OREGON DEPARTMENT OF AGRICULTURE

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Goose and Summer Lakes Basin Agricultural Water Quality Management Area Plan

October 2020

Developed by the

Oregon Department of Agriculture

and the

Goose and Summer Lakes Basin Local Advisory Committee

with support from the

Lakeview and Fort Rock/Silver Lake Soil and Water Conservation Districts

Oregon Department of Agriculture
Water Quality Program
635 Capitol St. NE
Salem, OR 97301
Phone: (503) 986-4700

Lakeview & Fork Rock/Silver Lake SWCDs
17162 Hwy 396
Lakeview, OR 97630
Phone: (541) 947-5855

Website: ***oda.direct/AgWQPlan***

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Acronyms and Terms

Ag Water Quality Program – Agricultural Water Quality Program
Area Plan – Agricultural Water Quality Management Area Plan
Area Rules – Agricultural Water Quality Management Area Rules
BLM – Bureau of Land Management
CAFO – Confined Animal Feeding Operation
cfs – cubic feet per second
CRP – Conservation Reserve Program
CWA – Clean Water Act
DEQ – Oregon Department of Environmental Quality
GWMA – Groundwater Management Area
LAC – Local Advisory Committee
LMA – Local Management Agency
Management Area – Agricultural Water Quality Management Area
NPDES – National Pollution Discharge Elimination System
NRCS – Natural Resources Conservation Service
OAR – Oregon Administrative Rules
ODA – Oregon Department of Agriculture
ODF – Oregon Department of Forestry
ODFW – Oregon Department of Fish and Wildlife
ORS – Oregon Revised Statute
OWEB – Oregon Watershed Enhancement Board
OWRI – Oregon Watershed Restoration Inventory
PMP – Pesticides Management Plan
PSP – Pesticides Stewardship Partnership
SIA – Strategic Implementation Area
SWCD – Soil and Water Conservation District
TMDL – Total Maximum Daily Load
USDA – United States Department of Agriculture
US EPA – United States Environmental Protection Agency
WPCF – Water Pollution Control Facility
USFS – United States Forest Service
WQPMT – Water Quality Pesticides Management Team

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Foreword

This Agricultural Water Quality Area Plan (Area Plan) provides guidance for addressing water quality related to agricultural activities in the Agricultural Water Quality Management Area (Management Area). The Area Plan identifies strategies to prevent and control water pollution from agricultural lands.

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

Required Elements of Area Plans

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

Plan Content

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

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

Chapter 3: Implementation Strategies. Presents goal(s), measurable objectives, strategic initiatives, proposed activities, and monitoring.

Chapter 4: Progress and Adaptive Management. Describes progress toward achieving the goal of the Area Plan and summarizes results of water quality and land condition monitoring.

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Chapter 1: Agricultural Water Quality Program

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

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

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

Each Area Plan is accompanied by Area Rules that describe local agricultural water quality regulatory requirements. ODA will exercise its regulatory authority for the prevention and control of water pollution from agricultural activities under the Ag Water Quality Program's general regulations (OAR 603-090-0000 to 603-090-0120) and under the Area Rules for this Management Area (OAR 603-095-3100). The general regulations guide the Ag Water Quality Program, and the Area Rules for the Management Area are the regulations with which landowners must comply. Landowners are encouraged through outreach and education to implement conservation and management activities.

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

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

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

1.2 History of the Ag Water Quality Program

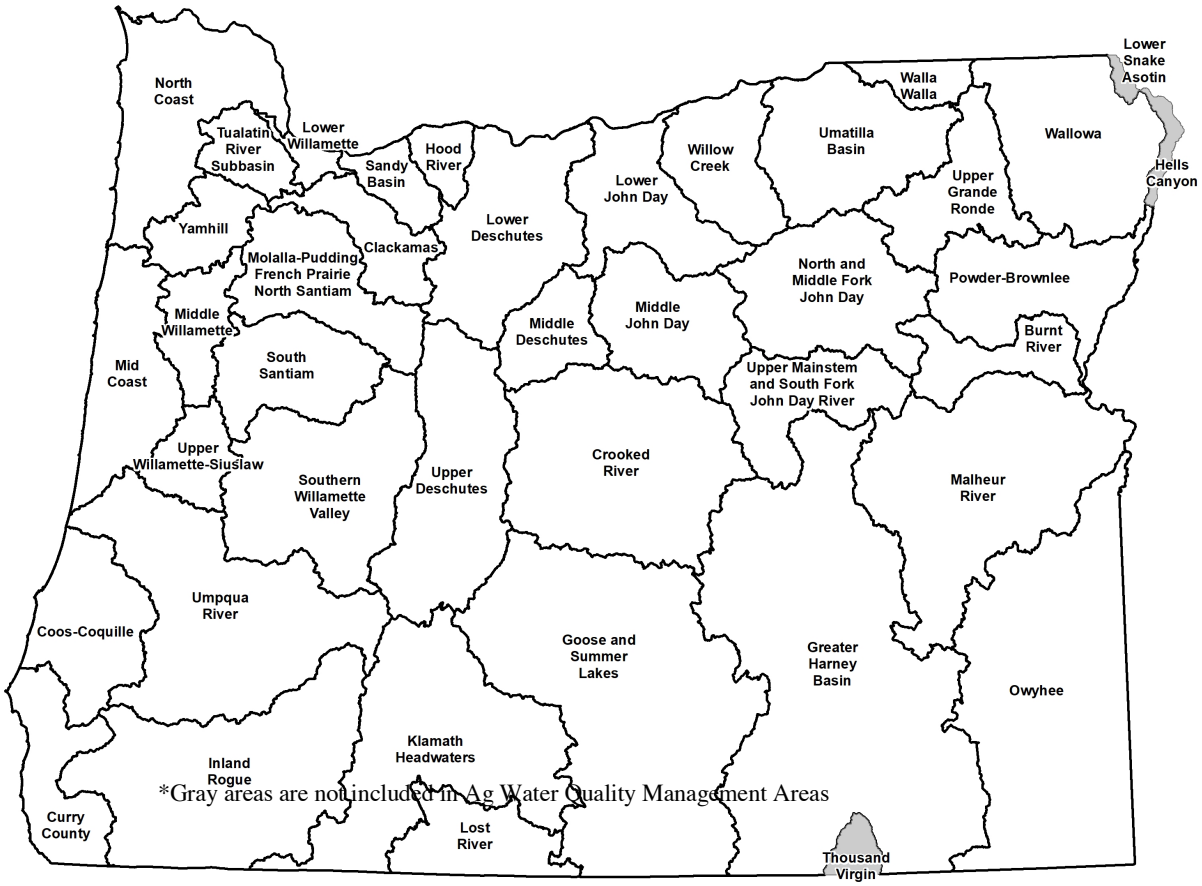
In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion and to achieve water quality standards (ORS 568.900 through ORS 568.933). The Oregon Legislature passed

additional legislation in 1995 to clarify that ODA is the lead agency for regulating agriculture with respect to water quality (ORS 561.191).

