Lower Willamette Agricultural Water Quality Management Area Plan

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Developed by the

Oregon Department of Agriculture

Lower Willamette Local Advisory Committee

With support from the

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West Multnomah Soil and Water Conservation District
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Acronyms and Terms Used in this Document

Ag Water Quality Program – Agricultural Water Quality Management Program
Area Plan – Agricultural Water Quality Management Area Plan
Area Rules – Agricultural Water Quality Management Area Rules
CAFO – Confined Animal Feeding Operation
CNPCP – Coastal Nonpoint Pollution Control Program
CWA – Clean Water Act
CZARA – Coastal Zone Act Reauthorization Amendments
DEQ – Oregon Department of Environmental Quality
DMA – Designated Management Agency
GWMA – Groundwater Management Area
HABs – Harmful Algal Blooms
LAC – Local Advisory Committee
LMA – Local Management Agency
Management Area – Agricultural Water Quality Management Area
MOA – Memorandum of Agreement
NPDES – National Pollution Discharge Elimination System
NRCS – Natural Resources Conservation Service
OAR – Oregon Administrative Rules
ODA – Oregon Department of Agriculture
ODF – Oregon Department of Forestry
OHA – Oregon Health Authority
ORS – Oregon Revised Statute
OWEB – Oregon Watershed Enhancement Board
PMP – Pesticides Management Plan
PSP – Pesticides Stewardship Partnership
RCA – Required Corrective Action
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
Foreword

This Agricultural Water Quality Management 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 through a combination of outreach programs, suggested land treatments, management activities, compliance, and monitoring.

The Area Plan is neither regulatory nor enforceable (Oregon Revised Statute (ORS) 568.912(1)). It references associated Agricultural Water Quality Management Area Rules (Area Rules), which are Oregon Administrative Rules (OARs) 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 state and federal law (OAR 603-090-0030(1)). At a minimum, an Area Plan must:

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

Plan Content

Chapter 1: Agricultural Water Quality Management Program Purpose and Background. The purpose is to have consistent and accurate information about the 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 available practices to address water quality issues.

Chapter 3: Local Goals, Objectives, and Implementation Strategies. Presents goal(s), measurable objectives, and timelines, along with strategies to achieve these goal(s) and objectives.

Chapter 4: Local Implementation, Monitoring, and Adaptive Management. ODA and the Local Advisory Committee (LAC) will work with knowledgeable sources to summarize land condition and water quality status and trends to assess progress toward the goals and objectives in Chapter 3.
Chapter 1: Agricultural Water Quality Management Program

1.1 Purpose and Applicability of Area Plans

As part of Oregon’s Agricultural Water Quality Management 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 due 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 LAC, with support and input from the SWCD and the Oregon Department of Environmental Quality (DEQ). The public was invited to participate in the original development and approval of the Area Plans and is invited to participate in the biennial review process. The Area Plan is implemented using a combination of outreach, conservation and management activities, compliance with Area Rules developed to implement the Area Plan, 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 to 603-095-0120). The Ag Water Quality Program’s general rules guide the Ag Water Quality Program, and the Area Rules for the Management Area are the regulations that landowners are required to follow. Landowners will be encouraged through outreach and education to implement conservation 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 properties grazing a few animals or raising crops.
- Agricultural lands that lay idle or on which management has been deferred.
- Agricultural activities in urban areas.
- Agricultural activities on land subject to the Forest Practices Act (ORS 527.610).

Water quality on federal lands in Oregon is regulated by DEQ and on Tribal Trust lands 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; to achieve water quality standards; and to adopt rules as necessary (ORS 568.900 through ORS 568.933). Senate Bill 502 was passed in 1995 to clarify that ODA is the lead agency for regulating agriculture with respect to water quality (ORS 561.191). The Area Plan and Area Rules were developed and subsequently revised pursuant to these statutes.

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

- Providing education, outreach, and technical assistance to landowners.
• Implementing projects to improve agricultural water quality.
• Investigating complaints of potential violations of 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: Map of 38 Agricultural Water Quality Management Areas

1.3 Roles and Responsibilities

1.3.1 Oregon Department of Agriculture

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

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

The Oregon Department of Agriculture has the legal authority to develop and implement Area Plans and Area Rules for the prevention and control of water pollution from agricultural activities and soil erosion, where such plans are required by state or federal law (ORS 568.909 and ORS 568.912). ODA 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. 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. The ODA will use enforcement where appropriate and necessary to gain compliance with Area Rules. Figure 2 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 the condition through required corrective actions (RCAs) 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 RCAs, ODA may assess civil penalties for continued violation of the 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.
Figure 2: Compliance Flow Chart

Oregon Department of Agriculture
Water Quality Program Compliance Process

ODA Receives Complaint, Notification, or Staff Observation

Information Complete? Complaint, Notification, or Observation Appears Valid?

YES

Case Not Opened

NO

Conduct Investigation

Pre-Enforcement ‘Fix-it’ Letter

NO

Follow-Up If Adequate Response

Yes

No Follow-Up If Adequate Response

Violation?

YES or LIKELY

* May issue a Notice of Noncompliance if there is a serious threat to human health or environment

* Pre-Enforcement Letter

Follow-Up Investigation

NO

Letter of Compliance Close Case

Violation?

YES

Notice of Noncompliance

Follow-Up Investigation

NO

Letter of Compliance Close Case

Civil Penalty

YES

Violation?

NO

NOTE: Landowner may seek assistance from SWCD or other sources as needed throughout the process. However, cost-share funds are no longer available once a Notice of Noncompliance has been issued.

Is an Advisory or Warning Not an Enforcement Action
1.3.2 Local Management Agency

A Local Management Agency (LMA) is an organization that ODA designated to assist with the implementation of an Area Plan (OAR 603-090-0010). The Oregon Legislature’s intent is for SWCDs to 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 agreement between ODA and each SWCD. Each SWCD implements the Area Plan by providing outreach and technical assistance to landowners. SWCDs also work with ODA and the LAC to establish implementation priorities, evaluate progress toward meeting Area Plan goals and objectives, and revise the Area Plan and Area Rules as needed.

1.3.3 Local Advisory Committee

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

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

- Participate in the development and ongoing revisions of the Area Plan,
- Participate in the development and revisions of the Area Rules,
- 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. Each landowner in the Management Area is required to comply with the Area Rules as well as select and implement a suite of measures to protect water quality. The actions of each landowner will collectively contribute toward achievement of the water quality standards.

Technical and financial assistance is available to landowners who want to work with SWCDs (or other local partners) to achieve land conditions that contribute to good water quality. Landowners also may 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 do not result from agricultural activities, such as:

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

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

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

1.4 Agricultural Water Quality

The CWA directs states to designate beneficial uses related to water quality for every waterbody, 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. Significant point sources are required to obtain permits that specify their pollutant limits. Agricultural operations regulated as point sources include permitted Confined Animal Feeding Operations (CAFOs), and many are regulated under ODA’s CAFO Program. Pesticide applications in, over, or within three feet of water also are regulated as point sources. Irrigation water flows from agricultural fields may be at a defined outlet but they do not currently require a permit.

Nonpoint 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 in OARs for each basin. They may include: public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, hydropower, and commercial navigation and transportation. The most sensitive beneficial uses 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. Many of these waterbodies have established water quality management plans that document needed pollutant reductions. The most common water quality concerns related to agricultural activities are temperature, bacteria, biological criteria, sediment and turbidity, phosphorous, algae, pH, dissolved oxygen, harmful algal blooms (HABs), nitrates, pesticides, and mercury. These parameters vary by Management Area and are summarized in Chapter 2.

1.4.3 **Impaired Waterbodies and Total Maximum Daily Loads (TMDLs)**

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

A TMDL includes an assessment of water quality data and current conditions and describes a plan to achieve conditions so that waterbodies will meet water quality standards. TMDLs specify the daily amount of pollution a waterbody can receive and still meet water quality standards. In the TMDL, point sources are allocated pollution limits as “waste load allocations” that are then incorporated in NPDES waste discharge permits, while a “load allocation” is attributed to nonpoint sources (agriculture, forestry, and urban). The agricultural sector is responsible for helping achieve the pollution limit by achieving the load allocation assigned to agriculture specifically, or to nonpoint sources in general, depending on how the TMDL was written.

Total Maximum Daily Loads generally apply to an entire basin or subbasin, not just to an individual waterbody on the 303(d) list. Waterbodies will be listed as achieving water quality standards when data show the standards have been attained.

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

The list of impaired waterbodies (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 ORS 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 of the Area Rules.

ORS 468B.025 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:

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

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

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

1.4.5 Streamside Vegetation and Agricultural Water Quality

Across Oregon, the Ag Water Quality Program emphasizes streamside vegetation protection and enhancement to prevent and control water pollution from agriculture activities and to prevent and control soil erosion. Streamside vegetation can provide three primary water quality functions: shade for cool stream temperatures, 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.

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

- Streamside vegetation improves water quality related to multiple pollutants, including: temperature (heat), sediment, bacteria, nutrients, toxics, and pesticides.
- Streamside vegetation provides fish and wildlife habitat.
• Landowners can improve streamside vegetation in ways that are compatible with their operation. Streamside conditions may be improved without the removal of the agricultural activity, such as with managed grazing.

• Streamside vegetation condition is measurable and can be used to track progress in achieving desired site conditions.

Site-Capable Vegetation
The Ag Water Quality Program uses the concept of “site-capable vegetation” to describe the vegetation that agricultural streams can provide to protect water quality. Site-capable vegetation is the vegetation that can be expected to grow at a particular site, given natural site factors (e.g., elevation, soils, climate, hydrology, wildlife, fire, floods) and 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 flowing through agricultural lands. The Area Rules for each Management Area require that agricultural activities 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 for 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 recognizes removal as a good conservation activity and encourages landowners to remove these plants. Voluntary programs through SWCDs and watershed councils provide technical assistance and financial incentives for weed control and restoration projects. In addition, the Oregon State Weed Board identifies invasive plants that can negatively impact watersheds. Public and private landowners are responsible for eliminating or intensively controlling noxious weeds as may be provided by state and local law enacted for that purpose. For further information, visit www.oregon.gov/ODA/programs/weeds.

1.5 Other Water Quality Programs

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

1.5.1 Confined Animal Feeding Operation Program

The Oregon Department of Agriculture is the lead state agency for the CAFO Program. The CAFO Program was developed to ensure that operators do not contaminate ground or surface water with animal manure or process wastewater. Since the early 1980s, CAFOs in Oregon have been registered to a general Water Pollution Control Facility (WPCF) permit designed to protect water quality. A properly maintained CAFO must implement a site-specific suite of structural and management practices to protect ground or surface water. To assure continued protection of ground and surface water, the 2001 Oregon State
Legislature directed ODA to convert the CAFO Program from a WPCF permit program to a federal National Pollutant Discharge Elimination System (NPDES) program. Oregon Department of Agriculture and DEQ jointly issue the NPDES CAFO Permit, which complies with all CWA requirements for CAFOs. In 2015, ODA and DEQ jointly issued a WPCF general CAFO Permit as an alternative for CAFOs that are not subject to the federal NPDES CAFO permit requirements. Currently, ODA can register CAFOs to either the WPCF or NPDES CAFO permit.

Either of the Oregon CAFO 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. You can view the CAFO program site at http://www.oregon.gov/ODA/programs/NaturalResources/Pages/CAFO.aspx

1.5.2 Groundwater Management Areas

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

Oregon has designated three 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.

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

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

In 2007, the interagency Water Quality Pesticide Management Team (WQPMT) was formed to expand efforts to improve water quality in Oregon related to pesticide use. The WQPMT includes representation from ODA, ODF, DEQ, and Oregon Health Authority (OHA). The WQPMT facilitates and coordinates activities such as monitoring, analysis and interpretation of data, effective response measures, and management solutions. The WQPMT relies on monitoring data from the Pesticides Stewardship Partnership (PSP) program and other monitoring programs to assess the possible impact of pesticides on Oregon’s water quality. Pesticide detections in Oregon’s streams can be addressed through multiple programs and partners, including the PSP program.
Through the PSP, state agencies and local partners work together to monitor pesticides in streams and to improve water quality (www.deq.state.or.us/wq/pesticide/pesticide.htm). 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.

