South Santiam Agricultural Water Quality Management Area Plan

Developed by the:

South Santiam Local Advisory Committee

Oregon Department of Agriculture

With support from the:

Linn Soil and Water Conservation District

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Acronyms and Terms Used in this Document

Ag Water Quality Program – Agricultural Water Quality Management Program
Area Plan – Agricultural Water Quality Management Area Plan
Area Rules – Agricultural Water Quality Management Area Rules
CAFO – Confined Animal Feeding Operation
CNPCP – Coastal Nonpoint Pollution Control Program
CWA – Clean Water Act
CZARA – Coastal Zone Act Reauthorization Amendments
DEQ – Oregon Department of Environmental Quality
GWMA – Groundwater Management Area
HUC – Hydrologic Unit Code
LAC – Local Advisory Committee
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
ODFW – Oregon Department of Fish and Wildlife
ORS – Oregon Revised Statute
OWEB – Oregon Watershed Enhancement Board
PMP – Pesticides Management Plan
PSP – Pesticides Stewardship Partnership
Regulations – Agricultural Water Quality Management Area Regulations
RUSLE – Revised Universal Soil Loss Equation
SWCD – Soil and Water Conservation District
T – Soil Loss Tolerance Factor
TMDL – Total Maximum Daily Load
USDA – United States Department of Agriculture
US EPA – United States Environmental Protection Agency
WQPMT – Water Quality Pesticides Management Team

Foreword

This Agricultural Water Quality Management Area Plan (Area Plan) provides guidance for addressing agricultural water quality issues in the South Santiam Agricultural Water Quality Management Area. The purpose of this Area Plan is to identify strategies to prevent and control water pollution from agricultural lands through a combination of educational programs, suggested land treatments, management activities, compliance, and monitoring.

The provisions of this Area Plan do not establish legal requirements or prohibitions, as described in Oregon Revised Statute (ORS) 568.912(1).

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 (Oregon Administrative Rule (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 the Oregon Department of Agriculture (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 Agricultural Water Quality Management Program.

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

Chapter 3: Local Goals, Objectives, and Implementation Strategies. Chapter 3 presents goal(s), measurable objectives and timelines, and strategies to achieve the goal(s) and objectives.

Chapter 4: Local Implementation, Monitoring, and Adaptive Management. ODA and the Local Advisory Committee (LAC) will work with partners to summarize land condition and water quality status. Trends are summarized 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), this Area Plan guides landowners and partners such as Soil and Water Conservation Districts (SWCDs) in addressing local agricultural water quality issues. The purpose of this Area Plan is to identify strategies to prevent and control water pollution from agricultural activities and soil erosion (ORS 568.909(2)) on agricultural and rural lands for the area within the boundaries of the Management Area (OAR 603-090-0000(3)) and to achieve and maintain water quality standards (ORS 561.191(2)). This Area Plan has been developed and revised by ODA, the LAC, with support and input from the SWCD and the Oregon Department of Environmental Quality (DEQ). Throughout the development and revision processes, the public was invited to participate. This included public comment at meetings and public hearings during the Area Plan approval process. This Area Plan is implemented using a combination of outreach and education, conservation and management activities, compliance, monitoring, evaluation, and adaptive management.

The provisions of this Area Plan do not establish legal requirements or prohibitions (ORS 568.912(1)). Each Area Plan is accompanied by OAR regulations 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 (OARs 603-090-0000 to 603-090-0120) and under the regulations for this Management Area (OARs 603-095-2400 to 603-090-2460). The Ag Water Quality Program's general OARs guide the Ag Water Quality Program, and the OARs for the Management Area are the regulations that landowners must follow.

This Area Plan and its associated regulations apply to all agricultural activities on non-federal and non-Tribal Trust land within the Management Area, including:

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

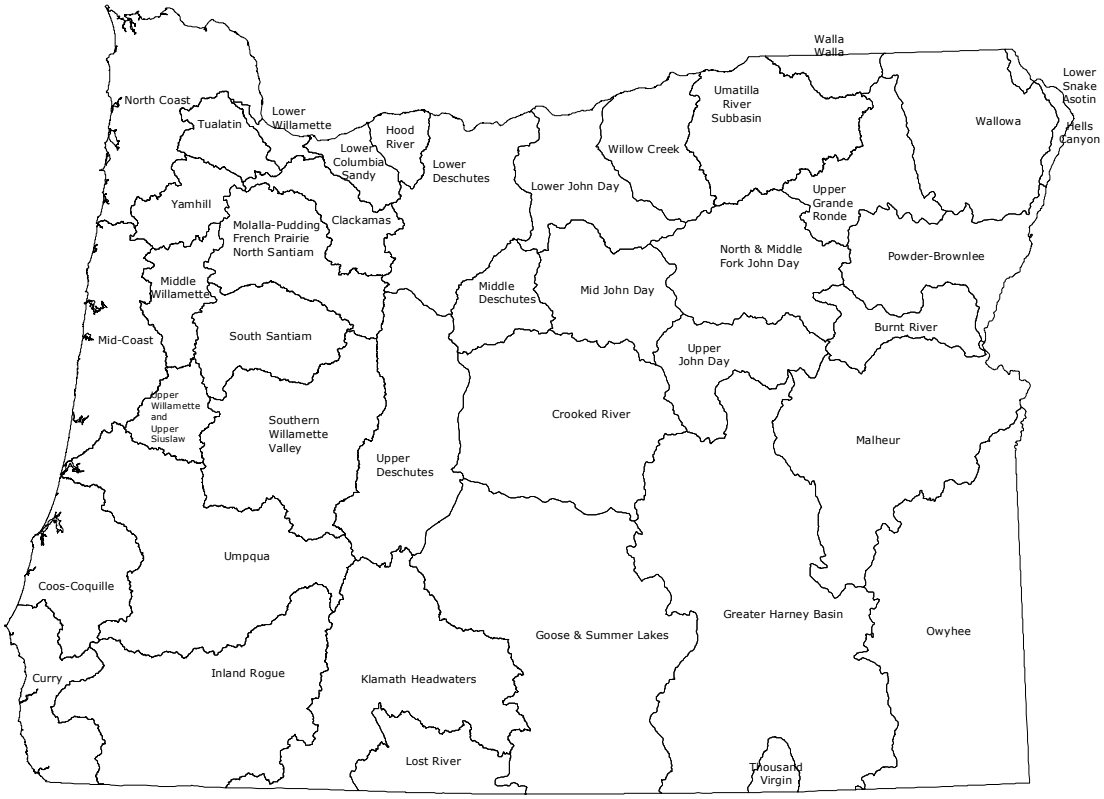
1.2 History of the Ag Water Quality Program

In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act, directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion, and to achieve water quality standards (ORS 568.900 through ORS 568.933). Senate Bill 502 was passed in 1995 to clarify that ODA regulates agriculture with respect to water quality (ORS 561.191). This Area Plan and its associated regulations were developed and subsequently revised pursuant to these statutes.

Between 1997 and 2004, ODA worked with LACs and SWCDs to develop Area Plans and associated regulations 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 regulations.
- Conducting biennial reviews of Area Plans and regulations.
- Monitoring, evaluation, and adaptive management.
- Developing partnerships with SWCDs, state, federal, and tribal agencies, watershed councils, and others.

Figure 1: Map of 38 Agricultural Water Quality Management Areas



1.3 Roles and Responsibilities

1.3.1 Oregon Department of Agriculture (ODA)

ODA is the agency responsible for implementing the Ag Water Quality Program (ORS 568.900 to 568.933, ORS 561.191, OAR 603-090, and OAR 603-095). The Ag Water Quality Program is intended to meet the needs and requirements related to agricultural water pollution, including:

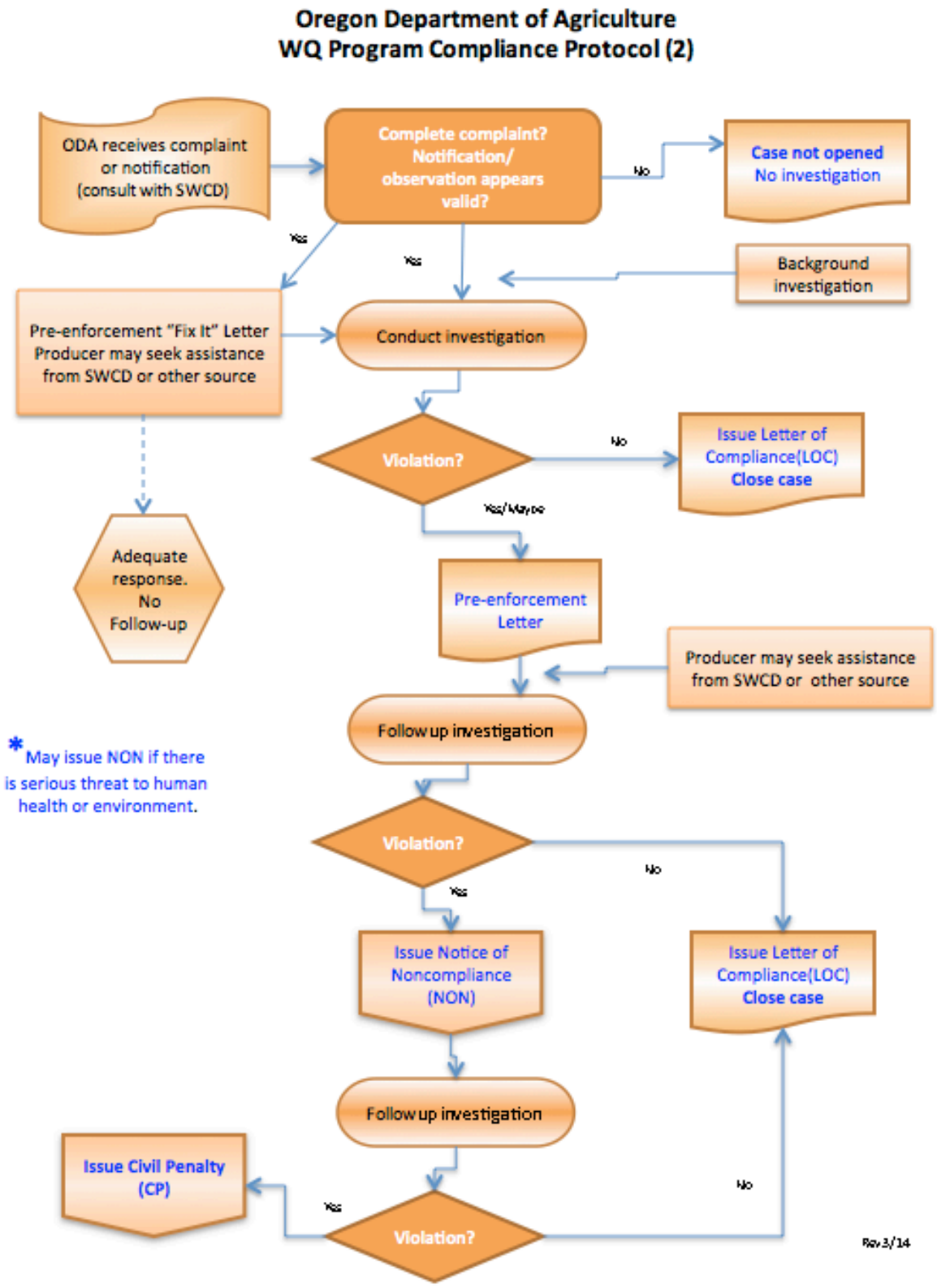
- State water quality standards.
- Load allocations for agricultural nonpoint source pollution assigned under Total Maximum Daily Loads (TMDLs) issued pursuant to the Clean Water Act (CWA), Section 303(d).
- Approved management measures for Coastal Zone Act Reauthorization Amendments (CZARA).
- Agricultural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

ODA has the legal authority to develop and implement Area Plans and associated regulations 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 will base Area Plans and regulations 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 associated regulations. ODA has responsibility for any actions related to enforcement or determination of noncompliance with regulations (OAR 603-090-0080 through OAR 603-090-0120). ORS 568.912(1) and ORS 568.912(2) give authority to ODA to adopt regulations that require landowners to perform actions necessary to prevent and control pollution from agricultural activities and soil erosion.