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

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

Figure 1.2 Map of 38 Agricultural Water Quality Management Areas*



1.3 Roles and Responsibilities

1.3.1 Oregon Department of Agriculture

ODA is the agency responsible for implementing the Ag Water Quality Program (ORS 568.900 to 568.933, ORS 561.191, OAR 603-090, and OAR 603-095). The Ag Water Quality Program was established to develop and implement water quality management plans for the prevention and control of water pollution from agricultural activities and soil erosion. State and federal laws that drive the establishment of an Area Plan include:

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

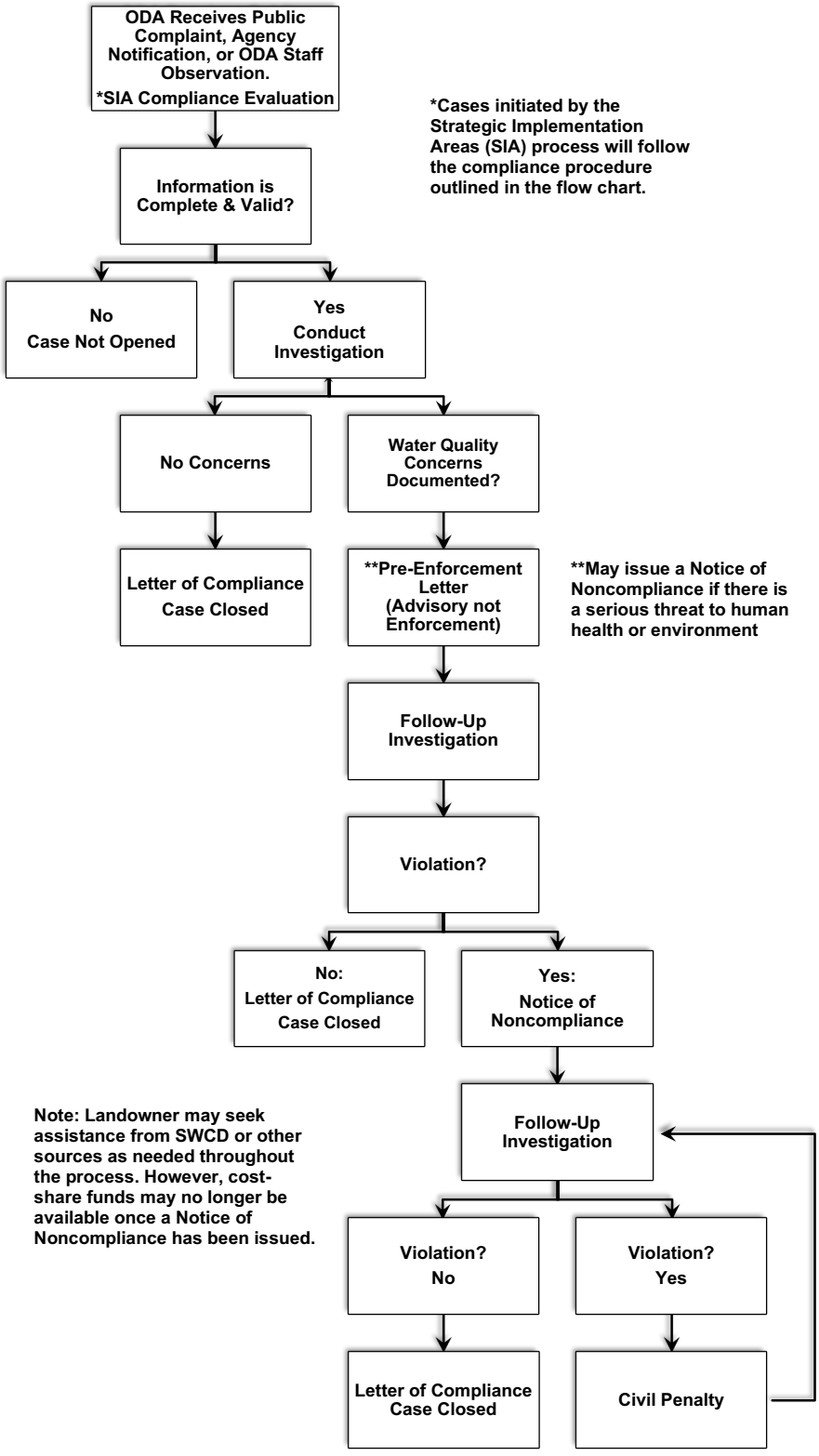
ODA bases Area Plans and Area Rules on scientific information (ORS 568.909). ODA works in partnership with SWCDs, LACs, DEQ, and other partners to implement, evaluate, and update the Area Plans and Area Rules. If and when other governmental policies, programs, or rules conflict with the Area Plan or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

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

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

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

Figure 1.3.1 Compliance Flow Chart



1.3.2 Local Management Agency

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

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

1.3.3 Local Advisory Committee

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

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

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

1.3.4 Agricultural Landowners

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

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

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

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

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

1.3.5 Public Participation

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

1.4 Agricultural Water Quality

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

1.4.1 Point and Nonpoint Sources of Water Pollution

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

Nonpoint-source water pollution originates from the general landscape and is difficult to trace to a single source. Nonpoint water pollution sources include runoff from agricultural and forest lands, urban and

suburban areas, roads, and natural sources. In addition, groundwater can be polluted by nonpoint sources including agricultural amendments (fertilizers and manure).

1.4.2 Beneficial Uses and Parameters of Concern

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

Many waterbodies throughout Oregon do not meet state water quality standards. The most common water quality concerns statewide related to agricultural activities are temperature, bacteria, biological criteria, sediment and turbidity, phosphorous, nitrates, algae, pH, dissolved oxygen, harmful algal blooms, pesticides, and mercury. Water quality impairments vary across the state; they are summarized for this Management Area in Chapter 2.

1.4.3 Impaired Waterbodies and Total Maximum Daily Loads

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

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

As part of the TMDL process, DEQ identifies Designated Management Agencies and Responsible Persons, which are parties responsible for submitting TMDL implementation plans. TMDLs designate ODA as the lead agency responsible for implementing the TMDL on agricultural lands. ODA uses the applicable Area Plan(s) as the implementation plan for the agricultural component of the TMDL. Biennial

reviews and revisions to the Area Plan and Area Rules must address agricultural or nonpoint source load allocations from relevant TMDLs.