Oregon Department of Agriculture 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 resources.

1.5.5 Drinking Water Source Protection

Oregon implements its drinking water protection program through a partnership between DEQ and OHA. The program provides individuals and communities with information on how to protect the quality of Oregon’s drinking water. The 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 see: www.deq.state.or.us/wq/dwp/dwp.htm.

1.6 Partner Agencies and Organizations

1.6.1 Oregon Department of Environmental Quality

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

A Memorandum of Agreement (MOA) between DEQ and ODA recognizes that ODA is the state agency responsible for implementing the Ag Water Quality Program. ODA and DEQ updated the MOA in 2012.

The MOA includes the following commitments:

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

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

Oregon Department of Agriculture and SWCDs work in close partnership with local, state, and federal agencies and organizations, including: DEQ (as indicated above), the United States Department of Agriculture (USDA) 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.

1.7 Measuring Progress

Agricultural landowners have been implementing effective conservation projects and management activities throughout Oregon to improve water quality for many years. However, it has been challenging for ODA, SWCDs, and LACs to measure progress towards improved water quality. ODA is working with SWCDs, LACs, and other partners to develop and implement strategies that will produce measurable outcomes. ODA also is working with partners to develop monitoring methods to document progress.

1.7.1 Measurable Objectives

Measurable objectives allow the Ag Water Quality Program to better evaluate progress towards improved water quality. 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 needed to achieve the measurable objective.

The Oregon Department of Agriculture, LAC, and LMA will establish measurable objectives and associated milestones for each Area Plan. Many of these measurable objectives relate to land conditions and primarily are implemented through focused work in small geographic areas (section 1.7.3), with a long-term goal of developing measurable objectives and monitoring methods at the Management Area scale.

At each biennial review, ODA and its partners will evaluate progress toward the most recent milestone(s) and why they were or were not achieved. ODA, the LAC, and LMA will evaluate whether changes are needed to keep on track for achieving the measurable objective(s) and will revise strategies to address obstacles and challenges.

The measurable objectives and associated milestones for the Area Plan are in Chapter 3 and progress toward achieving the measurable objectives and milestones 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, streamside vegetation generally is used as a surrogate for water temperature because shade blocks solar radiation from warming the stream. In addition, sediment can be used as a surrogate for pesticides and phosphorus because they 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.
- 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 resultant improvements in the water. Extensive monitoring of water quality is needed to evaluate progress, which is expensive and may fail to demonstrate improvements in the short term.
- Improved land conditions can be documented immediately, but there may be significant lag time before water quality improves or water quality impacts due to other sources.
- Reductions in water quality from agricultural activities are primarily through changes in land conditions and management activities.

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 less likely to document the short-term effects of changing land conditions on water quality parameters such as temperature, bacteria, nutrients, sediment, and pesticides.

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. Through the Focus Area process, the SWCD delivers systematic, concentrated outreach and technical assistance in a small geographic area. A key component of this approach 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 geographic areas and is supported by a large body of scientific research (e.g. Council for Agricultural Science and Technology, 2012. Assessing the Health of Streams in Agricultural Landscapes: The Impacts of Land Management Change on Water Quality. Special Publication No. 31. Ames, Iowa).

Systematic implementation in Focus Areas provides the following advantages:

- Measuring progress is easier in a small watershed than across an entire Management Area.
- Water quality improvement may be faster since small watersheds generally respond more rapidly.
- A proactive approach can address the most significant water quality concerns.
- Partners can coordinate and align technical and financial resources.
- Partners can coordinate and identify appropriate conservation practices and demonstrate their effectiveness.
- A higher density of projects allows neighbors to learn from neighbors.
- A higher density of projects leads to opportunities for increasing the connectivity of projects.
- Limited resources can be used more effectively and efficiently.
- Work in one Focus Area, followed by other Focus Areas, will eventually cover the entire Management Area.
Soil and Water Conservation Districts select a Focus Area in cooperation with ODA and other partners. The scale of the Focus Area matches the SWCD’s capacity to deliver concentrated outreach and technical assistance, and to complete (or initiate) projects. The current Focus Area for this Management Area is described in Chapter 3. The SWCD will also continue to provide outreach and technical assistance to the entire Management Area.

**Strategic Implementation Areas**

Strategic Implementation Areas (SIAs) are small watersheds selected by ODA in cooperation 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. 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 Area Rules. Finally, ODA completes a post-assessment to document progress made in the watershed. Chapter 3 describes any SIAs in this Management Area.

### 1.8 Monitoring, Evaluation, and Adaptive Management

The Oregon Department of Agriculture, LAC, and LMA will assess the effectiveness of the Area Plan and Area Rules by evaluating the status and trends in agricultural land conditions and water quality (Chapter 4). This assessment will include an evaluation of progress toward measurable objectives. ODA will utilize other agencies’ and organizations’ local monitoring data when available. ODA, DEQ, SWCDs, and LACs will examine these results during the biennial review and will revise the goal(s), measurable objectives, and strategies in Chapter 3 as needed.

**1.8.1 Agricultural Water Quality Monitoring**

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

Other partners may have water quality data that is described in Chapter 3 and presented in Chapter 4.

**1.8.2 Statewide Aerial Photo Monitoring of Streamside Vegetation**

Starting in 2003, ODA began evaluating streamside vegetation conditions using aerial photos. Stream segments representing 10 to 15 percent of the agricultural lands in each Management Area were randomly selected for long-term aerial photo monitoring. Stream segments are generally 3-5 miles long. ODA evaluates streamside vegetation at specific points within 30-, 60-, and 90-foot bands along both sides of stream segments from the aerial photos and assigns each segment a score based on streamside vegetation. The score can range from 70 (all trees) to 0 (all bare ground). The same stream segments are re-photographed and re-scored every five years to evaluate changes in streamside vegetation conditions over time. Because site-capable vegetation varies across the state, there is no single “correct” streamside vegetation index score. The purpose of this monitoring is to measure positive or negative change for an individual reach.
### 1.8.3 Biennial Reviews and Adaptive Management

All Area Plans and Area Rules around the state undergo biennial reviews by ODA and the LAC. As part of each biennial review, ODA, DEQ, SWCDs, and the LAC discuss and evaluate the progress on implementation of the Area Plan and Area Rules. This evaluation includes discussion of enforcement actions, land condition and water quality monitoring, and outreach efforts over the past biennium. ODA and partners evaluate progress toward achieving measurable objectives, and revise implementation strategies as needed. The LAC submits a report to the Board of Agriculture and the director of ODA describing progress and impediments to implementation, and recommendations for modifications to the Area Plan or Area Plans necessary to achieve the goal of the Area Plan. ODA and partners will use the results of this evaluation to update the measurable objectives and implementation strategies in Chapter 3.
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. Current LAC members are:

<table>
<thead>
<tr>
<th>Name</th>
<th>Area</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dean Apostol</td>
<td>Gresham</td>
<td>Hay, organic fruits, willow stakes, vegetables, and ducks, landscape architect</td>
</tr>
<tr>
<td>Chris Foster</td>
<td>Portland</td>
<td>Chestnut grower</td>
</tr>
<tr>
<td>Kathy Taggart</td>
<td>Gresham</td>
<td>Woody ornamentals, perennials, grasses</td>
</tr>
<tr>
<td>Roy Iwai</td>
<td>Multnomah County</td>
<td>Water Quality Program</td>
</tr>
<tr>
<td>Gordy Webster</td>
<td>Boring</td>
<td>Nursery</td>
</tr>
<tr>
<td>Martha Mitchell</td>
<td>Portland</td>
<td>Professional</td>
</tr>
</tbody>
</table>

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

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

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.

In 2001, ODA designated the East Multnomah SWCD (EMSWCD) as the lead LMA for the Lower Willamette Agricultural Water Quality Area Plan. See Appendix A for contact information. Responsibilities of the LMA include:

- Act as ODA’s LMA to develop and implement the Lower Willamette Agricultural Water Quality Management Area Plan.
- Assist ODA in the development and facilitation of the activities and responsibilities of the LAC as outlined in the Agriculture Water Quality Management Program, OAR 603-090.
- Coordinate ongoing water quality programs and projects in cooperation with all agencies, groups, and interested parties.
- Carry out the tasks associated with the project work plan.
- Use all grant funds for the purposes approved by ODA.
- Provide ODA with progress reports.

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. See sections 1.8.3, 3.2.3 and 4.4 for a description of the biennial review process and results from the 2018 Biennial Review. Biennial review years: 2006, 2009, 2011, 2013, 2015, 2017, and 2018.

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 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.

### Table 1: Land Use in the * Lower Willamette Management Area by State Zoning (Acres)*

<table>
<thead>
<tr>
<th>Zones</th>
<th>Washington County</th>
<th>** Multnomah County</th>
<th>Clackamas County</th>
<th>MA Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm Use</td>
<td>0</td>
<td>4,685</td>
<td>2,460</td>
<td>7,145 acres</td>
</tr>
<tr>
<td>Mixed Farm Forest</td>
<td>0</td>
<td>0</td>
<td>57</td>
<td>57</td>
</tr>
<tr>
<td>Forest Private and Federal</td>
<td>3,848</td>
<td>12,160</td>
<td>951</td>
<td>16,959</td>
</tr>
<tr>
<td>Rural Residential</td>
<td>0</td>
<td>1,527</td>
<td>3,295</td>
<td>4,822</td>
</tr>
<tr>
<td>Commercial</td>
<td>0</td>
<td>1,973</td>
<td>524</td>
<td>2,497</td>
</tr>
<tr>
<td>Industrial</td>
<td>0</td>
<td>23,580</td>
<td>894</td>
<td>24,474</td>
</tr>
<tr>
<td>Public Use/ Parks/ Open Space</td>
<td>0</td>
<td>17,198</td>
<td>535</td>
<td>17,733</td>
</tr>
<tr>
<td>Low-Very High Density Residential</td>
<td>0</td>
<td>61,932</td>
<td>4,253</td>
<td>66,185</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>200</td>
<td>3</td>
<td>203</td>
</tr>
</tbody>
</table>

* 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.

Other urban centers include Gresham, Fairview, Wood Village, Troutdale, Johnson City, Happy Valley, Gladstone, Lake Oswego, Maywood Park, Milwaukie, and West Linn.

#### 2.3.2 Agriculture

Farmland accounts for approximately five percent of the total land area within the Lower Willamette 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.

Nathaniel 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 for agricultural production in Multnomah and Clackamas counties. (Multnomah County 1990).

