



# **Oregon**

Department  
of Agriculture

## **South Santiam Agricultural Water Quality Management Area Plan**

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**Developed by the**

**Oregon Department of Agriculture**

**South Santiam Local Advisory Committee**

**With support from the**

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## Acronyms and Terms Used in this Document

**Ag Water Quality Program** – Agricultural Water Quality Management Program  
**Area Plan** – Agricultural Water Quality Management Area Plan  
**Area Rules** – Agricultural Water Quality Management Area Rules  
**CAFO** – Confined Animal Feeding Operation  
**CNPCP** – Coastal Nonpoint Pollution Control Program  
**CWA** – Clean Water Act  
**CZARA** – Coastal Zone Act Reauthorization Amendments  
**DEQ** – Oregon Department of Environmental Quality  
**DMA** – Designated Management Agency  
**GWMA** – Groundwater Management Area  
**HABs** – Harmful Algal Blooms  
**LAC** – Local Advisory Committee  
**LMA** – Local Management Agency  
**Management Area** – Agricultural Water Quality Management Area  
**MOA** – Memorandum of Agreement  
**NPDES** – National Pollution Discharge Elimination System  
**NRCS** – Natural Resources Conservation Service  
**OAR** – Oregon Administrative Rules  
**ODA** – Oregon Department of Agriculture  
**ODF** – Oregon Department of Forestry  
**OHA** – Oregon Health Authority  
**ORS** – Oregon Revised Statute  
**OWEB** – Oregon Watershed Enhancement Board  
**PMP** – Pesticides Management Plan  
**PSP** – Pesticides Stewardship Partnership  
**RCA** – Required Corrective Action  
**SIA** – Strategic Implementation Area  
**SWCD** – Soil and Water Conservation District  
**TMDL** – Total Maximum Daily Load  
**USDA** – United States Department of Agriculture  
**US EPA** – United States Environmental Protection Agency  
**WPCF** – Water Pollution Control Facility  
**WQPMT** – Water Quality Pesticides Management Team



## Foreword

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

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

## Required Elements of Area Plans

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

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

## Plan Content

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

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

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

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



# **Chapter 1: Agricultural Water Quality Management Program Purpose and Background**

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

As part of Oregon's Agricultural Water Quality Management Program (Ag Water Quality Program), the Area Plan guides landowners and partners such as Soil and Water Conservation Districts (SWCDs) in addressing 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 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 developed to implement the Area Plan, monitoring, evaluation, and adaptive management.

The provisions of the Area Plan do not establish legal requirements or prohibitions (ORS 568.912(1)). Each Area Plan is accompanied by Area Rules that describe local agricultural water quality regulatory requirements. ODA will exercise its regulatory authority for the prevention and control of water pollution from agricultural activities under the Ag Water Quality Program's general regulations (OAR 603-090-0000 to 603-090-0120) and under the Area Rules for this Management Area (OAR 603-095-2400 to 603-090-2460). The Ag Water Quality Program's general rules guide the Ag Water Quality Program, and the Area Rules for the Management Area are the regulations that landowners are required to follow. Landowners will be encouraged through outreach and education to implement conservation management activities.

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

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

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

## **1.2 History of the Ag Water Quality Program**

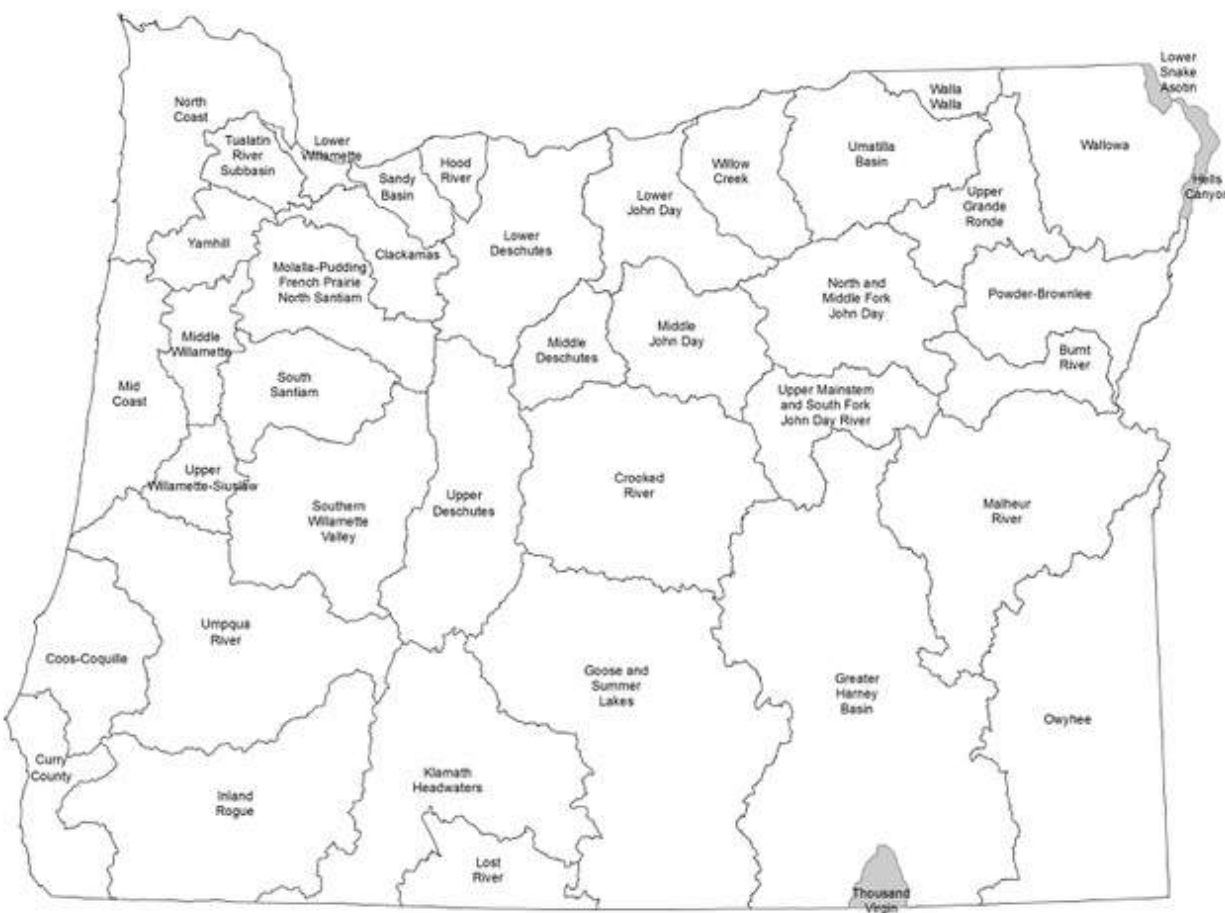
In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion, to achieve water quality standards, and to adopt rules as necessary (ORS 568.900 through ORS 568.933). 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). Since 2004, ODA, LACs, SWCDs, and other partners have focused on implementation including:

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

**Figure 1: Map of 38 Agricultural Water Quality Management Areas**

Grey areas are not incorporated into Ag Water Quality Management Areas



## 1.3 Roles and Responsibilities

### 1.3.1 Oregon Department of Agriculture

The Oregon Department of Agriculture is the agency responsible for implementing the Ag Water Quality Program (ORS 568.900 to 568.933, ORS 561.191, OAR 603-090, and OAR 603-095). The Ag Water Quality Program was established to develop and carry out a water quality management plan for the

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

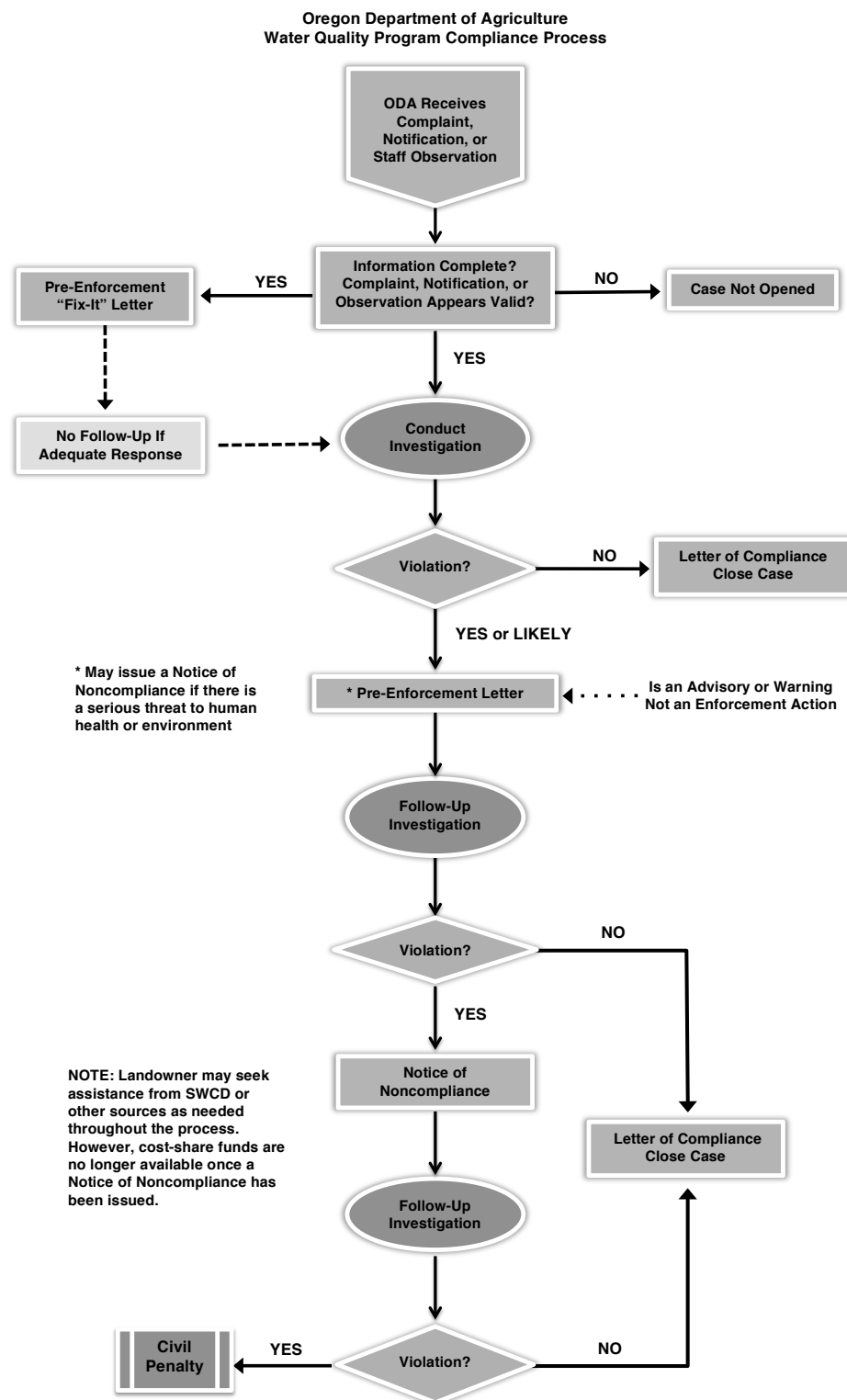
- State water quality standards,
- Load allocations for agricultural or nonpoint source pollution assigned under Total Maximum Daily Loads (TMDLs) issued pursuant to the federal Clean Water Act (CWA), Section 303(d),
- Approved management measures for Coastal Zone Act Reauthorization Amendments (CZARA),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

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

The Area Rules are a set of standards that landowners must meet on all agricultural or rural lands. (“Landowner” includes any landowner, land occupier or operator per OAR 603-95-0010(24)). All landowners must comply with the Area Rules. ODA will use enforcement where appropriate and necessary to gain compliance with Area Rules. Figure 2 outlines ODA’s compliance process. ODA will pursue enforcement action only when reasonable attempts at voluntary solutions have failed (OAR 603-090-0000(5)(e)). If a violation is documented, ODA may issue a pre-enforcement notification or an enforcement Order such as a Notice of Noncompliance. If a Notice of Noncompliance is issued, ODA will direct the landowner to remedy the condition through required corrective actions (RCAs) under the provisions of the enforcement procedures outlined in OAR 603-090-060 through OAR 603-090-120. If a landowner does not implement the RCAs, ODA may assess civil penalties for continued violation of the 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.

Any member of the public may file a complaint, and any public agency may file a notification of a violation of an Area Rule. As a result, ODA may initiate an investigation (See Figure 2).

**Figure 2: Compliance Flow Chart**



### **1.3.2 Local Management Agency**

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

The day-to-day implementation of the Area Plan is accomplished through an Intergovernmental 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 as many as 12 members. The LAC serves in an advisory role to the director of ODA and to the Board of Agriculture. The role of the LAC is to provide a high level of citizen involvement and support in the development, implementation, and biennial reviews of the Area Plan and Area Rules. The LAC's primary role is to provide advice and direction to 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 their responsibilities, which include but are not limited to:

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

### **1.3.4 Agricultural Landowners**

The emphasis of the Area Plan is on voluntary action by landowners to control the factors affecting water quality in the Management Area. However, 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 a suite of measures to protect water quality. 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 also may choose to improve their land conditions without assistance.

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

- Conditions resulting from unusual weather events,

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

The Oregon Department of Agriculture, the LACs, and the SWCDs 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 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. Significant point sources are required to obtain permits that specify their pollutant limits. Agricultural operations regulated as point sources include permitted Confined Animal Feeding Operations (CAFOs), and many are regulated under ODA's CAFO Program. Pesticide applications in, over, or within three feet of water also are regulated as point sources. Irrigation water flows from agricultural fields may be at a defined outlet but they do not currently require a permit.

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

### **1.4.2 Beneficial Uses and Parameters of Concern**

Beneficial uses related to water quality are defined by DEQ in OARs for each basin. They may include: public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality,

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

Many waterbodies throughout Oregon do not meet state water quality standards. Many of these waterbodies have established water quality management plans that document needed pollutant reductions. The most common water quality concerns related to agricultural activities are temperature, bacteria, biological criteria, sediment and turbidity, phosphorous, algae, pH, dissolved oxygen, harmful algal blooms (HABs), nitrates, pesticides, and mercury. Water quality impairments vary by Management Area and are summarized in Chapter 2.

### **1.4.3 Impaired Water Bodies and Total Maximum Daily Loads**

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

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

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

As part of the TMDL process, DEQ identifies the Designated Management Agency (DMA) or parties responsible for submitting TMDL implementation plans. TMDLs designate the local Area Plan 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.

For more general and specific information about Oregon’s TMDLs, see: [www.oregon.gov/deq/wq/tmdls/Pages/default.aspx](http://www.oregon.gov/deq/wq/tmdls/Pages/default.aspx). The list of impaired water bodies (303(d) list), the TMDLs, and the agricultural load allocations for the TMDLs that apply to this Management Area are summarized in Chapter 2.

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

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

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

ORS 468B.025 (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 to prevent and control water pollution from agriculture activities and to prevent and control soil erosion. Streamside vegetation can provide three primary water quality functions: shade for cool stream temperatures, streambank stability, and filtration of pollutants. Other water quality functions from

streamside vegetation include: water storage in the soil for cooler and later season flows, sediment trapping that can build streambanks and floodplains, narrowing and deepening of channels, and biological uptake of sediment, organic material, nutrients, and pesticides.

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

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

#### Site-Capable Vegetation

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

The goal for Oregon's agricultural landowners is to provide the water quality functions (e.g., shade, streambank stability, and filtration of pollutants) produced by site-capable vegetation along streams on agricultural lands. The Area Rules for each Management Area require that agricultural activities allow for the establishment and growth of vegetation consistent with site capability 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 for narrow streams. For example, shrubs and grass may provide shade, protect streambanks, and filter pollutants. However, on larger streams, mature site-capable vegetation is needed to provide the water quality functions.

In many cases, invasive, non-native plants, such as introduced varieties of blackberry and reed canarygrass, grow in streamside areas. This type of vegetation has established throughout much of Oregon due to historic and human influences and may provide some of the water quality functions of site-capable vegetation. ODA's statutory authority does not require the removal of invasive, non-native plants, however, ODA recognizes removal as a good conservation activity and encourages landowners to remove these plants. Voluntary programs through SWCDs and watershed councils provide technical assistance and financial incentives for weed control and restoration projects. In addition, the Oregon State Weed Board identifies invasive plants that can negatively impact watersheds. Public and private landowners are responsible for eliminating or intensively controlling noxious weeds as may be provided by state and local law enacted for that purpose. For further information, visit [www.oregon.gov/ODA/programs/weeds](http://www.oregon.gov/ODA/programs/weeds).

## **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**

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

Both of the Oregon CAFO permits require the registrant to operate according to a site-specific, ODA-approved, Animal Waste Management Plan that is incorporated into the CAFO permit by reference. For more information about the CAFO program, go to [www.oregon.gov/ODA/programs/NaturalResources/Pages/CAFO.aspx](http://www.oregon.gov/ODA/programs/NaturalResources/Pages/CAFO.aspx).

### **1.5.2 Groundwater Management Areas**

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

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

### **1.5.3 The Oregon Plan for Salmon and Watersheds**

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

### **1.5.4 Pesticide Management and Stewardship**

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

In 2007, the interagency Water Quality Pesticide Management Team (WQPMT) was formed to expand efforts to improve water quality in Oregon related to pesticide use. The WQPMT includes representation from ODA, Oregon Department of Forestry (ODF), DEQ, and Oregon Health Authority (OHA). The

WQPMT facilitates and coordinates activities such as monitoring, analysis and interpretation of data, effective response measures, and management solutions. The WQPMT relies on monitoring data from the Pesticides Stewardship Partnership (PSP) program and other monitoring programs to assess the possible impact of pesticides on Oregon's water quality. Pesticide detections in Oregon's streams can be addressed through multiple programs and partners, including the PSP.

