OREGON DEPARTMENT OF AGRICULTURE

Owyhee Agricultural Water Quality Management Area Plan

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Developed by the

Oregon Department of Agriculture

and the

Owyhee Local Advisory Committee

with support from the

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Acronyms and Terms

Ag Water Quality Program – Agricultural Water Quality Program
Area Plan – Agricultural Water Quality Management Area Plan
Area Rules – Agricultural Water Quality Management Area Rules
CAFO – Confined Animal Feeding Operation
CNPCP – Coastal Nonpoint Pollution Control Program
CWA – Clean Water Act
CZARA – Coastal Zone Act Reauthorization Amendments
DEQ – Oregon Department of Environmental Quality
GWMA – Groundwater Management Area
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
OHA – Oregon Health Authority
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
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 603-095-2700). 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).

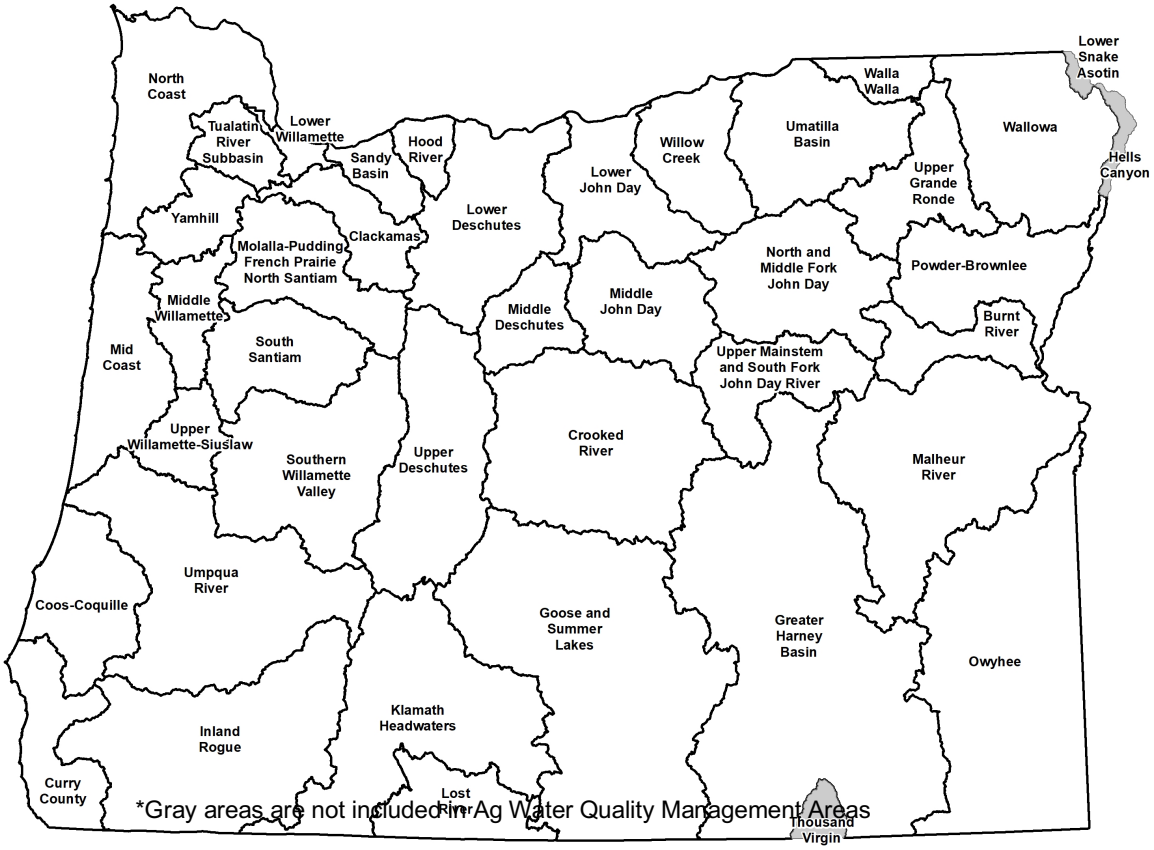
1.2 History of the Ag Water Quality Program

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 (CZARA),
- Agricultural activities detailed in a Groundwater Management Area (GWMA) Action Plan (if DEQ has established a GWMA in the Management Area and an Action Plan has been developed).

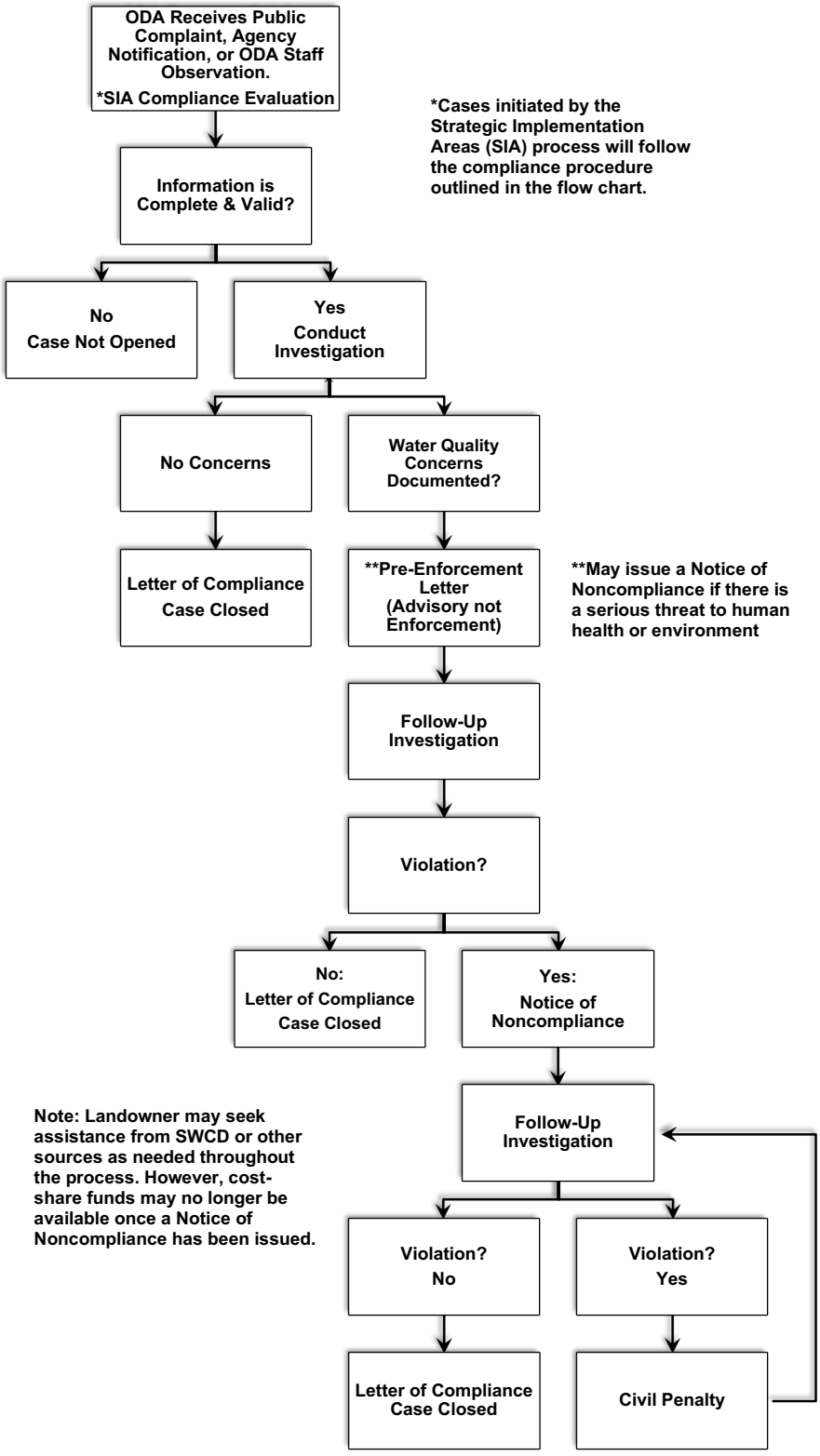
ODA bases Area Plans and Area Rules on scientific information (ORS 568.909). ODA works in partnership with SWCDs, LACs, DEQ, and other partners to implement, evaluate, and update the Area Plans and Area Rules. If and when other governmental policies, programs, or rules conflict with the Area Plan or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

