OREGON DEPARTMENT OF AGRICULTURE

South Santiam Agricultural Water Quality Management Area Plan

September 2023

Developed by the

Oregon Department of Agriculture

and the

South Santiam Local Advisory Committee

with support from the

Linn Soil and Water Conservation District

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Acronyms and Terms

Ag Water Quality Program – Agricultural Water Quality Program
Area Plan – Agricultural Water Quality Management Area Plan
Area Rules – Agricultural Water Quality Management Area Rules
CAFO – Confined Animal Feeding Operation
CWA – Clean Water Act
DEQ – Oregon Department of Environmental Quality
GWMA – Groundwater Management Area
HUC – Hydrologic Unit Code
LAC – Local Advisory Committee
LMA – Local Management Agency
Management Area – Agricultural Water Quality Management Area
NRCS – Natural Resources Conservation Service
OAR – Oregon Administrative Rules
ODA – Oregon Department of Agriculture
ORS – Oregon Revised Statute
OWEB – Oregon Watershed Enhancement Board
OWRI – Oregon Watershed Restoration Inventory
PSP – Pesticide Stewardship Partnership
SIA – Strategic Implementation Area
SWCD – Soil and Water Conservation District
TMDL – Total Maximum Daily Load
US EPA – United States Environmental Protection Agency

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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)). The Area Plan refers to associated Agricultural Water Quality Management Area Rules (Area Rules). The Area Rules are Oregon Administrative Rules (OARs) and are enforced by the Oregon Department of Agriculture (ODA).

Required Elements of Area Plans

Area Plans must describe a program to achieve the water quality goals and standards necessary to protect designated beneficial uses related to water quality as required by federal and state law (OAR 603-090-0030(1)).

Plan Content

Chapter 1: Agricultural Water Quality Program Purpose and Background. Presents consistent and accurate information about the Ag Water Quality Program.

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

Chapter 3: Implementation Strategies. Describes activities to make and track progress towards the goals of the Area Plan. Presents goals, measurable objectives, strategic initiatives, proposed activities, and monitoring efforts.

Chapter 4: Progress and Adaptive Management. Describes progress toward achieving Area Plan goals and measurable objectives by summarizing accomplishments and monitoring results.

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Chapter 1: Agricultural Water Quality Program

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

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

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

Each Area Plan is accompanied by Area Rules that describe local agricultural water quality regulatory requirements. ODA will exercise its regulatory authority for the prevention and control of water pollution from agricultural activities under the Ag Water Quality Program's general regulations (OAR 603-090-0000 to 603-090-0120) and under the Area Rules for this Management Area (OAR 603-095-2400). The general regulations guide the Ag Water Quality Program, and the Area Rules for the Management Area are the regulations with which landowners must comply. Landowners are encouraged through outreach and education to implement conservation and management activities.

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

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

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

1.2 History of the Ag Water Quality Program

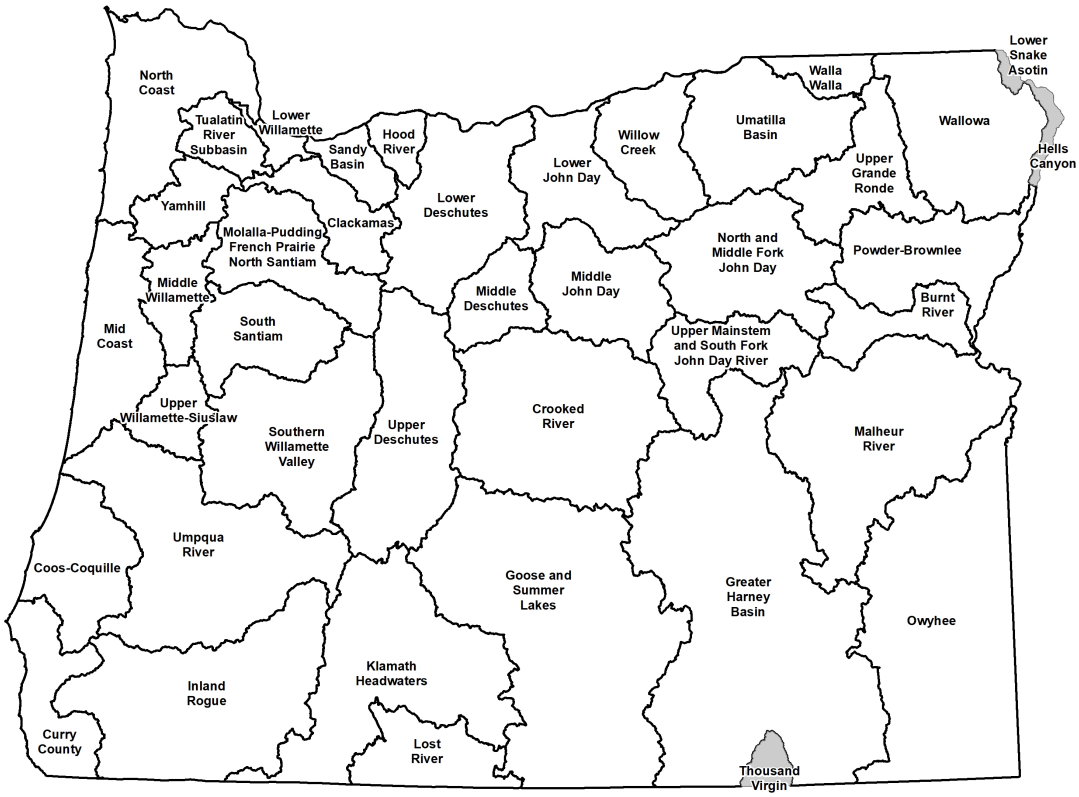
In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion and achieve water quality standards and to adopt rules as necessary (ORS 568.900 through ORS 568.933). The Oregon Legislature passed additional legislation in 1995 to clarify that ODA is the lead agency for regulating agriculture with respect to water quality (ORS

561.191). The Area Plan and Area Rules were developed and subsequently revised pursuant to these statutes.

Between 1997 and 2004, ODA worked with LACs and SWCDs to develop Area Plans and Area Rules in 38 watershed-based Management Areas across Oregon (Figure 1.2). Since 2004, ODA, LACs, SWCDs, and other partners have focused on implementation including:

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

Figure 1.2 Map of 38 Agricultural Water Quality Management Areas*



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

1.3 Roles and Responsibilities

1.3.1 Oregon Department of Agriculture

ODA is the agency responsible for implementing the Ag Water Quality Program (ORS 568.900 to 568.933, ORS 561.191, OAR 603-090, and OAR 603-095). The Ag Water Quality Program was established to develop and implement water quality management plans for the prevention

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

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

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

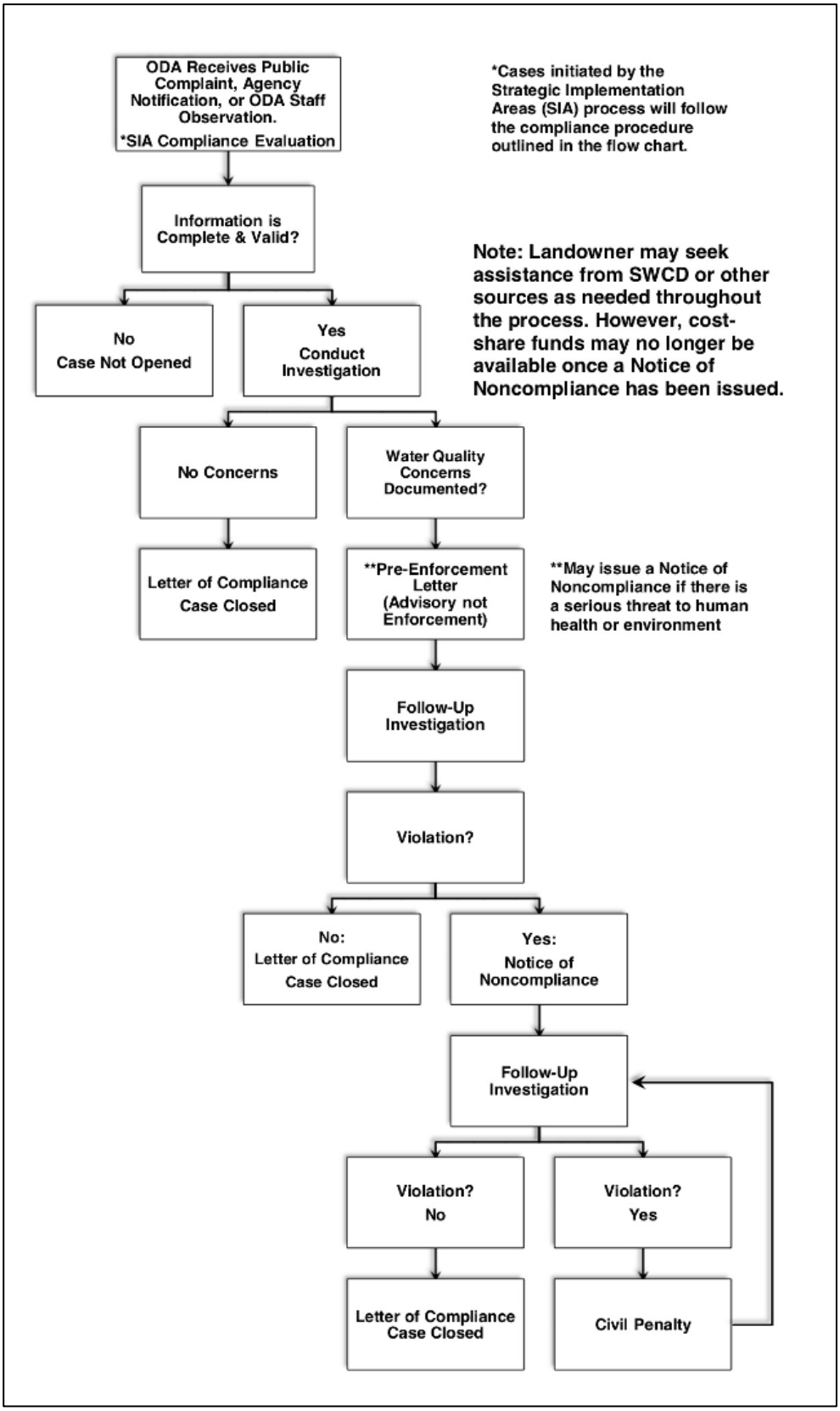
1.3.1.1 ODA Compliance Process

ODA is responsible for any actions related to enforcement or determination of noncompliance with Area Rules (OAR 603-090-0080 through OAR 603-090-0120). ORS 568.912(1) and ORS 568.912(2) give ODA the authority to adopt rules that require landowners to perform actions necessary to prevent and control pollution from agricultural activities and soil erosion.

The Area Rules are a set of standards that landowners must meet on all agricultural or rural lands. “Landowner” includes any landowner, land occupier, or operator per OAR 603-95-0010(24). All landowners must comply with the Area Rules. ODA will use enforcement where appropriate and necessary to achieve compliance with Area Rules. Figure 1.3.1 outlines ODA’s compliance process. ODA will pursue enforcement action only when reasonable attempts at voluntary solutions have failed (OAR 603-090-0000(5)(e)). If a violation is documented, ODA may issue a pre-enforcement notification or an enforcement order such as a Notice of Noncompliance. If a Notice of Noncompliance is issued, ODA will direct the landowner to remedy any conditions through required corrective actions under the provisions of the enforcement procedures outlined in OAR 603-090-060 through OAR 603-090-120. If a landowner does not implement the required corrective actions, ODA may assess civil penalties for continued violation of the Area Rules.

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

Figure 1.3.1.1 Compliance Flow Chart



1.3.2 Local Management Agency

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

The day-to-day implementation of the Area Plan is accomplished through an Intergovernmental Grant Agreement between ODA and each SWCD. Every two years, each SWCD submits a scope of work to ODA to receive funding to implement the Area Plan. Each SWCD implements the Area Plan by providing outreach and technical assistance to landowners. SWCDs also work with ODA and the LAC to establish implementation priorities, evaluate progress toward meeting Area Plan goals and objectives, and revise the Area Plan and Area Rules as needed.

1.3.3 Local Advisory Committee

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

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

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

1.3.4 Agricultural Landowners

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

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

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

- Hot springs, glacial melt water, unusual weather events, and climate change,
- Wildfires and other natural disasters,
- Septic systems and other sources of human waste,
- Public roadways, culverts, roadside ditches, and shoulders,
- Dams, dam removal, hydroelectric plants, and non-agricultural impoundments,
- Housing and other development in agricultural areas,
- Impacts on water quality and streamside vegetation from wildlife such as waterfowl, elk, and feral horses,
- Other circumstances not within the reasonable control of the landowner.

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

1.3.5 Public Participation

The public was encouraged to participate when ODA, LACs, and SWCDs initially developed the Area Plan 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 Plan and Area Rules, as needed, to address comments received. The director of ODA adopted the Area Plan and Area Rules in consultation with the Board of Agriculture.

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

1.4 Agricultural Water Quality

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

1.4.1 Point and Nonpoint Sources of Water Pollution

There are two types of water pollution. Point source water pollution emanates from clearly identifiable discharge points or pipes. Point sources are required to obtain permits that specify their pollutant limits. Agricultural operations regulated as point sources include permitted Confined Animal Feeding Operations (CAFOs), and all permitted CAFOs are subject to ODA's CAFO Program requirements. Irrigation return flow from agricultural fields may drain through a defined outlet, but is exempt under the CWA and does not currently require a permit.

