Goose and Summer Lakes Basin Water Quality Management Area Plan

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Developed by the

Goose and Summer Lakes Basin Local Advisory Committee

Oregon Department of Agriculture

With support from the

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Acronyms and Terms Used in this Document

Ag Water Quality Program – Agricultural Water Quality Management Program
Area Plan – Agricultural Water Quality Management Area Plan
Area Rules – Agricultural Water Quality Management Area Rules
BLM – Bureau of Land Management
CAFO – Confined Animal Feeding Operation
cfs – cubic feet per second
CREP – Conservation Reserve Enhancement Program
CRP – Conservation Reserve Program
CWA – Clean Water Act
DEQ – Oregon Department of Environmental Quality
DSL – Oregon Department of State Lands
EQIP – Environmental Quality Incentives Program
GWMA – Groundwater Management Area
HUC – Hydrologic Unit Code
IPM – Integrated Pest Management
LAC – Local Advisory Committee
Management Area – Agricultural Water Quality Management Area
MOA – Memorandum of Agreement
NOAA – National Oceanic and Atmospheric Administration
NPDES – National Pollution Discharge Elimination System
NRCS – Natural Resources Conservation Service
OAR – Oregon Administrative Rules
ODA – Oregon Department of Agriculture
ODF – Oregon Department of Forestry
ODFW – Oregon Department of Fish and Wildlife
OHA – Oregon Health Authority
ORS – Oregon Revised Statute
OSU – Oregon State University
OWEB – Oregon Watershed Enhancement Board
PMP – Pesticides Management Plan
PSP – Pesticides Stewardship Partnership
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
USEPA – United States Environmental Protection Agency
USFS – United States Forest Service
USFWS – United States Fish and Wildlife Service
WQPMT – Water Quality Pesticides Management Team

Foreword

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

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

Required Elements of Area Plans

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

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

Plan Content

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

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

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

Chapter 4: Local Implementation, Monitoring, and Adaptive Management. Summarizes land condition and water quality status and trends to assess progress toward the goals and objectives in Chapter 3.

Chapter 1: Agricultural Water Quality Management Program Purpose and Background

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

As part of Oregon's Agricultural Water Quality Management Program (Ag Water Quality Program), the Area Plan guides landowners and partners such as Soil and Water Conservation Districts (SWCDs) in addressing water quality issues due to agricultural activities. The purpose of the 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 this Management Area (OAR 603-090-0000(3)) and to achieve and maintain water quality standards (ORS 561.191(2)). The Area Plan has been developed and revised by ODA and the Agricultural Water Quality Management Area Local Advisory Committee (LAC), with support and input from the SWCD and the Oregon Department of Environmental Quality (DEQ). The public was invited to participate in the original development and approval of the Area Plans and is invited to participate in the biennial review process. The Area Plan is implemented using a combination of outreach, conservation and management activities, compliance with Area Rules developed to implement the Area Plan, monitoring, evaluation, and adaptive management.

The provisions of the Area Plan do not establish legal requirements or prohibitions (ORS 568.912(1)). Each Area Plan is accompanied by Area Rules that describe local agricultural water quality regulatory requirements. ODA will exercise its regulatory authority for the prevention and control of water pollution from agricultural activities under the Ag Water Quality Program's general regulations (OAR 603-090-0000 to 603-090-0120) and under the Area Rules for this Management Area (OAR 603-095-3100). The Ag Water Quality Program's general rules guide the Ag Water Quality Program, and the Area Rules for the Management Area are the regulations that landowners are required to follow.

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

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

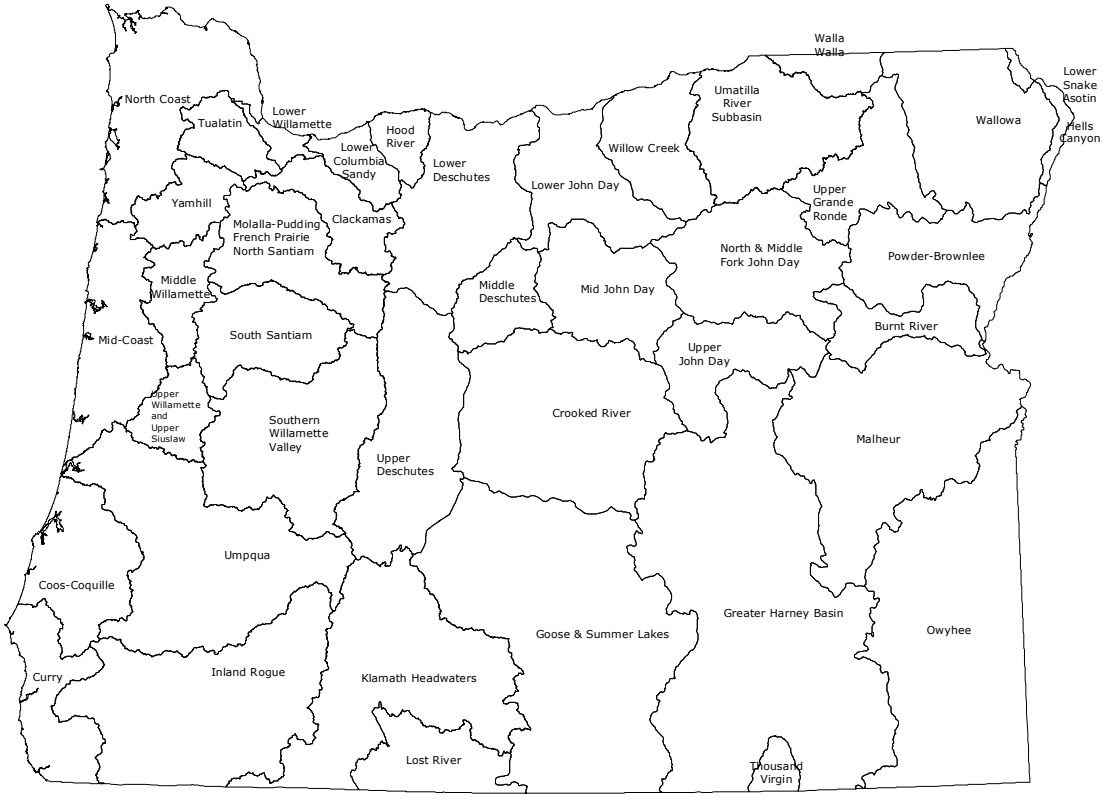
1.2 History of the Ag Water Quality Program

In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act (formerly known as "Senate Bill 1010") directing ODA to develop plans to prevent and control water pollution from agricultural activities, 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). The Area Plan and its associated Area Rules were developed and subsequently revised pursuant to these statutes.

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

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

Figure 1: Map of 38 Agricultural Water Quality Management Areas



1.3 Roles and Responsibilities

1.3.1 Oregon Department of Agriculture

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

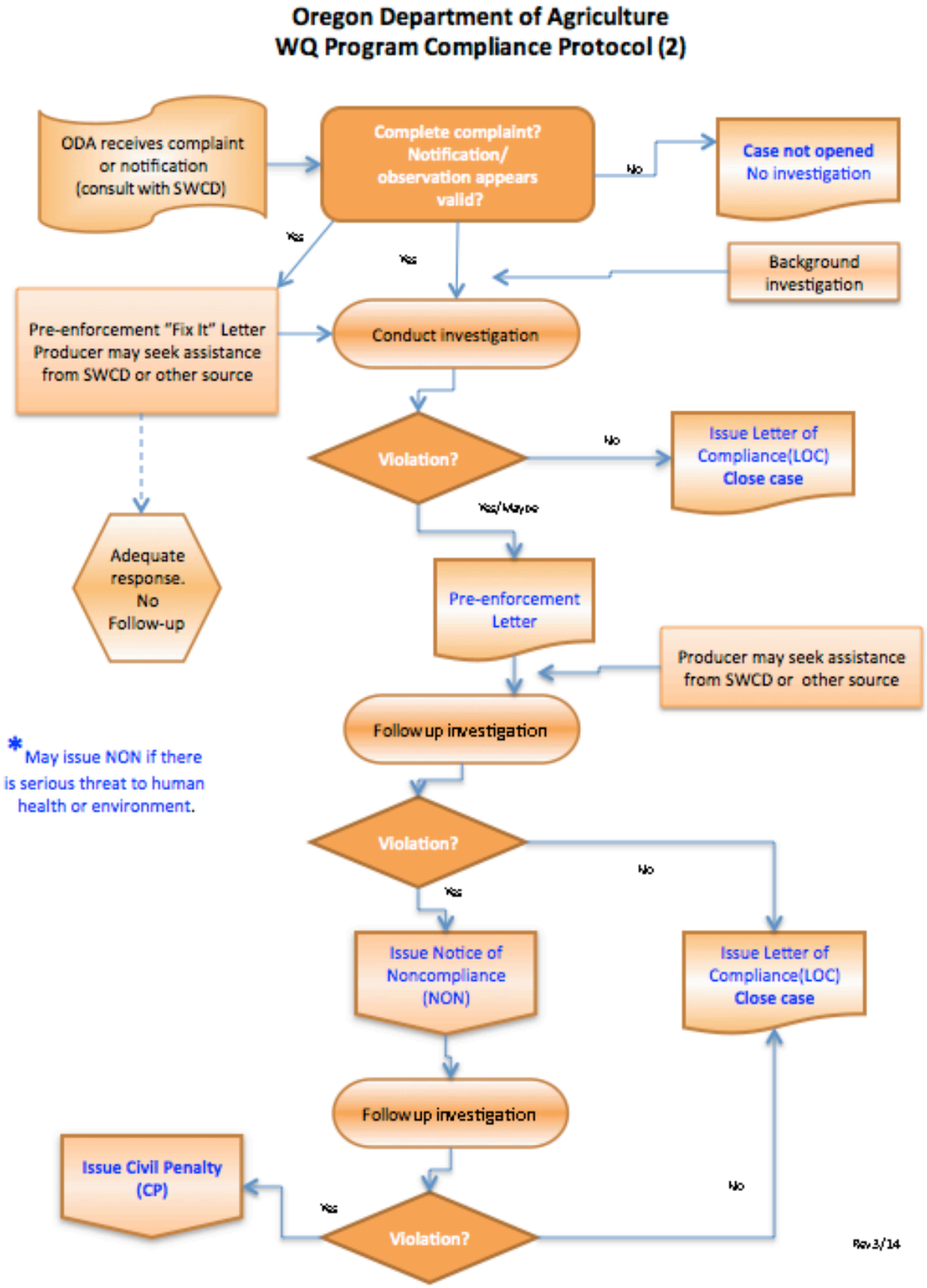
- State water quality standards.
- Load allocations for agricultural nonpoint source pollution assigned under Total Maximum Daily Loads (TMDLs) issued pursuant to the Clean Water Act (CWA), Section 303(d).
- Approved management measures for Coastal Zone Act Reauthorization Amendments (CZARA).
- Agricultural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