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](http://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.

The Oregon Department of Agriculture led the development and implementation of a Pesticides Management Plan (PMP) for the state of Oregon ([www.oregon.gov/ODA/programs/Pesticides/water/pages/AboutWaterPesticides.aspx](http://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 OHA. The program provides individuals and communities with information on how to protect the quality of Oregon's drinking water. DEQ and OHA encourage preventive management strategies to ensure that all public drinking water resources are kept safe from current and future contamination. For more information see: [www.oregon.gov/deq/wq/programs/Pages/dwp.aspx](http://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 Oregon to implement the federal CWA in our state. DEQ is the lead state agency with overall authority to implement the CWA in Oregon. DEQ coordinates with other state agencies, including ODA and ODF, to meet the requirements of the CWA. DEQ sets water quality standards and develops TMDLs for impaired waterbodies, which ultimately are approved or disapproved by the US EPA. In addition, DEQ develops and coordinates programs to address water quality including NPDES permits for point sources, the CWA Section 319 grant program, Source Water Protection, the CWA Section 401 Water Quality Certification, and GWMA. DEQ also coordinates with ODA to help ensure successful implementation of Area Plans.

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

The MOA includes the following commitments:

- ODA will develop and implement a monitoring strategy, as resources allow, in consultation with DEQ.

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

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

### **1.6.2 Other Partners**

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

The AgWQ 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 implemented through focused work in small geographic areas (section 1.7.3), with a long-term goal of developing measurable objectives and monitoring methods at the Management Area scale.

The State of Oregon continues to improve its ability to use technology to measure current streamside vegetation conditions and compare it to the vegetation needed to meet stream shade targets to keep surface waters cooler. 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 incentive programs.

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

The measurable objectives and associated milestones for the Area Plan are in Chapter 3 and progress toward achieving the measurable objectives and milestones is summarized in Chapter 4.

### **1.7.2 Land Conditions and Water Quality**

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

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

- Landowners can see land conditions and have direct control over them,
- Improved land conditions can be documented immediately,
- Reductions in water quality 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 cost-prohibitive and could fail to 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 less likely to document the short-term effects of changing land conditions on water quality parameters such as temperature, bacteria, nutrients, sediment, and pesticides.

### **1.7.3 Focused Implementation in Small Geographic Areas**

#### **Focus Areas**

A Focus Area is a small watershed with water quality concerns associated with agriculture. The Focus Area process is SWCD-led, with ODA oversight. The SWCD delivers systematic, concentrated outreach and technical assistance in the Focus Area. A key component of this approach is measuring conditions before and after implementation to document the progress made with available resources. The Focus Area approach is consistent with other agencies' and organizations' efforts to work proactively in small watersheds and is supported by a large body of scientific research (e.g. Council for Agricultural Science and Technology, 2012. Assessing the Health of Streams in Agricultural Landscapes: The Impacts of Land Management Change on Water Quality. Special Publication No. 31. Ames, Iowa).

Systematic implementation in Focus Areas provides the following advantages:

- Measuring progress is easier in a small watershed than across an entire Management Area,

- Water quality improvement may be faster since small watersheds generally respond more rapidly,
- A proactive approach can address the most significant water quality concerns,
- Partners can coordinate and align technical and financial resources,
- Partners can coordinate and identify appropriate conservation practices and demonstrate their effectiveness,
- A higher density of projects allows neighbors to learn from neighbors,
- A higher density of projects leads to opportunities for increasing the connectivity of projects,
- Limited resources can be used more effectively and efficiently,
- Work in one Focus Area, followed by other Focus Areas; will eventually cover the entire Management Area.

Soil and Water Conservation Districts select a Focus Area in cooperation with ODA and other partners. The scale of the Focus Area matches the SWCD's capacity to deliver concentrated outreach, technical assistance, and to complete projects. The current Focus Area for this Management Area is described in Chapter 3. The SWCD will also continue to provide outreach and technical assistance to the entire Management Area.

#### Strategic Implementation Areas

Strategic Implementation Areas (SIAs) are small watersheds selected by ODA, in cooperation with partners, based on a statewide review of water quality data and other available information. ODA conducts an evaluation of likely compliance with Area Rules, and contacts landowners with the results and next steps. Landowners have the option of working with the SWCD or other partners to voluntarily address water quality concerns. ODA follows up, as needed, to enforce the Area Rules. Finally, ODA completes a post-evaluation to document progress made in the watershed. Chapter 3 describes any SIAs in this Management Area.

## **1.8 Monitoring, Evaluation, and Adaptive Management**

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

### **1.8.1 Agricultural Water Quality Monitoring**

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

At each biennial review, DEQ assesses the status and trends of water quality in relation to water quality standards. Parameters included in the analysis are temperature, pH, and bacteria. DEQ will add additional parameters as the data become available, depending on the water quality concerns of each Management Area. ODA will continue to work with DEQ to cooperatively summarize the data results and how they apply to agricultural activities.

Water quality monitoring is described in Chapter 3, and the data are presented in Chapter 4.

### **1.8.2 Biennial Reviews and Adaptive Management**

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



## Chapter 2: Local Background

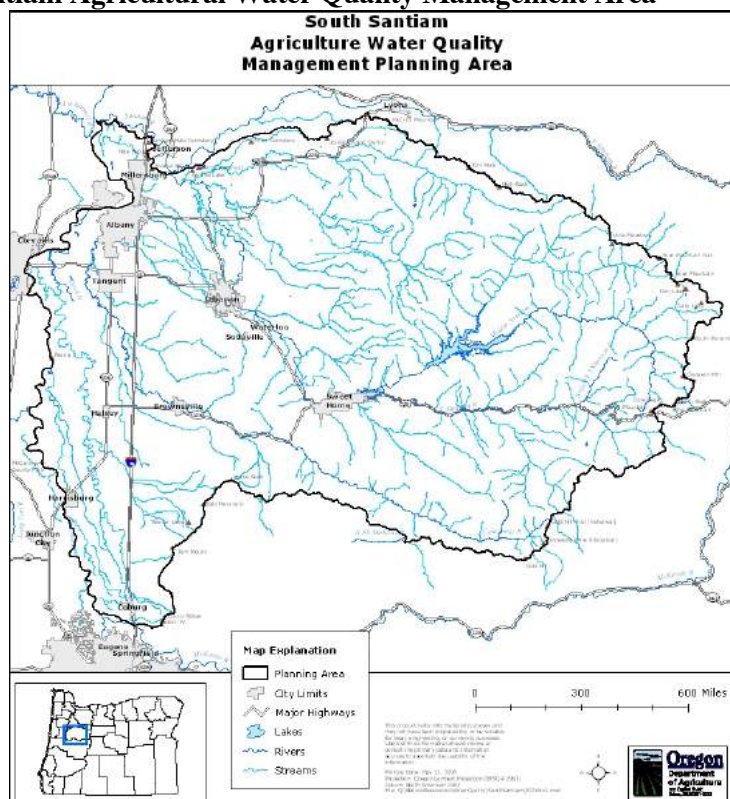
### Geographic and Programmatic Scope

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 3). 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 and Oregon Fill-Removal laws are not included in this Area Plan.

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 (Figure 3). The Management Area is in Linn and Lane counties in the central Willamette Valley. Communities in the Management Area include Albany, Brownsville, Coburg, Halsey, Harrisburg, Lebanon, Lyons, Scio, and Sweet Home, as well as several unincorporated communities mentioned in section 2.3.1.

Boundaries of the Management Area are the Cascade Mountains to the east, the North Santiam watershed boundary to the north, the Coburg Hills to the south, and the Willamette River on the west. The Management Area covers approximately 1,700 square miles, or 1.1 million acres. Elevations range from about 200 feet above sea level on the Willamette Valley floor to 5,700 feet at the crest of the Cascade Mountains.

**Figure 3. South Santiam Agricultural Water Quality Management Area**



## **2.1 Local Roles**

### **2.1.1 Local Advisory Committee**

The Area Plan was developed with the assistance of the LAC. The LAC was formed in 2001 to assist with the development of the Area Plan and Area Rules and with subsequent biennial reviews.

**Table 1: Current LAC members**

<b>Name</b>	<b>Location</b>	<b>Description</b>
Clint Bentz (Chair)	Scio / South Santiam	Small Woodlands/Trout Farm
Karren Cholewinski	Coburg / Calapooia	Horses
Arlene Gourley	Scio / South Santiam	Dairy
T. J. Hafner	Management Area	AgriCare Crop Advisor
Matt Herb	Management Area	Grass Seed/FFA Instructor/Farm Bureau
Charles Knoll	Calapooia and South Santiam	County Engineer, Linn County Road Dept.
Sudy Lamb	Bownsville/Calapooia	Cattle/Sheep/Alfalfa/Grass Hay
John Marble	Sweet Home / Calapooia	Beef Cattle/Grass/Timber/Consultant
David Neal	Tangent / Calapooia	Linn SWCD Board Chair, Irrigation
Joe Richards	Albany South Santiam	Agricultural Sales
Liz Van Leeuwen	Halsey / Muddy	Grass Seed

### **2.1.2 Local Management Agency**

Implementation of the Area Plan is accomplished through an Intergovernmental Grant Agreement(s) between ODA and the Linn SWCD(s). This Intergovernmental Grant Agreement defines the SWCD(s) as the LMA(s) for implementation of the Ag Water Quality Program in this Management Area. The SWCD was also involved in development of the Area Plan and Area Rules.

The LMA implements the Area Plan by conducting the 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 Area Plan and Area Rules in 2002.

Since approval, the LAC met in 2006, 2008, 2010, 2012, 2014 and 2017 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. Communities in the Management Area include Albany, Bownsville, Coburg, Halsey, Harrisburg, Lebanon, Lyons, Scio, and Sweet Home, as well as several unincorporated communities mentioned in section 2.3.1.

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### **2.3.1 Location, Water Resources, Land Use, Land Ownership, Agriculture**

#### **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 its low gradient.

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

**Table 2. Area and Major Tributaries of Management Area Watersheds**

<b>Watershed</b>	<b>Area (Acres)</b>	<b>Major Tributaries</b>
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

#### **Southern Willamette Valley Groundwater Management Area (GWMA)**

A portion of the GWMA is within the Management Area. Starting in the south, the GWMA includes land bounded on the west by Territorial Highway from Highway 36 north to Monroe, Highway 99W from Monroe to Corvallis, and Highway 20 from Corvallis to Albany. On the east, the GWMA is bounded by I-5 from just south of Coburg north to the intersection of I-5 with Muddy Creek and then follows Muddy Creek until its confluence with the Willamette River near Corvallis. From the north, the eastern boundary

is the Willamette River until its intersection with Highway 20. The southern boundary of the GWMA also includes several surface roads south of Junction City. See Figure 4 for a map of the GWMA.

## **Climate**

The watersheds in the Management Area experience the same general climate, with cool to cold, wet winters and dry summers. There is some variation in the climate between the Willamette Valley, foothills, and Cascade Mountains, especially during winter months. The average rainfall on the Willamette Valley floor at Albany is 42-inches annually (Langridge et al, 1987). Precipitation in the Cascade Mountains is both rain and snow and totals approximately 88-inches annually at Detroit (Langridge et al, 1987). The summer and fall bring dry and hot conditions across the Willamette Valley and up into the foothills. The Cascades are dry and slightly cooler than the valley and foothills during the summer and fall.

## **Geology and Soils**

### **Western and High Cascade Mountains**

The Cascade Mountains formed from both uplift and volcanic eruptions. Most of the soils in the Cascades formed from volcanic rock, but other parent materials include sedimentary rock and volcanic ash. With a few exceptions, most of the soils in the Cascades are well-drained silt loams (Langridge et al, 1987).

### **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 redbside 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).

## Land Use

### Agriculture and Forestry

Agriculture and forestry are the predominant land uses in the Management Area (Table 2). 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.

The top agricultural commodities in the Management Area in 2011 were annual ryegrass, wheat, dairy products, perennial ryegrass, tall fescue, broilers, farm forest products, cattle, other hay, and grass and grain straw ([extension.oregonstate.edu/linn/node/37](http://extension.oregonstate.edu/linn/node/37)). 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 2011 were \$273 million, up from 2009 sales of \$237 million; 2007 sales were \$295 million and 2004 sales were \$229 million ([extension.oregonstate.edu/linn/node/37](http://extension.oregonstate.edu/linn/node/37)).

Tables 3 and 4 provide more detail on some of the seed and livestock types in the Management Area.

**Table 3. Land use in Linn County by Acres (Please note that these figures are for Linn County, rather than the South Santiam Management Area.)**

Land Use	Acres of Management Area in Land Use	Percent of Management Area in Land Use
Cropland – Irrigated	35,152	2.7
Cropland – non-irrigated	258,943	20.0
Pasture/rangeland	76,251	5.9
Forest	881,656	69.0
Urban	13,522	1.1
Water	8,212	0.7
Other	8,138	0.6
Total	1,281,874	100.0

(Oregon Geospatial Data Clearinghouse, 2001)

**Table 4. Acres of grass grown for seed in Linn County in 2011**

Crop	Acres of Crop	% Change from 2009
Annual ryegrass	88,000	-1%
Perennial ryegrass	28,000	-21%
Orchardgrass	3,900	-7%
Fescue	25,900	-32%
Bentgrass	1,550	-18%
Total	157,070	-13%

([extension.oregonstate.edu/linn/node/37](http://extension.oregonstate.edu/linn/node/37))

**Table 5. Livestock in Linn County in 2011**

<b>Livestock type</b>	<b>Number of animals</b>	<b>% Change from 2009</b>
Cattle/calves	26,700	-13%
Beef cattle	10,500	-10%
Dairy cattle	6,000	No Change
Sheep (sheep, lambs, and ewes)	59,600	-1%
Wool	71,500	N/A
Swine	700	+40%
Horses	2900	-3%
Chickens	14,400	N/A

(extension.oregonstate.edu/linn/node/37)

**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, Crawfordville, 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 6 summarizes land ownership in the Management Area.

**Table 6. Land Ownership in the Management Area**

<b>Landowner/Manager</b>	<b>Acres</b>	<b>Percent of Land</b>
Private landowners	866,000	78.7
U.S. Forest Service	150,000	13.6
Bureau of Land Management	75,000	6.8
State of Oregon	500	0.04
U.S. Army Corps of Engineers	500	0.04
U.S. Fish and Wildlife	350	0.02
Other	7,650	0.8
Total	1.1 million	100.0

(Oregon Geospatial Data Clearinghouse, 2001)

**Water Resources****Water Availability**

Both rainwater and snowmelt contribute to surface and groundwater supplies in the Management Area. Summary flow data for the South Santiam are listed in Table 7.

**Table 7. Average annual, summer, and winter flows in cubic feet per second (cfs) for the South Santiam and Calapooia watersheds**

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

(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 ten to fifteen years, especially in the lower South Santiam and Calapooia watersheds. Hand lines and wheel lines are now commonly used for irrigation, in addition to linear and center pivot systems. Some growers have also installed low-pressure systems or drip irrigation systems on crops such as wine grapes, berries, and nursery stock.

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, Lacombe 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 storm water 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, Lacombe, 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). For more information, contact the Water Resources Department office listed in Appendix A.

## **2.4 Agricultural Water Quality**

### **2.4.1 Water Quality Issues**

DEQ evaluates data from its own monitoring program, the Watershed Councils, the U.S. Geological Survey, and the BLM and other partners to determine the listing status of stream segments in the Management Area. Eighteen stream segments exceed state standards for temperature. The Calapooia River up to river mile 42.8, is listed for iron, manganese, and bacteria in the fall, winter, and spring, and dissolved oxygen from January 1st to May 15th. In 2010, Daly Lake was added to the listed for aquatic weeds or algae.

### **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 criteria 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.

### **WQ Parameters and 303(d) list**

Every two years, DEQ is required to assess water quality and report to the U.S. EPA on the condition of Oregon's waters. DEQ prepares an Integrated Report in accordance with Clean Water Action (CWA) Sections 303(d), 305(b), and 314. The Integrated Report includes an assessment of each water body where data are available, the list of waters identified under Section 303(d) as water quality limited and needing a TMDL, as well as waters with established TMDLs that are expected to improve water quality. The current 2012 Integrated Report can be accessed at <http://www.oregon.gov/deq/wq/Pages/2012-Integrated-Report.aspx>

The 2012 Integrated Report identifies over 20, 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: dissolved oxygen, biological criteria, metals (including mercury), and aquatic weeds or algae. The Management Area also has over 35 stream segments with approved TMDLs for temperature and/or bacteria. For a complete list, access the 2012 database: <http://www.deq.state.or.us/wq/assessment/rpt2012/search.asp#db>.

The Willamette mainstem is also listed for several toxins, iron, and dioxin but these are beyond the scope of this Area Plan. If a Willamette Basin TMDL is developed in the future for any of the toxins, it may include agricultural load allocations that apply to the entire Management Area. While this Area Plan applies to all agricultural nonpoint water pollution, it focuses specifically on parameters on the 303(d) list and TMDLs in the Management Area including temperature, bacteria (*E. coli*), mercury, and aquatic weeds / algae.

#### *Temperature*

DEQ developed the temperature TMDL for temperature to protect salmon spawning, rearing and migration as the most sensitive beneficial uses in the South Santiam Area. Oregon's native cold-water aquatic communities, including salmonids, need cold water to support all stages of life. 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 that solar heating of the Area's waterways due to a lack of riparian vegetation from forestry, agriculture, rural residential, and urban activities contributes to warm stream temperatures.