#### 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 Management Area are typically mild with cool, wet winters and warm, dry summers. Temperatures are mild throughout the year, ranging from 34°F-80°F. The predominant winter precipitation is in the form of rain. The mean annual precipitation in the Management Area ranges from 37-50 inches and increases with elevation.
Figure 3: Map of Lower Willamette Ag WQ Management Area
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 Willamette Basin is bounded on the west by the relatively low Coast Range, with Mary's Peak, at 4,097 feet, its highest point. The Cascade Range, to the east with Mount Hood at 11,249 feet, contributes

### Table 2: Agricultural Production in Multnomah County (2012)

2012 US Census of Agriculture: [https://www.nass.usda.gov/Publications/AgCensus/2012/](https://www.nass.usda.gov/Publications/AgCensus/2012/)

<table>
<thead>
<tr>
<th>Production</th>
<th>Multnomah County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Land in Agricultural Production (acres)</td>
<td>29,983</td>
</tr>
<tr>
<td>Number of Farms</td>
<td>598</td>
</tr>
<tr>
<td>Average Size of Farms (acres)</td>
<td>50</td>
</tr>
<tr>
<td>Irrigated Land (acres)</td>
<td>4,637</td>
</tr>
<tr>
<td>Total Cropland (acres)</td>
<td>17,441</td>
</tr>
<tr>
<td>Land in Pasture-All Types (acres)</td>
<td>7,728</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Livestock (# farms with:)</th>
</tr>
</thead>
<tbody>
<tr>
<td># of permitted * Confined Animal Feeding Operations</td>
</tr>
<tr>
<td># Farms in the USDA National Organic Program</td>
</tr>
<tr>
<td># Farms enrolled in USDA ** Conservation Programs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># farms: with Beef Cows</th>
<th>111</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk Cows</td>
<td>3</td>
</tr>
<tr>
<td>Equine: Horses, Ponies, Mules, and Donkeys</td>
<td>102</td>
</tr>
<tr>
<td>Layers/ Poultry/ Turkey</td>
<td>122</td>
</tr>
<tr>
<td>Goats: Milk/ Angora/ Meat</td>
<td>34</td>
</tr>
<tr>
<td>Sheep and Lambs</td>
<td>39</td>
</tr>
<tr>
<td>Hogs and Pigs</td>
<td>20</td>
</tr>
<tr>
<td>Llamas and Alpacas</td>
<td>21</td>
</tr>
</tbody>
</table>

| Total Bee Colonies in Multnomah County | 830 |

<table>
<thead>
<tr>
<th>Crops (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Seeds, Grass Seeds, Hay, Forage, Silage</td>
</tr>
<tr>
<td>Vegetable Row Crops</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Orchards and Berries (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land in Orchards</td>
</tr>
<tr>
<td>Land in Christmas Trees</td>
</tr>
<tr>
<td>Land in Berries</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Greenhouse/ Nurseries</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Nursery and Greenhouse Types (in acres of growing square footage)</td>
</tr>
</tbody>
</table>

* Data from Oregon Department of Agriculture, Confined Animal Feeding Operation Program 2018

** Conservation Reserve, Wetlands Reserve, Farmable Wetlands, and CREP
to the basin's unique temperature and precipitation ranges. Maritime influences northward and southward seasonal ocean currents and easterly prevailing winds shape the regional climate. Warm, moist air blowing in from the southwest produce heavy precipitation in the late fall, winter, and early spring months in the Coast Range; producing intense seasonal rains with light, transitory snowfall, most of it at higher elevations. (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 River Subbasin is located in the northernmost portion of the Willamette River Basin and is drained by the Willamette River, Multnomah Channel, and tributaries. The Subbasins 408 square miles extend from the divides shared with the Sandy and Clackamas Subbasins in Cascade foothills on the east, across the Willamette River to the Tualatin divide on the west, north to the town of St. Helens and south to Willamette Falls at river mile 26.6. The southeastern portion of the Subbasin drains directly to the Willamette River and contains the majority of the Portland metropolitan area, while the northwestern portion generally drains rural and agricultural lands through tributaries that discharge to the Multnomah Channel. (ODEQ – TMDL 2006). 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.

The 2012 Census of Agriculture states there are 247 farms with irrigated land composed of 4,637 acres in Multnomah County. There are 31 active surface water withdrawal rights for irrigation in the Management Area (DEQ TMDL 2006). The Oregon Water Resources Department (OWRD) states that because demand for water in the summer months exceeds the available supply for many streams that OWRD no longer issues permits for additional appropriations from surface-water sources in the Willamette Basin.

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. Table 3 summarizes streamflow in Johnson Creek. A substantial portion of summer stream flow comes from Crystal Springs through Crystal Creek.

**Drinking Water**

None of the public water systems in the Management Area use surface water as their drinking water source; however, there are 32 public water systems using groundwater wells in the plan area that serve the cities of Portland, Gresham, Fairview, Wood Village, Milwaukie, and Johnson City as well as multiple other smaller communities. Many of these groundwater wells are identified as vulnerable to contamination due to characteristics of the drinking water supply aquifer and the potential for contaminants to reach the aquifer based on source water assessments completed by DEQ and OHA. Only minor areas of agricultural lands were identified in most of the drinking water source areas with the exception of the source areas for the following public water systems: Cottrell Elementary School District.
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. In Box 1 (on the next page) 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.
Box 1: 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](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 subsurface 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.

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 allows 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 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.
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 has been shifted. High stream temperatures that normally occur in July and August have been shifted to September and October. In addition, low stream temperatures that occur in January and February can be lowered further from bottom reservoir releases and lower temperatures, in some areas, have been shifted well into June. These prolonged shifts affect fall and spring salmonid spawning, incubation, and fry emergence timing. (ODEQ – TMDL 2006).

### 2.4 Agricultural Water Quality

#### 2.4.1 Water Quality Issues

<table>
<thead>
<tr>
<th>Species</th>
<th>Life Cycle</th>
<th>Location</th>
<th>Water Temperature</th>
<th>Fry Habitat</th>
<th>Juvenile Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook Salmon</td>
<td>Migration</td>
<td>Mainstem and large tributaries</td>
<td>42°F – 57°F (5.5°C – 13.8°C)</td>
<td>32°F – 68°F (0°C – 20°C)</td>
<td>Stream; river edges</td>
</tr>
<tr>
<td></td>
<td>Apr – Jun</td>
<td></td>
<td></td>
<td></td>
<td>Deeper water in main river channel</td>
</tr>
<tr>
<td></td>
<td>Spawning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sep – Oct</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coho</td>
<td>Migration</td>
<td>Mainstem and large tributaries</td>
<td>42°F – 57°F (5.5°C – 13.8°C)</td>
<td>32°F – 68°F (0°C – 20°C)</td>
<td>Stream; river edges</td>
</tr>
<tr>
<td></td>
<td>Sep – Dec</td>
<td></td>
<td></td>
<td></td>
<td>Deeper water in main river channel</td>
</tr>
<tr>
<td></td>
<td>Spawning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oct – Jan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chum</td>
<td>Migration</td>
<td>Lower mainstem and tributaries</td>
<td>45°F – 55°F (7.2°C – 12.7°C)</td>
<td>40°F – 56°F (4.4°C – 13.3°C)</td>
<td>Move directly to estuary</td>
</tr>
<tr>
<td></td>
<td>Nov – Dec</td>
<td></td>
<td></td>
<td></td>
<td>High sediment will kill</td>
</tr>
<tr>
<td></td>
<td>Spawning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nov – Dec</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steelhead Trout</td>
<td>Migration</td>
<td>Small tributaries</td>
<td>40°F – 57°F (4.4°C – 13.8°C)</td>
<td>40°F – 56°F (4.4°C – 13.3°C)</td>
<td>Backwater pools &amp; stream edges</td>
</tr>
<tr>
<td></td>
<td>Sep – Jan</td>
<td></td>
<td></td>
<td></td>
<td>Pools, off channel alcoves</td>
</tr>
<tr>
<td></td>
<td>Spawning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oct – Jan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Lamprey</td>
<td>Migration</td>
<td>Small tributaries</td>
<td>39°F – 49°F (3.8°C – 9.4°C)</td>
<td>40°F – 56°F (4.4°C – 13.3°C)</td>
<td>Stream edges</td>
</tr>
<tr>
<td></td>
<td>Nov – May</td>
<td></td>
<td></td>
<td></td>
<td>Pools, rifles, &amp; runs of tributary streams, large woody debris</td>
</tr>
<tr>
<td></td>
<td>Spawning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jan – May</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This information is general and will vary throughout the Lower Willamette Subbasin.
2.4.1.1 Beneficial Uses

Water quality standards are established to protect beneficial uses of the state's waters. Beneficial uses are assigned by basin in the OARs for water quality. Table 5 summarizes the State of Oregon’s designated beneficial uses for the Lower Willamette Subbasin. See section 1.4.2 for further information.

2.4.1.2 WQ Parameters and 303(d) List of Impaired Waters

A number of waterbodies within the Management Area are impaired (do not meet state water quality standards - Tables 6 and 7) for one or more water quality pollutants. The Oregon DEQ is required to submit a list of impaired waterbodies to the U.S. Environmental Protection Agency (EPA) every two years under section 303(d) of the federal CWA. This list is commonly referred to as the “303(d) list” and is made available online through DEQ’s 2012 Integrated Report Assessment Database and 303(d) list. Go online to access the DEQ database: [https://www.deq.state.or.us/wq/assessment/rpt2012/search.asp](https://www.deq.state.or.us/wq/assessment/rpt2012/search.asp) for more information on water quality pollutants, see Appendix E.

DEQ submitted its most recent Integrated Report to EPA in November of 2014. The EPA acted on this report on December 21, 2016 and partially approved and disapproved Oregon’s 2012 Integrated Report. The approved additions and removals are now effective for CWA purposes. In Table 6, are the 303(d) listings for stream segments found in agricultural and rural lands of the Lower Willamette based on EPA’s December 21, 2016 approval for the Management Area.

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### Table 5: State of Oregon Designated Beneficial Uses for the Lower Willamette Subbasin


<table>
<thead>
<tr>
<th>Beneficial Use</th>
<th>Willamette Mainstem from Mouth to Willamette Falls including Multnomah Channel</th>
<th>All Lower Willamette Tributaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Public Domestic Water Supply</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>(1) Private Domestic Water Supply</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Industrial Water Supply</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Irrigation</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Livestock watering</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>(2) Fish and Aquatic Life</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Wildlife and Hunting</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Fishing</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Boating</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Water Contact Recreation</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Aesthetic Quality</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Hydro Power</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Commercial Navigation &amp; Transportation</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

(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.
2.4.1.3 Basin TMDLs and Agricultural Load Allocations

DEQ, in accordance with the federal Clean Water Act, is required to establish Total Maximum Daily Loads (TMDLs) for pollutants on the list of impaired water bodies (303(d) list). TMDLs generally apply to an entire basin or subbasin, and not just to an individual waterbody that was on the 303(d) list. TMDLs specify the daily amount of pollution that a water body can receive and still meet water quality standards. See Table 7 for TMDLs in the Lower Willamette MA and refer to section 1.4.3 for further information related to TMDLs.

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. The agricultural sector is responsible for reducing agricultural nonpoint water pollution to meet the load allocation assigned to agriculture. Loading capacity provides a reference for calculating the amount of pollutant reduction needed to bring water into compliance with water quality standards. The load allocation represents the amount of pollutant that can be added to a waterbody and still achieve water quality standards. Non-point source (agricultural) load allocations apply all year-round to all perennial and fish-bearing intermittent waters within the Lower Willamette Management Area.
Table 7: Pollutants with *TMDLs and Load Allocations for the Lower Willamette Management Area

Updated from the DEQ 2012 Integrated Report (Last Accessed 08/02/18)
https://www.deq.state.or.us/wq/assessment/rpt2012/search.asp

| Cat 4A: Water quality limited, TMDL approved - See Appendix E 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**: Applies to all waterbodies in the Willamette Basin

**Load Allocation**: 27% is the estimated percent reduction needed to attain the interim water column guidance value. This interim guidance value, when attained, should eventually reduce the concentrations of mercury in fish tissue to levels that no longer pose an unacceptable health risk to consumers of the fish.

Note: DEQ is currently revising the TMDL for Mercury to account for a more stringent methyl mercury fish tissue criteria that was adopted in 2011. DEQ expects a final TMDL in 2019.

**Total Phosphate**: Applies to the Columbia Slough

The TMDL for phosphate applies April through October, is based on three different flow rates, and is applicable to storm water and groundwater sources and one-point source.

**Lead**: Applies to the Columbia Slough. DEQ developed specific allocations for these sources that accounted for four different flow rates in the Columbia Slough TMDL.

**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.

**Polychlorinated Biphenyls (PCBs) and Dioxin**: To address PCB and dioxin impairments in the Columbia Slough, DEQ established specific TMDL allocations for PCB and dioxin in the Columbia Slough for stormwater, sediment sources and one-point source discharger (for PCB).

**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 at: 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 Total Maximum Daily Load (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 Lower Willamette Management 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.

2.4.2 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.

Point source water pollution can be easy to identify, and is often associated with a factory discharge or local sewage treatment overflow pipe. Non-point source pollution can be difficult to pinpoint to a single source. 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 Prevention and Control Measures

Prevention and Control Measures 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 these prevention and control measures may be subject to enforcement procedures based upon the Area Rules. Enforcement procedures are outlined in Section 1.3.1 and in Figure 2. The Area Rules were developed based on the Prevention and Control Measures outlined in the sections below.