The emphasis of this Area Plan is on voluntary action by landowners or operators to control the factors effecting water quality in the Management Area. The regulations are outlined as a set of minimum standards that must be met on all agricultural or rural lands. Landowners and operators who fail to address these regulations may be subject to enforcement procedures, which are outlined below.

Enforcement Action—ODA will use enforcement mechanisms where appropriate and necessary to gain compliance with water quality regulations. Any enforcement action will be pursued only when reasonable attempts at voluntary solutions have failed. If a violation is documented, ODA may issue a pre-enforcement notification or an Order such as a Notice of Noncompliance. If a Notice of Noncompliance is issued, the landowner or operator will be directed by ODA to remedy the condition through required corrective actions under the provisions of the enforcement procedures outlined in OAR 603-090-060 through OAR 603-090-120. If a landowner does not implement the required corrective actions, civil penalties may be assessed for continued violation of the regulations. See the Compliance Flow Chart for a diagram of the compliance process. If and when other governmental policies, programs, or regulations conflict with this Area Plan or associated regulations, ODA will consult with the agency(ies) and attempt to resolve the conflict in a reasonable manner.

Figure 2: Compliance Flow Chart



1.3.2 Local Management Agency

A Local Management Agency is an organization that ODA has designated to implement an Area Plan (OAR 603-090-0010). The legislative intent is for SWCDs to be Local Management Agencies 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 who voluntarily address natural resource concerns. Currently, all Local Management Agencies in Oregon are SWCDs.

The day-to-day implementation of the Area Plan is accomplished through an intergovernmental agreement between ODA and each SWCD. Each SWCD implements the Area Plan by providing outreach and technical assistance to landowners. SWCDs also work with ODA and the LAC to establish implementation priorities, evaluate progress toward meeting Area Plan goals and objectives, and revise the Area Plan and associated regulations as needed.

1.3.3 Local Advisory Committee (LAC)

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

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

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

1.3.4 Agriculture's Role

Each individual landowner or operator in the Management Area is required to comply with the regulations, which set minimum standards. However, the regulations alone are not enough. To achieve water quality standards, individual landowners also need to attain land conditions that achieve the goals and objectives of the voluntary Area Plan. Each landowner or operator is not individually responsible for achieving water quality standards, agricultural pollution limits, or the goals and objectives of the Area Plan. These are the responsibility of the agricultural community collectively.

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

Area regulations only address impacts that result from agricultural activities. A landowner is responsible for only those conditions caused by activities conducted on land managed by the landowner or occupier. Conditions resulting from unusual weather events or other circumstances not within the reasonable control of the landowner or operator are considered when making compliance decisions. Agricultural landowners may be responsible for some of the above impacts under other legal authorities.
Under the Area Plan and associated regulations, agricultural landowners and operators are not responsible for mitigating or addressing factors that do not result from agricultural activities, such as:

- 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.

1.3.5 Public Participation

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

ODA, LACs, and SWCDs conduct biennial reviews of the Area Plans and regulations. Partners, stakeholders, and the general public are invited to participate in the process. Any future revisions to the regulations will include a public comment period and a public hearing.

1.4 Agricultural Water Quality

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 pesticide applications in, over and within three feet of water. Many CAFOs are regulated under ODA's CAFO Program. Irrigation water discharges may be at a defined discharge point, but does not currently require a permit.

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

1.4.2 Beneficial Uses and Parameters of Concern

Beneficial uses of clean water 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 are usually fish and aquatic life, water contact recreation, and public and private domestic water supply. These uses are generally the first to be impaired as a water body is polluted, 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 contribute to the impairment of beneficial uses in the Management Area. Beneficial uses that have the potential to be impacted in this Management Area are summarized in Chapter 2.

Many water bodies throughout Oregon do not meet state water quality standards. These water bodies may or may not have established water quality management plans documenting needed 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, nitrates, pesticides, and mercury. These parameters vary by Management Area and are summarized in Chapter 2.

1.4.3 Impaired Water Bodies and Total Maximum Daily Loads (TMDLs)

Every two years, the DEQ is required by the federal Clean Water Act (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. DEQ, in accordance with the CWA, is required to establish TMDLs for pollutants on the 303(d) list.

A TMDL includes an assessment of water quality data and current conditions and describes a plan to restore polluted waterways to conditions that meet water quality standards. TMDLs specify the daily amount of pollution that a water body can receive and still meet water quality standards. Through the TMDL, point sources are assigned pollution limits as "waste load allocations" in permits, while nonpoint sources (agriculture, forestry, and urban) are assigned pollution limits as "load allocations." TMDLs are legal orders issued by the DEQ, so parties assigned waste or load allocations are legally required to meet them. The agricultural sector is responsible for meeting the pollution limit (load allocation) assigned to agriculture specifically, or to nonpoint sources in general, as applicable.

TMDLs generally apply to an entire basin or subbasin, and not just to an individual water body on the 303(d) list. Once a TMDL is developed for a basin, the basin's impaired water bodies are removed from the 303(d) list, but they remain on the list of impaired water bodies. When data show that water quality standards have been achieved, water bodies will be identified on the list of water bodies that are attaining water quality standards.

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

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

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

Senate Bill 502 was passed in 1995, authorizing ODA as the state agency responsible for regulation of farming activities for the purpose of protecting water quality. A Department of Justice opinion dated July 10, 1996, states that "...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."

To implement Senate Bill 502, ODA incorporated ORS 468B into all of the Area Plans and associated regulations in the state. A Department of Justice opinion, dated September 12, 2000, clarifies that ORS 468B.025 applies to point and nonpoint source pollution.

ORS 468B.025 states that:

> "(1) ...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."

The aspects of ORS 468B.050 that apply to the Ag Water Quality Program, state that:

> "(1) Except as provided in ORS 468B.053 or 468B.215, without holding a permit from the Director of the Department of Environmental Quality or the State Department of Agriculture, which permit shall specify applicable effluent limitations, a person may not:
>
> > (a) Discharge any wastes into the waters of the state from any industrial or commercial establishment or activity or any disposal system."

Definitions (ORS 468B.005)

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

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

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

1.4.5 Streamside Vegetation and Agricultural Water Quality

Across Oregon, the Ag Water Quality Program emphasizes streamside vegetation protection and enhancement to prevent and control agricultural water pollution. Streamside vegetation provides three primary water quality functions: shade for cooler stream temperatures, streambank stability, and filtration of pollutants. Other water quality functions include: water storage for cooler and later season flows, sediment trapping that builds streambanks and floodplains, narrowing and deepening of channels, and biological uptake of sediment, organic material, nutrients, and pesticides.

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

- Streamside vegetation improves water quality related to multiple pollutants, including: temperature (heat), sediment, bacteria, nutrients, toxics, and pesticides.

- Streamside vegetation provides fish and wildlife habitat.
- Landowners can improve streamside vegetation in ways that are compatible with their operation.
- Streamside vegetation condition can be monitored readily to track the status and trends of agriculture's progress in addressing water quality concerns.

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 (e.g., channelization, roads, invasive species, modified flows, past 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, NRCS soil surveys, and 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 all streams flowing through agricultural lands. The agricultural water quality regulations for each Management Area require that agricultural activities provide water quality functions consistent with what the site would provide with site-capable vegetation.

In some cases, for narrow streams, mature site-capable vegetation may not be needed. For example, shrubs and grass may provide shade, protect streambanks, and filter pollutants. However, on larger streams, mature vegetation is important.

1.5 Other Water Quality Programs

1.5.1 Confined Animal Feeding Operation (CAFO)

ODA is the lead state agency for the CAFO Program. The CAFO Program was developed to ensure that operators and producers do not contaminate ground or surface water with animal manure. Since the early 1980s, CAFOs have been registered to a general Water Pollution Control Facility permit designed to protect water quality, while allowing the operators and producers to remain economically viable. A properly maintained CAFO does not pollute ground or surface water. To assure continued protection of ground and surface water, ODA was directed by the 2001 Oregon State Legislature to convert the CAFO Program from a Water Pollution Control Facility permit program to a federal National Pollutant Discharge Elimination System (NPDES) program. ODA and DEQ jointly issued a NPDES CAFO Permit in 2003 and 2009. The 2009 permit will expire in May 2014, and it is expected that a new permit will be issued at that time. The NPDES CAFO Permit is compliant with all Clean Water Act requirements for CAFOs; it does allow discharge in certain circumstances as long as the discharge does not violate Water Quality Standards.

Oregon NPDES CAFO Permits require the registrant to operate according to a site-specific, ODA approved, Animal Waste Management Plan that is incorporated into the NPDES CAFO Permit by reference. CAFO NPDES Permits protect both surface and ground water resources.

1.5.2 Drinking Water Source Protection

Oregon implements its drinking water protection program through a partnership between DEQ and the Oregon Health Authority. The program provides individuals and communities with information on how to protect the quality of Oregon's drinking water. DEQ and the Oregon Health Authority encourage community-based protection and preventive management strategies to ensure that all public drinking water resources are kept safe from future contamination. For more information see:

www.deq.state.or.us/wq/dwp/dwp.htm. Agricultural activities are required to meet those water quality standards that contribute the safe drinking water.

1.5.3 Groundwater Management Areas (GWMAs)

Groundwater Management Areas are designated by DEQ when groundwater in an area has elevated contaminant concentrations resulting, at least in part, from nonpoint sources. Once the GWMA is declared, a local groundwater management committee comprised of affected and interested parties is formed. The committee then 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. These include the Lower Umatilla Basin GWMA, the Northern Malheur County GWMA, and the Southern Willamette Valley GWMA. Each GWMA has a voluntary Action Plan to reduce nitrate concentrations in groundwater. If after a scheduled evaluation point DEQ determines that the voluntary approach is not effective, then mandatory requirements may become necessary.

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, DEQ, and the Oregon Health Authority. 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 can be addressed through multiple programs and partners, including the PSP Program described above.

Through the PSP Program, state agencies and local partners work together to monitor pesticides in streams and to improve water quality (www.deq.state.or.us/wq/pesticide/pesticide.htm). DEQ, ODA, 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. There has been noteworthy progress since 2000 in reducing pesticide concentrations and detections.

ODA led the development and implementation of a Pesticides Management Plan (PMP) for the state of Oregon (www.oregon.gov/ODA/PEST/water_quality.shtml). 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. The PMP sets forth a process for preventing and responding to pesticide detections in Oregon's ground and surface water resources by managing the pesticides that are currently approved for use by the U.S. EPA and Oregon in both agricultural and non-agricultural settings.

1.5.5 The Oregon Plan for Salmon and Watersheds

In 1997, Oregonians began implementing the Oregon Plan for Salmon and Watersheds referred to as the Oregon Plan (www.oregon-plan.org). The Oregon Plan seeks to restore native fish populations, improve

watershed health, and support communities throughout Oregon. The Oregon Plan has a strong focus on salmon, because they have such 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 associated regulations throughout Oregon.

1.6 Partner Agencies and Organizations

1.6.1 Oregon Department of Environmental Quality (DEQ)

The U.S. EPA has delegated authority to DEQ under the CWA authority for protection of water quality in Oregon. In turn, DEQ is the lead state agency with overall authority to regulate for water quality in Oregon. DEQ coordinates with other state agencies, including ODA and Oregon Department of Forestry, to meet the needs of the CWA. DEQ sets water quality standards and develops TMDLs for impaired waterbodies. In addition, DEQ develops and coordinates programs to address water quality including National Pollution Discharge Elimination Permits (for point sources), 319 program, Source Water Protection, 401 Water Quality Certification, and GWMAs. DEQ also coordinates with ODA to help ensure successful implementation of Area Plans as part of its 319 program.

