. 1984. Effects of Chronic Turbidity on density and growth of steelhead and Coho salmon. Trans. Am. Fish. Soc. Vol. 113, Iss. 2. 142-150 pp.
- Spromberg, J.A., and N.L. Scholz. 2011. Estimating the Future Decline of Wild Coho Salmon Populations Resulting from Early Spawner Die-offs in Urbanizing Watersheds of the Pacific Northwest, USA. Integrated Environmental Assessment and Management. Vol 7. No. 4. 648-656 pp.
- Oregon Department of Environmental Quality. Basin Summary Reports: Supplement to the Water Quality Toxics Assessment Report. November 2015. Hillsboro, OR.
- Oregon Department of Environmental Quality. Lower Willamette River Basin Total Maximum Daily Load TMDL. 2006. Portland, OR.
- Oregon Department of Environmental Quality. Lower Willamette Subbasin: DEQ's Water Quality Status and Trends Analysis for the Oregon Department of Agriculture's Biennial Review of the Agriculture Area Rules and Plan. August 2018. Portland, OR.
- Oregon Department of Environmental Quality. Oregon's 2012 Integrated Report Assessment Database and 303(d) List. www.deq.state.or.us/wq/assessment/rpt2012/search.asp. September 2016.
- Oregon Department of Environmental Quality. Oregon's Beneficial Uses 2003 Table 340A. www.deq.state.or.us/wq/standards/uses.htm. November 2016.
- Oregon Department of Environmental Quality. Willamette Basin Rivers and Streams Assessment. December 2009. Portland, OR.
- Oregon Department of Fish and Wildlife. 2008. Sensitive Species List (www.dfw.state.or.us/wildlife/diversity/species/docs/SSL_by_taxon.pdf), Salem, OR.
- Oregon Department of Fish and Wildlife. No date; accessed 1/12/12. Threatened, Endangered, and Candidate Fish and Wildlife Species in Oregon (pdf). Salem, OR.
- Oregon Water Resources Department. 1991. Lower Willamette Basin Report. Salem, OR.
- Oregon Watershed Enhancement Board. 1999. Oregon Aquatic Habitat Restoration and Enhancement Guide, Oregon Plan for Salmon and Watersheds. Salem, OR.
- Portland Water Bureau. 2010. Water Management & Conservation Plan. Portland, OR.
- Tillamook Bay National Estuary Project. 1997. Salmonid Habitat Requirements for Northern Oregon Coastal Streams. P.O. Box 493, 613 Commercial St., Garibaldi, OR 97118.
- United States Census Bureau. 2010 Census Oregon. www.census.gov. September 2016.
- United States Department of Agriculture. Census of Agriculture 2012 Oregon. https://www.nass.usda.gov/Publications/AgCensus/2012/. July 2018.
- United States Department of Agriculture NRCS Web Soil Survey. https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm. November 2018.
- United States Geological Survey; Gage 14142500 at Lower Willamette River Below Bull Run River https://waterdata.usgs.gov/or/nwis/current/?type=flow. August 2018.
- U.S. Environmental Protection Agency (USEPA). 2001. Issue Paper 5: Summary of technical literature examining the effects of temperature on salmonids. Region 10, Seattle, WA. EPA 910-D-01-005. 113pp.

APPENDIX A: Educational and Technical Services

Soil and Water Conservation Districts (Local Management Agency for Area Plan/ SWCDs)
Assist landowners in identifying and implementing land management activities and coordinate with other technical experts in natural resources.
East Multnomah SWCD: 503-222-7645/ Portland
West Multnomah SWCD: 503-238-4775/ Portland
Clackamas SWCD: 503-210-6000/ Beavercreek
Tualatin SWCD (District serves far NW portion of the Lower Willamette MA. Figure 4): 503-334-2288/ Hillsboro