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.
The Prevention and Control Measures relate directly to water quality issues identified on the 303(d) list 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 Prevention and Control Measures 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. Indicators of non-compliance are included to describe landscape conditions that should be avoided on agricultural land. A review of the information provided in this document may provide ideas on how to improve water quality through management activities.

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

The Area Rules are the only enforceable provision of the agricultural water quality program. Any actions related to determination of noncompliance with the Area Rules or enforcement will be taken up directly by ODA, as outlined in OARs 603-090-0080 through 603-090-0120. Area Rules are goal-oriented and describe conditions that should be achieved or avoided on agricultural lands, rather than practices that must be implemented. Area Rules were adopted for the Lower Willamette Management Area in 2003.

Under the Prevention and Control Measures in the Area Rules (OAR 603-095-1200), agricultural landowners and operators are not responsible for mitigating or dealing with factors that do not result from agricultural activities. These factors include but are not limited to:

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

ORS 468B.025 Prohibited activities.
(1) Except as provided in ORS 468B.050 or 468B.053, no person shall:
(a) Cause pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.
(b) Discharge any wastes into the waters of the state if the discharge reduces the quality of such waters below the water quality standards established by rule for such waters by the Environmental Quality Commission.
(2) No person shall violate the conditions of any waste discharge permit issued under ORS 468B.050.
(3) Violation of subsection (1) or (2) of this section is a public nuisance. [Formerly 449.079 and then 468.720; 1997 c.286 §5].

ORS 468B.050 when permit required.
(1) Except as provided in ORS 468B.053 or 468B.215, without first obtaining a permit from the Director of the Department of Environmental Quality or the Oregon Department of Agriculture, which permit shall specify applicable effluent limitations, no person shall:
(a) Discharge any wastes into the waters of the state from any industrial or commercial establishment or activity or any disposal system.
(b) Construct, install, modify or operate any disposal system or part thereof or any extension or addition thereto.
(c) Increase in volume or strength any wastes in excess of the permissive discharges specified under an existing permit.
(d) Construct, install, operate or conduct any industrial, commercial, confined animal feeding operation or other establishment or activity or any extension or modification thereof or addition thereto, the operation or conduct of which would cause an increase in the discharge of wastes into the waters of the state or which would otherwise alter the physical, chemical or biological properties of any waters of the state in any manner not already lawfully authorized.
(e) Construct or use any new outlet for the discharge of any wastes into the waters of the state.
(2) As used in this section, "confined animal feeding operation" has the meaning given that term in rules adopted by the Oregon Department of Agriculture or the Department of Environmental Quality.
[Formerly 449.083 and then 468.740; 1997 c.286 §6; 2001-c.248 §4]

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

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

Other Water Quality Parameters that may be Impacted:
Additional water quality parameters that may be positively impacted by this rule include chlorophyll a, pH, aquatic weeds and algae, and turbidity.
2.5.2 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 ORS 468B.050. Effective upon rule adoption (a) Landowners and operators shall prevent the runoff or leaching of contaminated water from feed and manure storage piles into waters of the state, including but not limited to groundwater. (b) Landowners or operators shall store, use, and apply crop nutrients in a manner that prevents transport into the waters of the state.

Intent

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

Sound agronomic practices related to nutrient management include:

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

Indicators of Non-Compliance

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

Clear Non-Compliance:

- Fertilizer product applied to, or remaining in surface water,
- Visible trail of manure, soil, or compost to surface water,
- Fall soil tests show excess of 30 ppm Nitrate (NO$_3^-$) in the first 12” of soil,
- Runoff water flowing through accumulated waste or areas of high animal usage.

Likely Non-Compliance (Requires further investigation):

- Excess depth of manure or compost applied to fields,
- Manure piles stored on permeable surfaces,
- Animal confinement areas located in close proximity to waterbodies,
- Indicators that runoff from confinement areas could easily flow into waters of the state 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.
Other Water Quality Parameters that may be Impacted:
Additional water quality parameters that may be positively impacted by this rule include chlorophyll $a$, pH, aquatic weeds and algae, and sedimentation.

Nitrate NO$_3$ is a polyatomic ion. It is made up of one nitrogen and three oxygen atoms. It is part of many important molecules. Potassium nitrate is a common nitrate, used in fertilizers because plants need both potassium and nitrates to live and grow.

2.5.3 Erosion Management

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

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

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

- Water bars,
- Surface crowning,
- Filter strips,
- Water and sediment control basins,
- Road surface maintenance (maintaining gravel or grass cover),
- Road drainage maintenance (maintaining culverts and ditches),
- Rolling dips,
- Out sloping road bench.

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

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

- Re-suspension of sediment in the stream that may contain pesticides,
- Greater erosive action on streambanks bringing more sediment that may contain pesticides into the stream.
**Erosion Prevention** - Erosion prevention starts at the “top” of the hill. This process focuses on ways to prevent soil particles from detaching and moving with water or wind. Erosion prevention is NOT placing straw bales at the bottom of a swale to catch sediment - the erosion has already occurred.

**Examples of erosion prevention include:**
- Utilize soil health principles and avoid leaving your soil bare or uncovered. Plant a cover crop. USDA Soil Health Website: www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health/
- Switching from conventional tillage to no-till,
- Contour cropping,
- Deep ripping a field to improve water infiltration,
- Any practice that reduces the detachment and movement of soil.

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

**Examples of sediment control measures include:**
- Strip cropping,
- Catch basins,
- Grass lined waterways,
- Vegetative filter strips,
- Straw bales (temporary measure),
- Sediment fence (temporary measure).

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

**Indicators of Non-Compliance for Soil Erosion**

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

**Likely Non-Compliance (Requires further investigation):**
- A drainage way that is growing deeper or wider in response to increased flows,
- Field swales with high water flow and without crop residues, grass cover, or sediment control structures,
- Steep slopes with minimal cover,
- Sediment deposits left from flowing water that are visible away from the ditch or channel,
- Lack of vegetation in and around drainage ditches.
Indicators of Non-Compliance for Erosion on Private Roads used for Agricultural Activities

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

Likely Non-Compliance:
- Inadequate culverts and water bars to keep runoff in natural channel.

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

2.5.4 Riparian Management

Intent
This Prevention and Control Measure is anticipated to allow landowners to develop a flexible riparian area management strategy while providing adequate vegetation to trap sediment, prevent flood debris from depositing on fields, and protect pasture and cropland from bank erosion. Vegetation along smaller streams provides aquatic and wildlife habitat and helps reduce solar radiation reaching the water which
impacts water temperature. This Prevention and Control Measure is also anticipated to minimize the impact of livestock on riparian vegetation.

**Indicators of Non-Compliance**

**Clear Non-Compliance:**
- Active streambank sloughing/erosion as a result of tillage, grazing, or destruction of vegetation by the landowner or occupier.
- Streambank sloughing/erosion caused by drain tile outlets.

**Likely Non-Compliance (requires further investigation):**
- Stream not protected by appropriate vegetation.

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

**Healthy Riparian Areas Provide Several Important 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,
- Stabilizing streambanks through plant root mass,
- Developing diverse channel characteristics providing pool depth, cover, and variations in water velocity necessary for fish habitat,
- Supporting a diversity of species,
- Shading for minimization of heating from sunlight,
- Providing a source of large woody debris for aquatic habitat,
- Providing a source of fine and 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.

Factors used to evaluate improvement of the riparian area condition could include:
- Increase in the numbers of desirable riparian plant species including grasses, sedges, rushes, trees and shrubs,
- Reduction in the amount of bare ground,
- Increase in the amount of fallen debris including leaves and wood,
- Maintenance of established beneficial vegetation,
- Maintenance or establishment of woody vegetation -- both trees and shrubs,
- Establishment of streambank integrity capable of withstanding 25-year, 24-hour rain events,
- Composition of the plant community reflecting decreases in noxious plant species,
- Shade provided that is consistent with site capability to reduce solar radiation (sunlight) reaching the water,
- Increased stubble height of herbaceous species and continued growth of shrubs and trees.
Stream temperature is an important measurement of the quality of water present in our streams. Cool water holds more dissolved oxygen and benefits aquatic life forms that are native to the Pacific Northwest.

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

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

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

2.6 Voluntary Measures and Strategies

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. A discussion of these strategies, broken down by pollutant, follows.

2.6.1 Nutrients

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

Over application of crop nutrients may result in nutrients 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. Landowners and operators are encouraged to adopt sound agronomic strategies to guide crop nutrient applications, and to ensure that nutrient applications do not lead to contamination of drinking water wells. Sound agronomic strategies include:

- Using fertilizer at agronomic rates,
- Setting realistic yield goals,
- Regular calibration of fertilizer application equipment,
- Appropriate application timing,
- Use of weather reports and crop growth stage to guide application timing,
- Periodic soil testing and plant tissue analysis,
- Periodic nutrient analysis of manure and/or compost products that are applied,
- Managing irrigation to prevent nutrient loss through leaching and/or surface runoff,
- Carefully managing nutrient applications and accounting for “non-fertilizer” sources of nutrients such as manure, compost bio-solids and leguminous and non-leguminous crop residues.

2.6.2 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. DEQ now requires a permit for pesticide applications in, over, or within three feet of water. This permit provides coverage for pesticide applications to control mosquitoes and other flying insect pests, weeds, algae, nuisance animals, and area-wide pest control.
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.

2.6.3 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.
2.6.4 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 are:

- 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.

2.6.5 Sediment

Erosion prevention means keeping soil particles from detaching and moving with water, wind, ice, or gravity and limiting sediment movement off the property. Erosion prevention starts at the “top” of the hill. Erosion prevention is not simply placing straw bales at the bottom of a swale to catch sediment--the erosion has already occurred.

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.

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. 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. To minimize the mobilization of sediment into waters of the state, growers are encouraged to:
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.
   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 2.6.4).

    **2.6.6 Streamside Area Management**

Adequate streamside vegetation provides three primary water quality functions (Council for Agricultural Science and Technology, 2012; National Council for Air and Stream Improvement, 2000; State of Oregon, 2000). Local agricultural water quality Area Rules require that agricultural activities provide these functions:

- Stream temperature moderation (vegetation blocks direct solar radiation).
- Reduced streambank erosion (roots stabilize banks and dissipate stream energy).
- Filtration of pollutants (e.g., bacteria, nutrients, toxics, sediment) from overland flows.

Adequate streamside vegetation also provides additional water quality functions (see references listed in paragraph above):

- Water storage that provides cooler and longer duration late season flows.
- Sediment trapping that builds streambanks and floodplains.
- Infiltration of water into the soil profile.
- Narrowing and deepening of channels.
- Biological uptake of sediment, organic material, nutrients, and pesticides.
- Maintenance of streamside integrity during high flow storm events.
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 as described in Section 1.4.5. 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).

Landowners often want to know what they need to do, or not do, to be in compliance with a rule or law. Some likely potential indicators of non-compliance for the streamside vegetation management rule could include:

- Active streambank sloughing/erosion in conjunction with tillage, grazing, or destruction of vegetation by humans or livestock,
- Stream not protected by appropriate filter strip/vegetated buffer.

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. Some strategies that can help reduce the impacts of erosion and sedimentation to riparian areas are to establish buffer zones, establish grassed waterways, or protect streambanks with vegetation.

### 2.6.7 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.

### 2.6.8 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. 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.

2.6.7 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,
• 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,
• Chemigated waters flowing into or ponding around wells, well pits, cisterns, or other direct conduits to ground water,
• 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.
Chapter 3: Strategic Initiatives

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

3.1.1 Management Area

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 needed to achieve the measurable objective. Section 1.7.1.

The Oregon Department of Agriculture, LAC, and LMA has established one measurable objective (MO) with associated milestones for the Area Plan: Measurable Objective #1 (section 3.1.1.1). Progress toward the Measurable Objective is discussed in section 4.1.1.1. Research and development of additional measurable objectives related to the Area Plan strategies may occur over time as new data, information, and methods become available.