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 an LAC (OAR 603-090-0020) with up to 12 members. The LAC serves in an advisory role to the director of ODA and to the Board of Agriculture. The role of the LAC is to provide a high level of citizen involvement and support 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" (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.

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 (OHA). The program provides individuals and communities with information on how to protect the quality of Oregon's drinking water. DEQ and OHA encourage preventive management strategies to ensure that all public drinking water resources are kept safe from current and future contamination. For more information, 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 (in partnership with OHA), 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 (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.

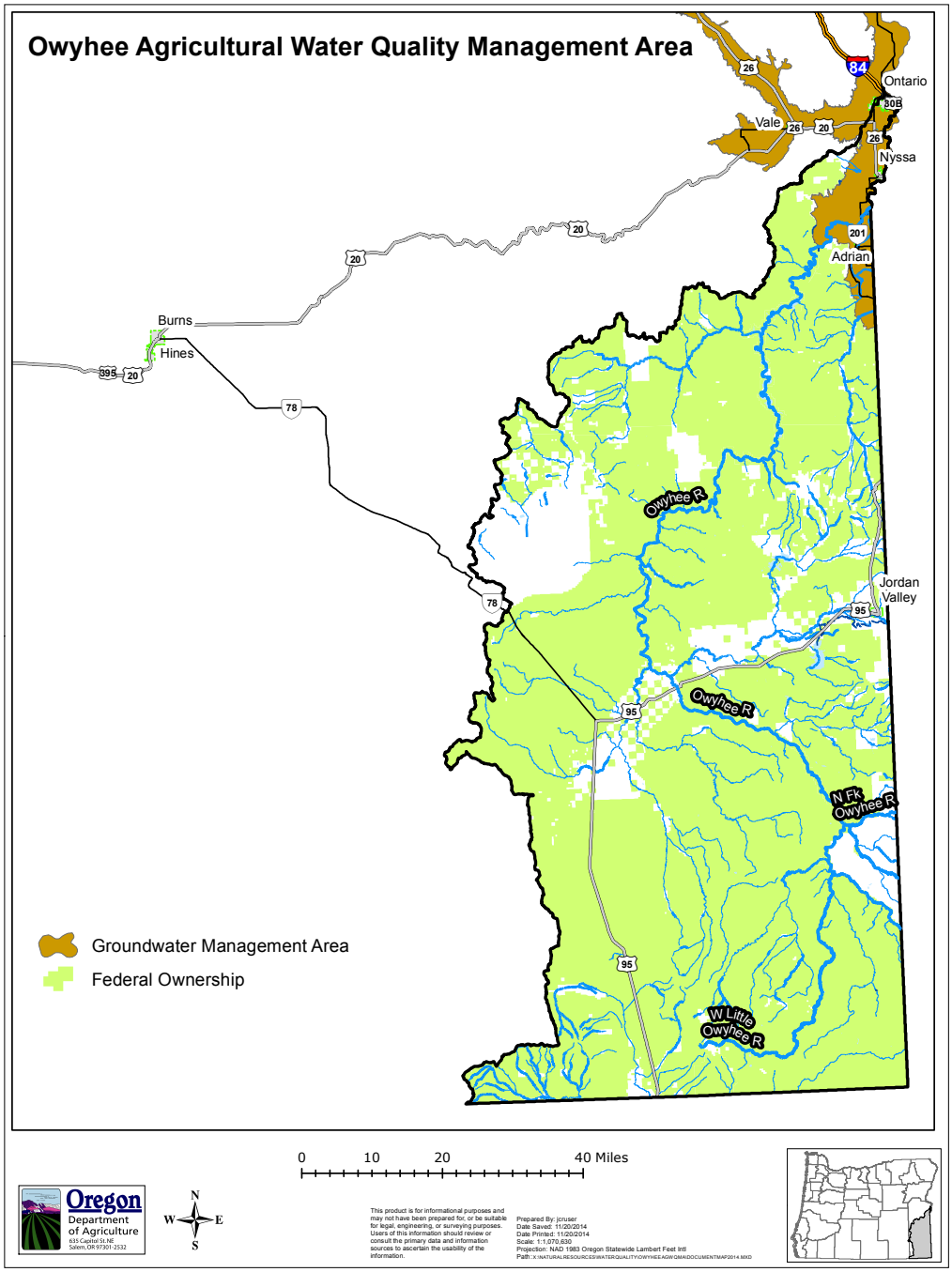
DEQ provides status and trends reports for selected parameters in relation to water quality standards. ODA will continue to work with DEQ to summarize the data results and how they apply to agricultural activities.

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

Chapter 2: Local Background

The Area Plan covers the Owyhee Basin, as defined by the United States Geologic Survey. The area includes the entire drainage of the Owyhee River in Oregon plus areas in Oregon draining to the Snake River starting one mile south of Ontario. It also includes some small intermittent creeks that flow to Nevada (Figure 3):

Figure 3. Map of Management Area



2.1 Local Roles

2.1.1 Local Advisory Committee

The Area Plan was developed with the assistance of the LAC. The LAC was formed 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
Rod Frahm, (Chair)	Ontario	Row Crops
Reid Saito, (Vice-Chair)	Nyssa	Row Crops
Martin Andre	Arock	Cattle
Charles Barlow	Nyssa	Row Crops
Norm Bennett	Nyssa	Dairy
Dave Bunker	Nyssa	Row Crops
Mike Hanley	Jordan Valley	Cattle
Vikki Price	Adrian/Nyssa	Row Crops
Bob Skinner	Jordan Valley	Cattle
Ray Waldo	Nyssa	Small Acreage, recreation
Lou Wettstein	Retired County Commissioner	Row Crops
Vacant		

2.1.2 Local Management Agency

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

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

2.2 Area Plan and Area Rules: Development and History

The director of ODA 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

The Owyhee River rises in northern Nevada and flows northwesterly through a small portion of Idaho and enters Oregon near the southeast corner of the state. Thereafter, it flows mostly north until it joins the Snake River just upstream from Nyssa, Oregon. The total length of the Owyhee River is 280 miles. It drains approximately 11,000 square miles, 6,200 of which are in Oregon. Major tributaries are the North, South, and Middle Forks of the Owyhee, the Little Owyhee, and Jordan Creek.

The Management Area contains several streams that are not tributaries to the Owyhee River. Succor Creek, for example, flows directly into the Snake River. At the far southern end of the management area, several small, intermittent streams, such as McDermitt Creek, flow into the Quinn River, and the Quinn River is a closed basin that is mostly in Nevada.