Oregon Department of Agriculture (ODA)
Oversees the Agricultural Water Quality Management Program. ODA issue permits, helps producers comply with confined animal feeding water management programs, and provides support to SWCDs.
Natural Resources Division: 503/ 986-4700/ Salem
Lower Willamette Water Quality Specialist Lower Willamette: 503-986-5141/ Salem
Online Link to Area Plan:
www.oregon.gov/ODA/programs/NaturalResources/AgWQ/Pages/AgWQPlans.aspx
Livestock Water Quality Specialist Area 3: 503-986-6468 / Salem (CAFO)

Lower Willamette Management Area Local Advisory Committee (LAC)
Voluntary committee composed of twelve agricultural producers, landowners, and other stakeholders in the Management Area. The LAC assists ODA with developing and reviewing the Agricultural Water Quality Management Area Plan and Area Rules.
Oregon Department of Agriculture: 503-986-4700

Oregon 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 (303(d) list), sets TMDL allocations.
Northwest Region Portland Office: 503-229-5263
Lower Willamette Basin Coordinator: 503-229-5350

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.
Ocean Salmon and Columbia River Program: 971-673-6000
North Willamette Watershed District: 503-947-6000 or 800-720-6339
Clackamas Headquarters: 503-947-6000/ Salem

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.
Molalla Unit Office: 503-829-2216
North Cascade District Stewardship Forester: 503-829-2216

Oregon Department of State Lands (DSL)
Administers state removal/fill law and provides technical assistance.
Salem: 503-986-5200

Oregon State University Extension Service (OSU Extension)
Offers educational programs, seminars, classes, tours, and publications to guide landowners in managing their resources.
Clackamas County: 503-655-8631/ Oregon City
Portland Metro Area Office: 971-361-9620

Oregon Water Resources Department (OWRD)
Provides technical and educational assistance and water rights permits and information.
Salem: 503-986-0900

Oregon Watershed Enhancement Board (OWEB)
Provides grants to help Oregonians take care of local streams, rivers, wetlands, and natural areas. Provides financial support for watershed council operations and projects.
Salem: 503-986-0178

USDA – Natural Resources Conservation Service (NRCS)
Provides information on soil types, soils mapping, and interpretation. Administer 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

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.
Clackamas County FSA Service Center: 503-655-3144/ Oregon City

Oregon Lower Willamette 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: Water Quality and Conservation Programs and Opportunities

The following is a list of some conservation programs available to landowners and organizations in the Lower Willamette Management Area. For the most current information please contact the organizations listed below for more information.

Oregon Department of Agriculture

Confined Animal Feeding Operation Program (CAFO)

The Oregon Department of Agriculture issues a Confined Animal Feeding Operation (CAFO) permit to livestock owners so manure does not pollute ground and surface water.
There are three main factors that determine if your farm needs a CAFO permit:

1. How many animals you have.
2. How long the animals are confined in a prepared area (e.g. in a barn, lot, pen).
3. How the manure and wastewater generated by the farm is stored (e.g. do you collect your manure in a tank or do you stack it in a pile).

Go online for more information:
https://www.oregon.gov/ODA/programs/NaturalResources/Pages/CAFO.aspx
or contact the Livestock Water Quality Specialist for Area 3: 503-986-6468 / Salem

Pesticide Management Plan

The ODA Pesticides and Fertilizer Program holds the primary responsibility for pesticide registration and use regulation within the state of Oregon under the Federal Insecticide Fungicide Rodenticide Act. As the EPA designated the state as the lead agency for pesticides, ODA is responsible for overseeing the development and implementation of a Pesticide Management Plan (PMP) for the state of Oregon as stipulated in the annual EPA/ODA Consolidated Pesticide Cooperative Agreement. 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 EPA in both the agricultural and non-agricultural settings. The PMP 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.