DEQ designated ODA as the Designated Management Agency for water pollution control activities on agricultural and rural lands in the state of Oregon to coordinate meeting agricultural TMDL load allocations. A Memorandum of Agreement (MOA) between DEQ and the ODA recognizes that ODA is the agency responsible for implementing the Ag Water Quality Program established under ORS 568.900 to ORS 568.933, ORS 561.191, and OAR Chapter 603, Divisions 90 and 95. The MOA between ODA and DEQ was updated in 2012 and describes how the agencies will work together to meet agricultural water quality requirements.

The MOA includes the following commitments:

- ODA will develop and implement a monitoring strategy, as resources allow, in consultation with DEQ.
- ODA will evaluate Area Plans and regulation effectiveness in collaboration with DEQ.
    - ODA will determine the percentage of lands achieving compliance with Management Area regulations.
    - 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 with the objective of determining:
    - 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 Plan.
    - Whether the rate of progress is adequate to achieve the goals of the Area Plan.

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 its associated regulations. The petition must allege with reasonable specificity that the Area Plan or associated regulations are not adequate to achieve applicable state and federal water quality standards (ORS 568.930(3)(a)).

1.6.2 Other Partners

ODA and SWCDs work in close partnership with local, state, and federal agencies and organizations, including: DEQ (as indicated above), the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) and Farm Service Agency, watershed councils, Oregon State University Extension Service, livestock and commodity organizations, conservation organizations, and

local businesses. As resources allow, SWCDs and local partners provide technical, financial, and educational assistance to individual landowners for the design, installation, and maintenance of effective management strategies to prevent and control agricultural water pollution.

1.7 Measuring Progress

Agricultural landowners and operators have implemented 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 this progress. ODA is working with SWCDs, LACs, and our partners to develop and implement objectives and strategies that will produce measurable outcomes for agricultural water quality.

1.7.1 Measurable Objectives

Measurable objectives allow the Ag Water Quality Program to better evaluate progress toward meeting water quality standards and load allocations where TMDLs have been completed. Many of these measurable objectives relate to land condition and are mainly implemented through focused work in small geographic areas (section 1.7.3). The measurable objectives for this Area Plan are in Chapter 3, and progress toward achieving the objectives is summarized in Chapter 4.

At a minimum, the measurable objectives of the Ag Water Quality Program and this Area Plan are to:

- Increase the percentage of lands achieving compliance with the regulations.
- Increase the percentage of lands meeting desired land conditions outlined in the Area Plan.

1.7.2 Land Condition and Water Quality

Land conditions can serve as useful surrogates (indicators) for water quality parameters. For example, streamside vegetation is generally 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 nutrients, because many pesticides and nutrients adhere to sediment particles.

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

- Landowners can see land conditions and have direct control over them.
- It can be difficult to separate agriculture's influence on water quality from other land uses.
- It requires extensive monitoring of water quality at an intensive temporal scale to evaluate progress; it is expensive and may fail to demonstrate short-term improvements.
- Improved land conditions can be documented immediately, but there may be a significant lag time or a need for more extensive implementation before water quality improves.
- Agricultural improvements in water pollution are primarily through improvements in land and management conditions.

Water quality monitoring data may help ODA and partners to measure progress or identify problem areas in implementing the Area Plan; although, as described above, it may be less likely to evaluate 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 significant water quality or land condition concerns that are associated with agriculture. ODA's intent in selecting Focus Areas is to deliver systematic, concentrated outreach and technical assistance in small geographic areas ("Focus Areas") through the SWCDs. A key component of this approach is measuring conditions before and after implementation to document the progress made with available resources. The focused implementation approach is consistent with other agencies' and organizations' efforts to work proactively in small geographic areas, and is supported by a large body of scientific research (e.g., Council for Agricultural Science and Technology, 2012).

Systematic implementation in Focus Areas can provide 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 the appropriate source specific conservation practices and demonstrate the effectiveness of these conservation practices.
- A higher density of projects allows neighbors to learn from neighbors.
- A higher density of prioritized projects leads to greater connectivity of projects.
- Limited resources are used more effectively and efficiently.
- Work in one Focus Area, followed by other Focus Areas, will eventually cover the entire Management Area.

SWCDs choose a Focus Area in cooperation with ODA and other partners. In some cases, a Focus Area is selected because of efforts already underway or landowner relationships already established. The scale of the Focus Area matches the SWCD's capacity to deliver concentrated outreach and technical assistance, and to complete (or initiate) projects over a biennium. The current Focus Area for this Management Area is described in Chapter 3.

Working within a Focus Area is not intended to prevent implementation within the remainder of the Management Area. The remainder of the Management Area will continue to be addressed through general outreach and technical assistance.

Strategic Implementation Areas

Strategic Implementation Areas are small watersheds selected by ODA, in cooperation with partners, and after review of water quality and other available information. ODA leads the assessment of current conditions and the landowner outreach. Strategic Implementation Areas and Focus Areas are both tools to concentrate efforts in small geographic areas to achieve water quality standards. As with Focus Areas, SWCDs and partners work with landowners to improve conditions that may impact water quality. However, Strategic Implementation Areas also have a compliance evaluation and assurance process that allows ODA to proactively gain compliance with Ag water quality regulations.

1.8 Implementation, Monitoring, Evaluation, and Adaptive Management

Implementation of the Area Plan and associated regulations will be assessed by evaluating the status and trends in agricultural land conditions. Measurable objectives will be assessed across the entire Management Area and within the Focus Area. ODA conducts land condition and water quality monitoring at the statewide level and will analyze this and other agencies' and organizations' local monitoring data. The results and findings will be summarized in Chapter 4 for each biennial review. ODA, DEQ, SWCDs, and LACs will examine these results during the biennial review and will revise the goal(s), objectives, and strategies in Chapter 3, as needed.

1.8.1 Statewide Aerial Photo Monitoring of Streamside Vegetation

Starting in 2003, ODA began evaluating streamside vegetation conditions using aerial photos acquired specifically for this purpose. ODA focuses on land condition monitoring efforts on streamside areas because these areas have such a broad influence over water quality. Stream segments representing 10 to 15 percent of the agricultural lands in each Management Area were randomly selected for monitoring. ODA examines streamside vegetation at specific points in 90-foot bands along the stream from the aerial photos and assigns each sample stream segment a score based on ground cover. The score can range from 70 (all trees) to 0 (all bare ground). The same stream segments are re-photographed and re-scored every five years to evaluate changes in streamside vegetation conditions over time. Because site capable vegetation varies across the state, there is no one correct riparian index score. The main point is to measure positive or negative change. The results are summarized in Chapter 4 of the Area Plan.

1.8.2 Agricultural Ambient Water Quality Monitoring Assessment

ODA currently evaluates water quality data from monitoring sites in DEQ's water quality database that reflects agricultural influence on water quality. These data are also published in the DEQ water quality database and evaluated at the statewide level to determine trends in water quality at agricultural sites statewide. Results from monitoring sites in the Management Area, along with local water quality monitoring data, are described in Chapter 4.

1.8.3 Biennial Reviews and Adaptive Management

The Area Plan and associated regulations 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 associated regulations. This evaluation includes enforcement actions, landscape and water quality monitoring, and outreach efforts over the past biennium across the Management Area and for the Focus Area. In addition, progress toward achieving agricultural load allocations may be documented (if a TMDL has been established). As a result of the biennial review, the LAC submits a report to the Board of Agriculture and the director of ODA. This report describes progress and impediments to implementation, and recommendations for modifications to the Area Plan or associated regulations necessary to achieve the purpose of the Area Plan. The results of this evaluation will be used to update the goal(s), measurable objectives, and strategies in Chapter 3.

Chapter 2: Local Background

2.1 Local Roles and Responsibilities

2.1.1 Local Advisory Committee (LAC)

This Area Plan was developed with the assistance of a LAC. The LAC was formed in 2001 to assist with the development of the Area Plan and regulations and with subsequent biennial reviews. Current members are:

LAC Member	Area/Watershed	Affiliation
Clint Bentz	Scio, South Santiam	Small woodlands, trout farm
Karren Cholewinski	Coburg, Calapooia	Horses
	Albany, Calapooia	Manager, Wilbur-Ellis Co.
Charles Knoll	Albany, Calapooia & South Santiam	County Engineer, Linn Co. Road Department
Sudy Lamb	Brownsville, Calapooia	Cattle, sheep, alfalfa, grass hay
John Marble	Sweet Home, Calapooia	Beef cattle, grass, timber, drinking water/wastewater consultant
Liz VanLeeuwen	Halsey, Calapooia	Grass seed

2.1.2 Local Management Agency

The implementation of this Area Plan is accomplished through an Intergovernmental Agreement between ODA and the Linn SWCD. This Intergovernmental Agreement defines the SWCD as the Local Management Agency for implementation of the Area Plan. The SWCD was/were also involved in development of the Area Plan and associated regulations.

2.2 Area Plan and Regulations: Development and History

ODA, the Linn SWCD, and other partners began soliciting community participation before the development of Area Plan and Rules. The SWCD prepared press releases to encourage participation on the LAC, and also spoke about the Area Plan and Rules development process at meetings of local organizations such as watershed councils and agricultural groups. The Linn County OSU Extension and Linn SWCD hosted an information session in early 2000 to inform grass seed growers of the Area Plan and Rules development process.

During the Area Plan and Rules development process, interested members of the public received announcements of all committee meetings. Meetings were publicized in local newspapers and publications, and ODA and Linn SWCD staff provided updates on the process to local watershed councils and other organizations.

Upon completion of a draft Area Plan and Rules, the Linn SWCD hosted two public information sessions and submitted press releases and radio announcements to local media. The draft Area Plan and Rules were available on ODA's website, and were also mailed to interested parties throughout the Management Area.

In September and October 2002, ODA conducted a public comment period on the draft Area Plan and Rules, which included a public hearing in Albany. After the public comment period, the LAC met again to discuss the comments with ODA and determine how to address the comments in the final Area Plan and Rules.

As the Area Plan and the Area Rules are evaluated as part of the periodic review process, ODA, the Linn SWCD, and other partners will continue to conduct outreach and education to the public and especially to agricultural producers. For more information on outreach and education efforts on the Area Plan and Rules, please consult Section 4 of the Area Plan.

The Area Plan and regulations were approved by the director of ODA in November 1, 2002.

Since approval, the LAC met in 2006, 2008, 2010, and 2012 to review the Area Plan and regulations. The review process included assessment of the progress of Area Plan implementation toward achievement of Plan goals and objectives.

Three years after approval of the Area Plan and adoption of the Area Rules in 2002, the LAC met to review and update the Area Plan and Rules. The LAC added educational information to the Area Plan about new water quality parameters of concern and updated information about sources of technical and financial assistance. The LAC agreed that the existing Area Rules were adequate to address water quality concerns within the area.

The LAC met again in 2008 to review the Area Plan and Rules. The LAC felt that the Area Plan was working well to address agricultural pollution issues and that a voluntary, outcome-based approach with an enforcement backstop is the best method to work with landowners in the Management Area. The LAC also emphasized that the partnerships within the Management Area between the Linn SWCD, ODA, OSU Extension, and the watershed councils are key in the successful implementation of the Area Plan.

The LAC met on September 29, 2010, and updated information in the Area Plan related to the GWMA, added targets, and added optional management practices for nutrient and irrigation efficiencies. At the review, the LAC recognized that there is a need for funding for monitoring. Monitoring is needed to determine baseline conditions and agricultural contributions to water quality. The LAC again concluded that the existing Area Rules were adequate to address water quality concerns within the area.

The LAC met on September 26, 2012. Information on TMDL load allocations, priority areas, evaluation of Area Plan implementation, monitoring, and research was updated in the Area Plan. At the review, only three LAC members were present. Those present asked that all members be contacted to confirm interest in continued participation. The LAC also asked that the audience of the Area Plan and the purpose of the LAC be better defined and communicated back to the LAC.

The LAC will meet again in two years to review the Area Plan and Rules. The LAC, ODA, and the LMA will evaluate the effectiveness of the Area Plan in improving water quality and land conditions, include the evaluation results in the next update of the Area Plan, and summarize the results in a biennial report to the Oregon Board of Agriculture. ODA, the LMA, and the LAC will discuss the monitoring and evaluation results at the next biennial review, what these results mean in terms of Area Plan effectiveness, and modifications to the Area Plan and Rules.

