Oregon
Department
of Agriculture

Lower Willamette Agricultural Water Quality Management Area Plan

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Developed by the:

Oregon Department of Agriculture
And
The Lower Willamette Local Advisory Committee

With support from the:

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

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Acronyms and Terms Used in this Document

Ag Water Quality Program – Agricultural Water Quality Management Program
Area Plan – Agricultural Water Quality Management Area Plan
Area Rules – Agricultural Water Quality Management Area Rules
CAFO – Confined Animal Feeding Operation
CNPCP – Coastal Nonpoint Pollution Control Program
CWA – Clean Water Act
CSWCD – Clackamas Soil and Water Conservation District
CZARA – Coastal Zone Act Reauthorization Amendments
DEQ – Oregon Department of Environmental Quality
DO – Dissolved Oxygen
EMSWCD – East Multnomah Soil and Water Conservation District
FSA – Farm Service America
GWMA – Groundwater Management Area
HUC – Hydrologic Unit Code
LAC – Local Advisory Committee
Management Area – Agricultural Water Quality Management Area
Metro – Portland Metro
MOA – Memorandum of Agreement
NPDES – National Pollution Discharge Elimination System
NRCS – Natural Resources Conservation Service
OAR – Oregon Administrative Rules
ODA – Oregon Department of Agriculture
ODF – Oregon Department of Forestry
ODFW – Oregon Department of Fish and Wildlife
ORS – Oregon Revised Statute
OWEB – Oregon Watershed Enhancement Board
PMP – Pesticides Management Plan
PSP – Pesticides Stewardship Partnership
Regulations – Agricultural Water Quality Management Area Regulations
RUSLE – Revised Universal Soil Loss Equation
SWCD – Soil and Water Conservation District
T – Soil Loss Tolerance Factor
TMDL – Total Maximum Daily Load
USDA – United States Department of Agriculture
US EPA – United States Environmental Protection Agency
WQPMT – Water Quality Pesticides Management Team
WRD – Water Resource Department

Foreword

This Agricultural Water Quality Management Area Plan (Area Plan) provides guidance for addressing water quality 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, Agricultural Water Quality Management Area Rules (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. Summarizes 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 Purpose and Background

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

As part of Oregon's Agricultural Water Quality Management Program (Ag Water Quality Program), the Area Plan guides landowners and partners such as Soil and Water Conservation Districts (SWCDs) in addressing local 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 Sates Environmental Protection Agency (US EPA)

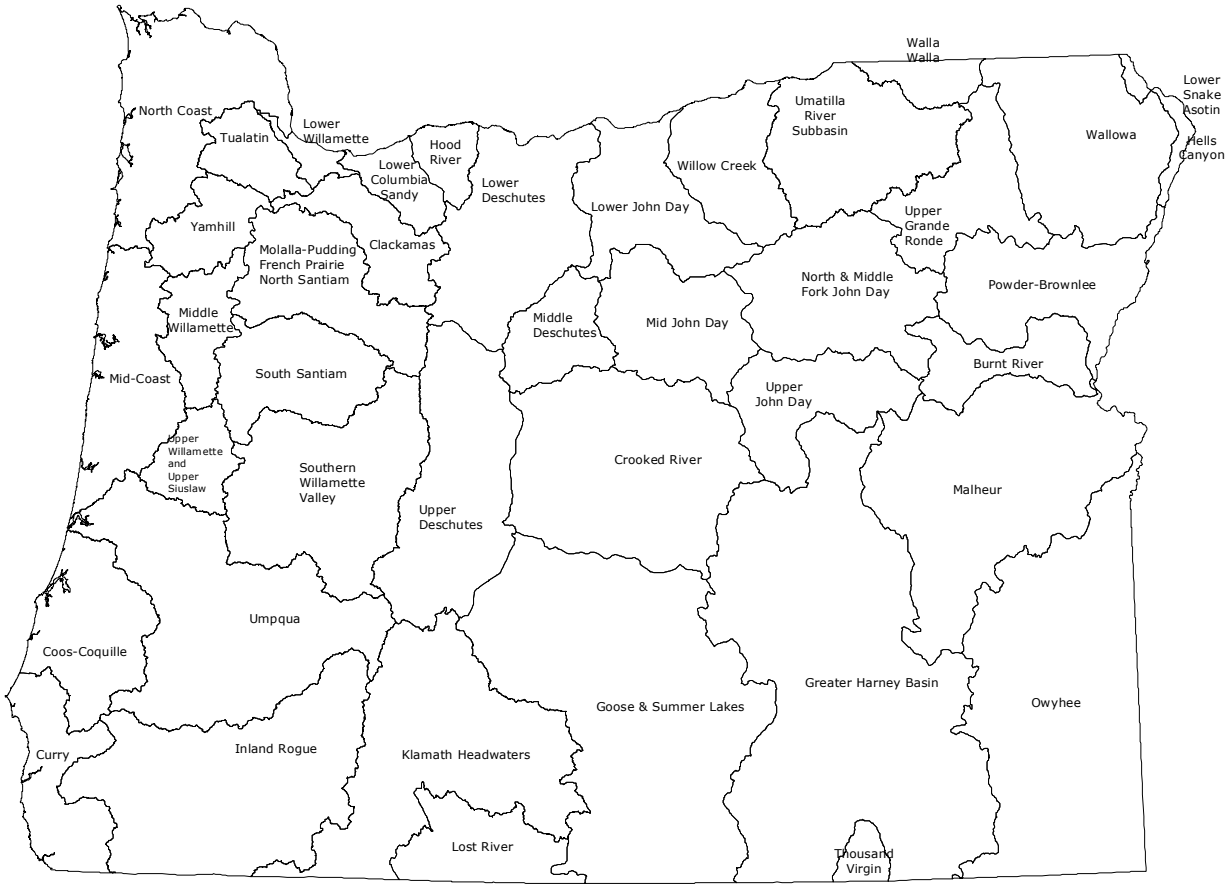
1.2 History of the Ag Water Quality Program

In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act, directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion, and to achieve water quality standards (ORS 568.900 through ORS 568.933). Senate Bill 502 was passed in 1995 to clarify that ODA regulates agriculture with respect to water quality (ORS 561.191). This Area Plan and its associated 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, federal, and tribal agencies, watershed councils, and others.

Figure 1: Map of 38 Agricultural Water Quality Management Areas



1.3 Roles and Responsibilities

1.3.1 Oregon Department of Agriculture (ODA)

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

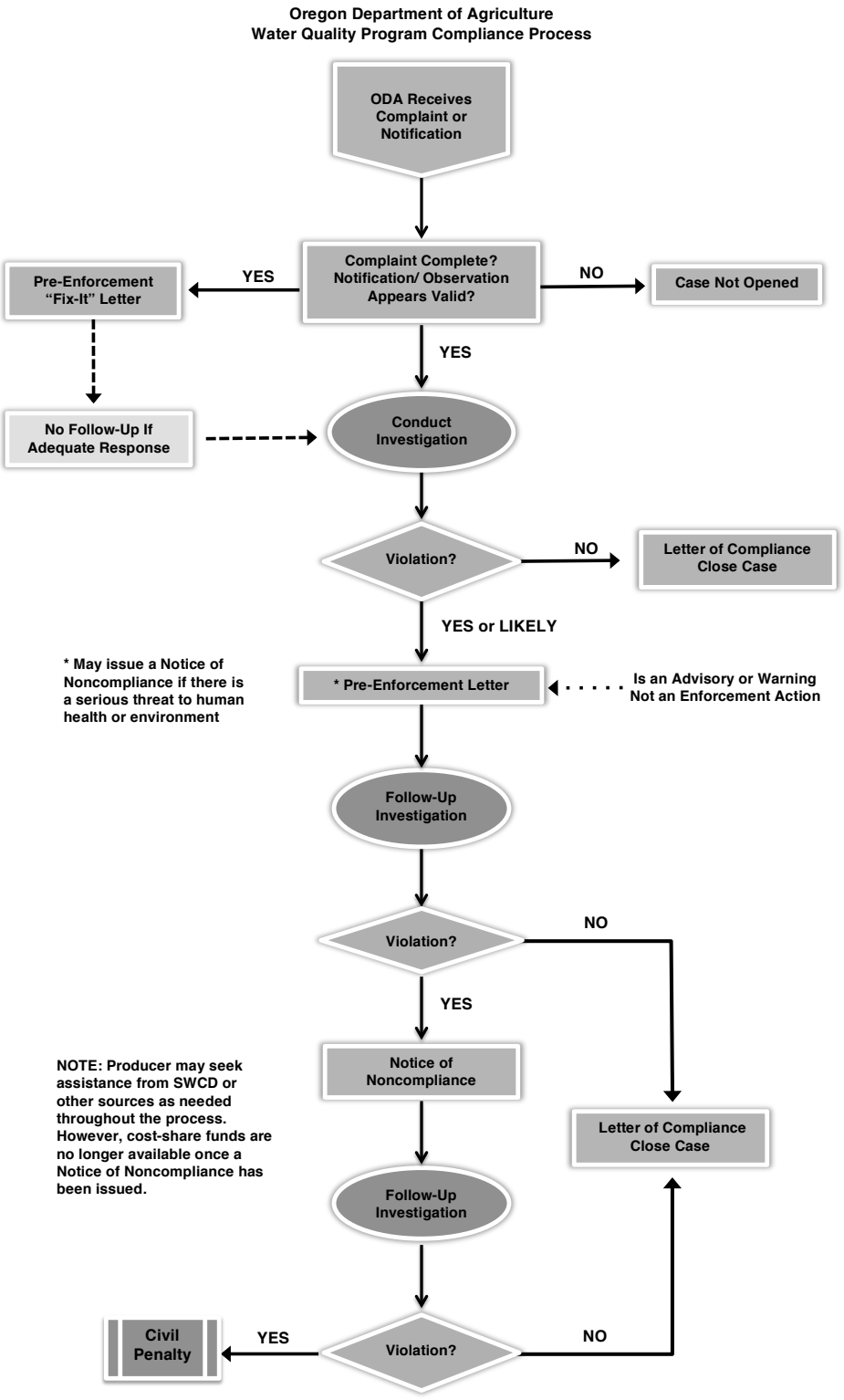
- State water quality standards.

- Load allocations for agricultural nonpoint source pollution assigned under Total Maximum Daily Loads (TMDLs) issued pursuant to the Clean Water Act (CWA), Section 303(d).
- Approved management measures for Coastal Zone Act Reauthorization Amendments (CZARA).
- Agricultural activities detailed in a Groundwater Management Area (GWMA) Action Plan (if 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 has responsibility for any actions related to enforcement or determination of noncompliance with 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 and operators 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 agricultural water quality 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 Order such as a Notice of Noncompliance. If a Notice of Noncompliance is issued, ODA will direct the landowner or operator 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 associated Area Rules, ODA will consult with the appropriate agency to resolve the conflict in a reasonable manner.

Figure 2: Compliance Flow Chart



1.3.2 Local Management Agency

A Local Management Agency (LMA) is an organization that ODA has designated to implement an Area Plan (OAR 603-090-0010). The Oregon legislative 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 (LAC)

For each Management Area, the director of ODA appoints an 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 Agriculture's Role

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. In addition, landowners need to 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 with other local partners) to achieve land conditions that contribute to good water quality. Landowners also may also choose to improve their land conditions without assistance.

Under the Area Plan and Area Rules, agricultural landowners are not responsible for mitigating or addressing factors that 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, public culverts, public 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, such as wastewater treatment plants. 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 discharges from agricultural fields may be at a defined discharge point 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 water bodies throughout Oregon do not meet state water quality standards. Many of these water bodies have established water quality management plans that document needed pollution 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 Water Bodies and Total Maximum Daily Loads (TMDLs)

Every two years, DEQ is required by the federal 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 on the 303(d) list.

A TMDL includes an assessment of water quality data and current conditions and describes a plan to restore polluted waterways to conditions that meet water quality standards. TMDLs specify the daily amount of pollution a water body 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 National Pollutant Discharge Elimination System (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 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 water body on the 303(d) list. Water bodies 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 or parties responsible for submitting TMDL implementation plans. TMDLs designate that the local Area Plan is the implementation plan for the agricultural component of the TMDLs that apply to this Management Area. Biennial reviews and revisions to the Area Plan and Area Rules must address agricultural or nonpoint source load allocations from TMDLs.

