OREGON DEPARTMENT OF AGRICULTURE

Willow Creek Agricultural Water Quality Management Area Plan

February 2024

Developed by the

Oregon Department of Agriculture

and the

Willow Creek Local Advisory Committee

with support from the

Morrow Soil and Water Conservation District

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

Morrow SWCD
430 Linden Way
Heppner, OR 97836
Phone: (541) 676-5452

Website: oda.direct/AgWQPlans

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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
CWA – Clean Water Act
DEQ – Oregon Department of Environmental Quality
GWMA – Groundwater Management Area
HUC – Hydrologic Unit Code
LAC – Local Advisory Committee
LMA – Local Management Agency
Management Area – Agricultural Water Quality Management Area
NRCS – Natural Resources Conservation Service
OAR – Oregon Administrative Rules
ODA – Oregon Department of Agriculture
ORS – Oregon Revised Statute
OWEB – Oregon Watershed Enhancement Board
OWRI – Oregon Watershed Restoration Inventory
PSP – Pesticide Stewardship Partnership
SIA – Strategic Implementation Area
SWCD – Soil and Water Conservation District
TMDL – Total Maximum Daily Load
US EPA – United States Environmental Protection Agency

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Foreword

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

The Area Plan is neither regulatory nor enforceable (Oregon Revised Statute (ORS) 568.912(1)). 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. Describes activities to make and track progress towards the goals of the Area Plan. Presents goals, measurable objectives, strategic initiatives, proposed activities, and monitoring efforts.

Chapter 4: Progress and Adaptive Management. Describes progress toward achieving Area Plan goals and measurable objectives by summarizing accomplishments and monitoring results.

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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 603-095-2840). 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

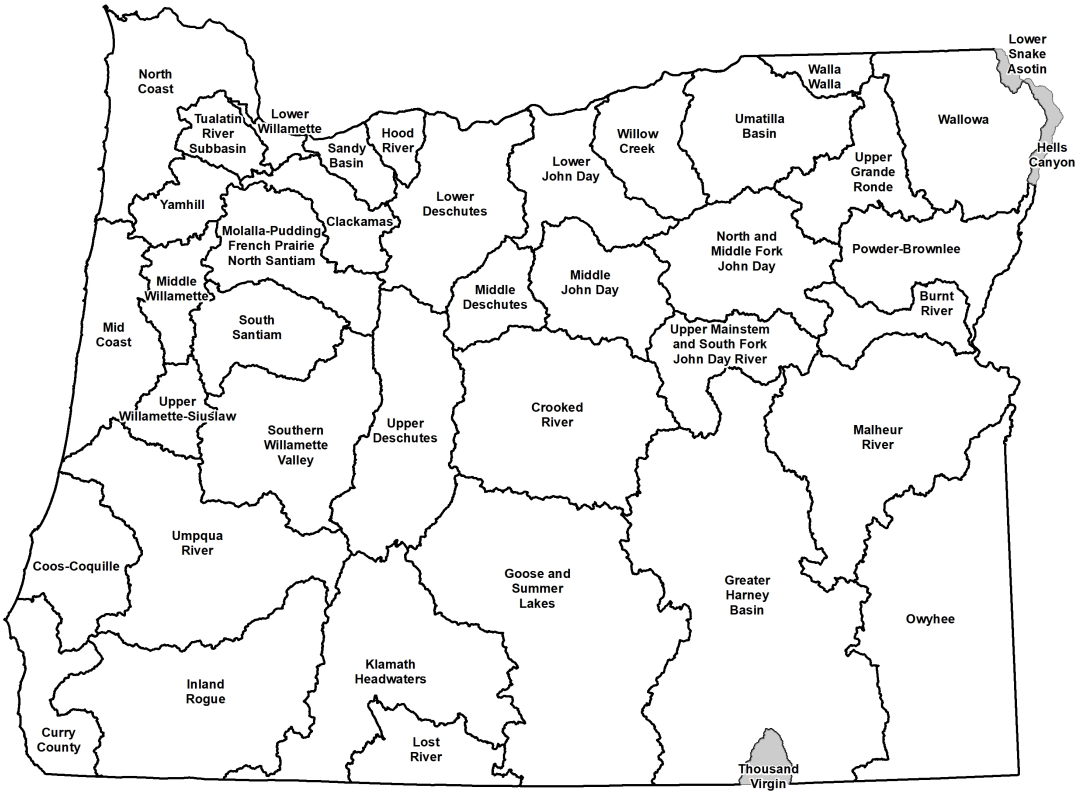
In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion and achieve water quality standards and to adopt rules as necessary (ORS 568.900 through ORS 568.933). The Oregon Legislature passed additional legislation in 1995 to clarify that ODA is the lead agency for regulating agriculture with respect to water quality (ORS

561.191). The Area Plan and Area Rules were developed and subsequently revised pursuant to these statutes.

Between 1997 and 2004, ODA worked with LACs and SWCDs to develop Area Plans and Area Rules in 38 watershed-based Management Areas across Oregon (Figure 1.2). 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*



*Gray areas are not included in Ag 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.

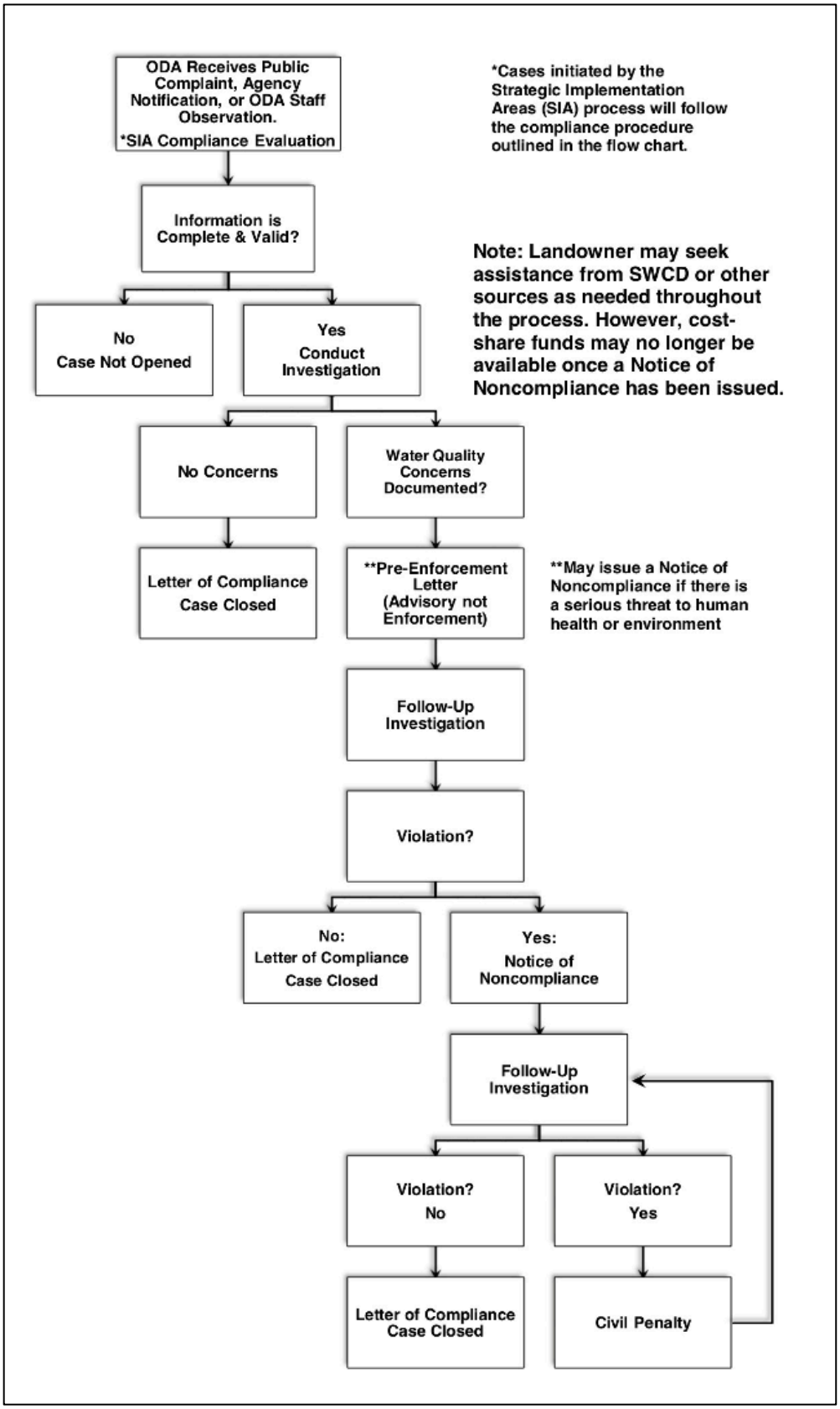
1.3.1.1 ODA Compliance Process

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 1.3.1.1).

Figure 1.3.1.1 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 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,
- Wildfires and other natural disasters,
- Septic systems and other sources of human waste,
- Public roadways, culverts, roadside ditches, and shoulders,
- Dams, dam removal, hydroelectric plants, and non-agricultural impoundments,
- Housing and other development in agricultural areas,
- Impacts on water quality and streamside vegetation from wildlife such as waterfowl, elk, and feral horses,
- Other circumstances not within the reasonable control of the landowner.

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

1.3.5 Public Participation

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

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 2.4.1.1.

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, 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 2.4.

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 "impaired" waters that do not meet water quality standards. The resulting list is commonly referred to as the "303(d) list" (http://www.oregon.gov/deq/wq/Pages/WQ-Assessment.aspx). In accordance with the CWA, DEQ must establish TMDLs for pollutants on the 303(d) list. For more information, visit www.oregon.gov/deq/wq/tmdls/Pages/default.aspx.

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

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 2.4.1.

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 sets of Area Rules.

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

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

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

" 'Pollution' or 'water pollution' means such alteration of the physical, chemical, or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state, which will or tends to, either by itself or in connection with any other substance, create a public nuisance or which will or tends to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses or to livestock, wildlife, fish or other aquatic life or the habitat thereof" (ORS 468B.005(5)).

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

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

1.4.5 Streamside Vegetation and Agricultural Water Quality

Across Oregon, the Ag Water Quality Program emphasizes streamside vegetation protection and enhancement. 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 canary grass, 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.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soil.

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. (Note that the beneficial effects on water quality vary based on factors such as soil type and ecoregion.) 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.

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/conservation-basics/natural-resource-concerns/soil.

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.

Any GWMA in this Management Area is described in Chapter 2.4.1.5. Any Measurable Objectives for the GWMA will be described in Chapter 3.1.5.

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, and 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 to expand efforts to improve water quality in Oregon related to pesticide use. This team facilitates and coordinates activities such as monitoring, analysis and interpretation of data, effective response measures, and management solutions. The team relies on monitoring data from the Pesticide 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.