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, 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.

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 1 lists the size and major tributaries of watersheds in the Management Area.

Table 1. Area and major tributaries of Management Area watersheds.

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

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

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). 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).

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

Table 2. Land use in Linn County by acres (Oregon Geospatial Data Clearinghouse, 2001). 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
Pasture/rangeland	76,251	5.9
Forest	881,656	69
Urban	13,522	1.1
Water	8,212	0.7
Other	8,138	0.6
Total	1,281,874	100

Table 3. Acres of grass grown for seed in Linn County in 2011 (extension.oregonstate.edu/linn/node/37).

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%

Table 4. Livestock in Linn County in 2011 (extension.oregonstate.edu/linn/node/37).

Livestock type	Number of animals	% Change from 2009
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

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, Halsey is located along a tributary of Muddy Creek and Tangent is location along an unnamed tributary to Lake Creek. Rural communities in the Calapooia and Muddy Creek watersheds include Calapooia, Cartney, Crawfordsville, Fayetteville, Holley, Miller, Mitchell, Munson, Plainview, Potter, Rowland, and Shedd. In the South Santiam, the cities of Lebanon, Sodaville, Sweet Home, and Waterloo are located along the mainstem, and Scio is along Thomas Creek. Unincorporated communities in the South Santiam watershed include Cascadia, Draperville, Foster, Fry, Narrows, Rock Hill, and Santiam Terrace.

Land Ownership

Private lands make up the largest portion of the Management Area. Other major landowners include the United States Forest Service (USFS) and the Bureau of Land Management (BLM). Table 5 summarizes land ownership in the Management Area.

Table 5. Land Ownership in the Management Area (Oregon Geospatial Data Clearinghouse, 2001).

Landowner/Manager	Acres	Percent of Land
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	.04
U.S. Army Corps of Engineers	500	.04
U.S. Fish and Wildlife	350	.02
Other	7,650	.8
Total	1.1 million	100

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 6.

Table 6. Average annual, summer, and winter flows in cubic feet per second (cfs) for the South Santiam and Calapooia watersheds (U.S. Geological Survey, 2000).

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

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, Lacomb Ditch diverts water from Crabtree Creek to Beaver Creek.

Municipal Use

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

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

Agricultural Water Control Districts

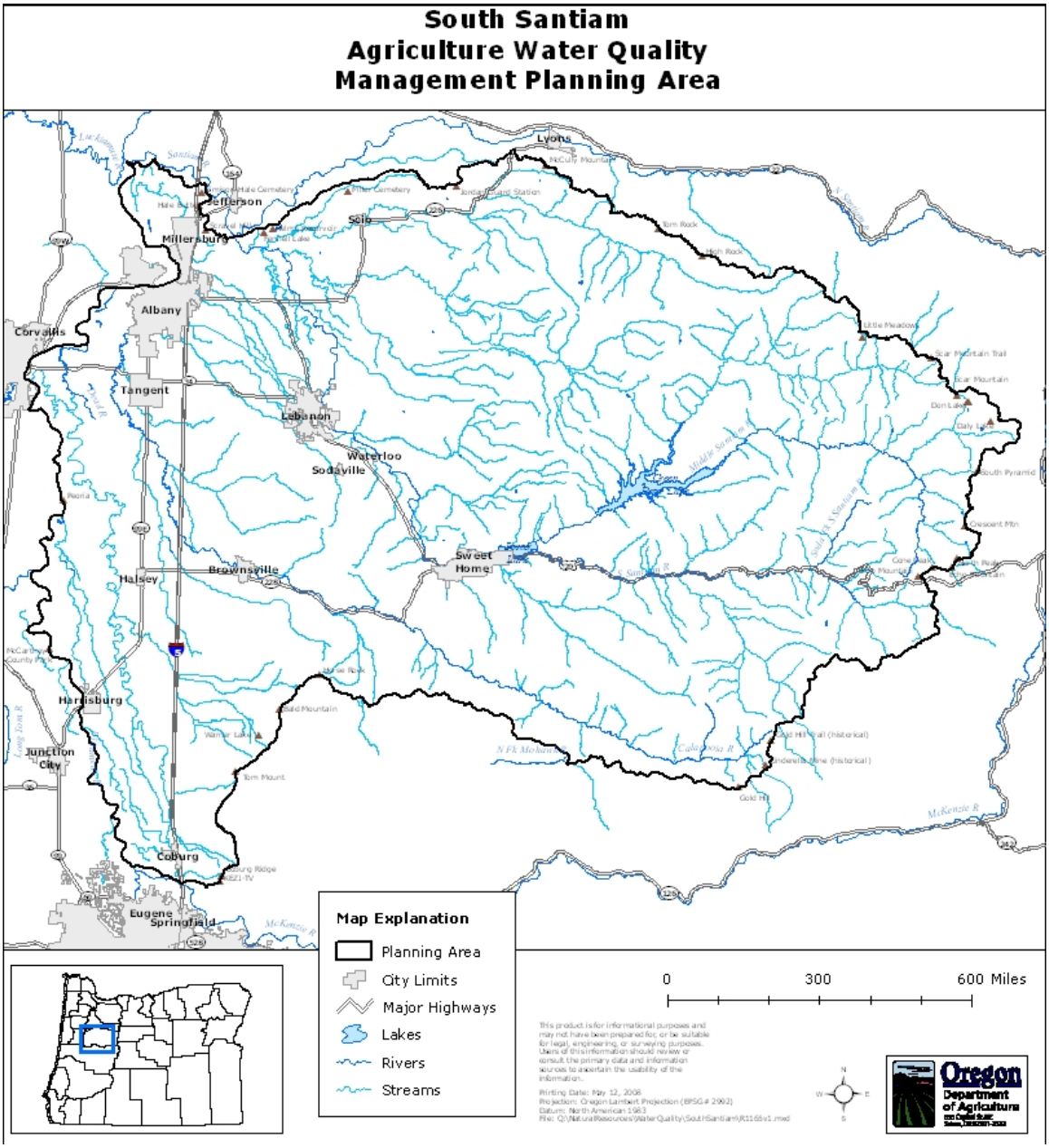
Several state recognized districts in the Management Area provide irrigation, flood control, drainage, water improvement, and diking services for their members. The Calapooia, Lacomb, and Queener Irrigation Districts deliver water for irrigation and construct and maintain irrigation water delivery infrastructure.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

2.3.2 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 1). 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.

2.3.3 Map of the Management Area

Figure 2. South Santiam Agricultural Water Quality Management Area



2.4 Agricultural Water Quality in the Management Area

Clean Water Act

The federal Clean Water Act (CWA) requires states to monitor water quality and identify water bodies that do not meet water quality standards. In Oregon, these tasks are the responsibility of the DEQ. Water bodies that are identified as "water quality limited" are placed on the state "303(d)" list (named after the section of the CWA that requires the list be maintained).

DEQ has established state water quality standards for several water quality parameters, such as bacteria, temperature, dissolved oxygen, and nutrients. The standards protect "beneficial uses" associated with waterbodies. Beneficial uses in Oregon include public domestic water supply, irrigation, livestock watering, salmonid fish rearing, spawning, and migration, water contact recreation, fish consumption, and aesthetic quality. A waterbody is placed on the 303(d) list for a particular parameter when water quality is deemed no longer adequate to protect the most sensitive beneficial use. For additional information, see Appendix B: Water Quality Parameters List and Affected Beneficial Uses.

Water Quality and Total Maximum Daily Loads in the Management Area

DEQ, in accordance with the federal Clean Water Act, is required to establish TMDLs for pollutants on the list of impaired water bodies (303(d) list). TMDLs generally apply to an entire basin or subbasin and not just to an individual water body that was on the 303(d) list. TMDLs specify the daily amount of pollution that a water body can receive and still meet water quality standards. Through the TMDL, nonpoint sources (including agriculture, forestry, and urban) are assigned "load allocations," while point sources are assigned "waste load allocations" in their permits. The agricultural sector is responsible for reducing agricultural water pollution to meet the load allocation assigned to agriculture. Once TMDLs are completed for a basin, the basin's water bodies are removed from the 303(d) list and are assigned to Category 4A (water quality limited, TMDL approved). In the future, when data show that water quality criteria have been met, water bodies will be assigned to Category 2 (attaining).

As part of the TMDL process, DEQ identifies the Designated Management Agencies or parties responsible for submitting TMDL implementation plans. An agreement between ODA and DEQ establishes that Agricultural Water Quality Management Area Plans serve as TMDL implementation plans. This Area Plan is the implementation plan for the agricultural component of the TMDLs that apply to the Management Area. Biennial reviews and revisions to the Area Plan and Area Rules will address any new agricultural load allocations in future TMDLs.

2.4.1 Local Issues of Concern

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 impacted by these water quality concerns include salmonid spawning, rearing and migration, human health, livestock watering, drinking water, and water contact recreation.

2.4.2 303(d) List of Impaired Water Bodies

In response to the 303(d) listings through 2006, DEQ developed TMDLs for the entire Willamette Basin for temperature, bacteria (*E. coli*), and mercury (Oregon Department of Environmental Quality, 2006). The Willamette TMDL can be accessed via the DEQ website at www.deq.state.or.us/wq/tmdls/willamette.htm, and the South Santiam Subbasin TMDL can be found at http://www.deq.state.or.us/wq/tmdls/docs/willamettebasin/willamette/chpt9ssantiam.pdf. Other impairments identified in the Management Area, such as flow and habitat modification, do not require TMDLs. Table 8 summarizes the agricultural load allocations that apply to the Management Area.

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. Appendix C lists the impaired waterbodies from the 2010 303(d) list. More information is available in the 2010 integrated report and 303(d) list database on the DEQ website (www.deq.state.or.us/wq/assessment/2010Report.htm).

Temperature
DEQ endeavored to set the 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, are sensitive to water temperature. Many sources contribute to elevated stream temperatures. On agricultural lands, absence of streamside vegetation, water withdrawals, and land management that leads to widened stream channels contribute to elevated stream temperatures. DEQ has identified the existing nonpoint source pollution as sources of solar heating of the Area's waterways due to a lack of riparian vegetation from forestry, agriculture, rural residential, and urban activities.

Bacteria
DEQ has set the bacteria TMDL to protect human water contact recreation (risk of infection and disease to people who come in contact with fresh water while fishing, swimming, or boating) as the most sensitive beneficial use. On agricultural lands, *E. coli* generally comes from livestock waste, either deposited directly into waterways or carried to waterways via runoff and soil erosion. Runoff and soil erosion from agricultural lands may also carry bacteria from other sources. There are numerous sources of bacteria in streams, including humans (from recreation or failing septic systems) and wildlife.

Mercury
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. On agricultural lands, if mercury is contributed it is 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, and home building or construction sites.

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 of concern in the GWMA. More information on the GWMA and nitrate is in sections 2.4.1, 2.5.4.

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.

2.4.3 Basin TMDLs and Agricultural Load Allocations

Table 8. Agricultural load allocations that apply to the Management Area.