Climate

As with most areas in eastern Oregon, the Management Area is hot and dry in the summer. Weather in this semi-arid area is the result of maritime air moving eastward from the Pacific Ocean over the Coast and Cascade Mountain ranges. As air masses rise to cross these mountains, much of the moisture in the air condenses and falls to the ground, making the air relatively dry by the time it reaches southeastern Oregon. There is an abundance of sunshine and a wide-range between maximum and minimum daily temperatures.

Average annual precipitation in the region is between 8 and 14-inches, with some isolated areas receiving up to 30-inches or more. Most of the precipitation occurs from November through February and May, with about one-third falling as snow. The amount of precipitation in a particular location depends on topography; the higher the elevation, the greater the precipitation.

Thunderstorms, occasionally accompanied by hail, typically occur each year over virtually every part of the planning area. High-intensity thunderstorms occur between April and September; storms during June or July are typically drier than those in August or September. At elevations below 6,000 feet, the snow pack usually melts by April, but at higher elevations, some snow remains until mid-June. Localized flooding often follows late winter or spring snowmelt. Flooding can occur as often as once every five years in the Jordan Valley area. These high flows can cause severe bank erosion and can rip out existing riparian vegetation. The stream receives sediment from this erosion, which carries a significant portion of the nutrients found in the streams and rivers downstream. In contrast to these high spring flows, many streams run dry late in the summer because the area receives low amounts of precipitation and most of it falls in the winter.

Reservoirs

The most prominent man-made feature of the Owyhee area is the Owyhee Dam, which is located about 11 miles southwest of Adrian, Oregon. It stores about 1.1 million acre-feet of water, most of which farmers use for irrigation. Construction of the Owyhee Dam began in 1928 and finished in 1932. Antelope Reservoir, located southwest of Jordan Valley, is another important water storage facility, with a capacity of about 70,000 acre-feet. Upper and Lower Cow lakes, which are natural lakes found a few miles northwest of Jordan Valley, are managed for irrigation and flood control. Succor Creek Reservoir holds about 6,000 acre-feet of water and serves a water improvement district. Other substantial reservoirs have been built in the Owyhee Basin in Nevada.

These larger reservoirs were constructed to open up new land for crops or improve existing irrigation facilities. After constructing the Owyhee Reservoir, the government recruited farmers to settle in the region. For example, the U.S. Department of the Interior had a sign-up to assign 33 farm units in 1937. Applicants had to have $2,000, farm equipment, and farming experience. Ex-servicemen were given preference.

Reservoirs have led to many benefits besides irrigation. The Bureau of Reclamation estimates that the Owyhee Reservoir has provided an accumulated $33,000,000 in flood control benefits

from 1950 to 1998. Water released from the bottom of the reservoir is cold, and the area immediately below the reservoir supports a productive fishery that is well known by local fishermen. The lake behind the reservoir provides many recreational opportunities as well. The Bureau of Land Management (BLM) estimates that the reservoir provides about 5,000 angler days a year, and many people use the reservoir and lands around it for boating, camping, and hunting.

Land Use

The public owns the majority of the land in the Management Area; the BLM manages approximately 3.3 million acres (80 percent of the basin), and the state of Oregon owns 232,000 acres (six percent). Private lands total approximately 480,000 acres (12 percent).

The majority of the acres in the Management Area are rangeland and most ranchers are cow/calf producers. Most row crops are raised below the Owyhee Reservoir. Farmers there grow a great variety of crops and all of them depend on irrigation. Crops include:

- Onion
- Potatoes
- Sugar beets
- Alfalfa for hay and seed
- Grains
- Corn, and
- Irrigated pasture

Economic Importance of Agriculture to Malheur County

Agriculture and its related industries are the largest sector of the Malheur County economy. When measured by the percentage of total sales, food crop procurement and processing was the largest industry, followed by crop production, livestock production, procurement, feeding, wholesale and retail trade. Malheur County's gross agricultural income for 2017 estimated by USDA Census at $353,326,000. Cattle and onions were the top agricultural commodities, bringing in about $245,114,000.

The 2017 Census of Agriculture estimated that Malheur County had 964 farms on 1,093,362 acres.

Legacy Issues

One of the legacy issues affecting water quality in this Management Area is mining. Gold was discovered in the Silver City, Idaho area in 1863 and many mines were active in Idaho until the 1920s. Some mining activity has continued. Miners used mercury to amalgamate the gold and silver at these Idaho mining sites, and it is still present in mining tailings and around old Idaho mining sites. A plume of mercury contamination from mining around Silver City, Idaho flows down Jordan Creek into Oregon and on into Antelope Reservoir, the Owyhee River, the Owyhee Reservoir, and the Snake River affecting the Brownlee Reservoir. No attempt has been made to clean up these sources.

Geological formations, such as Cinnabar Mountain southeast of Silver City, Idaho near Jordan Valley, and other geological sources of mercury also contribute to mercury levels in streams in this area. In fact, much of the mercury used for mining was obtained from nearby deposits in Nevada, south and west of McDermitt. Arsenic is also found throughout the Management Area from the natural breakdown of volcanic rock.

Several creeks have been altered in the management area; some of the alterations have been beneficial and some have not. One example of a detrimental change occurred in the mid-1980s when the U.S. Corps of Engineers straightened Jordan Creek upstream of the bridge at Dinwitty Lane. Soon after the straightening, high flows eroded a channel 12 to 15 feet deep in places. The streambanks have been slow to recover from this event.

The Lower Owyhee is on the 303(d) list for legacy levels of DDT and dieldrin. Both of these chemicals were banned in the United States in the early 1970s. However, they are very slow to break down and they accumulate in the fatty tissues of fish and other animals. These facts explain why they are still found in the Management Area.

Dimethyl tetrachloroterephthalate (DCPA) residues are present in groundwater as a legacy of past use of Dacthal for weed control. Growers voluntarily stopped using Dacthal between 1995 and 1998.

Heavy nitrogen fertilizer used by farmers before 1990 resulted in high nitrates in groundwater and in the vadose zone.

Irrigation

Most meadows and pastures are not irrigated. Flood irrigation is most often used on the few irrigated pastures and meadows. The system of dikes and levees maintained by ranchers mimic what beavers did historically by storing and dispersing spring floodwaters. The return flow from this irrigation helps augment water availability for use lower in the Owyhee watershed.

Irrigation practices in the row crop areas below Owyhee Reservoir differ from those in most areas in Oregon. Furrow irrigation is the primary technique farmers use and it consists of placing water in furrows and allowing the water to proceed across the field by gravity. When the water reaches the end of the field, it is collected in a small ditch, which could be directed to a variety of places. Usually the water is returned to an irrigation ditch and reused by another farmer down the line. By the time the water is returned to the Owyhee or the Snake River, it has been used several times. As a consequence of water reuse, the cumulative water-use efficiency of the cooperative systems of furrow irrigation is vastly more efficient than calculations of furrow irrigation based on individual fields.

The Bureau of Reclamation and private companies developed the irrigation system with this reuse of return flow in mind. The system consists of diverting water from a reservoir or from the river to a main canal then to smaller canals and laterals and finally to individual farms. The main canals are arranged one below the next to catch the return flow. During the latter part of the irrigation season, the water in many of these ditches can be largely return flow. In many ways, this reuse of water is efficient and helps spread the amount of water longer in the season. The reuse of water, when properly managed, may also reduce pollutants in drain water.