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

1.4.4 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 (ORS 468B.005)

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

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

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

1.4.5 Streamside Vegetation and Agricultural Water Quality

Across Oregon, the Ag Water Quality Program emphasizes streamside vegetation protection and enhancement to prevent and control 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 or 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 measureable 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 agricultural water quality 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 canary grass, 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 agricultral lands.

1.5.1 Confined Animal Feeding Operation Program

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 permit designed to protect water quality, while allowing the operators and producers to remain economically viable. 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 Water Pollution Control Facility permit program to a federal 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 federal NPDES CAFO permit regulations. 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 at www.oregon.gov/ODA/programs/NaturalResources/Pages/CAFO.aspx

1.5.2 Groundwater Management Areas

Groundwater Management Areas 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: the Lower Umatilla Basin GWMA, the Northern Malheur County GWMA, and the Southern Willamette Valley GWMA. Each GWMA has a voluntary action plan to reduce 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 they have cultural, economic, and recreational importance to Oregonians and because they are important indicators of watershed health. ODA's commitment to the Oregon Plan is to develop and implement Area Plans and associated Area Rules throughout Oregon.

1.5.4 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 rules relating to pesticide sales, use, and distribution, including pesticide operator and applicator licensing as well as proper application of pesticides, pesticide labeling, and registration.

In 2007, the interagency Water Quality Pesticide Management Team (WQPMT) was formed to expand efforts to improve water quality in Oregon related to pesticide use. The WQPMT includes representation from ODA, Oregon Department of Forestry (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, Department of Environmental Quality, 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 United States Environmental Protection Agency (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. Department of Environmental Quality 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 (DEQ)

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 Department of Environmental Quality set 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 Management Area Rules.

    - ODA will determine whether the target percentages of lands meeting the desired land conditions, as outlined in the goals and objectives of the Area Plans, are being achieved.
- ODA and DEQ will review and evaluate existing information 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 associated 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 and operators 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 toward 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 toward 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 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 Condition 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 may be 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 or concerns associated with agriculture. Through the Focus Area process, the SWCD delivers systematic, concentrated outreach and technical assistance in small geographic area. A key component of this approach is measuring land 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: 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 Implementation, Monitoring, Evaluation, and Adaptive Management

ODA, the LAC and the 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 data. 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

This and 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 Rules 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 and Introduction

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

2.1 Local Roles and Responsibilities

2.1.1 Local Advisory Committee (LAC)

For each Management Area, the director of ODA appoints an 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 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.

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

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

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.
- Coordinating with ODA to submit a written biennial report to the Board of Agriculture and the ODA director.

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

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

2.1.2 Local Management Agency (LMA)

The implementation of this Area Plan is accomplished through an Intergovernmental Agreement between ODA and the East Multnomah, Clackamas and West Multnomah SWCD(s). This Intergovernmental 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. Responsibilities as 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 Local Advisory Committee (LAC) as outlined in the Agriculture Water Quality Management Program, OAR 603-090.
- Coordinate ongoing water quality programs and projects in cooperation with all agencies, groups, and interested parties.
- Carry out the tasks associated with the project work plan.
- Use all grant funds for the purposes approved by ODA.
- Provide the department with progress reports. Progress reports will be quarterly and will contain information on the activities and tasks conducted by the District in accomplishing work items and detailed financial expenditure accounting.

2.2 Area Plan and Rules: Development and History

The Director of ODA approved the Area Plan and Area Rules in October of 2003. Since approval, the LAC has met in 2006, 2009, 2011, 2013, 2015, and 2017 to review the Area Plan and Area Rules. The review process included assessment of the progress of Area Plan and implementation toward achievement of plan goals and objectives. The Area Plan was last revised in 2015 to add measureable objectives,

impaired water bodies, describe focused implementation, and to clarify the role of individual landowners and the agricultural sector in meeting water quality standards and load allocations.

2.3 Geographical and Physical Setting

2.3.1 Lower Willamette Subbasin

The Lower Willamette Agricultural Water Quality Management Area (Management Area) is located in northwest Oregon surrounding the greater Portland Metropolitan area. See Figure 1 (page 4). The 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 (See Figure 3).

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).

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

The Lower Willamette Management Area is a combination of:

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

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

In 2012 there were 598 farms in the Lower Willamette Management Area composed of 29,983 acres. The average farm was 50 acres with a median size at 10 acres. Only five farms were greater than 1,000 acres. Total croplands equaled 17,441 acres composed of 466 farms. (USDA 2012) Dominant agricultural land uses include commercial nursery operations, berries, vegetable, livestock, orchards, and equestrian facilities. Also included are small acreage non-commercial farms.

In both counties, crops including nursery and greenhouse plants are produced in far greater amounts than livestock. The majority of farm owners in Multnomah and Clackamas counties describe farming as their secondary occupation. These landowners work at least 200 days per year at an occupation other than farming. (USDA 2012)

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

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. Below 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 www.websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

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)

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. Soils in this map unit are used for urban development, farming, and wildlife habitat.

Cascade-Urban Land-Cornelius (Johnson Creek region): Moderately deep and deep, moderately well drained and somewhat poorly drained silt loams. Cascade and Cornelius soils are characterized as a silt loam over a thick fragipan found at a depth of 20-30 inches. Fragipan is a sub-surface soil layer that restricts water flow and root penetration and is formed under immense compaction from natural events such as glaciers. The potential for farming is good in areas with less than eight percent slope.

Cascade-Powell (Clackamas County portion of this Management Area): Powell soils are somewhat poorly drained silt loams over a thick fragipan found at a depth of 20-30 inches with low permeability. These soils formed from silt materials and are subject to a seasonal water table above a depth of 20 inches from December – April. This region of the Management Area has rolling hills and high terraces. The soils are appropriate for cultivation with the limitation of a seasonal high water table and restricted rooting depth.

2.3.2 Water Resources

Major tributaries to the Willamette River in the Management Area are the Columbia Slough and Springbrook, Tyron, and Johnson Creeks. Nine streams travel through lands zoned as Farm Use: Ennis, Johnson, Jones, Joy, Kelley, McCarthy, Miller, Multnomah Channel, North Fork of Johnson Creek and the Willamette River mainstem.

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.

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 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 and occupies approximately 24% of the watershed, mostly in the upper portions of the watershed. Johnson Creek is composed of 25 river miles and drains 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 bankfull, 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).

Johnson Creek has a significant impact on water quality during both low- and high stream flows. Johnson Creek at Sycamore recently experienced its highest recorded gage height at 15.33 feet on December 7, 2015 with recorded streamflow at 2,740 cfs (USGS 2016). A substantial portion of summer stream flow comes from Crystal Springs, through Crystal Creek. Table 1 below summarizes streamflow in Johnson Creek at Milwaukie.

Table 1: Johnson Creek Surface Water Records
Period of record from 1989-2016 Drainage Area = 53.17 square miles
USGS Gage 14211550 at Johnson Creek at Milwaukie
www.waterdata.usgs.gov (last accessed November 2016)

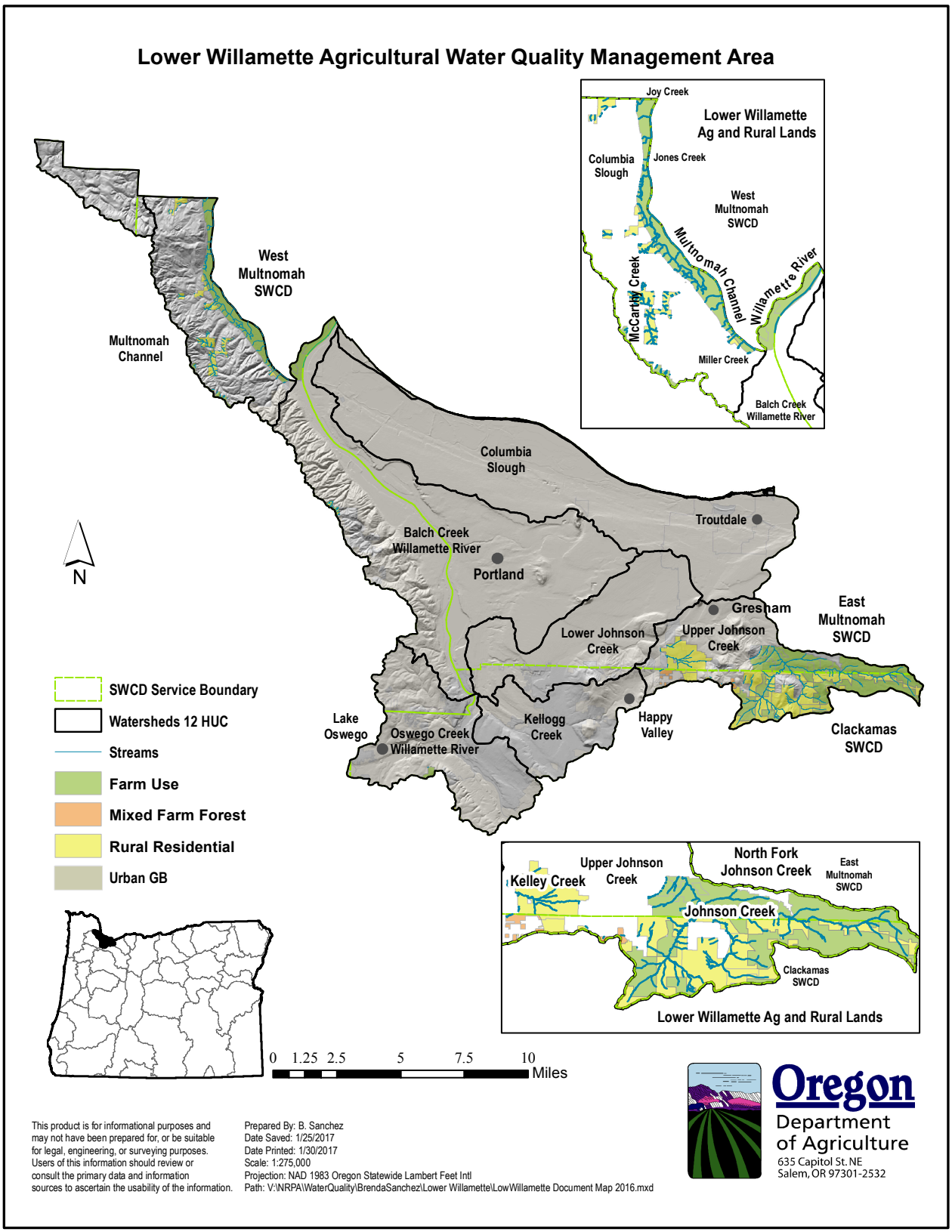
Winter Monthly Mean Peak Discharge	December at 163 cfs.	January at 161cfs.
Summer Monthly Mean Low Discharge	August at 19 cfs.	September at 21 cfs.
Maximum Discharge on Record	February 8, 1996 at 2,170 cfs.	
Minimum Discharge on Record	September 22, 2005 at 9.3 cfs.	
Highest Annual Average Flow	1997 at 136.5 cfs.	
Lowest Annual Average Flow	2001 at 38.7 cfs.	
2015 Average Annual Flow was 52.8 cfs.		

None of the public water systems in the Lower Willamette Ag WQMP 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 #107), Schmidt Nursery, and Pioneer Mobile Home Park located in the headwaters of Johnson Creek and Sauvie Island Moorage, Rocky Point Marina and Pirates Cove Marina located along Multnomah Channel.

A query of WRD's water rights database for private domestic points of diversion (using a threshold of 0.005 cfs for domestic water rights that are household use only, not irrigation) identified 14 private domestic water rights in the Lower Willamette Management Area. Most of these are in the Scappoose Creek or Johnson Creek watersheds. There are also numerous private groundwater wells for domestic use. Real Estate Testing data for 1989-2008 does not indicate significant detections of nitrate in groundwater where data is available.

Figure 3: Map of the Lower Willamette Management Area



2.4 Water Quality in the Lower Willamette Subbasin

2.4.1 Water Quality Concerns

The Willamette River is composed of 170 river miles and is highly modified by dam and reservoir operations. The dams and reservoirs are very important for flood control, navigation, recreation, hydropower, and irrigation. Because of these modifications to the Willamette River stream temperatures in the Lower Willamette are not only affected by the stratification of the reservoirs and bottom releases of stored water, there is also a temporal shift in their high and low temperatures which greatly impacts aquatic life.