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

The emphasis of the Area Plan is on voluntary action by landowners or operators to control the factors effecting water quality in the Management Area. The Area Rules are outlined as a set of minimum standards that landowners and operators must be meet on all agricultural or rural lands.

ODA will use enforcement where appropriate and necessary to gain compliance with agricultural water quality rules. Figure 2 outlines ODA's compliance process. Any enforcement action will be pursued only when reasonable attempts at voluntary solutions have failed (OAR 603-090-0000(5)(e)). If a violation is documented, ODA may issue a pre-enforcement notification or an Order such as a Notice of Noncompliance. If a Notice of Noncompliance is issued, ODA will direct the landowner or operator to remedy the condition through required corrective actions (RCAs) under the provisions of the enforcement procedures outlined in OAR 603-090-060 through OAR 603-090-120. If a landowner does not implement the RCAs, civil penalties may be assessed for continued violation of the rules. See the Compliance Flow Chart for a diagram of the compliance process. If and when other governmental policies, programs, or rules conflict with the Area Plan or associated Area Rules, ODA will consult with the appropriate agency to resolve the conflict in a reasonable manner.

Figure 2: Compliance Flow Chart



1.3.2 Local Management Agency

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

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

1.3.3 Local Advisory Committee

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

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

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

1.3.4 Agriculture's Role

Each individual landowner or operator in the Management Area is required to comply with the Area Rules, which set minimum standards. However, the rules alone may not be enough in every Management Area. Each landowner and operator in the Management Area is required to comply with the Area Rules. Landowners also are encouraged to engage in restoration activities to achieve the goals and objectives of the Area Plan. Each landowner and operator's actions will contribute toward achievement of the water quality standards.

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

Under the Area Plan and associated Area Rules, agricultural landowners and operators are not responsible for mitigating or addressing factors that do not result from agricultural activities, such as:

- Conditions resulting from unusual weather events.
- Hot springs, glacial melt water, extreme or unforeseen weather events, and climate change.
- Septic systems and other sources of human waste.
- Public roadways, culverts, roadside ditches and shoulders.

- Dams, dam removal, hydroelectric plants, and non-agricultural impoundments.
- Housing and other development in agricultural areas.
- Other circumstances not within the reasonable control of the landowner or operator.

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

1.3.5 Public Participation

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

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

1.4 Agricultural Water Quality

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 CAFOs, and many are regulated under ODA's CAFO Program. Pesticide applications in, over, or within three feet of water also are regulated as point sources. Irrigation water discharges from agricultural fields may be at a defined discharge point but they do not currently require a permit.

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

1.4.2 Beneficial Uses and Parameters of Concern

Beneficial uses related to water quality are defined by DEQ in OARs for each basin. They may include: public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, hydropower, and commercial navigation and transportation. The most sensitive beneficial uses usually are fish and aquatic life, water contact recreation, and public and private domestic water supply. These uses generally are the first to be impaired because they are affected at lower levels of pollution. While there may not be severe impacts on water quality from a single source or sector, the combined effects from all sources can contribute to the impairment of beneficial uses in the Management Area. Beneficial uses that have the potential to be impacted in this Management Area are summarized in Chapter 2.

Many water bodies throughout Oregon do not meet state water quality standards. Many of these water bodies have established water quality management plans that document needed pollutant reductions. The most common water quality concerns related to agricultural activities are temperature, bacteria, biological

criteria, sediment and turbidity, phosphorous, algae, pH, dissolved oxygen, harmful algal blooms, nitrates, pesticides, and mercury. These parameters vary by Management Area and are summarized in Chapter 2.

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

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

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

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

As part of the TMDL process, DEQ identifies the Designated Management Agency (DMA) or parties responsible for submitting TMDL implementation plans. TMDLs designate the local Area Plan as the implementation plan for the agricultural component of this Management Area. Biennial reviews and revisions to the Area Plan and associated regulations must address agricultural or nonpoint source load allocations from relevant 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 Oregon Water Pollution Control Law – ORS 468B.025 and ORS 468B.050

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

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

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

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

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

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

1.4.5 Streamside Vegetation and Agricultural Water Quality

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

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

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

- Streamside vegetation provides fish and wildlife habitat.
- Landowners can improve streamside vegetation in ways that are compatible with their operation. Streamside conditions may be improved without the removal of the agricultural activity, such as with managed grazing.
- Streamside vegetation condition is measureable and can be used to track progress in achieving desired site conditions.

Site-Capable Vegetation

The Ag Water Quality Program uses the concept of "site-capable vegetation" to describe the vegetation that agricultural streams can provide to protect water quality. Site-capable vegetation is the vegetation that can be expected to grow at a particular site, given natural site factors (e.g., elevation, soils, climate, hydrology, wildlife, fire, floods), and historical and current human influences (e.g., channelization, roads, modified flows, previous land management). Site-capable vegetation can be determined for a specific site based on: current streamside vegetation at the site, streamside vegetation at nearby reference sites with similar natural characteristics, Natural Resources Conservation Service (NRCS) soil surveys and ecological site descriptions, and local or regional scientific research. ODA does not consider invasive, non-native plants such as introduced varieties of reed canary grass and blackberry to be site-capable vegetation.

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 the water quality functions equivalent to what site-capable vegetation would provide.

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

1.5 Other Water Quality Programs

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

1.5.1 Confined Animal Feeding Operation Program

Oregon Department of Agriculture is the lead state agency for the CAFO Program. The CAFO Program was developed to ensure that operators do not contaminate ground or surface water with animal manure. Since the early 1980s, CAFOs in Oregon have been registered to a general Water Pollution Control Facility permit designed to protect water quality, while allowing the operators and producers to remain economically viable. A properly maintained CAFO does not pollute ground or surface water. To assure continued protection of ground and surface water, the 2001 Oregon State Legislature directed ODA to convert the CAFO Program from a Water Pollution Control Facility permit program to a federal National Pollutant Discharge Elimination System (NPDES) program. Oregon Department of Agriculture and DEQ jointly issue the NPDES CAFO Permit, which complies with all CWA requirements for CAFOs. This permit 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.

1.5.2 Groundwater Management Areas

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

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

1.5.3 The Oregon Plan for Salmon and Watersheds

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

1.5.4 Pesticide Management and Stewardship

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

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

Through the PSP, state agencies and local partners work together to monitor pesticides in streams and to improve water quality (www.deq.state.or.us/wq/pesticide/pesticide.htm). ODA, Department of Environmental Quality, and Oregon State University Extension Service work with landowners, SWCDs, watershed councils, and other local partners to voluntarily reduce pesticide levels while improving water quality and crop management. Since 2000, the PSPs have made noteworthy progress in reducing pesticide concentrations and detections.

Oregon Department of Agriculture led the development and implementation of a Pesticides Management Plan (PMP) for the state of Oregon (www.oregon.gov/ODA/programs/Pesticides/water/pages/AboutWaterPesticides.aspx). The PMP, completed in 2011, strives to protect drinking water supplies and the environment from pesticide

contamination, while recognizing the important role that pesticides have in maintaining a strong state economy, managing natural resources, and preventing human disease. By managing the pesticides that are approved for use by the United States Environmental Protection Agency (US EPA) and Oregon in agricultural and non-agricultural settings, the PMP sets forth a process for preventing and responding to pesticide detections in Oregon's ground and surface water resources.

1.5.5 Drinking Water Source Protection

Oregon implements its drinking water protection program through a partnership between DEQ and OHA. The program provides individuals and communities with information on how to protect the quality of Oregon's drinking water. Department of Environmental Quality and OHA encourage preventive management strategies to ensure that all public drinking water resources are kept safe from current and future contamination. For more information, see: www.deq.state.or.us/wq/dwp/dwp.htm.

1.6 Partner Agencies and Organizations

1.6.1 Oregon Department of Environmental Quality

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

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

The MOA includes the following commitments:

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

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

1.6.2 Other Partners

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

1.7 Measuring Progress

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

1.7.1 Measurable Objectives

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

After ODA, the LAC, and the LMA establish measurable objectives and associated milestones, they will evaluate progress toward the milestones at each biennial review of the Area Plan. Using adaptive management, the biennial review will evaluate progress toward the most recent milestone(s) and why they were or were not achieved. ODA, the LAC, and LMA will evaluate whether changes are needed to keep on track for achieving the longer-term measurable objective(s), and will revise strategies to address obstacles and challenges.