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

1.4.2 Beneficial Uses and Parameters of Concern

Beneficial uses related to water quality are defined by DEQ for each basin. The most sensitive beneficial uses usually are fish and aquatic life, water contact recreation, and public and private domestic water supply. These uses generally are the first to be impaired because they are affected at lower levels of pollution. While there may not be severe impacts on water quality from a single source or sector, the combined effects from all sources can contribute to the impairment of beneficial uses in the Management Area. Beneficial uses that have the potential to be impaired in this Management Area are summarized in Chapter 2.4.1.1.

Many waterbodies throughout Oregon do not meet state water quality standards. The most common water quality concerns statewide related to agricultural activities are temperature, bacteria, biological criteria, sediment, turbidity, phosphorous, nitrates, algae, pH, dissolved oxygen, harmful algal blooms, pesticides, and mercury. Water quality impairments vary across the state; they are summarized for this Management Area in Chapter 2.4.

1.4.3 Impaired Waterbodies and Total Maximum Daily Loads

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

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

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

The 303(d) list, the TMDLs, and the agricultural load allocations for the TMDLs that apply to this Management Area are summarized in Chapter 2.4.1.

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

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

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

ORS 468B.025 (prohibited activities) states that:
"(1) Except as provided in ORS 468B.050 or 468B.053, no person shall:
(a) Cause pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.
(b) Discharge any wastes into the waters of the state if the discharge reduces the quality of such waters below the water quality standards established by rule for such waters by the Environmental Quality Commission.
(2) No person shall violate the conditions of any waste discharge permit issued under ORS 468B.050."

ORS 468B.050 identifies the conditions when a permit is required. A permit is required for CAFOs that meet minimum criteria for confinement periods and have large animal numbers or have wastewater facilities. The portions of ORS 468B.050 that apply to the Ag Water Quality Program state that:
"(1) Except as provided in ORS 468B.053 or 468B.215, without holding a permit from the Director of the Department of Environmental Quality or the State Department of Agriculture, which permit shall specify applicable effluent limitations, a person may not:
(a) Discharge any wastes into the waters of the state from any industrial or commercial establishment or activity or any disposal system."

Definitions used in ORS 468B.025 and 468B.050:

" 'Pollution' or 'water pollution' means such alteration of the physical, chemical, or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state, which will or tends to, either by itself or in connection with any other substance, create a public nuisance or which will or tends to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses or to livestock, wildlife, fish or other aquatic life or the habitat thereof" (ORS 468B.005(5)).

" 'Water' or 'the waters of the state' include lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the State of Oregon and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters which do not combine or affect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction" (ORS 468B.005(10)).

" 'Wastes' means sewage, industrial wastes, and all other liquid, gaseous, solid, radioactive or other substances, which will or may cause pollution or tend to cause pollution of any waters of the state.' (ORS 468B.005(9)). Additionally, the definition of 'wastes' given in OAR 603-095-0010(53) "includes but is not limited to commercial fertilizers, soil amendments, composts, animal wastes, vegetative materials or any other wastes."

1.4.5 Streamside Vegetation and Agricultural Water Quality

Across Oregon, the Ag Water Quality Program emphasizes streamside vegetation protection and enhancement. Streamside vegetation can provide three primary water quality functions: shade to reduce stream temperature warming from solar radiation, streambank stability, and filtration of pollutants. Other water quality functions from streamside vegetation include water

storage in the soil for cooler and later season flows, sediment trapping that can build streambanks and floodplains, narrowing and deepening of channels, and biological uptake of sediment, organic material, nutrients, and pesticides. In addition, streamside vegetation provides habitat for numerous species of fish and wildlife. Streamside vegetation conditions can be monitored to track progress toward achieving conditions that support water quality.

Site-Capable Vegetation

The Ag Water Quality Program uses the concept of "site-capable vegetation" to describe the streamside vegetation that can be expected to grow at a particular site, given natural site factors (e.g., elevation, soils, climate, hydrology, wildlife, fire, floods) and historical and current human influences that are beyond the program's statutory authority (e.g., channelization, roads, modified flows, previous land management). Site-capable vegetation can be determined for a specific site based on current streamside vegetation at the site, streamside vegetation at nearby reference sites with similar natural characteristics, Natural Resources Conservation Service (NRCS) soil surveys and ecological site descriptions, and/or local or regional scientific research.

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

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

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

1.4.6 Soil Health and Agricultural Water Quality

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

Building soil health increases resiliency to extreme weather, protects water quality, and helps keep farms and ranches viable. Incorporating soil health practices can help landowners adapt and reduce risks. For more information, visit www.nrcs.usda.gov/wps/portal/nrcs/detail/or/soils/health.

1.5 Other Water Quality Programs

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

1.5.1 Confined Animal Feeding Operation Program

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

1.5.2 Groundwater Management Areas

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

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

Any GWMA in this Management Area is described in Chapter 2.4.1.5. Any Measurable Objectives for the GWMA will be described in Chapter 3.1.5.

1.5.3 The Oregon Plan for Salmon and Watersheds

In 1997, Oregonians began implementing the Oregon Plan for Salmon and Watersheds, referred to as the Oregon Plan (www.oregon-plan.org). The Oregon Plan seeks to restore native fish populations, improve watershed health, and support communities throughout Oregon. The Oregon Plan has a strong focus on salmonids because of their great cultural, economic, and recreational importance to Oregonians, and because they are important indicators of watershed health. ODA's commitment to the Oregon Plan is to develop and implement Area Plans and Area Rules throughout Oregon.

1.5.4 Pesticide Management and Stewardship

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

In 2007, Oregon formed the interagency Water Quality Pesticide Management Team to expand efforts to improve water quality in Oregon related to pesticide use. This team facilitates and coordinates activities such as monitoring, analysis and interpretation of data, effective response measures, and management solutions. The team relies on monitoring data from the Pesticide Stewardship Partnership (PSP) program and other federal, state, and local monitoring programs to assess the possible impact of pesticides on Oregon's water quality. Pesticide detections in Oregon's streams can be addressed through multiple programs and partners, including the PSP.

Through the PSP, state agencies and local partners work together to monitor pesticides in streams and to improve water quality (www.oregon.gov/ODA/programs/Pesticides/Water/Pages/PesticideStewardship.aspx). ODA, DEQ, and Oregon State University Extension Service work with landowners, SWCDs, watershed councils, and other local partners to voluntarily reduce pesticide levels while improving water quality and crop management. Since 2000, the PSPs have made noteworthy progress in reducing pesticide concentrations and detections.

Any PSPs in this Management Area are described in Chapter 3.1.4.

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

1.5.5 Drinking Water Source Protection

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

1.6 Partner Agencies and Organizations

1.6.1 Oregon Department of Environmental Quality

The US EPA delegated authority to DEQ to implement the federal CWA in Oregon. DEQ is the lead state agency with overall authority to implement the CWA in Oregon. DEQ works with other

state agencies, including ODA and the Oregon Department of Forestry to meet the requirements of the CWA. DEQ sets water quality standards and develops TMDLs for impaired waterbodies, which ultimately are approved or disapproved by the US EPA. In addition, DEQ develops and coordinates programs to address water quality including National Pollutant Discharge Elimination System permits for point sources, the CWA Section 319 grant program, the Source Water Protection Program (in partnership with the Oregon Health Authority), the CWA Section 401 Water Quality Certification, and Oregon's Groundwater Management Program. DEQ also coordinates with ODA to help ensure successful implementation of Area Plans.

A Memorandum of Agreement between DEQ and ODA recognizes that ODA is the state agency responsible for implementing the Ag Water Quality Program. ODA and DEQ updated the Memorandum of Agreement in 2012 and reviewed and confirmed it in 2018 (www.oregon.gov/ODA/shared/Documents/Publications/NaturalResources/DEQODAmoa.pdf).

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

1.6.2 Other Partners

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

1.7 Measuring Progress

Agricultural landowners have been implementing 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 is also working with partners to develop monitoring methods to document progress.

1.7.1 Measurable Objectives

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

The Ag Water Quality Program is working throughout Oregon with SWCDs and LACs toward establishing long-term measurable objectives to achieve desired conditions. ODA, the LAC, and

the SWCD will establish measurable objectives and associated milestones for each Area Plan. Many of these measurable objectives relate to land conditions and primarily are developed for focused work in small geographic areas (Chapter 1.7.3). ODA's longer-term goal is to develop measurable objectives, milestones, and monitoring methods at the Management Area scale.

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

At each biennial review, ODA and its partners will evaluate progress toward measurable objectives and milestone(s) and why they were or were not achieved. ODA, the LAC, and LMA will evaluate whether changes are needed to continue making progress toward the measurable objective(s) and will revise strategies to address obstacles and challenges.

The measurable objective(s) and associated milestone(s) within the Management Area are in Chapter 3.1 and progress toward achieving the measurable objective(s) and milestone(s) is summarized in Chapter 4.1.

1.7.2 Land Conditions and Water Quality

Land conditions can serve as useful surrogates (indicators) for water quality parameters. For example, because shade blocks solar radiation from warming the stream, streamside vegetation, or its associated shade, generally is used as a surrogate for water temperature. In some cases, sediment can be used as a surrogate for pesticides or phosphorus, which often adhere to sediment particles.

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

- Landowners can see land conditions and have direct control over them,
- Improved land conditions can be documented immediately,
- Water quality impairments from agricultural activities are primarily due to changes in land conditions and management activities,
- It can be difficult to separate agriculture's influence on water quality from other land uses,
- There is generally a lag time between changes on the landscape and the resulting improvements in water quality,
- Extensive monitoring of water quality would be needed to evaluate progress, which would be expensive and may not demonstrate improvements in the short term.

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

1.7.3 Focused Implementation in Small Geographic Areas

Focus Areas

A Focus Area is a small watershed with water quality concerns associated with agriculture. The Focus Area process is SWCD-led, with ODA oversight. The SWCD delivers systematic,

concentrated outreach and technical assistance. A key component is measuring conditions before and after implementation to document the progress made with available resources. The Focus Area approach is consistent with other agencies' and organizations' efforts to work proactively in small watersheds.
Focus Areas have the following advantages: a proactive approach that addresses the most significant water quality concerns, multiple partners that coordinate and align technical and financial resources, a higher density of projects that may lead to increased connectivity of projects, and a more effective and efficient use of limited resources.

Any Focus Areas in this Management Area are described in Chapter 3.1.2. SWCDs 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 consultation with partners, based on a statewide review of water quality data and other available information. ODA conducts an evaluation of likely compliance with Area Rules and contacts landowners with the results and next steps. The Oregon Watershed Enhancement Board (OWEB) and other partners make funding and technical assistance available to support conservation and restoration projects. These efforts should result in greater ecological benefit than relying solely on compliance and enforcement. Landowners have the option of working with the SWCD or other partners to voluntarily address water quality concerns. ODA follows up, as needed, to enforce the Area Rules. Finally, ODA completes a post-evaluation to document progress in the SIA.

Any SIAs in this Management Area are described in Chapter 3.1.3.

1.8 Progress and Adaptive Management

1.8.1 Biennial Reviews

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

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

1.8.2 Agricultural Water Quality Monitoring

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

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

DEQ provides status and trends reports for selected parameters in relation to water quality standards. ODA will continue to work with DEQ to summarize the data results and how they apply to agricultural activities.

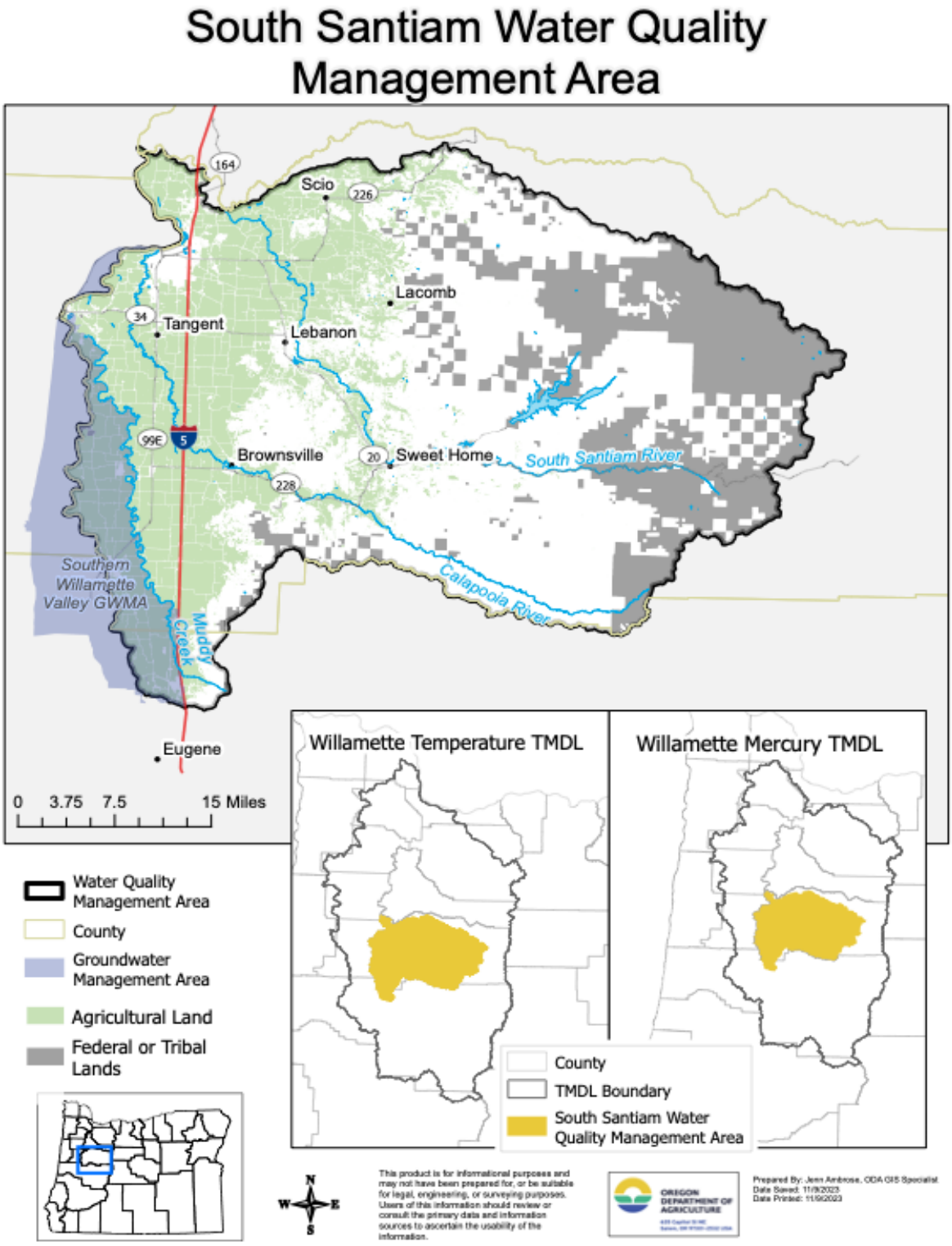
Water quality monitoring efforts in this Management Area are described in Chapter 3, and the data are summarized in Chapter 4.