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

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

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

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

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

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

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

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

beneficial uses or to livestock, wildlife, fish or other aquatic life or the habitat thereof.' (ORS 468B.005(5)).

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

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

1.4.5 Streamside Vegetation and Agricultural Water Quality

Across Oregon, the Ag Water Quality Program emphasizes streamside vegetation protection and enhancement. Streamside vegetation can provide three primary water quality functions: shade to reduce stream temperature warming from solar radiation, streambank stability, and filtration of pollutants. Other water quality functions from streamside vegetation include: water storage in the soil for cooler and later season flows, sediment trapping that can build streambanks and floodplains, narrowing and deepening of channels, and biological uptake of sediment, organic material, nutrients, and pesticides. In addition, streamside vegetation provides habitat for numerous species of fish and wildlife. Streamside vegetation conditions can be monitored to track progress toward achieving conditions that support water quality.

Site-Capable Vegetation

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

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

the establishment and growth of streamside vegetation to provide the water quality functions equivalent to what site-capable vegetation would provide.

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

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

1.4.6 Soil Health and Agricultural Water Quality

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

Healthy soils make farms and ranches more resilient. The western United States is experiencing higher temperatures, more weather variability, and greater storm intensity. Forecasts predict continued high-intensity storms in the winter and spring, combined with more frequent droughts, which may result in more erosion, especially on bare ground. Building soil health increases resiliency to extreme weather, protects water quality, and helps keep farms and ranches viable. Incorporating soil health practices can help landowners adapt and reduce risks. For more information, visit www.nrcs.usda.gov/wps/portal/nrcs/detail/or/soils/health.

1.5 Other Water Quality Programs

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

1.5.1 Confined Animal Feeding Operation Program

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

1.5.2 Groundwater Management Areas

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

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

If there is a GWMA in this Management Area, it is described in Chapter 2.

1.5.3 The Oregon Plan for Salmon and Watersheds

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

1.5.4 Pesticide Management and Stewardship

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

In 2007, Oregon formed the interagency Water Quality Pesticide Management Team (WQPMT) to expand efforts to improve water quality in Oregon related to pesticide use. 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 federal, state, and local monitoring programs to assess the possible impact of pesticides on Oregon's water quality. Pesticide detections in Oregon's streams can be addressed through multiple programs and partners, including the PSP.

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

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

1.5.5 Drinking Water Source Protection

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

1.6 Partner Agencies and Organizations

1.6.1 Oregon Department of Environmental Quality

The US EPA delegated authority to DEQ to implement the federal CWA in Oregon. DEQ is the lead state agency with overall authority to implement the CWA in Oregon. DEQ works with other state agencies, including ODA and the Oregon Department of Forestry (ODF), to meet the requirements of the CWA. DEQ sets water quality standards and develops TMDLs for impaired waterbodies, which ultimately are approved or disapproved by the US EPA. In addition, DEQ develops and coordinates programs to address

water quality including NPDES permits for point sources, the CWA Section 319 grant program, the Source Water Protection Program, the CWA Section 401 Water Quality Certification, and Oregon's Groundwater Management Program. DEQ also coordinates with ODA to help ensure successful implementation of Area Plans.

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

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

1.6.2 Other Partners

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

1.7 Measuring Progress

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

1.7.1 Measurable Objectives

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

The Ag Water Quality Program is working throughout Oregon with SWCDs and LACs toward establishing long-term measurable objectives to achieve desired conditions. ODA, the LAC, and the SWCD will establish measurable objectives and associated milestones for each Area Plan. Many of these measurable objectives relate to land conditions and primarily are developed for focused work in small geographic areas (section 1.7.3). ODA's longer-term goal is to develop measurable objectives, milestones, and monitoring methods at the Management Area scale.

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

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

The measurable objective(s) and associated milestone(s) within the Management Area are in Chapter 3 and progress toward achieving the measurable objective(s) and milestone(s) 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, because shade blocks solar radiation from warming the stream, streamside vegetation, or its associated shade, generally is used as a surrogate for water temperature. In some cases, sediment can be used as a surrogate for pesticides or phosphorus, which often adhere to sediment particles.

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

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

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

1.7.3 Focused Implementation in Small Geographic Areas

Focus Areas

A Focus Area is a small watershed with water quality concerns associated with agriculture. The Focus Area process is SWCD-led, with ODA oversight. The SWCD delivers systematic, concentrated outreach and technical assistance. A key component is measuring conditions before and after implementation to document the progress made with available resources. The Focus Area approach is consistent with other agencies' and organizations' efforts to work proactively in small watersheds.

Focus Areas have the following advantages: a proactive approach that addresses the most significant water quality concerns, multiple partners that coordinate and align technical and financial resources, a higher density of projects that may lead to increased connectivity of projects, and a more effective and efficient use of limited resources.

The current Focus Area for this Management Area is described in Chapter 3.

Strategic Implementation Areas

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

Any SIAs in this Management Area are described in Chapter 3.

1.8 Progress and Adaptive Management

1.8.1 Biennial Reviews

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

discussions, ODA and partners revise implementation strategies and measurable objectives in Chapter 3 as needed.