Measurable objectives allow the Ag Water Quality Program to better evaluate progress toward meeting water quality standards. Many of these measurable objectives relate to land conditions and primarily are implemented through focused work in small geographic areas (Chapter 1.7.3), with a long-term goal of developing measurable objectives and monitoring methods at the Management Area scale. The measurable objectives and associated milestones for the Area Plan are in Chapter 3 and progress toward achieving the measurable objectives and milestones is summarized in Chapter 4.

1.7.2 Land Conditions and Water Quality

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

- Extensive monitoring of water quality is needed to evaluate progress, which is expensive and may fail to demonstrate improvements in the short term.
- Improved land conditions can be documented immediately, but there may be significant lag time before water quality improves or water quality impacts may be due to other sources.
- Reductions in water quality from agricultural activities are primarily through changes in land conditions and management activities.

Water quality monitoring data may help ODA and partners to measure progress or identify problem areas in implementing Area Plans. However, as described above, water quality monitoring may be less likely to document the short-term effects of changing land conditions on water quality parameters such as temperature, bacteria, nutrients, sediment, and pesticides.

1.7.3 Focused Implementation in Small Geographic Areas

Focus Areas

A Focus Area is a small watershed with water quality or concerns associated with agriculture. Through the Focus Area process, the SWCD delivers systematic, concentrated outreach and technical assistance in small geographic area. A key component of this approach is measuring land conditions before and after implementation, to document the progress made with available resources. The Focus Area approach is consistent with other agencies' and organizations' efforts to work proactively in small geographic areas, and is supported by a large body of scientific research (e.g., Council for Agricultural Science and Technology, 2012).

Systematic implementation in Focus Areas provides the following advantages:

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

Soil and Water Conservation Districts select a Focus Area in cooperation with ODA and other partners. 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 SWCD will also continue to provide outreach and technical assistance to the entire Management Area.

Strategic Implementation Areas

Strategic Implementation Areas (SIAs) are small watersheds selected by ODA, in cooperation with partners based on a statewide review of water quality data and other available information. ODA conducts an evaluation of likely compliance with agricultural water quality regulations, and contacts landowners

with the results and next steps. Landowners have the option of working with the SWCD or other partners to voluntarily address water quality concerns. ODA follows up, as needed, to enforce agricultural water quality regulations. Finally, ODA completes a post-assessment to document progress made in the watershed. Chapter 3 describes any SIAs that are underway in this Management Area.

1.8 Monitoring, Evaluation, and Adaptive Management

ODA, the LAC and the LMA will assess the effectiveness of the Area Plan and associated Area Rules by evaluating the status and trends in agricultural land conditions and water quality data. This assessment will include an evaluation of progress toward measurable objectives on agricultural lands across the entire Management Area and within the Focus Area. ODA will utilize other agencies' and organizations' local monitoring data when available. The Area Plan summarizes the results and findings 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), measurable 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. Stream segments representing 10 to 15 percent of the agricultural lands in each Management Area were randomly selected for long-term aerial photo monitoring. Stream segments are generally 3-5 miles long. ODA evaluates streamside vegetation at specific points within 30-, 60-, and 90-foot bands along both sides of stream segments from the aerial photos and assigns each segment a score based on streamside vegetation. The score can range from 70 (all trees) to 0 (all bare ground). The same stream segments are re-photographed and re-scored every five years to evaluate changes in streamside vegetation conditions over time. Because site capable vegetation varies across the state, there is no single "correct" streamside vegetation index score. The purpose of this monitoring is to measure positive or negative change. The results for this Management Area are summarized in Chapter 4.

1.8.2 Agricultural Ambient Water Quality Monitoring

The Oregon Department of Agriculture evaluates water quality data from DEQ's long-term monitoring sites to determine trends in water quality at agricultural sites statewide. Results from monitoring sites in this Management Area, along with local water quality monitoring data, are described in Chapter 4.

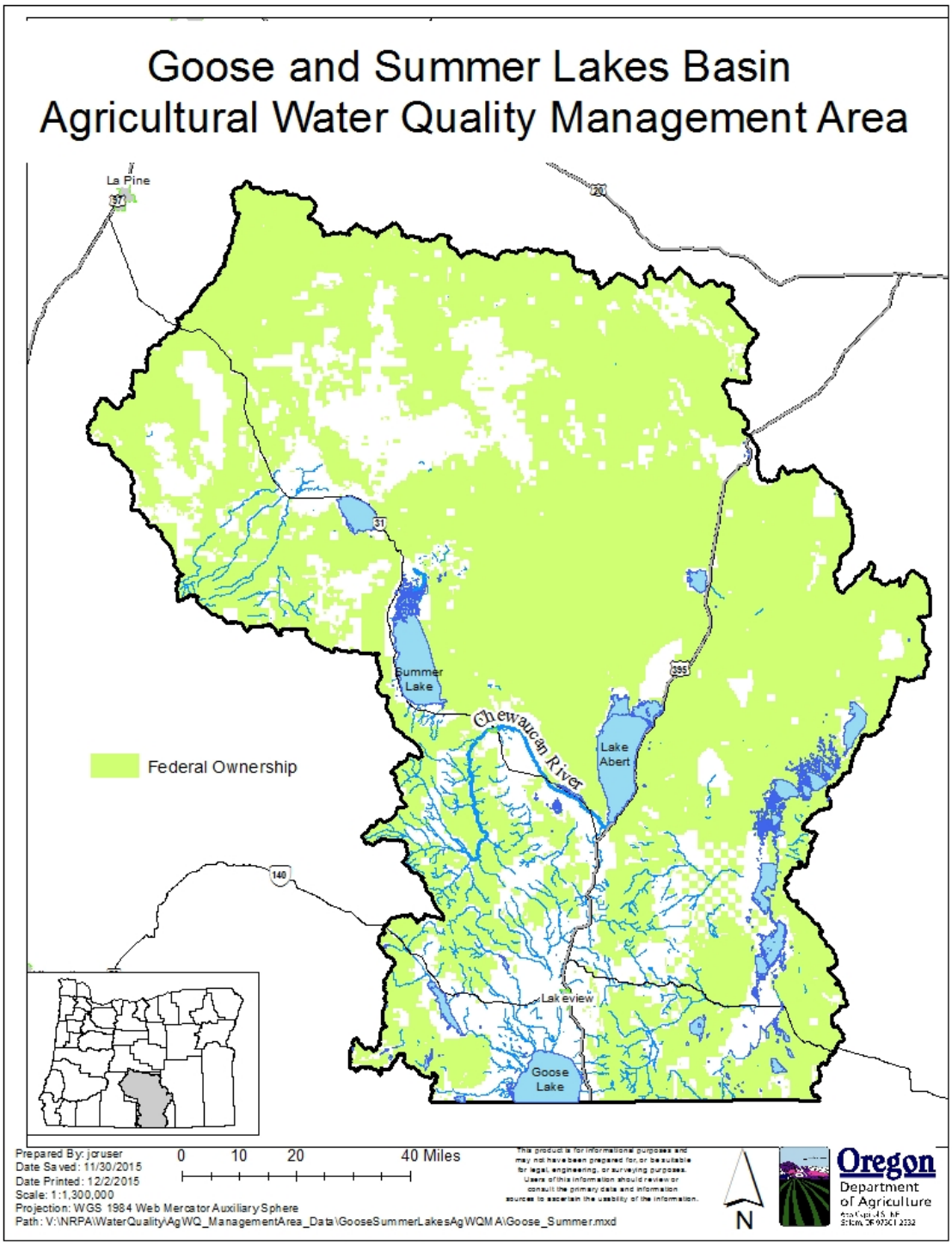
1.8.3 Biennial Reviews and Adaptive Management

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

Chapter 2: Local Background

The Goose and Summer Lakes Agricultural Water Quality Management Area (Management Area) consists of the Lake Abert, Goose Lake, Summer Lake, and Warner Lake Subbasins.

Figure 3. Map of Management Area



2.1 Local Roles and Responsibilities

2.1.1 Local Advisory Committee (LAC)

LAC members represent the interests of local landowners, producer groups, irrigation districts, watershed councils, and the Lakeview and Fort Rock/Silver Lake SWCDs. Members are:

Table 1. Current Local Advisory Committee (LAC) members.	
John O'Keeffe, Chair: Adel, cattle Pete Talbott, Vice-Chair: Westside, cattle Keith Barnhart: Valley Falls, cattle & SWCD Bob Elder: Paisley, cattle & hay & timber LeeRoy Horton: Christmas Valley, alfalfa & SWCD Mike O'Leary: Paisley, cattle	Bob Squires: Thomas Creek, Lakeview Water Users and cattle John Taylor: Plush, cattle Trevor Watson: ODFW fish biologist Alternate: Leon Baker: Silver Lake, alfalfa & SWCD

The LAC receives additional technical support from the NRCS; United States Forest Service (USFS); Bureau of Land Management (BLM); ODA and DEQ; Oregon State University-Lake County Cooperative Extension Service; and others.

The LAC and ODA want to support and assist existing conservation efforts such as watershed council projects and existing NRCS farm plans. Farmers and ranchers in the area have been practicing good land stewardship on their own and in conjunction with these programs for many years.

2.1.2 Local Management Agency

The Lakeview and Fort Rock/Silver Lake SWCDs are the Local Management Agencies for implementing the Area Plan. They provide meeting administration, outreach, and technical assistance to landowners.

The day-to-day implementation of this Plan is accomplished through Memoranda of Agreement between the SWCDs and ODA. The Lakeview and Fort Rock/Silver Lake SWCDs act as Local Management Agencies under such agreements.