Chapter 2: Local Background

Chapter 2 provides the local geographic, water quality, and agricultural context for the Management Area. It also describes the water quality issues, Area Rules, and potential practices to address water quality issues.

This Area Plan applies specifically to agricultural activities on all agricultural, rural, and forestlands within the Management Area that are not owned by the federal government, are not part of an Indian Reservation, or are not Tribal Trust Lands. This Management Area consists of: (1) all lands drained by the South Santiam River, Calapooia River, Muddy Creek, and their tributaries and (2) all streams flowing directly into the Willamette River between the South Santiam and Muddy Creek watersheds (Figure 2). It applies to all lands, regardless of size, in current agricultural use, and those lying idle, or on which management has been deferred. It also applies to agricultural operations within incorporated city boundaries. Activities subject to the Oregon Forest Practices Act are not included in this Area Plan.

Figure 2 South Santiam Management Area



2.1 Local Roles

2.1.1 Local Advisory Committee

The LAC was formed to assist with the development of the Area Plan and Area Rules and with subsequent biennial reviews. Table 2.1.1 lists the current members of the LAC.

Table 2.1.1 Current LAC members

Name	Geographic Representation	Description
Clint Bentz (Chair)	Scio/South Santiam	Small woodlands, trout farm
Karren Cholewinski	Coburg/Calapooia	General agriculture
Arlene Gourley	Scio/South Santiam	Dairy
T.J. Hafner	Management Area	AgriCare Crop Advisor
Sudy Lamb	Brownsville/Calapooia	Cattle, sheep, alfalfa, grass, hay
John Marble	Sweet Home/Calapooia	Beef, grass, timber
David Neal	Tangent/Calapooia	Irrigation
Joe Richards	Albany/South Santiam	Agricultural sales
Vacant		
Vacant		
Vacant		
Vacant		

2.1.2 Local Management Agency

SWCDs implement Area Plans through OWEB capacity grants, with details negotiated between ODA and each SWCD. The resulting Scopes of Work define the SWCDs as the LMAs for implementation of the Ag Water Quality Program in specific Management Areas. The LMA for this Management Area is Linn SWCD. This SWCD was also involved in development of the Area Plan and Area Rules.

The LMA implements the Area Plan by conducting activities detailed in Chapter 3, which are intended to achieve the goals and objectives of the Area Plan.

2.2 Area Plan and Area Rules: Development and History

The director of ODA approved the initial Area Plan and Area Rules in 2002.

Since approval, the LAC has met biennially to review the Area Plan and Area Rules. The biennial review process includes an assessment of progress toward achieving the goals and objectives in the Area Plan.

2.3 Geographical and Physical Setting

The Management Area includes the South Santiam, Calapooia, and Muddy Creek watersheds, as well as several smaller watersheds that drain directly to the Willamette River. The Management Area is in Linn and Lane counties in the central Willamette Valley. The Management Area covers approximately 1,700 square miles, or 1.1 million acres.

Physical Features

The headwaters of the South Santiam River are in the high Cascade Mountains. The river begins at the confluence of Sheep and Sevenmile creeks near Rooster Rock and flows generally west for several miles. The Middle Santiam joins the South Santiam at Foster Reservoir above Sweet Home. The river flows northwest from Sweet Home, passing just east of Lebanon, until it reaches its confluence with the North Santiam River south of Jefferson. The Santiam River then flows northwest into the Willamette River just south of Buena Vista.

The headwaters of the Calapooia River are on Tidbits Mountain in the Cascade Mountains near the Linn and Lane county boundary. The river flows down a steep gradient until it reaches the Willamette Valley floor near Holley. It then flows northwest toward its confluence with the Willamette River just west of Albany.

Muddy Creek's headwaters are northeast of Coburg in the Coburg Hills. The creek flows northwest parallel to the Willamette River and flows into the Willamette near Fischer Island south of Highway 34. The creek is slow moving with many meanders because of a low gradient.

Several smaller streams, including Murder Creek, Periwinkle Creek, Cox Creek, and Lake Creek, flow directly to the Willamette River.

Table 2.3a Area and Major Tributaries of Management Area Watersheds

Watershed	Area (Acres)	Major Tributaries
South Santiam River	665,600	Canyon Creek, Crabtree Creek, Hamilton Creek, Moore Creek, Pyramid Creek, Quartzville Creek, Thomas Creek, Wiley Creek
Calapooia River	364,160	Brush Creek, Butte Creek, Courtney Creek, Lake Creek, North Fork, Oak Creek, Shedd Slough
Muddy Creek and East Channel	143,565	Bishop Creek, Coleman Creek, Daniels Creek, Dry Muddy Creek, Little Muddy Creek, Pierce Creek, Putnam Creek, Tub Run, White Creek
Periwinkle Creek	Not available	
Cox Creek	Not available	
Murder Creek and Second, Third, and Fourth Lakes	Not available	Burkhart Creek, Truax Creek
Crooks Creek and McCarthy Slough	Not available	
Lake Creek	Not available	Camous Creek, Johnson Creek

Climate

According to the Linn County Future Climate Projections 2022 report (https://ir.library.oregonstate.edu/concern/parent/k930c542z/file_sets/zg64tt95r), there is a high confidence of heavy rains, flooding, and wildfires increasing due to climate change. Linn and Lane counties have a yearly average temperature of 50° F with an average of 10 days per year above 90° F. The Management Area gets an average of 53 inches of rain per year. The mean growing season (the number of days between 32° F temperatures) is 150 to 250 days in the valley. Although climate change is almost certain to affect the Willamette Valley, there is

uncertainty about the direction and specific consequences it will have to its species and habitats.

Geology and Soils

Western and High Cascade Mountains

Soils in the Coast Range Mountains are formed primarily from sedimentary material such as shale, sandstone, and siltstone, as well as some volcanic material. They are relatively unstable and subject to puddling and active erosion. Soils in the Coast Range foothills formed from alluvial and colluvial deposits, which have been weathered extensively. They are less subject to slumping than soils in steeper areas.

Willamette Valley

Much of the soils on the Willamette Valley floor were deposited by the Willamette River and its tributaries, or by catastrophic floods that swept down the Columbia Gorge and through the Willamette Valley between 13,000 to 15,000 years ago. Depending on the composition of the deposited material, soils in Willamette Valley bottomlands and terraces range from excessively drained gravelly sandy loam to poorly drained silty clay loam and silty clay (Langridge et al, 1987).

Biological Resources

A variety of plants and animals depend on the diverse aquatic habitats in the Management Area. Each of the following plant community types exist in the Management Area: submerged and floating, marshy shore, wetland prairie, shrub swamp, and wooded wetland (Guard, 1995). Trees include Douglas fir, grand fir, western red cedar, big-leaf maple, vine maple, red alder, Oregon ash, black cottonwood, and willow. Shrubs include Pacific ninebark, elderberry, Indian-plum, snowberry, serviceberry, wild rose, thimbleberry, and Douglas spirea. Sedges, rushes, horsetails, grasses, and forbs such as slough sedge, one-sided sedge, common rush, common horsetail, field horsetail, tufted hairgrass, California oatgrass, meadow barley, bleeding heart, blue-eyed grass, Oregon iris, and common camas are common in wetland and riparian areas (Guard, 1995). Invasive plant species, including Himalayan blackberry, Canada thistle, and reed canary grass have become established in many wetland and riparian areas.

Although many of the lowland aquatic habitats in the Management Area have been significantly modified, they support a diversity of wildlife (Csuti et al, 1997). Resident wildlife include beaver, river otter, shrew, great blue heron, green heron, black-crowned night heron, belted kingfisher, mallard, and wood duck. A variety of migratory waterfowl, including tundra swan, greater yellowlegs, lesser yellowlegs, dunlin, and least sandpiper, use seasonal wetlands on agricultural fields. Canadian geese winter-over and feed in the seasonal wetlands and surrounding agricultural fields. Depending on the habitat conditions, neo-tropical migratory birds such as Wilson's warbler, yellow warbler, willow flycatcher, and gray vireo may forage and nest in riparian areas. Riparian- and wetland-obligate reptiles and amphibians include the Pacific garter snake, western pond turtle, Pacific tree frog, and red-legged frog.

Native resident fishes in lowland aquatic habitats include redside shiner, leopard dace, Oregon chub, sculpin, three-spined stickleback, sucker, and cutthroat trout. Migratory fish that spawn, rear, or migrate in the rivers and their tributaries are Pacific lamprey, summer and winter steelhead, and fall and spring chinook (Oregon Department of Fish and Wildlife, 2001).

Species native to the area are important when understanding wildlife effects on water quality where they may overlap with agricultural producers. Vegetation native to the Management Area is integral to creating riparian management and planting plans.

Land Use

Agriculture and Forestry

Agriculture and forestry are the predominant land uses in the Management Area (Table 2.3b). The area is roughly split between agriculture and forestry. The headwaters and steep sections of the watersheds are located in the forestlands, while the slower moving mainstems flow predominantly through agricultural lands. Most farms in the management area are between 1 and 50 acres with the average land in ag use is 142 acres.

Agricultural lands account for approximately 314,947 acres, (https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Oregon/cp41043.pdf). The top agricultural commodities in the Management Area in 2017 include field/grass seed crops, forage (hay/haylage), hazelnuts (filberts), vegetables, corn for silage, wheat, dairy products, broilers, farm forest products, and cattle. Other significant commodities include Christmas trees, meadowfoam, white clover and ladino, peppermint for oil, processed vegetables, sheep, tree fruit and nuts, and berries. Linn County's agriculture industry gross sales in 2017 were $243 million, up from 2012 sales.

Since the inception of this management area, there has been an increase of smaller farms and hobby farms in the area. Though small, it is important to note their prevalence and include 1–10-acre farms in discussion groups and outreach efforts. Small farms can affect water quality as well as larger farms especially if left out of educational realms where best management practices and area rules are shared and discussed. Tables 2.3c and 2.3d provide more detail on some of the seed and livestock types in the Management Area.

Table 2.3b Land use in Linn County by Acres (note that these figures are for Linn County, rather than the South Santiam Management Area)

Land Use	Percent of Linn County in Land Use
Cropland	77
Pasture/rangeland	12
Forest	8
Other	3
Total	100.0

Source: www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Oregon/cp41043.pdf

Table 2.3c Acres of grass grown for seed in Linn County in 2017

Crop	Acres of Crop
Field/grass seed crops, all	126,684
Forage (hay/haylage), all	25,109
Hazelnuts (Filberts)	7,972
Vegetables harvested, all	6,186
Corn for silage or greenchop	4,227
Total	170,178

Source: www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Oregon/cp41043.pdf

Table 2.3d Livestock in Linn County in 2017

Livestock type	Number of animals
Cattle/calves	24,282
goats	2,479
layers	13,249
Sheep (sheep, lambs, and ewes)	46,064
turkeys	145
Swine	370
Horses	2,285
Chickens	1,191,697

Source: 2017 Census of Agriculture, U.S. Summary and State Data

Cities/Urban Areas

Most of the cities in the Management Area are located along rivers or their tributaries. The cities of Albany, Harrisburg, and Millersburg, as well as the community of Peoria, are along the Willamette River. The Calapooia River passes through the city of Brownsville, while Halsey is located along a tributary of Muddy Creek, and Tangent is located along an unnamed tributary to Lake Creek. Rural communities in the Calapooia and Muddy Creek watersheds include Calapooia, Cartney, Crawfordsville, Fayetteville, Holley, Miller, Mitchell, Munson, Plainview, Potter, Rowland, and Shedd. In the South Santiam, the cities of Lebanon, Sodaville, Sweet Home, and Waterloo are located along the mainstem, and Scio is along Thomas Creek. Unincorporated communities in the South Santiam watershed include Cascadia, Draperville, Foster, Fry, Narrows, Rock Hill, and Santiam Terrace.