East Multnomah Soil and Water Conservation District Programs

Working Farm Land Protection

We help ensure high quality farmland is available for current and future farmers by entering into voluntary farmland protection agreements which provide cash and other incentives. When our farmland is protected, we all benefit. Are you a farmer or landowner interested in learning more?
Visit our Landowner Options page or contact our Land Legacy Program Manager
at (503) 935-5374 or go online to: https://emswcd.org/landconservation/protecting-farmland

Erosion Solutions for Nurseries

We work with nurseries to plan and fund custom solutions that will reduce soil erosion without interfering with operations. Free planning is available to nurseries, as well as 75% cost share funding for projects that address soil erosion. To learn more about Erosion Solutions go online to:
https://emswcd.org/on-your-land/erosion-solutions

West Multnomah Soil and Water Conservation District

Soil School

Soil School is a day-long workshop that includes multiple sessions on a wide variety of topics – all having to do with soil. We schedule exciting experts to speak on a host of interesting and informative topics related to soil science. Next Soil School: April 13, 2019. Go online for more information:
https://wmswcd.org/projects/soil-school

Clackamas Soil and Water Conservation District Programs

Sprayer Efficiency Program

The Clackamas Soil and Water Conservation District offers reimbursement up to $500 to replace worn out sprayer tips, pressure regulators, pressure gauges, hoses, valves, and check-valve nozzle bodies. Replacing worn parts will reduce the amount of pesticides used, improve pesticide coverage, and reduce spray drift. For more information, visit the CSWCD website at: https://conservationdistrict.org

Equipment Rental Program

CSWCD currently offers an Equipment Rental Program Which makes a variety of agricultural equipment available at reasonable prices to Clackamas County residents. This program was originally created to provide hard-to-find equipment to help farmers and land managers conserve soil and water. This equipment is typically not available through other rental agencies and is often too large an investment for farmers who may only use it once or twice a year. The Conservation District recognizes that our agricultural producers have the ability to be our very best conservationists by keeping their land in production using good stewardship practices. For more information, visit the CSWCD website at: https://conservationdistrict.org

Windsocks Program

The program was created 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. For more information, visit the CSWCD website at: https://conservationdistrict.org

Oregon Watershed Enhancement Board (OWEB)

Provides grants for a variety of restoration, assessment, monitoring, and education projects, as well as watershed council staff support. There is normally a 25% local match requirement on all grants.
Contact: Soil and Water Conservation Districts, Watershed Councils, Oregon Watershed Enhancement Board

Natural Resources Conservation Service Programs

Agricultural Conservation Easement Program (ACEP)

NRCS provides financial assistance to eligible partners for purchasing agricultural land easements that protect the agricultural use and conservation values of eligible land.
Contact: Natural Resources Conservation Service, Soil and Water Conservation Districts

Conservation Reserve Enhancement Program (CREP)

Provides annual rent to landowners who enroll agricultural lands along streams. Also cost-shares conservation practices such as riparian tree planting, livestock watering facilities, and riparian fencing.
Contact: Natural Resources Conservation Service, Farm Service Agency, Soil and Water Conservation Districts, Oregon Department of Forestry.

Conservation Reserve Program (CRP)

Competitive CRP provides annual rent to landowners who enroll highly erodible lands. Continuous CRP provides annual rent to landowners who enroll agricultural lands along seasonal or perennial streams. Also cost-shares conservation practices such as riparian plantings.
Contact: Natural Resources Conservation Service, Farm Service Agency, Soil and Water Conservation Districts

Environmental Quality Incentives Program (EQIP)

Cost-shares water quality and wildlife habitat improvement activities, including conservation tillage, nutrient and manure management, fish habitat improvements, and riparian plantings
Contact: Natural Resources Conservation Service, Soil and Water Conservation Districts

APPENDIX C: 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.