The December 2009 DEQ [\*Willamette Basin Rivers and Streams Assessment\*](#) characterized the status of watershed conditions in the Willamette Basin. This assessment concluded that the most extensive habitat stressors in the South Santiam Subbasin included sparse riparian vegetation, low stream canopy cover, and low levels of large woody debris. In addition, human disturbance scores indicated that 84 percent of the stream extent within the subbasin had moderate to high levels of human disturbed riparian areas, and 46 percent of the stream extent was impaired by high water temperatures. Considered together, these habitat stressors pointed to a need for continued efforts to protect and enhance riparian areas in the Management Area.

#### *Bacteria*

DEQ developed the bacteria TMDL to protect human water contact recreation as the most sensitive beneficial use. There is a risk of infection and disease to people who come in contact with fresh water while fishing, swimming, or boating when bacteria levels exceed the water quality standard for bacteria. 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 numerous sources of bacteria in streams, including humans (from recreation or failing septic systems) and wildlife.

#### *Mercury*

DEQ developed the mercury TMDL to protect human fish consumption as the most sensitive beneficial use. Primary sources of mercury include erosion of soils containing mercury, air deposition from national and international sources, and discharge from specific legacy mining sites. On agricultural lands, mercury is contributed through eroded soils.

### **Other Parameters of Concern**

#### *Sediment*

A TMDL has not been set for sediment, but it can be of concern related to agricultural lands. Sediment carried in streams can adversely affect aquatic life by increasing water temperature through thermal absorption, reducing light penetration and visibility, reducing water infiltration through stream substrate (harming incubating fish eggs), and irritating gill filaments. Sediment deposition can also change the width:depth ratio of a stream, which directly influences stream temperature. Potential sources of sediment include runoff from agricultural lands, streambank erosion, home building or construction sites, and from natural processes as rivers move across their floodplains.

### *Nutrients*

A TMDL has not been set for nutrients, but it can be of concern related to agricultural lands. Fertilizers and manure are the main agricultural sources of nutrients. Improper storage or application can result in discharge of nutrients into either surface or ground water. Fertilizer run-off has been identified as one of the major contributing factors to algae blooms, including harmful algae blooms containing toxin-producing cyanobacteria species. Nutrients can also come from waste discharge, runoff, or seepage from urban areas, industrial and wastewater treatment plants, and septic systems; sediment runoff from forestlands; and background sources. Nutrients, in particular nitrate, is a concern in the GWMA, which is an area where nitrate contamination is documented. More information on the GWMA and nitrate contamination of groundwater is in section 2.4.3.

### *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).

### *Dissolved Oxygen*

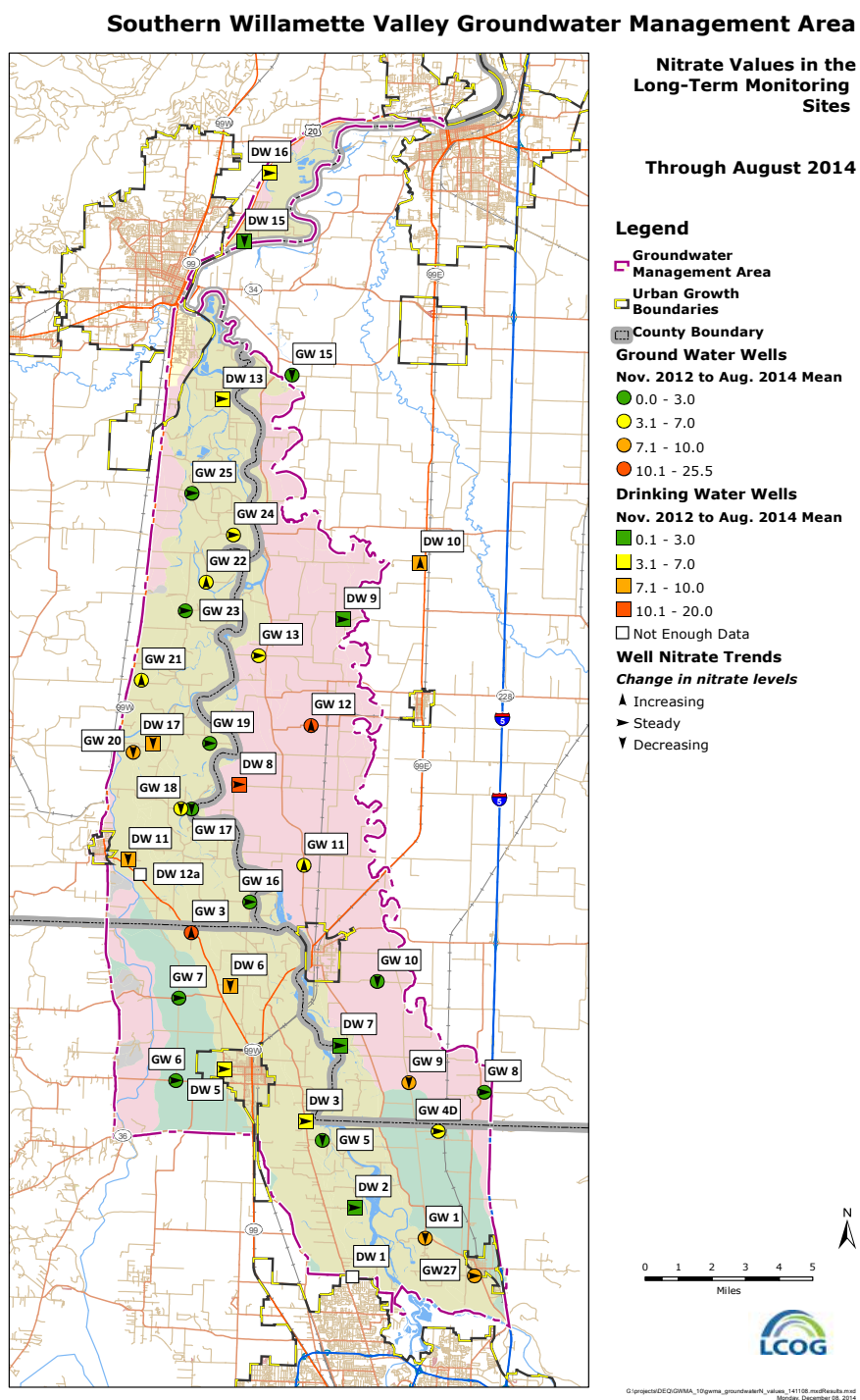
Dissolved oxygen criteria apply to specific designated uses (such as fish spawning) and are applied in the time periods when the designated use is present and in the segment that is designated for that use. The dissolved oxygen spawning criteria are applied in the waters and in the time periods when salmon, steelhead, bull trout, or resident trout spawning uses are present. The dissolved oxygen criteria applicable to other designated fish uses are applied year-round. During non-spawning periods, the dissolved oxygen criteria depends on a stream's designation as providing for cold, cool, or warm water aquatic life, each defined in OAR 340 Division 41.

## **2.4.2 GWMA Background, Sources of Impairment, Voluntary and Regulatory Measures**

In 2004, DEQ declared a GWMA for the Southern Willamette Valley because monitoring data showed elevated nitrate levels in groundwater (Figure 4). In December 2006, after significant debate and research, the GWMA stakeholder committee finalized and accepted the GWMA Action Plan. Stakeholders met again in 2016 to review, update, and prioritize the action plan. The Action Plan is not a regulatory document, but includes many recommendations and voluntary strategies to address the issue of excess nitrate in regional 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. To address this, the action plan provides recommendations and strategies to reduce nitrate inputs as related to four focus sectors: (1) agricultural, (2) residential, (3) commercial/industrial/municipal, and (4) public water supplies. For more information, see the

GWMA website at <http://gwma.oregonstate.edu>. Chapter 3 describes actions planned for agricultural lands and Chapter 4 provides accomplishments and monitoring and research results. The GWMA Action Plan for agriculture is included in this Area Plan in Appendix B.

**Figure 4. Map of the Southern Willamette Valley Ground Water Management Area**



### 2.4.3 Basin TMDLs and Agricultural Load Allocations

**Table 8. Agricultural Load Allocations that Apply to the Management Area**

Geographic Scope in Management Area	TMDL	Load Allocation for Agriculture
Parameter: Temperature		
Mainstem Willamette	Willamette TMDL (2006), Chapter 4	Basin-wide attainment and preservation of effective shade levels on smaller tributaries associated with system potential vegetation will eliminate most anthropogenic nonpoint source heat loads, including agriculture.  Surrogate measure is percent effective shade targets and a heat load equivalent of 0.05 °C of the Human Use Allowance. Other important measures — preserving and restoring cool water refuges where salmonids rear and migrate to when the river warms up in the summer; restore instream flow quantity.
South Santiam	Willamette TMDL (2006), Chapter 9	
Calapooia	Willamette TMDL (2006), Chapter 10	
Parameter: Bacteria		
Mainstem Willamette South Santiam	Willamette TMDL (2006), Chapter 2	66 to 83% reduction for agriculture land use
Calapooia	Willamette TMDL (2006), Chapter 10	65% reduction for agriculture land use
Parameter: Mercury		
Entire Management Area	Willamette TMDL (2006), Chapter 3	27% reduction for agriculture land use
Parameter: Dioxin		
Entire Management Area	Columbia River Basin TMDL (1991)	Only pulp and paper mills have been assigned an allocation; agriculture is a potential source, but no load allocation has been assigned due to lack of data

### 2.4.4 Sources of Impairment

#### *Include GWMA*

Many factors may affect surface and groundwater quality in the Management Area. Sources impacting temperature include wastewater treatment plants, industrial operations, removal and/or lack of riparian vegetation, seasonal reductions in stream flow, and stream channel and floodplain alteration. Contributors to bacteria and nutrient concerns include wastewater treatment plant overflows during heavy rains, legal and illegal waste dumping sites, leaching from septic systems and other sources to groundwater, runoff from residential areas, runoff and leaching from agricultural lands, and natural sources such as wildlife. Mercury can enter waterbodies from industrial and municipal wastewater discharges, erosion of soils that naturally contain mercury, runoff of atmospherically deposited mercury, and runoff from abandoned mines.

In the South Santiam watershed, 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.

In the Calapooia watershed, conditions, and activities on agricultural lands that may affect temperature, dissolved oxygen, bacteria, and phosphorus levels include:

- Cover over the soil, which can either prevent erosion or allow erosion of soil and attached nutrients;
- Streamside vegetation conditions – streamside vegetation may either be in poor condition, improving condition, or providing expected water quality benefits;
- Management of livestock access to streams;
- Nutrient management.

## **2.5 Voluntary and Regulatory Measures**

The focus of the Agricultural Water Quality Management Program is on voluntary and cooperative efforts by landowners, SWCDs, ODA, and others to protect water quality. However, the 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.

In this section, there are four Prevention and Control Measures that describe water quality issues, relevant definitions, and water quality concerns affected. Area Rules are referenced, when appropriate, in each Prevention and Control Measure. Each Area Rule has a border around it and appears in italics.

The Prevention and Control Measures and Area Rules relate directly to water quality concerns identified on the 303(d) list in the Management Area, and for the bacteria, mercury and temperature TMDLs that were established in September 2006. In addition, nitrate is discussed because of potential impacts to groundwater. Rules are not developed specifically for mercury, but the Area Rules in the bacteria and temperature prevention and control measures are also effective for the control of mercury.

### **2.5.1 Nutrients and Manure Management**

#### **Prevention and Control Measure: Bacteria**

##### **Issue:**

Animal and human wastes are a potential source for many diseases (Terrell and Perfetti, 1989). 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.

Sources of *E. coli* include discharge from wastewater treatment plants, leakage from failing septic systems, runoff of domestic animal manure from agricultural lands, yards, and other facilities, and runoff of manure from wild animals such as geese and elk. Daily bacteria production estimates have been calculated for several sources, including domestic and wild animals, and are summarized in Appendix D.

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. Appendix B includes detailed information about the bacteria standard. Within the Management Area, the Calapooia River and the mainstem Willamette exceeds state water quality standards for bacteria during the fall, winter, and spring.

Livestock manure is a potential source of bacteria and is also a potential source of nutrients and vegetative material. If stored properly and applied at agronomic rates, manure can be a beneficial source of nitrogen and phosphorus, as well as organic matter (Mikkelsen and Gilliam, 1995). Nothing in this Prevention and Control Measure is intended to discourage the use of manure or other amendments; rather, it seeks to ensure that they are applied correctly. Also, this Prevention and Control Measure is not intended to hold landowners responsible for water quality problems beyond their control, such as runoff of wildlife or wildfowl manure from agricultural lands into waterways.

This Prevention and Control Measure does not prohibit grazing in riparian areas. As long as grazing is conducted at appropriate times of year, stocking rates, duration, and intensity, and in compliance with the riparian Prevention and Control Measure, it should not violate this Prevention and Control Measure. However, unlimited, or concentrated livestock access to streams resulting in waste accumulation may lead to violations.

Landowners with livestock should be aware that rules for Confined Animal Feeding Operations (CAFOs) might apply to their facilities if they confine animals for part of the year. For more information, please contact the ODA.

The following Prevention and Control Measure references ORS 468B.025 and 468B.050. ORS 468B.025 is existing statute developed to address water pollution from all sources. A Department of Justice opinion dated September 12, 2000, clarifies that ORS 468B.025 applies to point and non-point source pollution as that term is commonly applied.

Senate Bill 502 was passed in 1995, authorizing ODA as the state agency responsible for direct regulation of farming activities for the purpose of protecting water quality. A Department of Justice opinion dated July 10, 1996, states "...ODA has the statutory responsibility for developing and implementing water quality programs and rules that directly regulate farming practices on Exclusive Farm Use and agricultural lands." In addition, this opinion states, "The program or rule must be designed to achieve and maintain Environmental Quality Commission's water quality standards."

### **Area 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.

### **Definitions**

“Pollution” has the meaning given in ORS 468B.005(3) which states: 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.

“Wastes” has the meaning given in ORS 468B.005(7) which states: 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.

Other substances that will or may cause pollution include commercial fertilizers, human wastes, soil amendments, composts, animal wastes, and vegetative materials.

“Waters of the state” has the meaning given in ORS 468B.005(8) which states: 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 effect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction.

### **Parameters That May Be Affected by this Prevention and Control Measure:**

**303(d)-Listed Parameters:** bacteria

**Other Parameters:** dissolved oxygen, nutrients, sedimentation, turbidity, toxics, and mercury.

### **2.5.2 Riparian/Streamside Area Management**

#### **Prevention and Control Measure: Temperature**

##### **Issue:**

Oregon’s temperature standard, which is described in detail in Appendix B, was set to protect cold water aquatic life, the most sensitive beneficial use affected by stream temperature. The importance and effect

of stream temperatures on aquatic life, including salmonids, has been the subject of much debate in recent years. There is general agreement that salmonids and other cold-water aquatic organisms require cool water temperatures to survive, and that levels of dissolved oxygen, also a requirement of aquatic life, increase with cooler temperatures.

However, it is difficult to determine the exact temperature requirements of cold water aquatic life in natural settings, where temperatures may vary several degrees in a stream reach. McCullough et al (2001) prepared a literature review of the physiological effects of temperature on several salmonid species. Norris et al (2000) suggest ways fish could exist in temperatures above those shown to be healthy in laboratory or field experiments: (1) fish may have adaptations to survive exposure to high temperatures; (2) fish may occupy cooler micro-habitats as a refuge from high stream temperatures; (3) various temperatures may influence cumulative effects of environmental stressors on fish; and (4) fish responses in laboratory experiments may be difficult to apply in the field. The authors also suggest further research to investigate the above hypotheses.

For many years, researchers have investigated factors that influence stream temperatures. Several authors emphasize the importance of water stored in the landscape and its importance in maintaining stream temperatures (Krueger et al, 1999; Moore and Miner, 1997; Naiman and Decamps, 1997). Clark (1998) explains that upland conditions strongly influence stream temperatures by affecting the infiltration of precipitation and the storage and release of water. Adequate ground cover in upland areas increases the likelihood of precipitation infiltrating the soil profile and decreases the possibility of overland flow, soil loss and resulting sediment delivery to streams. Many studies also highlight the significance of streamside shade in the maintenance of stream temperatures (Brown, 1969; Beschta, 1997). Other influences on stream temperature include stream channel width, stream depth, channel substrate, air temperature, and elevation (Bilby, 1984; Chen et al, 1998; Larson and Larson, 1996; Krueger et al, 1999; Ward, 1995).

For a more complete list of factors that affect stream temperature, please consult Appendix E.

## Area Rule

*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).*

## Definitions

**Perennial stream** – Natural channel in which water flows continuously and which is shown on a United States Geological Survey quadrangle map (OAR 603-095-0010(32)).

**Riparian vegetation** – Plant communities consisting of plants dependent upon or tolerant of the presence of water near the ground surface for at least part of the year (OAR 603-095-0010(36)).

## Parameters That May Be Affected by this Measure:

**303(d)-Listed Parameters:** temperature

**Other Parameters:** dissolved oxygen, sedimentation, turbidity, nutrients, bacteria, and mercury.

### **2.5.3 Soil Erosion Prevention and Control**

#### **Prevention and Control Measure: Mercury**

##### **Issue:**

Mercury is a metal that is liquid at room temperature, and was commonly used in the recent past for thermometers. It continues to have many dental, medical, and industrial uses. It is found naturally in the soils of the Willamette Valley. It is also found in fossil fuels and is released into the air upon combustion. In the air, mercury can travel over continents and oceans to be deposited on land, added to naturally-occurring mercury and is carried by stormwater and erosion into Oregon's waterways. Fish consumption is the most common way humans are exposed to elevated levels of mercury (Oregon Department of Environmental Quality, 2007).