Land Ownership

Private lands make up the largest portion of the Management Area. Other major landowners include the United States Forest Service (USFS) and the Bureau of Land Management (BLM). Table 2.3e summarizes land ownership in the Management Area.

Table 2.3e Land Ownership in the Management Area

Landowner/Manager	Acres	Percent of Land
Private	890,543	60.36
U.S. Forest Service	461,624	31.29
Bureau of Land Management	87,938	5.96
State of Oregon	23,729	1.61
U.S. Army Corps of Engineers	9,554	0.65
Local Government	1,207	0.08
U.S. Fish and Wildlife Service	375	0.03
Total	1,474,970	99.98%

Source: Oregon Geospatial Data Clearinghouse, 2022

Water Availability

Cascade mountain range runoff provides much of the surface water in the Santiam River Basin. Summary flow data for the South Santiam are listed in Table 2.3f.

Table 2.3f Average annual, summer, and winter flows in cubic feet per second (cfs) for the South Santiam and Calapooia watersheds

Watershed	Average Annual Flow (cfs)	Average Summer Flow (cfs)	Average Winter Flow (cfs)
Calapooia River @ Albany	902	117.5	1,950
South Santiam River @ Waterloo	2,961	926	5,326

Source: U.S. Geological Survey, 2000

Groundwater is most plentiful in the Management Area in areas with deposits of coarse alluvial material. The most productive areas are along the South Santiam River. Some groundwater is also available from the alluvial material along the Calapooia River and Muddy Creek; however, this material contains more silt and has less capacity to transmit water.

Dams and Reservoirs
Foster and Green Peter dams and reservoirs, the two major projects within the Management Area, are managed by the Army Corps of Engineers. The projects are used for flood control, irrigation, power generation, recreation, and navigability improvement on the Willamette River. Green Peter Reservoir has full pool and summer storage capacities of 428,100 and 249,900 acre-feet. Foster Reservoir, which re-regulates the water released from Green Peter Reservoir during power generation to maintain more constant stream flow in the South Santiam River, has full pool and summer storage capacities of 60,700 and 24,800 acre-feet (Oregon Water Resources Department, 1999).

Water Use

Consumptive uses of water in the Management Area include irrigation, livestock watering, municipal use, and industrial use. Irrigation is the primary consumptive use for which water rights are issued. Non-consumptive uses of water include recreation, power generation, and fish and wildlife habitat. Sources of appropriated water are reservoirs, surface water, and groundwater.

Irrigation
Irrigation in the Management Area has changed over the past 10 to 15 years, especially in the lower South Santiam and Calapooia watersheds. Hand lines and wheel lines are now commonly used only for smaller farms or particular crop irrigation. Many growers have also installed more modern systems such as computer or satellite-guided together with soil moisture probes to remotely regulate irrigation.

Irrigation withdrawals are most concentrated in the lower portions of each watershed. In addition to water withdrawals by individuals, several canals transport irrigation water to users. In the South Santiam watershed, Lacomb Ditch diverts water from Crabtree Creek to Beaver Creek.

Municipal Use
The cities of Albany, Lebanon, and Sweet Home withdraw water from the South Santiam River for municipal supply. Millersburg receives its water from the mainstem Santiam River. Water from the South Santiam is transferred to Albany and Lebanon through the Lebanon-Santiam Canal. Lebanon's intake is with the Hamilton Creek watershed and Albany's intake is within the Oak Creek watershed. Scio receives water from the South Santiam through the Peters Ditch. The city of Brownsville does not withdraw water directly from the Calapooia but receives its water from wells approximately 30 feet from the river.

The Brownsville ditch, or Mill Race, is an important part of the city's winter stormwater management system. The city of Brownsville has the main water rights to the Mill Race and there are a few rights for livestock watering. The Mill Race water comes from the Calapooia mainstem.

Agricultural Water Control Districts
Several state-recognized districts in the Management Area provide irrigation, flood control, drainage, water improvement, and diking services for their members. The Calapooia, Lacomb, and Queener irrigation districts deliver water for irrigation and construct and maintain irrigation water delivery infrastructure. The Muddy Creek Irrigation Project also provides these services within the Management Area, although its water is diverted from the McKenzie River. The Beaver Creek, Dever-Conner, Grand Prairie, North Lebanon, and Santiam Water Control Districts operate surface water control works such as dikes and drainage ditches to prevent flooding damage to agricultural lands and other property. The Fertile and Liberty District Improvement companies and the North Harrisburg Improvement District deliver irrigation water and construct and maintain water delivery facilities (Oregon Water Resources Department, 1987).

2.4 Agricultural Water Quality

2.4.1 Water Quality Issues

DEQ evaluates data from its own monitoring program, ODA, the Watershed Councils, the U.S. Geological Survey, BLM, and other partners to determine whether rivers and streams meet Oregon's water quality standards. Water bodies that do not meet water quality standards are listed as impaired. The listing status of stream segments can be accessed at https://www.oregon.gov/deq/wq/Pages/epaApprovedIR.aspx.

2.4.1.1 Beneficial Uses

Water quality refers to the general health of the water and to its ability to sustain beneficial uses. The beneficial uses of surface water and ground water include but are not limited to water supply, salmonid spawning, salmon and trout rearing and migration, aquatic life, and water contact recreation. Beneficial uses have varying levels of sensitivity and are affected by different factors. For example, temperature crtieria were set to protect cold water aquatic life, which is the most sensitive beneficial use affected by stream temperature. Water quality impaired waterbodies do not support applicable beneficial uses.

Multiple beneficial uses in the Management Area require clean water, including drinking water, recreational activities, aquatic life, and agriculture (www.oregon.gov/deq/wq/Pages/WQ-Standards-Uses.aspx).

2.4.1.2 Water Quality Parameters of Concern

DEQ's 2022 Integrated Report identifies several water quality parameters that are not meeting water quality standards (https://www.oregon.gov/deq/wq/Pages/epaApprovedIR.aspx). Parameters impacted by agricultural activities and land condition that are of primary concern include dissolved oxygen, temperature, mercury, and E. coli. There are also concerns with biocriteria, nutrients, and some pesticides. These are parameters for which water bodies are on

the 303(d) list and those with an approved TMDL. The current 2022 Integrated Report can be accessed at https://rstudioconnect.deq.state.or.us/2022_IR_Database/

The 2022 Integrated Report identifies 303(d) listed stream segments that need a TMDL in the Management Area. The water quality impairments identified for streams in the Management Area include temperature, dissolved oxygen, biological criteria, metals (including mercury), and aquatic weeds or algae. The Management Area also has approved TMDLs for temperature (dissolved oxygen), bacteria, and mercury.

Groundwater

Nitrate
Nitrate is highly soluble in water, easily mobile in the soil, and can potentially leach through the soil and into the groundwater. Shallow groundwater is hydrologically connected to surface water in many areas. Connectivity may vary depending on the time of the year and water availability (usually precipitation).

A low level of nitrate can be naturally occurring in groundwater and surface water. However, the use of synthetic and natural fertilizers, and animal manure management practices are potential sources of excess nitrate in drinking water (ground and surface water). When fertilizer containing nitrate is applied to crops, any amount that plants cannot take up can readily percolate down to groundwater or run off to nearby streams. Nitrate in uncovered manure piles can easily move to groundwater or streams and rivers during rainy months or snow-melt events. Irrigation and precipitation events can accelerate the movement of nitrate on the landscape to groundwater and surface water. High nitrate levels in drinking water cause a range of human health problems, particularly with infants, the elderly, and pregnant and nursing women.

Surface Water

Temperature
Temperature standard and associated numeric criteria were established to protect coldwater aquatic life, the most sensitive beneficial use affected by stream temperature. On agricultural lands, absence of streamside vegetation, water withdrawals, and land management that leads to widened stream channels contribute to elevated stream temperatures. DEQ has identified the existing nonpoint source pollution sources as solar heating of the Management Area's waterways due to a lack of riparian vegetation from forestry, agriculture, rural-residential, and urban activities. In the Management Area, conditions and activities on agricultural lands that may affect temperature are predominantly streamside vegetation. Vegetation may either be in poor condition, improving condition, or providing expected water quality benefits.

Bacteria
DEQ developed the bacteria TMDL to protect human water contact recreation as the most sensitive beneficial use. On agricultural lands, E. coli generally comes from livestock waste, either deposited directly into waterways or carried to waterways via runoff and soil erosion. Runoff and soil erosion from agricultural lands may also carry bacteria from other sources. There are multiple potential sources of bacteria in streams, including humans (from failing septic systems) and wildlife.

Mercury
DEQ developed the mercury TMDL to protect human fish consumption as the most sensitive beneficial use. Primary sources in the Management Area include atmospheric deposition from

global sources, land management activities and natural conditions that result in runoff or sediment erosion that can transport mercury to streams, and point sources (wastewater, stormwater, and industrial discharges). Mercury is tightly bound to organic matter in soils, and has accumulated over long periods of time, resulting in legacy concentrations in soil.

Turbidity
Turbidity refers to the clarity of a waterbody. It includes the amount of suspended solids in the water column. Sediment, algae, and other particles contribute to turbidity. High turbidity levels can negatively affect aquatic life by consuming dissolved oxygen, clogging gills and other respiratory organs, reducing water infiltration through stream substrate (harming incubating fish eggs), and reducing animals' ability to see predators and prey. In addition, high turbidity can increase the difficulty and cost of adequately treating drinking water. For potential sources of turbidity and fine sediment, DEQ has identified urban storm water discharge, urban and agricultural run-off, and bank erosion from areas where the riparian vegetation has been removed. Turbidity (Total Suspended Solids) has also been elected as a surrogate water quality measure to assess mercury.

Dissolved Oxygen
Dissolved oxygen refers to the amount of oxygen that is dissolved in water. Oregon's dissolved oxygen standards protect cool and cold-water aquatic life, which require relatively high levels of dissolved oxygen to breathe.

Dissolved oxygen levels can vary over the course of the day based on algal growth and decay. An increase in available nutrients may result in elevated algal production, eventually depleting dissolved oxygen when algae decay. Temperature and dissolved oxygen exhibit an inverse relationship; as water temperature falls, dissolved oxygen levels rise; as water temperature rises, dissolved oxygen levels fall. Elevated stream temperatures, in addition to affecting the metabolic processes of aquatic animals, cause further physical stress by lowering the dissolved oxygen available for respiration.

Pesticides
Agricultural pesticides of concern include substances in current use and substances no longer in use but that persist in the environment. Additional agricultural pesticides without established standards have also been detected. On agricultural lands, sediment from soil erosion can carry these pesticides to water. Current use agricultural pesticide applications, mixing-loading, and disposal activities may also contribute to pesticide detections in surface water. For more information, see www.oregon.gov/deq/wq/Pages/WQ-Standards-Toxics.aspx.

Aquatic Weeds and Algae
Harmful algal blooms are caused by over-production of naturally occurring cyanobacteria (blue-green algae). Some species release toxins that are harmful to humans, livestock, pets, and wildlife. When levels of nutrients, temperature, pH, and light are optimal, cyanobacteria grow rapidly, resulting in blooms where cyanobacteria are the dominant form of life in their environment. Cyanobacteria can cause negative impacts to water quality, including taste and odor problems in drinking water, unpalatable fish, elevated pH levels, and low dissolved oxygen levels. Nutrients entering the watershed from agricultural activities can accumulate in reservoirs or lakes and may fuel algal blooms and move downstream. Low stream flows and high-water temperatures downstream could also make conditions favorable for algal blooms.

Biological Criteria
To assess a stream's ecological health, the community of benthic macroinvertebrates is sampled and compared to a reference community (community of organisms expected to be

present in a healthy stream). If there is a significant difference, the stream is listed as water quality limited. These organisms are important as the basis of the food chain and are very sensitive to changes in water quality. This designation does not always identify the specific limiting factor (e.g., sediment, nutrients, or temperature).