In addition to the modifications along the Willamette River, it should be stated that the current condition of water quality in the Willamette River is a cumulative condition, occurring overtime, and impacted by all land-use in the basin such as urban development, forestry, and agriculture. The Willamette River Basin is the most densely populated region in Oregon and the lower Willamette River runs through the Portland Metro area. The lower Willamette River is a collection point for all upstream water quality concerns as well as impacts from the Portland Metro area. There are several partnerships and collaborations throughout the Willamette Basin working to restore good water quality in the Willamette River and improvements are ongoing.

With that stated, in a 2009 DEQ report on an assessment of the Willamette Basin rivers and streams the Lower Willamette subbasin ranks second worse after the Tualatin subbasin in extent of stream reaches with poor to very poor Oregon Water Quality Index scores (See section 4.2.1). Temperature was the leading source of impairment with 82% of the stream extent exceeding the temperature standard. Nutrient enrichment was also a major problem in the subbasin with 50% of stream reaches reporting a high total of phosphorus and 22% with a high total of nitrogen. Impairment with high levels of total solids (24%) was also fairly extensive (DEQ 2009). The Lower Willamette subbasin had the third highest proportion of stream reaches in the most disturbed condition for aquatic macroinvertebrates (77%) and aquatic vertebrates (41%). Only the Mid and Upper Willamette subbasins exceeded the Lower Willamette in the extent of biologically impaired streams. High fine sediment and poor quality fish habitat were the leading habitat impairments in the subbasin (DEQ 2009).

A 2015 DEQ report indicated that toxics are also a concern in the Lower Willamette Basin. Some of these toxics, including PCBs and legacy pesticides are associated with the Portland Harbor Superfund site. DEQ also found other pollutants, such as combustion by-products, current use pesticides, and metals at several sites in the Lower Willamette River (DEQ 2015).

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

2.4.2 Beneficial Uses

“Beneficial Use” is defined by the WRD (OAR 690-300-0010) as the reasonably efficient use of water without waste for the purpose consistent with the laws, rules, and the best interest of the people of the state. Water quality standards are established to protect *designated* beneficial uses of the state's waters. “Designated Beneficial Uses” are assigned by basin in the OARs for water quality (OAR 340-041-0002(17) and further states that designated beneficial uses are for the purpose or benefit to be derived

from a waterbody as described by WRD or Water Resources Commission. Table 2 summarizes the State of Oregon's designated beneficial uses for the Lower Willamette Subbasin.

Table 2: State of Oregon Designated Beneficial Uses for the Lower Willamette Subbasin		
Beneficial Use	**Willamette Mainstem from Mouth to Willamette Falls including Multnomah Channel**	**All Lower Willamette Tributaries**
Public Domestic Water Supply[1]	X	X
Private Domestic Water Supply[1]	X	X
Industrial Water Supply	X	X
Irrigation	X	X
Livestock watering	X	X
Fish and Aquatic Life	X	X
Wildlife and Hunting	X	X
Fishing	X	X
Boating	X	X
Water Contact Recreation	X	X
Aesthetic Quality	X	X
Hydro Power	X	X
Commercial Navigation & Transportation	X	
[1]With adequate pretreatment (filtration and disinfection) and natural quality to meet drinking water standards Adapted from the 2005 Table 340A Willamette Basin at www.deq.state.or.us/wq/rules/div041/dbutables/table340a.pdf		

2.4.3 WQ Parameters and 303(d) List

Many waterbodies throughout the Lower Willamette Subbasin are water quality limited for one or more water quality parameters. Section 303(d) of the federal Clean Water Act requires that a list, known as the 303(d) list, be developed of all impaired or threatened waters within each state. DEQ is responsible for assessing data, compiling the 303(d) list, and submitting the 303(d) list to US EPA for federal approval.

Water quality monitoring data reviewed by DEQ indicated that some waterbodies in the Lower Willamette River Subbasin failed to meet water quality standards for the following pollutant parameters: temperature, biological criteria, bacteria, aquatic weeds and algae, pH, chlorophyll a, dissolved oxygen, manganese, iron, ammonia, copper, lead, mercury, cyanide, chlordane, hexachlorobenzene, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), dioxin, and legacy pesticides DDT, endosulfan, endrine aldehyde, aldrin, and dieldrin.

DEQ submitted its most recent Integrated Report to EPA in November of 2014. EPA took action on this report on Dec. 21, 2016 and partially approved and disapproved Oregon's 2012 Integrated Report. The approved additions and removals are now effective for CWA purposes. EPA is also proposing additional waterbodies to the impaired list and is taking public comments on the proposed additions through February 6, 2017. In Table 3 are the 303(d) listings for stream segments found in agricultural and rural lands of the Lower Willamette based on EPA's Dec. 21, 2016 approval for the Management Area. Table 3 only lists a small percentage of the 303(d) listed streams within the entire Lower Willamette Subbasin. A complete listing can be found at: ***www.oregon.gov/deq/wq/Pages/WQ-Assessment.aspx***

Table 3: Highlighted 303(d) Listed Streams of the Lower Willamette Subbasin *Adapted from Willamette River Basin (2006) and Columbia Slough TMDLs (1998). Updated from the 2012 Integrated Report* *For a Complete 303(d) list of the Lower Willamette Go To: www.oregon.gov/deq/wq/Pages/WQ-Assessment.aspx*		
Listed Lower Willamette Waterbodies	**Cat 4A: Water Quality Limited 303(d) listed TMDL Approved**	**Cat 5: Water Quality Limited 303(d) listed TMDL Needed**
Columbia Slough Listing applies to river miles 0-8.7	Chorophyll a, DDE 4, 4, Dioxin (2,3,7,8-TCDD) Dissolved Oxygen, Fecal Coliform, Lead, pH, Phosphorus, PCBs, Temperature	Biological Criteria, Dissolved Oxygen, Iron
Johnson Creek Listing applies to river miles 0-23.7	DDT 4, 4, Dieldrin, *E. Coli*, Temperature	Biological Criteria, DDE 4,4, Dissolved Oxygen, Iron, Endosulfan, Endrin aldehyde, Lead, pH, PCBs, PAHs
Miller Creek Listing applies to river miles 0-1.8	No Cat 4A	Biological Criteria
Multnomah Channel Listing applies to river miles 0-21.7	Temperature	Dissolved Oxygen, Mercury
North Fork Johnson Creek Listing applies to river miles 0-2.1	*E.coli*	No Cat 5
Willamette River Listing applies to river miles 0-24.8	Dioxin (2,3,7,8-TCDD), Temperature, *E.coli*	Aldrin, Biological Criteria, Chlordane, Chorophyll a, Copper, Cyanide, DDT 4,4, DDE 4, 4, Dieldrin, Dioxin (2,3,7,8-TCDD), Hexachlorobenzene, Iron, Lead, Mercury, PCBs, and PAHs

2.4.4 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.

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. Once TMDLs are completed for a basin, the basin's waterbodies are removed from the 303(d) list and are assigned to Category 4A (water quality limited, TMDL approved). In the future, when data show that water quality criteria have been met, water bodies will be assigned to Category 2 (attaining). The two TMDLs that apply to the Lower Willamette Management Area are the Willamette TMDL (2006) and the Columbia Slough TMDL (1998).

An agreement between ODA and DEQ establishes that Agricultural Water Quality Management Area Plans serve as TMDL implementation plans for agricultural nonpoint water pollution. This Area Plan is the implementation plan for the agricultural component of the TMDLs that apply to the Lower Willamette Management Area. Biennial reviews of the Area Plan and Area Rules will address any new pollutant load allocations assigned to agriculture in future TMDLs.

In response to the 303(d) listings through 2006, DEQ completed a basin-wide temperature and bacteria TMDL for the Lower Willamette Subbasin, which was approved by EPA in 2006. The Lower Willamette

and Columbia Slough TMDLs can be accessed on the DEQ website: www.oregon.gov/deq/wq/tmdls/Pages/TMDLs-Approved-by-EPA.aspx.

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. The load allocations are summarized in Appendix G.

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.

2.4.5 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

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 1.3.3 and in Figure 2; page 7. 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 authorizes ODA, in cooperation with a local advisory committee, to develop Agricultural Water Quality Management Area Rules (Area Rules) that can be enforced to ensure prevention and control of water pollution from agricultural sources.

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

603-095-3740(2)
Waste Management
Effective upon rule adoption, no person subject to these rules shall violate any provision of ORS 468B.025 or ORS468B.050.

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

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

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

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

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

2.5.2 Nutrient Management

603-095-3740(3)
Nutrient Management
Effective upon rule adoption, no person subject to these rules shall violate any provision of ORS 468B.025 or ORS468B.050. Effective upon rule adoption (a) Landowners and operators shall prevent the runoff or leaching of contaminated water from feed and manure storage piles into waters of the state, including but not limited to groundwater. (b) Landowners or operators shall store, use, and apply crop nutrients in a manner that prevents transport into the waters of the state.

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

Sound agronomic practices related to nutrient management include:

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

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

Clear non-compliance:

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

Likely non-compliance, requires further investigation:

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

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

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

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.

603-095-3740(4)

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

(a) Visible evidence of erosion consists of one or more of the following features:
(A) Sheet wash, noted by visible pedestalling, surface undulations, and/or flute marks on bare or sparsely-vegetated ground; or
(B) Visibly active gullies, as defined by OAR 603-095-0010 (1); or
(C) Multiple rills, which have the form of gullies, but are smaller in cross sectional area than one square foot; or
(D) Visible soil deposition that could enter natural stream areas; or
(E) Streambanks breaking down, eroding, tension-cracking, shearing or slumping beyond the level that would be anticipated from natural disturbances given natural hydrologic characteristics; or
(F) Underground drainage tile outlets either improperly installed or maintained allowing soil or bank erosion to actively occur.

(b) Private roads used for agricultural activities shall be constructed and maintained such that road surfaces, fill, ditch lines, and associated structures are designed and maintained to prevent and control contributing sediment to waters of the state. All private roads not subject to the Oregon Forest Practices Act are subject to this regulation.

(c) Drainage and irrigation ditch construction and maintenance must be done such that:
(A) Ditch slope and ditch cross section are designed for the local soils and minimize erosion;
(B) Placement of disposed soils is done in a manner that prevents reintroduction to waters of the state; and
(C) Other appropriate best management practices are employed when necessary so that sediment delivery is consistent with water quality standards.

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

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

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

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

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

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

Examples of erosion prevention include:

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

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

Examples of sediment control measures include:

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

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

Indicators of non-compliance for soil erosion:
Clear non-compliance -

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

Likely non-compliance, requires further investigation -

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

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

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

Likely non-compliance -

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

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

2.5.4 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 wildlife habitat and helps reduce solar radiation reaching the water which impacts water temperature. This Prevention and Control Measure is also anticipated to minimize the impact of livestock on riparian vegetation. Streams that are regulated by this riparian rule are defined as those shown on the map that was created using the RLIS lite stm_line.shp and stm_fill.shp 2001 created by Metro. During the biennial review of the plan and rules, the LAC will consider Metro's updates to their stream data for inclusion into our stream map.

Indicators of non-compliance
Clear non-compliance -

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

603-095-3740(5)
Riparian Management. Effective upon rule adoption.

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

(A) shade for minimizing solar heating of the stream;

(B) streambank stability from flows at or below those expected to occur during or following a 25-year, 24-hour storm event;

(C) filtration, settlement, and biological uptake of sediment, organic material, nutrients, and pesticides in surface runoff by intercepting or slowing overland flow;

(D) improvement to water storage capacity of the riparian zone; and

(E) protection of streams from flashy flows by infiltrating runoff and overland flow.

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

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

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

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

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

(g) Within the entire Riparian Management Area the technical criteria to determine compliance with

OAR 603-095-3740(5)(a) are:

(A) Ongoing renewal or establishment of riparian vegetation, especially native.

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

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

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

- Streambank sloughing/erosion caused by drain tile outlets.

Likely non-compliance, requires further investigation -

- Stream not protected by appropriate vegetation.