For additional guidance in developing a Voluntary Conservation Plan, contact the East Multnomah, West Multnomah or Clackamas Soil and Water Conservation District or the Natural Resources Conservation Service. Go online for more information:
https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/cp

APPENDIX D: Water Quality Parameters and Standards

Aquatic Weeds and Algae: Harmful algal blooms are caused by over-production of naturally occurring cyanobacteria (blue-green algae). Some species release toxins that are harmful to humans, livestock, pets, and wildlife. When levels of nutrients, temperature, pH, and light are optimal, cyanobacteria grow rapidly, resulting in blooms where cyanobacteria are the dominant form of life in their environment. Cyanobacteria can cause negative impacts to water quality, including: taste and odor problems in drinking water, unpalatable fish, elevated pH levels, and low dissolved oxygen levels.

Bacteria: *Escherichia coli (E. coli)* is measured in streams to determine the risk of infection and disease to people. *E.coli* bacteria live in soil or vegetation and in the gastrointestinal tract of animals such as humans, wildlife, and livestock. *E.coli* enters surface water from the direct disposal of waste into streams or lakes or by seeping into groundwater. Bacteria could be in runoff from wooded areas, pastures, feedlots, septic tanks, manure piles, dog runs, and sewage plants.

- **Criteria:** Organisms of the coliform group associated with fecal sources may not exceed a 90-day log mean of 126 *E. coli* organisms per 100ml based on a minimum of five samples and no single sample shall exceed 406 *E. coli* organisms per 100ml.

Biological Criteria: EPA's proposed additions to the 303(d) list for the Management Area include biological criteria, which measure the aquatic macroinvertebrates community (aquatic bugs) that are sensitive to water quality. These proposed listings do not specify which water pollutant(s) may be affecting the macroinvertebrates. The Clackamas River and four of its tributaries are proposed for listing, along with three tributaries in the Abernethy Creek - Willamette River watershed.

DDT and Dieldrin: DDT and dieldrin are toxic organochlorinated pesticides that were commonly used as agricultural insecticides and to control disease-causing insects, such as mosquitoes. Both pesticides tend to bind to soil, rather than dissolve in water. Although these pesticides have since been banned in the U.S., they can still be found in the environment.

- DDT criterion of 0.000022 ug/L
- Dieldrin criterion 0.0000053 ug/L
- DDE criterion of 0.000022 ug/L

Dissolved Oxygen (DO): Dissolved Oxygen is the amount of gaseous oxygen (O2) dissolved in water. Oxygen enters the water by direct absorption from the atmosphere, by rapid movement, or as a waste product of plant photosynthesis. Water temperature and the volume of flowing water can affect dissolved oxygen levels. Target criteria for DO states there must not be less than 6.5 mg/L except during spawning. During spawning, DO must not be less that 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.

Mercury: Mercury is a heavy, silvery-white liquid metal element. Sources of mercury in the Willamette include: legacy mines, industrial and municipal point sources, sediment re-suspension, native soil erosion, storm water runoff, and atmospheric deposition from point,

mobile and global sources. These sources have contributed to a number of fish consumption advisories in the Lower Willamette. Mercury has an aquatic life acute criterion of 2.4 ug/L and a chronic criterion of 0.012 ug/L.

The criteria for the protection of human health:

- 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.
- That may chemically change to harmful forms in the environment;

Stream Water Temperature: Temperature is a critical water quality and environmental parameter because it governs the kinds and types of aquatic life, regulates the maximum dissolved oxygen concentration of the water, and influences the rate of chemical and biological reactions.

- **Criteria:** The seven-day average maximum temperature of a stream identified as having salmon and trout rearing and migration use may not exceed numeric criteria.
    - Rearing is approximately June through September;
    - Spawning is generally September through May.

Use	Numeric Criteria (7-Day Statistic)
Salmon and Steelhead Spawning	13.0 °C/ 55.4 °F
Core Cold water Habitat	16.0 °C/ 60.8 °F
Salmon and Trout Rearing and Migration	18.0 °C/ 64.4 °F
Salmon and Steelhead Migration Corridors	20.0 °C/ 68.0 °F
Bull Trout Spawning and Juvenile Rearing	12.0 °C/ 53.6 °F

Toxics: 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.

Appendix E: Drinking Water Source Areas for Public Water Systems