2.4.1.3 TMDLs and Agricultural Load Allocations

Table 2.4.1.3: Pollutants with Approved TMDLs* and Load Allocations more for the Management Area
Temperature: Applies to perennial and/or fish bearing waterbodies in the Management Area. **Load Allocation:** All nonpoint sources collectively (including agriculture): background solar radiation loading based on system potential vegetation near the stream; maximum increase of 0.05°C. **Surrogate:** Effective shade. **Current TMDL:** Willamette Basin TMDL, Chapters 4, 9, and 10 (DEQ; approved 2006). **TMDL Revisions:** DEQ is under a court order to update and replace the Willamette Basin temperature TMDLs to be consistent with current temperature standards: • DEQ must issue the revised TMDL for tributaries in the South Santiam Management Area by January 2024 (DEQ convened a Rules Advisory Committee in winter 2023 and will present the rules to the EQC for adoption in late 2023). Rulemaking website: www.oregon.gov/deq/rulemaking/Pages/willamettetempTMDL.aspx. • DEQ must issue the revised TMDL for the mainstem Willamette River and major tributaries, including the South Santiam up to Foster Dam by February 2025 (timeline for Rules Advisory Committee and EQC is TBD). • For more information: www.oregon.gov/deq/wq/tmdls/Pages/tmdlreplacement.aspx.
Bacteria (*E. coli.*): Applies to all waterbodies in the Management Area. **Load Allocation:** 65 to 83% reduction compared to average loads in 2006. • 65% for Calapooia River. **TMDL:** Willamette Basin TMDL, Chapters 2, 9, and 10 (DEQ; approved 2006).
Mercury: Applies to all perennial and intermittent streams in the Management Area. **Load Allocation:** For agriculture, forested, developed, and other non-urban land types: • Upper Willamette Subbasin (HUC 17090003): 97% reduction in mercury. • South Santiam Subbasin (HUC 17090006): 88% reduction in mercury. **Surrogate:** Total Suspended Solids (TSS). TSS is used as a surrogate because (1) the focus is on controlling soil erosion and (2) sampling mercury is complex and expensive. The target is a 75% reduction compared to 2019 levels. **Timeline:** Load reductions must be achieved by 2048; the TMDL provides interim milestones. **Reporting:** ODA will report to DEQ (annually, with five-year reviews) on progress toward implementing the TMDL for the entire Willamette Basin. **TMDL:** Willamette Basin Mercury TMDL (issued by DEQ in 2019, finalized by US EPA in 2021); the mercury TMDL was updated to reflect revised water quality standards that (1) establish safe levels of human fish consumption without unacceptable health risks and (2) protect aquatic life.
* TMDL information and documents can be found at: www.oregon.gov/deq/wq/tmdls/Pages/TMDLs-Willamette-Basin.aspx

2.4.1.4 Drinking Water

There are 176 public water systems (PWS) in the Management Area that obtain domestic drinking water from groundwater and surface water sources.These sources serve approximately

194,244 persons regularly. OHA rated some of the public water system wells in the Management Area for contaminant susceptibility for land use impacts to drinking water sources based on Source Water Assessments, aquifer characteristics, and well locations and construction. The majority of evaluated PWS wells rate as high or medium susceptibility.

In the past 10 years, there have been a number of PWS alerts for contaminants, including E. Coli, fecal coliform bacteria, and nitrate. Contaminants in water supplies potentially related to agriculture occur near human populations, agricultural land uses, and aquifers susceptible to contaminant infiltration. Below is a summary list of agricultural potential contaminant sources (PCS) within the management area (a map of these PCS records can be accessed using the link at the end of this section):

- 94 cropland PCS records
- 46 animal PCS records
- 13 other ag PCS records
- 52 CAFOs (15 cancelled; 37 permitted)

DEQ only addresses drinking water issues identified for public water systems. A query of Oregon Water Resources' water rights database for private domestic points of diversion (domestic surface water rights that are household use only, not irrigation) identified 42 private domestic water rights in the Management Area. There are also numerous private groundwater wells for domestic use. The Domestic Well Testing Act database (real estate transaction testing data) for 1989-2019 indicates nitrate levels for 160 results are ≥3 mg/L, 95 results are ≥5 mg/L, 52 results are 7mg/L, and 15 are ≥10mg/L out of 712 total results included in the database. The drinking water MCL for nitrates is 10 mg/L.

DEQ's full report of drinking water issues in the management area is available at: https://www.oregon.gov/deq/wq/programs/Pages/Nonpoint-Implementation.aspx.

2.4.1.5 GWMA

In May 2004, DEQ declared a portion of the Southern Willamette Valley (SWV) a Groundwater Management Area (GWMA) because of elevated groundwater nitrate levels. A portion of the Management Area is within the SWV GWMA.

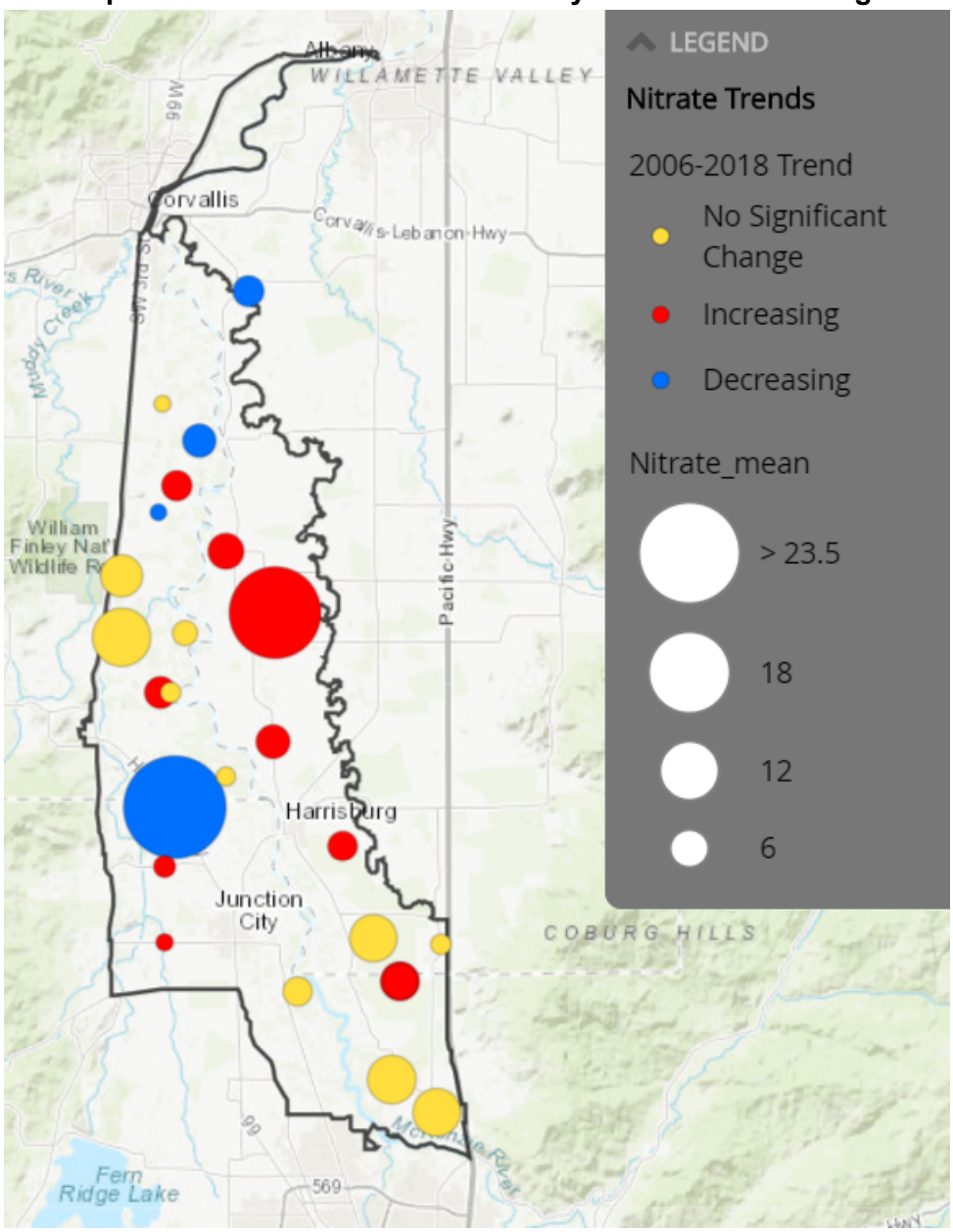
Although low background levels of nitrate (2 to 3 ppm) can be naturally occurring, a variety of human activities have caused high nitrate concentrations in the groundwater. Currently, 93 percent of the land area within the GWMA is in agricultural use. Although agricultural use makes up the vast portion of land area, there are also many non-agricultural potential sources of nitrate such as urban or rural residential land uses. Detailed information about the SWV GWMA can be found at http://gwma.oregonstate.edu. A new DEQ story map can be found at https://www.arcgis.com/apps/mapviewer/index.html?layers=a4e8f5a3195c475cb00b6a341dcdad3b that provides information and new analysis of the ground water nitrate trends.

The SWV GWMA stakeholder committee Action Plan for the SWV GWMA was finalized in 2009. The SWV GWMA Action Plan is not a regulatory document but includes many recommendations and voluntary strategies to address the issue of excess nitrate in regional groundwater. To address this, the SWV GWMA Action Plan provides recommendations and strategies to reduce nitrate inputs. The agricultural portion of the action plan is carried out by many partners. Agricultural practices to address nitrates in groundwater are integrated into Chapter 2.5.

In the recent analysis of groundwater nitrate trends in the SWV GWMA, important factors in explaining the nitrate concentrations in the long-term monitoring sites included water source, estimated fertilizer input, and proximity to a dairy operation (Piscitelli 2019). The full report can be found at https://ir.library.oregonstate.edu/concern/graduate_thesis_or_dissertations/cr56n703s.

See Figure 2.4.1.5 for a map of the GWMA.

Figure 2.4.1.5 Map of the Southern Willamette Valley Groundwater Management Area



Oregon Water Resources Department's 2021 Groundwater assessment report states:
"Declining water levels measured in wells over the course of many years indicate that groundwater discharge exceeds groundwater recharge over this time period, resulting in the depletion of groundwater storage. For this map, excessive declines were considered to be significant concerns, while moderate declines were considered concerning, as they may lead to a finding of further appropriation being beyond the capacity of the resource."
Scandella, B., & Iverson, J. (2021). (publication). 2021 OREGON GROUNDWATER RESOURCE CONCERNS ASSESSMENT (pp. 9–9). Oregon Water Resources Department .
https://www.oregon.gov/owrd/WRDReports/2021_Groundwater_Resource_Concerns_Report.pdf

2.5 Regulatory and Voluntary Measures

2.5.1 Area Rules

The focus of the Agricultural Water Quality Management Program is on voluntary and cooperative efforts by landowners, SWCDs, ODA, and others to protect water quality. However, the Agricultural Water Quality Management Act also provides for a regulatory backstop to ensure prevention and control of water pollution from agricultural sources in cases where landowners or operators refuse to correct problem conditions. The Area Rules serve as this backstop while allowing landowners flexibility in how they protect water quality. Area Rules are goal-oriented and describe characteristics that should be achieved on agricultural lands, rather than practices that must be implemented.

Each Area Rule relates directly to water quality concerns identified on the 303(d) list in the Management Area, and addresses the Upper Willamette TMDLs as required under the federal Clean Water Act. The concerns addressed in the Area Rules are described below.

Landowners in the Management Area are required to achieve the conditions outlined in the Area Rules below:

South Santiam

1. Waste, Nutrients, and Other Pollutants Rule

OAR 603-095-2440
(1)(a) Effective upon rule adoption, no person subject to these rules shall violate any provision of ORS 468B.025 or ORS 468B.050.

ORS 468B.025(1) states:
...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.

ORS 468B.050 identifies the conditions when a permit is required. In agriculture, under state rules, these are referred to as CAFO and are operations that confine animals on prepared surfaces to support animals in wet weather, have wastewater treatment works, discharge any wastes into waters of the state, or meet the federal definition of a CAFO (40 CFR § 122.23). Permitted facilities are inspected regularly by the ODA. (see Chapter 1.4.4).

2. Riparian/Streamside Area Management

OAR 603-095-2440
(1)(b) By January 1, 2003, agricultural activities along perennial streams shall allow for the establishment and maintenance of riparian vegetation consistent with site capability that promotes infiltration of overland flows, moderation of solar heating, and streambank stability.
(A) Minimal breaks in shade vegetation for essential management activities are considered appropriate.

(B) Management within the riparian area is allowed provided it does not compromise achieving the conditions described in (1)(b).

2.5.2 Voluntary Measures

Voluntary efforts are the focus of ODA, Linn SWCD, and the LAC. However, if a particular landowner refuses to correct a verified adverse condition on his or her property, ODA has regulatory authority to ensure pollution control. At the same time, ODA does not want to mandate or prohibit any specific agricultural activity. To maintain this flexibility, this Area Plan and its associated administrative rules describe prohibited conditions.

Readers should note that this Area Plan is only a guidance document; by itself it is not regulatory. However, it does refer to administrative rules that set enforceable requirements for landowners. To help distinguish between this Area Plan and its associated rules, all rule language is provided in Chapter 2.5.1 and is separate from this section.

This Area Plan encourages farmers and ranchers to manage their land to control conditions that have been identified as contributing to undesirable water quality using adaptive management techniques.

2.5.2.1 Waste Management

A landowner or operator's responsibility under this Area Plan is to prevent the introduction of waste materials into waters of the state. There are existing statutes and rules that regulate water quality that remain in effect and are enforced by other designated management agencies.

Wastes include excess soil, manure, fertilizers, and other substances.

Indicators of noncompliance include but is not limited to:

- Runoff flowing through areas of high livestock usage and carrying wastes into waters of the state,
- Livestock waste accumulated in drainage ditches or areas of flooding,
- Fecal coliform (*E. coli*) counts that exceed state water quality standards.
- Applying excess nutrients (including fertilizers, manure, and other additives) above amounts that crops can uptake.

Issue:
The most commonly used indicator of biologic pollution in a waterbody, the organism *Escherichia coli* (*E. coli*), is a member of a group of fecal coliform bacteria. These bacteria reside in the intestines of warm-blooded animals, including humans, livestock, wild birds, and mammals. The presence of *E. coli* alone does not confirm the contamination of waters by pathogens but it can indicate contamination by sewage or animal manure and the potential for health risks.