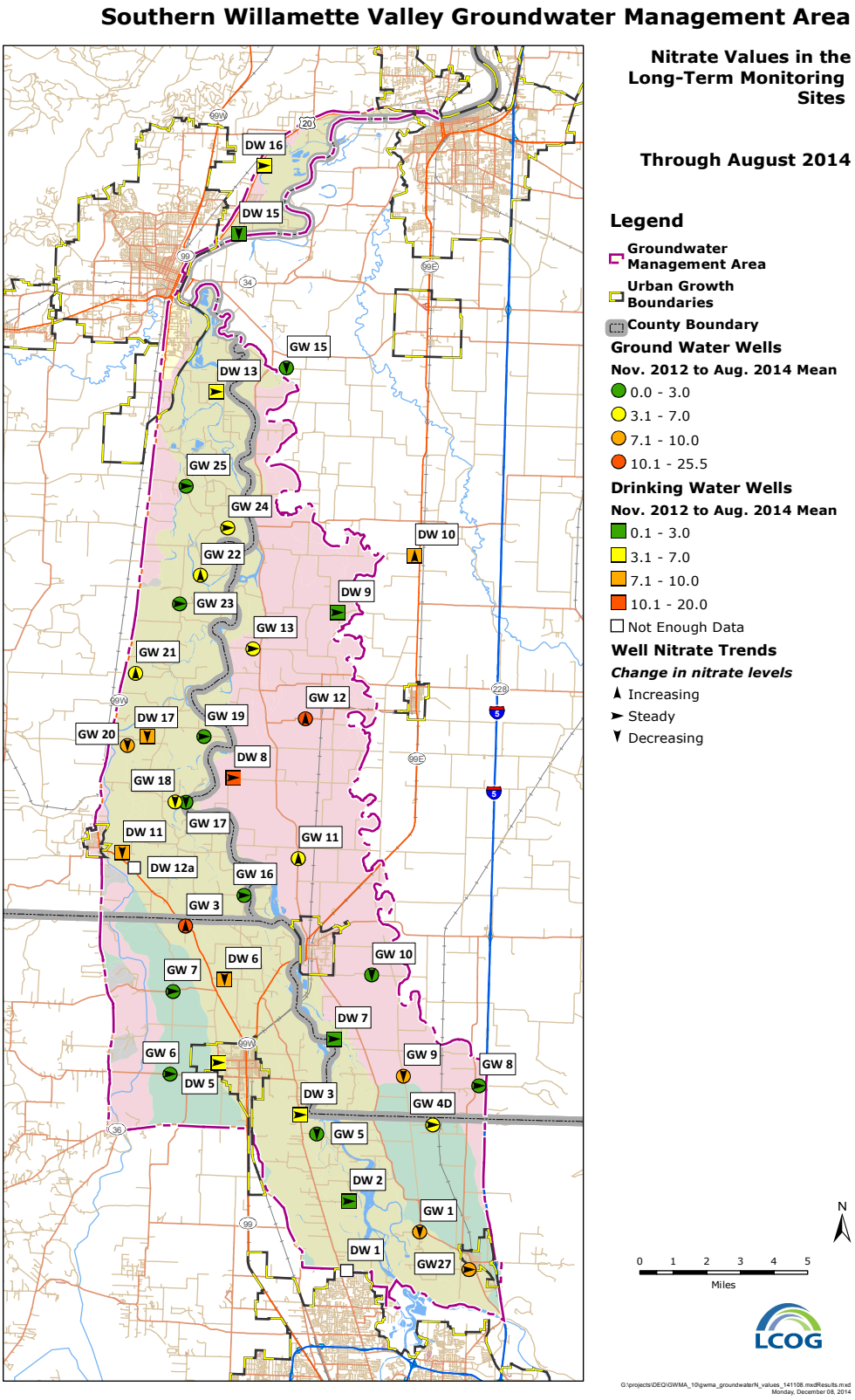
Geographic Scope in Management Area	TMDL	Load Allocation for Agriculture
Parameter: Temperature		
Mainstem Willamette	Willamette TMDL (2006), Chapter 4	All nonpoint sources collectively (agriculture's allocation is not specified): 0.05°C of the 0.3°C human use allocation (with a surrogate of effective shade)
South Santiam	Willamette TMDL (2006), Chapter 9	All nonpoint sources collectively (agriculture's allocation is not specified): 0.05°C of the 0.3°C human use allocation (with a surrogate of effective shade)
Calapooia	Willamette TMDL (2006), Chapter 10	All nonpoint sources collectively (agriculture's allocation is not specified): 0.05°C of the 0.3°C human use allocation (with a surrogate of effective shade)
Parameter: Bacteria		
Mainstem Willamette	Willamette TMDL (2006), Chapter 4	66 to 83% reduction from agricultural areas compared to average loads in 2006
Calapooia	Willamette TMDL (2006), Chapter 10	65% reduction compared to average loads in 2006
Parameter: Mercury		
Entire Management Area	Willamette TMDL (2006), Chapter 3	Agriculture: 27% reduction compared to average loads in 2006
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 Southern Willamette Valley Ground Water Management Area

In 2004, DEQ declared a GWMA for the Southern Willamette Valley because monitoring data showed elevated nitrate levels in groundwater (Figure 3). In December 2006, after significant debate and

research, the GWMA stakeholder committee finalized and accepted the GWMA Action Plan. This 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's website at http://gwma.oregonstate.edu. The updated Action Plan will be available on this site when completed. Chapter 4 provides a progress update and monitoring results.

Figure 3.


Southern Willamette Valley Groundwater Management Area
Nitrate Values in the Long-Term Monitoring Sites
Through August 2014
Legend
Groundwater Management Area
Urban Growth Boundaries
County Boundary
Ground Water Wells
Nov. 2012 to Aug. 2014 Mean
0.0 - 3.0
3.1 - 7.0
7.1 - 10.0
10.1 - 25.5
Drinking Water Wells
Nov. 2012 to Aug. 2014 Mean
0.1 - 3.0
3.1 - 7.0
7.1 - 10.0
10.1 - 20.0
Not Enough Data
Well Nitrate Trends
Change in nitrate levels
Increasing
Steady
Decreasing
N
0 1 2 3 4 5
Miles
LCOG
DW 16
DW 15
GW 15
DW 13
GW 25
GW 24
GW 22
GW 23
GW 13
GW 21
DW 10
DW 9
GW 12
DW 17
GW 19
GW 20
DW 8
GW 18
GW 17
DW 11
GW 11
DW 12a
GW 16
GW 3
DW 6
GW 10
GW 7
DW 7
GW 6
GW 9
GW 8
DW 5
DW 3
GW 4D
GW 5
DW 2
GW 1
DW 1
GW27

2.4.5 Sources of Impairment

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 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 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 Prevention and Control 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, and 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 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."

To implement Senate Bill 502, ODA incorporated ORS 468B.025 and 468B.050 into all of the Agricultural Water Quality Management Area Rules in the state.

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, liquid at room temperature, 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 Management, Irrigation Management, 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.

Riparian Areas and Streams

Practice	Resource Concerns Addressed	Potential Benefits of Practice to Producer	Potential Costs of Practice to Producer
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.	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 water temperature 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.

Nutrient and Manure Management

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
Apply nutrients and irrigation water according to soil test results and at agronomic requirements.	Helps prevent nutrient loss to surface and ground water.	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	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	Cost of fencing animal heavy use area; cost of feeding hay during the winter; cost of materials for protecting heavy use area.

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
compaction. Limit livestock access to pastures when soils are saturated; cover animal heavy use areas with rock, hog fuel, and/or geotextile.		so animals are not wading in mud.	
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.	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.	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.

Erosion, Sediment, and Mercury Control

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
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.

Nutrient and Irrigation Efficiencies

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
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

Pest Management

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
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: Goals, Objectives, and Strategies

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 Goal

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

- Implement the Area Plan through the education and outreach activities detailed in section 4.
- 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.

3.2 Measurable Objectives

To achieve the Area Plan goal, the following measurable objectives, strategies, milestones, and timelines were developed:

Objectives:

To address temperature and near stream area issues:

- Promote site-appropriate riparian vegetation in order to minimize stream bank erosion and moderate solar heating.
- Limit irrigation runoff and leaching.
- Improve the watershed's ability to capture, store, and release moisture to limit runoff.

To address bacteria and nutrient issues:

- Reduce contaminants in runoff and leaching from agricultural lands.

3.2.1 Milestones (Targets) and Timelines

The following milestones and timelines were developed in cooperation with ODA, the LAC and the SWCD. Focus Area Action Plans are developed as a tool with milestones and timelines for implementation of the Area Plan within a defined geographic area.

Objectives to track plan implementation

Note: The objectives below relate to streamside vegetation, but the Linn SWCD and LAC may add other issues to focus on, such as cropland erosion, pasture management, manure management, etc. and use other strategies to evaluate conditions.

- By July 1, 2012, a small geographic area will be identified within the Management Area where voluntary outreach and technical assistance work will be focused for the next two years.
- By January 1, 2014, ODA and/or the LMA will complete an assessment in the area that identifies:
    - The amount of streamside areas meeting water quality goals,
    - Streamside areas that are improving, and
    - Streamside areas that need work.

Objectives and timelines will be established for the areas needing work. ODA and the LMA will report back to the LAC on the status of land conditions, and outreach and technical assistance efforts in the area, at the 2014 biennial review.

- By the 2014 biennial review, the LMA will have offered technical assistance to all landowners in the area with lands where agricultural activities appear to prevent streamside vegetation from establishing. By the 2014 biennial review, the LMA will report back to the LAC and ODA on the amount of lands where landowners accept voluntary assistance to allow streamside vegetation to establish and develop.
- By July 1, 2015, ODA and/or the LMA will complete a follow-up assessment in the area and evaluate land condition changes over the two-year period.
- By the 2016 biennial review, an increase of 10% of streamside areas along agricultural lands where the assessment identifies agricultural activities as likely preventing riparian vegetation establishment will be in a condition where agricultural activities no longer prevent streamside vegetation from establishing.
- By 2020, an increase 25% of streamside areas along agricultural lands where the assessment identifies agricultural areas as likely preventing riparian vegetation establishment will be in a condition where agricultural activities no longer prevent streamside vegetation from establishing.

Management Area objectives

- By the 201[ ] biennial review, a rough assessment of streamside vegetation conditions along agricultural lands in the entire Management Area will be complete. This assessment can be used to track and report progress in streamside vegetation improvements over time and to identify areas to focus work. Assessment results will be considered at the 2016 biennial review and may be used to revise the goals below.
- By the 201[ ] biennial review, ODA and the LMA will compile information about the location, number, and size of water quality improvement projects completed in the priority area since area plan and rules adoption, as resources and grant program privacy rules allow.

3.2.2 Focus Area

Identify and focus outreach and technical assistance work in a small geographic area to help demonstrate the effectiveness of the Area Plan.

- The Lower Crabtree Watershed has been chosen to work in from July 2012 through July 2015. Primary focused work for this area will be from July 2013 to July 2015.
- The Linn SWCD plans to work in the Lower Thomas and Bear Branch after implementation is completed in the Lower Crabtree Watershed.

- Identify water quality parameter(s) of concern within the area and compile available baseline data.
- Assess baseline land conditions within the area(s).
- Conduct educational programs and one-on-one landowner contacts in the area(s) to promote public awareness of water quality issues and their solutions.
- Provide one-on-one voluntary technical assistance to landowners in the area(s) to achieve land conditions that contribute to good water quality.
- Secure necessary resources as available to help landowners in the area(s) achieve land conditions that contribute to good water quality.
- Assess land conditions within the area(s) again prior to the next biennial review of the Area Plan, and quantify changes from the baseline.

The Focus Area Action Plan is provided in Appendix F. Results of the assessment and targeted assistance are reported to the LAC at the Biennial Review and are summarized in Chapter 4.

3.3 Strategies for Area Plan Implementation

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.

3.3.1 Education and Outreach

As resources allow, the SWCDs, in partnership with other agencies and local organizations, will develop educational 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. Education and outreach activities 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 fair 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, letting them know the Area Plan and Rules exist.
- 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.

Targets

Targets are based on scopes of work with the Linn SWCD. The scope of work is developed as an agreement between ODA and the Linn SWCD with tasks related to implementation of the Area Plan. The targets are for the time period from July 2012 to July 2014 and are only for the Linn SWCD. Watershed councils and other groups may make additional efforts that fit within the mission and goals of the Area Plan. The Linn SWCD is not obligated to these targets; they only serve as direction from the LAC as activities that they would like to see accomplished.

3.3.2 Conservation Planning and Conservation Activities

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

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

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

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

Conservation activities should:

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

- Be flexible to adjust management based on feedback or monitoring and changing environmental and economic conditions.