2.2 Management Area Description

2.2.1 Geography

Location[1]
The Goose and Summer Lakes Basin Agricultural Water Quality Management Area consists of four closed subbasins in south-central Oregon: Summer Lake, Lake Abert, Goose Lake, and Warner Lake. The Management Area encompasses approximately 7,700 square miles and includes the towns and communities of Fort Rock, Christmas Valley, Silver Lake, Summer Lake, Paisley, Valley Falls, Lakeview, Plush, and Adel (see map). The Management Area includes most of Lake County, a significant portion of Harney County, and small pieces of Klamath and Deschutes County. Elevation above sea level ranges from 4,147' at Summer Lake to 8,456' on Crane Mountain east of Lakeview.

Climate[1]
The climate is semiarid. Average annual precipitation ranges from 5" in some of the eastern valleys to over 30" at higher elevations. Most of the precipitation falls during the winter. During the June through August growing season, an average of 2" of rain falls annually at lower elevations.

Annual precipitation varies considerably and often appears in multi-year droughts or deluges.[2] For instance, annual precipitation at Paisley between 1910 and 2000 averages 10.6", with a minimum of 4.86" and a maximum of 18.5" (minimum and maximum for Lakeview are 8.31" and 24.1"). Droughts occurred in 1929-32 (average annual precipitation of 7") and deluges (average annual precipitation > 15") in 1915-17 and 1981-83.

The Abert Lake and Warner Valley Subbasins are more arid than the Goose Lake Subbasin and have frost-free periods of 70 to 110 days.[3] Frost-free periods average 122 days in the open valleys, except in the Fort Rock/Christmas Valley area where the frost-free period is shorter.[1] Freezing temperatures can occur at any time during the year. Maximum temperatures can exceed 100ºF for a few weeks during the summer.[4]

Average minimum and maximum monthly temperatures at the lower elevations in the basin range from 18ºF to 37ºF in January and from 49ºF to 85ºF in July.

The natural thawing of creeks can cause considerable ice damage to streambanks and streamside vegetation.[4]

Geology and Soils[1]

Volcanic activity shaped the Management Area, which is characterized by steep, tilted fault-block mountains and closed drainage basins. Volcanic structures and associated lava flows have combined with faulting and folding to disrupt surface and subsurface drainage patterns.

Ancient lake deposits and valley fill sediments often obscures structural features in the valleys. Valley fill near the east side of Goose Lake is reported to be about 5,000 feet thick.

During the Pleistocene (the epoch from 2,588,000 to 12,000 years ago that spans the world's recent period of repeated glaciation), large lakes filled the Summer, Goose, Warner, and Fort Rock valleys. As time passed, the climate became drier, and most of the lakes evaporated. The present lakes and playas are all that remain of these ancestral lakes. With no surface outlets, saline concentrations have risen until now most lake waters in the basin are too salty for domestic or irrigation use.

A large accumulation of snow, over frozen ground in some areas, followed by rapid warming and heavy rains caused widespread flooding throughout eastern Oregon in December 1964.[4] Flooding scoured out creek beds and exposed mineral soils in the Management Area. The resulting soils are so compact and dense that they neither erode nor allow vegetation to grow. These areas can be seen in road cuts and streambanks throughout the Management Area.

Vegetation[1,3]

Almost three-quarters of the basin is classified as rangeland. Native vegetation consists primarily of low sagebrush, big sagebrush, blue bunch wheatgrass, and Sandberg bluegrass. Areas that receive more than 18" of precipitation commonly support Ponderosa pine and white fir. These areas are at elevations of about 5,000 to 8,000' or more and are located along the western boundary of the Management Area and east of Lakeview. Other plants in this zone include: lodge pole pine, quaking aspen, antelope bitterbrush, and Idaho fescue.

Less than four percent of the land is cultivated.

Great Basin redband trout[5, 6]

Redband trout (a subspecies of rainbow trout) are found throughout the Management Area. They are salmonids (related to salmon). They are adapted to arid forest and desert environments characterized by

extreme fluctuations in stream flow and temperature. Two life histories help them thrive in these potentially harsh conditions. Some live year-round in the upper reaches of streams. Others are migratory and live in reservoirs and lakes, but move to streams to spawn. Recent research has indicated that redband trout prefer temperatures of 55°F, but, unlike other salmonids, perform well in temperatures up to 75°F.[7]

A proposal in 1997 to list the redband trout under the federal Endangered Species Act was "not warranted at this time [2000] because it is not in danger of extinction or likely to become so within the foreseeable future," based on "the best available scientific and commercial information available."[8] (Collins Pine, J.M. Dambacher, S.P. Cramer, and Oregon Department of Fish and Wildlife (ODFW) were key players in local redband trout research). The information included a 1999 survey that showed trout densities to be "moderate to high,"[6] and the populations in the Chewaucan River and Deep Creek were characterized as "healthy."[9] The population was estimated at over one million throughout their entire range in Lake and Harney counties.[6] In addition, the cooperative nature of landowners on habitat and passage projects aided in the decision to not list.

2.2.2 Hydrology[1]

Most of the Management Area's water originates in the mountains lying along the western boundary of the basin and on the Warner Mountains. Most of the streams draining these upland areas flow into one of the major lakes on the valley floors. Peak discharge on most streams is in May and is derived primarily from melting snow. Low flows generally occur in August and September. There are no permanent snowfields in the basin. Flows during the late summer and fall are supplied naturally by springs and seeps. Irrigation water and water released from reservoirs augment summer flow;[4] irrigation water returns to streams through overland or subsurface flows. The northeastern quarter of the basin is drained by intermittent streams that are dry except for brief periods following rainfall or snowmelt. These streams discharge into numerous small playas where the waters either evaporate or percolate to groundwater.

The waters of many major lakes in the basin are alkaline and saline.

The Management Area incorporates four closed subbasins. The southern end of Goose Lake is the only point at which surface water historically flowed out of the basin. Groundwater may flow north from the Fort Rock area into the Deschutes River Basin.

Streams within the Goose Lake and Lake Abert subbasins drain into Goose Lake and Lake Abert, respectively. The Warner Lake and Summer Lake subbasins consist of many closed drainages. While streams in the southern Warner Lakes Subbasin drain to the Warner Lakes, there is no surface connection between many of the small streams in the northern part of the Subbasin and the lakes. The Summer Lake Subbasin consists of many small drainage systems. Except for Silver Creek and tributaries that flow to Silver Lake and the Ana River that flows to Summer Lake, the streams in the Subbasin are intermittent and form a large number of small drainage systems that have no surface connection.

Some streams on the 303(d) list or shown on maps as perennial have sections that dry up every year and are therefore intermittent.[4]

Large flood flows sometimes occur during spring snowmelts or, rarely, from winter rainstorms invading from Western Oregon.[10] These storms have caused extensive damage to stream channels. The storm of December 1964 devastated streams throughout the western United States[11] and caused almost $2 million in agricultural damage in Lake County alone.[12] In the Management Area, 4.41" of rain were recorded at Valley Falls from December 19-23. The peak discharge of the Chewaucan River a few miles north near Paisley, 6,490 cubic feet per second (cfs), far exceeded any that had occurred at the Paisley gauging station in the previous 50 years and was greater than the historic peak discharge of 4,000 cfs at the site in

1909. Local flooding isolated the city of Lakeview, Oregon for several days and inundated about 50 homes. The Army Corps of Engineers constructed two miles of berms along the Chewaucan River through Paisley in 1972 to protect the sewage lagoons. [4,10] Strong floods hit the Management Area again in 1997. On January 2, 1997, three inches of rain fell in Paisley[2] and flows over 4,500 cfs were subsequently recorded on the Chewaucan.[13] Both the 1964 and 1997 floods exceeded the 100-year flood magnitude of 4,200 cfs.[14]

Water Rights[1]

The major water use in the basin is irrigation. The oldest water rights date back to 1867. There are rights to irrigate over 183,000 acres; fewer than 45,000 of these acres are served by irrigation companies or districts. Few water rights for groundwater use were issued prior to 1960. Since then, use of groundwater has expanded dramatically.

As of 1989, about 42 percent of the irrigation water rights had groundwater sources. About 85 percent of the acreage irrigated with groundwater was in the Summer Lake Subbasin, primarily in the Fort Rock area.

Landowners also have the right to divert water for livestock use outside of the irrigation season.[4]

Flood Irrigation

Diversion of high flows in early spring is the most common method of irrigation water management. During this period of natural high runoff, farmers and ranchers maximize the use of the high flows through flood irrigation. This flooding of hay meadows actually mimics natural hydrologic processes that occurred annually for thousands of years within the region prior to permanent European settlement. Flood irrigation cycles the high flows through farmers' fields, and the irrigation water returns to the system as overland flows or via percolation through the soil. This benefits the environment by groundwater recharge, cooling of return flows through subbing, augmentation of late summer stream flows, and the creation of wildlife habitat. In addition, flood irrigation is economical, reduces the need for power production, and reduces pesticide application to control rodents.

Flood irrigation is a highly efficient use of water in non-storage systems. In the Management Area, much of the high flow not used for flood irrigation enters the large shallow lakes and some is lost to evaporation. No other method of irrigation enables the landowner to deliver high volumes of water at a time when it is available. Sprinklers, for example, deliver a constant amount of water; this does not allow the landowner to deliver large amounts of water to the crop during high flows or to meet the crop need before flows diminish, when many uses conflict for minimal water.

Flood irrigation of meadows during the spring and summer directly benefits many species of migratory birds (e.g. sandhill cranes, pintail ducks, snow geese, and other waterfowl) by providing high quality feeding and resting habitat during migration.[5] Breeding birds that benefit include sandhill cranes, ducks (mallards, gadwall, and cinnamon teal), Canada geese, and shorebirds (white-faced ibis, long-billed curlews, and willets).