Any PSPs in this Management Area are described in Chapter 3.1.4.

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

1.5.5 Drinking Water Source Protection

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

1.6 Partner Agencies and Organizations

1.6.1 Oregon Department of Environmental Quality

The US EPA delegated authority to DEQ to implement the federal CWA in Oregon. DEQ is the lead state agency with overall authority to implement the CWA in Oregon. DEQ works with other state agencies, including ODA and the Oregon Department of Forestry 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 National Pollutant Discharge Elimination System permits for point sources, the CWA Section 319 grant program, the Source Water Protection Program (in partnership with the Oregon Health Authority), 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 2018, and reviewed and confirmed it in 2023. (https://www.oregon.gov/oda/shared/Documents/Publications/NaturalResources/WaterQualityGoalsMOA.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 NRCS and United States Department of Agriculture Farm Service Agency, watershed councils, Oregon State University Agricultural Experiment Stations and Extension Service, tribes, livestock and commodity organizations, conservation organizations, and local businesses. As resources allow, SWCDs and local partners provide technical, financial, and educational assistance to individual landowners for the design, installation, and maintenance of effective management strategies to prevent and control agricultural water pollution and to achieve water quality goals.

1.7 Measuring Progress

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

1.7.1 Measurable Objectives

A measurable objective is a numeric long-term desired outcome to achieve by a specified date. Milestones are the interim steps needed to make progress toward the measurable objective and consist of numeric short-term targets to reach by specific dates. Together, the milestones define the timeline 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 (Chapter 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 3.1 and progress toward achieving the measurable objective(s) and milestone(s) is summarized in Chapter 4.1.

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.

Any Focus Areas in this Management Area are described in Chapter 3.1.2. SWCDs will also continue to provide outreach and technical assistance to the entire Management Area.

Strategic Implementation Areas

Strategic Implementation Areas (SIAs) are small watersheds selected by ODA, in 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 3.1.3.

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 Agricultural Water Quality Monitoring

In addition to monitoring land 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 more than 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, chlorophyll a, specific conductance, dissolved oxygen, 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.

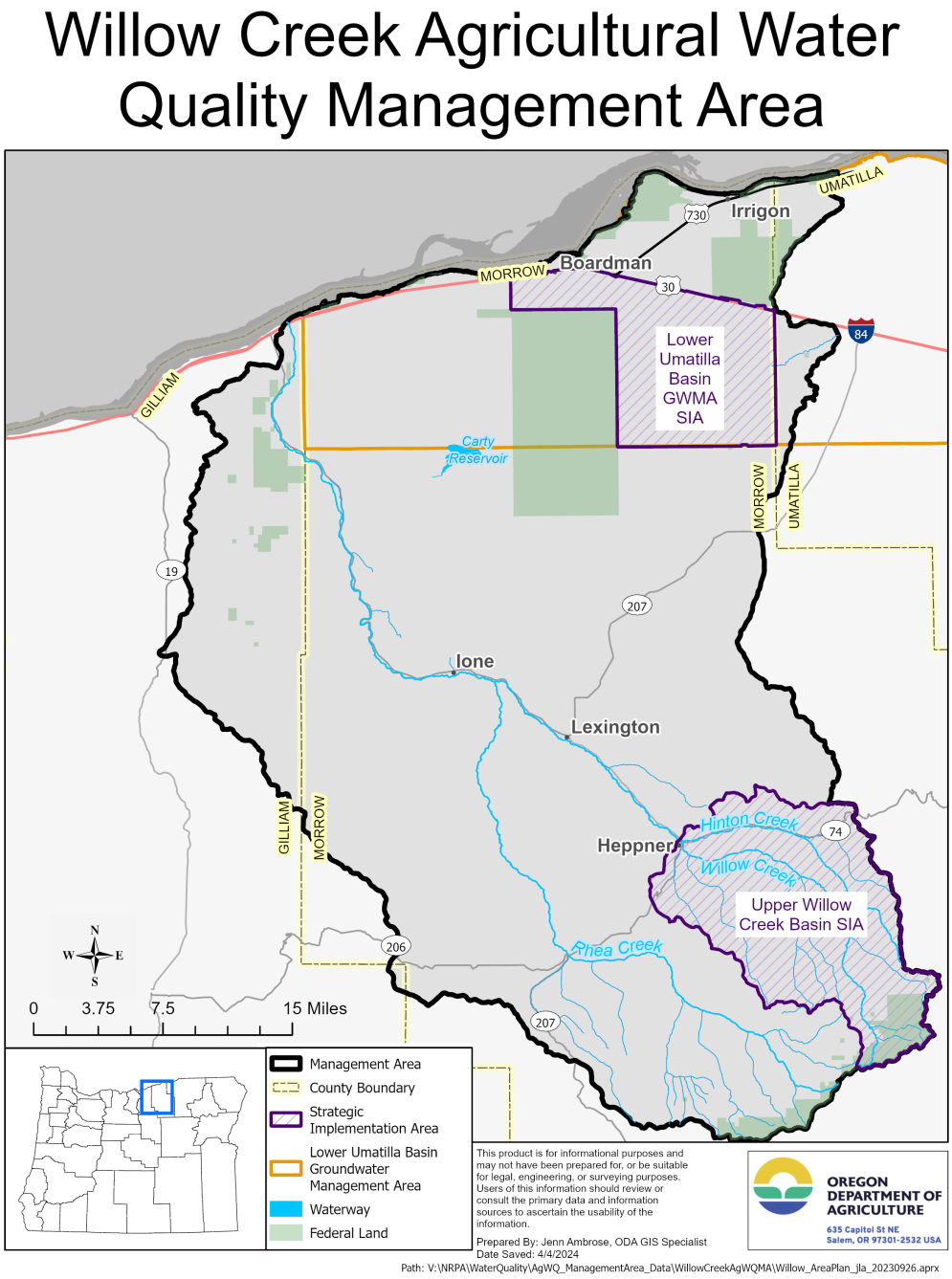
Water quality monitoring efforts in this Management Area are described in Chapter 3, and the data are summarized in Chapter 4.

Chapter 2: Local Background

Chapter 2 provides the local geographic, water quality, and agricultural context for the Management Area. It also describes the water quality issues, Area Rules, and potential practices to address water quality issues.

The operational boundaries of this Area Plan include all agricultural and rural lands in Oregon that contribute to the Umatilla River and its tributaries, and that drain directly to the Columbia River between the Umatilla and Walla Walla rivers except federally managed land, lands within the Umatilla Indian Reservation, and activities subject to the Oregon Forest Practices Act (FPA). This Area Plan applies to agricultural lands in current use and those lying idle or on which management has been deferred. This plan applies to rural lands not in agricultural use, but which affect agricultural lands such as roadways and rural residences.

Figure 2 Willow Creek Agricultural Water Quality Management Area



2.1 Local Roles

2.1.1 Local Advisory Committee

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	Description
Joe McElligott (Chair)	Ione	Wheat, cattle
Bev Bridgewater	West Extension Irrigation District	
Erin Heideman	Ione North	Wheat
Jake Neiffer	Lexington	Livestock
Jim McElligott	Ione	Wheat, cattle
Mark McElligott	Rhea Creek	Wheat, cattle
Mark Reitmann	South Heppner/Hardman	Wheat, cattle
Terry Felda	Ione/Heppner	Sheep, llamas, cattle
Travis Harrison	Lexington	Wheat, cattle, irrigation

2.1.2 Local Management Agency

SWCDs implement Area Plans through OWEB capacity grants, with details negotiated between ODA and each SWCD. The resulting Scopes of Work define the SWCDs as the LMAs for implementation of the Ag Water Quality Program in specific Management Areas. The LMA for this Management Area is Morrow SWCD. This SWCD was also involved in development of the Area Plan and Area Rules.

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

2.2 Area Plan and Area Rules: Development and History

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

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

2.3 Geographical and Physical Setting

2.3.1 Geographic Area

Willow Creek is a 79-mile-long stream that drains into the Columbia River at river mile (RM) 253. Willow Creek and its tributaries drain an area of about 880 square miles, ranging in elevation from 269 feet at its confluence with the Columbia River to 5,775 feet at its headwaters near Bald Mountain in the Umatilla National Forest. The primary tributaries to Willow Creek are Eightmile Creek and Rhea Creek. Between Willow Creek and Umatilla River drainage lies a 472-square-mile expanse of semi-arid land. This area has seasonal streams, which seldom

drain into a Columbia River tributary. These tributaries include Sixmile Canyon, Juniper Canyon, and Sand Hollow.

Seventy-eight percent of the Management Area is in Morrow County and 22 percent is in Gilliam County. Communities included in the Management Area are Boardman, Irrigon, Ione, Lexington, and Heppner. As of 2020, the Morrow County population was approximately 34,950.

2.3.2 Climate

The climate for most of the basin is semi-arid, with average annual precipitation ranging from 8 inches per year at the mouth of Willow Creek to 34 inches per year in the mountainous headwaters. Yearly precipitation occurs mostly between December and March. Air temperatures during the winter can sometimes fall below 0° F, while summer air temperatures have been recorded as high as 114° F. Mean annual temperature for the entire basin is about 50° F.

2.3.3 Geology and Soils

Most of the Management Area lies in the Columbia Basin Ecological Province. The physiography is mainly hilly upland sloping up north to south and dissected by numerous dendritic-pattern drainages. There are two subdivisions to the province. The ancient lake basin in the north portion of the Management Area, which is largely irrigated agriculture, and the silty uplands in the southern portion, which are dryland agriculture and native rangelands.

Underlying the region is a thick sequence of lava flows known as the Columbia River Basalt. The basalts range in age from six to 16.5 million years old. Individual flows range in thickness from 5 to 150 feet. The basalts are thickest, possibly more than 5,000 feet, near the Columbia River.

The lake basin, with its underlying strata of gravel beds, hardpans, and other materials, is geologically related to the era of glacial melt farther north following the ice age. The glacial melt resulted in flood events that deposited sand, silt, gravel, and other materials over the landscape. The soils are dominantly sand, loamy sand, or sandy loam in texture.

The silty uplands consist of loess (wind deposited soil) mantled over the basalt plateaus. The soils are the moderate deep silt loam Condon and Morrow soils series.

2.3.4 Water Resources (Hydrology)

The upper Willow Creek drainage has a total annual flow of approximately 30,000 acre-feet; however, by RM 4, total annual flow is reduced to an estimated 23,000 acre-feet due to extensive irrigation withdrawals and stream channel losses. Peak flows in Willow Creek, near the mouth, occur in January, while farther upstream near Heppner, they occur between March and April. Minimum flows typically occur during the months of July to September, during which time channels may be completely dry or run intermittently for prolonged periods.