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

3.3.3 Funding

Sometimes the cost of conservation measures do 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 SWCDs 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

3.3.4 Monitoring and Evaluation

Water Quality Research, Monitoring, and Enhancement

Several individuals and organizations are working to research, monitor, and improve or maintain water quality in the Management Area. The South Santiam Watershed Council conducted monitoring in several tributaries of the South Santiam River and completed an assessment of the lower South Santiam watershed in 2000. The assessment identified several streams as high priority for restoration activities because of the restoration opportunities and high likelihood of project success. Monitoring data generally suggested that water quality meets or exceeds water quality standards in the lower South Santiam watersheds, although bacteria and turbidity were both identified as potential concerns. The Calapooia Watershed Council has developed its own assessment and monitoring program in the Calapooia watershed. The BLM, USFS, and Weyerhauser have completed several watershed assessments within the Management Area.

In 2012, the North Santiam, South Santiam, and Calapooia watershed councils were awarded a 319 grant from DEQ to conduct water quality monitoring. The councils developed a monitoring plan, and data collection began in late 2012. Much of the monitoring work is intended to characterize the influence of cities throughout the region on water quality but some of the sites will also reflect predominantly agricultural influence.

On agricultural lands, the U.S. Department of Agriculture-Agricultural Research Service (USDA-ARS) and OSU Extension have completed several research projects in the area related to riparian areas, groundwater quality, and fertilizer and pesticide use in grass seed. Studies in grass seed fields found nutrients and pesticides at lower than expected levels in shallow groundwater, both in the grass seed field and in the riparian area. Researchers concluded that grass seed production practices at the study sites, such as proper nitrogen fertilizer application rates and timing, which are representative of grass seed production practices in the Willamette Valley, are effective in protecting surface water and groundwater from nutrient and pesticide contamination (Griffiths et al., 1997; Jenkins et al., 1994; Young et al., 2000; Mellbye et al., 2001). Another study in the Management Area demonstrated the effectiveness of streamside buffers in removing nitrate (Wigington et al., 2003).

In 2012, Mueller-Warrant et al. published a study of surface water sources of nitrogen within 40 sub-watersheds of the Calapooia River watershed. The authors collected water quality samples from sites within predominantly forested sub-watersheds as well as sites within predominantly agricultural sub-watersheds. The total amount of nitrogen found in the winter water quality samples was positively correlated to the percentage land cover of seven common crops. The form of nitrogen found in water quality samples was predominantly nitrate, implying mineralization of nitrogen that had been cycled through plant growth in crop production systems. The study noted that fertilizer use efficiency in the area is already very high and recent nitrogen prices provide a strong incentive to use nitrogen efficiently. However, the wide variation in total nitrogen concentrations found in the study sub-watersheds, including low rates of nitrogen in some of the agricultural watersheds, suggested that some strategies might be more effective than others in preventing nitrogen loss to streams. The authors also suggest that improvements in livestock management practices could have a significant impact on nitrogen concentrations in surface water.

Priority Areas as a Plan Implementation Strategy

Why Focus Efforts in a Priority Area?

The Oregon Agricultural Water Quality Program relies primarily on voluntary improvements in land conditions for agriculture to fulfill its responsibility to prevent and control water pollution. One way to implement an Area Plan systematically is to focus and measure implementation in relatively small regions within the Management Area.

The priority area concept evolved from conversations between ODA, LMAs, LACs, and other stakeholders and partners seeking better ways to implement the Agricultural Water Quality Program and Area Plans. ODA and program partners believe that strategic, focused, and systematic delivery of outreach and technical assistance will lead to more measurable levels of implementation and allow ODA and the LMA to make better use of limited resources.

While the priority area approach is relatively new for ODA, the LMA, and the LAC, it is consistent with other agencies' and organizations' efforts to work proactively in targeted geographic areas.

Selecting A Priority Area

A priority area is usually a small watershed (6th or 7th field HUC) with agricultural lands. An initial priority area will be selected with input from ODA, the LMA, the LAC, and other partners, based on one or more of the following factors:

- Significant water quality concerns probably associated with agricultural activities;
- LMA and other partners are already working with landowners in an area;
- Size of the area matches the LMA's capacity to work in the entire area in a relatively short time frame.

During the 2012 biennial review process, ODA, the LMA, and the LAC discussed the priority area concept, an initial priority area, future priority areas, measurable objectives for implementation in the priority area, and timelines for implementation. The initial and future areas of focus for the Management Area are described in the Objectives and Targets sections of this Area Plan.

Land Condition and Water Quality

Once a priority area is selected, land condition measures are identified for which baseline and post-implementation data will be collected and mapped. These land condition measures serve as surrogates for the water quality parameters of concern in the priority area. For example, streamside vegetation is generally used as a surrogate for water temperature; sediment may be used as a surrogate for pesticides and mercury; and livestock access to waterways could be used as a surrogate for bacteria. Water quality monitoring data may also help partners evaluate the effects of changing land conditions on water quality parameters such as temperature, bacteria, nutrients, sediment, and pesticides, to evaluate progress in the priority area and to help identify future priority areas.

The Oregon Agricultural 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 land conditions;
- It can be difficult to separate agriculture's influence on water quality data from other influences, such as bacteria from failing septic systems, wildlife, and recreation;
- Other factors such as climate change may have long-term impacts on water quality that are beyond agriculture's control;
- It is expensive to monitor water quality at the scale needed to evaluate effectiveness;
- Changes in land conditions, such as streamside vegetation, will take a long time to translate into water quality improvements.

Focused Outreach and Technical Assistance

After baseline streamside conditions are mapped, the LMA and other interested partners deliver focused and systematic outreach and technical assistance to landowners in the priority area. Every landowner with potential land condition concerns is contacted with an offer of voluntary assistance. Focused, one-on-one (active) outreach and technical assistance efforts are often more effective in reaching landowners than general (passive) outreach. This focused program delivery will allow ODA, the LMA, and the LAC to implement the Area Plan systematically by moving focused work from one small watershed to the next over time, eventually reaching the entire Management Area.

Monitoring and Evaluation

ODA, the LMA, and the LAC will evaluate and document the implementation of the Area Plan by assessing improvement of land conditions in the priority area during each biennial review. Comparisons

of baseline and post-implementation land conditions (along with available water quality data) will allow these partners to determine whether the selected land condition measures have improved. These partners and other stakeholders will also be able to evaluate the status and trends of Area Plan implementation more readily than from reports of implementation efforts scattered throughout a Management Area.

The priority area process will help ODA, the LMA, the LAC, and other program partners to evaluate whether implementation of the Agricultural Water Quality Program is achieving the measurable objectives in the Area Plan, such as:

- Achieve X% compliance with the Area Rules over Z years
- Achieve Y% water-quality protective vegetation over Z years

To measure baseline conditions in the priority area, the LMA will map streamside areas on agricultural lands and estimate the percentage of streamside areas that fall into four categories, referred to as Class I, II, III, and IV in this Area Plan (Table 9).

Table 9. Classes of Streamside Vegetation for Assessing Land Conditions.

Class	Water-Quality Protective Vegetation	Agricultural Impacts	Three Functions Provided
I	Present	None	All three
II	Establishing and growing	None	Depends on size / location / density of vegetation
III	Unable to establish	Prevent vegetation from establishing	No
IV	Unable to establish	None – non ag factors prevent vegetation from establishing	No

Every two years, ODA, the LMA, and the LAC will evaluate the progress of Area Plan implementation in the priority area. The percentage of streamside areas that fall into the four classes will be updated. Streamside areas can be reclassified from Class III to Class II where projects remove agricultural impacts and allow streamside vegetation to establish. Reclassification from Class II to Class I will usually take longer than two years, because streamside vegetation needs to grow to a height where it can provide shade and other functions.

Evaluating plan effectiveness through focused work in small areas

As described on page 44, the agricultural water quality program at ODA is working with the LAC and LMA to identify small geographic areas to focus efforts for the two-year period before the next biennial review. ODA and the LMA then develop action plans to work on a voluntary basis with agricultural landowners in the small area to improve land conditions over the two-year period.

Based on the water quality concerns in the small area, ODA and the LMA will select one to two land conditions or "measures" to evaluate before and after the two-year action plan period. Land conditions are classified as:

- Agricultural activities need modification to allow conditions to improve;
- Conditions improving but not yet achieving the goals of the plan;
- Achieving the goals of the plan.

ODA and the LMA will work together to answer the following questions over the next two years for the small area, and report to the LAC at the next biennial review:

- What are the agricultural water quality concerns in the small area, and what land conditions relate to those concerns?
- What percentage of agricultural lands in the small area are in a condition that achieves the goals of the plan, in improving condition, or in a condition that needs improvement?
- What is the percent change in lands in these respective conditions during a 2-year period?
- Can land conditions of concern in the area be eliminated purely through voluntary outreach, education and technical and financial assistance over a 2-year period?
- If water quality data are available, how do water quality conditions change in the area as agricultural land conditions change?
- Are positive land condition changes at the small area level effective in improving water quality?

At the next biennial review, ODA, the LACs, and the LMA will discuss the results from the area assessment and voluntary conservation efforts, evaluate the effectiveness of the focused efforts in the area, and recommend next steps. Some of the questions to discuss include:

- Was the LMA able to contact and meet with all landowners in the area with potential concerns?
- Are all agricultural landowners with potential concerns working towards making improvements?

Based on the results of the effectiveness evaluation of the Area Plan and Rules, as well as any additional water quality concerns identified in the Management Area, the LAC, ODA, and the Linn SWCD will consider making appropriate modifications to the Area Plan and Rules in consultation with the ODA Director and State Board of Agriculture.

For a description of monitoring and evaluation activities, see Chapter 4.

Chapter 4: Implementation, Monitoring, and Adaptive Management

4.1 Implementation and Accomplishments

Many conservation activities and implementation monitoring tracks have been implemented to benefit water quality. The SWCD and NRCS track activities that have been implemented through quarterly reports to ODA and through a NRCS database, respectively. Projects that have received funding from the OWEB are tracked in OWEB's restoration database. In addition, partner agencies can submit reports of projects and activities in the Management Area that improve water quality. The South Santiam LAC has one primary goal: Limit water pollution from soil erosion and agricultural activities to achieve applicable water quality standards. The following is a summary of how the LAC, Linn SWCD, NRCS and other agricultural partners have addressed the Objectives and Strategies.