2.2.3 Land Use

Historical[3,15]

Parties sent out by the federal government and the Hudson Bay Company explored the region in the first half of the nineteenth century. Prospectors traversed the basin after gold was discovered in the John Day and Powder Rivers regions in the 1860s. The first homesteaders settled the Goose Lake Basin in 1869.

Early agriculture was based on use of meadows in the open valleys for stock grazing. This is still the principal agricultural activity in the basin. Early settlers depended upon natural flooding of meadows to produce hay for winter forage. The major agricultural lands north of Goose Lake, in the southern part of the Warner Valley, at Paulina Marsh, and along the Chewaucan River once were marshes. Local farmers developed drainage and irrigation systems in the late 1800s and early 1900s to increase hay yields and improve pasture.

The Fort Rock/Christmas Valley area was settled rapidly between 1905 and 1915. However, most of the homesteads were based on dryland farming and had been abandoned by 1920. Agriculture expanded rapidly in the area again in the 1970s with increased groundwater use. As many as 65,000 acres were placed under irrigation, primarily for alfalfa production.

Current

Private lands comprise approximately 23 percent of the Management Area.[16] The state of Oregon owns 74,000 acres, some of which comprise the Summer Lake Wildlife Management Area. The Federal government manages the rest. The BLM manages three-quarters of these lands; the USFS and US Fish and Wildlife Service (USFWS) manage the balance of the Federal lands. Private lands are generally concentrated in the valley bottoms, while rangelands and forestlands are in public ownership.

Lumber, government, and agriculture form the economic base for Lake County, which makes up over 90 percent of the Goose and Summer Lakes Basin.[1] [Because less than 10 percent of the Management Area lies in adjacent counties, no economic data for those counties are cited here.]

In the year 2012, 138,500 acres were harvested in Lake County, of which 137,000 consisted of hays and forage and 1,500 consisted of oats.[17] Farmers and ranchers also raised 159,200 cattle and horses. In 2012, Lake County Gross Farm and Ranch Sales totaled $106,917,000.

The population of the Management Area is approximately 7,500 persons,[15] with less than one person per square mile. Average per capita income is less than $22,000. The state of Oregon classifies Lake, Klamath, and Harney counties as Economically Distressed Areas.

2.3 Agricultural Water Quality in the Management Area

Temperature, dissolved oxygen, pH, sedimentation, nutrients, and heavy metals are included by Oregon's DEQ on its 2010 303(d) list, which identifies 'water-quality limited' streams, as required by the Federal Clean Water Act. The source of heavy metals is unknown. In addition, the LAC chose to proactively address potential bacteria problems.

2.3.1 Beneficial Uses

State agencies use the term "beneficial use" in different ways. The Federal Clean Water Act requires states to designate beneficial uses related to water quality that must be protected for the public interest and that are not tied to water rights. The Area Plan and Rules address these beneficial uses of water (Tables 1 and 2). These beneficial uses are applied broadly throughout a basin and are codified in DEQ's OARs. Another definition of the term "beneficial use," which is outside the scope of the Area Plan, are the uses for which Oregon's Water Resources Department issues water rights.

'Fish and aquatic life' is usually the most sensitive use because the animals are affected by the greatest number of water quality parameters.

The Goose Lake Basin provides habitat for nine native fish species. Four are Federally listed as 'species of concern' (Goose Lake redband trout, Goose Lake lamprey, Goose Lake sucker, and pit roach), and the Modoc sucker is federally endangered, but proposed for delisting. The Goose Lake redband trout, Goose Lake lamprey, Goose Lake tui chub, and Goose Lake sucker are endemic, meaning they are not found anywhere else. The endemic fishes of the Goose Lake basin split their life histories between Goose Lake and its tributaries, as opposed to the five native but non-endemic species that primarily reside, spawn, rear, migrate, and seek refuge in streams leading to Goose Lake (Status and Distribution of Native Fishes in the Goose Lake Basin, Oregon. Sheerer, P.D., et al., Northwestern Naturalist 91(3):271-287. 2010).

Table 2. Beneficial Uses designated for the Goose and Summer Lakes Basin (OAR 340-41-0140)

Beneficial Use	Goose Lake	Highly Alkaline & Saline Lakes	Freshwater Lakes, Reservoirs & Streams
Public Domestic Water Supply*			X
Private Domestic Water Supply*			X
Industrial Water Supply		X	X
Irrigation			X
Livestock Watering	X		X
Fish & Aquatic Life[2]	X	X	X
Wildlife & Hunting	X	X	X
Fishing	X	X	X
Boating	X	X	X
Water Contact Recreation	X	X	X
Aesthetic Quality	X	X	X

*With adequate pretreatment (filtration & disinfection) and natural quality to meet drinking water standards.
[2]See Table 140B for fish use designations

Table 3. Beneficial use designations – fish use in the Goose and Summer Lakes Basin (OAR 340-041-0140, Table 140B).

Geographic Extent of Use	Redband or Lahontan Cutthroat Trout	Cool Water Species (no salmonids)
Summer Lake Subbasin		
Ft. Rock Subbasin: Silver, Buck, and Bridge Creeks	X	
Ft. Rock Subbasin: all other streams		X
Alkali Lake Subbasin		X
All other Summer Lake Subbasin streams	X	
All other Management Area streams	X	
All other Highly Alkaline & Saline Lakes		X

Some of these beneficial uses may not be attainable in waterbodies due to natural conditions. For instance, some of the freshwater streams are ephemeral and can't support Great Basin redband trout.[18] Natural conditions of the alkali lakes in the Management Area allow only limited support of the beneficial uses indicated in Tables 1 and 2. This limited support also varies significantly among the lakes.

2.3.2 Water Quality Parameters

Streams are on the 2010 303(d) list primarily for excessive summer temperatures (Table 4).[19] In addition, three streams are listed for impaired aquatic insect communities, probably due to excessive sediment and nutrients. The sources of the pH, dissolved oxygen, and heavy metal concerns currently are unknown.

Headwater streams usually have good water quality.[1] However, many streams on the valley floors exhibit low dissolved oxygen (usually attributed to the naturally high water temperatures) and high turbidity levels. Low dissolved oxygen is associated with high water temperatures, which often occur naturally in these systems. Spring runoff is naturally muddy. Several reservoirs in the basin are shallow and on colloidal soils. As a result, solids are kept in suspension in the reservoirs and contribute to poor water quality downstream. In addition, elevated bacteria levels have been measured in many streams including

Kelly, Drews, Cottonwood, Thomas, Cox and Crooked creeks, and the Chewaucan River. Data are insufficient to identify the source of the bacteria or to know if the problems are chronic. Water temperatures increase during low-flow periods.

Groundwater generally is of good quality. However, groundwater in two areas in the Basin has been contaminated: a chemical waste disposal site near Alkali Lake released herbicide wastes, and uranium mill tailings near Lakeview leached into groundwater.[1]

Table 4. Location and seasonality of exceedances of Oregon's Water Quality Criteria in the Goose and Summer Lakes Management Area from 2010 Integrated Report 303(d) list.

Water Quality Criterion	Stream Segments on the 303(d) List	
Biological Criteria Benthic macroinvertebrate (aquatic insects) community impaired	**Lake Abert Subbasin** Chewaucan River above Bagley Ditch (35.2-61.5) - indication of sedimentation **Goose Lake Subbasin** Thomas Creek above Jaunta Ditch (12-35.9) - indication of sedimentation and excessive nutrients	**Warner Lakes Subbasin** Burnt Creek (0-9) – indication of sediment and organic enrichment
pH	**Warner Lakes Subbasin** Honey Creek (0-25.6)	
Dissolved oxygen < 6.5 mg/L	**Goose Lake Subbasin** Thomas Creek (0-35.9)	**Warner Lakes Subbasin** Twentymile Creek (0-28.9)
Heavy Metals	**Goose Lake Subbasin** East Branch Thomas Creek (0-4.9): Iron Thomas Creek (0-35.9): Iron	**Warner Lakes Subbasin** Fifteenmile Creek (0-6): Silver Twelvemile Creek (0-17.3): Arsenic, Silver Twentymile Creek (0-28.9): Arsenic, Silver
Water temperature exceeds summer 64° F (salmonid fish rearing) or year- around 68° F Redband criteria	**Lake Abert Subbasin** Augur Creek (Mile 0-2.7) Bear Creek (0-9.5) Ben Young Creek (0-8) Chewaucan River 0-61.5) Coffeepot Creek (0-10) Little Coffeepot Creek (0-4.3) Morgan Creek (0-4.8) Shoestring Creek (0-7) Shoestring Creek, West Fork (0-3.4) South Creek (0-10.6) Swamp Creek (0-6.2) Willow Creek (0-15.3) **Goose Lake Subbasin** Bauers Creek (Mile 0-11.2) Camp Creek (0-14.3) Camp Creek, East Fork (0-4.9) Cox Creek (0-15.2) Cox Creek, North Fork (0-4.5) Dent Creek (0-6.1) Drews Creek above Reservoir (25.1-39.8) Hay Creek (0-12.8) Quartz Creek (0-5.7) Shingle Mill Creek (0-3.9) Thomas Creek (0-35.9)	**Warner Lakes Subbasin** Camas Creek (0-18.7) Deep Creek (0-38) Deep Creek, North Fork (0-2.9) Dismal Creek (0-7.7) Drake Creek (0-12) Fifteenmile Creek (0-6.6) Honey Creek (0-25.6) Horse Creek (0-5.8) Little Honey Creek (0-7.4) Parsnip Creek (0-10.9) Polander Creek (0-2.6) Porcupine Creek (0-4) Snyder Creek (0-13) Twelvemile Creek (0-5.1, 5.8-11.2) Twentymile Creek (0-28.9) **Summer Lake Subbasin** Silver Creek (0 to 33.3)

Elevated stream temperatures can stress aquatic organisms and deplete oxygen from water. The temperature standard has several different temperature requirements (criteria), based on the type of aquatic use being supported. The current temperature standard requires that waters supporting redband trout not exceed 68˚F; it was increased from 64˚F in 2004. Waters designated as "cool water" cannot be warmed by more than 0.5˚F. The standard allows streams to naturally exceed these temperatures; however, if they do, human activities may not increase the water temperature even more.