Fisheries

Streams, lakes, and reservoirs in the planning area provide habitat for at least 15 native fish species and several nonnative trout, sunfish, and bass species. Oregon Department of Fish and Wildlife (ODFW) periodically stocks a coastal strain of hatchery rainbow trout in reservoirs. In addition to rainbow trout fingerlings, brown trout were planted by ODFW in the Owyhee River below Owyhee Dam to provide a popular catch-and-release fishery.

Although ODFW no longer routinely stocks warm water fish species, smallmouth bass, black crappie, channel catfish, and black bullhead have become established from previous introductions in the Owyhee River above the Owyhee Reservoir and in Cow Lakes.

Lahontan cutthroat trout inhabit two basins in the Trout Creek Mountains and a small number live in Sage Creek and Line Canyon Creek in the Quinn River Basin. The BLM reports annually to the US Fish and Wildlife Service for grazing authorization on allotments where Lahontan cutthroat trout are present. Initial consultation concluded that current grazing practices are not likely to jeopardize the continued existence of the trout.

Water Reservations

On October 14, 2016, the Oregon Water Resources Commission approved the request by ODA to extend the term of 60,000 ac-ft Owyhee Reservations of Unappropriated Water (OAR 690-511-0110) an additional 20-years so that they expire on January 7, 2037. Water from the reservations is to be stored in a surface or subsurface multipurpose reservoir; used for future economic development in agriculture, and has a priority date of November 6, 1992. Uses include irrigation, stockwater; agricultural, municipal or commercial use, recreation, and hydropower generation.

2.4 Agricultural Water Quality

This Area Plan addresses sediment, nutrients, bacteria, toxics, and temperature concerns related to agricultural activities.

The LAC is committed to the rational use of natural resources for income and social welfare for the residents of Malheur County. The LAC is committed to foster production practices consistent with the preservation of natural resources of the county. In keeping with these principles, it is essential that all rules and regulations be based on sound science. Malheur County has low per capita income and high unemployment compared to the rest of Oregon. As a matter of fairness, all aspects of this Plan must be sound and contribute to income and employment.

2.4.1 Water Quality Issues

Many people receive their drinking water from wells. Well monitoring studies detected nitrate and Dacthal di-acid contamination in the shallow aquifer within the irrigated portion of the lower Owyhee River Basin. This area was designated the Northern Malheur County Groundwater Management Area (GWMA) in 1989 by DEQ for nitrates.

2.4.1.1 Beneficial Uses

Lahontan cutthroat trout inhabit two basins in the Trout Creek Mountains and a small number live in Sage Creek and Line Canyon Creek in the Quinn River Basin. The BLM reports annually to the US Fish and Wildlife Service for grazing authorization on allotments where Lahontan cutthroat trout are present. Initial consultation concluded that current grazing practices are not likely to jeopardize the continued existence of the trout.

2.4.1.2 WQ Parameters and 303(d) list

In December 2018, the EPA approved Oregon's 303(d) list of impaired waterbodies (www.oregon.gov/deq/wq/Pages/epaApprovedIR.aspx). Stream temperatures and bacteria are the major concerns in several tributary watersheds to the Owyhee River. The Malheur River and its major tributaries are also on the 303(d) list (Table 2.4.1.2). And, methylmercury has been detected above water quality standards in several reservoirs.

Table 2.4.1.2 303(d) listings for various reaches of the Owyhee River and main tributaries.	
Owyhee River	Temperature, metals, methylmercury, phosphorus, some pesticides, bacteria
Cherokee Creek North Fork Owyhee McDermitt Creek	Temperature
Jordan Creek	Metals, dissolved oxygen, methylmercury
Crooked Creek	Arsenic, methylmercury
Antelope Reservoir	Methylmercury

Most of the water quality violations, e.g. temperature and chlorophyll a, relate to the beneficial use of fish and aquatic life. In addition, excessive levels of bacteria (*E. coli*), nitrates, and toxics can cause problems for people (human contact recreation and drinking water). Mercury is a concern for fish consumption.

Elevated stream **temperatures** can stress aquatic organisms and deplete oxygen from water. Excessive nutrients, such as nitrogen and phosphorus, can increase 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 uses up oxygen in the process. The breakdown of aquatic plants can use up large amounts of 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.

Nitrates are primarily carried into surface and groundwater as molecules dissolved in water. **Phosphorus** can be either dissolved or attached to soil particles. **Sediment** carried in streams can impair aquatic life by reducing light penetration and visibility, reducing water infiltration through stream substrate (harming incubating fish eggs), and irritating gill filaments. Sediment also decreases the abundance of aquatic insects, which are a primary food source for fish.

2.4.1.3 TMDLs and Agricultural Load Allocations

The Snake River - Hells Canyon TMDL was adopted in 2004 and is a joint effort among Idaho DEQ, Oregon DEQ, and US EPA. This TMDL addresses temperature, bacteria, chlorophyll *a* (a product of excessive algae growth), sediment, pesticides, and dissolved oxygen in the Snake River from where it enters Oregon near Adrian to immediately upstream of the inflow of the Salmon River. The TMDL provides some load allocations for Snake River tributaries, including the Owyhee River.

To reduce stream temperatures, farmers and ranchers are expected to promote and protect riparian vegetation. However, shade targets are not provided. The phosphorus target of 0.07 mg/L will require a significant reduction (72 percent) and is expected to address chlorophyll and dissolved oxygen concerns; in the Management Area, phosphorus primarily moves to streams via irrigation-related erosion. The LAC does not consider the target achievable due to natural delivery of phosphorus to Owyhee Reservoir. TMDL targets for sediment include $\leq$ 50 mg/L total suspended solids as a monthly average and a 27 percent reduction in suspended sediment load at the mouth of the Owyhee River. Much of the sediment enters the Owyhee River from irrigation-related erosion.

The TMDL determined no need to provide load allocations for pH and bacteria. The pesticide targets are for DDT and dieldrin, both of which are banned and no longer in use in the United States.

2.4.1.4 Drinking Water

Nine public water systems obtain domestic drinking water from groundwater and surface water sources to regularly serve approximately 18,230 people in the Management Area.

In the last ten years, three have had alerts for *E. coli* (including the city of Adrian), and both the cities of Nyssa and Adrian have had alerts for nitrates. The Domestic Well Testing Act database (real estate transaction testing data) for 1989-2018 indicates 68 significant detections of nitrate (>5mg/L) from 228 total wells. Of those wells, 31 had nitrate concentrations ≥10mg/L.

2.4.1.5 GWMA

DEQ, in conjunction with stakeholders, developed the Northern Malheur County GWMA Action Plan to reduce nitrate concentrations to 7 mg/L https://www.oregon.gov/deq/FilterDocs/gw-nmcgwma-bmpimplrpt.pdf.

Nitrate concentrations found in the groundwater are strongly influenced by agricultural fertilization, shallow depth to water table, large amounts of irrigation water applied, permeable soil types, and direction of ground water flow. Nitrates have been tracked in eleven wells in the Management Area starting in July 1991. Results through December 2012 showed that eight of the wells exceeded the standard at least once, and the average nitrate concentration of eight wells exceeded 7 mg/L, and seven exceeded 10 mg/L. The highest nitrate levels were around Cairo Junction and Nyssa.

In 2014, DEQ concluded in their DRAFT Fourth Northern Malheur County Groundwater Management Area Nitrate Trend Analysis Report that:

- The decrease in nitrate concentrations from 1991 through 2012 is statistically significant, even though some wells show increasing trends.
- The Action Plan goal of an area-wide nitrate concentration of 7 mg/L has not yet been met. Area-wide mean and median concentrations are 12.5 and 9.9, respectively.
- Continued and perhaps expanded best management practices implementation is needed.