3.1.1.1 Measurable Objective #1

Strategy: Prevent runoff of agricultural waste: Manure from livestock and horse operations.
Waterbody: Johnson Creek
Pollutant: Bacteria
Water Quality Criteria: Bacteria (E. coli). Johnson Creek is listed as an impaired stream for bacteria and has an approved TMDL.
Timeframe 2018 to 2028: Milestones chosen based on two-year increments (biennial reviews) over a ten-year period.
Water Quality Sampling Site: Johnson Creek at SE 282nd Avenue (Figure 4). One sample taken monthly 12 times a year (section 4.3.2). Data provided by the East Multnomah SWCD. The sampling site was chosen because of its location in agricultural lands.

Note:
- Measurable Objective (MO) #1 and applicable water quality data is to be used for the evaluation of progress toward achieving the Area Plan’s goal and for making informed decisions regarding adaptive management.
- Bacteria found in Johnson Creek water samples are from unknown sources.
- 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.
- 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 plants.

**Measurable Objective #1**

**2018 Current Condition:** Monitoring 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 meeting the water quality standard for bacteria (**E.coli**). Section 4.3.2, Graph 1, and Table 11.

**Measurable Objective #1:** By 2028, water samples collected from Johnson Creek at SE 282nd Avenue and SE Stone Road from November 2010 to September 2028 will meet water quality standards, or meet water quality standards at least 95% of the time.

- **Milestone 1:** By 2020, increase the percentage of water samples meeting the water quality standard for bacteria from the previous biennial review reporting period.
- **Milestone 2:** By 2022, increase the percentage of water samples meeting the water quality standard for bacteria from the previous biennial review reporting period.
- **Milestone 3:** By 2024, increase the percentage of water samples meeting the water quality standard for bacteria from the previous biennial review reporting period.
- **Milestone 4:** By 2026, increase the percentage of water samples meeting the water quality standard for bacteria from the previous biennial review reporting period.

**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. See sections 2.5.1, 2.5.2, 2.6.1 and 2.6.3. Appendices B, C and D. Seek technical assistance as needed. Appendix A.
- The LMA 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 Sections 3.2.2.1 and 3.2.2.1.
- The ODA and the LMA should engage in partnership activities (section 3.2.2.4) to accomplish water quality monitoring (sections 3.3 and 3.3.1).
- ODA’s Strategic Initiatives: Focus Areas 3.1.2 and Strategic Implementation Areas 3.1.3. These initiatives have recently been implemented in the Johnson Creek Subbasin. Johnson Creek FA 2013 to 2015 and Upper Johnson Creek SIA 2015 to 2017. See sections 4.1.2 and 4.1.3. Table 9.

During biennial reviews of the Area Plan, the MO and associated milestones can be modified as needed and are to be adapted and updated to reflect new data, information, and methods as they come about. See sections 4.1 and 4.1.1.1 for progress toward measurable objective/s.

**3.1.2 Focus Area**

The Johnson Creek Focus Area was closed in June of 2015. Currently, there is not a Focus Area in the Lower Willamette MA. The EMSWCD (LMA) has moved their efforts to Beaver Creek located in the Sandy Subbasin Water Quality MA. The Sandy Subbasin is another Management Area within the EMSWCD service boundary. Because of the lack of participation in the Johnson Creek Focus Area, ODA chose to include the Johnson Creek watershed in the 2015 Strategic Implementation Areas Program. See sections 3.1.3, 3.1.3.1, and 4.1.3 for information and results on the Johnson Creek SIA.
Key components of the focused approach are:
- Conduct a pre-assessment of land conditions (section 4.1.2),
- Identify areas of concern (section 3.1.3.1),
- Conduct education and outreach to landowners (section 3.2.2.1),
- Offer technical assistance to landowners and financial assistance (section 3.2.2.2),
- Conduct post assessment at two-year intervals (section 4.1.2),
- Report accomplishments to ODA and the Clackamas Subbasin LAC (section 4.1.2).

3.1.3 Strategic Implementation Areas

ODA is implementing a Strategic Implementation Area (SIA) approach in Oregon to help prevent and control water pollution from agricultural activities by working with agricultural landowners and natural resources partners in small watersheds. SIAs are priority areas where ODA identifies and aids those who may need assistance complying with water quality regulations.

The Upper Johnson Creek watershed was chosen in July 2015 as an SIA in the Lower Willamette Management Area. The Upper Johnson SIA work has been completed. See section 3.1.3.1 for description and 4.1.3 for evaluations and final report for the Upper Johnson SIA.

3.1.3.1 Upper Johnson Creek SIA (2015 to 2017)

In July of 2015, ODA selected and began implementing the SIA regulatory process in the Upper Johnson Creek watershed. The area selected encompasses a portion a 6th Field HUC (Hydrologic Unit Code) totaling approximately 17,000 acres (agricultural acres are approximately 2,700) along the main stem of Upper Johnson Creek and connecting perennial and intermittent waterways. The SIA portion will be the area east of Highway 26 and is located in two Management Areas; the Lower Willamette and Clackamas. Agricultural areas of the watershed consist mostly of nurseries, and small acreage livestock facilities.

Water quality concerns in the watershed are for bacteria, nutrients, temperature, and toxics. Appendix E.

Each property owner of three or more acres was sent an invitation to an ODA led Open House; 230 landowner invitations were sent. The Open House was held on January 20, 2016 and five landowners attended. The Upper Johnson Creek SIA work is completed and results are found in section 4.1.3.

3.2 Strategies and Activities

3.2.1 Strategies

- Prevent runoff of agricultural wastes: agricultural activities will not discharge any wastes or place waste where it is likely to run off into waters of the state.
- Prevent and control upland and cropland soil erosion using practical and available methods.
- Control active channel erosion to protect against sediment delivery to streams.
- Prevent bare areas due to livestock overgrazing near streams.
- Improve fertilizer and pesticide use and storage.
- Establish streamside vegetation along streams on agricultural properties to provide streambank stability, filtration of overland flow, and moderation of solar heating.
3.2.2 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 Lower Willamette 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 and or in cooperation 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 outlined in sections 3.2.2.1 – 3.2.2.4 and section 3.3 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.

3.2.2.1 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.

The list of recommended activities outlined below are provided for the ODA, the LMA (SWCD), and Management Area partners to consider when putting together a strategy for community and landowner engagement or are planning an event or activity aimed at achieving the goal of the Area Plan. 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 Lower Willamette Area Plan has identified bacteria, stream temperature, mercury, nutrients, and toxics as priority water quality parameters of concern (Table 7 - Chapter 2). Events and activities related to water quality should have a focus on these water quality concerns whenever possible.

2. The Lower Willamette 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. Chapter 2: Tables 6 and 7.
   - Inform agricultural landowners and operators of the availability of technical assistance and farm planning public services available in the Management Area. Appendix A.
   - Inform agricultural landowners and operators of the availability of cost-share and programs available in the Management Area. Appendix C.
   - Inform agricultural landowners and operators of their responsibilities toward preventing and controlling water pollution and soil erosion from agricultural activities. Section 2.5.
   - Inform the agricultural community of the goal and strategies of the Area Plan. Distribute to farmers and ranchers as a resource for farm planning. Chapter 3.

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. Section 2.6/ Appendix B.
   - Prevent and control soil erosion from agricultural activities. Section 2.6/ Appendix B.
   - Self-evaluate their agricultural operation and their impacts to water quality from agricultural activities. Section 2.6/ Appendix B.

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 efforts at 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.

### 3.2.2.2 Technical Assistance

The 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. The 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 also be carried out in a manner that encourages the agricultural landowner or operator to work cooperatively and participate in the voluntary efforts necessary to accomplish the Area Plan’s goal.

Implementing farming practices that prevent and control water pollution from agricultural activities by the agricultural community is crucial to the success of the Area Plan. Agricultural landowners and operators are encouraged to participate in technical assistance activities by supporting and participating in
the activities outlined in section 3.2.2 as well as providing guidance and direction on local agricultural water quality concerns and solutions to ODA, the LMA, agribusiness associations, and Management Area partners. 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. 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 practical working knowledge of farming practices that work toward the prevention and control of water pollution with others who would benefit. Sections 2.5 and 2.6 and Appendix B 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 (Table 2 - Chapter 2) 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. Appendix B.
- 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. Appendix B.
- Provide assistance to 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. Appendix D.
- 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. Appendix B.
- 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. Appendix C.
- 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. Sections 2.5 & 2.6/ Appendix B.
  - Prevent and control soil erosion from agricultural activities. Sections 2.5 & 2.6/ Appendix B.
  - Self-evaluate their agricultural operation and their impacts to water quality from agricultural activities. Sections 2.5 & 2.6/ Appendix B.
3.2.2.3 Biennial Review of the Lower Willamette Area Plan

Every two years the ODA will conduct a review of the progress made toward achieving the Area Plan’s mission, goals and objectives. The ODA will administer the Area Plan, coordinate the LAC, and work with the LMA to conduct the biennial review meeting/s. Biennial review activities:

a) Adapt and modify the Area Plan to accommodate recently identified challenges, new data, new information, and shifting priorities.

b) Convene the LAC members and recruit new members as needed.

c) Compile and report the most recent results of ODA’s compliance actions in the Lower Willamette.

d) Review progress and achievements toward the Area Plan’s goals and objectives by ODA, the LMA, and Management Area partners by tracking outputs and reporting accomplishments.

e) Analyze available water quality monitoring data and report the status and trends indicated.

f) Evaluate and measure progress toward achieving the Area Plan’s goals and objectives by setting and evaluating milestones, describing outcomes, and developing measurable objectives.

g) Deliberate and troubleshoot impediments to achieving the goals and objectives of the Area Plan.

3.2.2.4 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 and the LMA collaborate and participate in partner efforts to improve 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.

3.3 Monitoring and Evaluation

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 Status and Trend Monitoring and Evaluation

Status and trend monitoring and evaluation assists DEQ in fulfilling its roles in the biennial review process described in the Memorandum of Agreement between ODA and DEQ. Water quality status and trends reports are created to inform discussions between DEQ Basin Coordinators and ODA Agriculture Water Quality Specialists prior to the biennial review. The discussions between DEQ and ODA prior to the biennial review could include: water quality and what’s working and not working, source(s) and solutions, data needs and future monitoring to answer these questions. The status and trend report present an analysis of water quality data readily accessible from public databases and available in sufficient quantity to indicate status and trends.

Analysts retrieved data from DEQ (volunteer monitoring database not included, however, some volunteer data is queried from the Water Quality Portal), EPA and USGS databases. Many organizations provided data that was queried and evaluated for use in this report. The time period for the query was from January 1, 2000 to June 1, 2018. Parameters included in the query were temperature, pH, dissolved oxygen, total suspended solids, total phosphorus, and bacteria. Monitoring stations which had at least two years of recent data and/or at least 8 years of data fit the criteria to assess status and trends (see flow chart in full report). The report will be updated for future biennial reviews. Their report is summarized in section 4.3 and can be found at [https://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx](https://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx).
Chapter 4: Implementation, Monitoring, and Adaptive Management

Table 8 provides the framework for measuring and evaluating progress toward achieving the goal and strategies of the Area Plan. The table identifies activities to achieve the goal and strategies, specifies indicators to evaluate progress, and details the sections where tracked and reported accomplishments are located. This framework illustrates the course for discussing implementation, monitoring and adaptive management of the Area Plan.