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

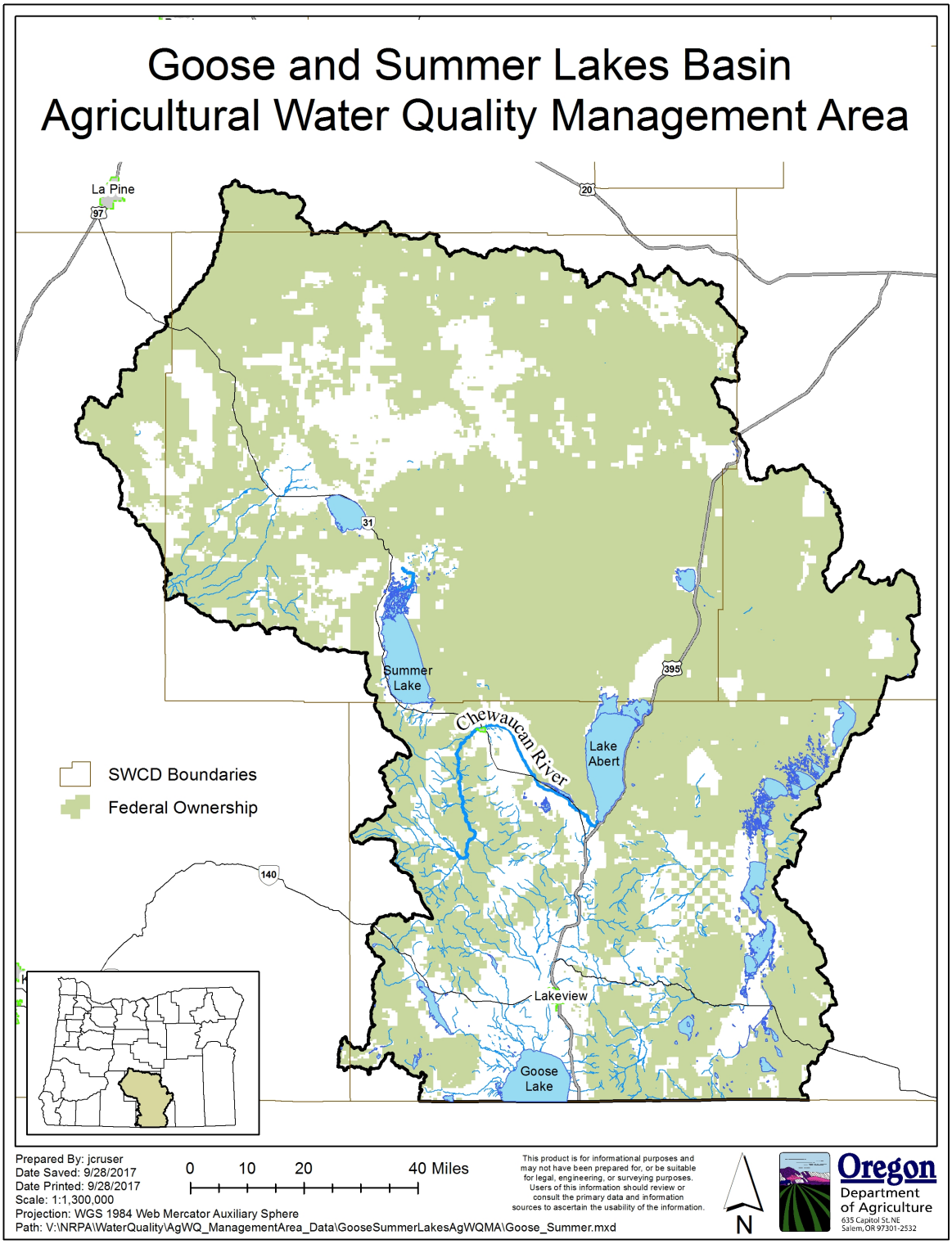
1.8.2 Water Quality Monitoring

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

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

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

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


Goose and Summer Lakes Basin
Agricultural Water Quality Management Area
La Pine
97
20
31
Summer Lake
395
Chewaucan River
Lake Abert
SWCD Boundaries
Federal Ownership
140
Lakeview
Goose Lake
Prepared By: jcruser
Date Saved: 9/28/2017
Date Printed: 9/28/2017
Scale: 1:1,300,000
Projection: WGS 1984 Web Mercator Auxiliary Sphere
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0 10 20 40 Miles
This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.
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Oregon
Department of Agriculture
635 Capitol St. NE
Salem, OR 97301-2532

The Goose and Summer Lakes Management Area consists of the Lake Abert, Goose Lake, Summer Lake, and Warner Lake subbasins.

2.1 Local Roles

2.1.1 Local Advisory Committee

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

Table 2.1.1 Current LAC members

Name	Geographic Representation	Agricultural Product or Interest Representation
John O'Keeffe (Chair)	Adel	Cattle
Pete Talbot (Vice-Chair)	Westside	Cattle
Keith Barnhart	Valley Falls	Cattle, Lakeview SWCD Director
Bob Elder	Paisley	Cattle, Hay, Timber
LeeRoy Horton	Christmas Valley	Alfalfa, Fort Rock/Silver Lake SWCD
Mike O'Leary	Paisley	Cattle
Bob Squires	Thomas Creek	Cattle, Lakeview Water Users
John Taylor	Plush	Cattle
Justin Miles	Lakeview	ODFW Fish Biologist
Leon Baker (Alternate)	Silver Lake	Alfalfa, Fort Rock/Silver Lake 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

Implementation of the Area Plan is accomplished through an Intergovernmental Grant Agreements between ODA and the Lakeview and Fort Rock/Silver Lake SWCDs. This Intergovernmental Grant Agreement defines the SWCDs as the LMAs for implementation of the Ag Water Quality Program in this Management Area. The SWCDs were also involved in development of the Area Plan and Area Rules.

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

2.2 Area Plan and Area Rules: Development and History

The director of ODA initially approved the Area Plan and Area Rules in 2003.

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

2.3 Geographical and Physical Setting

2.3.1 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 typically averages approximately 10", but some years may only receive 5" and some years may receive up to 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.

2.3.2 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 Oregon Water Resources Department, through its Watermasters, regulate and distribute water from rivers, streams, reservoirs, and wells by priority date. The State adopted the water code in 1909 and although many subsequent laws have been passed since then, the prior appropriation doctrine still remains as the principle determinant in who is allowed to divert water in times of shortage.

As in most rural parts of the state, irrigation is the largest use of water in the Basin. The oldest water rights in the Goose Lake Basin date back to the year 1860. There are water rights to irrigate over 224,000 acres; fewer than 45,000 of these acres are served by irrigation companies or districts which means about 174,000 acres irrigated are from private diversions and delivery systems. Few water rights for groundwater use were issued prior to 1960, and since then, the use of groundwater expanded robustly until the 1990's when water availability became much scarcer.

As of 2015, about 38 percent of the total irrigation water rights rely on groundwater sources. About 85 percent of the acreage irrigated with groundwater is in the Summer Lake Subbasin, primarily in the Fort Rock area.

Water diverted or pumped for livestock use can often times be allowed outside of the irrigation season. It is best to check with the local Watermaster in Lakeview if there are any questions.[4] Landowners may also have the right to divert water for livestock use outside of the irrigation season.

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).

2.3.3 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 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.

2.4 Agricultural Water Quality

2.4.1 Water Quality Issues

Temperature, dissolved oxygen, pH, sedimentation, nutrients, and heavy metals are included by Oregon's DEQ on its 2012 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 has chosen to proactively address potential bacteria problems.

2.4.1.1 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 2.4.1.1.a and b). 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' are 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 was listed federally endangered, and was recently delisted. 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 2.4.1.1.a. Beneficial Uses designated for the Goose and Summer Lakes Basin (OAR 340-41-0140)			
Beneficial Use	**Goose Lake**	**Highly Alkaline and Saline Lakes**	**Freshwater Lakes, Reservoirs and Streams**
Public Domestic Water Supply*			X
Private Domestic Water Supply*			X
Industrial Water Supply		X	X
Irrigation			X
Livestock Watering	X		X
Fish and 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 and disinfection) and natural quality to meet drinking water standards. [2]See Table 140B for fish use designations			

Table 2.4.1.1.b. 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 and 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 cannot 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.