Agricultural sources of *E. coli* include runoff of domestic animal manure from agricultural lands. Numerous factors influence the nature and amount of bacteria that reach waterways. Some of these factors are climate, topography, soil types and infiltration rates, animal species, and animal health.

When bacteria reach a waterway, they may settle into sediments in a streambed and can live there for an extended period of time. If sediments are disturbed by increased stream turbulence

following a runoff event (human or animal traffic or other means), sediment-bound bacteria may be re-suspended into the water column (Sherer et al 1992). Sediment disturbance likely accounts for erratic bacteria levels typically measured in water quality monitoring programs.

Oregon's water quality standard for bacteria was established to protect the most sensitive beneficial use affected by bacteria levels, which is water contact recreation. Within the Management Area, the Calapooia River and the mainstem Willamette exceed state water quality standards for bacteria during the fall, winter, and spring.

Table 2.5.2.1 Nutrient and Manure Management

Resource Concerns Addressed	Practice	Benefits to Producer	Costs to Producer
Helps prevent nutrient runoff into waters of the state and leaching into groundwater.	e. Prevent silage leaching and/or store and manage leachate from silage and other vegetative materials (Bruneau, Hodges, and Lucas, 1995; Feise, Adams, and LaSpina, 1993).	Preventing leaching maintains higher nutrient content of ensiled feed material. Practice may be eligible for cost-sharing programs.	May require cost of facility development and purchase of moisture-absorbing materials. Practice may be eligible for cost-sharing programs.
	a. Apply nutrients according to soil test results (Hart, Pirelli, and Cannon, 1995; Marx, Hart, and Stevens, 1999; Natural Resources Conservation Service, 1997i; Sullivan, 1998; Waskom, 1994).	May help reduce fertilizer costs; ensures that plants receive needed nutrients for growth; makes plants more competitive against weeds. Practice may be eligible for cost-sharing programs.	Costs of soil testing; time associated with taking soil samples. Practice may be eligible for cost-sharing programs.
Helps prevent nutrient and bacteria runoff into waters of the state and leaching into groundwater.	b. Store manure under a tarp or roof; preferably on an impervious surface such as concrete or plastic (Gamroth and Moore, 1996; Godwin and Moore, 1997; Moore and Wilrich, 1993).	Prevents nutrient leaching so manure applied on crops or pasture has higher nutrient content; may save some fertilizer costs; producers may be eligible for cost-sharing programs.	Cost of constructing manure storage facilities. Practice may be eligible for cost-sharing programs.
Helps prevent sediment, nutrient and bacteria runoff into waters of the state and leaching into groundwater. Helps protect streamside areas.	c. Establish animal heavy-use areas 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 heavy-use areas with rock, hogged fuel, and/or	Protects pastures from compaction during the winter, improving growth. May improve animal health by covering heavy-use areas with material so animals are not wading in mud. Practice may be eligible for cost-sharing programs.	Cost of fencing heavy-use area; cost of feeding hay during the winter; cost of materials for protecting heavy-use area. Practice may be eligible for cost-sharing programs.

	geotextile. Clean manure regularly from heavy-use area (Natural Resources Conservation Service, 1997d).		
Helps prevent sediment, nutrient and bacteria runoff into waters of the state. Helps protect streamside areas.	f. Installing gutters and downspouts in areas with high livestock use. Connect downspout water to drainage system or, if possible, route clean downspout to a location where it can soak into the ground (Natural Resources Conservation Service, 1997f).	May improve animal health by lessening mud during the winter, so animals are not wading in mud. Practice may be eligible for cost-sharing programs.	Cost of installation and maintenance of gutters and downspouts. Practice may be eligible for cost-sharing programs.
	d. Site barns and heavy-use areas away from streams (Godwin and Moore, 1997).	Helps prevent flooding in barns and heavy-use areas. Practice may be eligible for cost-sharing programs.	Need either off-stream watering facility or other source of water for livestock. Practice may be eligible for cost-sharing programs.
	g. Cover heavily used animal walkways with sand, rock, and/or geotextile (Natural Resources Conservation Service, 1997c).	Can improve animal health because animals are not wading in mud. Can help prevent animal health problems such as scratches, hoof or foot rot, and worms. Practice may be eligible for cost-sharing programs.	Cost of sand, rock or other materials. Owners should be aware that feeding equine species on sand may result in sand colic. Practice may be eligible for cost-sharing programs.

2.5.2.2 Riparian/Streamside Area Management

A landowner or operator's responsibility under this Area Plan is to implement measures that prevent and control water pollution from agricultural activities. Areas near waterbodies are especially important to water quality and sensitive to management activities.

The streamside area is defined as the area near the stream where management practices can most directly influence the conditions of the water. This area usually ranges from 10 feet to 100 feet from the water, depending on the slope, soil type, stream size, and morphology.

The riparian area, as defined in OAR 690-400-0010(14), is a zone of transition from an aquatic to a terrestrial system, dependent upon surface or subsurface water, that reveals through the zone's existing or potential soil-vegetation complex the influence of such surface or subsurface water. A riparian area may be located adjacent to a lake, reservoir, estuary, pothole, spring, bog, wet meadow, muskeg, slough, or ephemeral, intermittent, or perennial stream.

Water is the distinguishing characteristic of riparian areas, but soil, vegetation, and landform also exert strong influence on these systems. In a healthy riparian ecosystem, these four components interact to produce a wide variety of conditions.

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

- Dissipation of stream energy associated with high flows and thus influencing the transport of sediment,
- Capture of suspended sediment and bedload that builds streambanks and develops floodplain function,
- Retention of floodwater and recharging groundwater,
- Stabilization of streambanks through plant root mass,
- Development of diverse channel characteristics providing pool depth, cover, and variations in water velocity necessary for fish production,
- Support of biodiversity,
- Shade for moderation of solar heat input,
- Recruitment of large woody debris for aquatic habitat.

Indicators to determine improvement of this condition include:

- Ongoing, natural recruitment of desirable riparian or upland plant species,
- Management activities maintain at least 50 percent of each year's growth of woody vegetation – both trees and shrubs,
- Management activities minimize the degradation of established native vegetation,
- Maintenance of established beneficial vegetation,
- Maintenance or recruitment of woody vegetation – both trees and shrubs,
- Streambank integrity capable of withstanding 25-year flood events.

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

- Expansion of riparian area as evidenced by development of riparian vegetation and plant vigor,
- Reduction in actively eroding streambank length beyond that expected of a dynamic stream system,
- Community composition changes reflecting an upward trend in riparian condition (increases in grass-sedge-rush, shrubs, and litter and decreases in bare ground),
- Plant community composition reflecting an upward trend as indicated by decreases in noxious plant species,
- Stream channel characteristics show upward trend consistent with landscape position (i.e. a decrease of width-to-depth ratio of the channel),
- Shade patterns consistent with site capability,
- Stubble height of herbaceous species and leader growth of shrubs and trees.

Table 2.5.2.2 Management in Riparian Areas and Streams

Resource Concerns Addressed	Practice	Potential Costs of Practice to Producer
Helps establish desirable riparian vegetation, promotes streambank integrity; helps filter nutrients and sediment from runoff; helps reduce stream temperatures by providing shade.	a. Light rotational grazing in riparian area; timed when growth is palatable to animals and when riparian areas are not saturated (Adams, 1994; Chaney, Elmore and Platts, 1993; Rogers and Stephenson, 1998).	May require time and financial investment for livestock control and off-stream watering facilities. Practice may be eligible for cost-sharing programs.
Helps promote desirable riparian vegetation; promotes streambank integrity; helps filter nutrients and sediment from runoff; may help narrow channel and reduce erosion in channel.	b. Livestock exclusion from riparian area; establish off-stream watering facilities (Natural Resources Conservation Service, 1997g and 1997h).	May require higher weed control costs than seasonal riparian grazing. May require financial investment for livestock control and off-stream watering facilities. Practice may be eligible for cost-sharing programs.
Helps establish perennial riparian vegetation rapidly; promotes streambank integrity; may help narrow channel and reduce erosion in channel.	c. Plant perennial vegetation in riparian area. Recommend using native vegetation, or if using non-native vegetation, avoid using invasives (Guard, 1995; Pojar and MacKinnon, 1994).	Costs of vegetation and weed control. May require financial investment for riparian fencing and off-stream watering facilities while vegetation establishes. Practice may be eligible for cost-sharing programs.

2.5.2.3 Soil Erosion Prevention and Control

Prevention and Control Measure: Mercury

Agricultural landowners do not have any control over air deposition of mercury (past, present, or future), but they can adopt management strategies that reduce the runoff of sediment and water that carry mercury to stream systems. ODA has identified minimizing bare ground in winter as the strategy most likely to reduce sediment and mercury reaching streams. Additional high priority strategies are to limit livestock access to streamside areas, establish streamside vegetation for filtering, and stabilize channel banks. Addressing erosion from roads and road-related structures (referenced below) will also help prevent mercury from reaching stream systems. Soil health strategies promote infiltration of precipitation, which reduces runoff of mercury to streams.

Table 2.5.2.3 Erosion and Sediment Control

Resource Concerns Addressed	Practice	Benefits to Producer	Costs to Producer
Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.	a. Grazing management: graze pasture plants to appropriate heights, rotate animals between several pastures; provide access to water in each pasture (Ko, 1999; Lundin, 1996; Hirschi, 1997).	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. Practice may be eligible for cost-sharing programs.	Cost of installing fencing, watering facilities for rotational grazing system; time involved in moving animals through pastures. Practice may be eligible for cost-sharing programs.

Helps prevent sediment runoff to waters of the state.	b. Farm road construction: construct fords appropriately, install water bars or rolling dips to divert runoff to roadside ditches (Blinn, 1998; U.S. Forest Service, 1998).	May help prevent water damage on farm roads. Practice may be eligible for cost-sharing programs.	Cost of installation and maintenance. Practice may be eligible for cost-sharing programs.
	c. Plant appropriate vegetation along drainage ditches; seed ditches following construction (Natural Resources Conservation Service, 1997a).	May help prevent ditch bank erosion and slumping. Practice may be eligible for cost-sharing programs.	Costs of establishing vegetation. Practice may be eligible for cost-sharing programs.
Helps prevent sediment runoff into waters of the state; filters nutrients and slows runoff.	d. Plant cover crops on erosion-sensitive areas (Natural Resources Conservation Service, 1997b; Hirschi, 1997).	May reduce weed problems; prevents loss of applied nutrients. Practice may be eligible for cost-sharing programs.	Costs of establishing cover crops; cover crops may compromise primary crop. Practice may be eligible for cost-sharing programs.
Helps prevent irrigation return flow and associated nutrients and sediment to waters of the state.	e. Irrigate pasture or crops according to soil moisture and plant water needs (Hansen and Trimmer, 1997; Trimmer and Hansen, 1994).	May reduce costs of irrigation; may help crop or pasture production. Practice may be eligible for cost-sharing programs.	Installation/ maintenance cost. Monitoring time. Practice may be eligible for cost-sharing programs.
Helps prevent nutrient runoff into waters of the state.	f. Install/maintain diversions or French drains to prevent unwanted drainage into barnyards and heavy-use areas (Natural Resources Conservation Service, 1997e).	Decreases muddiness and shortens saturation period in protected areas. Practice may be eligible for cost-sharing programs.	Cost of installation. Practice may be eligible for cost-sharing programs.
Prevents gully erosion and sediment runoff to waters of the state.	g. In areas where gullies repeatedly appear, install underground outlet or grassed waterway to capture and convey water (Natural Resources Conservation Service, 1997j and 1997k; Hirschi, 1997).	Prevents loss of soil and fertilizers, lessens inconvenience of driving equipment over gullies. Practice may be eligible for cost-sharing programs.	For underground outlet, costs of installing inlets and plastic pipe; for grassed waterways, costs of installation, seeding, weed control, and any land put out of production. Practice may be eligible for cost-sharing programs.

Controls sediment and nutrient movement to waters of the state. Erosion control during high water events.	h. Install and manage field borders/filter strips along field boundaries (Natural Resources Conservation Service, 2001)	Prevents loss of soil and fertilizers, lessens inconvenience of driving equipment in wet areas. Practice may be eligible for cost-sharing programs.	Cost of management and installation. Practice may be eligible for cost-sharing programs.

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 ridgetops 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.

Pesticide Management

Resource Concerns Addressed	Practice	Benefits to Producer	Costs to Producer
Reduces risk of pesticide runoff to streams or other water resources.	Apply pesticides according to the label. Comply with label restrictions and precautions.	Compliance with Oregon law; reduces health risks to applicator, may decrease costs.	
Reduces risk of pesticide runoff to streams.	Triple rinse pesticide application equipment and apply rinsates to sites; dispose of or recycle clean containers according to Oregon law.	Compliance with Oregon law. Eliminates disposal costs of collected rinsates identified as hazardous waste.	
	Calibrate, maintain, and correctly operate application equipment.	May reduce use and therefore cost of pesticides; reduces health risks to applicator.	
Reduces risk of pesticide runoff to streams, may reduce loss of non-target species.	Integrated pest management practices such as pheromone traps, beneficial insect release, and field monitoring. (Either in combination with pesticide use or as a	May improve effectiveness of pest control system.	Time involved by producer to scout fields is usually offset by reduced or more effective pesticide use.

	replacement to pesticide use).		
Reduces risk of pesticide runoff to streams or soil contamination.	Store and mix pesticides in leak-proof facilities.	Helps protect drinking water; reduces health risks to applicator.	Cost of installation and maintenance.