The construction of Willow Creek Reservoir has altered the hydrology of lower Willow Creek. High peak flows from snowmelt and cloudburst events have been eliminated and replaced with more constant flows during late winter and spring. The historic flood events allowed periodic access to floodplains and were responsible for natural channel modifications. The controlled releases from the reservoir have resulted in a stream channel that is more stable but still subject to erosion caused by prolonged high flows during reservoir drawdown.

Erosion problems occur for downstream landowners when reservoir releases are high and the flows fluctuate. Severe erosion occurs when flows are high for extended periods of time and when streambanks are saturated and then flows drop off rapidly. Channel morphology and low summer flows are not conducive to establishment and maintenance of riparian vegetation for streambank stability in some reaches. Flows from the larger, unregulated streams provide natural flood flows to the lower reaches of Willow Creek.

2.3.5 Water Use

Surface water rights for irrigation exist for 170 cubic feet per second (cfs) for the entire Management Area. Other surface water rights for livestock, domestic, municipal, and industrial uses total only about 3 cfs. The season of use varies so that the actual use of water is spread out throughout the year.

Surface water rights exist for approximately 80,000 acres of irrigation from the Columbia River. Water is lifted from the river with the use of vertical pump stations into pipelines and canals that deliver water to irrigators. The irrigation season is March 1 through October 31.

West Extension Irrigation District (WEID) diverts water from the Umatilla River at Three Mile Dam and delivers water through a 27-mile-long concrete-lined canal to 9,235 acres. All drainage from the WEID is to the Columbia River. Water is diverted from March 15 through October 31. As part of the Umatilla Basin Project, water from the Umatilla River is sometimes exchanged with water from the Columbia River. WEID is currently in the process of piping open ditch laterals in Boardman. WEID is encouraging flood irrigators to convert to sprinkler irrigation systems. Its focus is on water conservation and efficient management of water resources.

There are approximately 58,500 acres of primary water rights for irrigated agriculture from groundwater sources, mainly wells. Additionally, there are 15,000 acres of supplemental groundwater wells, which are mainly used to supplement irrigation from the Columbia River.

The U.S. Army Corps of Engineers (USACE) has a water right to store water in the Willow Creek Reservoir that is junior to most downstream water users.

The Port of Morrow is applying effluent from food processing plants to about 6,000 acres of cropland. This application is regulated by permits issued by DEQ and the concentration is adjusted with fresh water to meet permit requirements.

Data centers have recently become a water user within the Management Area. A data center is a facility used to house computer systems and associated components, such as telecommunications and storage systems. Water for data centers is typically used to cool the air inside the facility. Electronics such as servers generate a large thermal load and require cooling above and beyond a normal air conditioning unit can provide. The water volume used varies depending on the outside temperatures and time of year; during summer months a higher volume of water is used compared to winter months when the outside air is cooler and can be redirected to cool the facility instead of using water. Newer designed data centers can operate their cooling systems in air temperatures around 70 to 75º F before having to use the water-cooling systems thus lowering their overall water use. A typical amount of water used on an annual basis for a data center can range between 7 and 9 million gallons per building depending on its design.

2.3.6 Groundwater

Extensive development of the basalt groundwater resource, largely for irrigation, began in the mid 1960s. Estimates of annual groundwater use and annual groundwater recharge to the basalts indicated that the available groundwater supply was being significantly overdrawn in some areas. The Oregon Water Resources Department (WRD) documented declines in many wells as well as interference between wells. Critical groundwater areas have been established, by order of WRD, in the Ordnance, Butter Creek, and Ella Butte areas. These orders control the amount of water pumped from wells in those areas and limits the development of new wells.

The Oregon DEQ declared the Lower Umatilla Basin a Groundwater Management Area (GWMA) in 1990 because nitrate-nitrogen concentrations exceed 10 mg/l (the federal safe drinking water standard) in many area groundwater samples. Under the Oregon Groundwater Protection Act (ORS 468B.180), DEQ is required to declare a GWMA if area-wide groundwater contamination is found to be caused primarily by non-point source activities. DEQ and other state agencies conducted a hydrogeologic investigation to determine the extent of the contamination and to identify the potential sources of that contamination.

2.3.7 Reservoirs

The USACE constructed a 160-foot-high dam just upstream of Heppner to control flash flood events, which in the past have claimed both lives and property. This dam is located at the confluence of mainstem Willow Creek and the Balm Fork of Willow Creek and creates the Willow Creek Reservoir. The reservoir has an area of 157 acres and volume of 6,249 acre-feet. Storage capacity at maximum controlled pool elevation is 14,000 acre-feet.

Since Willow Creek Reservoir is operated primarily as a flood-control project, it is operated to maintain specific capacity to fill in response to rain or snowmelt events. During late winter and spring, when reservoir waters rise above the maximum pool elevation, excess water is released. The discharge rate is limited to 500 cfs minus the flow from Hinton and Shobe creeks. During the dry season, reservoir releases are generally reduced to less than 10 cfs. A target flow of 3 cfs is maintained during the summer. During summer months, the reservoir is maintained at a level above the flood control level to accommodate recreational activities. About October 15, the pool level is reduced to the winter flood control level and maintained at that level during the winter by releasing larger amounts of water as needed.

Carty Reservoir is a 38,300-acre-foot reservoir located in the Sixmile drainage and is classified as an industrial pond. It provides cooling water for the coal-fired electricity generation plant and has no direct discharge to streams. The reservoir is maintained with water pumped from the Columbia River.

2.3.8 Land Ownership and Land Use

The total area in the Willow Creek Agricultural Water Quality Management Area is approximately 1,500 square miles or 961,000 acres. Ninety percent of the area is privately owned; 9 percent is public land managed by federal agencies — the US Forest Service (USFS), the Bureau of Land Management (BLM), the US Fish and Wildlife Service (USFWS), and the Department of Defense (DOD); and about 1 percent is owned by the State of Oregon.

Range, forest, and shrubland cover 60 percent of the Management Area; 39 percent is cropland, both dry and irrigated; and 1 percent has urban, industrial, and other uses.

There are 82,375 acres of private forestland and approximately 13,530 acres of timber patches located on higher elevation grazing lands. Forest management activities on these lands are under the jurisdiction and management of the Oregon Department of Forestry (ODF).

2.3.9 Agriculture

Economically, Morrow County is regarded as one of the state's leading agricultural centers. Two-thirds of gross farm sales come from crops and one-third from livestock. The major crops grown in the irrigated northern part of the county include potatoes, onions, corn, and alfalfa hay. Smaller acreages of high value crops such as mint and vegetables are also important to this area. Wheat is the major crop in the dryland central portion and cattle are the major commodity in the southern region. Dairy is a new commodity for the region with huge facilities located in the Boardman and Ione area.

Previously, approximately 143,827 acres of cropland, mainly in the south-central part of the Management Area, have been removed from crop production and enrolled into the Conservation Reserve Program (CRP) and planted to permanent vegetation. Expired CRP contracts and no new sign ups have resulted in a reduction of acres to 95,716. Currently, approximately 90 percent of the acre reduction remains in permanent cover. This program provides benefits to the watershed by reducing soil erosion and improving wildlife habitat.

In addition to raw commodity production, there is a large and growing food-processing industry located near the Columbia River and the transportation network. This adds value to the commodity before it is exported from the area and provides numerous jobs.

2.4 Agricultural Water Quality

2.4.1 Water Quality Issues

2.4.1.1 Beneficial Uses

Multiple beneficial uses in the Management Area require clean water, including drinking water, recreational activities, aquatic life, and agriculture (www.oregon.gov/deq/wq/Pages/WQ-Standards-Uses.aspx).

Beneficial uses in the Willow Creek Ag Water Quality Management Area include public and private water supply, irrigation, industrial, livestock watering, salmonid fish rearing and spawning, resident fish and aquatic life, wildlife and hunting, boating, fishing, water contact recreation, hydropower, and aesthetics (OAR 340-041-0310 (Table 310A)). Of the beneficial uses of water in the Management Area, the most sensitive use for most waters is spawning and rearing of cold-water fisheries and water contact recreation.

2.4.1.2 Water Quality Parameters of Concern

Groundwater

Nitrate
Nitrate in the groundwater is the major water quality parameter of concern in the area due to the documented contamination of drinking water in domestic wells. This has been identified by DEQ with the designation of the Lower Umatilla Basin Groundwater Management Area.

Surface Water

According to the 2022 Integrated Report, there are several water quality parameters of concern for agriculture (https://www.oregon.gov/deq/wq/Pages/epaApprovedIR.aspx), listed below:

Nutrients

Nutrients can occur naturally in streams and rivers, but elevated concentrations are often the result of pollution due to human activities. Phosphorus and nitrates have been nationally identified as the most important nutrients to prevent from reaching surface water bodies and groundwater. Nitrate is the primary form of nitrogen in surface water and groundwater because it readily dissolves in water and is easily transported. Studies conducted by the U.S. Geological Survey (USGS) National Water Quality-Assessment (NAWQA) Program estimate that about 90 percent of nitrogen and 75 percent of phosphorus originates from nonpoint sources; the remaining percentages are from point sources.

Excess nutrients can promote the growth of algae, which can reduce beneficial uses of the stream. Biological processes (such as algal production) in surface waters are controlled by the availability of temperature, light, and nutrients. Abundant algae cause wide fluctuations in pH and dissolved oxygen, impacting aquatic life. Nuisance algae and plant growth impair aesthetics and can cause odor problems.

Temperature

Water temperature is primarily a summer concern, a season characterized by low flow and high air temperature, for rearing of resident trout (salmonids). Water temperatures above 70°F can be immediately lethal to salmonids due to a breakdown in their respiration and circulation systems. Temperatures between the mid-60's°F to 70°F are stressful to salmonids, and fish survival is reduced as the salmonids are more susceptible to a variety of other agents. The sub-lethal effects associated with higher than optimum temperatures are disease, reduced metabolic energy for feeding, and reduced growth or reproductive behavior due to avoidance of areas with high temperatures.

Improved flow and riparian conditions set the stage for channel evolution and shading that ultimately lead to natural temperatures, particularly if management allows for restoration of other stream functions as well, such as floodplain recharge and increased sinuosity. (Willow Creek subbasin TMDL, 2007)

Determining whether the stream temperature is above or below the temperature standard is based on the average of the maximum daily water temperatures for the stream's warmest, consecutive seven-day period during the year. Water temperature measurements must be taken with continuous recording temperature sensors, in well-mixed and representative locations of streams.

A one-time measurement above the standard is not a violation of the standard. When stream flow is exceptionally low, or air temperature is exceptionally high, the temperature criteria are waived.