<table>
<thead>
<tr>
<th>Activities to Achieve the Goal and Strategies of the Area Plan</th>
<th>LW MA Implementation</th>
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<td>Section 3.3: Water Quality Monitoring</td>
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<td>3.1.2: Focus Areas (FA)</td>
<td>Section 2.6: Voluntary Measures and Strategies</td>
<td>3.3.1: Status and Trend Monitoring and Evaluation</td>
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<td>3.1.1-3.1.3: Strategic Initiatives 3.2.2.1 - 3.2.2.4 Activities</td>
<td>3.2.2.4: Partnerships</td>
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<tr>
<td>Measurable Objective/s evaluation and results.</td>
<td>Applied farming practices.</td>
<td>Water quality status and trend data, analysis, and reporting.</td>
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<td>Tracked outputs and reporting for activity sections 3.2.2.1 - 3.2.2.4.</td>
<td>Partner water quality monitoring data, analysis, and reporting.</td>
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<td>(SIA) Evaluation and compliance results.</td>
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<th>Water Quality</th>
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<td>(MO) 4.1.1 and 4.1.1.1 (FA) 4.1.2</td>
<td>4.2, 4.2.1, 4.2.2, and 4.4.</td>
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<td>Tables 10, 10a and 10b and Box 2</td>
<td>Tables 11 and 12. Figure 4.</td>
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4.1 Progress Toward Measurable Objectives

4.1.1 Management Area

The ODA, LAC, and LMA has established one measurable objective (MO) and associated milestones for the Area Plan: Measurable Objective #1. See section 1.7.1, 3.1.1, and 3.1.1.1 for background information on Measurable Objective #1. Section 4.1.1.1 will be used to report initial results in the 2020 version of the Area Plan.

4.1.1.1 Measurable Objective #1

2020 Current Condition: Monitoring samples taken from Johnson Creek at SE 282nd Avenue and SE Stone Road from November 2010 to September 2020 resulted in XX% (XX/117) of the observations meeting the water quality standard for bacteria (E. coli). Section 4.3.2, Graph 1, and Table 11.
Measurable Objective #1: By 2028, water samples collected from Johnson Creek at SE 282nd Avenue and SE Stone Road from November 2010 to September 2028 will meet water quality standards, or meet water quality standards at least 95% of the time.

- Milestone 1: By 2020, increase the percentage of water samples meeting the water quality standard for bacteria from the previous biennial review reporting period. Progress toward achieving Milestone 1 will be evaluated in 2020.

Progress Discussion: Was Milestone 1 achieved? Tracking and reporting of activities (outputs) for bacteria reduction between 2018 to 2020: Insert reported and tracked activities for the 2020 Biennial Review. Adaptive Management: Insert recommendations from the LAC to adapt management if necessary.

4.1.2 Focus Areas

Johnson Creek Focus Area 2013 to 2015 (Closed): The Johnson Creek Focus Area was closed in June of 2015. Currently, there is not a Focus Area in the Lower Willamette MA. The EMSWCD (LMA) has moved their efforts to Beaver Creek located in the Sandy Subbasin Water Quality MA. The Sandy Subbasin is another Management Area within the EMSWCD service boundary. The EMSWCD is committed to working in the Beaver Creek Subbasin for some time into the future so there is no current planning of a Focus Area in the Lower Willamette MA. Refer to the previous 2017 Lower Willamette Area Plan for information and results related to the now closed Johnson Creek Focus Area.

4.1.3 Strategic Implementation Areas

Upper Johnson Creek Strategic Implementation Area 2015-2017 (Completed) 
The Upper Johnson SIA work has been completed. Table 9 is a summary of the evaluation. See sections 3.1.3 and 3.1.3.1 for background information and a description of the Upper Johnson SIA. ODA selects new SIAs annually and the potential to return to the Lower Willamette MA could be considered in the future.

4.2 Activities and Accomplishments

The Area Plan’s LMAs (SWCDs) track activities that have been implemented through quarterly reports to ODA. Below is a summary of the LMAs work during the last biennium and Table 10 is an approximate summary of the LMA’s outputs toward implementing the activities lined out in section 3.2. Data is provided by the Lower Willamette Management Area’s LMAs. East Multnomah, West Multnomah, and Clackamas SWCDs.

4.2.1 Local Management Agency Activities and Accomplishments

Clackamas Soil and Water Conservation District
Agricultural water quality technical assistance and on-site evaluations most often requested from the Clackamas SWCD was related to soil erosion from fields and streambanks and manure management from livestock and horse operations. The District found that the most challenging water quality concerns they faced in the last biennium were related to invasive weeds displacing native riparian vegetation and finding contractors to do small projects (install practices) for a reasonable price.
The District’s Facebook page is where the District posts information regarding pasture and manure management, workshops, native plant sales, riparian planting information, etc. The District also posts numerous times per month on the District’s webpage, which is then wrapped up into a monthly e-newsletter and sent to those who subscribe. Our WeedWise, Conservation Planning, Outreach and Education, and Administration departments also publish regular updates on our website regarding projects and events.

The District partnered with the Clackamas River Water Providers to produce the Field to Faucet brochure. The publication reminds folks that their streams may feed into a river that provides drinking water to many people. It outlines a number of practices that will protect water quality and includes links to additional information. The District also published Conservation on Steep Slopes, which explains how to evaluate your slope, provides best management practice for living on a slope, signs of soil movement, and when to call a specialist. The District’s partnerships with the watershed council, water providers, and other local organizations and government have all been valuable to implement our tasks and activities.

January 2017- August 2018 Events:
- Mud and Manure Management – 2017
- Pasture Management – 2018

Table 9: Summary of Results for the Upper Johnson Creek SIA 2015 to 2016

<table>
<thead>
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<th>Concern Level</th>
<th>Evaluation Results</th>
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<tr>
<td>Potential Violation</td>
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<tr>
<td>Opportunities for Improvement</td>
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<tr>
<td>Limited Opportunities for Improvement</td>
<td>743</td>
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<table>
<thead>
<tr>
<th>Cases Opened</th>
<th>Closed</th>
<th>Open to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>23</td>
<td>0</td>
</tr>
</tbody>
</table>

Description of Concern Levels
Potential Violation: Likely potential for agricultural activities to impair surface or ground water or agricultural activities may be preventing adequate vegetation along streams (field verified) or field verified likely violation such as discharge of agricultural waste into waters of the state or active removal of riparian vegetation.

Opportunities for Improvement: Possible potential for agricultural activities to impact surface or ground water or agricultural activities may be preventing adequate vegetation along streams.

Limited Opportunities for Improvement: No water quality concerns related to agricultural activities were observed or minimal potential for agricultural activities to impact surface or ground water or vegetation along streams may be inadequate but unable to determine if agricultural activities are limiting vegetation.

Summary of Compliance Actions
23 cases were open; 9 of those were nurseries the others were small farms. 9 properties were determined after speaking with the landowners that they were either Limited Opportunities for Improvement, already working with the SWCD or there were no agricultural activities on site.

Pre-Enforcement Actions: 14. Water quality concerns were related to manure management, riparian conditions, and soil erosion.
2 Fix-It letters were sent to 2 landowners to address minor concerns. No follow up. Cases closed.
6 Water Quality Advisories (WQA) were given. 4 Letters of Compliance were sent to 4 landowners after receiving WQAs and working with ODA and the SWCD to address concerns. Follow up site visits indicated they were in compliance. 2 WQAs required no follow up. All cases closed. 6 properties had site inspections resulting in an In-Field Determination that 5 properties were in compliance and 1 was given a water quality advisory. No follow up. All cases closed.

Enforcement Actions: 0. All evaluated properties were in compliance at the closing of the JC SIA.
• Using Beneficial Insects to Control Crop Pests March 2017
• Beneficial Insect Field Day – June 2017
• Beneficial Insect Field Day – June 2018
• Lavender Festival - June 2018

East Multnomah Soil and Water Conservation District
Sediment continues to be the most challenging agricultural water quality concern. For crops that are actively managed and/or harvested during the rainy season, it is both complex and expensive to integrate erosion prevention into the operation. A project the District is currently working on required an engineered design and approximately $75,000 in cost share with a total project cost of around $100,000.

An erosion prevention project on a 75-acre nursery was installed during the summer of 2018. Practices included re-grading and installing geotextile and rock on farm roads, creating two grassed waterways that included catch basins and pipe to carry runoff, and installing two sediment basins with baffle walls and surface skimmers. The District has been working with private landowners to re-vegetate riparian areas in the Johnson Creek watershed for several years, and between January and August of 2018 they conducted one last outreach mailing. This was followed up with phone calls and has led to some interest.

One of the goals of the District’s riparian re-vegetation program is to protect and improve water temperatures. Between 2009 and 2018, we removed weeds, planted native trees and shrubs, and controlled weeds to reduce competition on 56 acres of agricultural land along 2.76 miles of stream in the Johnson Creek Watershed. The District partnered with Clackamas and Tualatin SWCDs to tend a booth at the Oregon Association of Nurseries Far West Shows. In 2017, the District focused on cover crops, and for 2018, the focus was on erosion prevention products. For the 2017 Northwest Agricultural Show, the District partnered with NRCS as well as Clackamas and Tualatin SWCDs on a booth. The focus was beneficial insects for pest. Unfortunately, this event is no longer held in the area.

In support of a new program area called Erosion Solutions, the District held a listening session to get input from nurseries in 2017. In addition, they partnered with ACF West to demonstrate the installation of erosion prevention products.

Materials were created for all of the outreach events described. Topics included cover crops, beneficial insects to reduce the need for pesticides and erosion prevention. In addition, an article about soil and water conservation districts was included in the December 2017 issue of the Oregon Association of Nurseries Digger Magazine. The District uses social media to spread the word about the District’s outreach events. The District’s website has a lot of information about agricultural water quality as well as the District’s program offerings. The best projects are often the result of farmers who were recommended to the District by a peer.

January 2017- August 2018 Events:
• Oregon Association of Nurseries Far West Show 2017 and 2018
• Northwest Agricultural Show 2017
• Erosion Solutions Listening Sessions 2017
• Erosion Prevention Products with ACF West Demonstration 2017
Box 2: Clackamas Cotton Brief Challenge – Partnership Project Highlight

by the Clackamas Soil and Water Conservation District

Clackamas SWCD had one promotion that gained a lot of traction regarding healthy soil and the benefits, including improved infiltration, reduced erosion, and healthier crops. Soil Your Undies – the Clackamas Cotton Brief Challenge was taken on by a number of producers in our county. This program asked producers and home gardeners to bury a pair of 100% cotton briefs in a hole 6-8 inches deep. After two months we asked them to dig up their brief. If the cotton was mostly decomposed, then the soil is healthy because there is a good population of microbes present. If the briefs were just dirty, but mostly intact, then we recommended they did some work on improving their soil health. We used cotton briefs because if there was a good microbe community then after two months you might not find your underwear, Except for the elastic band which the microbes will not touch.

We had a number of participants. They produced Christmas trees, hazelnuts (two producers), blueberries, nursery stock, cattle, sheep, plus two home gardeners. In addition, we buried four pair at our Conservation District farm. I also wrote a three part series of articles on the program and many of the local newspapers reported on it. Actually, the Wilsonville/West Linn newspaper interviewed me for 20 minutes, wrote a great article AND then it was picked up by KOIN 6 TV. They came out and filmed me digging up underwear. They aired the story on the 4 p.m. and 5 p.m. evening news and again on the 6 a.m. newscast. We also made the front page header on the Oregon City News/Clackamas Review with a larger than life photo on the next page.

Our fair booth also caused a stir with a size 50 pair of briefs flying above our booth asking folks to “Ask us about Soil Health”. We also had five pair of underwear in various stages of decomposition strung inside the booth from farms in Clackamas County. We are working on a soil health workshop for this fall or winter.

West Multnomah Soil and Water Conservation District

Agricultural water quality technical assistance and on-site evaluations most often requested from the District was related to protecting and or restoring riparian areas and livestock and horse manure management. The District found that the most challenging water quality concerns they faced in the last biennium was related to protecting and restoring riparian areas.

Over the last biennium and after nearly ten years the District was able to get-off-the-ground one of their largest restoration projects in the Lower Willamette Subbasin. The project is the restoration of a 120-acres at the bottom of Cornelius Pass Road and included site preparation, removal of a culvert that opened up over four miles of salmon habitat and the planting of 6.75 acres of riparian habitat. Eventually five to ten more acres of riparian and wetland habitat will be restored; increasing habitat and mitigating effects from pollutants coming from up stream.

The District writes and produces a quarterly newsletter that reaches between 800-900 individuals. The District also has around 300-400 Twitter followers and anywhere from 300-600 avid followers on Facebook.