Dacthal was a commonly used herbicide in onions for decades until 1995-1998 when growers stopped using it. Dacthal residue levels ranged from no detection to several hundred parts per billion. A lifetime health advisory level of 70 parts per billion has been established by the EPA for Dacthal and its breakdown products.

The contamination of nitrates and Dacthal di-acid is believed to have occurred over decades of irrigation. Best management practices to reduce groundwater contamination include:

- Soil, plant tissue, and water testing for precise nutrient management,
- Applying nutrients at agronomic rates specific to each crop,
- Pest management with products with short half-lives,
- Conservation cropping sequence,
- Continuing sound crop rotation,
- Mulching and polyacrylamide (PAM),
- Irrigation water management, including irrigation scheduling,
- Piping or lining irrigation delivery systems,

- Conversion to more efficient systems of irrigation,
- Capturing and reusing field runoff for irrigation.

Additional information is available on the Malheur Experiment Station website (http://www.cropinfo.net/BestPractices/)

Groundwater moves an estimated 0.4 miles per year in the Cairo Junction area. Therefore, it may take over 11 years for water in the Cairo Junction area to discharge. Other estimates have indicated it will take 20 years for the groundwater to move from the upper reaches of the aquifer to the lower discharge areas. Due to this slow movement of groundwater, it will take decades to realize the full benefit of improved agronomic practices.

2.4.2 Sources of Impairment

2.5 Regulatory and Voluntary Measures

The strategy of the ODA, Malheur County SWCD and watershed councils for controlling pollution on agricultural and rural lands relies on existing and expanded programs and practical and feasible projects, while focusing on proactive planning activities for those conditions which are the most significant and controllable sources of nutrients, sediment, bacteria, and other sources of pollution arising from agricultural use.

2.5.1 Area Rules

OAR 603-095-2740
Prohibited Conditions
(1) A landowner shall be responsible for only those conditions caused by activities conducted on land managed by the landowner. Criteria do not apply to conditions resulting from unusual weather events or other exceptional circumstances that could not have been reasonably anticipated.
(2) Pollution Control and Waste Management
Effective on rule adoption. No person subject to these rules shall violate any provision of ORS 468B.025or ORS 468B.050.
(3) Streamside Conditions
By January 1, 2008, no person may contribute to conditions that preclude establishment and development of adequate riparian vegetation for streambank stability and shading, consistent with site capability.
(4) Irrigation Surface Water Return Flow
(a) After January 1, 2008, irrigation surface water return flow to waters of the state shall not cause an excessive, systematic, or persistent increase in sediment levels already present in the receiving waters, except where the return flows do not cause the receiving waters to exceed established sediment standards.
(b) A landowner conducting irrigation activities in accordance with a plan approved in writing by the department or its designee shall be deemed to be in compliance with this rule.

2.5.2 Voluntary Measures

2.5.2.1 Streamside Conditions

Vegetation, both in the uplands and in the riparian area, plays a critical role in water quality. Generally, healthy plant communities:

- Hold soil in place,
- Protect stream banks,
- Capture, store, and safely release precipitation,
- Filter nutrients from both the groundwater and surface runoff,
- Provide shade to moderate water temperatures.

In addition to the water quality benefits, healthy vegetation improves fish habitat. Riparian vegetation protects spawning, rearing, and holding areas by trapping sediment that could smother eggs. Vegetation improves the recruitment of large woody debris. This debris helps to create pools for fish to rest in, provides hiding cover, and habitat diversity. Vegetation provides organic debris to feed aquatic insects, which are an essential element in the diets of many fish.

Healthy riparian vegetation benefits farmers and ranchers too. Benefits include increased forage production, less stream bank erosion, increased late season flows and stable stream channels. Techniques that improve riparian area management can lead to economic benefits as well. Many research projects and practical on-farm examples have shown this to be true. Riparian vegetation, consistent with site capability, is a cost effective means of reducing stream bank erosion and heating from solar radiation.

In recent years, the state and federal governments have developed several cost-share programs to aid landowners in improving their management of riparian areas. These programs will help pay for fencing to establish riparian pastures, pay an annual rental fee for planting woody vegetation along streams, assist in developing off-stream watering sources that will help keep cattle out of the riparian area, and many other options. Some of the programs available include:

- Conservation Reserve Enhancement Program (CREP),
- Oregon Watershed Enhancement Board (OWEB),
- Environmental Quality Incentives Program (EQIP),
- DEQ Nonpoint Source 319 Grant Program.

2.5.2.2 Stream Temperature Considerations

There are many important factors to consider when discussing stream temperature in the Owyhee area. As discussed in the Climate section of this Area Plan, air temperatures are high and stream flows are low during the summer in southeastern Oregon. This limits the ability to have cool water. Other natural factors such as the numerous hot springs in the area, the north-to-south orientation of the main stem, and the heat radiating from rocky canyon walls have a profound heating effect on streams. Wide channels of the main stem of the Owyhee and of some tributaries due to flooding minimize stream shading by riparian vegetation. Thus, the moderating influence of shade is limited in these situations. Natural cycles of flooding along most Owyhee tributaries make it difficult to retain tall riparian vegetation because it is scoured out.

Another consideration is that large areas of the Owyhee River (roughly 186 river miles) have no agricultural activities occurring near them. This is because the mainstem, West Little, and North Fork of the Owyhee rivers are designated National Wild and Scenic Rivers. An Order of Modified Injunction was filed in the District Court of Oregon on April 28, 2000. The Order directed the elimination of grazing at “areas of concern” identified in the 1993 “Main, West Little, and North Fork Owyhee National Wild and Scenic Rivers Management Plan.” Before this court Order, cattle had access to only 12 miles of the Owyhee River.

2.5.2.3 Agricultural Waste

The aim of agricultural waste control is to minimize the transport of nutrients, pathogens, and sediment into surface and groundwater. Numerous conservation strategies may be taken to minimize waste inputs into waters of the state. A discussion of these strategies, broken down by waste component, follows.

Nutrients

Crop nutrients are elements taken in by a plant that are essential to its growth, which are used by the plant in the production of its food and tissue. Over-application of crop nutrients may result in nutrient runoff and leaching into waters of the state. This may cause nuisance algal growth, which leads to fluctuating pH, and low, dissolved oxygen levels. Landowners and operators are encouraged to adopt sound agronomic strategies to guide crop nutrient applications.

Sound agronomic strategies include: use of generally accepted fertilizer guidelines; setting realistic yield goals; regular calibration of fertilizer application equipment; appropriate application timing; periodic soil testing and plant tissue analysis; periodic nutrient analysis of manure and/or compost products that are applied; managing irrigation to prevent nutrient loss through leaching and/or surface runoff; carefully managing nutrient applications; and accounting for "non-fertilizer" sources of nutrients such as manure, compost bio-solids, and crop residues.

Livestock Waste

Manure is an important nutrient source for crop and pasture production. Proper livestock waste management can decrease nutrient and bacteria contamination of water resulting from agricultural activities. Livestock are not responsible for all the bacteria found in creeks and rivers; many bacteria detected in streams are from waterfowl and other wildlife.