For nonpoint sources of stream heating (e.g., vegetation disturbance, stream channel alteration) attributed to agriculture and rural lands, the temperature TMDL establishes thermal goals for on-the-ground conditions that would lead to more natural stream temperature patterns. The TMDL recovery targets call for natural shade-producing vegetation along all streams in the plan area and the removal of stressors that are impeding that attainment of a natural vegetative and

channel geometry conditions. In certain areas, shade producing riparian vegetation may not be appropriate due to local site conditions. Site-specific determinations will be made by the ODA.

pH and Dissolved Oxygen
Extremes in water pH and low levels of dissolved oxygen can harm fish and other aquatic life. Both conditions can be caused by the availability of nutrients, warm temperatures, and light, all of which stimulate aquatic plant or algae growth. Excessive aquatic plant growth can increase water pH, which may harm fish. Plant and algal growth, and the death and subsequent decomposition of aquatic plants and algae can deplete the water of dissolved oxygen resulting in the death of fish and other aquatic animals. These conditions are usually aggravated by low stream flow. The water quality standard for pH (hydrogen ion concentrations) values range from 6.5 to 9.0. (OAR 340-041-0315(1))

Bacteria
Bacteria counts are used to determine the safety for human contact, recreation, and domestic water supplies. High levels of *E. coli* bacteria can cause severe gastric illness and even death. Potential sources of bacteria include animal manure and septic systems. Streams may be listed as violating this criterion during the summer period (the highest use period for water contact recreation), or for the fall-winter-spring period. The DEQ standard sets a maximum level allowable over a 90-day period (126 *E. coli* per 100ml), as well as a single sample maximum of 406 *E. coli* organisms per 100 ml. (OAR 340-041-0009)

Sediment
Sediment includes fine silt and organic particles suspended in the water column, settled particles, and larger gravel and boulders that move at high flows. Sediment movement and deposition is a natural occurrence, but high levels of sediment can degrade fish habitat by filling pools, creating a wider and shallower channel and covering spawning gravels. Suspended sediment or turbidity in the water can cause physical damage to fish and other aquatic life, modify behavior, and increase temperature by absorbing incoming sunlight. Sediment comes from erosion on range, forestland and croplands, erosion from streambanks and streambeds, and runoff from roads and developed areas. Nutrients, pesticides, and toxic substances can also be attached to sediment particles.

Biological Criteria
Biological criteria refer to the support of plants and animals that live at least part of the life cycle in water. Factors that affect biological criteria are stream disturbances, excessive heat inputs, and excessive sediment. The biologic condition is assessed through sampling of streambed insects and fish counting.

Waters of the state shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities. (OAR 340-041-0011)

Aquatic Weeds and Algae
Both rooted aquatic plants and algae are a natural part of stream systems. They grow by taking in nutrients from the water column and sunlight. When water temperatures are warm enough and sufficient nutrients are present, excessive growth can occur; this can be a problem for both aquatic life and recreational beneficial uses. Excessive growth can affect aquatic life in several ways. During sunlight hours, plants and algae remove carbon dioxide from the water column as part of photosynthesis. With excessive growth, this can result in increased pH (alkaline conditions). During the night, plant growth removes oxygen from water and releases carbon dioxide, resulting in both low pH (acidic conditions) and low dissolved oxygen. In addition, when

algae die and decompose, they remove oxygen from the surrounding water. Low dissolved oxygen can lead to decreased fish habitat and even fish kills. Additionally, low dissolved oxygen levels can lead to changes in water chemistry that allow mercury to be more able to enter the food chain. Algal blooms also often create odors and coloration that are objectionable to recreational users.

Harmful algal blooms (HABs) occur when excessive amounts of the naturally occurring blue-green algae, cyanobacteria, reach levels that create toxins that can be dangerous to animals and humans.

Cyanobacterial blooms cause taste and odor problems, decreased aesthetics, depleted dissolved oxygen, and harmful toxins. Physical factors that contribute to the creation of HABs include the availability of light, meteorological conditions, alteration of water flow, vertical mixing, and temperature. Chemical factors include pH changes, nutrient loading (principally in various forms of nitrogen and phosphorus), and trace metals.

2.4.1.3 TMDLs and Agricultural Load Allocations

The TMDL and Water Quality Management Plan for Willow Creek was completed by the Oregon DEQ in 2006 and approved by the EPA on February 19, 2007. The Willow Creek TMDL addresses high summer water temperatures and pH levels and bacteria concentrations that exceed standards. The Willow Creek TMDL provides an estimate of natural temperatures along much of Willow Creek and establishes numeric goals for on-the-ground conditions that would lead to more natural temperatures and bacteria and pH levels.

Meeting the TMDL allocations will require efforts associated with agriculture, forestry, and reservoir operations. For agriculture in general, this means restoring riparian and streamside areas so that banks are stable and vegetated and decreasing stream exposure to livestock, runoff, and other sources of bacteria. Specific management expectations for agricultural landowners for the promotion and protection of riparian vegetation and reduction in runoff of sediment and bacteria are established in this Area Plan and associated Area Rules. Widespread implementation of effective management practices for prevention and control of pollution is expected to aid in achievement of TMDL objectives and meeting water quality standards.

Table 2.4.1.3: Pollutants with Approved TMDLs and Load Allocations for the MA

Temperature, pH, Bacteria: Applies to Willow Creek Subbasin HUC4 from the Columbia River through Ione and Heppner.

Load Allocation:

- Temperature: reduce solar loading, increase effective shade (all subbasin perennial streams)
- pH, target 6.5-8.5 steady
- Bacteria, 90-day period target < 126 organisms per 100 ml
- Bacteria, single sample target < 406 organisms

Surrogate:

- Temperature: percent effective shade
- pH
- Bacteria: *E. coli* organisms entering streams per runoff

Current TMDL: Willow Creek Subbasin TMDL, (DEQ; approved 2007).

TMDL Revisions: No revisions

- For more information: https://www.oregon.gov/deq/FilterDocs/umaWillowappendD.pdf

2.4.1.4 Drinking Water

DEQ summarizes drinking water issues in each Management Area prior to biennial reviews. DEQ's full report is available at: https://www.oregon.gov/deq/wq/programs/Pages/Nonpoint-Implementation.aspx.

There are 17 public water systems using groundwater wells in the plan area serving approximately 11,799 people. Nitrate alerts (generated when nitrate exceeds 5 mg/L) exist for Country Garden Estates Mobile Home Park, the Port of Morrow, the City of Boardman, and Lamb Weston. Lamb Weston had more than 20 nitrate alerts and four maximum contaminant level (MCL) violations in 2020, two to four times as many as it has had in the years since, and it continues to get nitrate test results approaching the MCL. The drinking water standard for nitrates is 10 mg/L. These contaminants are often related to animal and cropland agriculture; fecal bacteria are present throughout the Management Area. The locations of nitrate contamination of private domestic wells and public drinking water sources is near to agricultural land use such as row crops and livestock, near Irrigon and Boardman and the western border of the town of Umatilla, in the very northeastern section of the Management Area. The Domestic Well Testing Act database (real estate testing data) from 1989-2018 indicates 43 significant detections of nitrate (≥7mg/L) in private wells out of 139 total wells included in the database for this area. Of those private wells, 28 had nitrate concentrations of ≥10mg/L. The private wells with high nitrate are primarily concentrated in the northeast portion of the area where residences are the most numerous.

DEQ recommends measures to reduce the movement of bacteria and leachable nitrate in soils and irrigation management to prevent leaching in the Management Area. This would reduce risk to groundwater sources of drinking water, reducing treatment costs for communities, and protecting public health.

DEQ also recommends ODA and the SWCD include a task in the plan to further evaluate agricultural land uses in and upgradient of private domestic and public drinking water wells in the Columbia shore communities of Boardman, Irrigon, and Country Garden Estates, and at Port of Morrow and Lamb Weston.

ODA and the Morrow SWCD are currently in the process of inventorying large and small livestock operations including acreage, irrigation, and drainage paths within the LUBGWMA. In addition, ODA and the Morrow SWCD will also inventory crop and sprinkler systems, including crop type observed, irrigation method/type, cover crop (if any), and rotation crop (if known). This effort will assist in nutrient utilization analysis in the area, as well as the development of irrigation and nutrient best management practices. Results will be presented at the next biennial review.

2.4.1.5 GWMA

The Lower Umatilla Basin Groundwater Management Area (LUBGWMA) includes parts of northern Morrow and Umatilla counties. DEQ designated it a GWMA in 1990 because of high

levels of nitrate in the groundwater. It's one of three GWMAs in Oregon. See more about GWMAs in Oregon Revised Statute 468B.175 to 468B.188.

The LUBGWMA Committee is tasked with developing long-term plans to reduce nitrate levels in the area. The committee is appointed by DEQ and includes local residents, businesses, organizations, and county, city, and tribal government representatives. The committee is locally led and state supported. Per statute, ODA is responsible for developing portions of the plans that addresses farming practices. Find more information about the committee, including its Second Action Plan, at https://lubgwma.org.

2.4.2 Sources of Impairment

2.4.2.1 Groundwater Sources

Irrigated agriculture, pastures, and CAFOs are the relevant potential sources of groundwater nitrogen pollution. The major sources of groundwater pollution from agricultural activities are manure, wastewater, fertilizers, and mineralization of organic matter. Applied nitrogen to the soil that is not utilized by plant growth remains in the soil and can be leached to groundwater if sufficient water is available to move it through the soil profile.

LUBGWMA

A 2011 report completed by DEQ, ODA, and OSU Extension titled *Estimation of Nitrogen Sources, Nitrogen Applied, And Nitrogen Leached to Groundwater in the Lower Umatilla Basin Groundwater Management Area* concluded the sources of nitrate identified in the LUBGWMA Action Plan contribute significantly different amounts of nitrogen to groundwater, and can be classified into three tiers:

Tier One – Irrigated Agriculture (81.6% of total nitrogen);

Tier Two – Pastures (8.1% of total nitrogen), food processors (4.6% of total nitrogen), and on-site septic systems (3.9% of total nitrogen);

Tier Three – Lawns (0.9% of total nitrogen), CAFO waste applied to dry land crops (0.7% of total nitrogen), vegetable gardens (0.3%) of total nitrogen, and the Depot Washout Lagoon (0.09% of total nitrogen).

EPA has contracted a current study (2023) to detail nitrogen loading in the area, including sources and application.

2.4.2.2 Surface Water Sources

Probable nonpoint sources of pollution include lack of healthy riparian vegetation communities, eroding agricultural and forest lands, eroding streambanks, runoff and erosion from roads and urban areas, and runoff from livestock and other agricultural operations. Pollutants from nonpoint sources are carried to the surface water through the action of rainfall, snowmelt, irrigation and urban runoff, and seepage.

A major nonpoint source of water quality impairment is heat input that results in high water temperatures. Water temperature naturally fluctuates with air and soil temperatures on a daily and seasonal basis. Temperature increases may be caused by both natural and man-caused

events resulting in vegetation removal, low seasonal flows, changes in channel shape, and alteration to the floodplain. Channelization or alteration of stream courses can alter gradient, width/depth ratio and sinuosity, causing sediment and temperature increases.