Mercury is also a severe poison. According to the DEQ (2007), small children and fetuses are most sensitive to mercury's toxic effects.

Mercury from point and non-point sources is bio-accumulating in fish tissue to levels that adversely affect public health. Mercury binds to particles; thus, there are both higher levels of total suspended solids as well as higher mercury levels in the wet season. In setting the TMDL for mercury, DEQ has found that erosion of native soil makes up almost 48 percent of the mercury in the Willamette Basin. Some industrial facilities and domestic wastewater treatment facilities also discharge mercury, but at low levels.

The current DEQ mercury TMDL consists of interim targets and allocations. DEQ plans to finalize these after additional data collection and public outreach (Oregon Department of Environmental Quality, 2007).

Existing Area Rules help control mercury from agricultural sources by limiting erosion, filtering sediment, and controlling pollution. No specific rule to control mercury from agricultural activities is necessary at this time. Refer to the Prevention and Control Measure for bacteria and temperature for the Area Rules that address mercury in this area.

### **2.5.4 Optional Issues: Upland, Irrigation, and Livestock Management**

#### **Role of Upland Vegetation to Prevent and Control Pollution**

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

Healthy upland areas provide several important ecological functions, including:

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

#### **Nitrate**

Nitrate is a form of nitrogen that is dissolved in water (mainly an issue in groundwater). Oregon does not have a standard for nitrate, but public drinking water systems must adhere to the Environmental Protection Agency (EPA) standard of 10 mg/L, which was established due to health concerns. Individuals with household wells are not required to adhere to drinking water standards.

Nitrate is highly soluble in water, easily mobile in the soil, and can potentially leach through the soil and into the groundwater. Potential sources of nitrate pollution include fertilizer, animal waste, septic systems, and wastewater.

### **2.5.5 Menu of Optional Management Practices**

The focus of the Area Rules is to achieve desired conditions; landowners have flexibility to choose the most feasible and effective practices for their property. The following tables are intended as suggestions for landowners who want ideas on how to meet Area Rules and generally maintain and enhance natural resources on their property. The tables provide some idea of the water quality benefits of each practice as well as potential costs and benefits to landowners. The tables are organized by resource, such as nutrients and manure.

Landowners who want more information on any of the following practices, or who are looking for other ideas for water quality improvement and conservation on their lands, may contact several agencies and organizations that provide technical assistance, including the Linn SWCD, the NRCS, and the OSU Extension Service (see Appendix A). Also, please consult Appendix H for a list of publications describing water quality improvement practices for agricultural landowners and Appendix G for cost-sharing programs to cover some of these practices.

**Table 9: Riparian Areas and Streams**

<b>Practice</b>	<b>Resource Concerns Addressed</b>	<b>Potential Benefits of Practice to Producer</b>	<b>Potential Costs of Practice to Producer</b>
Rotational grazing in riparian area; timed when growth is palatable to animals and when riparian area soils are not saturated.	May help establish desirable riparian vegetation and address temperature and bacteria TMDLs.	Allows limited use of riparian area for grazing, improves wildlife habitat.	Requires intense management to insure that grazing does not prevent site capable vegetation from establishing.
Livestock exclusion from riparian area; establishing off-stream watering facilities.	Helps promote desirable riparian vegetation; promotes streambank integrity; helps filter nutrients and sediment from runoff; may help narrow channel and reduce erosion in channel.	May lessen streambank erosion and loss of pastures; less time involved in managing livestock grazing in riparian area, improves wildlife habitat.	May require higher weed control costs in riparian areas than seasonal riparian grazing. May require financial investment for livestock control and off-stream watering facilities.
Planting perennial vegetation in riparian area.	Helps establish perennial riparian vegetation rapidly; promotes streambank integrity; may help narrow channel and reduce erosion in channel; provides appropriate shade necessary to moderate solar heating and address temperature, mercury and bacteria TMDLs.	May lessen streambank erosion and loss of pastures. If livestock are excluded from riparian area, area may be eligible for federal cost-share programs. Some alternative perennial agricultural products may be harvested from riparian areas.	Costs of vegetation and weed control. May require financial investment for riparian fencing and off-stream watering facilities while vegetation establishes.

**Table 10: Nutrient and Manure Management**

<b>Practice</b>	<b>Resource Concerns Addressed</b>	<b>Benefits to Producer</b>	<b>Costs to Producer</b>
Apply nutrients and irrigation water according to soil test results and at agronomic requirements.	Helps prevent nutrient loss to surface and ground water and address nitrate contamination in the GWMA.	May help reduce fertilizer costs; ensures that plants receive needed nutrients for growth; makes plants more competitive against weeds.	Costs of soil testing; time associated with taking soil samples.
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 animal heavy use areas with rock, hog fuel, and/or geotextile.	Helps prevent sediment, nutrient and bacteria loss to surface and ground water. Helps protect streamside areas.	Protects pastures from compaction during the winter, improving growth. May improve animal health by covering animal heavy use areas with material so animals are not wading in mud.	Cost of fencing animal heavy use area; cost of feeding hay during the winter; cost of materials for protecting heavy use area.
Site barns and animal heavy use areas away from streams.	Helps prevent sediment, nutrient, and bacteria runoff into surface and ground water. Helps protect streamside areas and address bacteria TMDL.	Helps prevent flooding in barns and animal heavy use areas.	Need either off-stream watering facility or other source of water for livestock.
Prevent silage leaching and/or store and manage leachate from silage and other vegetative materials.	Helps prevent nutrient loss to surface or groundwater.	Preventing leaching maintains higher nutrient content of ensiled feed material.	May require cost of facility development and purchase of moisture-absorbing materials.
Installing gutters and downspouts on buildings in areas with high livestock use.	Helps prevent sediment, nutrient and bacteria runoff into waters of the state. Helps protect streamside areas and address bacteria TMDLs.	May improve animal health by lessening mud during the winter, so animals are not wading in mud.	Cost of installation and maintenance of gutters and downspouts.

**Table 11: Erosion, Sediment, and Mercury Control**

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

**Table 12: Nutrient and Irrigation Efficiencies**

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

Selker et al, 2004

**Table 13: Pest Management**

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

## **Chapter 3: Implementation Strategies**

### **Goal**

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

The Area Plan is implemented through education and outreach described in 3.2 below to achieve the following land conditions on agricultural lands throughout the Management Area that contribute to good water quality:

- 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.

### **LAC Mission**

The mission of the Area Plan is to implement and evaluate an outcome-based plan that will promote and support agricultural activities, while preserving water quality.

## **3.1 Measurable Objectives**

### **3.1.1 Management Area**

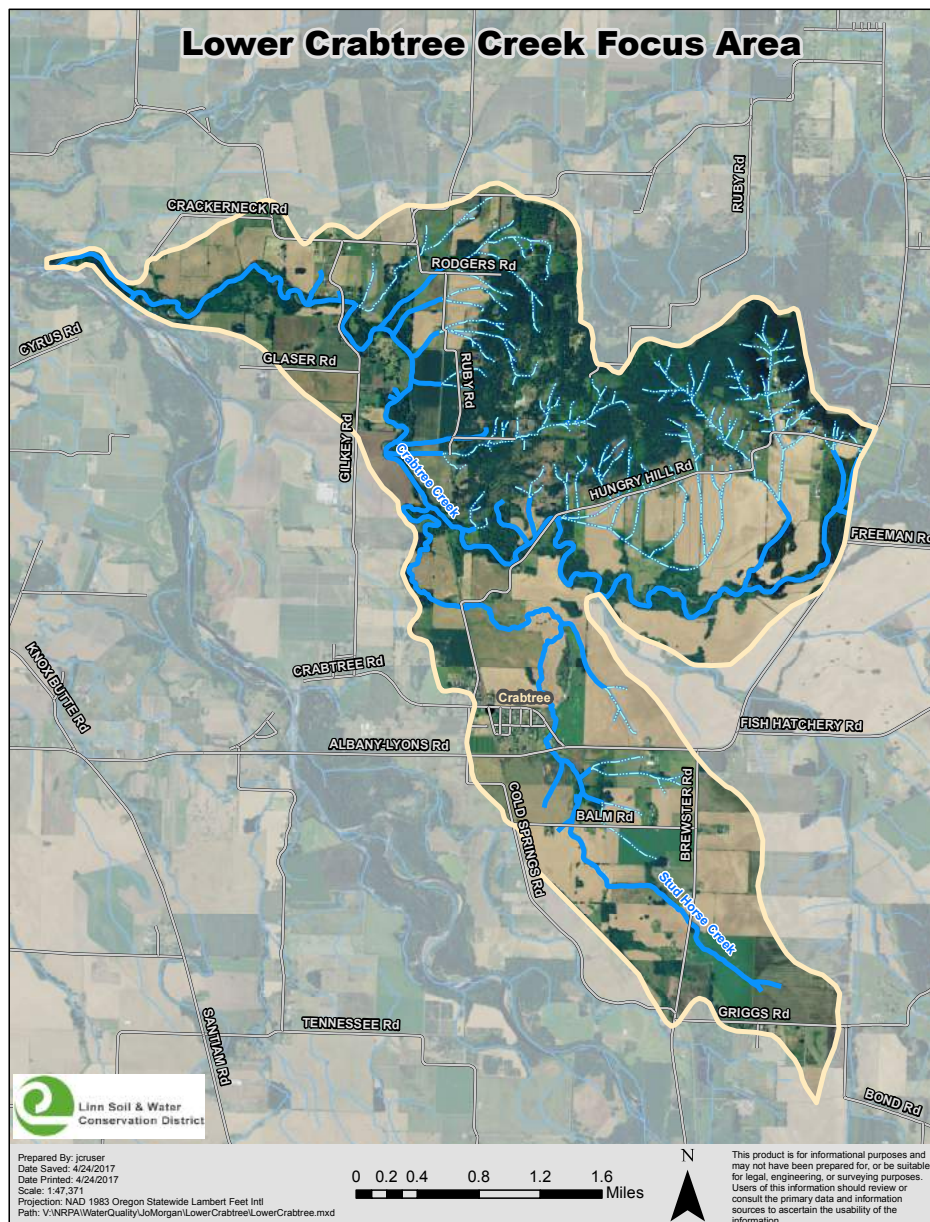
ODA is working with SWCDs and LACs throughout Oregon towards establishing long-term Measurable Objectives to achieve desired conditions. At the current time, ODA and the SWCDs are using focus area milestones to serve as a stepping stone to show progress.

### **3.1.2 Focus Area(s)**

Work in the Crabtree Creek Focus Area was completed at the end of the 2015-2017 fiscal biennium. Linn SWCD is currently working in the Bear Branch Focus Area located within the Molalla-Pudding-French Prairie, North Santiam Agricultural Water Quality Management Area Plan.

The Crabtree Creek Watershed was selected for Linn SWCD's Focus Area. Crabtree Creek's source is located in the western foothills of the Cascades (Figure 5). From there the stream travels North of the town of Crabtree, winding its way through agricultural bottom lands until its confluence with the South Santiam River. The area's main agricultural products are grass seed, mint, filberts, legumes, vegetable crops, and vegetable seeds. The Focus Area concentrates on those reaches of the lower Crabtree Creek mainstem downstream from the Highway 226. Highway 226 was chosen because there is a huge difference in the types of agricultural production on the East side versus the West side, with the West side having more highly intensively grown crops that require irrigation and have a higher return to the producer.

**Figure 5. Lower Crabtree Creek Focus Area**



### Basis for Selection of Focus Area

The Linn SWCD Board and staff determined the Focus Area based on Linn SWCD goals, ODA considerations for the focus area, and these other factors:

- Stream is on DEQ's 303(d) listing for impaired waterbodies and has TMDL development,
- Is a high use agricultural area of Linn County,
- Capacity of the Linn SWCD and allocated timeframe for completion.

Through the use of several programs of funding Linn SWCD sought to implement conservation practices to increase shade potential and decrease sedimentation inputs from agricultural activities.

Plans to use the ODA Streamside Vegetation Assessment method were hampered by technical issues throughout the implementation of the Focus Area. Therefore, a map exercise comparing pre- and post-project streamside conditions was conducted. Results and lessons learned are provided in Chapter 4.

## **3.2 Strategies and Activities**

### **3.2.1 Southern Willamette Valley Groundwater Management Area**

Researchers at Oregon State University monitored non-point source loading of nitrogen in Lane County in the 1990s. Building upon this work and the community ties built in the GWMA by DEQ, the Partnership to Improve Nutrient Efficiency (PINE) was formed to bring together commercial farmers, ODA, SWCDs and others to assess the current state of groundwater in the GWMA. The project's goals are to:

- Assess the effectiveness of current fertilizer management practices in the GWMA for reducing nitrate contamination of groundwater,
- Test models that can support nutrient and ecosystem services trading to improve surface and groundwater quality.

PINE began in 2013 by working with OSU Extension and producers to locate and test lysimeters in Benton, Linn and Lane counties that were used in a 1990s study and were still in the ground. The team identified additional producers to install smaller Prenart lysimeters at a total of 15 sites. Producers allow for soil and water sampling on their fields and share information about their land management practices. In turn, PINE shares information about leaching and soils data back to producers. Sampling began in 2014 and will continue through 2017. The partners will calculate monthly nitrogen budgets for each field to highlight connections between leaching and management.

The PINE study established a multi-agency Technical Expert Panel (TEP) that has provided comments and input to the study at least once per year since 2014. The TEP includes staff from ODA, two SWCDs, USDA-NRCS and OSU extension staff, in addition to EPA's Groundwater Ecology Division and DEQ. The work will be published in the peer-reviewed literature, and thus will be reviewed prior to submission to any journal, and then will be subject to peer review at the journal by independent scientists.

Current PINE work is to:

- Measure nitrate leaching from 14 active farm fields (2014-2017),
- Soil sample pre-fertilizer and post-harvest on study fields and additional fields throughout the GWMA,
- Publish annual fact sheets for the public,
- Develop water quality scenario and model,
- Continue sharing soil and water quality data,
- Develop project website,
- Develop protocol to assess crop Nutrient Use Efficiency for one or two GWMA crops.

In 2016, sampling at long-term monitoring wells was reduced from 160 samples to approximately 80 samples in 2016 due to budget constraints. DEQ continues to collect quarterly samples from 12 monitoring wells installed in the southern Willamette Valley, in addition to annual well sampling at 27 locations and 6 surface water locations. In addition to nitrate and chloride sampling, nitrogen isotope sampling was also conducted in order to identify the sources of nitrate contamination. EPA continues to provide free stable isotopic analyses on surface and groundwater samples collected by DEQ's laboratory. Data from nitrogen isotope ratios will assist in identifying nitrate contamination sources and help to focus efforts at reducing nitrate levels in the SWV GWMA.

ODA, Tetra Tech, and DEQ, through an EPA Regionally Applied Research Effort (RARE) Level of Effort grant, developed a groundwater contour mapping tool to predict the 5-year groundwater flow paths to increase understanding of the GWMA's groundwater recharge areas. The model attempts to connect land use practices on the surface with groundwater recharge. It allows agricultural growers to visualize the potential radius of their agricultural influence and identify influences that may be up-gradient of groundwater wells. Use of the contour model in conjunction with over eight years of groundwater quality and elevation data will allow DEQ and its partners to interpret the time trends in well nitrate data and target implementation of Best Management Practices (BMPs).

In addition to GWMA monitoring and research, partners adopted an Action Plan that includes agricultural priorities for outreach and implementation efforts in the GWMA (Appendix B of this Area Plan). Actions include outreach such as conducting workshops and learning about the community through surveys.

**University of Oregon Capstone Project:** The University of Oregon and DEQ are partnering on a student Capstone project in 2017, which looks at what types of messages resonate with rural residents to get their drinking water wells tested or treated. The project will gather baseline data on the community awareness of local groundwater contamination in specific "neighborhoods" in the GWMA. It will also seek to identify community demographics within the GWMA that may influence attitudes and behaviors in regards to local drinking water contamination. The results from this study will help the GWMA Committee, DEQ staff, and others in the state working on similar issues to better understand constituents' needs, create the appropriate communication tools, and prompt changes in behavior.

**Well Inspection Training:** DEQ hosted well inspection training in September in conjunction with the Rural Community Assistance Corporation (RCAC) and the University of Illinois. The one-day training focused on RCAC's Well Assessment Program and Well Assessment Tool and outlined best practices for working with private well owners who are not regulated by the Safe Drinking Water Act.

### **3.2.2 Linn SWCD Strategies**

The LAC has identified the following as high priority strategies or tasks for improving water quality and achieving the Goals and Objectives in the Management Area. The LAC recommends that the Linn SWCD, ODA, Watershed Councils, and any other agencies or organizations wishing to aid in addressing water quality issues implement these strategies. For a complete list of organizations that provide educational and technical assistance in the Management Area, please consult Appendix A.

To accomplish the high priority strategies, Linn SWCD has chosen the following actions for outreach, project planning and implementation and funding. The strategies are consistent with Linn SWCD's scope of work for the 2015-2017 fiscal biennium, developed as an agreement between ODA and the Linn SWCD with tasks related to implementation of the Area Plan. Watershed councils and other groups may make additional efforts that fit within the mission and goals of the Area Plan.