A landowner or operator can use many different conservation strategies to help minimize animal waste reaching waters of the state. Harrowing pastures after livestock have been moved off helps to incorporate the manure into the soil so the crop will take up the nutrients. This also greatly reduces the chances bacteria and nutrients will runoff into a stream. Vegetative buffer strips can minimize the effects of runoff, by catching pollutants before reaching a stream. Examples of waste management include the diversion of clean water away from potential pollutants; waste collection, storage, and utilization; and facilities operation and maintenance. If applying manure to cropland, it is important to apply at rates that do not exceed agronomic needs for nitrogen and phosphorus based on soil and/or tissue tests for the crop to be grown. Pasture management and/or prescribed grazing can help maintain the integrity of pastures, thus decreasing waste runoff. Through the management of livestock access to riparian areas, the effects of animal waste can be reduced. Some examples of techniques to achieve this may be off-stream watering, seasonal grazing (riparian pastures), and/or exclusion (temporary or permanent).

Animal Feeding Area Management

Management of animal waste from Animal Feeding Operations is a local and national priority. The LAC encourages livestock operators to assess their feeding area management for any discharges of pollution to the waters of the state. If operators think they might have a problem, the LAC recommends they contact local, county, state, and federal agencies for technical assistance.

When assessing their management, the LAC suggests operators consider the following:

- Animal waste collection, storage, and disposal at agronomic rates,

- Excluding waters of the state from confinement areas,
- Control of surface runoff to and from the waste storage and confinement areas,
- Off-stream water development.

Sediment in Irrigation Return Flow

Excessive levels of sediment in tailwater discharges can harm aquatic life and can carry nutrients, particularly phosphorus, into streams and rivers. It should be noted that sediment is defined as soil particles, both mineral and organic, that are in suspension, are being transported, or have been moved from the site of origin by flowing water or gravity.

This is a particular concern in some parts of the Management Area because of the existing irrigation system. Most crop fields are furrow irrigated. Normally, the irrigation tailwater is returned to a ditch and reused by another farmer down the line. By the time the water is returned to the Owyhee or the Snake River, it has been used several times. The irrigation water can pick up sediment and other substances as it travels down the furrow. This effect is compounded when the water is reused.

It is important to note that most soils in the planning area consist of very fine particles. These soils are the silts that were the last material to settle out of the water from the Lake Bonneville Flood[1]. Once they are in water, they stay suspended for a long time. Long-time residents, many of whom were the first farmers to irrigate crops, describe the soils as having the consistency of baby powder. In the early days of irrigation, water moving down a furrow could kick up a small dust cloud. Thus, the nature of the soils makes it difficult to control irrigation-induced erosion.

Many farmers have been reducing soil loss from furrow irrigation. Some of the methods they use include:

- Laser leveling,
- Straw mulching,
- Polyacrylamide,
- Filter strips,
- Gated pipe,
- Cement ditches,
- Sediment ponds,
- Water control structures,
- Pump back systems,
- Surge irrigation,
- Bubblers (eliminate trash in irrigation water, which helps to reduce water applied to a field),
- Conservation tillage,
- Conservation crop rotations,
- Irrigation management (soil moisture monitoring, proper scheduling, etc.),
- Sprinkler and drip irrigation in place of surface furrow irrigation where technically and economically feasible.

Conversion from furrow to sprinkler irrigation can have many water quality benefits, including use of less water for irrigation and creation of less tail water. However, as noted previously, the

[1] This massive flood occurred about 14,000 years ago when water from a 20,000 square mile lake broke loose. This flood greatly affected the Snake River and the region around it. Floodwaters carved out new canyons and deposited huge amounts of soil and boulders. When the flood came through the area around the mouth of the Owyhee River, the water backed up and the silt settled out over several years.

conversion to sprinkler and its reliance on electrical power can be very expensive; and there is a concern that the application of less irrigation water will reduce groundwater recharge and lower wells.

Researchers at the Malheur Experiment Station have worked on many methods to maximize water use efficiency. Producers in the area have adopted many of the practices recommended from the results of this work.

Many ranchers who flood irrigate their hay meadows have installed berms to redirect the surface flow back onto the meadow. This improves control of their irrigation and reduces surface return flow to rivers.

Voluntary efforts are the focus of ODA, the Malheur County SWCD, the watershed councils and the LAC. However, situations may arise when a particular landowner refuses to correct the conditions on his or her property. In this case, ODA has enforcement authority to ensure pollution control. At the same time, ODA does not want to mandate or prohibit any specific agricultural activity. To maintain this flexibility, this Area Plan and Area Rules describe prohibited conditions.

Readers should note that this Area Plan is only a guidance document, and by itself it is not regulatory. However, it does refer to administrative rules that set requirements for landowners. To help distinguish between this Area Plan and its associated rules, all rule language is separated from the rest of the text by solid lines.

Chapter 3: Implementation Strategies

Goal

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

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

1. Reduce sediment in irrigation return flows,
2. Reduce stream bank erosion,
3. Reduce placement, delivery, or sloughing of wastes into streams,
4. Increase riparian vegetation for bank stablility and stream shading consistent with vegetative site capabilities.

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

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

3.1 Measurable Objectives and Strategic Initiatives

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

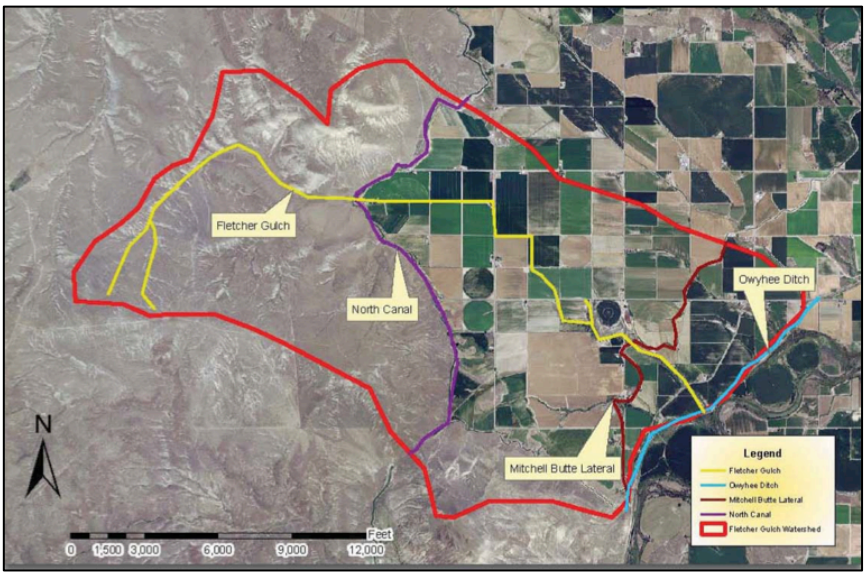
3.1.1 Management Area

ODA is working with SWCDs and LACs throughout Oregon toward establishing long-term measurable objectives to achieve desired conditions. Currently, ODA and the Malheur SWCD are using Focus Area measurable objectives to show progress in this Management Area. These are described below.

3.1.2 Fletcher Gulch Watershed

The Fletcher Gulch watershed is about 20 miles southwest of Ontario and consists of approximately 6,500 acres, of which 2,906 acres are irrigable land and 3,600 acres are rangeland. The North Canal divides the cropland to the east from the rangeland to the west. Landownership includes approximately 3,000 acres of private land (east of the canal) and about 3,500 acres of federal land managed by the BLM west of the canal. Most of the private land is in irrigated row crops but there are also some fields with grazing cattle.

Figure 4: Fletcher Gulch Watershed



Fletcher Gulch is a 6½-mile ephemeral drainage that empties into the Old Owyhee Ditch. The drainage water moves along the Old Owyhee Ditch to downstream water users and eventually the Owyhee River. Sediments and nutrients that wash off fields in the Fletcher Gulch watershed are passed downstream. In addition, the water flowing out of Fletcher Gulch also contains sediment eroded from canal banks maintained by the Owyhee Irrigation District.