2.5 Regulatory and Voluntary Measures

2.5.1 Area Rules

A landowner or operator's responsibility under this Area Plan is to implement measures that prevent and control the sources of water pollution associated with agricultural and rural lands and activities. A landowner or operator is not responsible for conditions caused by other landowners or for circumstances not within their reasonable control, including unusual weather events.

Willow Creek (2003)
OAR 603-095-2840 Prevention and Control Measures

(1) Limitations: All landowners or operators conducting activities on agricultural lands are provided the following exemptions from the requirements of OAR 603-095-2840 (Prevention and Control Measure).

(a) A landowner or operator shall be responsible for water quality resulting from conditions caused by the management of the landowner or operator.
(b) Rules do not apply to conditions resulting from unusual weather events or other circumstances not within the reasonable control of the landowner or operator. Reasonable control of the landowner means that technically sound and economically feasible measures must be available to address conditions described in Prevention and Control Measures.
(c) The Department may allow temporary exceptions when a specific integrated pest management plan is in place to deal with certain weed or pest problems.

(2) Waste Management: Effective on rule adoption, no person subject to these rules shall violate any provision of ORS 468B.025 or 468B.050 (see Chapter 1.4.4).

(3) Upland Management and Soil Erosion: By January 1, 2008, landowners must control upland soil erosion using practical and available methods.

(a) Landowners must control active channel (gully) erosion to protect against sediment delivery to streams.
(b) On croplands, a landowner may demonstrate compliance with this rule by:
(A) Operating consistent with a Soil and Water Conservation District (SWCD)-approved conservation plan that meets Resource Management Systems (RMS) quality criteria for soil and water resources; or
(B) Operating in accordance with an SWCD-approved plan for Highly Erodible Lands (HEL) developed for the purpose of complying with the current US Department of Agriculture (USDA) farm program legislation; and farming non-HEL cropland in a manner that meets the requirements of an approved USDA HEL compliance plan for similar cropland soils in the county; or
(C) Farming such that the predicted sheet and rill erosion rate does not exceed 5 tons/acre/year, as estimated by the Revised Universal Soil Loss Equation (RUSLE); or

(D) Constructing and maintaining terraces, sediment basins, or other structures sufficient to keep eroding soil out of streams.

(c) On rangelands, a landowner may demonstrate compliance with this rule by:

(A) Operating consistent with a Soil and Water Conservation District (SWCD)-approved conservation plan that meets Resource Management Systems (RMS) quality criteria for soil and water resources, or

(B) Maintaining sufficient live vegetation cover and plant litter to capture precipitation, slow the movement of water, increase infiltration, and reduce excessive movement of soil off the site; or

(C) Minimizing visible signs of erosion, such as pedestal or rill formation and areas of sediment accumulation.

(4) Streamside Management: By January 1, 2008, landowners must promote the establishment and development of adequate riparian vegetation for streambank stability, filtering sediment and shading, consistent with site capability.

(5) Irrigation Management: By January 1, 2008, irrigation must be done in a manner that limits the amount of pollutants in the runoff from the irrigated area or that leaches into groundwater.

2.5.2 Voluntary Measures

Voluntary efforts are the focus of ODA, Morrow SWCD, and the LAC. However, if a landowner refuses to correct a verified adverse condition on his or her property, ODA has regulatory 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 its associated administrative rules describe Prohibited Conditions.

Readers should note that this Area Plan is only a guidance document; by itself it is not regulatory. However, it does refer to administrative rules that set enforceable requirements for landowners. To help distinguish between this Area Plan and its associated rules, all rule language is provided in Chapter 2.5.1 and is separate from this section.

This Plan encourages farmers and ranchers to manage their land to control conditions that have been identified as contributing to undesirable water quality using adaptive management techniques.

2.5.2.1 Waste Management

A landowner or operator's responsibility under this Area Plan is to prevent the introduction of waste materials into nearby bodies of water. There are existing statutes and rules that regulate water quality that remain in effect and are enforced by other designated management agencies.

Wastes include excess soil, manure, fertilizers, and other substances.

Indicators of noncompliance include but is not limited to:

- Runoff flowing through areas of high livestock usage and carrying wastes into waters of the state,
- Livestock waste accumulated in drainage ditches or areas of flooding,
- Fecal coliform (*E. coli*) counts that exceed state water quality standards,
- Applying excess nutrients (including fertilizers, manure, and other additives) above amounts that crops can uptake.

2.5.2.2 Upland Management and Soil Erosion

A landowner or operator's responsibility under this Area Plan is to implement measures that prevent and control water pollution from upland agricultural activities and soil erosion. This includes agricultural, rural lands, and road management that may not be in close proximity to waterbodies but have the potential to contribute to water quality degradation by runoff of sediment and wastes. Careful management of areas used for grazing, feeding, and handling are critical to the success of livestock operations and have potential to affect water quality by the runoff of sediment and animal wastes.

Upland areas are the rangelands, forests, and croplands that are upslope from the riparian areas. These areas extend to the ridge tops of watersheds. With a protective cover of crops and crop residue, grass (herbs), shrubs or trees, consistent with site capability, these areas will capture, store, and safely release precipitation thereby reducing the potential of excessive soil erosion or delivery of soil or pollutants to the receiving stream or other body of water. Vegetation is dependent on physical characteristics including soil, geology, landform, water, and other climate factors. Proper management of upland vegetation considers physical and biological conditions, controls soil erosion, and minimizes transport of soil and nutrients to the stream. Upland management also considers livestock production while, at the same time, should consider forest health and protection of fish and wildlife habitat. Healthy uplands maintain productivity over time and are resilient to stresses caused by variations in physical conditions such as climatic changes.

Healthy upland areas provide several important ecological functions. These include:

- Capture, storage, and safe release of precipitation,
- Provide for plant health and diversity that support habitat (cover and forage) for wildlife and livestock,
- Filtration of sediment,
- Filtration of polluted runoff,
- Provide for plant growth that increases root mass that utilizes nutrients and stabilizes soil against erosion. Indicators of these conditions include:
- Recruitment of beneficial plant species,
- Groundcover to limit runoff of nutrients and sediment,
- Cropland cover that is sufficient to limit movement of nutrients and sediment,
- Roads and related structures designed, constructed, and maintained to limit sediment delivery to streams,
- Noxious weed and insect pest populations contained (see state weed laws and county weed regulations to determine weed species that must be controlled).

Factors to evaluate upland area condition may include:

- Vegetation utilization through stubble height measurements,
- Plant species composition to measure plant health and diversity,
- Groundcover (live plants, standing plant litter and ground litter) as a measure of potential erosion,
- Evidence of overland flow (pattern and quantity),
- Site productivity (domestic livestock and wildlife carrying capacity),
- Soil erosion potential through prediction models available through NRCS.

Noxious weeds present a challenge to establishing upland and streamside vegetation. These weeds can harm water quality in many ways. Some examples are:

- Reduced groundcover resulting in increased erosion,
- Reduced infiltration of precipitation into the soil,
- Crowding out of vegetation appropriate to each site.

Landowners and public land managers need to be vigilant in their weed control efforts. The Morrow County Weed Control District policy requires all landowners that have “A”-listed weeds to have a written weed management plan approved by the Morrow SWCD/ Weed Advisory Board.

This Area Plan does not prescribe specific practices to landowners for management of upland areas to reduce runoff of sediment and other wastes. Site specific recommendations for management to protect water quality, including grazing management systems, desirable vegetation types, and road construction and maintenance, can be obtained from sources listed in the Implementation Strategies section of this Area Plan. Examples of practices that alone or in combination with other practices may be effective in controlling soil erosion are listed here for consideration.

Effective management practices for controlling soil erosion and sediment delivery:

- Conservation tillage (crop residue management) – reduced tillage, minimum tillage, direct seeding, modified conventional tillage, reservoir tillage, sub-soiling, or deep chiseling,
- Nutrient management – soil testing and fertilizer placement,
- Cover crops – perennial or annual,
- Contour farming practices – strip cropping, divided slopes, terraces (level and gradient), cross-slope tillage,
- Crop rotations,
- Early or double seeding in critical areas,
- Vegetative buffer strips – filter strips, grassed waterways, field borders, contour buffer strips,
- Irrigation scheduling – soil moisture monitoring and application rate monitoring,
- Prescribed burning,
- Weed control,
- Road design and maintenance,
- Sediment retention basins and runoff control structures,
- Reforestation,
- Tree thinning – commercial and pre-commercial,
- Streambank protection.

Livestock management must be done in a manner that limits soil erosion and minimizes the delivery of sediment and animal wastes to nearby streams. A grazing management system should promote and maintain adequate vegetative cover for protection of water quality, by consideration of intensity, frequency, duration, and season of grazing.

Effective management practices for prevention and control of impacts from livestock:

- Grazing management or scheduling based on intensity, duration, frequency, and season of use; pasture rotation including resting and deferrals; riparian pastures,
- Vegetation management – grass seeding, weed control, controlled burning,

- Fencing – including temporary, cross, and enclosures,
- Watering facilities – spring development, water gaps, off-stream water, (may require water rights, refer to ORS 537.141),
- Salt and mineral distribution,
- Waste management systems – clean water diversions; waste collection, storage, and utilization; facilities operation and maintenance,
- Safe diversion of runoff,
- Protection of clean water sources,
- Lot maintenance – smoothing, mounding, seeding, filter strips, catch basins, berms.

2.5.2.3 Riparian and Streamside Area Management

A landowner or operator's responsibility under this Area Plan is to implement measures, as needed that prevent and control water pollution from agricultural activities. Areas near waterbodies are especially important to water quality and sensitive to management activities.

The streamside area is defined as the area near the stream where management practices can most directly influence the conditions of the water. This area usually ranges from 10 feet to 100 feet from the water, depending on the slope, soil type, stream size, and morphology.

The riparian area is a zone of transition from an aquatic to a terrestrial system, dependent upon surface or subsurface water, that reveals through the zone's existing or potential soil-vegetation complex the influence of such surface or subsurface water. A riparian area may be located adjacent to a lake, reservoir, estuary, pothole, spring, bog, wet meadow, muskeg, slough, or ephemeral, intermittent, or perennial stream.

Water is the distinguishing characteristic of riparian areas, but soil, vegetation, and landform also exert strong influence on these systems. In a healthy riparian ecosystem, these four components interact to produce a wide variety of conditions.

Healthy riparian areas provide several important ecological functions. These include:

- Dissipation of stream energy associated with high flows and thus influencing the transport of sediment,
- Capture of suspended sediment and bedload that builds streambanks and develops floodplain function,
- Retention of floodwater and recharging ground water,
- Stabilization of streambanks through plant root mass,
- Development of diverse channel characteristics providing pool depth, cover, and variations in water velocity necessary for fish production,
- Support of biodiversity,
- Shade for moderation of solar heat input,
- Recruitment of large woody debris for aquatic habitat.