January 2017- August 2018 Events:

- Soil School 2016, 2017, and 2018
- Pollinators and BMPs 2017
4.2.2 Partnership Efforts and Programs in the Lower Willamette

Oregon Watershed Enhancement Board
The Oregon Watershed Enhancement Board (OWEB) is a state agency that provides grants to help Oregonians take care of local streams, rivers, wetlands and natural areas. Community members and landowners use scientific criteria to decide jointly what needs to be done to conserve and improve rivers and natural habitat in the places where they live. OWEB grants are funded from the Oregon Lottery, federal dollars, and salmon license plate revenue. The agency is led by a 17-member citizen board from the public at large, tribes, and federal and state natural resource agency boards and commissions. Since 1995 OWEB has funded approximately eight water quality and aquatic habitat improvement projects on agricultural and rural lands in the Lower Willamette MA. Projects: Culvert replacements, bridge installations, fish passage improvements, invasive plant removal and roof gutters. Project information is from the Oregon Watershed Restoration Inventory available online at: https://www.oregon.gov/OWEB/data-reporting/Pages/owri.aspx

East Multnomah Soil and Water Conservation District
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. East Multnomah SWCD

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Table 10: Lower Willamette Management Area’s Cumulative Reporting of Activities and Accomplishments
January 1, 2017 to August 31, 2018

This table is an approximate total of combined accomplishments by East Multnomah, West Multnomah, and Clackamas SWCDs. * Clackamas SWCD does not track number of brochures distributed.

<table>
<thead>
<tr>
<th>Community and Landowner Engagement Events and Activities.</th>
<th>July 2015 to December 2017</th>
<th>January 2017 to August 2018</th>
<th>Cumulative Total 2015 to 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community and Landowner Events and Activities</td>
<td>11</td>
<td>15</td>
<td>26</td>
</tr>
<tr>
<td>Total Attendees to all Events and Activities</td>
<td>431</td>
<td>485</td>
<td>916</td>
</tr>
<tr>
<td>Fact Sheets/ Brochures Developed</td>
<td>0</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Fact Sheets and Brochures Distributed</td>
<td>0</td>
<td>* 150</td>
<td>150</td>
</tr>
<tr>
<td>Newsletters</td>
<td>1,228</td>
<td>800</td>
<td>2028</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical Assistance</th>
<th>July 2015 to December 2017</th>
<th>January 2017 to August 2018</th>
<th>Cumulative Total 2015 to 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landowners Provided with Technical Assistance</td>
<td>35</td>
<td>80</td>
<td>115</td>
</tr>
<tr>
<td>On-Site Evaluations</td>
<td>35</td>
<td>87</td>
<td>122</td>
</tr>
<tr>
<td>Fund Applications Submitted for Projects</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Voluntary Conservation Plans Prepared</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Total Acres in Conservation Plans</td>
<td>1.0</td>
<td>102.3</td>
<td>103.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2017-2018 Applied Farming Practices</th>
<th>Units</th>
<th>Watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riparian Forest Buffers/ Riparian Plantings (Includes StreamCare and CreekCare Tables 10a and 10b)</td>
<td>37.5 acres/ 5.2 miles</td>
<td>Multnomah Channel &amp; Johnson Creek- multiple ag properties</td>
</tr>
<tr>
<td>Drip Irrigation</td>
<td>76 acres</td>
<td>Johnson Creek &amp; Columbia Slough</td>
</tr>
<tr>
<td>Irrigation Water Management</td>
<td>76 acres</td>
<td>Johnson Creek &amp; Columbia Slough</td>
</tr>
<tr>
<td>Erosion Prevention- Multiple Practices</td>
<td>75 acres</td>
<td>Johnson Creek</td>
</tr>
<tr>
<td>Rainwater Harvesting</td>
<td>1 acre</td>
<td>Columbia Slough</td>
</tr>
</tbody>
</table>

---
staff evaluates the area along the creek and then determines the weed control needs and recommended plantings. 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. The following accomplishments in Table 9 were 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/.

<table>
<thead>
<tr>
<th>StreamCare Riparian Treatments</th>
<th>Total January 2017</th>
<th>Total September 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Trees and Shrubs Planted or Re-Planted</td>
<td>49,610</td>
<td>54,135</td>
</tr>
<tr>
<td>Total Acres of Buffer</td>
<td>38 acres</td>
<td>56.19</td>
</tr>
<tr>
<td>Total Stream Miles Treated</td>
<td>2 miles</td>
<td>2.76</td>
</tr>
</tbody>
</table>

Table 10a: East Multnomah SWCD StreamCare Total Accomplishments on Agricultural Lands Along Johnson Creek

Data provided by East Multnomah SWCD – See Figure 3 for Location of Johnson Creek

Clackamas Soil and Water Conservation District and Johnson Creek Watershed Council CreekCare Program

The Johnson Creek Watershed Council in collaboration with the Clackamas SWCD worked with private landowners in the Sunshine Creek sub-watershed and planted approximately 4,500 trees and shrubs (2017 to 2018).

<table>
<thead>
<tr>
<th>2018 Total Number of Landowners</th>
<th>2018 Total Number of Project Acres</th>
<th>2018 Total Planted Stream Miles (both sides of the stream)</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>21.94</td>
<td>2.49</td>
</tr>
<tr>
<td>10</td>
<td>5.5</td>
<td>0.69</td>
</tr>
</tbody>
</table>

2018 Number of Trees & Shrubs Planted 2017-2018 – 4,500

Table 10b: Clackamas SWCD and Johnson Creek Watershed Council 2017 to 2018 CreekCare Report for Sunshine Creek (Johnson Creek sub-watershed)

Data provided by Johnson Creek Watershed Council – See Figure 3 for Location of Sunshine Creek

The program faced three main challenges this year: uncertainty in funding, the lack of an AmeriCorps crew, and the weather. In past years, we were able to secure a 10-person crew for the winter through the National Civilian Community Corps (NCCC) program of AmeriCorps, which supplemented our paid crews during planting season, reducing planting crew expense. Meanwhile, between the large number of new projects and some uncertainty around the status of our funding for the program, we found we were short of funds to be able to pay crews for planting. However, we were able to recruit a cadre of dedicated volunteers for planting season making it possible to complete this year’s CreekCare plantings.
4.3 Monitoring—Status and Trends

4.3.1 Water Quality

At each biennial review, DEQ assesses the status and trends of water quality in relation to water quality standards. DEQ has provided a status and trend report to ODA for the Lower Willamette Subbasin. Analysts retrieved data from DEQ, EPA and USGS databases. Fourteen stations in the Lower Willamette MA contained sufficient data to evaluate water quality status and trends. Of those, nine stations were selected to summarize based on their correlation and or proximity to agricultural lands. The time period for the query was from January 2000 to May 2018. Refer to Table 11 for a summary of the status and trends report. See Appendix E for information related to the water quality pollutants. Sections 4.3.2, 4.3.3 and Table 12 provide additional water quality monitoring results from partner efforts. Figure 4 illustrates location of water quality monitoring sites.

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. 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. The data will be tracked over time to identify improvements or other changes. Displayed below are two graphs illustrating results for bacteria monitoring at two sites: JC at 282nd and JC near Stone Rd – upstream from 282nd (Table 11). Water quality data for bacteria and other parameters from East Multnomah SWCD will either be analyzed in the 2020 Status and Trends Report or provided in this section at the 2020 Biennial Review.

![Graph 1: Johnson Creek at 282nd - E.coli](image1)

![Graph 2: Johnson Creek near Stone Rd- E.coli](image2)
Figure 4: Lower Willamette Monitoring Locations

Lower Willamette Water Quality
Tables 11 and 12 Monitoring Locations

Table 11 Monitoring Locations

Table 12 Monitoring Locations
Table 11: Water Quality Status and Trends at Monitoring Locations in the Lower Willamette Management Area

(See Figure 4 for locations)

ODEQ’s 2017 and 2018 Lower Willamette Water Quality Status and Trends Analysis.

See full report online at: https://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx

Upstream

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Temperature ±</td>
<td>744/ (22.5%)</td>
<td>1372/ (21%)</td>
<td>855/ (25.6%)</td>
<td>2047/ (30.5%)</td>
<td>461/ (14.4%)</td>
</tr>
<tr>
<td>Bacteria: E. coli</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>pH</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0/10</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>± TSS</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Trending Status

<table>
<thead>
<tr>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-</td>
<td>-</td>
<td>NT</td>
<td>NT</td>
<td>-</td>
</tr>
<tr>
<td>Bacteria: E. coli</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>pH</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>ST</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>NT</td>
</tr>
<tr>
<td>Total Phosphorous</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>NT</td>
</tr>
<tr>
<td>± TSS</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>NT</td>
</tr>
</tbody>
</table>


Individual samples - no trending status analysis available.

Reported: Number samples exceeding the water quality standard expressed over total number of observations taken over time.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollutants</td>
<td>2017</td>
<td>2018</td>
<td>2017</td>
<td>2018</td>
</tr>
<tr>
<td>Bacteria: E. coli</td>
<td>34/107 (31.8%)</td>
<td>34/110 (30.9%)</td>
<td>33/107 (30.8%)</td>
<td>33/110 (30%)</td>
</tr>
<tr>
<td>Temperature</td>
<td>22/100 (22%)</td>
<td>23/103 (22.3%)</td>
<td>31/100 (31%)</td>
<td>32/103 (31%)</td>
</tr>
</tbody>
</table>

[3] City of Gresham Data – Toxics (individual samples - no trending status analysis available) 2008 to 2018

Number of times the sample exceeded the Aquatic Life Water Quality Criteria for Toxic Pollutants (Freshwater Chronic).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollutants</td>
<td>2017</td>
<td>2018</td>
<td>2017</td>
<td>2018</td>
</tr>
<tr>
<td>Dieldrin &amp; Aldrin</td>
<td>0/44</td>
<td>0/47</td>
<td>0/44</td>
<td>0/47</td>
</tr>
<tr>
<td>DDT, DDD, DDE</td>
<td>44/44</td>
<td>47/47</td>
<td>44/44</td>
<td>47/47</td>
</tr>
<tr>
<td>Mercury</td>
<td>2/66</td>
<td>2/69</td>
<td>1/66</td>
<td>1/69</td>
</tr>
</tbody>
</table>

+ 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.

± TSS: Total Suspended Solids is the dry-weight of suspended particles, that are not dissolved, in a sample of water that can be trapped by a filter that is analyzed using a filtration apparatus. TSS data is used as a surrogate measurement for DDT in the Johnson Creek TMDL.

α Total Phosphorous: The parameter total phosphorus (TP) defines the sum of all phosphorus compounds that occur in various forms.

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 AgWQ Management Area. Interpretation of results will require knowledge of local conditions known to affect the observed water quality conditions at individual sites.
4.3.3 Multnomah Channel Water Quality Monitoring 2017 Report

(Excerpted from the West Multnomah SWCD 2017 Water Quality Monitoring 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). Data was collected between May 17, 2017 and October 11, 2017.

2017 Weather Summary: Summer 2017 was a hot and dry one. Air temperature was above the average for the study period; 82 out of 147 testing days reported a higher than normal high air temperature. Weather Underground 2017. While not a record, 20 days were at or above 90°F. Average is 11. Table 12 is a summary of the data and reports the number of days over the salmonid rearing criteria (18°C Seven-day running average maximum) are established by the Oregon DEQ for all observations between 2019-2017. For a full report go online to: https://wmswcd.org/programs/water-quality-monitoring/.