Prior to 1998, the majority of the cropland in Fletcher Gulch was irrigated with furrow-irrigation through a series of old concrete and earth ditches, resulting in low on-farm irrigation efficiencies of 20 percent to 40 percent. The NRCS estimates composite annual furrow irrigation erosion for the typical crop rotation at 34 tons per acre per year.

The major cause of erosion and low irrigation efficiency is the irrigation of relatively long furrow runs on steep slopes. More than half the irrigated acreage in the watershed has slopes exceeding 1.5 percent. Fields with 1.5 percent or less have been leveled or smoothed to put the fields at a milder grade.

Assessment Method:

1. Grab sample from water column: Two times per month during the irrigation season: total suspended solids, total phosphorous,

2. All irrigated farm fields are assigned one of the following categories:

Table 3.1.2: Categories for assessing farm fields for the likelihood of contributing sediment and total phosphorus to irrigation drains		
	Likelihood of pollutants in field runoff	**Irrigation System**
Class 1	None or minimal	Pivot, swipe, linear
Class 2	Some	Other sprinkler: Wheel line, solid set, big gun, hand lines, etc.
Class 3	Very likely	Flood
Class 4	Likely at some times	Drip in annual crop

Measurable Objective

By July 1, 2021: increase total of all agricultural lands in Class 1 from current 52% to 75%.

3.1.3 Groundwater Management Area

The measurable objective of the GWMA Action Plan is to reduce nitrate concentrations to 7 mg/L NO3 in groundwater. No dates for this measurable objective have been set by DEQ.

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 2021-2024.

Activity	4-year Target	Description
Community and Landowner Engagement		
# active events that target landowners/managers (workshops, demonstrations, tours)	12	Field Days and Irrigation District meeting working with irrigation changes
# landowners/managers participating in active events	100	Field Days and Irrigation District meeting working with irrigation changes
Technical Assistance (TA)		
# landowners/managers provided with TA (via phone/walk-in/email/site visit)	60	
# site visits	30	Field Visits for Planning and Completion
# conservation plans written*	13	
On-the-ground Project Funding		
# Management area funding applications submitted	11	Upland Projects including Juniper removal and stream bank protection
# Focus Area Projects submitted	2	Buried open ditch to Pivots

* 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 and Land Condition Monitoring

3.3.1 Water Quality

DEQ monitors five sites in the Management Area as part of their ambient monitoring network.

- Crooked Creek at Kiger Road
- Jordan Creek at Arock
- Jordan Creek up stream of Jordan Valley
- Owyhee River at Rome (Highway 95)
- Owyhee River at Highway 201

Chapter 4: Progress and Adaptive Management

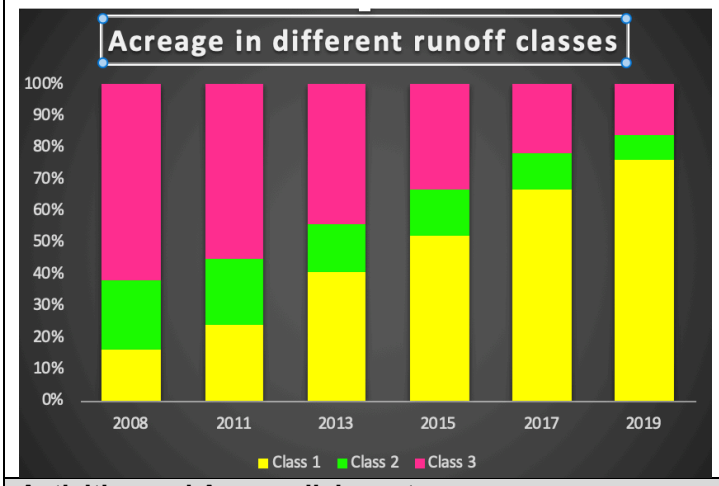
4.1 Measurable Objectives and Strategic Initiatives

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

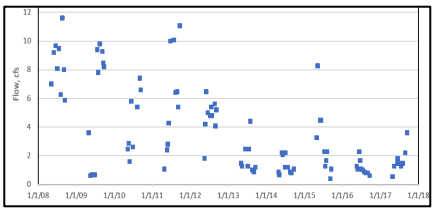
4.1.1 Management Area

Table 4.1.1 Fletcher Gulch Focus Area

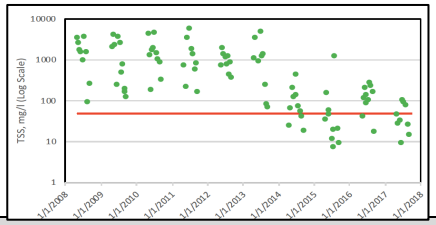
Measurable Objective
By July 1, 2021: increase total of all agricultural lands in Class 1 from current 52% to 75%.
Current Conditions
Progress Toward Measurable Objectives: Achieved objective
Assessment Results: Ag lands in Class 1 = 76%



Flow: Reduced Runoff



Total Suspended Solids: Decreasing to TMDL target



Activities and Accomplishments
This Focus Area is closed after achieving the objective of converting 15% of ag lands in Class 1 to 75% over 10 years. At the same time, Class 3 decreased from 62% to 16%. In addition, flows decreased by about 80%, and total phosphorus, dissolved phosphorus, and total suspended solid concentrations decreased by 25%, 50%, and 97% respectively. NRCS created a story map (https://nrcs.maps.arcgis.com/apps/Cascade/index.html?appid=b7f126c6b7d146eb8958817b69037219) and video (https://www.youtube.com/watch?v=9Fkq5A6uPUs) to celebrate this achievement.
Adaptive Management Discussion
Success was due to aligning the efforts and funding of multiple partners (including Owyhee Irrigation District, Owyhee Watershed Council, Malheur County SWCD NRCS, OWEB, ODA) with interested landowners and working in this area for over 10 years.

4.1.2 Groundwater Management Area

DEQ continues to collect data from the well network four times per year. The most recent comprehensive Trend Analysis Report is dated August 2015 and includes data through 2012.

There has been no subsequent report. There is currently no measureable objectives for the Groundwater Management Area.

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 2016-2020 by Malheur Soil and Water Conservation District and the Owyhee Watershed Council.

Activity	4-year results	Description
Community and Landowner Engagement		
# active events that target landowners/ managers (workshops, demonstrations, tours)	6	Weed Management Meetings, Irrigation District presentations for funding projects
# landowners/managers participating in active events	51	Weed Management Meetings, Irrigation District presentations for funding projects
Technical Assistance (TA)		
# landowners/managers provided with TA (via phone/walk-in/email/site visit	110	Irrigation sprinkler designs and Weed Management Plans in the Jordan Valley area
# site visits	40	Irrigation and Riparian restoration
# conservation plans written*	12	Irrigation Management Plans
On-the-ground Project Funding		
# funding applications submitted	21	Irrigation and Riparian restoration
# funding applications awarded	17	Irrigation and Riparian restoration

* 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. OWRI results are provided annually in January after a year of proofing and GIS management.

Table 4.2b Implementation funding (cash and in-kind) for projects on agricultural lands reported 1997-2018 (OWRI data include most, but not all projects, implemented in the Management Area).

Landowners	OWEB	DEQ	NRCS	BOR	Owyhee Irrigation District	BLM	All other sources*	TOTAL
$7,612,152	8,514,116	$112,548	$944,395	$596,412	$694,839	$278,500	$1,080,713	$19,833,675

*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 (OWRI data include most, but not all projects, implemented in the Management Area).