Indicators to determine improvement of this condition include:

- Recruitment of desirable riparian plant species,
- Maintenance of established beneficial vegetation,
- Maintenance or recruitment of woody vegetation, both trees and shrubs,
- Streambank integrity capable of withstanding 25-year flood events.

Factors used to evaluate improvement of the riparian area condition could include:

- Expansion of riparian area as evidenced by development of riparian vegetation and plant vigor,
- Reduction in actively eroding streambank length beyond that expected of a dynamic stream system,
- Community composition changes reflecting an upward trend in riparian condition (increases in grass-sedge-rush, shrubs, and litter and decreases in bare ground),
- Plant community composition reflecting an upward trend as indicated by decreases in noxious plant species,
- Stream channel characteristics show upward trend consistent with landscape position (i.e., a decrease of width-to-depth ratio of the channel),
- Shade patterns consistent with site capability,
- Stubble height of herbaceous species and leader growth of shrubs and trees.

Streamside management addresses many of the water quality parameters of concern identified in the 303(d) list. Streamside vegetation influences water temperature through shade, stream width- to-depth ratio, groundwater recharge and discharge, and other hydrologic factors. Sediment reductions improve fish and invertebrate habitat. Bacteria reductions improve the safety of water for human consumption and contact recreation. Healthy riparian condition improves water quality by reducing stream disturbances and preventing excessive heat and contaminant inputs.

Grazing near streams must be managed to prevent negative impacts to streambank stability, allow for recovery of plants, and leave adequate vegetative cover to ensure protection of riparian functions including shade and habitat. Off-stream watering systems, upland water developments, feed, salt, and mineral placement are examples of methods to be considered as ways to reduce impacts of livestock to streamside areas.

Healthy streamside areas are directly influenced by management of surrounding areas. This Area Plan does not prescribe specific practices to landowners for management of streamside areas. Site specific recommendations for management to protect water quality, including buffer width, vegetation types, and grazing timing, can be obtained from sources listed in the Implementation Strategies section of this Area Plan.

Effective management practices for prevention and control of impacts to streamside areas:

- Critical area planting,
- Vegetative buffer strips – Continuous Conservation Reserve Program (Continuous CRP), Conservation Reserve Enhancement Program (CREP), riparian buffers, riparian forest buffers,
- Livestock management – seasonal grazing; fencing, exclusion, temporary; riparian pastures,
- Water developments – off-stream watering, water gaps, spring development,
- Conservation tillage practices,
- Weed control,
- Nutrient and chemical application scheduling,
- Road, culvert, bridge, and crossing maintenance,
- Wildlife management.

2.5.2.4 Irrigation Management

A landowner or operator's responsibility under this Area Plan is to implement measures that prevent and control water pollution from irrigation. This includes pollution to groundwater as well as from surface runoff. Diversion of water for irrigation or other uses and the return of that water to surface or groundwater are activities that have potential for contributing to water quality problems.

Irrigated lands are either riparian, floodplain, or upland upon which water is applied for the purpose of growing crops. Diversion of water from a waterbody to be applied on land for the purpose of growing crops is a recognized beneficial use of water. Irrigation water use is regulated by the Oregon WRD in the form of water rights, which specify the rate, duty, and season that water can be applied to a particular parcel of land. Refer to WRD Rules (OAR 690 and ORS 536 through 543) for more details.

Irrigation in the basin is done by flooding, drip, or sprinkler application. Water usually is diverted from surface sources (stream or pond) and from groundwater sources. Water withdrawals influence stream flows and thus, indirectly affect water quality. Over-irrigating can leach agricultural chemicals (including nitrate) to groundwater, directly affecting water quality.

Subject to legal water rights, water withdrawals (dependent on surface water characteristics and method of diversion) should be made in a manner to minimize the adverse impacts on stream flows and groundwater. The efficacy of irrigation water application is generally enhanced by assuring the quantity and timing of application based on the needs of the crop, as determined by soil moisture levels, crop water use budgets, or other monitoring tools.

Irrigation water, if not managed, will carry valuable fertilizers and nutrients past the root zone to where it is not available for beneficial use and will eventually be carried down into the groundwater. This is in violation of ORS 468B, described in Chapter 1.4.4.

Area soils within the LUBGWMA are mostly sands and fine sands with low moisture holding capacities, therefore, there is generally a small buffer between proper irrigation quantities/rates and irrigation which will push nutrients to the groundwater. There are areas within the region that have sandy loam soils with a higher soil moisture holding capacity; it is important that an irrigation and nutrient management plan include soil specifics.

Especially within the LUBGWMA, flood irrigation should not be utilized as a method of irrigation. Near the irrigation source, flood irrigation in this type of soil will quickly leach nutrients beyond the root zone and add to the contaminated groundwater in the area.

All irrigators within the region should have an irrigation management plan to match irrigation application quantities and rates to the crop and environmental demands. A companion nutrient management plan should match fertilizer and nutrient applications to agronomic demand.

Irrigation management aims at increasing food production and contributing to economic development through improvements in performance, productivity, and sustainability of irrigated agriculture and irrigation systems.

An irrigation management plan should consist of:

- Soil types and map
- Crop types, acreage, schedules, and critical moisture period

- Irrigation system types, efficiencies
- Estimated water use (evapotranspiration-ET) and peak ET, weekly
- Irrigation rate, frequency, and total, weekly

Characteristics of an irrigation system that has minimal effect on water quality include:

- Operation based on an irrigation and nutrient management plan
- Delivery of water efficiently to the land within legal water rights
- Minimal overland return flows
- Return flow routing that provides for settling, filtering and infiltration
- Minimal effect on stability of streambanks and minimal soil erosion
- Scheduling of water application appropriate to the site including consideration of soil conditions, crop needs, climate, and topography
- Installation and management of diversion structures that control erosion and sediment delivery, and protect the stability of streambanks
- Diversions that are adequately screened and which provide for fish passage. (Refer to ORS 498.268 for screening requirements)
- Sediment is captured from irrigation runoff before it enters rivers and streams

Contamination of groundwater is a major concern in the northern part of the Management Area. Many area groundwater samples indicate nitrate-nitrogen concentrations that exceed the federal safe drinking water standard. Irrigated agriculture is the dominant land use in the area and is a source of nitrate-nitrogen from agricultural activities coming from fertilizers and mineralization of organic matter as well as residential activities such as septic systems, lawn over-fertilization, and livestock. Nitrogen not utilized by plant growth is stored in the soil and can be leached to groundwater if sufficient water is available to move it through the soil profile. (*Lower Umatilla Basin Groundwater Management Area Action Plan, 1997*)

Effective management practices for prevention and control of impacts from irrigation:

- Irrigation scheduling based on crop needs, soil type, climate, topography, infiltration rates,
- Irrigation system efficiency and uniformity monitoring,
- Diversion maintenance – push-up dam management, fish screens,
- Return flow management,
- Flow measuring devices,
- Backflow devices,
- Reservoir tillage,
- Cover crops.

2.5.2.5 Nutrient and Farm Chemical Management

Crop nutrient applications, including manure, sludge, commercial fertilizer, and other added nutrient inputs, should always be done at a time and in a manner that reduces the possibility of runoff into any nearby stream or waterway as well as leaching to groundwater. Fertilizers should be applied according to a nutrient management plan.

A nutrient management plan should consist of:

- Soil and water tests
- Fertilizer type and storage
- Nitrogen (N), phosphorus (P), and potassium (K) fertilizer concentrations

- Field map
- Application equipment and method
- Crop N utilization, by month
- N, P, and K application, by month

Fertilizers should be applied in accordance with nutrient budgets developed for each crop using current yield estimates, water analysis, soil tests, tissue tests, and/or other appropriate tests and information.

Surface applied nutrients should not be applied to frozen soil, on snow, or when significant rainfall (more than one inch) is predicted as imminent, (greater than a 67 percent probability within 24 hours of application) by the National Weather Service. Extra care shall be used when utilizing surface (rill or flood) irrigation to minimize nutrient contamination of tail water. In no case should chemigated or fertigated irrigation waters be applied in a manner such that a direct hydraulic connection occurs with waters of the state.

Concentrated potential contaminants (CPCs) are substances managed on a property that may or may not be toxic or dangerous but need special consideration when storage locations are chosen. Typical farm and ranch CPCs include, but are not limited to manure; compost; fuel, lubricants, and other motor vehicle chemicals; insecticides, herbicides, and other farm chemicals; fertilizer; used truck and tractor batteries; solvents; garbage; and cleaning products. Fertilizers, pesticides, and other chemicals that have been applied to the land are not considered concentrated after application.

Safe storage of all CPCs is encouraged, including consideration of major factors, which might make any site potentially threatening to surface and/or groundwater. Management practices for spill prevention and control must be implemented.

Chapter 3: Implementation Strategies

Goal

1. Prevent and control water pollution from agricultural activities and soil erosion, and achieve applicable water quality standards.
2. To bring the Willow Creek watershed into balance between practical, economical, agricultural use and environmental responsibility and protection.

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

- Control soil erosion on uplands to acceptable rates,
- Prevent and control pollution caused by the introduction of wastes into waters of the state including groundwater,
- Provide adequate riparian vegetation, consistent with site capability, for streambank stability and stream shading,
- Limit nitrate groundwater contamination in irrigated agriculture by promoting irrigation and fertilizer management plans and education.

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,
6. Irrigation and nutrient application is done according to irrigation and nutrient management plans that account for soil, environmental and crop demand to minimize leaching of 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 4.1.

3.1.1 Management Area

3.1.1.1 Measurable Objective #1

Control soil erosion on uplands to acceptable rates.
Uplands will be evaluated for erosion potential. ODA and the SWCD will develop an assessment method that will track soil loss on uplands. The assessment and the results will be presented at the next biennial review.

Measurable Objective
By 2026, ODA and the SWCD will develop an assessment method that will track erosion potential on uplands. Objective will be updated during the next biennial review when the assessment is completed showing baseline data.

3.1.1.2 Measurable Objective #2

Prevent and control pollution caused by the introduction of wastes into waters of the state.
Livestock operations along streams are evaluated for likelihood of pollution from bacteria and sediment.

Assessment Method:
The method consists of looking for likely sources (manure piles and heavy use areas) during a riparian vegetation field survey. If sources are identified, ODA or the SWCD will contact the landowner to provide technical assistance, if needed.

Measurable Objective
By June 30, 2030, fewer than 5% of livestock operations are likely to pollute surface water.
Milestone
By June 30, 2027, the number of livestock operations identified that are likely to pollute surface water is reduced to 10%.