2.4.1.2 WQ Parameters and 303(d) list

Streams are on the 2012 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 have low dissolved oxygen (usually attributed to the naturally high-water temperatures) and high turbidity. 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 2012 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.

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.

2.4.1.3 TMDLs and Agricultural Load Allocations

Currently, there are no TMDLs or agriculutural load allocations developed for the management area.

2.4.1.4 Drinking Water

Drinking water in the Management Area is from both public and private systems, and the majority of drinking water is from groundwater. Twenty active public water systems obtain domestic drinking water from groundwater to serve 3400 people; additional public water systems serve another 550 people. Approximately 42 private surface drinking water rights and numerous private groundwater wells provide water for domestic use.

Drinking water contaminates of concern within this Management Area are: *E. coli*, nitrate, arsenic, fluorine, nickel, and toluene. Of this list, only *E. coli* and nitrate are potentially sourced from agriculture.

All three community public water systems in the Management Area (Christmas Valley, Lakeview, and Paisley) have recent alerts for total coliform. Only the Christmas Valley Domestic Water System had a violation of the contaminant limit for total coliform or *E. coli*.

Most of the soils in the Management Area contains have moderately high to high nitrate leaching potential. Nitrate from sources such as fertilizers and septic systems can readily penetrate to the aquifers used for drinking water when leaching potential is moderately high or high.

Nitrate alerts (generated when nitrate exceeds 5 mg/L) exist only for the Silver Lake Mercantile (four alerts in 10 years of 5-6 mg/L). The drinking water maximum contaminant level for nitrates is 10 mg/L. Nitrate concentrations > 10 mg/L have been measured in private wells north of Goose Lake in soils with high leaching potential.

It is difficult to determine how much of an impact agriculture may have on groundwater sourced for drinking in this MA. Most of the soils with moderately high to high leaching potential are federally owned or, in alfalfa hay near Christmas Valley, which is not fertilized with nitrogen. However, landowners should always properly manage manure and fertilizer to minimize leaching of nitrates and *E. coli* to groundwater.

2.4.2 Sources of Impairment

Point and non-point sources of pollution in the area include runoff and erosion from agricultural and forest lands, eroding stream banks, and runoff from roads and urban areas. Pollutants from non-point sources can be carried to the surface water or groundwater through the actions of rainfall, snowmelt, irrigation returns, urban runoff, and seepage. A major nonpoint source of water quality impairment is increased heat input due to vegetation removal, seasonal flow reduction, changes in channel shape, and alteration to the floodplain. Channelization and bank instability may alter gradient, width to depth ratio, and sinuosity, causing undesirable changes in sediment transport regime, erosional and depositional characteristics, and temperature.

2.5 Regulatory and Voluntary Measures

2.5.1 Area Rules

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.**

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

- Streamside vegetation
- Manure and other wastes

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.

2.5.2 Voluntary Measures

2.5.2.1 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

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[, 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 stream flows
- 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 storm water storage and reducing storm water 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.

2.5.2.2 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. For example, streamside conditions may be improved without the removal of the agricultural activity, such as managed grazing.

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 and increase stream sinuosity;
- Stabilize streambanks;
- Encourage riparian vegetation;
- Properly place, design, and maintain culverts, bridges, and crossings;
- Encourage off-stream 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 off-stream 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.

Chapter 3: Implementation Strategies

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

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.

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

1. Temperature
2. Sediment
3. Nutrients
4. Bacteria

The goal will be achieved by land management that:

1. Promotes sufficient site-capable vegetation is established along streams to stabilize streambanks, filter overland flow, and moderate solar heating.
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 and Strategic Initiatives

Measurable objectives allow the Ag Water Quality Program to evaluate progress toward meeting water quality standards and TMDL load allocations. Any measurable objectives are stated here. Progress is reported in Chapter 4.

3.1.1 Management Area

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.

3.1.2 Focus Areas and Other Coordinate Efforts in Small Watersheds

Focus Areas are selected by SWCDs and all landowner participation in projects is voluntary. The SWCDs have two current focus areas, and one previous focus areas, in which to focus work and track related improvements in the landscape that affect water quality.

3.1.2.1 Bridge and Silver Creeks Focus Area (previous)

This focus area is approximately 16,400 acres and encompasses agricultural lands along Bridge and Silver Creeks between Fremont-Winema National Forest land and Highway 31. There are approximately 3 miles of perennial streams in this focus area. The predominant agriculture activity is this area is livestock pastures and hay fields. Fort Rock/Silver Lake SWCD chose this area in attempt to focus work on perennial streams. There are three perennial streams within the SWCDs boundaries; Bridge and Silver Creeks are two of the three. The SWCD also selected Bridge and Silver creeks, as they are adjacent to a previous focus area, Buck Creek (one of the three perennial streams), thus providing continuity with the previous focus area work.

Assessment Method: 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 ag activities	At least one of the following met	<50%	<50%
Class IV = Non-agricultural land, e.g. highway 31			

Measurable Objective: By June 30, 2019: 2.7 stream miles in Class I (90%)
Milestone: By June 30, 2019, increase Class I to 2.8 stream miles

3.1.2.2 Thomas and Cogswell Creeks Focus Area (current)

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 down-cutting of the stream channel in some areas, requiring extensive watershed restoration. In the middle and lower watershed, channel modifications are primarily related to road development, physical barriers, and channel straightening. 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.

In July of 2019, Lakeview SWCD added Cogswell Creek to their focus area. Cogswell Creek also flows into Goose Lake, originates in the Freemont-Winema National Forest, but is east of Goose Lake and is approximately 2 miles long.

Assessment Method: Same method as Bridge and Silver Creeks Focus Area.

Measurable Objective for Thomas Creek: By June 30, 2025: increase Class I to 23.9 stream miles (90%).
Revised Measurable Objective for Thomas and Cogswell Creeks: By June 30, 2023, increase Class I to 27.9 stream miles.
Milestone: By June 30, 2021 decrease:

1. Class II by 5%, or 1.4 miles
2. Class III by 3.5%, or by 1.0 miles

3.1.2.3 Critical Ground Water Focus Area (current)

North Lake County provides some of the highest quality hay in Oregon. The hay is irrigated with groundwater using conventional pivot systems. While pivots are considered one of the more efficient methods of irrigation, water is still lost to evaporation and leaching beyond the root zone. We are setting out to help to improve irrigation efficiency to slow the rate of withdrawal from the aquifer while also addressing leaching of nutrients (from fertilizer) to groundwater due to over-irrigation. Landowners are interested in converting from conventional pivot systems (70% efficient) to Low Energy Precision Application (LEPA)/Low Elevation Spray Application (LESA) pivot systems (85-90% efficient).