### **3.2.3 Outreach**

As resources allow, the SWCD, in partnership with other agencies and local organizations, will develop outreach programs to improve the awareness and understanding of agricultural water quality issues. They will strive to provide the most current information in a manner that avoids conflict and encourages cooperative efforts to solve problems. Implementation of the Area Plan is a priority element in the SWCD's Annual Work Plan and Long-range Business Plan. Outreach activities may include:

- Host public information sessions about the Area Plan and Rules,
- Contact county livestock association, the South Santiam and Calapooia Watershed councils, county Farm Bureau, Oregon State grange and other organizations,

- Host meetings about water quality issues and optional management practices,
- Maintain a current version of the Area Plan and Rules on the ODA website,
- Compile a list of existing demonstration project sites around the South Santiam/Calapooia area. Evaluate existing sites to determine if some high priority practices, management systems, or geographic locations are not covered. Establish any additional needed demonstration sites and use existing demonstration sites to showcase optional management practices for agricultural commodities specific to the South Santiam/Calapooia area,
- Conduct tours of demonstration sites and typical agricultural operations to discuss what might be typical water quality concerns and some options for addressing each concern in cooperation with OSU Extension,
- Host booths or include Area Plan and Rules information at another organization's booth at the Linn County Farm Expo or other events with typical water quality concerns for different operations and ways to address water quality concerns,
- Provide information to realtors in the South Santiam/Calapooia area, and if possible, deliver presentations at realtor meetings,
- Submit articles about water quality issues, the Area Plan and Rules, and optional management practices to local livestock associations, agricultural publications, Farm Bureau chapters, and other commodity groups. OSU Extension, watershed council, and SWCD newsletters, and other publications,
- Provide one-on-one technical assistance to landowners, informing them of Area Plan and Rules,
- Provide information on federal and local cost-sharing programs to landowners,
- Disseminate information to schools about agriculture, water quality, and the Area Plan and Rules,
- Disseminate information to county commissioners and other elected officials about implementation and progress regarding the Area Plan and Rules and work of the LAC,
- Develop BMP brochure for guidelines on meeting agricultural water quality rules and regulations for grass seed producers.

### **3.2.4 Conservation Planning and Conservation Activities**

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

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

A detailed list of specific measures that can be used to address agricultural pollution are contained in other documents such as the NRCS Field Office Technical Guide, available for reference at the local NRCS office and at <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/fotg>. Landowners and operators have flexibility in choosing management approaches to address water quality issues on their lands.

Voluntary conservation plans describe the management systems and schedule of conservation activities that the landowner will use to conserve soil, water, and related plant and animal resources on all or part of a farm unit. Landowners, operators, consultants, or technicians available through a SWCD or the NRCS

may develop voluntary conservation plans. A conservation plan can be used to outline specific measures necessary to address the “Prevention and Control Measures” outlined in this Area Plan.

Conservation activities should:

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

For a list of agencies and organizations to contact for more information about resource management, please refer to Appendix A: Sources of Information and Technical Assistance.

### **3.2.5 Funding**

Sometimes the cost of conservation measures does not fit well with a producer’s operating budget. Local, state, and federal technical and financial resources are available to improve the cost-effectiveness of protecting and improving water quality. It is not the intent of the Area Plan to impose a financial hardship on any individual. If there are potential water quality threats on their land, it is the responsibility of the landowner or operator to request technical and/or financial assistance and to develop a reasonable time frame for addressing potential water quality problems.

As resources allow, the SWCD, NRCS, and other natural resource agency staff is available to help landowners evaluate approaches for reducing runoff and soil erosion on their farms and incorporate these into voluntary conservation or water quality plans. Personnel in these offices can also design and assist with project implementation, and help identify sources of cost sharing or grant funding.

Technical and financial assistance may be available through current USDA conservation programs. Other programs that stand ready to partner for conservation include the U.S. EPA’s nonpoint source implementation grants (“319 funds”), or state programs such as the Oregon Watershed Enhancement Board (OWEB) grant programs, the Riparian Tax Incentive Program, and the Wildlife Habitat Conservation and Management Program.

The SWCD will seek funding to implement the Area Plan. Funding is necessary in four main areas:

- Education: to fund workshops, tours, and development of published materials,
- Technical assistance: to hire staff to work with landowners to develop and implement solutions to agricultural water quality concerns,
- Financial assistance: to provide cost-share dollars to assist landowners to implement agricultural water quality conservation activities,
- Monitoring: to monitor land conditions and water quality and evaluate how agricultural activities are impacting streams in the Management Area.

For sources of financial assistance, see Appendix G: Conservation Funding Programs.

### **3.3 Monitoring and Evaluation**

#### **3.3.1 DEQ Status and Trends Monitoring**

Water quality in the Management Area is currently monitored by DEQ, US EPA and USGS. Many other organizations also provide data. DEQ summarizes monitoring results in a report called the *Oregon DEQ Water Quality Status and Trends report for the South Santiam AgWQ Management Area*, March 2019 report. Data collected between January 01, 2000 to January 01, 2019 within the Management Area are described in this report. These groups primarily measure temperature, pH, dissolved oxygen, total suspended solids, total phosphorus, and bacteria (*E. coli*, *fecal coliform*, and *Enterococcus*).

This report will be updated for future biennial reviews. The full report can be found online at <https://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx>. An interpretation of the monitoring and evaluation results is provided in Chapter 4.

#### **3.3.2 ODA Temperature Monitoring**

In 2017, ODA began working with 13 local organizations to collect data on stream temperature, air temperature, stream flows, and riparian vegetation on agricultural lands. This monitoring will be carried out for 20 years. Data will be used by ODA to determine whether improved stream temperatures can be measured as a result of improved riparian vegetation on agriculture lands. In addition, the local organizations will use the data to answer their own questions relating to stream temperature. Oregon's DEQ will use the data to assess whether the monitored stream reaches are meeting water temperature standards.

As part of this project, the Calapooia Watershed Council deployed equipment at three locations in the Brush Creek watershed. The South Santiam Watershed Council deployed equipment in two locations on McDowell Creek and three locations on Hamilton Creek. Data collected will enable us to understand the effects of projects implemented on agricultural lands in these watersheds. Once sufficient data has been evaluated results will be reported in Chapter 4 over time.



## **Chapter 4: Implementation, Monitoring, and Adaptive Management**

### **4.1 Progress Toward Measurable Objectives**

#### **4.1.1 Management Area**

At the current time, there is not a Focus Area for this Management Area as Linn SWCD is working in the Bear Branch Focus Area which is located in the Molalla-Pudding-French Prairie-North Santiam Agricultural Water Quality Management Area. The Bear Branch Focus Area is just north of the South Santiam Management Area. The SWCD's next focused efforts will migrate into the South Santiam over time.

#### **4.1.2 Focus Area(s)**

Outreach in the Crabtree Creek area has been successful. Many landowners sign up for conservation programs and do voluntary improvements on their property, including manure storage facilities, riparian enhancements, riparian fencing, irrigation water upgrades, and rotational grazing:

- Contacted 81 landowners,
- Distributed 134 fact sheets,
- Provided technical assistance and onsite visits to 22 landowners,
- Submitted 9 applications for funding for projects,
- Received a \$15,000 OWEB small grant with match for a total of \$38,919 for a manure management facility,
- Approved 3 conservation plans for a total of 100-acres,
- Installed riparian fencing on 1,200-feet of streambank,
- Planted streamside vegetation on 3-acres.

#### *Crabtree Creek Focus Area Pre- and Post-assessment*

The ODA Streamside Vegetation Assessment was not completed and a milestone was not chosen for the Focus Area. However, a map exercise to compare pre- and post-project changes in vegetation estimates that:

- 3.5 agricultural stream miles were assessed,
- 10.0 stream miles needed improvement (23%),
- 0.9 stream mile was improved through riparian restoration projects (= 2% of the assessed ag streams, or 9% of the streams that needed improvement).

#### *Adaptive Management*

A lack of funding to implement projects hindered success in the Lower Crabtree Creek Focus Area. Competing areas of concern also pulled money from available sources, further limiting the amount of on the ground work that could be accomplished. Next focus areas will be chosen to align with partners to leverage funds available for projects. Incentives for areas of high value crops is also needed to encourage additional voluntary set aside areas for streamside vegetation.

## 4.2 Activities and Accomplishments

### 4.2.1 Linn SWCD Accomplishments

During the 2017-2019 fiscal biennium, Linn SWCD conducted the following activities within the South Santiam Management Area. Work that was done within the Crabtree Creek Focus Area is provided separately (see 4.1.2 above).

#### *Community Engagement*

- Published quarterly articles for the OSU Extension's *Growing*. Topics included:
  - *Wetlands, the New Farming*
  - *What Is An SWCD?*
  - *Conserving Resources for Gains*
  - *Conservation Enhancement with CREP*
  - *Composting for Profit*
  - *Six Reasons to Incorporate Grazing into Your Production*
  - *Strategic Implementation Area in Linn County*
  - *Drainage Considerations*
- Conducted five landowner engagement events such as workshops and tours with 6158 attendees. Workshops included the Living on the Land Workshop series (4 workshops with OSU were conducted in Scio near the Focus Area—see 4.1.2 above). Four of the Living on the Land Workshop series were conducted in Harrisburg.
- Present biennial results for the South Santiam Agricultural LAC at their biennial review meeting.
- Linn SWCD collaborates with a variety of Partners such as the Calapooia Watershed Council, North Santiam Partners, OSU Extension, NRCS and FSA meetings. Staff attended 101 partner events and meetings, eight of which were hosted by the SWCD with a total attendance of 89 participants. Highlights include:
  - Slug Task Force and hosting the Slug Symposium with OSU
  - Drought Task Force
  - Annual Ryegrass Growers Association

#### *Technical Assistance*

- CREP Technical Assistance provided resulted in 32 contracts for a total of 381 acres. To date Linn SWCD has provided CREP Technical Assistance on 1006 acres in Linn County, with 74 cumulative contracts which require status reviews and mid-management assessments and 848 practice implementation certifications for the first two-years of each contract.
- Provided 1:1 technical assistance for 243 landowners.
- Conducted 51 on-site technical assistance visits.
- The following practices were implemented:
  - Acres of irrigation management – 745.5 acres
  - Acres of nutrient management – 1,73.9 acres
  - Acres of riparian establishment – 0.5 acres
  - Acres of cover crop - 9.4 acres
  - Acres of brush management – 105.3 acres
  - Feet water transference pipeline installed – 10,550 feet
  - Acres of prescribed grazing – 102.8
  - Feet of hedgerow – 2,862 feet
  - High tunnels – 5,478 sq feet

### ***Funding***

- Submitted 3 technical assistance grant applications
- Wrote NACD grant for NRCS Technical Assistance
- 1 DEQ 319-grant submitted
- Wrote OWEB grant for NRCS Farm Bill backlog certification implementation
- EQIP \$976,936
- CSP \$213,597

### ***Monitoring***

- Linn SWCD is the lead for OWEB's Westside CREP Monitoring Pilot Project

## **4.2.2 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.

PINE study Accomplishments May 2017-May 2019:

- Completed field work on monthly nitrate leaching from 14 fields in the GWMA from January 2014 through December 2017 (4 years),
- Calculated water balances and monthly nitrate leaching rates for all 14 fields,
- Collected soil samples in pre-fertilization and post-harvest for all 14 fields in 2016 and 2017; measured extractable ammonium and nitrate, and total carbon and nitrogen in these soils
- Shared 4 years of field data with farmers via biannual summary sheets,
- Conducted interviews of most study farmers to understand their nutrient management practices,
- Presented work to over 40 groups at the local, regional and national scale,
- Held the 5th Technical Expert Panel meeting in May 2019 where the PINE team received feedback from state agencies, OSU extension staff and other experts.

It is challenging to measure nitrogen leaching from agricultural fields, because soils and cropping practices can vary within a field. The lysimeter study, as with previous lysimeter studies in the region, are limited by the number of samplers that can be installed. This study has increased the within-field replication compared to previous studies from 1 to 3, and provides a good comparison with previous studies by sampling those same detectors over time.

The PINE team is working on a report and papers from the work that will be published in 2020. This report will include information on the nitrate leaching results and soils data.

## **4.3 Monitoring—Status and Trends**

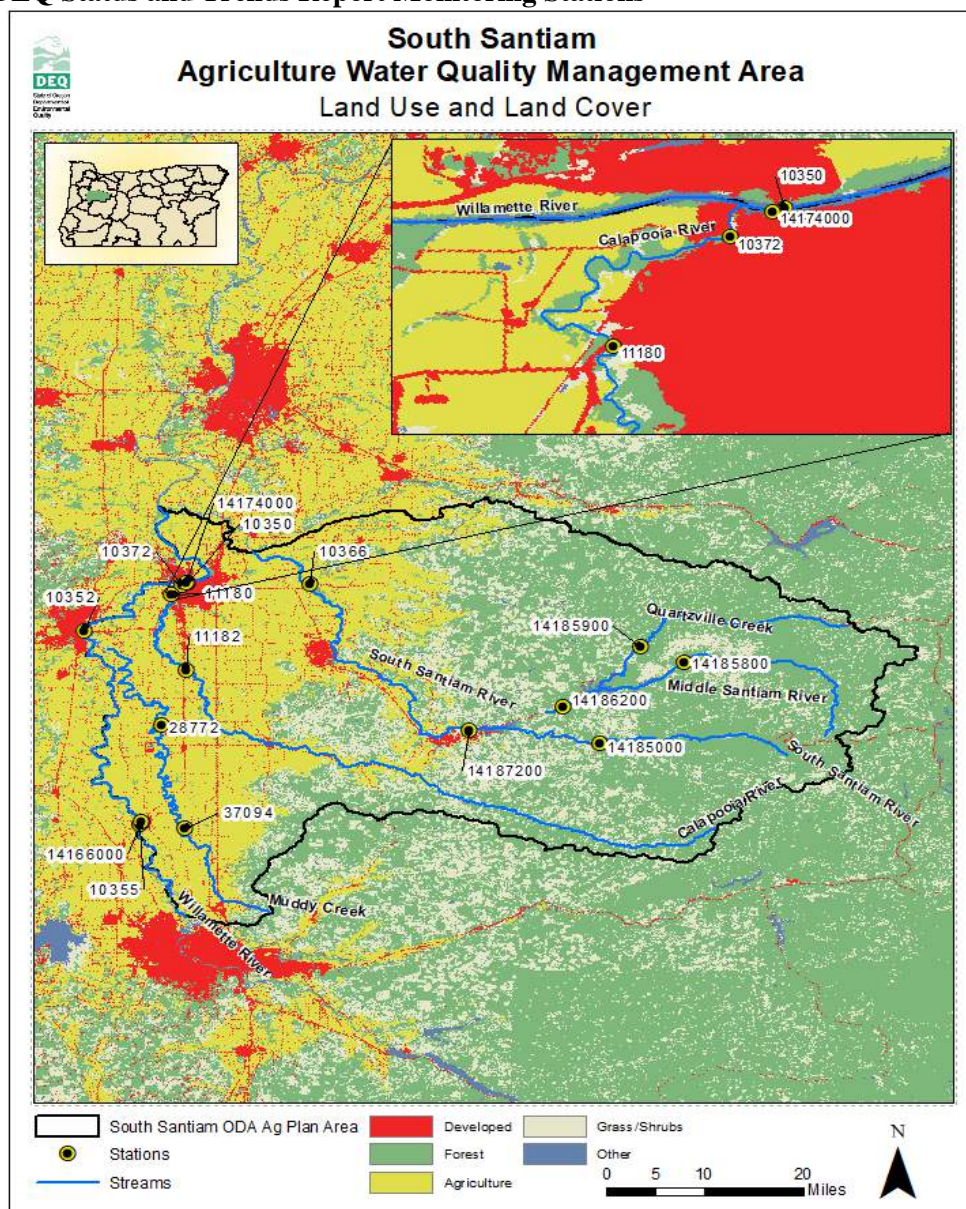
### **4.3.1 Water Quality**

For this biennial review, DEQ reviewed data from 16 monitoring stations that were sufficient to assess status and/or trends (DEQ. *South Santiam Agricultural Water Quality Management Area Water Quality Status and Trends Report, January 2019*). A status assessment was made at a monitoring station if data

were available within the last whole two years in the period from January 1, 2016 to November 1, 2018. A trend assessment was made at a monitoring station if data were available in a minimum of eight different years for any year in the period from January 1, 2000 to January 1, 2019.

This report is best used as a summary and statistical analysis of the status and trends in water quality data collected throughout the South Santiam Management Area. Interpretation of results will require knowledge of local conditions known to affect the observed water quality conditions at individual sites. Five stations were identified as having greater than 20 percent agricultural land use. These stations are highlighted in Table 8 below and the locations are shown on Figure 6. However more information is needed to know whether one land use or another is a larger or smaller contributing factor with regard to a particular water quality parameter. The report provides a basis from which we can identify areas of concern where we would like to have more information.