3.1.1.3 Measurable Objective #3

Provide adequate riparian vegetation, consistent with site capability, for streambank stability and stream shading.
By providing sufficient vegetation near streams and in riparian areas for streambank stability and stream shading, landowners will be creating conditions that could result in less sediment being produced from eroding streambanks and moderation of water temperature. Management changes that result in increased riparian vegetation will take time to accomplish. Landowners will be expected to make every feasible effort to achieve properly functioning conditions in their streamside areas.

Assessment Method:
Streamside vegetation was categorized based on the degree to which it was likely to prevent and control water pollution, compared to site capability. The method consists of a combination of aerial photo evaluation and local knowledge to determine how similar the groundcover and canopy cover/shade are to what could be provided by site-capable vegetation. Vegetation communities developed are described in Table 3.1.1.3a and Willow Creek site-capable plant communities are mapped in Figure 3.1.1.3

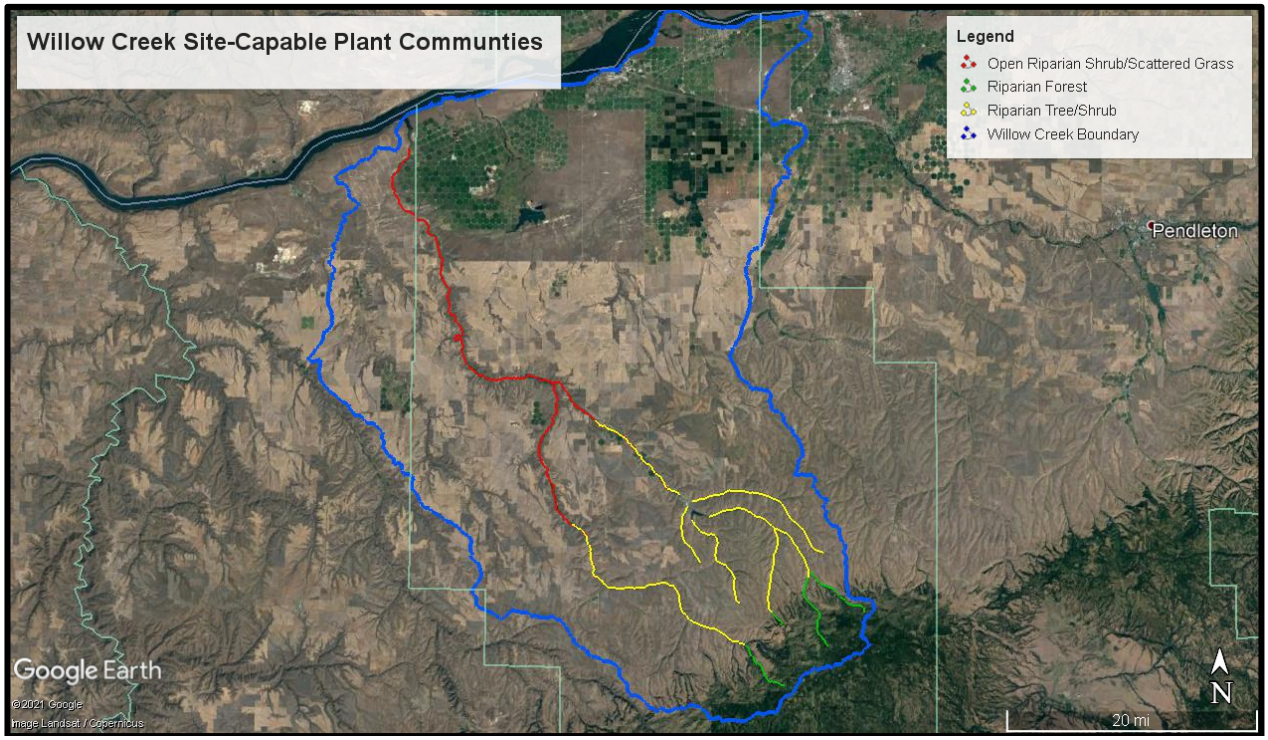
Table 3.1.1.3a Site-capable streamside vegetation communities

Community Name	Plant Description	% canopy cover over stream	% groundcover	Where	% of assessed streams
Riparian Forest	Douglas fir, ponderosa pine, alder, cottonwood	90	n/a	Higher elevation / higher rainfall	13
Riparian Tree/Shrub	Black cottonwood, black hawthorn, alder, willows, roses	75	80	Lower elevation / higher rainfall	39
Open Riparian Shrub/Scattered Grass*	Mostly willows, Wyoming big sage, rabbitbrush, wildrye and reed canary grass	60	70	Lower elevation / lower rainfall	48

*Open Riparian Shrub/Scattered Grass: This community type can support most willow type trees and small shrubs. However, there is roughly 11 percent of this area that deals with heavily incised channels from flood events and man-made alterations from decades ago where only invasive grass such as reed canary and other native grasses and forbs can establish. This community type is found most prevalent on lower Rhea Creek and lower Willow Creek.

SWCD and ODA staff identified perennial stream reaches on non-federal and non-tribal trust lands. Perennial reaches flowing through urban areas and industrial forestlands were excluded.

Figure 3.1.1.3 Willow Creek site-capable plant communities



SWCD staff determined classifications based on how much canopy and groundcover was present compared to what could be provided by site-capable vegetation.

Table 3.1.1.3b Determining classes based on surrogates (compared to that provided by site capability)

WQ functions provided by riparian veg, to the extent allowed by site capability	How to determine classes?	% of that provided by site capability	
		Canopy cover over stream	Groundcover
Class I = Fully provided	Both of the following met	>75%	>75%
Class II = Partially provided, not impaired by agricultural activities	At least one of the following met	>50%	>50%
Class III = Likely not provided due to agricultural activities	At least one of the following met	<50%	<50%

SWCD staff calculated the percentages of stream miles in each category and provided these to ODA. Because of large properties and landownership patterns in this Management Area, landowners generally own both sides of a stream and the vegetation on opposite banks tends to be in a similar class. A majority of the streams were classified as “partially provided, not impaired by agricultural activities” because many stream reaches in this area lack canopy cover over the streams.

Measurable Objective
By June 30, 2047, 85% (128.86 Miles) of perennial streams in agricultural areas will have streamside vegetation that likely provides the full suite of water quality functions the site is capable of (i.e., shade, bank stability, filtration of overland flow) (Class I). The LAC, SWCDs, and conservation partners would prefer a measurable objective of zero operations. However, the number of operations will fluctuate due to landowner turnover, natural disasters, and other circumstances that can hinder progress toward meeting that measurable objective.
Milestones
• By June 30, 2027, 40% (60.64 Miles) of perennial streams in agricultural areas will have streamside vegetation that likely provides the full suite of water quality functions the site is capable of (i.e., shade, bank stability, filtration of overland flow) (Class I). • By June 30, 2037, 65% (98.54 Miles) of perennial streams in agricultural areas will have streamside vegetation that likely provides the full suite of water quality functions the site is capable of (i.e., shade, bank stability, filtration of overland flow) (Class I).

3.1.2 Focus Areas and Other Coordinated Efforts in Small Watersheds

There are no Focus Areas in this Management Area.

3.1.3 Strategic Implementation Areas (SIA)

Lower Umatilla Basin Groundwater Management Area SIA (Initiated 2023)

The LUBGWMA SIA encompasses the area between Interstate 84 and the north edge of the Bombing Range from Peters Road to Bombing Range Road, the area east of Bombing Range Road to the Morrow County line, and the north edge of the SIA is Interstate 84.The primary agriculture in the SIA boundary are irrigated crops, confined animal feeding operations, and pasture. The local agricultural concerns are livestock, over fertilization of nutrients, and inefficient irrigation practices. The local water quality concerns are high nitrates in surface water and groundwater, and temperature, sediment, and other pollutants within streams.

Emphasis within the SIA will be gathering data to document irrigated agriculture best management practices for the LUBGWMA, cooperative grower agreements to demonstrate best management practices, and outreach to the local industry.

The LUBGWMA SIA is in the initial planning stages. More information will be provided at the next biennial review.

Upper Willow Creek Basin SIA (Initiated 2019)

The Upper Willow Creek Basin SIA encompasses five 6th field HUCs (headwaters Willow Creek, Skinners Fork, Balm Fork, Hinton Creek, and Shobe Creek-Willow Creek). The primary agriculture in the SIA boundary are livestock, wheat, pasture, and hay. The local agricultural concerns are unmanaged livestock access to streamside areas, runoff from flood irrigated pastures, and lack of streamside vegetation. The local water quality concerns are stream temperature, pH, *E. coli*, sediment, and aquatic weeds and algae.

SIA Compliance Evaluation Method:
ODA evaluated all agricultural tax lots within the SIA to identify opportunities to improve water quality and ensure compliance with Area Rules. The evaluation considered the condition of streamside vegetation, areas of bare ground, and potential livestock impacts (including manure management). The process involved both a remote evaluation and field verification from publicly accessible areas. For more information see: https://www.oregon.gov/oda/shared/Documents/Publications/NaturalResources/SIAProgressReport.pdf

Opportunity levels:

- **Likely in Compliance (LC):** ODA identified no likely agricultural water quality regulatory concerns, and the goals of the Area Plan are likely being achieved.
- **Restoration Opportunity (RO):** ODA identified no likely agricultural water quality regulatory concerns, but there is likely some opportunity for improvement through voluntary measures to reach the goals of the Area Plan.
- **Compliance Opportunity (CO):** ODA identified that agricultural activities may impair water quality or evaluation was inconclusive. There also may be an opportunity for improvement through voluntary measures to reach the goals of the Area Plan.
- **Potential Violation (PV):** During the Field Evaluation, ODA observed a potential violation of the Area Rules. There also may be an opportunity for improvement through voluntary measures to reach the goals of the Area Plan.

Measurable Objective
By October 16, 2024, all 9 tax lots identified as a Potential Violation or Compliance Opportunity will be improved to Restoration Opportunity or Likely in Compliance.

Monitoring:
There are multiple problems of concern in the stream systems including lack of riparian vegetation; high stream temperatures in the summer months; channel incision; bare ground near streams; and nutrient, bacteria, and sedimentation levels that can reach poor water quality standards.

Livestock access to streams is the most common problem identified in the SIA boundary. Heavy livestock use areas seasonally along streams result in reduced riparian vegetation and can cause bacteria, sediment, and temperature concerns. The majority of the projects implemented in the SIA will focus on reducing livestock access to streams using riparian fencing, establishing

upland water developments, installing or improving water gap developments, and improving riparian vegetation. Measuring *E. coli* and total suspended solids (TSS) concentrations throughout the watershed will capture any improvements made to these heavy livestock use areas.

Nutrient issues have been identified in the Upper Willow Creek Basin Watershed, but SIA monitoring will not focus on nutrient-based parameters because there have already been past studies and monitoring focused on nutrient loads. Currently, the University of Idaho contracts with the U.S. Army Corps of Engineers to collect water quality data for water that flows into the Willow Creek Reservoir. With limited funds for monitoring, focused efforts will be used for tracking parameters that are closely related with livestock impacts to water quality in streams.