Activity Type	Miles	Acres	Count*	Activity Description
Riparian	8	183	-	
Fish Passage	0	-	0	
Instream Habitat	3	-	-	
Wetland	-	31	-	
Road	0	-	0	
Upland	-	174,449	-	Juniper removal and irrigation improvements
TOTAL	11	174,662	0	

* # of hardened crossings, culverts, etc.

4.3 Water Quality and Land Condition Monitoring

4.3.1 Water Quality

DEQ analyzed data for dissolved oxygen, *E. coli*, pH, total phosphorus, temperature, and total suspended solids in the Management Area. (DEQ. 2020 Oregon Water Quality Status and Trends Report. www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx). The analysis is incomplete because it excludes some of the phosphorus and total suspended solids data collected by the Malheur SWCD due to timing issues with receiving data from federal labs.

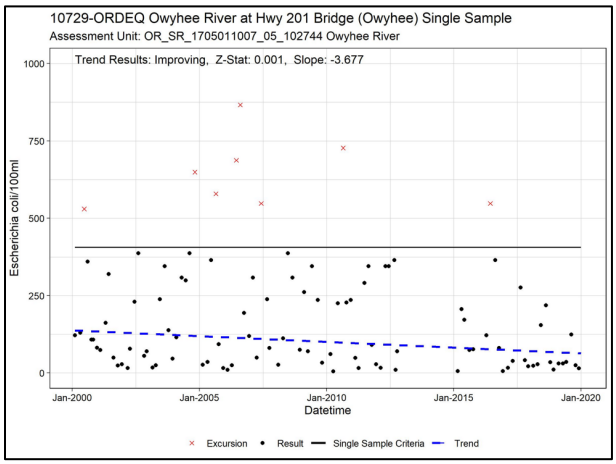
The results clearly showed significant improvements at the mouth of the Owyhee River (Graphs 4.3.1), likely due to landowner efforts to improve the quality and reduce the amount of irrigation runoff. However, there are areas of concern for total phosphorus in parts of the watershed.

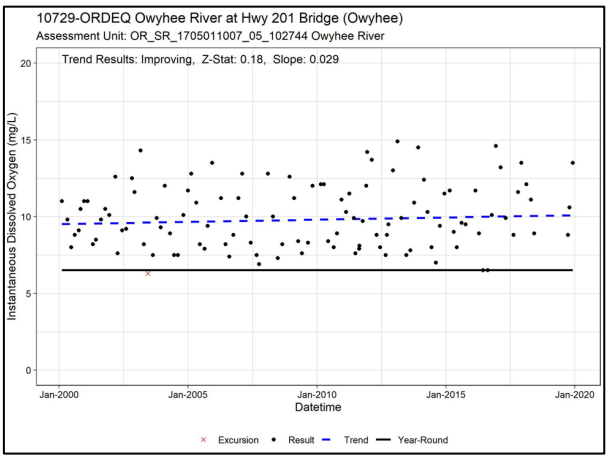
Table 4.3.1. Attainment of water quality standards (2016-2019) and trends (2000-2019) at selected river sites in the Management Area.

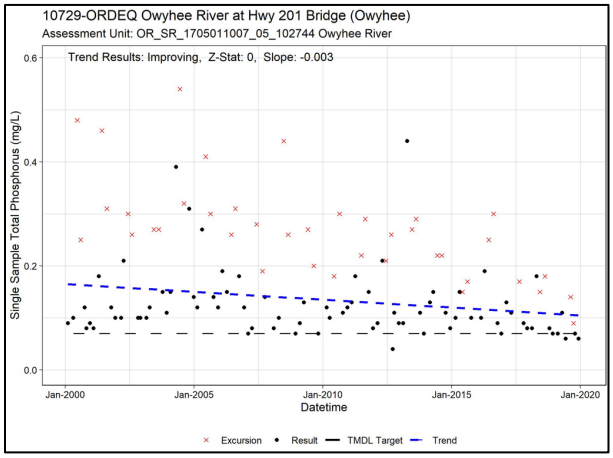
Site Description	*E. coli*	pH	Dissolved Oxygen	Total Phosphorus[1]	Total Suspended Solids[2]
	Attaining water quality standard?			Attaining TMDL target *or* 2016-2019 median (mg/L)	
Owyhee River mouth	Mostly ↑	Yes	Yes ↑	No ↑	Mostly ↑
Owyhee River @ Rome	Yes	Yes	Yes	Median < 0.05	Median = 6
Jordan Creek @ Arock	Yes	Yes	Yes ↓	Median > 1.0	Median = 12
Crooked Creek @ Kiger Rd	Almost	Yes ↓	Yes ↑	Median < 0.05	Median = 12

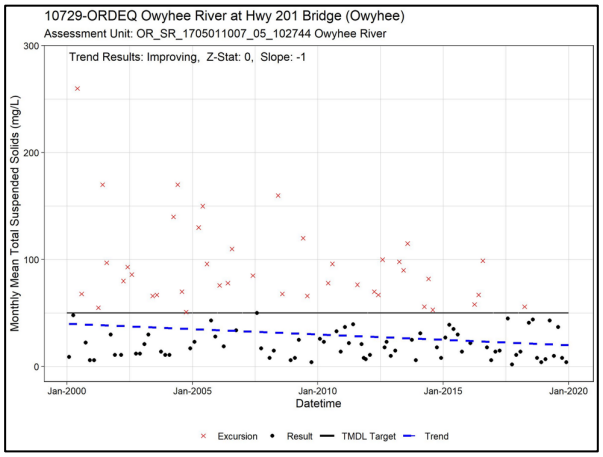
[1] TMDL target = 0.07 mg/L total phosphorus concentration May-September; applies only to mouth of Owyhee River
[2] TMDL target = 50 mg/L total suspended solids concentration; applies only to mouth of Owyhee River
↑ Statistically significant improving trend
↓ Statistically significant degrading trend

Graphs 4.3.1. Statistically significant improvements in water quality at the mouth of the Owyhee River over 20 years. Parameters are: *E. coli* (top left), dissolved oxygen (top right), total phosphorus (bottom left), and total suspended solids (bottom right). Trend line is dashed; solid line is the target.









4.4 Biennial Reviews and Adaptive Management

ODA, the LAC, the LMA, and other partners met on January 21, 2021 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
The Owyhee LAC was happy with the progress that has been made over the past twenty years. The water column in the Owyhee River has continued to improve with the change in irrigation practices and upgrades to the delivery systems. The LAC also feels that the Malheur Soil & Water Conservation District along with the Owyhee Watershed Council continue to provide educational opportunites to landowners addressing both riparian functions and upland watershed process. The local LAC continues to work with the local agencies to better document the changes happening in the water column by establishing a Local Irrigation Monitoring Work Group to begin to establish future drainsheds in the Malheur watershed. The LAC would still like to see more funding to be directed towards real time flow data located in all irrigation delivery systems within the

management area. The COVID pandemic has also made it more difficult for local entities to work with partners within this past year, (2020).
Recommended Modifications and Adaptive Management
The only modifications that are being made are establishing consistent measurable objectives and outcomes across the watershed. The local monitoring work group will continue to fine tune what those parameters may look like and present them to the LAC at the next biennial meeting.

Table 4.4b Number of ODA compliance actions in 2016-2020.

Location	Letter of Compliance	Pre-Enforcement Notification	Notice of Noncompliance	Civil Penalty
Outside SIA(s)	1	0	0	0
Within SIA(s)	0	4	0	0