Objectives and Strategies	Progress and Partners
Objectives Address temperature and near stream area issues: • Promote site-appropriate vegetation in order to minimize stream bank erosion and moderate solar heating. • Limit irrigation runoff. • Improve the watershed's ability to capture, store, and release moisture to limit runoff. • Address bacteria and nutrient issues: • Reduce contaminants in runoff from agricultural lands.	**Progress** Linn Soil and Water Conservation District in co-operation with USDA NRCS and FSA has implemented 55 conservation plans to cover 4000 +/- acres in Linn County. Following is a summary: Temperature & Near stream Area • 40,211+/-feet of streambank fencing. • 848 acres of irrigation management to promote timely and proper application of water to crops. • 505 acres of nutrient management to properly apply nitrogen, potash, and phosphorous • 241.7 acres of riparian establishment through the Conservation Reserve Enhancement Program (CREP) Bacteria & Nutrients • 25 acres of cover crop • 169 acres of Brush Management • 2,000+/- feet of installed grass waterways and the construction of 5 waste management facilities to reduce contaminants from running off agricultural lands. Specific projects & efforts include: • 5 waste management facilities (Linn SWCD) • 40,211 feet stream bank protection (NRCS, Linn SWCD aided in 31,913 feet of the total) • 306 acres of irrigation upgrades (NRCS with EQIP funding, Linn SWCD helped on 47 acres of the total) • 24,296 feet water transference pipeline installed (Linn SWCD and NRCS) • 461 acres of prescribed grazing (NRCS with EQIP funding, Linn SWCD aided in 60 acres of the total) • 848 acres of irrigation water management (NRCS with EQIP funding, Linn SWCD aided in 120 acres of the total)

Objectives and Strategies	Progress and Partners
	• 506 acres of Prescribed Grazing management
<u>Strategies</u>: Education & Outreach • 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 put information at someone else's booth, at the Linn county fair 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 and optional management practices to local livestock associations, Small Farmer Magazine etc., Farm Bureau chapters, and other commodity groups, Extension newspapers, watershed council and	**<u>Progress</u>: Education & Outreach** • Linn SWCD held local landowner workshops in 2012, 2013, and 2014 with help from ODA and held local farmer meeting with USDA and NRCS. • Linn SWCD contacted county livestock association and local Watershed Councils. Linn SWCD has a working agreement with both Watershed councils to monitor water quality in both Watersheds. • Linn SWCD sponsored several meetings and attended agriculture events to present information about water quality issues and optional management practices to further help water quality. • Linn SWCD worked with ODA to put Area Plan and Rules documents on the ODA website. • Linn SWCD worked with OSU Extension to develop several practices that would fit with local landowner's need, such as no-till, strip till and intensive pasture management. • Linn SWCD worked with OSU Extension to co-sponsor a South Valley Farm Tours to feature demonstration sites of practices that help water quality in agricultural production while maintaining production viability. • Linn SWCD held a water quality informational presentation at Linn County Agriculture Expo. Provided information on state and federal programs that help finance implementation of on-farm practices. • Linn SWCD provided several realtors with information on soils, streams, and educational tools. • Published monthly articles to Growing, an OSU Extension and Albany Democrat Herald publication, that reaches 13,000 people monthly • Linn SWCD worked with 296 landowners to provide technical assistance and to make them aware of the Area Plans and Rules. • Linn SWCD worked with 8 landowners on local cost share, OWEB Small Grants programs. Totaling $80,000. The district worked with 47 landowners on federal programs such as EQIP and CREP. • Local county commissioners are informed of Linn SWCD monthly meetings and are informed of LAC work and Area Plan and Rules implementation.

Objectives and Strategies	Progress and Partners
SWCD newsletters, Farm Services Agency newsletters, and other publications. • Provide one-on-one technical assistance to landowners, letting them know about the Area Plan and Rules. • Provide information on federal and local cost-sharing programs to landowners. • Disseminate information to schools about agriculture and water quality and the plan and rules. • Disseminate information to county commissioners and other elected officials about the plan and rules and work of the LAC.	

4.2 Water Quality Monitoring—Status and Trends

DEQ Ambient Monitoring

The DEQ maintains two long-term water quality monitoring sites in the management area as part of its statewide ambient monitoring network. These sites are established and monitored six times per year to track long-term water quality trends in large watersheds. Out of the two ambient sites in the management area, ODA considers the South Santiam River at Crabtree site to be partially influenced by agriculture. Forestlands are the other main type of land use in the watershed above this monitoring site. A review of DEQ data for the South Santiam at Crabtree site indicated that water quality is generally good at this site, and has remained in good condition for several years.

The DEQ Oregon Water Quality Index Summary Report for 2013 can be found at http://www.deq.state.or.us/lab/wqm/docs/wqiAnnualRep2014.pdf. The DEQ uses the Oregon Water Quality Index (WQI) to characterize water quality at its long-term monitoring sites. The index analyzes water quality variables and produces a score describing general water quality. The index is unitless, with scores ranging from 10 (very poor) to 100 (excellent). The DEQ ambient site on the South Santiam at Hwy 226 had the second best water quality in the state, of the sites ODA reviews. It had a WQI score of 94, ranking it as "excellent." No problems were listed for the analyses reported. The other DEQ site is on the Calapooia River at Queen Avenue in Albany, which may be affected by urban influence and was not included in ODA's data review.

The DEQ ambient monitoring sites are located throughout the state to track regional and statewide status and trends in water quality. The majority of the sites, including the sites described above, are located strategically to reflect the influence of large areas on water quality. While the sites are useful for evaluating water quality status and trends in entire watersheds, they don't necessarily tell us if more localized water quality concerns are present in smaller streams in a watershed. It is also difficult to determine the source of problems from sites near the mouth of large watersheds. In addition, these sites are sampled six times per year, so variations in water quality between sampling events are not captured.

Biological monitoring data provide another way to look at water quality conditions in the management area. During the 2010 review, DEQ analyzed samples of aquatic organisms collected in streams

throughout the management area and compared the samples with reference streams. The presence or absence of certain species in the samples collected can indicate whether a waterbody experiences temperature, sediment, or other water quality concerns. In the Management Area, DEQ analysis of biological monitoring data found the following:

- The streams which had a high percentage of agriculture and poor temperature conditions were Muddy Creek, Thomas Creek at Highway 226 Bridge, Hamilton Creek, Courtney Creek, Wiley Creek, and Cedar Creek (Wiley).
- Streams with high agricultural land use and poor sediment conditions were Courtney Creek, Thomas Creek at Highway 226 bridge, Cedar Creek (Wiley) and Calapooia.
- Streams that had highly disturbed conditions for aquatic habitat were Muddy Creek, Thomas Creek, Hamilton Creek, Courtney Creek, and Wiley Creek.

South Santiam Watershed Council Monitoring

The South Santiam Watershed Council monitors three streams reflecting agricultural influence, Crabtree, Hamilton and Thomas Creeks. Water quality from 2013 through 2014 for both was mostly good. Crabtree Creek had a wide swing in pH (5.9 to 8.1) from October through November 2013, and one elevated *E. coli* (>2400) in December 2013. It should be noted that many of the monitoring sites had elevated *E. coli* at that time, possibly indicating an accidental discharge. Hamilton Creek had two high *E. coli* counts (both around 400) in November 2013 and March 2014. It also had one high total suspended solids and turbidity sample in March 2014. Thomas Creek had one high *E. coli* (>2400) in December 2013, and one high total suspended solids in July 2014. South Santiam Watershed Council monitoring reports can be found at http://www.sswc.org/what-we-do/monitoring.

GWMA Monitoring

DEQ is currently conducting quarterly sampling of up to 40 groundwater-monitoring locations in the GWMA for nitrate. This program includes monitoring 24 shallow monitoring wells and 16 domestic wells. The domestic wells are generally installed deeper than the monitoring wells. There does appear to be some downward contamination trends, although there are some areas where nitrate levels are still increasing. The average groundwater nitrate concentration from 2006 to 2014 for both types of monitoring locations is 6.0 mg/L. EPA has conducted stable O/H isotope monitoring to the GWMA for the last 2 years; this information is very valuable when identifying source(s) of water in the wells.

In some rural areas, well water nitrate concentrations can be elevated. Households may be unaware of this type of contamination, and that increases the risk of health problems associated with nitrate consumption. Much of this nitrate comes from agricultural nitrogen use, and thus improvements in N management are needed to reduce the leaching to groundwater. Previous work in the Southern Willamette Valley by researchers at Oregon State University determined the importance of cover crops and irrigation practices in reducing nitrogen (N) leaching.

A new lysimeter project started in late 2013, and includes 12 actively managed agricultural fields, many of them were part of the 1990-era study conducted by OSU to examine the influence of current crops and nutrient management on nitrate leaching below the rooting zone. The current study represents current crops in the areas and includes five grass fields, three vegetable fields, and one each of mint, hazelnuts, blueberries and wheat. New nutrient management practices include slow release fertilizers and precision agriculture approaches in some of the fields. This work will examine the nitrogen balances and rate of N leaching at the field level from the 1990's to the present. Data from this study will be incorporated into the USDA-APEX model, with final goals of the project to provide information and tools that will help farmers, managers and conservation groups quantify the water quality benefits of management practices they are conducting or funding and use that information to set priorities and inform nutrient water quality trading.

In early 2010, an evaluation of the accomplishments was completed. This evaluation included reporting of agricultural accomplishments by the ODA's Water Quality and Confined Animal Feeding Operations programs, the Natural Resource Conservation Service, and the Linn, Benton, and Upper Willamette Districts. This evaluation found that 65% of the agricultural measures of implementation had been completed. Based on the Action Plan evaluation, it was determined that an update to the Action Plan was necessary.

ODA staff completed an update to the overview of the agricultural section of the Action Plan. In addition, the goals, objectives, strategies, and actions of the agricultural section are in the process of being updated. On October 26, 2011, an agriculture workgroup met to review and update the agricultural section of the GWMA Action Plan. The agriculture workgroup consisted of ODA staff, District staff, NRCS staff, and seven local agricultural producers. The purpose of the agriculture workgroup meeting was to review updates to the Action Plan and review research needs. The workgroup asked that information on precision agricultural practices that producers are implementing be included in the Action Plan. The goals of the Action Plan were updated to be consistent with the statutes related to the ODA's Agricultural Water Quality Program and statutes related to the GWMA. Research needs that were identified include: additional research to understand what is happening below the root zone of crops, and the effects of various recommended management practices on leaching of nutrients. The updates to the GWMA Action Plan should be completed in early 2015.

4.3 Progress Toward Measurable Objectives

Progress towards meeting measurable objectives within the focus area is on target. The Linn SWCD selected a focus area, conducted the pre-assessment and has delivered technical and financial assistance to landowners in the focus area. The project phase of implementation will continue through the early 2015. The target date for completion of the post-assessment is June 30, 2015.

Measurable objectives established for the management area are overly optimistic. Reconsideration of these objectives is needed. More reasonable timeframes can be identified during the 2016 biennial review.

4.4 Aerial Photo Monitoring of Streamside Vegetation

ODA collects and evaluates aerial photos of stream segments selected at random along agricultural lands in each management area. Based on the streamside vegetation present at the time of the assessment, each stream segment receives a score. The same stream segments are re-photographed and re-scored every five years to track changes in streamside vegetation conditions.

By itself, a score does not tell whether streamside vegetation is in good or poor condition. A score provides some idea of the mixture of bare ground, grasses, shrubs, and trees present at a site, but it does not compare the vegetation that is there with the types of vegetation that can be expected given the site capability.

Nine streams were assessed in the South Santiam River Basin. Five of these had notable changes in the riparian index score (RIS), though only two of these were significant changes (e.g. 5% or more). Crabtree Creek's score decreased by 4%, 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's RIS improved by 3% due to an increase in tree and shrub cover, though bare/ag cover also increased significantly in the 90 left band. Hamilton Creek had a 6% reduction in RIS mostly due to tree loss in both bands. Much like Crooks Creek, Muddy Creek's RIS increased due to tree and shrub cover, but it also had a significant increase in bare/ag in the 90 left band. Pierce Creek –by contrast – had an increase in tree cover and a decrease in bare/ag, resulting in a 5% increase in its RIS. Table 10 provides aerial photo monitoring results:

Table 10: Results of Aerial Photo Monitoring of Streamside Vegetation

Stream	2007 Score	2012 Score	% Difference (If notable)
Cochran Creek	34.39	34.58	
Crabtree Creek	54.67	52.68	- 4
Crooks Creek	45.89	47.08	+ 3
Hamilton Creek	54.37	50.98	- 6
Muddy Creek	42.93	44.27	+ 3
Owl Creek	38.40	38.93	
Pierce Creek	40.88	42.98	+ 5
Plainview Creek	32.44	31.83	
Spoon Creek	35.73	36.30	

4.5 Biennial Reviews and Adaptive Management

ODA and the Linn SWCD will evaluate the effectiveness of the Area Plan in improving water quality and land conditions as resources allow. Information considered in the evaluation will include, but not be limited to: water quality monitoring data collected by the Oregon DEQ, area watershed councils, and other agencies and organizations monitoring water quality in the Management Area; results of compliance surveys of land conditions conducted by the ODA (this sampling is for information purposes only and does not result in enforcement); and results of random surveys of Management Area landowners to determine awareness of water quality issues. Results of effectiveness evaluations will be presented to the LAC on a biennial basis.

Some of the questions to consider in the discussions include:

- Are all of our goals and objectives measurable?
- Were the activities that we committed to do over the previous two years in our goals, objectives, and strategies accomplished?
- Were all violations that were found during investigations resolved or are they in the process of being resolved?
- Were our goals and objectives for land condition improvements met?
- Are water quality data from agricultural lands showing improvement?
- How do water quality and land condition data trends compare? Do we need to start collecting other kinds of land condition data?