Sediment above natural levels affects drinking water for humans and interferes with salmonid reproduction and rearing. The formation of appreciable deposits of sediment smothers gravels in the streambed that are essential for successful spawning, incubation, and rearing of salmonids.

Excessive nutrients, such as nitrogen, can produce increased plant growth, which in turn can increase pH and reduce dissolved oxygen through daily respiration and photosynthesis processes. When aquatic plants die, they drop to the stream bottom and are broken down by bacteria, which use up oxygen in the process. The breakdown of aquatic plants can use up large amounts of the oxygen needed by other aquatic life for survival. Dissolved oxygen levels can also be reduced in slow moving waters, as most oxygen dissolved in water comes from contact with air.

Bacteria are used to determine the safety for "human contact recreation." Heavy metals may restrict human and animal uses. Their source in the Management Area is unknown.

2.4 Land Management

To help achieve water quality standards in the Management Area, an effective strategy should:

- Encourage adequate riparian vegetation along surface waters, based on site capability
- Minimize streambank erosion
- Minimize runoff that contains potential pollutants

2.4.1 Management Intent

1. Encourage Adequate Riparian Vegetation along Surface Waters, based on Site Capability

   Riparian vegetation consists of plants that depend on or tolerate the presence of water near the ground surface for at least part of the year.

   Adequate riparian vegetation helps:

   - Minimize streambank erosion by increasing the cohesiveness and structural strength of streambanks and by reducing flow velocities[20, 21, 22]
   - Reduce increases in summer water temperature[23, 24]
   - Maintain late season flows by increasing the ability of the adjacent soils to store water during runoff seasons[25, 26, 27]
   - Moderate winter stream temperatures through the inflows of relatively warmer groundwater from adjacent soils[28]
   - Filter out and process excess nutrients, bacteria, and sediment in runoff that could pollute adjacent streams[29, 30, 31, 32]

   Adequate riparian vegetation should:

   - Include a variety of plant species and ages, based on site capability
   - Include plants that have root masses capable of withstanding high streamflows
   - Provide adequate cover to protect the streambank and dissipate energy during high flows
   - Include sufficient ground cover to help filter out excess sediment or nutrients in overland flows
   - Provide shade, where allowed by site capability

As riparian vegetation matures, stream channels are expected to narrow and deepen. These stream channels will have less water surface area exposed to solar radiation (thereby reducing heating rates

during summer) and will be more connected to their floodplain. Better floodplain connectivity has the added benefit of increasing stormwater storage and reducing stormwater velocities. These streams will also meander more, which will reduce flow velocities and reduce the damage from flooding.

2. Minimize Streambank Erosion[33]

   Streambanks naturally change in form or location over time. Some bank instability usually occurs in undisturbed streams, and human activities can increase the rate and amount of streambank erosion. Adequate vegetation, and structures where appropriate, can significantly increase streambank stability.

   Bank stability can be an important indicator of watershed condition and can directly affect several beneficial uses. Unstable banks contribute to:
   - Sediment in the stream channel caused by slumps and surface erosion
   - Fine sediment in the water and gravel beds
   - Wider channels, which increases exposure of water to solar radiation
   - Decreasing stream depth and alteration of fish habitat

Vegetation on uplands helps reduce streambank erosion by increasing infiltration rates of water into the soil and by slowing down overland flows.[34, 35, 36, 37] Appropriate vegetation does not include excessive juniper and the presence of noxious weeds.

3. Minimize Runoff that Contains Potential Pollutants

   Potential pollution will be reduced by having less runoff and fewer possible pollutants (sediment, nutrients, bacteria) in the runoff.

   Sediments can enter from overland flow or gullies on croplands, rangelands, farmsteads, and roads. Reduction in sediment will 1) reduce nutrient concentrations in streams, since many nutrients, especially phosphorus, attach to soil particles, and 2) increase dissolved oxygen due to a reduction in sediment oxygen demand.[38, 39]

   Nutrients and bacteria can enter streams and lakes from natural sources and as a result of human activities.

2.4.2 Optional Management Strategies

The following strategies are suggestions for landowners who want ideas on how to meet Area Rules and generally maintain and enhance natural resources on their property. The list is not all-inclusive.

Appropriate management activities and strategies for individual farms and ranches may vary with the specific cropping, topographical, environmental, and economic conditions that exist at a given site. Because of these variables it is not possible to recommend uniform management strategies for all farms or ranches in the Management Area.

The NRCS' Field Office Technical Guide contains extensive lists of management strategies as well. NRCS offices are in Klamath Falls, Lakeview, and Burns. SWCDs, Cooperative Extension Agents, ODFW biologists, and private consultants can also recommend activities and strategies.

Stream Management

Objectives: achieve adequate riparian vegetation, increase streambank stability, filter-out pollutants, moderate stream temperature

- Minimize channelization
- Stabilize streambanks
- Encourage riparian vegetation
- Properly place, design, and maintain culverts, bridges, and crossings
- Encourage upstream reservoir storage
- Enhance water storage in riparian soils

Upland Management

Objectives: reduce soil erosion, improve infiltration of water into soil, capture runoff

- Encourage vegetation that provides good ground cover and enhances water capture and storage: prescribed burning, range plantings, juniper control, weed control
- Use of sediment retention basins
- Roads: limit access seasonally where appropriate to avoid road damage; properly maintain, design, and place

Livestock Management

Objectives: reduce soil erosion, manage manure, encourage healthy uplands and adequate riparian vegetation (based on site capability)

- Manage grazing: livestock distribution; grazing intensity, duration, frequency, and season
- Manage livestock watering
- Manage salt and mineral placement
- Manage runoff from feeding areas

Irrigation Management

Objectives: minimize potential pollutants, reduce soil erosion

- Schedule irrigation based on crop needs and local conditions to optimize water use
- Manage return flows: filter return flows with vegetation, and actively manage the timing and amount of return flow release

Ditch Management

Objectives: reduce erosion

- Manage vegetation: burning, clipping, critical area planting
- Stabilize banks (structural and bioengineering)
- Install culverts to minimize erosion from the discharge
- Construct offstream or headwater storage
- Size ditches appropriately to handle maximum flows

Cropland Management

Objectives: reduce soil erosion, reduce potential pollutants in runoff

- Use conservation tillage
- Select crops that hold soil in place and enhance a crop rotation
- Control weeds
- Develop nutrient budgets based on water and soil testing, tissue testing, plant needs.
- Apply appropriate amounts of chemicals at proper times; dispose of containers properly
- Avoid potential chemical spills and their effects: have cleanup plan, store tanks away from streams
- Use Integrated Pest Management

2.4.3 Requirements

Landowners in the Management Area are required to manage agricultural activities that affect water quality (details below):

- Streamside vegetation
- Manure and other wastes

Oregon Administrative Rules 603-095-3140

(1) Landowners must comply with OAR 603-95-3140(2) through (3) within the following limitations:

(a) A landowner is responsible for only those conditions resulting from activities controlled by that landowner. A landowner is not responsible for deleterious effects of management practices by other landowners on other lands. A landowner is not responsible for conditions that: are natural, could not have been reasonably anticipated, or that result from unusual weather events or other exceptional circumstances.

(2) Streamside Vegetation

(a) Effective August 1, 2008, management activities will allow the establishment, maintenance, or improvement of streamside vegetation for summer shade and streambank stability, based on site capability.

(b) Part (a) does not apply to flood control practices that have been historically used in the Management Area. These practices include, but are not limited, to the maintenance of flood-control channels, dikes, and catch basins.

(c) Part (a) does not apply to irrigation water conveyance systems, including but not limited to irrigation canals, ditches, and laterals.

(3) Waste Management

(a) Effective on rule adoption, no person subject to these rules shall violate any provision of ORS 468B.025 or ORS 468B.050.

Rule (3) references existing state law (see Chapter 1.4.4). ORS 468B.050 refers to situations when permits are required, such as for certain confined animal feeding operations.

Rule (3) ensures that concentrated nutrient concentrations, pathogens associated with high animal density areas, high sediment concentrations in run-off, toxics, or other potential pollutants are not transported to waters of the state.

Wastes associated with livestock operations can include manure from seasonal feeding and birthing areas, gathering pastures and corrals, rangelands and pasture, and any other situations not already covered by Oregon's Confined Animal Feeding Operation laws. Potential indicators of noncompliance include 1) runoff flowing through areas of high livestock usage and entering rivers or canals, 2) livestock waste located in drainage ditches or areas of flooding, and 3) fecal coliform counts that exceed State water quality standards. Livestock grazing is allowed to the extent it does not violate State water quality standards and complies with the Area Rules. Livestock facilities located near streams should employ an adequate runoff control and waste management system. Compliance with the Streamside Vegetation Rule will help keep wastes from being carried into waters of the state. Landowners can contact the NRCS and SWCD for assistance with complying with this Rule.

Wastes also include excess sediment discharges. Landowners who, based on visible erosion scars and/or sediment-laden runoff, are discharging significant quantities of sediment, may be in violation of this Rule.

ENFORCEMENT

ODA seeks input from the local SWCD prior to evaluating conditions for compliance. The following Area Rules provide for resolution of complaints.