Table 12: Number of Days Stream Temperature Exceeded Rearing Criteria (18°Celsius/ 64.4°Fahrenheit) from May to October for years 2009, and 2011 to 2017 WMSWCD Water Quality Monitoring Results - Multnomah Channel Tributaries (See Figure 4)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Crabapple</td>
<td>NA</td>
<td>NA</td>
<td>52</td>
<td>58</td>
<td>67</td>
<td>NA</td>
<td>60</td>
<td>87</td>
<td>67.2</td>
</tr>
<tr>
<td>Upper McCarthy</td>
<td>NA</td>
<td>NA</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>15</td>
<td>3.2</td>
</tr>
<tr>
<td>Sheltered Nook (McSH)</td>
<td>NA</td>
<td>NA</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>18</td>
<td>18</td>
<td>27</td>
<td>11.3</td>
</tr>
<tr>
<td>McCarthy at Folkenburg</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>16</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>4.4</td>
</tr>
<tr>
<td>McCarthy at NW 8th</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>62</td>
<td>79</td>
<td>37</td>
<td>62</td>
<td>60.0</td>
</tr>
<tr>
<td>McCarthy at Metro</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>14</td>
<td>43</td>
<td>NA</td>
<td>0</td>
<td>79</td>
<td>34.0</td>
</tr>
<tr>
<td>McCarthy at Highway 30</td>
<td>45</td>
<td>52</td>
<td>57</td>
<td>84</td>
<td>60</td>
<td>75</td>
<td>71</td>
<td>NA</td>
<td>63.4</td>
</tr>
</tbody>
</table>

4.3.4 Oregon Water Quality Toxics Monitoring of the Lower Willamette

Because of growing public concern about toxics in the environment, Oregon’s legislature provided funds to DEQ in 2007 to establish a statewide toxic monitoring program. Three sites in the Lower Willamette—Clackamas River at Hwy. 99 in Gladstone; Willamette River at Hawthorne Bridge; and the Tualatin River at Boones Ferry Road—were sampled six times between April 2008 and May 2010 for more than 500 chemicals, including: legacy chlorinated pesticides, current-use pesticides, priority pollutant metals such as copper and arsenic, industrial chemicals, flame retardants, combustion by-products, pharmaceuticals and other personal care products. Below is a summary of results for the Willamette River at the Hawthorne Bridge monitoring site, which is the only DEQ toxics monitoring site within the Lower Willamette Agricultural Area Plan:

Summary of Results:
- Copper, iron, and pentachlorophenol (pesticide/wood preserver) exceeded applicable water quality criteria
- Two current use pesticides had consistent detections across all seasons.
- Detected three consumer products—carbamazepine (an antiepileptic), diethyl phthalate (a plasticizer) and sulfamethoxazole (antibiotic).

4.4 Biennial Reviews and Adaptive Management

Two years after the adoption of the Lower Willamette Area Rules/OARs and approximately every two years following, ODA, in cooperation with the Lower Willamette LMAs, the LAC, and DEQ will assess
the progress of the Area Plan implementation toward achievement of Area Plan goals and objectives through the biennial review process. These assessments will include:

- A review of projects, demonstrations, and tours used to showcase successful management practices and systems;
- An evaluation of outreach and education programs designed to provide public awareness and understanding of water quality issues;
- An evaluation of the effectiveness of technical and financial assistance sources available to the agricultural community;
- Documentation of violations of the prevention and control measures and subsequent corrections;
- An evaluation of available current water quality monitoring data and sources of pollution in the Lower Willamette; and
- A review of load allocations as found in any completed Lower Willamette TMDL and the anticipated effectiveness of this Plan in meeting the load allocations as described in the TMDLs for the Lower Willamette.

Based on these assessments, ODA, the Lower Willamette LMAs, the LAC, and the State Board of Agriculture will consider making appropriate modifications to the Lower Willamette Area Plan and the associated Area Rules.

2017 to 2018 Compliance Actions

Pre-Enforcement Actions: 1 – Fix-It Letter was issued. Case 17-0078 was a public complaint regarding the dumping of chicken manure in a residential area pond. The individual who dumped the manure is unknown. Three houses in the vicinity of the pond have chickens. All three were contacted. Two said in a phone call that it was not them and the third was sent a Fix-It letter because we could not contact via phone. Case closed.

Enforcement Actions: 0

2018 Summary of impediments

The Lower Willamette LAC did not distinguish any new impediments. They recognized that the Lower Willamette still needs continued outreach regarding Area Rules and welcomes new and innovative practices to help nurseries with soil erosion. The LAC also observed that they need more LAC members and more representation from the agricultural community. ODA and the SWCDs will work together to recruit additional LAC members over the next biennium.

2018 Recommendations for modifications

The Lower Willamette LAC expressed they were satisfied with the revisions of the Area Plan as well as the progress achieved over the last biennium. Some modifications to the Area Plan were identified and that is to update and refine the guidelines in sections 2.5 and 2.6. The development of the measurable objective resulted in a productive discussion of bacteria in Johnson Creek and will help the Districts determine how the next Biennium will move forward regarding outreach and technical assistance needs over the next biennium.
References

- IUCN SSC Amphibian Specialist Group, 2015. Rana aurora. The IUCN Red List of Threatened Species.
• Oregon Department of Environmental Quality. Lower Willamette River Basin Total Maximum Daily Load TMDL. 2006. 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.
• Tillamook Bay National Estuary Project. 1997. Salmonid Habitat Requirements for Northern Oregon Coastal Streams. P.O. Box 493, 613 Commercial St., Garibaldi, OR 97118.
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/ Oregon City
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: 503-429-0869

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: Best Management Practices

### Riparian Areas and Streams

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

### Nutrient and Manure Management

<table>
<thead>
<tr>
<th>Practice</th>
<th>Resource Concerns Addressed</th>
<th>Potential Benefits of Practice to Producer</th>
<th>Potential Costs of Practice to Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Apply nutrients according to soil test results.</td>
<td>Helps prevent nutrient runoff into waters of the state.</td>
<td>May help reduce fertilizer costs; ensures that plants receive needed nutrients for growth; makes plants more competitive against weeds.</td>
<td>Costs of soil testing; time associated with taking soil samples.</td>
</tr>
<tr>
<td>b. Establish sacrifice areas. Sacrifice areas are small pastures where animals are confined during the winter to protect other pastures from trampling and compaction. Limit livestock access to pastures when soils are saturated; cover sacrifice areas with rock, hog fuel, and/or geotextile.</td>
<td>Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.</td>
<td>Protects pastures from compaction during the winter, improving growth. May improve animal health by covering sacrifice areas with material so animals are not wading in mud.</td>
<td>Cost of fencing sacrifice area; cost of feeding hay during the winter; cost of materials for protecting sacrifice area.</td>
</tr>
<tr>
<td>c. Site barns and sacrifice areas away from streams.</td>
<td>Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.</td>
<td>Helps prevent flooding in barns and sacrifice areas.</td>
<td>Need either off-stream watering facility or other source of water for livestock.</td>
</tr>
<tr>
<td>Practice</td>
<td>Resource Concerns Addressed</td>
<td>Potential Benefits of Practice to Producer</td>
<td>Potential Costs of Practice to Producer</td>
</tr>
<tr>
<td>----------</td>
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</tr>
<tr>
<td>d. Prevent silage leaching and/or store and manage leachate from silage and other vegetative materials.</td>
<td>Helps prevent nutrient runoff into waters of the state.</td>
<td>Preventing leaching maintains higher nutrient content of ensiled feed material.</td>
<td>May require cost of facility development and purchase of moisture-absorbing materials.</td>
</tr>
<tr>
<td>e. Installing gutters and downspouts in areas with high livestock use.</td>
<td>Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.</td>
<td>May improve animal health by lessening mud during the winter, so animals are not wading in mud.</td>
<td>Cost of installation and maintenance of gutters and downspouts.</td>
</tr>
<tr>
<td>f. Cover manure storage piles.</td>
<td>Helps prevent sediment, nutrient, and bacteria runoff into waters of the state.</td>
<td>Do not lose the nutrients in manure that can be spread on pastures or crops.</td>
<td>Cost of installation and maintenance of cover.</td>
</tr>
</tbody>
</table>

**Soil Erosion and Sediment Control**

<table>
<thead>
<tr>
<th>Practice</th>
<th>Resource Concerns Addressed</th>
<th>Potential Benefits of Practice to Producer</th>
<th>Potential Costs of Practice to Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Grazing management: graze pasture plants to appropriate heights, rotate animals between several pastures; provide access to water in each pasture.</td>
<td>Helps prevent sediment runoff into waters of the state. Helps prevent streamside areas.</td>
<td>May improve pasture production; easy access to water may increase livestock production as well. May improve composition of pasture plants and help prevent weed problems.</td>
<td>Cost of installing fencing, watering facilities for rotational grazing system; time involved in moving animals through pastures.</td>
</tr>
<tr>
<td>b. Farm road construction: construct fords appropriately, install water bars to divert runoff to roadside ditches and catch-basins</td>
<td>Helps prevent sediment runoff to waters of the state.</td>
<td>May help prevent water damage on farm roads.</td>
<td>Cost of installation and maintenance.</td>
</tr>
<tr>
<td>c. Plant appropriate vegetation along drainage ditches; seed ditches following construction.</td>
<td>Helps prevent sediment runoff into waters of the state.</td>
<td>May help prevent ditch bank erosion and slumping.</td>
<td>Costs of establishing vegetation.</td>
</tr>
<tr>
<td>d. Plant cover crops on erosion-sensitive areas.</td>
<td>Helps prevent sediment runoff into waters of the state.</td>
<td>May reduce weed problems; prevents loss of applied nutrients.</td>
<td>Costs of establishing cover crops; cover crops may compromise primary crop.</td>
</tr>
<tr>
<td>e. Irrigate pasture or crops according to soil moisture and plant water needs.</td>
<td>Helps prevent irrigation return flow and associated nutrients and sediment to waters of the state.</td>
<td>May reduce costs of irrigation; may help crop or pasture production.</td>
<td>Installation/maintenance cost. Monitoring time.</td>
</tr>
<tr>
<td>f. Install/maintain diversions or French drains to prevent unwanted drainage into barnyards and sacrifice areas.</td>
<td>Helps prevent nutrient runoff into waters of the state.</td>
<td>Decreases muddiness and shortens saturation period in protected areas.</td>
<td>Cost of installation.</td>
</tr>
<tr>
<td>g. Implement contour farming.</td>
<td>Farming sloping land in such a way that preparing land, planting, and cultivating are done on the contour.</td>
<td>Reduced runoff and erosion. Increased infiltration to soil profile. Reduced sediment transport.</td>
<td>Cost of a new cropping system.</td>
</tr>
</tbody>
</table>
APPENDIX C: 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](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. Pesticides that are no longer marketed, also called “legacy” pesticides, are regulated through a separate process under the Clean Water Act. 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/](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/](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/](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

Oregon Department of Fish and Wildlife
State Tax Credit for Fish Habitat Improvements
Provides tax credit for part of the costs of voluntary fish habitat improvements and required fish screening devices.
Contact: Oregon Department of Fish and Wildlife

Oregon Department of Forestry
State Forestation Tax Credit
Provides for reforestation of under-productive forestland not covered under the Oregon Forest Practices Act. Situations include brush and pasture conversions, fire damage areas, and insect and disease areas.
Contact: Oregon Department of Forestry

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.
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

Public Law 566 Watershed Program
Program available to state agencies and other eligible organizations for planning and implementing watershed improvement and management projects. Projects should reduce erosion, siltation, and flooding; provide for agricultural water management; or improve fish and wildlife resources.
Contact: Natural Resources Conservation Service, Soil and Water Conservation Districts
APPENDIX D: 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 E: 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 ng/L
- Dieldrin criterion 0.0000053 ng/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.

Lead: Lead is a chemical element. Sources of lead to the Columbia Slough include, municipal and industrial storm water, industrial discharges, combined sewer overflows, contaminated sites, contaminated sediment, and air emissions.

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 criteria 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;

**Polychlorinated Biphenyls (PCBs) and Dioxin:** PCBs, including dioxin are highly bio-accumulative toxic compounds that have been found in fish tissue in the Columbia Slough. Many products contain PCBs, including electrical transformers, hydraulic fluids, and printing inks. Although these compounds have mostly been banned, small amounts are still allowed in many products.

**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.

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

**Total Phosphate:** Phosphorus is a chemical element. The presence of too much phosphorus in waterbodies can increase plant and algal production, which can cause pH levels to be too high or too low.

**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.