Potentially impacted 303(d) list parameters

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

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

- Slowing stream flow when water spreads over riparian areas – allowing the sediment in the water to fall out and be deposited on land rather than being carried downstream,
- Retaining floodwater and recharging groundwater,
- Stabilizing streambanks through plant root mass,
- Developing diverse channel characteristics providing pool depth, cover, and variations in water velocity necessary for fish habitat,

- Supporting a diversity of species,
- Shading for minimization of heating from sunlight,
- Providing a source of large woody debris for aquatic habitat,
- Providing a source of fine and 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 it 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.
(See: www.deq.state.or.us/wq/wqpermit/pesticides.htm).

- Calibrate, maintain, and correctly operate application equipment. Spray rigs need to be calibrated each time there is a change in product and/or application rate. Nozzles 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 persists 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 Waste

Manure is an important nutrient source for crop and pasture production. Proper livestock waste management can decrease nutrient and bacteria contamination of water resulting from agricultural activities. Livestock waste management provides for livestock crossing and water access such that livestock do not loiter in riparian vegetation and natural waterways. There are many different conservation strategies a landowner or operator can take to help minimize animal waste reaching waters of the state such as:

- Vegetative buffer strips, which can minimize the effects of runoff by catching pollutants before reaching a stream.
- Waste management systems are clean water diversions; 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 the integrity 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.
    c. Utilize soil health principles and avoid leaving your soil bare or uncovered. Plant a cover crop. www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health/
    d. Under certain farming conditions sub-soiling or deep ripping a field can improve water infiltration.
    e. Controlling the timing and location of livestock grazing.

f. Properly designed and maintained conservation strategies such as strip cropping, catch basins, grass-lined waterways, vegetative filter strips, straw bales and other methods can be very effective in retaining sediment.

2) **Construct and Maintain Agricultural Access Roads.** Roads and road-related structures (e.g. stream crossings, 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, 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 maintenenance 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). 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: Measurable Objectives and Strategic Initiatives: Strategy for Measuring Progress

The implementation strategy of the Area Plan for controlling water pollution on agricultural and rural lands relies on existing and expanded conservation efforts. For the purposes of this Area Plan, these efforts will include goals, measurable objectives, strategic inititatives, and activities directed at achieving the Area Plan mission.

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

Mission Strategy

- Prevent runoff of agricultural wastes: agricultural activities will not discharge any wastes or place waste where it is likely to run off into waters of the state.
- Prevent and control upland and cropland soil erosion using practical and available methods.
- Control active channel erosion to protect against sediment delivery to streams.
- Prevent bare areas due to livestock overgrazing near streams.
- Establish streamside vegetation along streams on agricultural properties to provide streambank stability, filtration of overland flow, and moderation of solar heating.

3.1 Goals and Objectives of the Area Plan

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

3.1.1 Goals and Objectives

The goals of the Area Plan are to:

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

Objectives will be completed during the upcoming biennium. Objectives will be included in the next biennial review.

3.2 Management Area Activities

In order to achieve the objectives outlined in the Area Plan, the following activities (or tasks) should be considered. Activities include:

1. Conduct outreach and educational programs to promote public awareness of the Area Plan as well as community and landowner engagement in water quality issues and solutions.
2. Provide technical assistance to landowners and assist with voluntary conservation planning, provide information related to conservation programs and cost-share funding and support project planning to implement conservation practices.
3. Foster collaboration with partners, stakeholders, agencies, and organizations to improve water quality in agricultural and rural lands.
4. Administer a biennial review of the Area Plan.
5. Identify focus areas and develop a Focus Area Action Plan within the Management Area.

3.2.1 Outreach and Education

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

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

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

Large Acreage (>20 acres)

- Nurseries
- Row Crops

Small Acreage (<20 acres)

- Nurseries
- Livestock

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

Large Acreage Farms

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

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

1. **Increased riparian cover** – Benefits from this change include improved streambank stability, increased shade for streams and other waterbodies, improved filtration of soil and other contaminants in overland water flow, and increased opportunity for water to infiltrate into the soil.
2. **Reduction in the amount of bare soil** – This recommendation is especially important during the rainy season. The benefit of reducing areas of bare soil is to lessen erosion and the possibility of losing valuable topsoil to ditches or streams. From both a production and long-term sustainability standpoint, any practices that keep soil in place will save landowners money in soil amendments and fertilizers. The erosion potential of fields should be considered when determining the timing of initial and final plantings. This strategy should result in the most erosion prone fields having the highest amount of protection.
3. **Improved road construction and maintenance** – The benefit of this recommendation is reduced sediment run off from roads or road embankments. Roads are often a major source of sediment to ditches and streams, so proper construction and maintenance is an important part of good operation management and would benefit water quality.
4. **Slowing the rate of overland water flow** – Slowing overland water flow may occur as a result of many of the best management practices implemented to accomplish other goals in an agricultural producer's operation. Any improvement to soil infiltration or increased vegetation on a property would slow down the rate of run-off reducing the ability to carry soil and contaminants. Allowing water to soak into the ground and recharge the groundwater system reduces the amount of erosion of streambanks from high flows.
5. **Improved fertilizer and pesticide use and storage** – The LAC is promoting an improved awareness of proper storage and application of agricultural chemicals and nutrients. Avoiding an opportunity for these compounds to be carried into surface water either by washing off a crop or transport attached to soil particles will reduce toxics and nutrient input. Best Management Practices may be employed to determine appropriate application rates for nutrients and other standards for constructing proper storage facilities.

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

Small Acreage Farms

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

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

1. **Improved manure management** – Storage and disposal of animal waste may be a serious issue for landowners with limited land on which to spread manure as a soil amendment and fertilizer. The LAC encourages the use of environmentally friendly, practical options to be presented to landowners in an attempt to help them solve these problems.
2. **Increased riparian cover** – Benefits from this change include improved streambank stability, increased shade for streams and other waterbodies, improved filtration of soil and other contaminants in overland water flow and increased opportunity for water infiltration into the soil.
3. **Improved pasture management** – This recommendation includes proper grazing practices and improving or maintaining the health and vigor of pasture plant communities. Benefits of this recommendation are numerous, including reduced soil erosion, improved soil condition, increased forage production and improved animal health.

4. **Installation of off-stream livestock watering troughs** – Benefits of this practice include cleaner water for livestock consumption, reduced input of animal waste to streams, and protection of streambanks and riparian vegetation.
5. **Installation of sacrifice areas** – This practice provides an area for animals to spend the winter, protecting pastures from damage during the rainy season. Removing animals from pastures in the winter reduces compaction of the soils when they are wet and protects the health of pasture grasses. These benefits translate to reduced soil erosion and runoff of sediment-laden water.
6. **Appropriate stocking rates** – Appropriate animal numbers per acre is beneficial for animal health as well as improved forage production thus reducing the cost of animal feed. In cases where too many animals are kept on too few acres, animal waste storage and disposal can become a "mountainous" problem. The LAC recommends that small acreage landowners carefully consider the capacity of their property for sustaining healthy livestock conditions before animals are brought onto the land.

Outreach Tools

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

Evaluation of Outreach

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

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

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

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

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

3.2.2 Technical Assistance

Provide technical assistance to landowners and others by conducting site visits, recommending conservation practices, arranging for technical and financial cost share assistance, developing and updating conservation plans, and assisting in the implementation of conservation practices.

- Proactively offer and provide site evaluations on any agricultural lands within the Management Area to assess conditions that may affect water quality.
- Showcase successful projects, practices, and systems through appropriate media and newsletters.
- Conduct tours of successful projects for landowners and the media.
- Work with landowners to improve water quality in the Management Area through planning and implementation of technically sound and economically feasible conservation practices that contribute to meeting Area Plan objectives.
- Review and/or conduct ongoing research on the effectiveness of conservation measures.

- Assist any interested person conducting agricultural management or land disturbing activities to develop and implement a voluntary conservation plan.

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

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

3.2.3 Conservation Planning and Conservation Activities

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

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

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

Voluntary conservation plans describe the management systems and schedule of conservation activities that the landowner will use to conserve soil, water, and related plant and animal resources on all or part of a farm unit. Landowners, operators, consultants, or technicians available through a SWCD or the NRCS may develop voluntary conservation plans. A conservation plan can be used to outline specific measures necessary to address the “Prevention and Control Measures” outlined in this Area Plan.

Conservation activities should:

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

3.2.4 Partnerships

Participate and collaborate with partners, stakeholders, agencies, and organizations to improve water quality in agricultural and rural lands.

The LMAs will work with other partner agencies such as the USDA NRCS, Oregon State University Extension Service, ODFW, ODEQ, and the Lower Willamette watershed councils to carry out Area Plan strategies.

3.2.5 Focus Area Action Plan

A Focus Area Action Plan, with a timeline, has been developed by the LMAs and approved by ODA, outlining the procedure for assessing the focus area and providing landowner assistance. The Focus Area Action Plan should be updated and adapted as activities and tasks are implemented in the Focus Area to reflect changes in methodology, assessment results, and achievements in the Focus Area.

Key components of the focused approach are:

- Conduct a pre-assessment of land conditions,
- Identify areas of concern,
- Conduct education and outreach to landowners,
- Offer technical assistance to landowners and financial assistance, if needed
- Conduct post assessment at two year intervals,
- Report accomplishments to ODA and the Lower Willamette Subbasin LAC.

3.2.6 Biennial Review

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.

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

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

Activities directly related to the Biennial Review of the Ag Water Quality Area Plan include:

- Adapt and revise the Area Plan as needed
- Facilitate and/or host Biennial Review and LAC meetings
- Recruit new LAC members
- Area Plan review of revisions, additions, and progress
- Tracking outputs and accomplishments toward the Area Plan goals and objectives
- Completing a Board of Agriculture report summarizing the Biennial Review and impediments and modifications to the Area Plan.

3.3 Strategic Initiatives

3.3.1 Measurable Objectives

Measurable objectives allow the Ag Water Quality Program to better evaluate progress toward 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 intent is to show that Oregon agriculture is improving water quality and the state and federal financial investment in agricultural water quality improvements are paying off and showing measurable results. Measurable Objectives need to be specific, measurable, achievable, relevant, and time-bound.

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 future biennial reviews, ODA, EMSWCD, and the Lower Willamette LAC will evaluate progress with the measurable objectives (and associated milestones and timelines) and use an adaptive management approach to modify the milestones and objectives as needed.

The measurable objectives and associated milestones for the Area Plan will be included in Chapter 3 once complete and progress toward achieving the measurable objectives and milestones is summarized in Chapter 4. ODA, the Lower Willamette LAC, and the EMSWCD is in the development phase of determining measurable objectives. A draft of the objectives will be available in 2017.

3.3.2 Focus Areas

SWCDs around the state are focusing efforts in small geographic areas with water quality concerns associated with agriculture. Concentrating outreach and technical assistance in a "focus area" is the systematic approach to achieving water quality standards on agricultural land. One way to evaluate and document the effectiveness of agriculture's water quality improvements is to concentrate restoration and tracking efforts in a "Focus Area." A focus area is a relatively small watershed within an Agricultural Water Quality Management Area. The Districts based their choices on multiple factors including water quality impairments and other assessments. Over time and across the management area, the cumulative effect of work within focus areas is anticipated to foster a positive shift toward achieving the water quality goal of the Area Plan through voluntary actions.

Oregon Department of Agriculture approved a Focus Area Action Plan (FAAP or Action Plan) developed by each SWCD for the current biennium that outlines the key components of the Focus Area process. The SWCDs will report the results to ODA at the end of each fiscal biennium via the Action Plan. As part of each Biennial Review, ODA will summarize the results in Chapter 4, discuss and evaluate progress with the LAC, and use adaptive management to adjust implementation strategies as needed.

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

- Identify water quality parameter(s) of concern and a possible land condition surrogate (e.g. streamside vegetation as a surrogate for temperature);

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

3.3.3 Focus Area Description: Johnson Creek

Currently the Johnson Creek Focus Area is closed. The EMSWCD decided they should move into another area because of the low response from Johnson Creek landowners. They moved their ODA sponsored Focus Area to Beaver Creek located in the Sandy Subbasin Water Quality Management Area. The Sandy Subbasin Management Area is another Management Area within the EMSWCD service boundary.