**Figure 6. DEQ Status and Trends Report Monitoring Stations**



**Table 14. Stations that fit the DEQ Status and Trends Criteria and have >20% Agriculture/Range**

Site ID	Site Description	<i>E. coli</i> (mpn/100mL)	pH	Dissolved Oxygen (mg/L)	Temperature (deg C)	Total Phosphorus (mg/L)	Total Suspended Solids (mg/L)
		# exceeding standard/N <sup>1</sup>				median <sup>2</sup> /N <sup>1</sup>	median <sup>3</sup> /N <sup>1</sup>
28772	Muddy Creek @ Oak Plain Dr	-	0/18	1/18	-	-	-
37094	Muddy Creek @ Priceboro Rd	-	0/18	1/18	-	-	-
11180	Calapooia R @ Queen Rd	2/2	0/116	0/116	-	-	0/117
10372	Calapooia R @ 3 <sup>rd</sup> St in Albany	-	2/60	0/70	-	-	-
11182	Calapooia R @ Hwy 99E	0/0	0/42	0/42	-	-	0/48

<sup>1</sup> N = Total # of observations

<sup>2</sup> DEQ has no benchmark for total phosphorus in this Management Area; ODA benchmark for potential water quality concerns = 0.08 mg/L

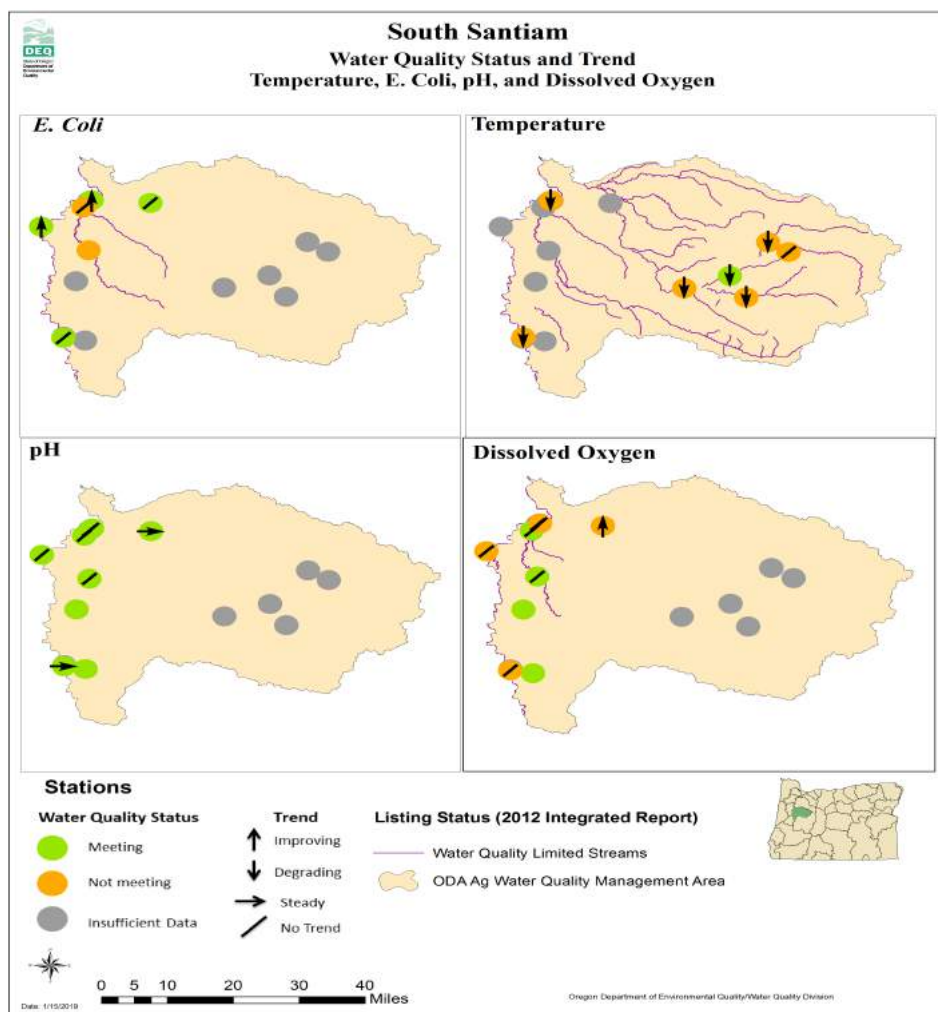
<sup>3</sup> Without applicable targets or criteria, all stations with sufficient data to assess status were categorized as "Meeting". Trend was determined by significant trends associated with long-term datasets.

↓ Statistically significant degrading trend

↑ Statistically significant improving trend

A dash (-) means that no status and trends data were available.

**Figure 7. Summary of Stations that fit the Criteria for Status and Trend Analysis**



One or more exceedances within the last three years of available data defined whether a station was meeting or not meeting. Trend was determined by significant trends associated with long-term datasets.

***Dissolved Oxygen:***

Stations 11180, 11182, 28772, 37094 had dissolved oxygen concentrations that met the criteria in the last two years.

***E. coli:***

Data collected at six stations were sufficient to assess status. Four stations met *E. coli* concentrations met the criteria in the last two years. Two stations did not meet criteria in the last two years. Data collected at five stations were sufficient to assess trends. Three stations did not have a statistically significant trend.

***pH:***

Data collected at eight stations were sufficient to assess status. All eight stations (10350, 10352, 10355, 10366, 11180, 11182, 28772, 37094) met the pH criteria in the last two years. Data collected at seven stations were sufficient to assess trends. The remaining five stations (10350, 10352, 10372, 11180, 11182) did not have statistically significant trends.

***Temperature:***

Data collected at seven stations were sufficient to assess status. One station had a temperature that met the criteria in the last two years. Six stations exceeded the criteria in the last two years. Data collected at seven stations were sufficient to assess trends. Six stations had a degrading trend. One station did not have a statistically significant trend.

***Total Phosphorus:***

The available data was not sufficient to determine any status or trends for total phosphorus.

***Total Suspended Solids:***

Data were not available in sufficient quantity to assess status. Data collected at five stations were sufficient to assess trends. One station had a degrading trend, one station had a steady trend and three stations did not have a statistically significant trend.

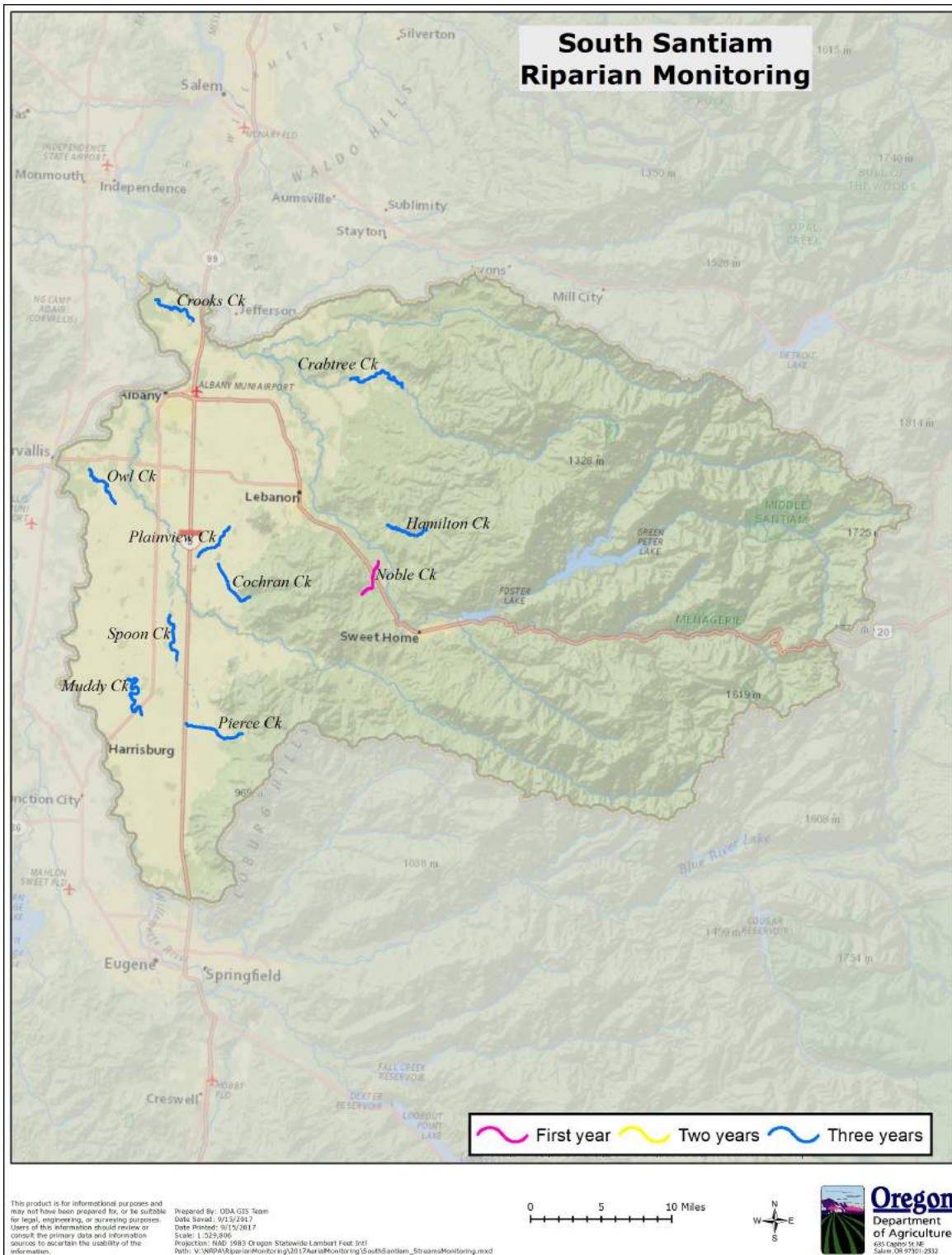
**4.3.2 Land Conditions**

The ODA Aerial Monitoring project began in 2003 and was completed in August, 2018. This project used passive monitoring, where ODA would not actively try to improve riparian conditions. Monitoring was done using high resolution true color and near-infrared aerial photography. The photographs were all georeferenced, orthorectified digital images formatted for use in GIS. Thirty-five basins were photographed in a five-year rotation, with each stream being photographed three times during the life of the project. Aerial photography was normally done in late May or early June to maximize green coverage. Riparian cover was assessed in three bands along each side of the stream, 30, 60, and 90 feet away from each bank. In addition to riparian conditions, additional information on stream characteristics such as bank stability, incision, sediment load, and extent of riparian fencing were noted.

Final results for streams within the South Santiam Management Area indicate that ten streams were monitored in the South Santiam Basin, but only nine of these were photographed all three years (2007, 2012, and 2017)(Figure 8). Riparian index scores (RIS) for these streams ranged from a low of 32.44 for Plainview Creek to a high of 54.67 for Crabtree Creek (Table 9). Plainview Creek had the band with the least coverage by trees at six percent, while Crabtree had the greatest tree coverage with one band at 56 percent. Bare ground was less than five percent for all bands on all streams except one band on Hamilton Creek and one on Owl. Bare/agriculture ground was highest on Plainview Creek (17 percent in one band), though both Cochran and Crooks creeks had one band with 15 percent. All the streams showed improvements in their RIS, except Crabtree and Hamilton creeks. 2017 was a very wet year in this basin, but the RIS improvements were seen both in 2012 and 2017, implying that management and not climate

conditions were responsible for the improvements. Final data for the South Santiam is provided in Figure 8 below.

**Figure 8. Map of the South Santiam Riparian Monitored Streams**



**Table 15. Statewide Aerial Photo Monitoring of Streamside Vegetation**

<b>Stream</b>	<b>2007 Score</b>	<b>2012 Score</b>	<b>2017 Score</b>	<b>Percent Difference, If Notable</b>
Cochran Creek	34.39	34.58	36.42	5.9
Crabtree Creek	54.67	52.68	52.81	-3.4
Crooks Creek	45.89	47.08	48.27	5.2
Hamilton Creek	54.37	50.98	50.55	-7.0
Muddy Creek	42.93	44.27	45.26	5.4
Owl Creek	38.40	38.93	39.89	3.9
Pierce Creek	40.88	42.98	43.51	6.4
Plainview Creek	32.44	31.83	33.76	4.1
Spoon Creek	35.73	36.30	37.79	5.8

**Conclusions:**

**Cochran Creek:** About 90 percent of this stream reach was ditched and straightened.

**Crabtree Creek:** A wide stream that appears to have a large sediment load. Many bare point bars visible. The RIS decreased mostly because of tree loss and an increase in bare/ag land in the right bands. This stream also had a significant amount of lateral channel migration between 2007 and 2012. Surprisingly, this was the only stream in the basin exhibiting noticeable channel movement.

**Crooks Creek:** About 50 percent of this reach is swampy, while the upstream section has many impoundments.

**Hamilton Creek:** This reach had fairly good sinuosity, but the bare point bars visible indicate excess sediment loading. Its RIS dropped mostly due to tree loss in both bands.

**Muddy Creek:** This reach has very good sinuosity, but the channel width varies from about 40 to about 100 feet for no apparent reason. Increased shrub cover raised the RIS of this stream significantly.

**Noble Creek:** This reach is basically a narrow channel through swampy ground. It was only photographed in 2007.

**Owl Creek:** About 70 percent of this reach is ditched, and probably used as an irrigation conveyance. The lower 20 percent of the reach has good sinuosity but is dammed with ponded flow. In the 2017 photograph, it was obvious that the banks of this stream had been sprayed out with an herbicide.

**Pierce Creek:** About 60 percent of this reach appears to have been channelized in the past, but is now regaining some sinuosity. Much like Muddy Cree, Pierce Creek's RIS increased because of increased shrub cover, though there also was an increase in tree cover in both 60 foot bands. Conversely, bare/ag. cover in the 90 right band also increased by more than 10 percent.

**Plainview Creek:** Nearly all of this reach is ditched; upstream stretch has a faintly defined channel.

**Spoon Creek:** Part of this reach is dammed and ditched, though some straightened reaches also have extensive riparian vegetation. The RIS improved because of increased tree cover in the 30 and 60 foot bands, though bare/ag. cover also increased in the 90 foot bands.

## **4.4 Biennial Reviews and Adaptive Management**

### **4.4.1 LAC Discussion and Recommendations**

#### ***Crabtree Creek Focus Area***

We discussed how success in focus areas where the predominant crop is low value is quite different than challenges in the Willamette Valley due to high crop values in the valley. Incentives that compete with the crop values in the valley are not sufficient to encourage voluntarily doing more than complying with the rules.

Some areas have mature partnerships and trust between landowners and the SWCDs is high. Although trust between landowners and SWCD is high in the South Santiam, this is less so for landowners with state and federal agencies. EPA has been building trust with landowners through the SWV GWMA initiatives. By starting in watersheds where agencies can build support for their programs, we can demonstrate to others the value of the program. Small gains in building trust with landowners may constitute success in one watershed where in another where relationships have already been established may be making progress with more on-the-ground work. Defining ‘success’ for each watershed can be helpful in understanding the value of focus areas overall.

Focus Areas take time to demonstrate success—a two- or four-year process is too soon to tell whether progress has or will be made. Lack of funding is critical to success. Funding is critical to success. Funds to implement projects are limited to and competition for those funds is intense.

#### ***SIAs***

The LAC recommended Thomas Creek for a future SIA. This watershed has many potential partners, past successful OWEB Restoration grantees in the watershed and sediment issues to address. Amy and Eric added that Thomas Creek coincides with their organizations’ priorities. The South Santiam Watershed Council (SSWC) is planning to work in Thomas Creek; beginning high in the watershed and working their way downstream.

Crabtree Creek is also recommended. The SSWC is working with the Bonneville Environmental Foundation (BEF) on diversifying the source of restoration funds in the Willamette. The SSWC has received restoration funding for a riparian project on Crabtree Creek. The funds were received from BEF, which received them from Coca Cola company. The SSWC had provided BEF a list of potential projects that had high ecological value (ESA steelhead, drinking water protection) and could be quickly initiated (had landowner buy in, contractors at the ready, etc). A SSWC project ready for implementation was selected, in addition to projects outside South Santiam that met criteria for receiving Coca Cola funding. By having a list of projects in the queue, SSWC was able to implement a project on Crabtree Creek. A large corporate funder prefers to engage with one entity (e.g. BEF) rather than multiple nonprofits (e.g. 40 watershed councils).

#### ***Monitoring***

The LAC recommends that monitoring be done to help landowners know if they are making progress towards achieving water quality standards. While the DEQ status and trends monitoring has value for the overall TMDL process at current resource levels, is not at a scale that can definitively say whether agriculture is making progress in specific watersheds. We discussed SIA and ODA monitoring that is geared to say whether projects we are doing are making a difference. The LAC was appreciative of these efforts and interested in hearing about our progress at future LAC meetings.

### ***Recommendation for Next LAC Meeting***

The LAC and partners discussed a potential field trip for the next LAC meeting in lieu of the 2021 meeting. This could be a joint meeting with the Middle Willamette LAC. Topics may include cover crops, soil health and soil erosion, and what we are learning from the SWV GWMA.

### **4.4.2 ODA Compliance**

As typical throughout Oregon, the approach of identifying issues and working with growers through primarily providing information, engaging with the SWCDs, NRCS, and WCs to provide technical assistance, and sometimes financial assistance, has proven successful in achieving compliance with the rules without a need to resort to punitive measures such as civil penalties (Table 9).

**Table 16. Resulting Compliance Actions**

<b>Compliance Action</b>	<b>#s of Actions</b>	<b>Description</b>
Letter of Compliance	2	Compliance Achieved
Water Quality Advisory	4	ODA Recommends Actions; Landowner Determines How
Fix It Letter	1	Site Visit Not Warranted
Letter of Warning	0	Required Actions Possible
Notice of Non-Compliance	0	ODA Requires Actions
Civil Penalty	0	Penalty Fee Assessed

During the biennium, five compliance cases were initiated; of these ODA initiated one case. Two cases were initiated via public written complaint and two via another agency notification. Issues encountered during compliance actions were primarily related to riparian vegetation (4) nutrients (1) and manure management (1).

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Below is a list of some selected references with more specific information on water quality and natural resources improvement practices. Copies of many of these publications are available from the local OSU Extension office or local SWCD. Underlined publications are also available online on the publishing agency's website.