Assessment Method: Document the irrigated cropland acres that are converted to LEPA/LESA irritation systems in Thorn Lake HUC.

Measurable Objective: By June 30, 2029, increase Class I by 25%, or by 8,840 acres
Milestone: By June 30, 2021, increase Class I by 5%, or by 1,770 acres

3.1.3 Upper Chewaucan Strategic Implementation Area

The Upper Chewaucan SIA is located southwest of Paisley in the Chewaucna watershed. The project area icludes nine HUCs which represent Mill Creek, Bear Creek, Coffeepot Creek, Elder Creek, Augur Creek, Dairy Creek, South Creek, Swamp Creek, and Ben Young Creek. Each tributary flows into the Chewaucan River and is considered high priority to area resource managers as this watershed supports habitat for Chewaucan Redband trout (state listed Sensitive-Vulnerable), winter range for mule deer, and thousands of acres of irrigated meadow and range that economically support ranching families in the watershed. These same irrigated meadow systems also supports and provides priority habitat for thousands of water birds that utlize this area in the spring for food, nesting, brooding and rearing. This area is part of the Southern Oregon North Eastern California Region, or the Pacific Flyway.

The 50,000 acre Brattain Fire burned the northern and eastern half of the SIA in September 2020.

SIA Compliance Evaluation Method:
ODA completed a compliance evaluation of agricultural activities and potential concerns related to surface and ground water. The evaluation considered the condition of streamside vegetation, bare ground, and potential livestock impacts. The process involved both a remote evaluation and field verification from publicly accessible areas.

Categories for evaluation are:

- **Limited Opportunity for Improvement (LM):** ODA identified that there are likely no regulatory concerns,
- **Low Opportunity for Improvement (LO):** ODA identified that there are likely no regulatory concerns, but there may be an opportunity for improvement (uplift) to reach the ecological goals of the Area Plan,
- **Opportunity for Improvement (OPP):** ODA identified that agricultural activities may be impairing water quality, or evaluation was inconclusive using remote and field verifications,
- **Potential Violation (PV):** ODA identified during the remote evaluation and verified during the field evaluation from a publicly accessible location, that a potential violation of the Area Plan Rules exists.

Measurable Objective:
By February 28, 2024, 100% of evaluated agricultural tax lots in the Upper Chewaucan SIA will be in compliance with the streamside vegetation and water pollution (waste) Area Rules. Due to the Brattain Fire of Septemeber 2020, the ODA and SWCD may need to extend timelines for above and below objectives.

Local Partner Objectives (tempered by COVID and fire recovery)

- By the end of 2020, all OPP landowners will have been contacted and invited to participate in implementation of projects to achieve enhanced water quality.
- By 2024 reduce the number of tax lots of concern to zero.
- By 2022 half of the OPP landowners with conservation plans will work with project partners to secure funding for implementation. Grant applications funded for conservation plans and implementation completed for all landowner categories with a developed conservation plan.
- By 2021 develop and implement an agriculture water quality monitoring plan. Baseline data will be collected and ongoing monitoring will provide an indicator of successful practice implementation.

3.2 Proposed Activities

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

Table 3.2 Planned Activities for July 2019-June 2023 Lakeview SWCD, FRSL SWCD, and Lake County Umbrella Watershed Council.

Activity	4-year Target	Description
Community and Landowner Engagement		
# active events that target landowners/operators	12	Working group meetings/ emerging issues technologies workshops.
# landowners/managers participating in active events	700	
s# of website views	2,400	On Lake County Umbrella Watershed Council's website
# of followers on Social Media	300	On Lake County Umbrella Watershed Council's facebook
Technical Assistance (TA)		
# landowners/operators provided with TA	100	
# site visits	140	
# conservation plans written*	4	
On-the-ground Project Funding		
# funding applications submitted	22	

* Definition: any written management plan to address agricultural water quality. Can include NRCS-level plans. Can include: nutrients, soil health, grazing, riparian planting, forest thinning to improve upland pastures to reduce livestock pressure on riparian areas, etc. Cannot include projects with no or weak connection to agricultural water quality (weed eradication not for riparian restoration, fuels reduction, alternative energy, rain gardens/rain harvesting, non-agricultural culvert replacement, and instream habitat enhancement that does not also improve water quality)

3.3 Water Quality 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.

DEQ monitors five sites in the Management Area as part of their ambient monitoring network (Honey Creek at Plush, Thomas Creek at Stock Drive Road bridge, Chewaucan River 2.4 miles upstream of Paisley, Deep Creek west of Adel, and Twentymile Creek at highway 140, east of Adel). The LAC believes that the Thomas Creek site is too close to the discharge of the Lakeview wastewater treatment plant to

evaluate agricultural effects on water quality. The Twentymile Creek location is not on the creek but on an irrigaton ditch that rarely connects with Crump Lake, and the Honey Creek site is in backwater created by an irrigation diversion.

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

Chapter 4: Progress and Adaptive Management

4.1 Measurable Objectives and Strategic Initiatives

The following tables provide the assessment results and progress toward measurable objectives and milestones in the last two years. See Chapter 3.1 for background and assessment methods.

4.1.1 Management Area

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.

4.1.2 Focus Areas

Table 4.1.2.1 Bridge and Silver Creeks Focus Area

Measurable Objective		
By June 30, 2019: 2.7 stream miles in Class I (90%)		
Milestones		
By June 30, 2019, increase Class I to 2.8 stream miles		
Current Conditions		
Progress Toward Measurable Objectives and Milestones The measurable objective was accomplished, Class I stream miles increased from 1.6 to 2.7.		
Assessment Results (stream miles)		
Class	2017	2019
I	1.6	2.7
II	0.9	0.3
III	0.5	0.0
IV	0.3	0.3
TOTAL	3.3	3.3
Activities and Accomplishments		
Community and Landowner Engagement		
# active events that target landowners/ operators	0	
# landowners/operators participating in active events	0	
Technical Assistance (TA)		
# landowners/operators provided with TA	6	
# site visits	2	
# conservation plans written	0	
Adaptive Management Discussion		

Moved everything in a positive direction. As streamside vegetation continues to grow, more improvement will happen over time. Had trouble with one landowner but they have sold and the conditions are drastically improving. One-on-one contact was the most effective method to engage landowners. Area Rules were included in engagement efforts as a basis for why they should make improvements.