Johnson Creek Focus Area 2013-2015 (Closed)
Johnson Creek is a tributary to the Willamette River in the Lower Willamette sub-basin; HUC 170900120101. The upper portion of the Johnson Creek watershed is in both Multnomah and Clackamas Counties; the focus area is in the portion of the watershed that is in Multnomah County outside of the City of Gresham's boundary. The Focus Area contains 93 agricultural properties composed of 979 acres. The main agricultural use is nursery crops with small areas of pasture for livestock and horses. Other land uses include commercial, forest, and rural residential.

3.3.4 Strategic Implementation Areas (SIA)

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

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

SIA Implementation Process and Timeframe
1. Coordination and Planning Meetings:
    - Throughout the SIA process, ODA meets with the local SWCDs, and other key partners (Watershed Councils, NRCS, etc.

2. Compliance Pre-Evaluation:
    - Riparian vegetation, bare ground, and manure piles are visually evaluated for each parcel using aerial photographs and field verification from public viewpoints to identifying potential for agricultural activities to impact surface or ground water.
3. Outreach and Compliance:
    - ODA sends the owners of all evaluated properties introductory letters and SIA outreach materials, and invites them to an open house.
    - ODA plans and hosts an open house.
    - ODA conducts escalating outreach and on-site visits dependent on concern level.
    - If a compliance investigation is opened, ODA's normal compliance process is followed.
    - SWCD responds to landowners that contact them during the outreach and compliance phase.
4. Compliance Post-Evaluation:
    - The post-evaluation re-categorizes the concern level after the producer works with the local SWCD, ODA, or other partner to address any potential water quality issues.

Note: It is very important landowners understand that the EMSWCD and CSWCD are not involved with the regulatory SIA process and are not regulatory agencies. SWCDs work in Focus Areas and ODA works in SIAs. However, SWCDs will be able to provide landowners technical and, potentially, financial assistance with implementation as a result of the SIA evaluation. More information on the SIA evaluation can be found in Section 3.3.5 and 4.3.3.

3.3.5 Strategic Implementation Area Description (SIA)

In July of 2015 ODA selected and began implementaing the SIA regulatory process in the Upper Johnson Creek watershed. SIAs are conducted in agricultural areas with the potential for farming and ranching operations to adversely impact water quality and are selected using an ODA statewide prioritization process. 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, and temperature

ODA began the SIA process in July 2015. This process includes ODA conducting a Compliance Evaluation of the agricultural operations within the area described above and is completed by ODA examining publically available information (primarily aerial photographs).

The Upper Johnson Creek SIA is still an active compliance SIA and results are found in section 4.3.3.

Chapter 4: Implementation, Monitoring, and Adaptive Management

4.1 Progress Toward the Area Plan's Mission, Goals, Objectives, and Activities

Progress has been ongoing since the implementation of the Area Plan in 2003. Currently, ODA, in cooperation with the LMAs and other partners are working on methods to measure progress toward improving water quality and impacting changes in landscape condition. Currently, work is focused on measuring streamside vegetation and water quality status and trends. As the Area Plan moves forward, the ODA, SWCDs, and the LAC over the next biennium will work to update the Area Plan's goals and objectives. Efforts will be focused on drafting objectives, activities, and timelines for the task of measuring progress toward the Area Plan's mission and goals. These are anticipated to be available at the next Biennial Review.

At this time, progress in the Management Area can be assessed from the outputs reported by the SWCDs on their agricultural water quality accomplishments toward outreach and education, technical assistance, conservation planning, applied practices, and engagement in partnership activities in the Lower Willamette MA.

4.1.1 Lower Willamette Management Area Accomplishments

The Area Plan's Local Management Agencies track activities that have been implemented through quarterly reports to ODA. Table 4 is an approximate summary of the LMA's outputs toward implementing the activities lined out in section 3.2 from July 1, 2015 – December 31, 2016. Data is provided by the Lower Willamette Management Area's LMA (East Multnomah is the designated LMA) as well as accomplishments from two other SWCDs in the management; the West Multnomah and Clackamas SWCDs.

West Multnomah SWCD
West Multnomah SWCD's work within the Lower Willamette Management Area has largely focused on McCarthy Creek. A particularly high priority watershed, to date the District's Healthy Streams Program has restored 1 ¾ mile of McCarthy Creek, planting more than 20,000 native trees and shrubs in more than 10 acres of riparian area. The Conservation District has also worked with numerous other livestock, horse and small farming operations in various other watersheds since July 1, 2015.

4.2 Progress toward Measurable Objectives and Strategic Initiatives

4.2.1 Progress toward Measurable Objectives

The ODA, LAC, and LMAs 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. ODA, the Lower Willamette LAC, and the EMSWCD will develop measurable objectives over the next biennium.

4.2.2 Progress and Accomplishments: Johnson Creek Focus Area (Closed)

The initial Focus Area assessment was completed by mapping soils on Highly Erodible Lands (HEL) in the Johnson Creek watershed. Following the mapping, the percentage of HEL on agricultural properties was then calculated. The areas with the HEL were then prioritized based on this assessment. A mailing explaining the Focus Area goals and financial assistance available was sent to all agricultural landowners

in the Johnson Creek Focus Area. Landowners were asked to call or email if they were interested. After some time there was no response to our outreach efforts so further actions were needed such as follow up letters, phone calls, and/or emails to increase interest. No erosion prevention plans were developed or implemented in the Focus Area despite extensive outreach via mail, email, and phone.

EMSWD was able to contract a marketing firm to survey a focus group to help identify barriers and develop incentives that would lead to implementation. At the time of the 2017 Biennial Review the survey had just been completed and the results will be summarized and added into the Area Plan accomplishments by the next Biennial Review.

Table 4: Lower Willamette Management Area's Cumulative Reporting of Activities and Accomplishments July 1, 2015 – December 31, 2016 *This table is a combined total of accomplishments by East Multnomah, West Multnomah, and Clackamas SWCDs*	
Activity: Outreach and Education	
Workshops/ Presentations: **5**	
Tours/ Demonstrations: **0**	
Total Attendees to Workshop, Presentations, Tours and Demonstrations: **231**	
Displays/ Information Booths: **6**	
Total Visitors to Displays and Information Booths: **200**	
Fact Sheets/ Brochures Developed: **0**	
Fact sheets and Brochures Distributed: **0**	
Newspaper Articles: **7**	
Newsletters Distributed: **1,228**	
Activity: Technical Assistance	
Landowners Provided with Technical Assistance: **35**	
On-Site Evaluations: **35**	
Voluntary Conservation Plans Approved: **1**	
Total Acres in Conservation Plans: **1**	
Fund Applications for Landowner Projects: **1**	
Water Quality Projects Implemented: **5**	
Total Acres (Project Size) in Water Quality Projects: **4.8**	
Applied Conservation Practices (Approximate Units)	
Riparian plantings	**4.8 acres**

Table 5: Johnson Creek Focus Area (Closed) Summary of Milestones and Progress July 1, 2013 – June 30, 2015			
Methodology: Highly Erodible Land Classification	**Johnson Creek FA Milestones:** 1. Reduce the amount of erosion and sedimentation on 10% of the Highly Erodible Land (Class I) on agricultural properties in the Focus Area. 2. Calculate and report the percentage of each HEL class treated with erosion control or prevention practices. 3. Calculate and report the erosion reduction from practices installed.		
	Percent of Ag Land in Focus Area	**Percent of Ag Land Treated**	**Erosion Reduction from Treated Ag Land**
Class I: Highly Erodible Land	39%	0	0
Class II: Potentially Highly Erodible land	0	0	0
Class III: Not highly Erodible Land	61%	0	0
Prioritized Sites: > 50% Highly Erodible Land: 27			
% of Prioritized Sites Treated: 0			

The EMSWCD decided they should move onto another area because of the low response from Johnson Creek landowners. They moved their ODA sponsored Focus Area to Beaver Creek located in the Sandy Subbasin Water Quality Management Area. The Sandy Subbasin Management Area is another Management Area within the EMSWCD service boundary. Johnson Creek is the main agricultural area in the Lower Willamette AgWQ Management Area and it will not have an active focus area while EMSWCD focuses efforts in the Sandy Subbasin.

Located in Table 5 is a summary of the LMA's milestones and assessment results for the Johnson Creek Focus Area. Milestones could not be achieved due to lack of participation by Johnson Creek landowners. At some point in the future the LMA may return to Johnson Creek in another focused effort to address soil erosion. With that stated, East Multnomah SWCD and Clackamas SWCD have been providing technical assistance and conservation planning in the Johnson Creek watershed for decades and will continue to provide, outreach, technical assistance, and conservation planning to the agricultural community on a site by site basis as requested.

4.2.3 Progress on the Upper Johnson Creek Strategic Implementation Area

Work is ongoing in the Upper Johnson SIA. ODA is still completing site assessments and follow-ups with landowners in the SIA. Table 6 is a summary of the compliance evaluations up to December 20, 2016 in the Upper Johnson Creek SIA. Concerns were mainly focused on manure management, bare ground, and condition of streamside vegetation.

Table 6: Johnson Creek Strategic Implementation Area Summary as of 12/20/16
Reported Numbers are Number of Taxlots - Total Taxlots Assessed in SIA: 766
24 cases were opened. 20 are closed and 4 are still pending.

Evaluation Categories	Field Evaluation Determinations
No Concern	714
Low Concern	41
Moderate Concern	10
Significant Concern	1
Serious Concern	0
Total Assessed Tax Lots	766

Summary by Percent (#Concerns/ Total Tax Lots)			
Tax Lots with No Concern	Tax Lots with Low Concern	Tax Lots with Moderate Concern	Tax Lots with Significant/ Serious Concern
89%	**6%**	**4.5%**	**0.5%**

4.3 Partnership Efforts and Accomplishments in the Lower Willamette

4.3.1 East Multnomah SWCD StreamCare Program

East Multnomah SWCD has been focusing outreach and restoration in the Lower Willamette through the District's StreamCare program. The StreamCare program provides eligible landowners with 5 years of weed control, native tree and shrub plantings, and maintenance free of charge. East Multnomah SWCD 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 7 were completed on agricultural properties under the StreamCare riparian re-vegetation program since they began planting.

Table 7: East Multnomah SWCD StreamCare Total Accomplishments on Agricultural Lands Along Johnson Creek

StreamCare Riparian Treatments	Totals to Date
Total Number of Trees and Shrubs Planted or Re-planted	49,610
Total Acres of Buffer	38 acres
Total Stream Miles Treated	2 miles

4.3.2 Other Partnerships

Oregon Department of Agriculture

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.