Complaints and Investigations (OAR 603-095-3160)

(1) When the department receives notice of an alleged occurrence of agricultural pollution through a written complaint, its own observation, through notification by another agency, or by other means, the department may conduct an investigation. The department may, at its discretion, coordinate inspection activities with the appropriate Local Management Agency.

(2) Each notice of an alleged occurrence of agricultural pollution will be evaluated in accordance with the criteria in ORS 568.900 to 568.933 or any rules adopted thereunder to determine whether an investigation is warranted.

(3) Any person allegedly being damaged or otherwise adversely affected by agricultural pollution or alleging any violation of ORS 568.900 to 568.933 or any rules adopted thereunder may file a complaint with the department.

(4) The department will evaluate or investigate a complaint filed by a person under section OAR 603-095-3160(3) if the complaint is in writing, signed and dated by the complainant and indicates the location and description of:

(a) The waters of the state allegedly being damaged or impacted; and

(b) The property allegedly being managed under conditions violating criteria described in ORS 568.900 to 568.933 or any rules adopted thereunder.

(5) As used in section OAR 603-095-3160(4), "person" does not include any local, state or federal agency.

(6) Notwithstanding OAR 603-095-3160, the department may investigate at any time any complaint if the department determines that the violation alleged in the complaint may present an immediate threat to the public health or safety.

(7) If the department determines that a violation of ORS 568.900 to 568.933 or any rules adopted thereunder has occurred, the landowner may be subject to the enforcement procedures of the department outlined in OARs 603-090-0060 through 603-090-0120.

Chapter 3: Goals, Objectives, and Strategies

LAC MISSION

Implement an agricultural water quality management area plan that helps private landowners comply with state water quality laws, while maintaining a viable agricultural community

AREA PLAN GOAL

Prevent and control water pollution from agricultural activities and soil erosion, and achieve applicable water quality standards, where possible

While these parameters are present at some natural level, primary water quality concerns are:

- Temperature
- Sediment
- Nutrients
- Bacteria

The goal will be achieved by land management that:

1. Promotes stable streambanks.
2. Limits the movement of nutrients and bacteria from agricultural and rural lands to state waters.
3. Reduces sedimentation of streams due to soil erosion.

3.1 Measurable Objectives

The LAC intends to strategically address water quality throughout the Management Area by systematically working in Focus Areas. Measurable Objectives will be developed for Focus Areas after the initial assessment of riparian vegetation conditions (Chapter 3.1.1.). All efforts in Focus Areas are voluntary unless ODA receives a complaint about a specific property or self-initiates an investigation.

Buck Creek

Objective: By June 30, 2017 = 0.6 agricultural stream miles (8.5%) in Class III
Current condition (June 30, 2015) = 0.8 agricultural stream miles (11.3%) in Class III

Crooked Creek

Objective: By June 30, 2025 = 8.2 agricultural stream miles (90%) in Class I
Current condition (June 30, 2015) = 4.1 agricultural stream miles (45%) in Class I
Milestones: By June 30, 2017 = 5.1 agricultural stream miles (56%) in Class I
By June 30, 2019 = 6.2 agricultural stream miles (68%) in Class I

Thomas Creek

Objective: By June 30, 2025 = 23.9 agricultural stream miles (90%) in Class I
Current condition (Oct. 1, 2015) = 17.3 agricultural stream miles (65%) in Class I
Milestones: By June 30, 2017 = 19.4 agricultural stream miles (73%) in Class I

3.1.1 Strategic Initiatives

Strategic Initiatives consist of focused work in small geographic areas. The Management Area has Focus Areas, but no Strategic Implementation Areas (SIAs). Focus Areas are selected by SWCDs and all landowner participation in projects is voluntary. SIAs are designated by ODA and include a compliance evaluation with follow-up site visits as necessary.

3.1.1.1 Focus Areas

The SWCDs have designated three areas in which to focus work and track related improvements in the landscape that affect water quality.

In each area, SWCD staff assessed streamside vegetation within 35 feet of the streambank using the following classification system.

Table 5. Determining classes based on vegetation (compared to that provided by site capability).

WQ functions provided by riparian veg, to the extent allowed by site capability	How to determine classes?	*% of that provided by site capability*	
		Canopy Cover Over Stream*	Ground Cover*
Class I = Fully provided	Both of the following met	>75%	>75%
Class II = Partially provided, not due to ag activities	At least one of the following met	>50%	>50%
Class III = Likely not provided due to agricultural activities	At least one of the following met	<50%	<50%
Class IV = Non-agricultural land, e.g. highway 31			

Buck Creek
Buck Creek drains approximately 60 square miles west of the town of Silver Lake in Lake County. The Mainstem is perennial but tributaries are ephemeral or intermittent. Approximately 8 miles of Buck Creek flows through three parcels of private land between the Fremont-Winema National Forest and Highway 31 (red line on map). Buck Creek dissipates in Paulina Marsh after crossing Highway 31. Buck Creek supports redband trout. The primary agricultural uses are cattle grazing and haying. The Fort Rock/Silver Lake SWCD selected this area because of potential water quality concerns related to redband habitat.

Crooked Creek
Crooked Creek drains 75 square miles southeast of Lake Abert. Its 21-mile long system starts on the Fremont-Winema National Forest and flows north to Rivers End Reservoir on the Chewaucan River. Nearly all land bordering Crooked Creek downstream from the National Forest is privately owned. The watershed supports redband trout. Stream flows are driven by seasonal precipitation, but the mainstem is perennial.

At the request of the Lake County Umbrella Watershed Council, River Design Group provided a Crooked Creek Reconnaissance and Restoration Prioritization Plan in April 2012. The field assessment covered almost the entire mainstem of Crooked Creek and most of the lower reaches of the primary tributaries. The Crooked Creek project area was delineated into four morphologically distinct sections: upper forest, upper valley, canyon, and lower valley.

The upper, forested section is primarily managed by the USFS and was historically influenced by logging and a timber mill. The two valley sections are pluvial-filled fault troughs that historically supported expansive wetland complexes influenced by beaver. The valley sections currently sustain ranching operations that include cattle grazing and haying. Crooked Creek and tributary streams draining the valley segments have been affected by channel relocation, the highway corridor, and agricultural operations. The canyon section linking the upper and lower Crooked Creek valleys was either formed or accentuated during the Pleistocene when the lake that occupied the upper valley periodically overtopped its downstream control and scoured the land separating the two valleys. The canyon section is highly affected by the Highway 395 corridor. A finer-scale delineation yielded eight reaches over the project

area, based on changes in channel and valley morphology. Stream corridor conditions varied over the eight project reaches but were most influenced by channel and valley morphologies, and land use. This area was selected by the Lakeview SWCD because of concerns affecting stream channel function, fish passage, and redband trout habitat.

Thomas Creek
The Thomas Creek watershed is west of Lakeview. Thomas Creek is 40 miles long and flows south into Goose Lake. The lower 20 miles flow through private lands; the upper 20 miles are in the Fremont-Winema National Forest, except for 6 miles on private land.

Thomas Creek has a long history of physical modifications due to both natural and man-made events. In 1997, a 100-year flood event caused severe downcutting of the stream channel in some areas, requiring extensive watershed restoration. In the upper watershed, channel modifications are primarily related to road development, physical barriers, channel straightening, and livestock grazing impacts. The Goose Lake Fishes Conservation Strategy and the Fremont-Winema National Forest Stream Analysis Plan recognize Thomas Creek as a priority watershed for restoring and maintaining the native Goose Lake Fish species that use this area for spawning and rearing habitat. This area was selected by the Lakeview SWCD because of concerns affecting stream channel function, fish passage, and redband trout habitat.

3.2 Strategies for Area Plan Implementation

Landowners must minimize conditions on agricultural lands that might contribute to reduced water quality:

a. Limit erosion and sediment delivery from agricultural and rural lands to waters of the state.
b. Limit nutrient and bacteria loading from agricultural and rural lands to waters of the state.
c. Avoid waste discharges to waters of the state.
d. Manage livestock access to streams, wetlands, and riparian areas.
e. Ensure proper animal waste storage and utilization or disposal.
f. Promote streambank stabilization and the restoration and enhancement of wetlands and riparian habitat.

Conservation partners will:

a. Focus on education and providing technical assistance to landowners, not regulation.
b. Use the media and other educational methods to increase awareness of agriculture's efforts to maintain and improve water quality.

To the greatest degree possible, prevention and control of agricultural pollution is encouraged in a cooperative spirit through the voluntary efforts of landowners, aided by information and technical and financial assistance from local, state, and federal agencies, and others.

Education is the key to the success of this Area Plan. The NRCS, SWCDs, and watershed councils work together to provide farmers and ranchers in the Management Area with information about the goals and objectives of the Area Plan and requirements of the Area Rules.

The following strategies are used at the local level by the appropriate SWCD through work plans and Memoranda of Agreement with ODA, in cooperation with landowners, other agencies, and organizations.

1. **Conservation**
   Prevent and limit water pollution in the Management Area through planning and implementation of technically sound and economically feasible conservation activities.

2. **Community Awareness**
   Create a high level of awareness and an understanding of water quality among the agricultural community and general public, in a manner that minimizes conflict and encourages cooperative efforts, through education and technical assistance.
   a. Incorporate Area Plan implementation as a priority element in the SWCDs' Annual Work Plans and Long Range Plans, with support from partner organizations.
   b. Inform landowners of the Area Plan and Rules.
   c. Showcase successful strategies and systems; conduct tours for landowners and media.
   d. Recognize successful projects and strategies through appropriate media and newsletters.
   e. Conduct educational programs to promote public awareness of water quality issues and their solutions.
   f. Offer and provide site evaluations on any lands within the Management Area to assess conditions that may affect water quality.