Table 4.1.2.2 Thomas and Cogswell Creeks Focus Area

Measurable Objective		
Previous for Thomas Creek: by June 30, 2019, increase Class I to 23.9 stream miles (90%)		
Milestones		
Previous for Thomas Creek: by June 30, 2019, increase Class I by 4 miles, or 15%.		
Current Conditions		
Progress Toward Measurable Objectives and Milestones The measurable objective for Thomas Creek has been achieved.		
Assessment Results for Thomas Creek		
I	18.1	25.0
II	7.3	1.1
III	1.2	0.5
IV (Not Ag)	12.9	12.9
Total Ag Area Assessed	**26.6**	**26.6**
Activities and Accomplishments		
Community and Landowner Engagement		
# active events that target landowners/ operators		0
# landowners/operators participating in active events		0
Technical Assistance (TA)		
# landowners/operators provided with TA		10
# site visits		12
# conservation plans written		0
Adaptive Management Discussion		
The biggest factor contributing to achieving the measurable objective is favorable conditions that provided adequate to above normal vegetation growth. Other factors include fencing and changes in management and ownership. The Lakeview SWCD found that one-on-one site visits were most effective in engaging landowners and plans to continue working in Thomas Creek and has added Cogswell Creek to the Focus Area starting in July 2019.		

4.1.2.3 Critical Ground Water Focus Area

The Fort Rock/Silver Lake SWCD has just begun work in this Focus Area. The pre-assessment has been completed (Table 4.1.2.3). In 2021, ODA, the SWCD and the LAC will review and discuss progress made in this focus area. Interim-assessment results will be reported in this Area Plan in 2023.

Table 4.1.2.3 Initial Assessment Results in Acres	
Class	**2019**
I	100
II	35,260
Total	**35,360**

Table 4.1.3 Upper Chewaucan SIA – Status: Open

Compliance Measurable Objective (ODA Led)
By February 28, 2024, 100% of evaluated agricultural tax lots in the Upper Chewaucan SIA will be in compliance with the streamside vegetation and water pollution (waste) Area Rules.
Local Partner Objectives
• By the end of 2020, all OPP landowners will have been contacted and invited to participate in implementation of projects to achieve enhanced water quality. • By 2024, reduce the number of tax lots of concern to zero. • By 2022, half of the OPP landowners with conservation plans will work with project partners to secure funding for implementation. Grant applications funded for conservation plans and implementation completed for all landowner categories with a developed conservation plan. • By 2021, develop and implement an agriculture water quality monitoring plan. Baseline data will be collected and ongoing monitoring will provide an indicator of successful practice implementation.
Current Conditions
Field Evaluation Results as of 9/9/19: LM = 85, LO = 5, OPP = 8, PV = 0
Activities and Accomplishments

• ODA:
  ○ Evaluated 254 agricultural tax lots equaling 13,435 agricultural acres, including 14 stream miles.
  ○ Sent all agricultural landowners within the SIA copies of the Area Rule Summary and the Landowner Self-Assessment Tool.
  ○ Conducted 1 Partner Meeting and 15 individuals representing 8 agencies/entities attended.
• SWCD applied for and was awarded an OWEB SIA grant of $125,000 for landowner engagement, technical assistance, and monitoring activities.
• SWCD is currently in the process of engaging OPP landowners to invite them to work on watershed health improvement projects and developing the SIA Local Monitoring Plan.

Adaptive Management Discussion
The 50,000-acre Brattain Fire burned the northern and eastern half of the SIA in September 2020. Landowners using these burned lands for livestock grazing are understandably focused on recovering from the fire. The SWCD has asked both ODA and OWEB if SIA funding can be used to help with recovery. In addition, the NRCS has requested emergency funding for reseeding to keep bare soils from eroding. The fires will likely affect the ability of both ODA and the SWCD to meet their objectives.

4.2 Activities and Accomplishments

ODA, the LAC, the LMA, and other partners identified the following priority activities to track progress toward meeting the goal and objectives of the Area Plan. ODA will review the four-year results and then provide a report at the end of the 2021-2023 Biennium.

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

Table 4.2a Activities conducted in 2017-2019 biennium by Lakeview SWCD, FRSL SWCD, and Lake County Umbrella Watershed Council.

Activity	2-year results	Description
Community and Landowner Engagement		
# active events that target landowners/operators	9	Project tours, workshops, working group meetings/emerging issues technologies workshops.
# landowners/managers participating in active events	350	
Technical Assistance (TA)		
# landowners/operators provided with TA	52	Consultation
# site visits	72	
# conservation plans written*	0	
On-the-ground Project Funding		
# funding applications submitted	7	

* Definition: any written management plan to address agricultural water quality. Can include NRCS-level plans or simpler plans. Can include: nutrients, soil health, water quality, irrigation, grazing, riparian planting, forest thinning to improve upland pastures to reduce livestock pressure on riparian areas, etc. Cannot include projects with no or weak connection to ag water quality (weed eradication that is not for riparian restoration, fuels reduction, alternative energy, non-ag rain gardens/rain harvesting, non-ag culvert replacement, and instream habitat enhancement that does not also improve water quality)

Table 4.2b and 4.2c summarize information from the OWRI on restoration project funding and accomplishments on agricultural lands in the Management Area. The majority of OWRI entries represent voluntary actions of private landowners who have worked in partnership with federal, state, and local groups to improve aquatic habitat and water quality conditions. The data includes most, but not all projects, implemented in the Management Area. OWRI results are provied annually in January after a year of proofing and GIS management.

Table 4.2b Implementation funding for projects on agricultural lands reported 1997-2018

Landowners	OWEB	DEQ	NRCS	USFS	USFWS	Ducks Unlimited	ODOT	ODFW	Other*	TOTAL
1,434,997	5,812,778	0	94,914	1,079,416	1,024,271	1,158,364	1,292,770	1,007,920	1,652,457	14,557,887

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

Table 4.2c Miles and acres treated on agricultural lands reported 1997-2018

Activity Type	Miles	Acres	Count*	Activity Description
Riparian	64	468	NA**	Fencings, plantings, noxious weed treatment, off-channel water.
Fish Passage	276	NA	30	Fish ladders installed/improved, fish screens, habitat improvement
Instream	21	NA	NA	Bank stablizlation, large wood and rock placement, habitiat strutures places,connecting side channels.
Wetland	NA	7,845	NA	Grass/herb/forest wetland improvement, fencing, erosion control.
Road	0	NA	0	NA
Upland	NA	16,732	NA	Juniper treatment, fencing, grazing management, vegetation planted/reseeded, off-channel water development.
TOTAL	362	25,045	30	

* # of hardened crossings, culverts, etc.

**Not applicable

4.3 Water Quality and Land Condition Monitoring

4.3.1 Water Quality

DEQ evaluated dissolved oxygen, *E. coli*, pH, temperature, total suspended solids and total phosphorus, and temperature data in the Management Area. Fifty-nine stations had data from 2015-2018 (DEQ. Oregon Water Quality Status and Trends Analysis. 2019.) https://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx

Five locations are part of DEQ's ambient monitoring program with long-term monitoring. Most of the rest of the sites were continuous temperature monitoring locations in headwaters on the national forest in all four subbasins.