### **General Water Quality Protection**

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### **Riparian Areas and Streams**

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### **Grazing and Pasture Management**

Ursander, D. et al. 1997. Pastures for Profit: a guide to rotational grazing. University of Wisconsin, Madison, Wisconsin.

### **Erosion and Sediment Control**

Hansen, H. and W. Trimmer. 1997. Irrigation runoff control strategies. Oregon State University, Corvallis, Oregon.

Trimmer, W. and H. Hansen. 1994. Irrigation scheduling. Oregon State University, Corvallis, Oregon.

### **Pesticide Management and Integrated Pest Management**

Kerle, E.A., J.J. Jenkins, and P.A. Vogue. 1996. Understanding pesticide persistence and mobility for groundwater and surface water protection. Oregon State University, Corvallis, Oregon.

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### **Irrigation Management**

Jenson, L., and C.C. Shock. 2001. Strategies for Reducing Irrigation Water Use. Oregon State University Extension Service, Corvallis, Oregon. Publication EM 8783.

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## **Appendix A: Sources of Information and Technical Assistance**

### **Farm Services Agency (FSA)**

31978 N. Lake Creek Drive  
Tangent, OR 97389  
(541) 967-5925

Maintains agricultural program records and administers federal cost-share programs. Maintains up-to-date aerial photographs and slides of agricultural and forest lands.

### **Soil and Water Conservation Districts (SWCDs)**

Provide technical assistance in a wide variety of agricultural and natural resource areas and assists landowners in accessing federal and local funding programs.

#### **Linn SWCD**

33935 HWY 99E, Suite C  
Tangent, OR 97389  
(541) 926-2483

#### **Upper Willamette SWCD**

780 Bailey Hill Rd., Suite 5  
Eugene, OR 97402  
(541) 465-6436 ext. 102

### **Natural Resources Conservation Service (NRCS)**

Provides information on soil types, soils mapping, and interpretation. Administers and provides assistance in developing conservation plans for federal programs such as the Conservation Reserve Program, Conservation Reserve Enhancement Program, the Environmental Quality Incentives Program, and the Wetlands Reserve Program. Makes technical determinations on wetlands and highly erodible lands.

#### **Linn County**

31978 N. Lake Creek Drive  
Tangent, OR 97389  
(541) 967-5925

#### **Lane County**

780 Bailey Hill Rd., Suite 5  
Eugene, OR 97402  
(541) 465-6443

### **Oregon Department of Agriculture (ODA)**

635 Capitol St NE  
Salem, OR 97301  
Natural Resources (503) 986-4700 and Pesticides (503) 986-4635

The Natural Resources Programs is responsible for developing and implementing Area Plans and Rules across Oregon, the CAFO Program, the Smoke Management Program, and for providing support to Oregon's SWCDs.

The Pesticides Programs regulates the sale and use of pesticides; tests and licenses all users of restricted-use pesticides, is responsible for fertilizer registration, and investigates incidents of alleged pesticide misuse.

### **Oregon Department of Environmental Quality (DEQ)**

165 East 7<sup>th</sup> Ave., Suite 100  
Eugene, OR 97401

(541) 686-7838

Responsible for protecting Oregon's water and air quality, cleaning up spills and releases of hazardous materials, and managing the proper disposal of solid and hazardous wastes. Maintains a list of water quality limited streams and establishes TMDL for water quality limited water bodies.

**Oregon Department of Fish and Wildlife (ODFW)**

**South Willamette Watershed District Office**

7118 NE Vandenberg Avenue

Corvallis, OR 97330

(541) 757-4186

<http://www.dfw.state.or.us>

Works with landowners to protect and enhance habitat for a variety of fish and wildlife species, manages recreational fishing and hunting programs, monitors fish and wildlife populations, conducts education and information programs, and administers wildlife habitat tax deferral program.

**Oregon Department of Forestry (ODF)**

4690 Hwy 20

Sweet Home, OR 97386

(541) 367-6108

<http://www.odf.state.or.us>

Implements Oregon forest practices laws, administers Oregon forestry property tax programs, provides forest management technical assistance to landowners, and administers or assists with several federal and local cost-sharing programs.

**Oregon Department of State Lands (DSL)**

775 Summer Street NE, Suite 100

Salem, OR 97301-1279

(503) 986-5200

<http://oregon.gov/DSL/index.shtml>

Administers Oregon fill and removal law and provides technical assistance to landowners.

**OSU Extension**

33630 McFarland Rd

Tangent, OR

(541) 967-3871

<http://extension.oregonstate.edu/linn/index.php>

Offers educational programs, seminars, classes, tours, publications, and individual assistance to guide landowners in meeting natural resource management goals.

**Oregon Water Resources Department (WRD)**

Provides information on streamflows and water rights, issues water rights, and monitors water use.

**Regional Office**

125 East 8<sup>th</sup> Ave, Eugene, OR 97401

(541) 682-3620

**State Office** - <http://www.wrd.state.or.us>

725 Summer Street NE, Suite A, Salem, OR 97301

(503) 986-0900

**Oregon Watershed Enhancement Board (OWEB)**

775 Summer St. NE, Suite 360

Salem, OR 97301-1290

(503) 986-0178

<http://oregon.gov/OWEB/>

Provides funding for a variety of watershed enhancement, assessment, monitoring, and educational activities. Provides support to watershed councils throughout Oregon.

### **Watershed Councils**

Bring diverse interests together to cooperatively monitor and address local watershed conditions. Collect watershed condition data, conduct education programs, and train and involve volunteers.

#### **South Santiam Watershed Council**

4431 Highway 20

Sweet Home, OR 97386

(541) 367-5564

[sswc@centurytel.net](mailto:sswc@centurytel.net)

<http://www.sswc.org>

#### **Calapooia Watershed Council**

PO Box 844

Brownsville OR 97327

(541) 812-7622

[calapooia@peak.org](mailto:calapooia@peak.org)

[www.calapooia.org](http://www.calapooia.org)



## Appendix B: SWV GWMA Strategy and Measures

The SWV GWMA complete strategy and measures can be found at <http://wellwater.oregonstate.edu/swvgwma>. Table 7, from the GWMA Action Plan, below provides implementation measures and the various partners who are implementing these measures.

Table 7 – Agriculture Measures of Implementation and Potential Implementing Entities		
Strategy	Measures of Implementation	Potential Lead Implementing Agencies
Coordinate agricultural surface water and groundwater pollution control efforts	Groundwater quality tasks included in SWCD Scopes of Work (on-going) Groundwater quality items included during Water Quality Management Area Plans review (on-going) Nutrient use efficiency, irrigation efficiency, and manure management identified with NRCS local work groups (on-going)	ODA, SWCDs
1.2 Organize and deliver workshops and demonstration projects	4) Demonstration projects designed and implemented (years 2 and 3) 5) Tours completed (on-going) 6) Workshops completed (on-going) 7) Attendance at tours and workshops (on-going)	SWCDs, NRCS, ODA, OSU Extension
1.3 Write and publish articles	8) Articles written and published in newsletters and other local media (on-going)	SWCDs, OSU Extension, LCOG
1.4 Share information and coordinate with agribusiness, producers, and producer groups	9) Follow-up meeting with agribusiness field representatives (Year 2) 10) Presentation at agribusiness or producer group meetings (on-going) 11) Establish systems for tracking groundwater quality contacts (Year 1) 12) Track groundwater quality contacts (on-going)	SWCDs, ODA, NRCS
2.1 Work with producers to implement practices to improve groundwater quality	13) Landowners provided with technical assistance (on-going) 14) Best management practices implemented by landowners (on-going)	SWCDs, NRCS, OSU Extension, ODA
2.2 Obtain financial support for technical assistance and practice implementation	1) Groundwater quality tasks included in SWCD Scopes of Work (on-going) 3) Nutrient use efficiency, irrigation efficiency, and manure management identified with NRCS local work groups (on-going) 15) Track changes in funding amounts and allocations (on-going) 16) Landowners signed up for USDA cost-share programs (on-going) 17) Grant applications submitted and approved for implementation of practices (on-going)	SWCDs, NRCS, ODA, OSU Extension

Table 7 – Agriculture Measures of Implementation and Potential Implementing Entities		
Strategy	Measures of Implementation	Potential Lead Implementing Agencies
2.3 Develop and target priority area to evaluate progress	18) BMPs identified in relation to improvement of groundwater quality (on-going) 19) Soil nitrate levels in the priority area measured (Year 2) 20) Landowners contacted in the priority area (Year 2) 21) Practices implemented in the priority area (Year 2)	
2.4 Obtain adequate funding for implementation in the priority area	22) Landowners interested in implementation of specific practices (on-going) 23) Funds proposals submitted (on-going)	
3.1 Evaluate current monitoring to determine needs in agricultural areas	24) Current monitoring evaluated and additional monitoring needs identified (Year 1) 25) Aquifer characteristics evaluated (Years 2 and 3)	DEQ, ODA, OSU, NRCS, WSCs
3.2 Measure success of BMP implementation efforts	26) Measure baseline of BMP awareness, implementation, ease of implementation, and barriers to implementation (within priority area) (Year 1) 27) Repeat measurement after 2 years	ODA, SWCDs
3.3 Document groundwater related violations	28) Track the number of groundwater violations and investigations (on-going)	OSU
3.4 Research and document BMP effectiveness; implement priority research identified in February 2010	29) Meet to update the priority list of ideas to research (Year 2) 30) Maintain research plan and identified sources of funding (on-going) 31) Design and implement nitrate leaching study to further characterize nitrate leaching potential (Year 1) 32) Implement, measure, research and document BMP effectiveness (on-going)	OSU, ODA, NRCS
3.5 Obtain sufficient funding to support priority research needs	33) Grant applications prepared and submitted (on-going)	OSU, ODA, NRCS

## Appendix C: 2010 Water Quality Assessment List and Decision Matrix for Water Bodies in the South Santiam Management Area

“TMDL” means a TMDL has been established for the waterbody and approved by EPA, and is being implemented. The water is considered Water Quality Limited until it meets the water quality standard. These waters get de-listed from the 303 (d) list and are identified as having a TMDL on the water quality assessment list or other measure to support the TMDL needed reductions.

“303(d) List” means the waterbody exceeds listing criteria and is placed on the 303(d) List.

“Potential concern” means data indicate a waterbody may typically meet water quality standards except under unusual circumstances (e.g. unusual weather circumstances) or in situations where toxics exceed levels of concern but do not exceed definitions used for the 303(d) List. In these cases, the waterbodies are identified as being of potential concern and the DEQ will seek more data to verify the assessment.

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**Bacteria (Criteria: 30-day log mean > 126 organisms/100 mL based on at least 5 samples or single sample > 406 organisms/100 mL)**

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DEQ has set the bacteria TMDL to protect human water contact recreation, the most sensitive beneficial use. Urban stormwater discharge and agricultural run-off are two potential sources of bacteria. The bacteria TMDL address the entire area.

303 (d) List/TMDL Approved September 2006  
Calapooia River, River Mile (RM) 0 to 42.8  
Oak Creek, RM 0 to 21.6

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### Mercury TMDL

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Human fish consumption is the most sensitive beneficial use for which DEQ has set the Mercury TMDL. Primary sources of mercury include air deposition from national and international sources, discharge from specific legacy mining sites, and erosion of soils containing mercury. The Mercury TMDL has a basin wide strategy for mercury reduction.

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### Temperature (Criteria: rearing and migration 64 F, spawning 55 F)

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DEQ set the TMDL for temperature to protect salmon spawning, rearing, and passage as the most sensitive beneficial uses in the South Santiam Area. DEQ has identified the existing nonpoint source pollution sources as solar heating of the Area’s waterways due to a lack of riparian vegetation from forestry, agriculture, rural residential, and urban activities. There are separate temperature TMDLs for the mainstem Willamette, the South Santiam, and the Calapooia.

**303 (d) List/TMDL Approved September 2006 (covered under the TMDL)** Beaver Creek, RM 0 to 16  
Cedar Creek, RM 0 to 1.3  
Crabtree Creek, RM 0 to 37.3  
Hamilton Creek, RM 0 to 16.1  
McDowell Creek, RM 0 to 11.3  
Middle Santiam River, RM 0 to 37.2  
Moose Creek, RM 0 to 9.2  
Neal Creek, RM 0 to 10.1  
Quartsville Creek, RM 3.3 to 26.8 (Summer)

Scott Creek, RM 0 to 3  
South Santiam River, RM 0 to 63.4  
Sucker Slough, RM 0 to 9.8  
Thomas Creek, RM 0 to 40  
Wiley Creek, RM 0 to 17.2  
Brush Creek, RM 0 to 6.4  
Calapooia River, RM 0 to 78  
Courtney Creek, RM 0 to 14  
Little Muddy Creek, RM 0 to 12.2  
Muddy Creek, RM 0 to 33.4  
North Fork Calapooia River, RM 0 to 4.3  
Oak Creek, RM 0 to 21.6  
Sodom Ditch, RM 0 to 5.8

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**Dissolved Oxygen (Criteria: DO < 8 mg/L for Cold Water Aquatic Life)**

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**303 (d) List**

Calapooia River, RM .1 to 31.2

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**Flow Modification**

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**303 (d) List (water quality limited, not needing a TMDL)**

Beaver Creek, RM 0 to 16  
Hamilton Creek, RM 0 to 11.6  
Thomas Creek, RM 0 to 16.2  
Calapooia River, RM 0 to 42.8

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**Habitat Modification**

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**303 (d) List (water quality limited, not needing a TMDL)**

Canyon Creek, RM 0 to 13.1  
Middle Santiam River, RM 5.3 to 37.1  
Moose Creek, RM 0 to 9.2  
Quartsville Creek, RM 3.3 to 26.8  
Soda Creek, RM 0 to 2.4  
South Santiam River, RM 35.7 to 63.4  
Squaw Creek, RM 0 to 3.5  
Thomas Creek, RM 0 to 16.2

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**pH**

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**303 (d) List**

Cedar Creek, RM 0 to 1.9

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**Aquatic Weeds or Algae**

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**303 (d) List**

Daly Lake

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## Metals

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### **303(d) List**

#### **Iron**

Calapooia River, RM 0 to 78

#### **Manganese**

Calapooia River, RM 0 to 42.8

#### **Potential Concern**

Calapooia River, RM 0 to 42.8: Arsenic, Chromium, Copper, Manganese, and Nickel

Muddy Creek, RM 0 to 56.1: Iron and Manganese

Truax Creek, RM 0 to 11.3: Iron and Manganese

Murder Creek, RM 0 to 2.8: Iron and Manganese

South Santiam River, RM 0 to 63.5: Manganese

### **Additional Parameters of Potential Concern**

#### **Alkalinity**

Canyon Creek, RM 0 to 13.1

Cedar Creek, RM 0 to 1.3

Coal Creek, RM 0 to 2.2

Crabtree Creek, RM 0 to 37.3

Elk Creek, RM 0 to 1.7

Fitt Creek, RM 0 to 2.2

Rock Creek, RM 0 to 3.4

South Santiam River, RM 0 to 63.5

Wiley Creek, RM 0 to 17.3

Calapooia River, RM 0 to 78

#### **Biological Criteria**

Crabtree Creek, RM 0 to 37.3

#### **Phosphorus**

Calapooia River, RM 0 to 77.9

### **Mainstem Willamette Listings**

Dioxin, Aldrin, DDE, DDT, Dieldrin, PCBs, and Iron



## Appendix D: Average Daily Fecal Coliform Production Rates for Wildlife and Domestic Animal Species

The following daily production rates for fecal coliform were developed by the Virginia Department of Conservation and Recreation and the Virginia Department of Environmental Quality and included in Total Maximum Daily Load documents. While the averages do not specify *E. coli* production rates, the proportions would likely be the same between species.

Species	Average Daily Production of Fecal Coliforms (in millions)
Human	1,950
Pet (dog)	450
Horse	420
Beef Cattle	33,000
Dairy Cattle	25,200
Heifer	11,592
Sheep	27,000
Deer (whitetail)	347
Raccoon	113
Muskrat	25
Beaver	.2
Goose	799
Duck (mallard)	2,430
Wild Turkey	93

(Virginia Tech Department of Biological Systems Engineering, 2000.)



## **Appendix E: Factors that Affect Stream Temperature**

(Krueger et al, 1999)

### **Physical**

Weather

Season

Year

Climate

Cloudiness

Wind

Position on the landscape

Microclimate

Time of day/angle of the sun

Sunlight, shade, reflection

Daytime/nighttime temperatures

Morning temperature

Elevation

Soil temperature

Air temperature

Latent heat

Time of exposure

Penetration of light (short vs. long waves)

### **Stream Structure**

Morphology (differing potentials)

Flow

Gradient

Depth

Volume

Width

Sinuosity

Ponds, glides, riffles (mixing)

### **Local**

Storage (dams)

Effluent (interflow)

Hyporrheic

Soil structure

Soil physics/geology

Streambed

Temperature at the source

Physical limits to heating

Roughness

Debris

Refugia (variation in stream)

Catastrophic events

Condition of uplands

Vegetation +/- (potentials)

Bank stability

Turbidity/pollution

### **Management**

Land uses (roads, agriculture, forestry)

Water management (regulated flows)



## **Appendix F: Focus Area Action Plan**

### ***Crabtree Creek Action Plan*** *Santiam Ag Water Quality Management Area* *Linn SWCD – 2013-2015*

#### **I. INTRODUCTION**

##### **A. Description of Watershed**

The area of interest is the lower portion of Crabtree Creek, south of the city of Scio, Oregon. Looking predominately from Highway 226W to the confluence of Crabtree Creek to the South Santiam.