3. **Funding**
   Identify funding sources to achieve Area Plan goals and objectives and comply with Area Rule Requirements.

   Costs of implementing this Area Plan are difficult to assess in the absence of detailed, site-specific inventories of resource problems and quantification of nutrient and sediment loadings and other water quality issues of concern.

   Technical and cost-sharing assistance for installation of certain management strategies may be available through current USDA conservation programs such as Environmental Quality Incentive Program (EQIP), Continuous Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), and other programs such as the US EPA's nonpoint source implementation grants and the Oregon Watershed Enhancement Board (OWEB). Other agencies may also be available to provide technical assistance or financial assistance to private landowners.

   To implement this Area Plan, management agencies (SWCDs, watershed councils, etc.) need support and resources for staff to conduct the following:
   - Educational programs (production and presentation)
   - Identification of high priority areas for implementation
   - On-going evaluation of Area Plan progress toward achieving water quality goals
   - Coordinated planning and implementation activities with other agencies, organizations, and individuals working on similar goals
   - Watershed assessments
   - Water quality monitoring
   - Meeting management and facilitation

3.3 Monitoring

Monitoring is encouraged for landowners who want to document improvements in their riparian vegetation and stream conditions. Those wishing to do so should contact their local SWCD or watershed council. Photo monitoring (keeping a record with photographs) is a simple and effective method.

Water quality in the Management Area currently is monitored on a limited basis by: DEQ, ODFW, USFS, and the BLM. These groups primarily measure water temperature, although fish and aquatic insect populations, physical stream habitat, turbidity, and air temperature are also monitored by some.

At ODA's request, DEQ monitors one location in the Management Area, located at the bridge where Stock Drive Road crosses Thomas Creek. This site has been monitored since around December 2012 at the request of ODA. DEQ used to collect data on the Chewaucan River but they appear to have dropped that site.

The LAC does not feel that the Thomas Creek site represents agricultural conditions. The river gradient is very low and water is believed to back up to the site from the Lakeview wastewater discharge ½ mile downstream. At certain times of the year, the backed up discharge may be the only source of water at this site.

All land condition assessments are done in focus areas, of which there are currently three. Additional focus areas will be selected over time as focused SWCD and watershed council efforts are finished.

Chapter 4: Implementation, Monitoring, and Adaptive Management

4.1 Progress Towards Measurable Objectives

The following tables provide assessment results from focus areas and the landowner efforts that contributed to riparian area improvements.

Table 6. Streamside vegetation assessment results for Buck Creek (see Chapter 3.1).

Class	Assessment Results (stream miles)				% change 2010-2015
	2010	2013	2015	2017	
I: Likely sufficient	3.7	3.55	3.7	To be determined	0%
II: Insufficient but not impeded by agricultural activities	2.1	2.75	2.6		24%
III: Likely impeded by agricultural activities	1.3	0.8	0.8		-38%
IV: Non-agricultural	0.9	0.9	0.9	0.9	n/a
TOTAL	**8**	**8**	**8**	**8**	**n/a**

The measurable objective was just determined this summer so there was no milestone to meet in 2015. In the last five years, ½ mile of Buck Creek improved from Class III to II. In the last two years, conservation activities consisted of:

- 5 landowners contacted by visits
- Projects installed: 5 diversions, 0.2 miles of riparian fencing
- Grants received: 3 (2 SWCD, one watershed council)

Additional projects are underway and planned.

Table 7. Streamside vegetation assessment results for Crooked Creek (see Chapter 3.1).

Class	Assessment Results (stream miles)			% change 2013-2015
	2013	2015	2017	
I: Likely sufficient	3.0	4.1	To be determined	37%
II: Insufficient but not impeded by agricultural activities	4.7	4.7		0%
III: Likely impeded by agricultural activities	1.4	0.3		-79%
IV: Non-agricultural	1.9	1.9	1.9	n/a
TOTAL	**11**	**11**	**11**	**n/a**

The measurable objective was just determined this summer so there was no milestone to meet in 2015. In the last two years, 1.1 miles of Crooked Creek improved from Class III. Conservation activities coordinated by the SWCD and Lake County Watershed Council resulted in:

- 8 landowners with projects: 6 culverts replaced/moved, 9 headcuts stabilized, 0.7 stream miles planted with 500 willow plants, 20 acres planted with riparian seed mix along stream, 2 hardened crossings, 400 feet of juniper-revetment bank stabilization, 0.5 mile historical channel relocation (included new irrigation infrastructure with fish passage), 10 rock grade control structures
- Grants received: 2 large OWEB grants partnered with Ducks Unlimited, USFWS, and Resource Advisory Committee (RAC) total in excess of $400,000

Two more landowners are being brought on board.

Table 7. Streamside vegetation assessment results for Thomas Creek (see Chapter 3.1).			
Class	**Assessment Results (stream miles)**		
	2015	**2017**	**2019**
I: Likely sufficient	17.3	To be determined	To be determined
II: Insufficient but not impeded by agricultural activities	6.73		
III: Likely impeded by agricultural activities	2.57		
IV: Non-agricultural (USFS)	12.9	12.9	12.9
TOTAL	**39.5**	**39.5**	**39.5**

4.2 Accomplishments and Activities

Focus Area activities are captured in 4.1.

	Outreach/Education	**Implementation outside Focus Areas**
Riparian vegetation	1. ODA presentation of riparian rules at stockwater workshop 2. Articles in newsletters (see below)	SWCD • 3 riparian fencing projects along a total of ¾ mile of stream • 3 off-site water systems • Planned and assisted with design for grazing plan for 2 miles of riparian area in Thomas Creek • Submitted proposal for fencing 1½ miles of Dry Creek, trib to Goose Lake Watershed Council 1. Mantua Streambank Stabilization – Thomas Creek - 700 ft streambank stabilization - 500 willow plantings 2. Camas Creek Willow Planting Project - 3,000 willow plantings 3. Amsbaugh Thomas Creek Willow Planting Project - 1,000 willow plantings 4. Camp Creek Restoration – Goose Lake Basin - 1 mile stream reconstuction - 1,000 willow plantings 5. Other - 1 water gap – Thomas Creek - 1 mile of riparian fencing – Camp Creek - 1 mile of riparian fencing – Thomas Creek - 100 acres juniper Feldkamp – Goose Lake - 50 acres juniper Juniper RV Park – Goose Lake
Irrigation water improvements	Field Tour 1. USFWS: 10 people 2. Goose Lake Fishes Working Group: 20 3. Off Site Water/spring development workshop: 18	SWCD: Replaced old diversion on Honey Creek Watershed Council 1. 70's Ranch Diversion/fish passage – (Thomas Creek) - 1 fish ladder - 1 fish screen - 900 ft. ditch pipeline 2. Twentymile Creek Irrigation improvement at ditch and

		fish passage - 1 fish ladder - 1fish screen - Irrigation headgate replacement 3. Cox Flat Culvert Removal, Bridge Replacement (Thomas Creek) - 1 bridge - 300 ft streambank stabilization 4. Pitcher Ranch – Buck Creek Fish Passage - 3 diversion structure replacements - 3 fish ladders
Uplands	Articles in newsletters (see below)	<u>SWCD</u> - sprayed 7,000 acres of invasive annual grasses - 6 off-site water systems - 500 acres of juniper cutting - CCAAs with 15 landowners <u>Watershed Council</u> 1. Albertson Upland Enhancement (Goose Lake) - 40 acres juniper and conifer removal - 2 spring developments 2. Upper Sycan Juniper Treatment (Sycan) - 85 acre juniper removal 3. Shine Ranch Juniper Treatment (Goose Lake) – 65 acre juniper removal
Water Quality	1. Booth at the Lake County Fair 2. 2-day Outdoor Education Program for all K-6th graders at North Lake Elementary (140 students) 3. 8 newsletters distributed to 400 landowners with articles on pasture management, streamside vegetation, weeds, and conservation	

4.3 Monitoring—Status and Trends

4.3.1 Water Quality

The LAC believes that the DEQ-monitored site reflects the influence of the Lakeview wastewater discharge rather than agricultural activities (Chapter 3.3) so the analysis is not presented here.

4.3.2 Land Conditions

The SWCD is tracking streamside vegetation conditions in Focus Areas (see 4.1)

The ODA results from aerial photography (Chapter 1.8.1) are not presented here due to LAC concerns about 1) suitability of the designated reference sites, 2) lack of site-capable scores for comparison, 3) the effect of juniper cutting on the scores, and 4) incorrect interpretations of the aerial photographs.

4.4 Biennial Reviews and Adaptive Management

The November 24, 2015, biennial review consisted mostly of a discussion of ODA's proposed changes to the Area Plan and concerns about ODA's interpretation of the water quality site monitored by DEQ and riparian vegetation from aerial photographs. The LAC supports the systematic use of focus areas to strategically address water quality concerns throughout the Management Area. The LAC evaluated the SIAs designated as 'high priority' in the Management Area and indicated that none of them would make useful SIAs because they are either already Focus Areas or they consist of landowners that are already working with the SWCD or watershed council.

Impediments identified by the LAC:

- Drought resulting in season-long low flows in streams

Recommendations from the LAC:

- ODA should select a more appropriate site to monitor agriculturally-influenced water quality
- ODA's aerial photography analysis is flawed and the results are not useful. Another process should be developed

SOURCES OF FOOTNOTED CITATIONS

[1]Goose and Summer Lakes Basin Report. State of Oregon Water Resources Department. May 1989.

[2]Oregon Climate Data (Oregon State University). www.ocs.orst.edu/ocs_data.htm

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