Table 4.3.1 Attainment of water quality standards for 2016-2019 in Management Area Subbasins. Results highlighted in grey are potential agricultural water quality concerns and are discussed below.							
Subbasin Name	**Site Locations**	**Parameter**					
		Dissolved oxygen	***E. coli***	**pH**	**Total Phosphorus (mg/L)[1]**	**Total Suspended Solids (mg/L)[2]**	
		Attainment?			**Median, Maximum (# of samples)**		
Summer Lake	Headwaters of WF Silver Creek	Yes	-	Yes	0.04, 0.04 (4)	1, 2 (4)	
Lake Abert	Chewaucan River above Paisley[3]	Mostly ↑	Yes	Yes	0.05, 0.18 (21)	4, 32 (19)	
	Lake Abert	Yes	No	-	-	-	
Goose Lake	Thomas Creek @ Stockdrive Road[3]	Not in summer	Not in summer	Yes	0.11, 0.17 (23)	9, 45 (22)	
Warner Lakes	Honey Creek @ Plush[3]	No	Mostly	Yes ↓	0.045, 0.12 (22)	3, 10 (21)	
	Deep Creek near Adel*	Yes ↑	Mostly	Yes	0.04, 0.11 (22)	3, 10 (11)	
	20Mile Creek @ Hwy 140*	No	Mostly	Yes ↓	0.15, 0.89 (22)	4, 76 (21)	

[1] DEQ has no benchmark for total phosphorus in this Management Area; ODA benchmark for potential water quality concerns = 0.08 mg/L

[2] DEQ has no benchmark for total suspended solids in this Management Area

[3] DEQ ambient monitoring site

↑ Statistically significant improving trend

↓ Statistically significant degrading trend

Almost all temperature results were from headwater stations that were almost exclusively in national forest; these locations showed some stations attaining the water quality standard, but most not. It can be assumed that most streams in the Management Area are not attaining water quality standards.

Deep Creek: no identified issues. Headwaters are forested; the rest of the watershed is primarily grazed rangeland.

Chewaucan River: phosphorus and sediment are a concern at this location; the Brattain Fire will likely exacerbate these issues. The watershed above Paisley is primarily forested and consists of a mix of National Forest; industrial forestlands; and grazed timber, range, and meadows. Monitoring in the Upper

Chewaucan SIA should help track the effects of the fire and resultant landowner practices to control erosion.

Thomas Creek at Stockdrive Road: This site is about one-half mile upstream of the discharge of the Lakeview wastewater treatment plant. The gradient is very flat, and the LAC is concerned that phosphorus measured at this site may be a result of backed-up water from the wastewater discharge, which at certain times of the year may be the only source of water at this site. Thomas Creek upstream of the site was historically channelized, resulting in significant erosion, and is a likely contributor to sediment measured at the site. *In 2017, the LAC requested additional information to determine whether wastewater discharge is influencing this site and, if so, to recommend modifications for tracking the effects of agricultural activities.*

Honey Creek: Headwaters are forested; the rest of the watershed is primarily grazed rangeland. However, the sampling location consists of water backed from an irrigation diversion during the summer. Water quality at this location likely reflects local conditions rather than the watershed. More monitoring locations are needed to characterize the effects of upstream agriculture on water quality of Honey Creek.

Twentymile Creek: the sampling location is an irrigation drain about one mile west of Twentymile Creek; water flowing from this location is mostly piped to center pivots and rarely reaches Crump Lake. Adjacent lands are drained for agricultural use; phosphorus from the drained soils is likely concentrating in the ditch. The water quality results are consistent with a slow-moving irrigation ditch. However, while the water rarely reaches Crump Lake, these drains are still home to fish and wildlife.

ODA and DEQ are committed to investigating, before the next biennial review, whether the monitoring site on Thomas Creek is showing results of activities in the upper watershed or wastewater discharges.

Three of the sites in DEQ's ambient monitoring network do not reflect watershed conditions and cannot be used to determine the effect of agriculture on water quality in the watershed. Data from the Honey Creek and Twentymile Creek ambient sites will no longer be presented in the Area Plan. Before the next biennial review, ODA and DEQ will determine the suitability of the Thomas Creek site for tracking agricultural water quality. And, farmers and ranchers should work to keep phosphorus out of the irrigation system in the Warner Valley.

4.4 Biennial Reviews and Adaptive Management

ODA, the LAC, the LMA, and other partners met on October 29 to review implementation of the Area Plan and provided recommendations for the future (Tables 4.4a and 4.4b).

Table 4.4a Summary of biennial review discussion

Summary of Progress and Impediments
• Development and growth of the Lake County Watershed Council has been a great benefit for agricultural water quality. • Focused Investment Partnerships (FIPs): it can be challenging to get momentum going in a smaller geographic region, but when partners and landowners get geared up and when something like a FIP gets put in place a lot of great work can happen. • Focus Areas may be a benefit in some areas, but the geographic area doesn't always align with partners. Also the requirement to spend 25% of ODA's Scope of Work funds in a Focus Area has been hard to meet for years for the Fort Rock/Silver Lake SWCD. • The Brattain fire exemplified that long-term lack of managing forest can have devastating effects; upland health is equally if not more important to riparian and in-stream watershed health. Additionally, fires have burned up a lot of riparian fencing that protect riparian areas. • DEQ's sampling locations for tracking water quality in Twentymile, Honey, and Thomas creeks are not representative of the watershed and instead reflect local conditions.
Recommended Modifications and Adaptive Management
• Align Focus Areas with FIPs; remove requirement to spend 25% of ODA's Scope of Work funds in a Focus Area. • DEQ should select sampling locations for their ambient program that reflect the cumulative impacts from the watershed, not just local locations at the site. • DEQ should rename their ambient site at Twentymile Mile Creek; the monitoring site is an agricultural drain • Focus conservation efforts on managing forests, e.g. forest thinning and prescribed burns, to reduce intensity of wildfire and the devastating effects fire has on the land and on infrastructure, such as riparian fencing, that helps protect water quality. • Tease out effects of wildfires on water quality. • ODA should propose a monitoring location to DEQ for Thomas Creek other than at Stockdrive Road.

Table 4.4b Number of ODA compliance actions in 2017-2019.

Locations	Letter of Compliance	Pre-Enforcement Notification	Notice of Noncompliance	Civil Penalty
Outside SIA(s)	1	0	0	0
Within SIA(s)	0	0	0	0

SOURCES OF FOOTNOTED CITATIONS

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