Nutrient and Irrigation Efficiencies

A landowner or operator's responsibility under this Area Plan is to implement measures that prevent and control water pollution from irrigation, this includes pollution to groundwater and surface water. Diversion of water for irrigation or other uses and the return of that water to the surface or groundwater are activities that have potential for contributing to water quality problems.

Irrigated lands are lands either riparian, floodplain, or upland upon which water is applied for the purpose of growing crops. Diversion of water from a water body to be applied on land for the purpose of growing crops is a recognized beneficial use of water. Irrigation water use is regulated by the OWRD in the form of water rights, which specify the rate, duty, and season that water can be applied to a particular parcel of land. Refer to OWRD Rules (OAR 690 and ORS 536 through 543) for more details.

All irrigators within the region should have an irrigation management plan to match irrigation application quantities and rates to the crop and environmental demands. A companion nutrient management plan should match fertilizer and nutrient applications to agronomic demand.

Irrigation management aims at increasing food production and contributes to economic development through improvements in performance, productivity, and sustainability of irrigated agriculture and irrigation systems.

An irrigation management plan should consist of:

- Soil types and map
- Crop types, acreage, schedules, and critical moisture period
- Irrigation system types, efficiencies
- Estimated water use (evapotranspiration-ET) and peak ET, weekly
- Irrigation rate, frequency and total, weekly

Characteristics of an irrigation system that has minimal effect on water quality include:

- Operation based on an irrigation and nutrient management plan,
- Delivery of water efficiently to the land within legal water rights,
- Minimal overland return flows,
- Return flow routing that provides for settling, filtering, and infiltration,
- Minimal effect on stability of streambanks and minimal soil erosion,
- Scheduling of water application appropriate to the site including consideration of soil conditions, crop needs, climate, and topography,
- Installation and management of diversion structures that control erosion and sediment delivery and protect the stability of streambanks,
- Diversions that are adequately screened and which provide for fish passage. (Refer to ORS 498.268 for screening requirements),
- Sediment is captured from irrigation runoff before it enters rivers and streams.

Nutrient and Irrigation Efficiencies

Resource Concerns Addressed	Practice	Benefits to Producer	Costs to Producer
Reduces the risk of excess nitrogen in the soil at the end of the growth season.	Apply fertilizer at the correct rate and time applications for crop uptake.	Precise application saves money in fertilizer costs.	Time related to precision application.
Prevents the application of excess nutrients.	Sample soil prior to fertilizer application to know existing nutrients.	Precise application saves money in fertilizer costs.	Cost of soil sampling and analysis.
Takes up extra nitrogen and limits potential for leaching into ground water.	Plant winter cover crops to take up excess nitrogen left over after crops are harvested.	Stores extra nitrogen in plant matter for later release when cover crop is incorporated into the soil.	Cost of seed and fuel to plant cover crop.
Prevents leaching of excess nitrogen past the root zone.	Properly maintain irrigation systems to prevent over-irrigation.	Uniform irrigation application and save producer money on nitrogen costs.	Replacement nozzles at least every four years is recommended.
Prevents over-irrigation and leaching of excess nitrogen past the root zone.	Monitor soil water content and adjust irrigation schedules to maintain soil water content in an appropriate range in the root zone.	Allows accurate irrigation application and keeps nutrients available to crops.	Soil monitoring equipment and time to evaluate soil water content.
	Schedule irrigation applications based on expected evapotranspiration rates.	Allows accurate irrigation application and keeps nutrients available to crops.	Time to evaluate expected evapotranspiration rates.

Chapter 3: Implementation Strategies

Chapter 3 describes efforts to make and track progress toward the goals of the Area Plan. It presents the goals, measurable objectives, strategic initiatives, proposed activities, and monitoring efforts.

Goal
Prevent and control water pollution from agricultural activities and soil erosion, and to achieve applicable water quality standards.

The LAC established these objectives to achieve the Area Plan goal:

- Streamside vegetation along perennial streams that provide streambank stability, infiltration 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 35 feet of streams on pasturelands and/or rangelands,
- Active erosion induced 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.

The following conditions on agricultural lands contribute to good water quality in this Management Area:

1. Sufficient site-capable vegetation is established along streams to stabilize streambanks, filter overland flow, and moderate solar heating,
2. Crop lands are covered throughout the year with either production crops, crop residues, or cover crops,
3. Pastures have minimal bare ground,
4. Irrigation runoff does not deliver sediment, nutrients, or chemicals to streams,
5. Leachate and residues from livestock manure are not entering streams or groundwater.

3.1 Measurable Objectives and Strategic Initiatives

Measurable objectives allow the Ag Water Quality Program to evaluate progress toward meeting water quality standards and TMDL load allocations. Any measurable objectives are stated here. Progress is reported in Chapter 4.1.

3.1.1 Management Area

Measurable Objective: TSS

Assessment Method: To be determined

Measurable Objective and Associated Milestones:
For TSS, the mercury TMDL establishes a measurable objective for maximum instream TSS at 4 mg/L in 2049, with a 2019 milestone of 17 mg/L. Progress is reported in Section 4.1.1. TSS will be reduced by additional adoption of strategies to reduce upland and streambank erosion.

3.1.2 Focus Areas and Other Coordinated Efforts in Small Watersheds

There are currently no Focus Areas in this Management Area.

3.1.3 Strategic Implementation Areas (SIA)

There are currently no SIAs in this Management Area.

3.1.4 Pesticide Stewardship Partnerships (PSP)

There are no PSPs in this Management Area.

3.1.5 Groundwater Management Area (GWMA)

Southern Willamette Valley GWMA

There is no measurable objective for the Southern Willamette Valley GWMA. A description of the SWV GWMA and recent nitrate trends are provided in Chapter 2.4.1.5. Monitoring is described in Chapter 3.3.

3.2 Proposed Activities

ODA, the LAC, the LMA, and other partners have identified the following priority activities to track progress toward meeting the goals and objectives of the Area Plan (Table 3.2).

Table 3.2 Planned Activities for 2024-2027 throughout the Management Area by Linn SWCD

Activity	4-year Target	Description
Landowner Engagement		
# events that actively engage landowners (workshops, demonstrations, tours)	48	1 event per month (booth/table, native plant sale, living on the land workshop series, grassed waterway outreach)
# landowners participating in active events	7,000	
Brochures provided to land owners		Work with ODA and UW SWCD to create and update handouts and educational materials
Technical Assistance (TA)		
# landowners provided with TA (via phone/walk-in/email/booth/site visit)	400	
# site visits	80	For technical assistance only, when required to attend compliance site visits with ODA. This number may be higher.
# conservation plans written*	4	Trying to work with the final landowner in the Crabtree Creek area.
* Definition: any written management plan to address agricultural water quality concerns, such as: nutrients, soil health, grazing, irrigation, and streamside vegetation. Can include farm and ranch plans (including small acreages) and NRCS-certified plans. Excludes projects with weak connection to agricultural water quality.		

3.3 Additional Agricultural Water Quality and Land Condition Monitoring

3.3.1 Water Quality

3.3.1.1 DEQ Monitoring

DEQ monitors water quality in the Management Area as part of its ambient monitoring network.

3.3.1.2 ODA Temperature Monitoring

The Calapooia and South Santiam Watershed Councils are participating in a state-wide, long-term project spearheaded by ODA to determine whether reduced summer stream temperatures can be documented as a result of streamside vegetation enhancement on agricultural lands. Monitoring started in 2017 and will continue for 20 years. Data are collected on stream temperature, air temperature, stream flows, and streamside vegetation. The Calapooia Watershed Council selected Brush Creek because it is one of the larger tributaries to the Calapooia River and is lined by several CREP projects; they are monitoring three sites. The South Santiam Watershed Council selected Hamilton and McDowell creeks because they were part of the Willamette Model Watershed Program and have experienced extensive restoration work since 2009; they are monitoring eight sites. Stream temperature data are provided to DEQ annually and are incorporated in its Status and Trends Reports. ODA will write the final report.

3.3.1.3 GWMA Monitoring

DEQ currently collects quarterly samples from 12 groundwater monitoring wells installed in the southern Willamette Valley, in addition to annual well sampling at 27 locations and six surface water locations. Some locations are also sampled for chloride and phosphorous. This program includes monitoring 23 shallow monitoring wells, 16 domestic wells, and six surface water sites. The domestic wells are generally installed deeper than the monitoring wells. EPA continues to provide stable isotopic analyses on surface and groundwater samples collected by DEQ's laboratory. EPA published an article in 2021 summarizing the results of this study, which included identification of nitrogen sources across monitoring wells (Weitzman et al., 2021). EPA and DEQ are collaborating on a web-based tool to display historical data collected at these sites for public access.

3.3.2 Land Conditions

The following section describes the process DEQ used to assess streamside vegetation and shade conditions in the Southern Willamette Basin. Shade helps reduce the rate of stream warming from solar radiation. Results of the assessment are summarized in Chapter 4.3.2 of this Area Plan. The results show where conditions may be sufficient, as well as where ODA and partners should focus efforts to improve conditions in the future. This shade assesment will be included in the Willamette Subbasins TMDL which is currently being developed and will be completed by January 2024.

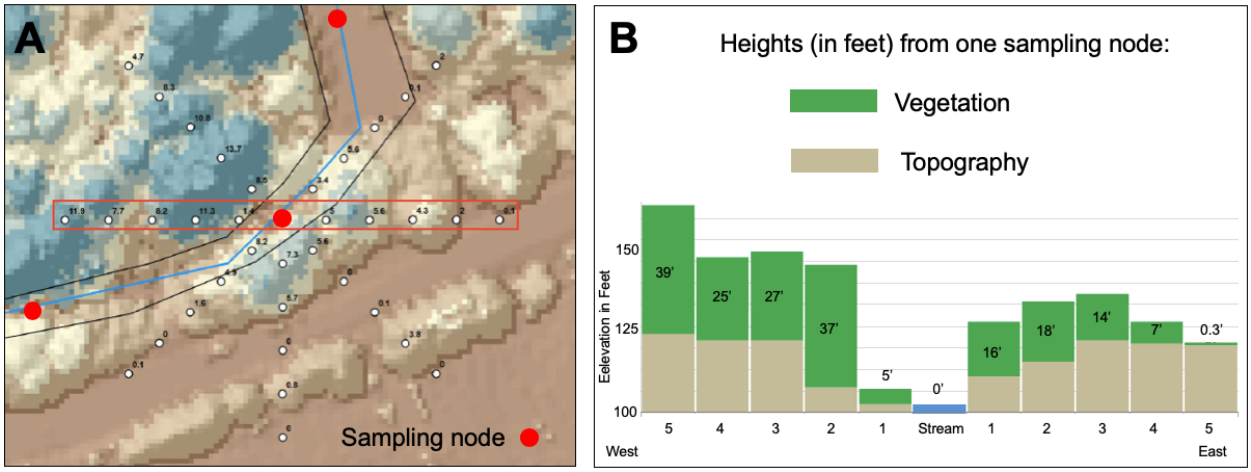
In 2019, DEQ hosted a Willamette TMDL implementation workshop, which included a presentation, "Assessing the Status of Riparian Restoration, Protection, and Shading in the Southern Willamette Basin" (presentation and results are posted at: www.oregon.gov/deq/wq/tmdls/Pages/TMDLs-Willamette-Basin.aspx#implementation). In this study, DEQ assessed nonpoint source solar heating along streams in the southern half of the Willamette Basin to compare current conditions to targets established in the TMDL. DEQ

assessed current levels of “effective shade” (shade), which measures the percent of a stream that is shaded by streamside vegetation plus topography.

DEQ assessed shade along perennial and intermittent streams in the U.S. Geological Survey’s National Hydrography Dataset (NHD). DEQ included all NHD streams because of known inaccuracies in stream flow classification. Many streams classified as intermittent streams are actually fish-bearing, with aquatic life using residual pools in the dry season. When and where more accurate stream classification is provided, DEQ will revise the shade assessment. DEQ recommends using the methods described by EPA in 2015 (www.epa.gov/measurements-modeling/streamflow-duration-assessment-method-pacific-northwest) to determine stream flow duration.

DEQ used Lidar data, computer mapping, and computer modeling to calculate current shade levels (as of the date Lidar was acquired, which ranges from 2009 to 2014 in this Management Area). DEQ set up sampling nodes to model shade every 656 feet (200 meters) along streams. For each sampling node, DEQ used the Heat Source model to calculate effective shade (amount of sun blocked) throughout a mid-summer day, using vegetation and topographic heights from Lidar.

Figure 3.3.2b A: Background shows Lidar imagery, color-coded by vegetation height; for each sampling node (red dot), DEQ calculated vegetation and topographic heights in seven directions (white dots), out to a distance of 246 feet (75 m); B: Cross section, west and east of the sampling node, shows vegetation and topographic heights



Results of these additional monitoring activities are presented in Chapter 4.3.

Chapter 4: Progress and Adaptive Management

Chapter 4 describes progress toward achieving Area Plan goals and measurable objectives by summarizing accomplishments and monitoring results. Tracking activities is straightforward; monitoring water quality or land conditions takes more effort; relating changes in land conditions to changes in water quality is important but more challenging.

4.1 Measurable Objectives and Strategic Initiatives

The following tables provide the assessment results and progress toward measurable objectives and milestones in the past four years (2019-2022). See Chapter 3.1 for background and assessment methods.