There are three main land uses in these areas: cropland, pastureland, and headquarters.

In the Crabtree Watershed, cropland operations are highly variable. Producers are able to grow a variety of crops due to soils, access to irrigation, and temperate climate. Crops such as mint, orchards/berries, beans, corn, vegetables and seeds, and grass seed are produced in this area. These crops are considered high input crops and require significant water and nutrients to grow. Most of these crops are located adjacent to waterways to access irrigation. Because of this, these operations have the potential to cause significant impacts to stream/riparian habitat.

##### **B. Basis for Selection of Focus Area**

ODA has identified many conservation opportunities with animal operations through the Agriculture Water Quality Management Area Program. Some of the needs include manure storage facilities, manure transfer, heavy use area protection, fencing, pasture planting, forested riparian buffers, as well as management practices such as nutrient management and prescribed grazing. Linn SWCD is working with ODA to target specific animal operations in order to prioritize the limited resources.

Linn SWCD has worked with several animal operations in this watershed. Some animal operations have used District assistance in obtaining a CNMP. There have also been practices installed such as manure storage buildings, roof runoff structures, heavy use protection areas, underground outlets, pasture plantings, fencing, stream crossing, herbaceous weed control, forested riparian buffers, and associated management practices. The adoption of these practices was successful in protecting on-site water resources. The success of the installation of these practices and the continued demand for these practices is an indicator of probable success in the future.

The Linn Soil and Water Conservation District has participated with NRCS in identifying priority resource concerns. Their focus for applying conservation practices comes from the South Santiam Agricultural Water Quality Management Area Plan (South Santiam AgWQMAP), which was written in association with Oregon Department of Agriculture. Priority areas in the South Santiam AgWQMAP include Thomas Creek, Crabtree Creek, the Lower South Santiam River, as well as other areas in the County. Link to plan:

[http://www.oregon.gov/ODA/NRD/docs/pdf/plans/south\\_santiam\\_2010\\_progrpt.pdf?ga=t](http://www.oregon.gov/ODA/NRD/docs/pdf/plans/south_santiam_2010_progrpt.pdf?ga=t)

The North Santiam Watershed Council, the South Santiam Watershed Council, and the Calapooia Watershed Council each have action plans that identify priority areas in common with this implementation strategy. In particular, the North Santiam Watershed Council has identified Bear Branch Creek as a focus area and the South Santiam Watershed Council has identified Thomas Creek, Crabtree Creek, Hamilton Creek, McDowell Creek, Ames Creek, Burkhart Creek, and One Horse Slough as high

priority. These areas have some of the highest concentrations of animal operations in the county. The watershed councils are actively working to implement conservation practices in these areas that address water quality. The watershed councils are currently monitoring water quality on some of the identified streams and have plans to increase their monitoring efforts.

### C. Water Quality Parameters of Concern

The focus area is within a watershed that is on the 303d list for at least temperature and sediment. ODA has observed poor practices on animal operations within this project area. Many of the agricultural operations in Linn County are in need of improvements to structures, vegetation and management practices in order to protect water quality. Because the number of animal operations is unknown at this time, it is not clear as to exactly how many acres need treatment. Based on past conservation implementation in these areas and measurements taken from maps, it is expected that there is up to 125 acres that need treatment. Some landowners may not yet be ready to implement conservation practices on their property.

### D. Description of Assessment Method(s)

Early in 2013 the Linn Soil and Water Conservation District (Linn SWCD) and NRCS combined forces to inventory streams located within these watersheds and compiled it into a stream matrix. Streams were inventoried based off of six different parameters including: stream type, fish presence, if it is a 303d listed stream, shade presence, potential of nutrient enrichment, and the adjacent land use. Each stream was rated on a 31-70 scale; 70 being a high impact and a 30 being no impact. Linn SWCD and NRCS utilized GIS and aerial images to rate each stream reach and categorized them into high, medium, and low priority. High priority means there are conservation measures that can be taken to improve threatened/endangered aquatic and terrestrial species. Stream reaches with a low priority means that riparian areas and adjacent land uses are properly functioning.

<b>Riparian condition classifications</b>		
Class I rating 31-34 Low Impacts Green	Class II rating 35-53 Moderate Impacts Yellow	Class III rating 54-70 High Impacts Red
Vegetation likely sufficient to moderate solar heating, stabilize streambanks, and filter out pollutants consistent with site capability.	Agricultural activities not impairing riparian growth, but vegetation likely insufficient to moderate solar heating, stabilize streambanks, or filter out pollutants consistent with site capability.	Agricultural activities likely not allowing vegetation to moderate solar heating, stabilize streambanks, or filter out pollutants consistent with site capability.

## II. MEASURABLE OBJECTIVE(S)

The specific goals are to:

Enhance water quality through the adoption and/or increased level of conservation practices in Riparian Class II by 10% of the agricultural operations in the Crabtree Creek sub-watersheds

The district used three assessments within the priority area to focus on both crop and animal operations including temperature, sedimentation and riparian condition. The objective is to reduce any stream area categorized in the red class and to show additional improvement in any yellow classification. The overall goal is to show improvement on 125 acres.

There are three alternatives to be considered:

1. No Action
2. Installation of structural and vegetative improvements on medium and high priority sites to reduce water temperatures, bacteria, and sediment load.
3. Adoption of a resource management system on land adjacent to medium and high priority streams to solve resource concerns that improve threatened and endangered species habitat.

1. No Action

The no action alternative will result in degradation to threatened and endangered species from low levels of management, poor vegetation along streams, and insufficient or outdated structures. No action may also produce harmful effects on fish and wildlife due to continued low stream flows during summer months, and the continued environmental impact of irrigation upon local streams may produce social tension within certain communities. There may be negative effects to soil quality through the mismanagement of manure and land resources. Finally, no action may cause negative perception of farm operations by members of the local communities.

2. Installation of Structural and Vegetative Improvements

Structural improvements such as heavy use area protection, roof runoff structures, and underground outlets can have a positive impact on water quality by reducing the amount of manure loss from the sites. These structures allow for clean water to be moved away from highly disturbed land. However, without management of these areas and associated pasturelands, the full benefits of water quality cannot be reached.

Efficient irrigation systems would likely have a positive impact upon the identified resource concerns. However, installing new equipment without ensuring effective management would not maximize potential for optimal irrigation water use, which might lessen the benefit to local stream flows. This alternative would limit the customer base only to those seeking new irrigation systems and would not provide assistance for those who desire improved management of an existing system. The cost per acre for system improvement-only contracts would be considerably higher than for a management plan or a contract, which includes a combination of installation and management.

By adopting and improving vegetative management plans throughout the implementation area, a positive impact can be made on water quality and quantity in a cost effective, openly available, and timely capacity. These practices can reduce nutrient runoff, increase soil tilth, and allow for more water to remain in streams. The practice will correlate to less erosion, decrease sediment loads in streams and decreased temperature in streams.

While this alternative will do well to accomplish the objectives of the plan, it will miss valuable opportunities to make significant improvements that would be achieved with structural/vegetative improvements.

3. Adoption of a Resource Management System on land adjacent to medium and high priority streams.

This alternative would give producers the opportunity to make an even greater positive impact on water quality and quantity. Positive benefit to water quality will be obtained by replacing old structures that have outlived their useful lifespan, installing new structures to meet current needs, improving vegetative practices, and increasing levels of management. By adding management practices such as nutrient management and prescribed grazing, pastures and buffers will more likely be healthy and functional in order to keep sediment out of surface water and provide shade for streams. This allows for reduced sediment loads, decreased temperatures in streams by allowing

more water to be left in the systems, and a reduction in bacteria from runoff and over-application of nutrients.

This alternative also includes both the option of installing new irrigation systems, increasing management levels and installing structural and vegetative improvement, which extends the availability of this project to more customers. Maximizing the opportunity to reduce irrigation water demands in the area improves the potential to increase summer stream flow for the benefit of endangered or threatened salmon and steelhead, as well as other wildlife. In addition, the cost per acre of this alternative would be less than system improvement-only contracts.

This final option is the preferred alternative as it will address all issues associated with threatened and endangered fish species in the implementation area. See the below list for practices that can be used to address this problem. By installing these practices, water quality will be maintained at first, but over the long term, it will have an improved trend. Water quantity should begin seeing improvement immediately following implementation.

## I. IMPLEMENTATION ACTIVITIES AND TIMELINE

Instructions: The timeframe for implementation should match the timeframe for the current Scope of Work (SOW). Activities should be planned and implemented by quarters, so they can be included in the quarterly SOW reporting. The following items should be included as implementation activities, and tied to specific quarters, but the order and details may vary depending on your focus area:

- Develop the Action Plan
- Conduct pre-assessment of landscape, water quality, or watershed conditions
- Contact agricultural landowners with information on the Agricultural Water Quality Area Plan and Rules and assistance available from SWCD and partners (mailing, personal contacts)
- Conduct targeted outreach, site assessment, and project planning for priority landowners (phone calls, targeted mailing, workshops, door to door)
- Seek funds for project implementation, if needed
- Implement recommended practices
- Conduct post-assessment of conditions
- Report results as percent change

The table can be refined and updated during the biennium based on progress and new information received.

*Example:*

Quarter #	Quarter Ending	Activity	Results	Notes
1	Sept. 2013	*Coordinate efforts with NRCS (EQIP funding pools), FSA's CREP funding and additional funding *Better identify and inventory land use within the priority area to better market education and outreach efforts and focus programs	Coordinated with NRCS to include their priority areas with SWCD priority areas, sought NFWF funding to help with outreach, signed up for ODA online tool for mapping and inventorying priority area, did articles on what priority area is and SB1010 rules.	Worked with ODA on letter for landowners in focus area

<b>2</b>	<b>Dec. 2013</b>	<p>Contact 10 targeted landowners</p> <ul style="list-style-type: none"> <li>*Provide information on AG water quality</li> <li>*Conduct informational interview to assess reasons landowners has not previously been involved in conservation programs</li> <li>*Provide technical assistance</li> <li>*Inform landowner of opportunities; i.e. grant / cost share options</li> </ul>	Coordinated with NRCS to do focused outreach together. Contacted 5 landowners. Seeking funding to do 2 projects with 2 landowners.	Working on a postcard mailing to the priority area with NRCS for mailing in Jan-Feb
<b>3</b>	<b>Mar. 2014</b>	<p>Contact 10 targeted landowners</p> <ul style="list-style-type: none"> <li>*Provide information on AG water quality</li> <li>*Conduct informational interview to assess reasons landowners has not previously been involved in conservation programs</li> <li>*Provide technical assistance</li> <li>*Inform landowner of opportunities; i.e. grant / cost share options</li> </ul>	Contacted 5 landowners. Informed them of SB1010 rules and cost share programs that are available to them. Going through review of on-site evaluations. Providing technical assistance where needed.	Working on targeted outreach brochure. Working with NRCS to target agricultural operators with nutrient issues.
		Develop 1 conservation plan		
<b>4</b>	<b>June 2014</b>	Required reporting		
		<p>Contact 10 targeted landowners</p> <ul style="list-style-type: none"> <li>*Provide information on AG water quality</li> <li>*Conduct informational interview to assess reasons landowners has not previously been involved in conservation programs</li> <li>*Provide technical assistance</li> <li>*Inform landowner of opportunities; i.e. grant / cost share options</li> </ul>	<p>Contacted 10 targeted landowners.</p> <ul style="list-style-type: none"> <li>*provided facts sheets of focus area and SB1010 rules regarding the South Santiam Plan</li> <li>*provided technical assistance</li> <li>*reviewed toolkit of funding mechanisms with landowners</li> </ul>	Seeking RCPP funding to help facilitate on the ground activities in this area.
		Develop 1 conservation plan		
<b>5</b>	<b>Sept. 2014</b>	<p>Contact 10 targeted landowners</p> <ul style="list-style-type: none"> <li>*Provide information on AG water quality</li> <li>*Conduct informational interview to assess reasons landowners has not previously been involved in conservation programs</li> <li>*Provide technical assistance</li> <li>*Inform landowner of opportunities; i.e. grant / cost share options</li> </ul>		
		Required reporting		
<b>6</b>	<b>Dec. 2014</b>	<p>Contact 10 targeted landowners</p> <ul style="list-style-type: none"> <li>*Provide information on AG water quality</li> </ul>		

		*Conduct informational interview to assess reasons landowners has not previously been involved in conservation programs *Provide technical assistance *Inform landowner of opportunities; i.e. grant / cost share options Required reporting		
7	Mar. 2015	Contact 10 targeted landowners *Provide information on AG water quality *Conduct informational interview to assess reasons landowners has not previously been involved in conservation programs *Provide technical assistance *Inform landowner of opportunities; i.e. grant / cost share options Required reporting		
8	June 2015	Post-assessment; provide quantitative results to ODA; information to District board and partners Required reporting		
(After)	Dec. 2015	Present results at Biennial Review		

#### IV. RESULTS

##### A. Pre and Post-Implementation Assessments

Instructions: Summarize the pre-implementation assessment results in a table, using measures that are appropriate for your parameter or surrogate (e.g. stream miles, acres, or percentages). You will use the same table for the post-implementation assessment results later. You may score non-agricultural areas as a separate category if there is a justifiable reason to do so (e.g. show the extent of stream miles with poor riparian vegetation due to non-ag causes).

**The SWCD evaluated the stream acreage, by taxlot, for riparian vegetation, temperature and sedimentation.**

	Percent of Stream Miles within Focus Area		
	2013	2015	2017
Green	10		
Yellow	90		
Red	0		

## Appendix G: Conservation Funding Programs

The following is a list of some conservation funding programs available to landowners and organizations in Oregon. For more information, please refer to the contact agencies for each program. Additional programs may become available after the publication of this document. For more current information, please contact one of the organizations listed below.

<b>Program</b>	<b>General Description</b>	<b>Contact</b>
Conservation Reserve Enhancement Program (CREP)	Provides annual rent to landowners who enroll agricultural lands along water quality limited streams. Also cost-shares conservation practices such as riparian tree planting, livestock watering facilities, and riparian fencing.	NRCS SWCDs Oregon Dept. of Forestry
Conservation Reserve Program (CRP)	Competitive CRP provides annual rent to landowners who enroll highly erodible lands. Continuous CRP provides annual rent to landowners who enroll agricultural lands along seasonal or perennial streams. Also cost-shares conservation practices such as riparian plantings.	NRCS SWCDs
Emergency Watershed Protection Program (EWP)	Available through the USDA-Natural Resources Conservation Service. Provides federal funds for emergency protection measures to safeguard lives and property from floods and the products of erosion created by natural disasters that cause a sudden impairment to a watershed.	NRCS SWCDs
Environmental Protection Agency Section 319 Grants	Fund projects that improve watershed functions and protect the quality of surface and groundwater, including restoration and education projects.	DEQ SWCDs Watershed Councils
Environmental Quality Incentives Program (EQIP).	Cost shares water quality and wildlife habitat improvement activities, including conservation tillage, nutrient and manure management, fish habitat improvements, and riparian plantings.	NRCS SWCDs
Federal Reforestation Tax Credit	Provides federal tax credit as incentive to plant trees.	IRS
Forestry Incentives Program (FIP)	Provides cost sharing for several forest stand improvement practices.	NRCS SWCDs Oregon Dept. of Forestry
Forest Resource Trust	State assistance up to 100 percent of the costs to convert non-stocked forestland to timber stands. Available to non-industrial private landowners.	Oregon Dept. of Forestry

<b>Program</b>	<b>General Description</b>	<b>Contact</b>
Oregon Watershed Enhancement Board (OWEB).	Provides grants for a variety of restoration, assessment, monitoring, and education projects, as well as watershed council staff support. 25% local match requirement on all grants.	SWCDs OWEB Watershed Councils
Oregon Watershed Enhancement Board Small Grant Program.	Provides grants up to \$10,000 for priority watershed enhancement projects identified by local focus group.	SWCDs OWEB Watershed Councils
Partners for Wildlife Program.	Provides financial and technical assistance to private and non-federal landowners to restore and improve wetlands, riparian areas, and upland habitats in partnership with the U.S. Fish and Wildlife Service and other cooperating groups.	U.S. Fish and Wildlife Service NRCS SWCDs
Public Law 566 Watershed Program	Program available to state agencies and other eligible organizations for planning and implementing watershed improvement and management projects. Projects should reduce erosion, siltation, and flooding; provide for agricultural water management; or improve fish and wildlife resources.	NRCS SWCDs
Resource Conservation & Development (RC & D) Grants	Provides assistance to organizations within RC & D areas in accessing and managing grants.	Resource Conservation and Development
State Forestation Tax Credit	Provides for reforestation of under-productive forestland not covered under the Oregon Forest Practices Act. Situations include brush and pasture conversions, fire damage areas, and insect and disease areas.	Oregon Dept. of Forestry
State Tax Credit for Fish Habitat Improvements	Provides tax credit for part of the costs of voluntary fish habitat improvements and required fish screening devices.	Oregon Dept. of Fish and Wildlife
Stewardship Incentive Program (SIP).	Cost sharing program for landowners to protect and enhance forest resources. Eligible practices include tree planting, site preparation, pre-commercial thinning, and wildlife habitat improvements.	NRCS SWCDs Oregon Dept. of Forestry
Wetlands Reserve Program (WRP)	Provides cost sharing to landowners who restore wetlands on agricultural lands.	NRCS SWCDs
Wildlife Habitat Tax Deferral Program	Maintains farm or forestry deferral for landowners who develop a wildlife management plan with the approval of the Oregon Department of Fish and Wildlife.	NRCS SWCDs Oregon Dept. of Fish and Wildlife