4.4 Water Quality Monitoring in the Lower Willamette Management Area

Water quality monitoring data is reviewed every two years and summarized during the biennial review process. For each Management Area, ODA currently evaluates other agencies' and organizations' available water quality data to answer several questions such as those listed below:

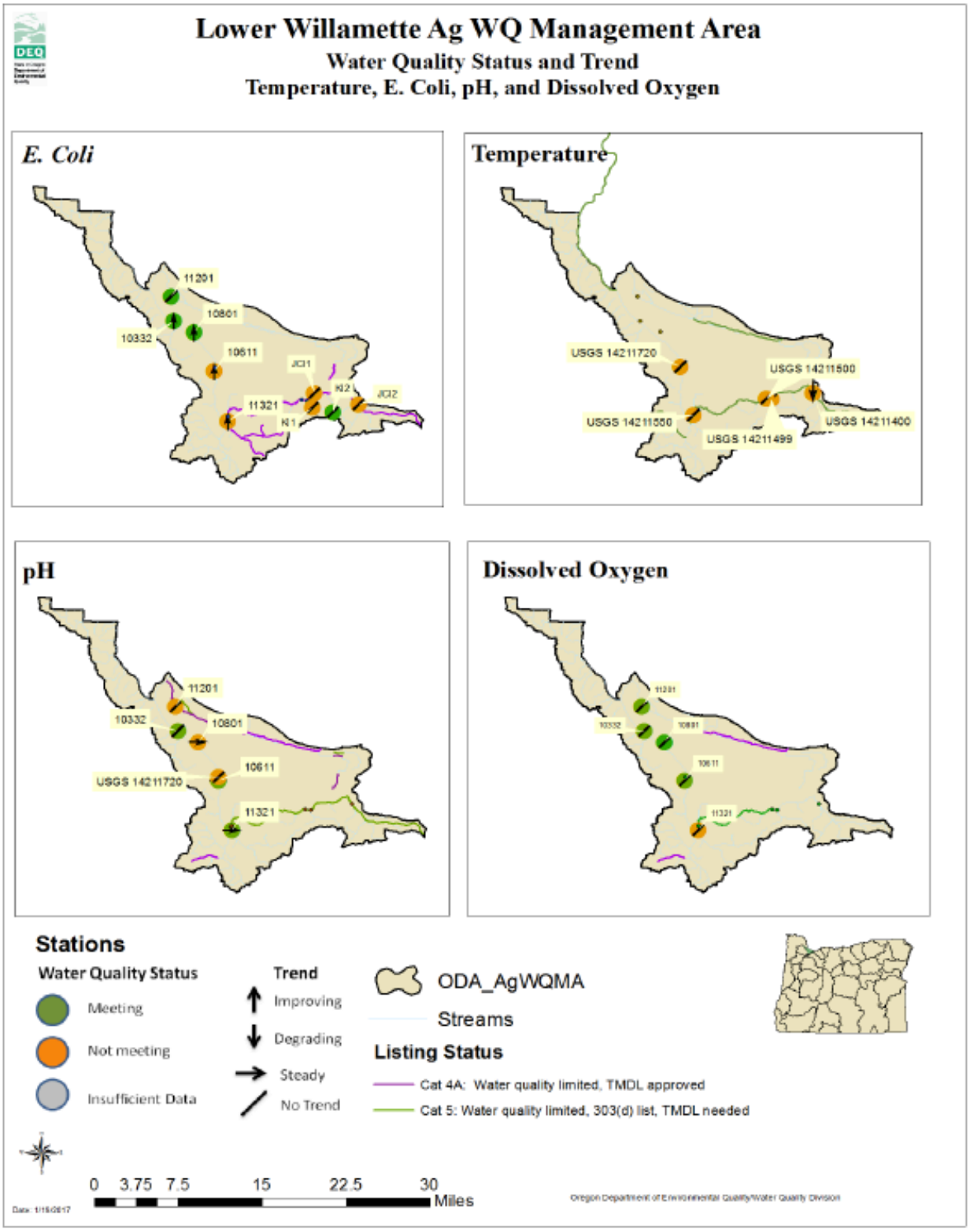
- What water quality and land condition data from agricultural watersheds are available?
- What are the trends in available water quality and land condition data in agricultural watersheds since Area Plan and Area Rule adoption?
- What are the trends in available water quality and land condition data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

4.4.1 Summary of Water Quality Status and Trends

Department of Environmental Quality analysts retrieved data from DEQ (LASAR), EPA (STORET) and USGS (NWIS) databases. The time period for the query was from January 1, 2000 to December 1, 2016. Parameters included in the query were temperature, pH, dissolved oxygen, and bacteria. The data returned were evaluated for data quality. Temperature status was assessed using data provided by the Johnson Creek Watershed Council and the East Multnomah SWCD. Below in Table 10 is a summary of the results through December 2016.

Table 10: Summary of Water Quality Status and Trends in the Lower Willamette (DEQ 2017) *See also figure 4 on the following the page*
Temperature
5 USGS stations contained sufficient data to observe long-term temperature trends within the Lower Willamette Subbasin. All stations had exceedances of the water quality standard, primarily during summer and late summer. Data provided by the Johnson Creek Watershed Council showed temperature status at six locations during 2016. These stations had exceedances of the water quality standard.
pH
Stations 10332 and 10611 had no exceedances of the water quality standard during the 16-year timeframe and station 11321 was in compliance with the water quality standard when assessing water quality status. Station 10801 has an increase in exceedances of the water quality standard, beginning in 2008 and continuing through 2016.
Bacteria: *E.coli*
• Improving *E.coli* trends are present in stations 10332, 10801, 10611, and 11321. Station 11201 is in compliance of the water quality standard during the 16-year timeframe, while all other stations have had some exceedances in the last 16-years. Stations 10801 and 10332 meet the water quality standard during the last two-years. All four City of Gresham monitoring stations in the Johnson Creek watershed routinely exceed the water quality standards. • Data in Johnson Creek is only available through DEQ at the mouth (Station 11321 – Johnson Creek at SE 17th Ave), the station has 15% of its upstream area with agricultural land use, and shows consistent exceedance of the water quality standard. However, the station has a declining trend of about 16 MPN/100mL per year. The City of Gresham has provided E. coli data at two additional sites on Johnson Creek (JCI1 and JCI2), which also have consistent exceedances of the water quality standard. Two stations on Kelley Creek also contain data for E. coli, provided by the City of Gresham. Kelley Creek at Pleasant Valley Grange (KI1) has consistent exceedances of the water quality standard, while Kelley Creek at Rodlum Road (KI2) has few exceedances.
Dissolved Oxygen
• Stations 10611 and 10332 have no exceedances of the water quality standard during the last 16-years, while stations 11201 and 10801 have one to two exceedances occurring longer than two-years ago, meeting the criteria for status. Station 11321 has many exceedances of the water quality standard during the 16-year timeframe • Data is not available in upper Johnson Creek but at the mouth there are consistent exceedances of the water quality standard during the spawning time period. In order to address the status and trend of dissolved oxygen in relation to the water quality standard near agricultural land additional monitoring is needed in areas more immediately downstream of agricultural lands.
Toxics
• *Dieldrin and Aldrin:* Data provided by the City of Gresham represents Dieldrin concentrations from 2008 through 2016 at two locations along Johnson Creek (JCI1 and JCI2). Aldrin data exists at station JCI2. All results for Dieldrin and Aldrin were below the freshwater criteria for Dieldrin (0.056 ug/l) and Aldrin (3 ug/L). • *Mercury:* Four stations contain data to assess trends of mercury from 2004 to 2016. Station KI1 had no exceedances of the chronic freshwater mercury criteria, while JCI1 and KI2 had one exceedance and JCI2 had two. • *DDT, DDD, DDE:* Data was available to assess trends from 2008-2016 of DDT, DDE, and DDD at two sites in Johnson Creek (JCI1 and JCI2). At station JCI1, there were three exceedances of the freshwater criterion for DDT (0.001 ug/l). At station JCI2, all detectable DDT results (6 samples) were in exceedance of the freshwater criterion. *Total Suspended Solids (TSS):* TSS is used as a surrogate measure for DDT in the Lower Willamette TMDL with values greater than 15 mg/l identified as exceeding the TMDL load allocation. Two sites contain data to assess TSS trends from 2000 to 2016 (JCI1 and JCI2) and two sites have data from 2006 – 2016 (KI1 and KI2). Each of the four stations have many exceedances of the TMDL allocation.

Figure 4: Lower Willamette Water Quality Status and Trends (DEQ 2017)



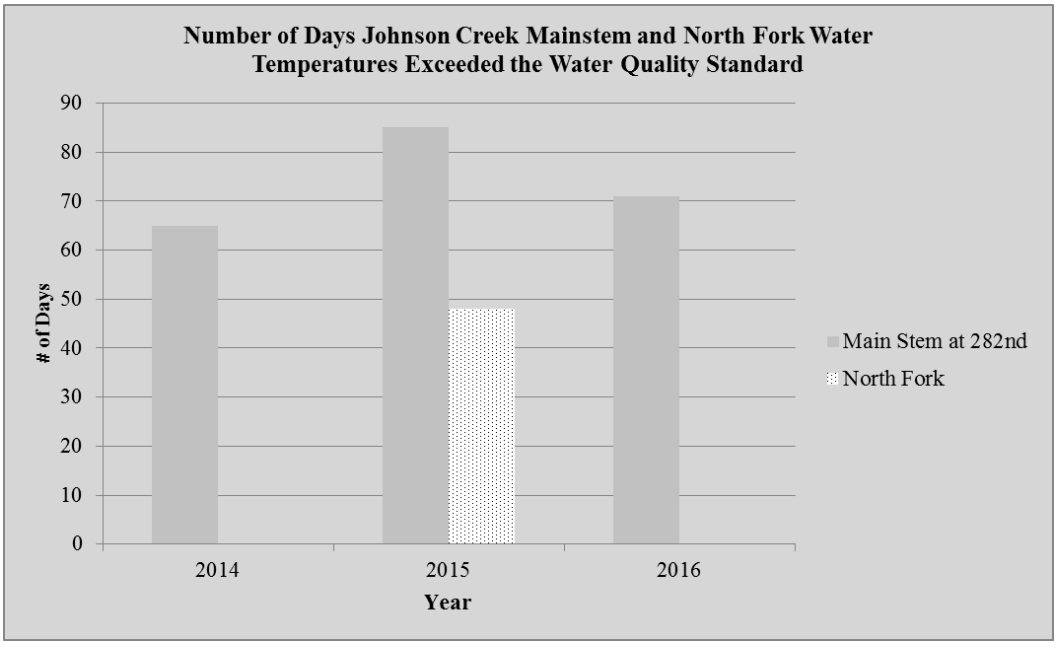
Is the monitoring data adequate to address status and trends in relation to WQ standards and TMDL load allocations?

- **Temperature:** Data analyzed at stations in the upper portion of Johnson Creek where higher percentages of agricultural land are present are consistently not meeting the temperature water quality standard. The sampling station on Johnson Creek at Regner Road in Gresham (USGS-14211400) has 32% agricultural land use in its upstream area and shows an increase in the mean August seven day average daily maximums. (DEQ 2017)
    - All stations within the Lower Willamette AgWQ management area are represented by varied land uses, mostly dominated by urban, agriculture and forest. Additional data is needed to evaluate site potential vegetation on the agricultural land, which would require remote sensing data to determine tree heights and calculate effective shade. (DEQ 2017)
- **pH:** This report did not analyze nutrients data but pH data in the lower Columbia Slough (Station 11201) indicates that there is an increase in the number of exceedances of the pH water quality standard there. In order to address the status and trend of nutrient concentrations in relation to the

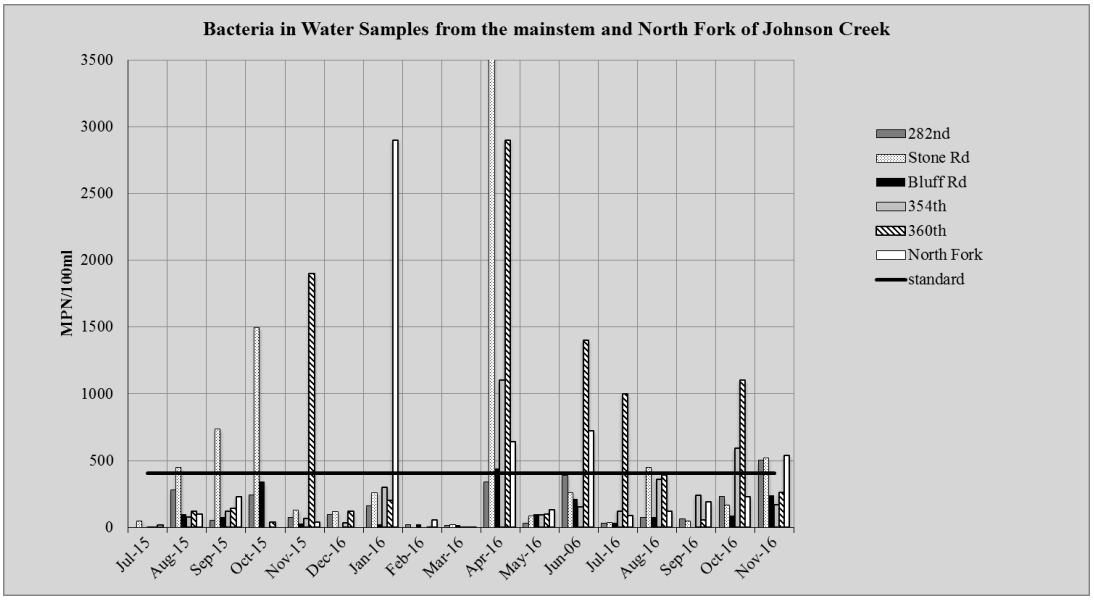
4.4.2 East Multnomah SWCD - Upper Johnson Creek Base-Line Monitoring