4.1.1 Management Area

ODA is working with SWCDs and LACs throughout Oregon toward establishing long-term measurable objectives to achieve desired conditions.

During the biennial review of this Management Area plan in 2023, the South Santiam LAC asked that a Management Area-wide measurable objective be set:

- That the Linn SWCD works together with ODA, the South Santiam Watershed Council, and any other willing partners to create a monitoring plan and partnership.
- Includes the creation of a monitoring plan by June 2025. And that the monitoring plan, if executed, would be sufficient to establish a baseline measurement of Total Suspended Solids within all applicable reaches of the South Santiam Agricultural Water Quality Management Area.

Table 4.1.1.1 Measurable Objective: TSS

Measurable Objective
By 2049, maximum instream TSS = 4 mg/L Milestone = By 2019, maximum instream TSS = 17 mg/L
Current Conditions
Progress Toward Measurable Objectives and Milestones According to the DEQ's 2022 Status and Trends Report, most TSS samples exceeded the 2019 milestone (see Chapter 4.3.1).

4.1.2 Focus Areas and Other Focused Efforts in Small Watersheds

There are currently no Focus Areas in this Management Area.

4.1.3 Strategic Implementation Areas

There are currently no SIAs in this Management Area.

4.1.4 Pesticide Stewardship Partnerships

There are no PSPs in this Management Area.

4.1.5 Groundwater Management Area

No measurable objective has been developed for this GWMA.

Southern Willamette Valley GWMA

GWMA accomplishments May 2017-May 2019:

- DEQ has continued to monitor 39 wells as part of a long-term monitoring program for the Southern Willamette Valley Groundwater Management Area.
- The SWV GWMA Committee continues to meet on a biannual basis to track groundwater quality trends, provide feedback to researchers, and inform actions in the GWMA.
- OSU MS student Cody Piscitelli began his MS thesis work focused on examining the time trends in the DEQ groundwater and surface water nitrate concentrations. He reported on his initial findings at the April GWMA meeting. Cody plans to complete his thesis in August 2019.

4.2 Activities and Accomplishments

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

Future Area Plans will compare results and targets in Table 4.2a.

Table 4.2a Activities conducted in 2019-2022 throughout the Management Area by Linn SWCD

Activity	4-year results	Description
Landowner Engagement		
# events that actively engage landowners (workshops, demonstrations, tours)	42	Covid limited in-person workshops; living on the land series very successful (hoping to replicate it in future years)
# landowners participating in active events	6249	
# landowners provided brochures	642	Information coming from USDA office, some handouts created by ODA
Technical Assistance (TA)		
# landowners provided with TA (via phone/walk-in/email/booth/site visit)*	287	Varies between calls and walk-ins, referrals from other agencies; concerns about education, production, compliance, lots of water resurces concerns lately with the drought, manure management a big concern, flooding issues a big concern. Reporting on neighbors occasionally, compliance issue calls with ODA; farms that want education/what to do; a lot of triage of not knowing whom to speak to about various concerns; lots of calls coming from people being proactive, wanting to do the right thing.
# site visits	76	
# conservation plans written**	3	

On-the-ground Project Funding		
# funding applications submitted	2	
# funding applications awarded	0	

* Number reported likely double-counts some landowners due to tracking methods.

** Definition: any written management plan to address agricultural water quality concerns, such as: nutrients, soil health, grazing, irrigation, and streamside vegetation. Can include farm and ranch plans (including small acreages) and NRCS-certified plans. Excludes projects with weak connection to agricultural water quality.

Monitoring

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

ODA initiated annual reporting to DEQ for agricultural water quality implementation related to TMDLs. Table 4.2d shows a subset of key on-the-ground practices implemented in this Management Area in 2020. Practices are reported by Practice Group (suite of similar practices that use the same reporting unit). Table 4.2d also conveys which practice groups help to address the temperature, bacteria, and/or mercury TMDLs.

Table 4.2b Implementation funding (cash and in-kind) for projects on agricultural lands reported 1997-2020 (OWRI data include most, but not all projects, implemented in the Management Area.)

Landowners	OWEB	DEQ	NRCS*	ODFW	BPA	All other sources**	TOTAL
444,165	6,804,923	64,637	2,242,918	673,564	877,302	4,859,191	$15,966,700

* This table may not include all NRCS funding due to privacy concerns.

**Includes city, county, tribal, other state and federal programs, and non-profit organizations. There were too many entities to list.

Table 4.2c Miles and acres treated on agricultural lands reported 1997-2020 (OWRI data include most, but not all projects, implemented in the Management Area.)

Activity Type*	Miles	Acres	Count**	Activity Description
Upland		401		
Road	15		205	
Streamside Vegetation	82	1,825		
Wetland		698		
Instream Habitat	35			
Instream Flow	0		0 cfs	
Fish Passage	162		25	
TOTAL	**293**	**2,925**	**230**	

* This table may not include all NRCS projects due to privacy concerns.

** # hardened crossings, culverts, etc.

Table 4.2d South Santiam 2022 on-the-ground practices implemented

Practice Group	Unit	#Implemented	Temperature	Bacteria	Mercury
UPLAND					
Irrigation	Acres	727	x		x
Fence	Feet	200		x	x

Woody Plantings	Acres				x
Cover Plantings	Acres	767			x
Heavy Use Area	#			x	x
RIPARIAN					
Woody Plantings	Acres	180	x	x	x
Fence	Feet		x	x	x

4.3 Additional Agricultural Water Quality and Land Condition Monitoring

4.3.1 Water Quality

DEQ analyzed data for dissolved oxygen, E. coli, pH, total phosphorus, temperature, and total suspended solids in the Management Area. (DEQ. 2022 Oregon Water Quality Status and Trends Report; https://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx).

Data are from DEQ, US EPA, and USGS databases for 2001 through 2020. DEQ determined status for stations in five-year periods and trends for stations with at least eight years of data collected at the same time of year.

Only three locations have sufficient data to calculate recent status and trends and are most likely to help characterize agricultural water quality in the Management Area (Table 4.3.1); there are other locations on the Willamette River itself. These are all part of DEQ's ambient monitoring network.

Table 4.3.1 Attainment of water quality standards for 2016-2019, and 2000-2019 trends

Site Description	Parameter					
	E. coli	**pH**	**Dissolved Oxygen**	**Temp.**	**Total Phosphorus (mg/L)**	**Total Suspended Solids (mg/L)**
	Attainment Status and Trend				median; maximum[1]	median; maximum[2]
Calapooia River at Hwy 99E	No	Yes	Yes	-	0.03, 0.2	3.5; 50
Calapooia River at Queens Rd (Albany)	*No*	Yes	Yes↑	-	0.04; 0.21↑	6, 64
South Santiam River at Hwy 226	Yes	Yes	Yes↑	-	0.01; 0.04	2; 7↑
Santiam River below Greens Bridge	-	-	-	No	-	-
North Santiam at Niagara	-	-	-	No	-	-
South Santiam Upper	-	-	-	No	-	-
North Santiam at Niagara	-	-	-	No	-	-
South Santiam Upper	-	-	-	No	-	-

[1] DEQ has no benchmark for total phosphorus in this Management Area; ODA benchmark for potential water quality concerns = 0.08 mg/L
[2] DEQ has no benchmark for total suspended solids in this Management Area
↑ Statistically significant improving trend
↓ Statistically significant degrading trend

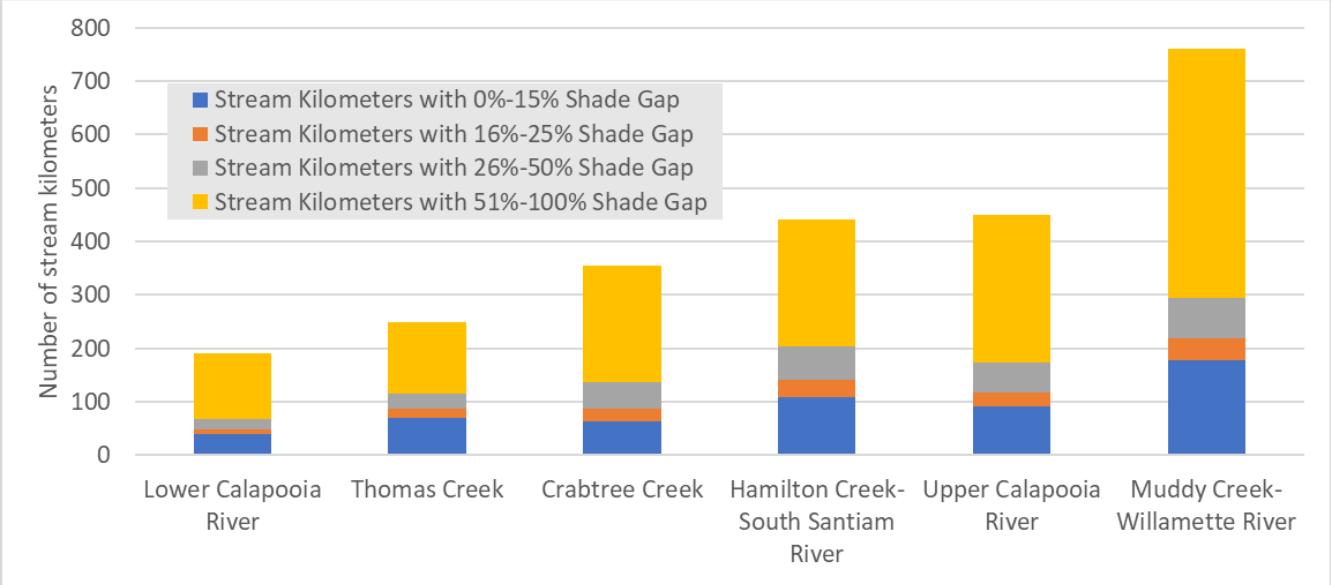
These results suggest that E. coli , phosphorus, and sediment are of concern in the Calapooia River; the DEQ analyses do not indicate whether sediment and phosphorus concentrations are related or whether there is a seasonal pattern to the concentrations.

High water temperature is an increasing problem across the Management Area. Data show that the North Santiam, South Santiam, and most South Santiam tributaries are not attaining water quality standards and are degrading. This is readily seen in the DEQ Integrated Report in 303d listings, and the area is included in the Willamette Basin Revised Temperature TMDL.

Data from more locations are needed to pinpoint agricultural issues in the Calapooia drainage and throughout the Management Area and to determine whether phosphorus is delivered to the Calapooia River during erosion events. It would be helpful to have a comprehensive evaluation of all data, including those not provided to DEQ, and develop and implement a monitoring plan for determining agricultural water quality and identifying issues throughout the Management Area.

4.3.2 Land Conditions

Figure 4.3.2 DEQ assessed land conditions in the area for ability to provide effective shade to streams



4.4 Biennial Reviews and Adaptive Management

ODA, the LAC, the LMA, and other partners met on September 20, 2023, to review implementation of the Area Plan and provided recommendations for the future (Tables 4.4a and 4.4b).

Table 4.4a Summary of biennial review discussion

Progress
• No progress has been made toward measurable objectives because none have been developed for this area. The LAC recommends that Linn SWCD and board develop measurable objectives for this Management Area specific to developing a monitoring plan, management area-wide, based on parameters of concern related to the TMDLs in the area.
• Though ODA has regulatory authority, ODA allows landowners to approach the SWCD for help with fixing the issue. Other entities with such authority, such as Oregon Department of Forestry, resort to fines more quickly. This causes landowners to fix but not to seek additional helpful information such as

the SWCD can provide. ODA working in this way has contributed to the success of landowner engagement in this area.

• Farm tours help with outreach.

Impediments

• Landowners are afraid of sharing success stories with government agencies. This could be used as an incentive to work with the agencies, but landowners aren't inclined to share info about their land and practices.

• In cases where ODA's regulatory authority is used and a landowner faces investigation for water quality violations, that activity has a high level of visibility in the community. The neighbors of this landowner will feel wary of ODA in the future, which may extend to the SWCD. This may limit the SWCD and other entities from working in a community for years or generations to come.

• Larger farms have more time/resources to look for grants and resources whereas smaller farms don't have the time to even look for the resources available to them.

• Smaller farms don't know that they're doing something "wrong" or are out of compliance with rules and regulations.

• Newer small farm turnover causes barrier to knowing rules and regulations.

• Culturally, some landowners don't participate in any government programs in Linn County.

• Covid was an impediment to outreach and engagement.

• Some grants and programs "have an agenda," such as limiting access to streams, which provide grants that end up taking lands out of the hands of the landowner.

• High turnover rates among government employees are a barrier to legacy of information. It takes a long time for producers to establish trust with government agency members.

Recommended Modifications and Adaptive Management

• Additional use of social media to get information out.

• "Through the grapevine" communication about info and events mitigated by what? Outreach via pamhlets, farmers markets 4-H.

• Tying in with realty groups to inform new/young farmers of SCWD services. Develop QR code to Instalink SWCD website to new landowners so they can have the information on their phone.

Table 4.4b Number of ODA compliance activities in 2019-2022

Location	Cases		Site Visits	Agency Actions				
				Letter of Compliance		Pre-Enforcement Notification	Notice of Noncompliance	Civil Penalty
	New	Closed		Already in compliance	Brought into compliance			
Outside SIA	12	13	25	5	5	12	0	0
Within SIA	0	0	0	0	0	0	0	0

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