What types of objectives and strategies should be identified for the next 2 years to address the agricultural sources of those problems?

- Continue to focus technical assistance efforts in the Crabtree Focus Area.
- Focus on achieving compliance with streamside rules, managing livestock access to streams and/or managing livestock manure, and nutrient management.
- Provide monitoring results, status and trends by watershed for the 2015 biennial review.

Is additional water quality or landscape monitoring needed to identify areas where focused work is needed?

- An assessment of streamside vegetation conditions along agricultural lands throughout the Management Area would provide more information on landscape conditions that affect water quality and identify areas where focused work on streamside vegetation is needed.
- Establish "site capable" scores for the aerial photo monitored stream segments for comparison with existing scores. This will provide a better idea of the existing conditions of the streamside vegetation compared with the conditions that are needed to achieve water quality goals.

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Appendices

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 7th 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
104 4th Ave SW
P.O. Box 765
Albany, OR 97321
(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 8th Ave
Eugene, OR 97401
(541) 682-3620
State Office
725 Summer Street NE, Suite A
Salem, OR 97301
(503) 986-0900
http://www.wrd.state.or.us

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
http://www.sswc.org
Calapooia Watershed Council
PO Box 844
Brownsville OR 97327
(541) 812-7622
calapooia@peak.org
www.calapooia.org

Appendix B: Water Quality Parameters List and Affected Beneficial Uses

The following is a list of parameters used by DEQ in establishing the 303(d) list, developing TMDLs, and identifying the beneficial uses of water impacted by these parameters. This is an abbreviated summary and does not contain detailed descriptions of the standards. Specific information about these standards can be found in the Oregon 303(d) List or in OAR 340-041-0445. Listed parameters in the Management Area are indicated in boxes.

The 303(d) List and TMDLs can be obtained from the DEQ website at http://www.deq.state.or.us/wq/catlist.htm#wa or by calling the Water Quality Division of the DEQ at (503) 229-5279.

Parameters

Aquatic Weeds or Algae
Standard – The development of fungi or other growths having a deleterious effect on stream bottoms, fish, or other aquatic life, or which are injurious to health, recreation, or industry shall not be allowed.
Beneficial Uses Affected – Public and Private Domestic Water Supply, Irrigation, Industrial Water Supply, Livestock Watering, Fishing, Water Contact Recreation, Aesthetic Quality.

Bacteria
Standard - Fecal bacteria levels shall not exceed a 30-day log mean of 126 *E. Coli* organisms per 100 ml, based on a minimum of 5 samples and no single sample shall exceed 406 *E. coli* organisms per 100 ml. Bacterial pollution or other conditions deleterious to waters used for domestic purposes, livestock watering, irrigation, bathing, or shellfish propagation, or otherwise injurious to public health, shall not be allowed.
Beneficial Uses Affected - Public and Private Domestic Water Supply, Livestock Watering, Water Contact Recreation.

Biological Criteria
Standard – Waters of the State shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.
Beneficial Uses Affected - Salmonid Spawning, Rearing and Migration, Resident Fish and Aquatic Life.

Chlorophyll a
Standard – The following average Chlorophyll a values shall be used to identify water bodies where phytoplankton may impair the recognized beneficial uses:
1. Natural lakes, which thermally stratify: 0.01 mg/l
2. Natural lakes, which do not thermally stratify, reservoirs, rivers, and estuaries: 0.015 mg/l

Beneficial Uses Affected - Water Supply, Fishing, Water Contact Recreation, Aesthetic Quality.

Dissolved Oxygen
Standard - For waterbodies identified as salmonid spawning, dissolved oxygen must not be less than 11.0 mg/l. For waterbodies supporting coldwater aquatic life, dissolved oxygen must not fall below 8 mg/l. For water bodies supporting cool water aquatic life, dissolved oxygen must not fall below 6.5 mg/l. For water bodies supporting warm water aquatic life, dissolved oxygen must not be less than 5.5 mg/l.
Beneficial Uses Affected - Salmonid Spawning, Rearing and Migration, Resident Fish and Aquatic Life.

Flow Modification
Standard – The creation of tastes or odors or toxic or other conditions that are deleterious to fish or other aquatic life or affect the potability of drinking water or the palatability of fish or shellfish shall not be allowed.
Beneficial Uses Affected - Salmonid Spawning, Rearing and Migration, Resident Fish and Aquatic Life.

Habitat Modification
Standard – The creation of tastes or odors or toxic or other conditions that are harmful to fish or other aquatic life or affect the potability of drinking water or the palatability of fish or shellfish shall not be allowed.
Beneficial Uses Affected – Salmonid Spawning, Rearing and Migration, Resident Fish and Aquatic Life.

Nutrients
Standard - see standards for aesthetics, pH, dissolved oxygen, chlorophyll a, and aquatic weeds or algae.
Beneficial Uses Affected - Aesthetics or use identified under related parameters.

pH
Standard - pH shall not fall outside 6.5 to 8.5. The following exception applies: waters impounded by dams existing on January 1, 1996, which have pHs that exceed the criteria shall not be considered in violation of the standard if the Department of Environmental Quality determines that the exceedance would not occur without the impoundment and that all practicable measures have been taken to bring the pH in the impounded waters into compliance with the criteria.
Beneficial Uses Affected - Salmonid Spawning, Rearing and Migration, Resident Fish and Aquatic Life, Water Contact Recreation.

Sedimentation
Standard – The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry shall not be allowed.
Beneficial Uses Affected - Salmonid Spawning, Rearing and Migration, Resident Fish and Aquatic Life.

Temperature
Standard – The seven day average maximum temperature is: 64F for water bodies with salmonid fish rearing and migration, 61F for core cold water habitat, 55F for water bodies with salmonid fish spawning, 54F for water bodies with bull trout. Following a temperature TMDL, temperature water quality limited waters cannot be warmed more that 0.3 degrees Celsius (0.5 degrees F) by sources of anthropogenic (human) heating.
Beneficial Uses Affected - Salmonid Spawning, Rearing and Migration, Resident Fish and Aquatic Life.

Total Dissolved Gas
Standard – The concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection shall not exceed 110 percent of saturation, and the liberation of dissolved gases, such as carbon dioxide, hydrogen sulfide, or other gases, in sufficient quantities to cause objectionable odors or to be deleterious to fish or other aquatic life, navigation, recreation or other reasonable uses made of such waters shall not be allowed.
Beneficial Uses Affected - Salmonid Spawning, Rearing and Migration, Resident Fish and Aquatic Life.

Toxics
Standard - Toxic substances shall not be introduced above natural background levels in the waters of the state in amounts, concentrations, or combinations which may be harmful, may chemically change to

harmful forms in the environment, or may accumulate in sediments or bio-accumulate in aquatic life or wildlife to levels that adversely impact public health, safety, or welfare; aquatic life; wildlife; or other designated beneficial uses. Standards for specific toxic substances may be viewed on the Oregon DEQ website at http://waterquality.deq.state.or.us/wq/wqrules/340Div41Tbl20.pdf.
Beneficial Uses Affected - Public, Private and Industrial Water Supply, Irrigation, Livestock Watering, Resident Fish and Aquatic Life, Fishing, Water Contact Recreation.

Turbidity
Standard – No more than ten percent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activities.
Beneficial Uses Affected - Resident fish and Aquatic Life, Aesthetics.

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.

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

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

Mercury TMDL

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.

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

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

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

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

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

Aquatic Weeds or Algae

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303 (d) List

Daly Lake

Metals

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

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.

Riparian condition classifications		
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
2	**Dec. 2013**	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	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
3	**Mar. 2014**	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	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		
4	**June 2014**	Required reporting		
		Contact 10 targeted landowners	Contacted 10 targeted	Seeking

		*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	landowners. *provided facts sheets of focus area and SB1010 rules regarding the South Santiam Plan *provided technical assistance *reviewed toolkit of funding mechanisms with landowners	RCPP funding to help facilitate on the ground activities in this area.
		Develop 1 conservation plan		
5	**Sept. 2014**	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		
6	**Dec. 2014**	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		
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).

A. 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		

B. Two-Year Implementation Summary

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.

Program	General Description	Contact
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

Program	General Description	Contact
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

Appendix H: References on Water Quality Improvement Practices for Agricultural Landowners

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

Adams, E.B. 1992. Farming practices for groundwater protection. Washington State University, Spokane, Washington.

Hermanson, R.E. 1994. Care and feeding of septic tanks. Washington State University, Spokane, Washington.

Hirschi, M. et al. 1994. 50 ways farmers can protect their groundwater. University of Illinois, Urbana, Illinois.

Hirschi, M., et al. 1997. 60 ways farmers can protect surface water. University of Illinois, Urbana, Illinois.

Ko, L. 1999. Tips on land and water management for small acreages in Oregon. Oregon Association of Conservation Districts, Portland, Oregon.

Selker, J., and D. Rupp. 2004. Groundwater and Nitrogen Management in Willamette Valley Mint Production. Oregon State University Extension Service, Corvallis, Oregon. Publication EM 8861.
U.S. Department of Agriculture Natural Resources Conservation Service. 1998. National Handbook of Conservation Practices. U.S. Department of Agriculture Natural Resources Conservation Service, Portland, Oregon.

Riparian Areas and Streams

Adams, E.B. 1994. Riparian Grazing. Washington State University, Spokane, Washington.

Darris, D. and S.M. Lambert. 1993. Native willow varieties for the Pacific Northwest. U.S. Department of Agriculture Soil Conservation Service, Corvallis Plant Materials Center, Corvallis, Oregon.

Nash, E. and T. Mikalsen, eds. 1994. Guidelines for streambank restoration. Georgia Soil and Water Commission, Atlanta, Georgia.

Linn Soil and Water Conservation District, South Santiam Watershed Council, USDA Natural Resources Conservation Service, and East Multnomah Soil and Water Conservation District. 2005. Guide for using Willamette Valley native plants along your stream. Linn Soil and Water Conservation District, Tangent, Oregon.

Nutrient and Manure Management

Godwin, D. and J.A. Moore. 1997. Manure management in small farm livestock operations: protecting surface and groundwater. Oregon State University, Corvallis, Oregon.

Hart, J. 1995. How to take a soil sample...and why. Oregon State University, Corvallis, Oregon.

Hart, J. 1999. Analytical laboratories serving Oregon. Oregon State University, Corvallis, Oregon.

Marx, E.S., J. Hart, and R.G. Stevens. 1999. Soil Test Interpretation Guide. Oregon State University, Corvallis, Oregon.

Moore, J. and T. Willrich. 1993. Manure management practices to reduce water pollution. Oregon State University, Corvallis, Oregon.

Sattell, R. et al. 1999. Nitrogen scavenging: using cover crops to reduce nitrate leaching in western Oregon. Oregon State University, Corvallis, Oregon.

Stephenson, G., Hannaway, D., Blickle, A., Brewer, L., Brewer, L.J., Chaney, M., and Livesay, M. 2003. Managing Small-acre Horse Farms: For Green Pastures, Clean Water, and Healthy Horses. Oregon State University Extension Service. Publication EC 1558.

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.

Menzies, G., C.B. MacConnell, and D. Havens. 1994. Integrated pest management: effective options for farmers.

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.

Mitchell, A.R. 1997. Irrigating Peppermint. Oregon State University Extension Service, Corvallis, Oregon. Publication EM 8662.

Rackham, R.L. 1996. Irrigating Deciduous Fruit and Nut Trees in Oregon. Oregon State University Extension Service, Corvallis, Oregon. Publication EC 1424.

Semesrud, J., M. Hess, J. Selker, B. Strik, B. Mansour, R. Stebbins, and A. Mosley. 2000. Western Oregon Irrigation Guides. Oregon State University Extension Service, Corvallis, Oregon. Publication EM 8713.

Schock, C.C. 2001. Drip Irrigation: An Introduction. Oregon State University Extension Service, Corvallis, Oregon. Publication EM 8782.

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