The East Multnomah SWCD began collecting monthly water samples in 2011 after the Lower Willamette Agricultural Water Quality LAC identified a need for baseline data. East Multnomah collect 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

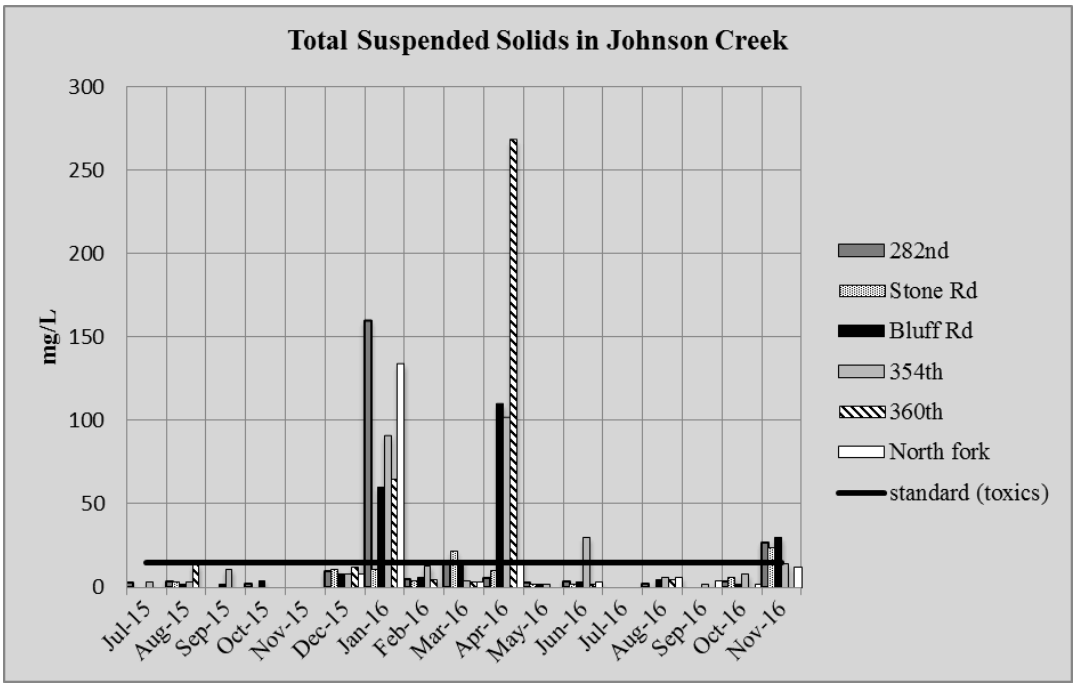
Graph 1: EMSWCD water quality monitoring results for Upper Johnson Creek. Graph illustrates the number of days stream temperature exceeded the water quality standard at two monitoring sites in 2014, 2015, and 2016.



Graph 2: EMSWCD water quality monitoring results for Upper Johnson Creek. Graph represents that grab samples taken at the six-water quality monitoring sites had a presence of bacteria. Results are displayed for monthly samples from July 2015 – November 2016. Sources of bacteria are unknown.



Graph 3: EMSWCD water quality monitoring results for Upper Johnson Creek. Graph represents grab samples taken at the six-water quality monitoring sites measuring total suspended solids. DEQ assigned total suspended solids as a surrogate for toxics, legacy pesticides in this case. The standard of 15 mg/ L is shown on the graph. Generally Johnson Creek exceeds this standard after large rain events, but the data is not consistent enough to allow us to identify the specific amount of rainfall that triggers the exceedance. Results are displayed for monthly samples from July 2015 – November 2016.



4.4.3 West Multnomah Soil and Water Conservation District - Multnomah Channel Water Quality Monitoring

Since 2011, the West Multnomah SWCD has been monitoring water quality on perennial streams in the rural part of western Multnomah County that flow directly into the Multnomah Channel. Seven monitoring stations were set up on two streams (McCarthy and Crabapple) with additional probes on Miller Creek and the middle reach of McCarthy Creek.

Method: One HOBO TidbiT v2 Submersible Temperature Logger was placed at each site in May. All probes were recalled in October. Data was downloaded to Microsoft Excel worksheets and was run through DEQ's HYDROSTATS Simple where the average 7 day average daily maximun temerature (7dAM) was calculated.

2017 Monitoring Update

McCarthy Creek – Data collected by Multnomah County (MCRS, 2010) and WMSWCD show that McCarthy Creek has elevated levels of both temperature and sediment with temperature being the greatest concern. Summer temperatures exceed the 7 day average daily maximum (7dAM) temperature criteria (18° C/64° F) for most of July and August. Data collected for sites in the middle and upper reaches of the watershed indicate most of heating occurs in the Folkenberg area or below. Macroinvertebrate samples have shown that McCarthy Creek is moderately impaired with elevated temperatures and sediment loads as the primary causes. The latter of which has been shown to be the most significant.

Crabapple Creek – A single probe has been deployed on Crabapple Creek just downstream of Highway 30 and the railroad tracks since 2011. Past data indicated similar temperature fulgurations as McCarthy Creek. Several spikes in temperature were observed in 2012 and theorized to be human induced but have not been seen since. With lack of upstream data, it is hard to know the specific areas contributing to the heating. Like McCarthy Creek, macroinvertebrate samples have shown that both sediment and temperature are the primary factors in degraded water quality. However the sampling area is within a 2005 in-stream project by Metro and may still be coming back into equilibrium.

Miller Creek – In order to offset yearly variability a probe has been deployed on Miller Creek since 2011. Miller was selected due to its proximity (3 miles), equivalent aspect and similar land use to McCarthy. According to past water quality data Miller Creek has the least degraded water quality for perennial streams in the West Hills. During the study period beginning in 2011, the 7dAM has never risen above 18°C. Macroinvertebrate data has shown that Miller Creek is not impaired

Table 11: Number of Days Stream Temperature Exceeded Rearing Criteria (18°Celsius/ 64.4°Fahrenheit) from May to October for years 2009, and 2011 to 2016 WMSWCD Water Quality Monitoring Results - Multnomah Channel Tributaries

Monitoring Location	2009	2011	2012	2013	2014	2015	2016	Average
Crabapple	NA	NA	52	58	67	NA	60	**59.3**
Upper McCarthy	NA	NA	3	0	0	0	6	**1.8**
Sheltered Nook (McSH)	NA	NA	4	0	3	18	18	**8.6**
McCarthy above Folkenburg	NA	NA	NA	16	0	6	NA	**7.3**
McCarthy mid Folkenburg	NA	NA	NA	NA	62	79	34	**58.3**
McCarthy below Folkenburg	NA	NA	NA	14	43	NA	7	**21.3**
McCarthy @ Highway 30	45	52	57	84	60	75	NA	**59.6**

4.5 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 Summary of impediments

The Lower Willamette LAC and partners discussed these impediments to implementing the Area Plan:

- Water quality monitoring efforts need to be increased and new/ innovative strategies are needed to help determine if water quality is improving or declining within each of the water quality parameters for the Lower Willamette 303(d) listed streams. The committee would like to know if agricultural nonpoint source pollution is occurring above or below the allocated "load allocations" for agriculture in the Lower Willamette.
- Having an efficient way to share water quality data amongst partners and insuring consistent quality data.
- Increased funding for landowners to implement ag water quality practices in ag lands.
- A lack of awareness of the Area Plan and Area Rules in the Management Area
- A low number of willing participation by the larger agricultural community to implement water quality practices, to request technical assistance from SWCDs, and acknowledge the extent of water quality concerns on their property.

2017 Recommendations for modifications

- Create a field guide for farmers so they can have prevention measures and Area Rules readily available in the field.
- Reduce the number of pages in the Area Plan. The plan is too extensive. Condense sections.
- Update goals, objectives, and activities. Draft measurable objectives to measure progress toward accomplishing the Area Plan's mission and goals.

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APPENDIX A: Educational and Technical Services for Natural Resource and Farm Management

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
Clackamas SWCD: 503-210-6000/ Oregon City

Oregon Department of Agriculture (ODA)
Oversees the Agricultural Water Quality Management Program. ODA issues 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: 503/ 986-5141/ Salem
Online Link to Area Plan:
www.oregon.gov/ODA/programs/NaturalResources/AgWQ/Pages/AgWQPlans.aspx

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. Administers and provides assistance in developing plans for CRP, EQIP, WRP, and other cost share programs. Makes technical determinations on wetlands and highly erodible land.
Multnomah County: 503-326-3941
Clackamas County: 503-655-3144

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: Outreach Tools

- Possible media types that the LAC considered effective include:
  - Newspaper
  - Public radio
  - Local newsletters from watershed councils, OSU Extension Service, and Farm Bureau
  - Trade journals (i.e. Digger)
  - Direct mailings
  - Public access television
- Some local events that may provide opportunities for landowner interaction include:
  - County fairs
  - Horse symposium
- Other outlets for distribution of information include agri-businesses such as:
  - Feed stores
  - Agricultural vendors- wholesale and retail
  - Farm implement dealers
  - Large animal veterinarians
  - Retail garden centers
  - Horse stables
- Agricultural groups that may hold meetings or events that would be good conduits for presenting information include:
  - Oregon Equestrian Trails
  - School students/associations (i.e. 4-H, Future Farmers of America)
  - Oregon Recreation and Parks Association
  - Oregon Association of Nurserymen
  - Granges
  - Farm Bureau
- Activities and techniques that may be used to educate landowners and promote BMP implementation may include:
  - Demonstration projects
  - Example photos before and after conservation practices have been implemented
  - Workshops with a varied topic that would include information on the Lower Willamette Area Plan and Rules (i.e. weed control, wells/septic systems, livestock health)
  - Marketing techniques to draw landowners to workshops such as contests, drawings, children's activities
  - Tax incentive or other assistance programs (i.e. conservation easements, cost share)
  - Focus groups to target the best vehicle to deliver pertinent information
  - Conservation curriculum development or promotion to schools
  - Tours to environmentally progressive operations or demonstration sites
  - Promotion of BMPs by agricultural producers to other producers

APPENDIX C: Best Management Practices

Riparian Areas and Streams			
Practice	**Resource Concerns Addressed**	**Potential Benefits of Practice to Producer**	**Potential Costs of Practice to Producer**
a. Rotational grazing in riparian area; timed when growth is palatable to animals and when riparian areas are not saturated.	Helps establish desirable riparian vegetation, promotes streambank integrity; helps filter nutrients and sediment from runoff; promotes channel narrowing.	May lessen streambank erosion and loss of pastures; allows limited use of riparian area for grazing when grass is most nutritious, controls weeds and improves wildlife habitat.	May require time and financial investment for livestock control and off-stream watering facilities.
b. Livestock exclusion from riparian area Establishing off-stream watering facilities.	Helps promote desirable riparian vegetation; promotes streambank integrity; helps filter nutrients and sediment from runoff; may help narrow channel and reduce erosion in channel.	May lessen streambank erosion and loss of pastures; less time involved in managing livestock grazing in riparian area, improves wildlife habitat.	May require higher weed control costs than seasonal riparian grazing. May require financial investment for livestock control and off-stream watering facilities.
c. Planting perennial vegetation in riparian area.	Helps establish perennial riparian vegetation rapidly; promotes streambank integrity; may help narrow channel and reduce erosion in channel.	May lessen streambank erosion and loss of pastures. If livestock are excluded from riparian area, are may be eligible for federal cost-share programs. Some alternative perennial agricultural products may be harvested from riparian areas.	Costs of vegetation and weed control. May require financial investment for riparian fencing and off-stream watering facilities while vegetation establishes.
Nutrient and Manure Management			
Practice	**Resource Concerns Addressed**	**Potential Benefits of Practice to Producer**	**Potential Costs of Practice to Producer**
a. Apply nutrients according to soil test results.	Helps prevent nutrient runoff into waters of the state.	May help reduce fertilizer costs; ensures that plants receive needed nutrients for growth; makes plants more competitive against weeds.	Costs of soil testing; time associated with taking soil samples.
b. Establish sacrifice areas. Sacrifice areas are small pastures where animals are confined during the winter to protect other pastures from trampling and compaction. Limit livestock access to pastures when soils are saturated; cover sacrifice areas with rock, hog fuel, and/or geotextile.	Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.	Protects pastures from compaction during the winter, improving growth. May improve animal health by covering sacrifice areas with material so animals are not wading in mud.	Cost of fencing sacrifice area; cost of feeding hay during the winter; cost of materials for protecting sacrifice area.
c. Site barns and sacrifice areas away from streams.	Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.	Helps prevent flooding in barns and sacrifice areas.	Need either off-stream watering facility or other source of water for livestock.

Practice	Resource Concerns Addressed	Potential Benefits of Practice to Producer	Potential Costs of Practice to Producer
d. Prevent silage leaching and/or store and manage leachate from silage and other vegetative materials.	Helps prevent nutrient runoff into waters of the state.	Preventing leaching maintains higher nutrient content of ensiled feed material.	May require cost of facility development and purchase of moisture-absorbing materials.
e. Installing gutters and downspouts in areas with high livestock use.	Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.	May improve animal health by lessening mud during the winter, so animals are not wading in mud.	Cost of installation and maintenance of gutters and downspouts.
f. Cover manure storage piles.	Helps prevent sediment, nutrient, and bacteria runoff into waters of the state.	Do not lose the nutrients in manure that can be spread on pastures or crops.	Cost of installation and maintenance of cover.
Soil Erosion and Sediment Control			
Practice	**Resource Concerns Addressed**	**Potential Benefits of Practice to Producer**	**Potential Costs of Practice to Producer**
a. Grazing management: graze pasture plants to appropriate heights, rotate animals between several pastures; provide access to water in each pasture.	Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.	May improve pasture production; easy access to water may increase livestock production as well. May improve composition of pasture plants and help prevent weed problems.	Cost of installing fencing, watering facilities for rotational grazing system; time involved in moving animals through pastures.
b. Farm road construction: construct fords appropriately, install water bars to divert runoff to roadside ditches and catch-basins	Helps prevent sediment runoff to waters of the state.	May help prevent water damage on farm roads.	Cost of installation and maintenance.
c. Plant appropriate vegetation along drainage ditches; seed ditches following construction.	Helps prevent sediment runoff into waters of the state.	May help prevent ditch bank erosion and slumping.	Costs of establishing vegetation.
d. Plant cover crops on erosion-sensitive areas.	Helps prevent sediment runoff into waters of the state; helps filter nutrients and slow runoff.	May reduce weed problems; prevents loss of applied nutrients.	Costs of establishing cover crops; cover crops may compromise primary crop.
e. Irrigate pasture or crops according to soil moisture and plant water needs.	Helps prevent irrigation return flow and associated nutrients and sediment to waters of the state.	May reduce costs of irrigation; may help crop or pasture production.	Installation/ maintenance cost. Monitoring time.
f. Install/maintain diversions or French drains to prevent unwanted drainage into barnyards and sacrifice areas.	Helps prevent nutrient runoff into waters of the state.	Decreases muddiness and shortens saturation period in protected areas.	Cost of installation.
g. Implement contour farming.	Farming sloping land in such a way that preparing land, planting, and cultivating are done on the contour.	Reduced runoff and erosion. Increased infiltration to soil profile. Reduced sediment transport.	Cost of a new cropping system.

APPENDIX D: Water Quality References for Agricultural Landowners

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

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

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

Nutrients, Cover Crops, and Irrigation
EM 8646 Nutrient Management for Dairy Production: Assessing Your Manure Management for Water Quality Risk
EM 8649 Manure Management in Small Farm Livestock Operations: Protecting Surface and Groundwater (html)
FS 281 Manure Management Practices to Reduce Water Pollution (html)
EM 8825 Composting: An Alternative for Livestock Manure Management and Disposal of Dead Animals
EC 1492 Gardening and Water Quality Protection: Understanding Nitrogen Fertilizers
EC 1493 Gardening and Water Quality Protection: Using Nitrogen Fertilizers Wisely
EM 8704 Using Cover Crops in Oregon (pdf)
M 8716 Simple Irrigation Scheduling Using the 'Look and Feel' Method (includes soil appearance cards in English and Spanish)

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

Streams
EM 8636 The Water Quality Limited Stream Segments List--What does it mean? (Available only online. Cannot be ordered)
EM 8761 Stream*A*Syst: A Tool To Help You Examine Stream Conditions on Your Property
PNW 552 Taking Care of Streams in Western Washington, Western Oregon, and Coastal Alaska: A Homeowner's Guide to Riparian Areas

Groundwater
EC 1374 Rural Domestic Water Supply (html)
EM 8559 How Soil Properties Affect Groundwater Vulnerability to Pesticide Contamination
EM 8560 Site Assessment for Groundwater Vulnerability to Pesticide Contamination
EM 8561 Understanding Pesticide Persistence and Mobility for Groundwater and Surface Water Protection
EM 8596 Assessing the Risk of Groundwater Contamination from Livestock Manure Management Worksheet
EM 8597 Reducing the Risk of Groundwater Contamination from Livestock Manure Management

APPENDIX E: Conservation Funding Programs

The following is a list of some conservation funding programs available to landowners and organizations in Oregon. Additional programs can become available after the publication of this document. For the most current information please contact the organizations listed below.

Program	General Description	Contact
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.	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.	Natural Resources Conservation Service, Farm Service Agency, Soil and Water Conservation Districts
Conservation Stewardship Program (CSP)	Provides cost-share and incentive payments to landowners who have attained a certain level of stewardship and are willing to implement additional conservation practices.	Natural Resources Conservation Service, Soil and Water Conservation Districts
Emergency Watershed Protection Program (EWP)	Available through the USDA-Natural Resources Conservation Service. Provides federal funds for emergency protection measures to safeguard lives and property from floods and the products of erosion created by natural disasters that cause a sudden impairment to a watershed.	Natural Resources Conservation Service, Soil and Water Conservation Districts
Environmental Quality Incentives Program (EQIP)	Cost-shares water quality and wildlife habitat improvement activities, including conservation tillage, nutrient and manure management, fish habitat improvements, and riparian plantings.	Natural Resources Conservation Service, Soil and Water Conservation Districts
Oregon Watershed Enhancement Board (OWEB)	Provides grants for a variety of restoration, assessment, monitoring, and education projects, as well as watershed council staff support. 25% local match requirement on all grants.	Soil and Water Conservation Districts, Watershed Councils, Oregon Watershed Enhancement Board

APPENDIX F: The Conservation Planning Process

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

1. Identify Problems—Identify resource problems, opportunities, and concerns in the planning area.

2. Determine Objectives—Identify, agree on, and document the client's objectives.

3. Inventory Resources—Inventory the natural resources and their condition, and the economic and social considerations. This includes on-site and related off-site conditions.

4. Analyze Resource Data—Analyze the resource information gathered in planning step 3 to clearly define the natural resource conditions, along with economic and social issues. This includes problems and opportunities.

5. Formulate Alternatives—Formulate alternatives that will achieve the client's objectives, solve natural resource problems, and take advantage of opportunities to improve or protect resource conditions.

6. Evaluate Alternatives—Evaluate the alternatives to determine their effects in addressing the client's objectives and the natural resource problems and opportunities. Evaluate the projected effects on social, economic, and ecological issues. Special attention must be given to those ecological values protected by law or Executive Order.

7. Make Decisions—The client selects the alternative(s) and works with the planner to schedule conservation system and practice implementation. The planner prepares the necessary documentation.

8. Implement the Plan—Implement the selected alternative(s). The planner provides encouragement to the client for continued implementation.

9. Evaluate Plan—Evaluate the effectiveness of the plan as it is implemented and make adjustments as needed.

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

APPENDIX G: Lower Willamette TMDL Load Allocations

Temperature: DEQ has established a stream temperature TMDL for all perennial streams in the Lower Willamette Subbasin including the mainstem Willamette River (DEQ TMDL 2005). Oregon's native cold-water aquatic communities, including salmonids, are sensitive to water temperature. Several temperature criteria have been established to protect various life stages and fish species.

Temperature Criteria:

- The seven-day-average maximum temperature of a stream identified as having salmon and steelhead spawning may not exceed 13.0 degrees Celsius (55.4 degrees Fahrenheit).
- The seven-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration may not exceed 18.0 degrees Celsius (64.4 degrees Fahrenheit);
- The seven-day-average maximum temperature of a stream identified as having a migration corridor may not exceed 20.0 degrees Celsius (68.0 degrees Fahrenheit).

Oregon's temperature standard contains provisions that effectively limit the cumulative anthropogenic (point and nonpoint source) heating of surface waters to no more than 0.3 degrees Celsius at the point of maximum impact. Of that 0.3 degrees Celsius load allocation all nonpoint sources collectively, including agriculture, have a shared load allocation of 0.05 degrees C of water temperature.

Percent effective shade is used as a surrogate measure for nonpoint source pollutant loading because it is easily translated into quantifiable water management activities. 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.

Bacteria: DEQ has established watershed-specific bacteria TMDLs for Johnson Creek, Fairview Creek, and Springbrook Creek (DEQ TMDL 2005). Escherichia coli: *E. coli* is measured in streams to determine the risk of infection and disease to people. Bacteria sources include humans (recreation or failing septic systems), wildlife, and agriculture. On agricultural lands, *E. coli* generally comes from livestock waste, which is deposited directly into waterways or carried to waterways by livestock via runoff and soil erosion. Runoff and soil erosion from agricultural lands can also carry bacteria from other sources.

Target criteria for bacteria states organisms of the coliform group associated with fecal sources may not exceed a 30-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. Allocations were determined conservatively by calculating a reduction based upon some confidence interval of the mean of the measured samples that ensure compliance with the "do not exceed" 406-organisms/ 100ml criteria. Load allocations for bacteria are expressed in terms of percent reduction necessary to achieve numeric standard in order to translate the acceptable loads into more applicable measures of performance.

Analysis of the load duration curves reveals no clearly dominant source of bacteria. That is, similar reductions are necessary under low flow and high flow conditions and the percent reduction necessary from all sources and/or land use categories appears to be similar. Specifically, data from Johnson Creek, the only watershed evaluated in the subbasin that has significant amount of rural acreage, showed that urban and rural land uses contribute similar bacteria loads to the stream.

The percent reduction was determined conservatively by calculating a reduction based upon some confidence interval of the mean of the measured samples that ensures compliance with the geometric mean criterion of 126 cfu/100ml and also addresses the 406 cfu/100ml criterion. Required reductions are 66% for the Fairview Creek Watershed, 78% for the Johnson Creek Watershed and 80% for the Springbrook Creek Watershed. Except for CAFOs in the Johnson Creek Watershed, both wasteload and load allocations will be expressed as a percent reduction from current levels. DEQ believes that this approach will aid in implementation of the TMDL because it sets a tangible and common goal for both point and nonpoint source management practices and programs (DEQ TMDL 2005). The Johnson Creek load allocation for bacteria of 78% was also applied to all other streams in the Lower Willamette subbasin. The Columbia Slough TMDL also established a bacteria TMDL for the Columbia Slough based on four different flow rates (DEQ 1998).

Mercury: Sources of mercury in the Willamette include: legacy mines, industrial and municipal point sources, sediment re-suspension, native soil erosion, stormwater 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. Consequently, DEQ has established an interim TMDL load allocation of a 27% reduction in total mercury that applies to the mainstem Willamette and all its tributaries. DEQ anticipates re-assessing this TMDL at some point in the future to take into account updated information on the fate, transport, bioaccumulation, loading, and sources of mercury in the Willamette Basin.

Dissolved Oxygen (DO): 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.

Total Phosphate: DEQ developed a total phosphate allocation for the 1998 Columbia Slough TMDL to address pH impairments. 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. The TMDL for phosphate applies April through October, is based on three different flow rates, and is applicable to stormwater and groundwater sources and one point source.

Lead: Sources of lead to the Columbia Slough include, municipal and industrial stormwater, industrial discharges, combined sewer overflows, contaminated sites, contaminated sediment, and air emissions. DEQ developed specific allocations for these sources that accounted for four different flow rates in the Columbia Slough TMDL.

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. Both the Johnson Creek watershed (DEQ 2006) and the Columbia Slough (DEQ 1998) 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 stormwater and sediment sources.

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

Toxics: 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.

The criteria for the protection of human health:

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