The SWCD has an approved monitoring plan and will submit the DEQ Sampling and Analysis Plan in the spring of 2024.

Monitoring Objective
The monitoring objective is to identify *E. coli* and TSS concentrations in the Upper Willow Creek watershed's main stream systems (Hinton, Willow, Balm Fork, Skinner, Shobe) and determine how concentrations change spatially and temporally for each stream system.

Assessment Method/Sampling Plan
E. coli and TSS data will be collected as a baseline. The SWCD will start sampling in spring of 2024 through fall of 2025. The SWCD will sample twice a month at six proposed sampling location in April, May, October, and November. The SWCD will sample once a month at six proposed sampling location in June, July, August, and September. The SWCD will collect one sample after a rain/storm event during the spring and fall months.

3.1.4 Pesticide Stewardship Partnerships (PSP)

There are no PSPs in this Management Area.

3.1.5 Groundwater Management Area (GWMA)

The Lower Umatilla Basin Groundwater Management Area (LUBGWMA) includes parts of northern Morrow and Umatilla counties. DEQ designated it a GWMA in 1990 because of high levels of nitrate in the groundwater. It is one of three GWMAs in Oregon.

3.1.5.1 Measurable Objective #1

Inventory non-permitted livestock operations within the LUBGWMA.

Assessment Method: By 2025, the Morrow SWCD through ODA funds, will complete an inventory of large and small livestock operations including acreage, irrigation, and drainage paths within the LUBGWMA. The method consists of inventorying large and small livestock operations, inventorying irrigation types, and inventorying manure storage and location to irrigation drains. The Morrow SWCD will work the ODA GIS Specialist to implement this data in a useable GIS layer.

These results will help the LAC develop future measurable objectives and milestones at the 2026 biennial review. Measurable objectives include:

Measurable Objective
By June 30, 2025, the Umatilla SWCD and Morrow SWCD will complete a 100 percent inventory of large and small livestock operations including acreage, irrigation, and drainage paths within the LUBGWMA.

3.1.5.2 Measurable Objective #2

Inventory crop and sprinkler systems within the LUBGWMA.

Assessment Method: The Morrow SWCD and Umatilla SWCD, through ODA funding, will complete an inventory of crop and sprinkler systems in the LUBGWMA including crop type observed, irrigation method/type, cover crop (if any), and rotation crop (if known).

These results will help in the development of best management practices (BMPs) for the area. BMPs are methods designed to minimize adverse environmental effects of farming practices while maintaining agricultural production. Soil properties and crop needs will determine the correct amounts of nutrients to apply and the timing of application as well as the application method. Adoption of BMPs can help to avoid excessive levels of nutrients in the system that can become harmful when lost to the surrounding environment. In addition, these results will help the LAC develop future measurable objectives and milestones at the 2026 biennial review. Measurable objectives include:

Measurable Objective
By June 30, 2025, the Umatilla SWCD and Morrow SWCD will complete a 100 percent inventory of crop and sprinkler systems in the LUBGWMA including crop type observed, irrigation method/type, cover crop (if any), and rotation crop (if known).

3.2 Proposed Activities

Table 3.2 Planned activities for 2024-2027 throughout the Management Area by Morrow County Soil and Water Conservation District

Activity	4-year Target	Description
Landowner Engagement		
# events that actively engage landowners (workshops, demonstrations, tours)	12	
# landowners participating in active events	300	
Technical Assistance (TA)		
# landowners provided with TA (via phone/walk-in/email/booth/site visit)	2,000	
# site visits	700	
# conservation plans written*	50	
# Irrigation management plans	10	Irrigation management plans via ODA, OSU, NRCS, or other. Management plan development will be accelerated once BMPs are developed (likely by June 30, 2025).
# Nutrient management plans	10	Nutrient management plans via ODA, OSU, NRCS, or other. Management plan development will be accelerated once BMPs are developed (likely by June 30, 2025).

On-the-ground Project Funding		
# funding applications submitted	80	
* Definition: any written management plan to address agricultural water quality concerns, such as: nutrients, soil health, grazing, irrigation, and streamside vegetation. Can include farm and ranch plans (including small acreages) and NRCS-certified plans. Excludes projects with weak connection to agricultural water quality.		

3.3 Additional Agricultural Water Quality and Land Condition Monitoring

3.3.1 Water Quality

DEQ Monitoring

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

3.3.2 Land Conditions

There is no additional land condition monitoring.

Results of these additional monitoring activities are presented in Chapter 4.3.

Chapter 4: Progress and Adaptive Management

Chapter 4 describes progress toward achieving Area Plan goals and measurable objectives by summarizing accomplishments and monitoring results. Tracking activities is straightforward; monitoring water quality or land conditions takes more effort; relating changes in land conditions to changes in water quality is important but more challenging.

4.1 Measurable Objectives and Strategic Initiatives

The following tables provide the assessment results and progress toward measurable objectives and milestones in the past three years (2021-2023). See Chapter 3.1 for background and assessment methods.

4.1.1 Management Area

Progress on Measurable Objectives will be reported at the 2026 biennial review.

Table 4.1.1.1 Management Area Results: Soil Erosion

Measurable Objective
Measurable objectives are not developed at this time.
Milestones
N/A
Activities and Accomplishments
N/A
Adaptive Management
Collaborate with NRCS to help complete soil erosion assessment for management area wide measurable objectives.

Table 4.1.1.2 Management Area Results: Pollution from Wastes

Measurable Objective
By June 30, 2030, fewer than 5% of livestock operations are likely to pollute surface water. The LAC, SWCDs, and conservation partners would prefer a measurable objective of zero operations. However, the number of operations will fluctuate due to landowner turnover, natural disasters, and other circumstances that can hinder progress towards meeting that measurable objective.
Milestones
By June 30, 2027, the number of livestock operations that are likely to pollute surface water is reduced by 10%.
Assessment Results
In 2021, seven different livestock operations were identified that are likely to pollute perennial streams.
Progress Toward Measurable Objectives and Milestones
Assessments were not repeated for this biennial review meeting.
Activities and Accomplishments
Morrow SWCD submitted and was awarded a DEQ 319 grant to address a winter-feeding area.
Adaptive Management Discussion
The SWCD/ODA did not repeat the assessment due to time and resources being needed in the LUBGWMA.

Table 4.1.1.3 Management Area Results: Riparian Vegetation

Measurable Objective
By June 30, 2047, 85% (128.86 Miles) of perennial streams in agricultural areas will have streamside vegetation that likely provides the full suite of water quality functions the site is capable of (i.e., shade, bank stability, filtration of overland flow) (Class I).
Milestones
• By June 30, 2027, 40% (60.64 Miles) of perennial streams in agricultural areas will have streamside vegetation that likely provides the full suite of water quality functions the site is capable of (i.e., shade, bank stability, filtration of overland flow) (Class I). • By June 30, 2037, 65% (98.54 Miles) of perennial streams in agricultural areas will have streamside vegetation that likely provides the full suite of water quality functions the site is capable of (i.e., shade, bank stability, filtration of overland flow) (Class I).
Assessment Results
Percent of assessed streams on agricultural land in different classes.

Riparian Vegetation Classes	2021	2026
Class I: Fully provided	31%	TBD
Class II: Partially provided, not impaired by agricultural activities	65%	TBD
Class III: Likely not provided due to agricultural activities	4%	TBD
Total	**100%**	**100%**

Progress Toward Measurable Objectives and Milestones
Conditions were not repeated for this biennial review meeting.
Activities and Accomplishments
Morrow SWCD submitted and awarded OWEB CREP TA grant in 2021 and 2023. Other OWEB grants awarded include Dow Ranch Beaver Dam Analogs Phase 2, Proudfoot Ranch Watershed Enhancement, McElligott's Ione Riparian Enhancement (monitoring grant), Glavey Ranch Beaver Dam Analogs, and Burns Upland Spring Development.
Adaptive Management Discussion
• Assessments were not repeated due to most resources being placed towards LUBGWMA. • Permitting is slowing project implementation.

4.1.2 Focus Areas and Other Focused Efforts in Small Watersheds

There are no Focus Areas in this Management Area.

4.1.3 Strategic Implementation Areas

LUBGWMA SIA

The LUBGWMA SIA is in the initial planning stages. More information will be provided at the next biennial review.

Upper Willow Creek Basin SIA

Table 4.1.3 2019 Upper Willow Creek Basin SIA

Evaluation Results
As of October 16, 2019, 9 tax lots were identified as either a Potential Violation or a Compliance Opportunity. LC = 282, CO = 21, CO = 7, PV = 2
Measurable Objective
By October 16, 2024, all 9 tax lots identified as a Potential Violation or a Compliance Opportunity will be downgraded to Restoration Opportunity or Likely in Compliance.

Adaptive Management Discussion		
SIA is open and work is continuing. SWCD received a DEQ 319 grant to implement BDAs.		
Monitoring Activities		
Monitoring is expected to start in spring/summer 2024.		
Activity	**Accomplishment**	**Description**
ODA		
# acres evaluated	84,428	
# stream miles evaluated	85	
# landowners at Open House	N/A	No Open House due to COVID.
# landowners receiving outreach materials	6	
SWCD and Conservation Partners		
# landowners provided with technical assistance	9	
# site visits	4	2 ODA site visits
# conservation plans written	0	
SIA and Project Funding		
# funding applications submitted	1	$125,000 OWEB Grant for TA and monitoring
# funding applications awarded	1	

4.1.4 Pesticide Stewardship Partnerships

There are no PSPs in this Management Area.

4.1.5 Groundwater Management Area

The measurable objective for the Lower Umatilla Basin GWMA is listed in Chapter 3 and was recently added during the 2024 biennial review. Results from this measurable objective will be reported in 2026.

There has been extensive discussion regarding the LUBGWMA, agricultural management plans within the LUBGWMA, and obtaining verifiable nutrient leaching data within the LUBGWMA. Morrow SWCD has agreed to implement a groundwater SIA beginning in 2024 within the LUBGWMA to collect data for both targeted BMP development in the region and groundwater contamination potential.

Table 4.1.5.a Groundwater Management Area Results:
Inventory non-permitted livestock operations within the LUBGWMA.

Measurable Objective
By June 30, 2025, the Umatilla SWCD and Morrow SWCD will complete an inventory of large and small livestock operations including acreage, irrigation, and drainage paths within the LUBGWMA.
Activities and Accomplishments
• The Morrow SWCD received an ODA Agricultural Water Quality Support Grant to complete the inventory. • The database and data input forms are being developed and the Morrow and Umatilla SWCDs will begin the inventory in May of 2024.
Adaptive Management
None provided.

Table 4.1.5.b Groundwater Management Area Results: Inventory crop and sprinkler systems within the LUBGWMA.

Measurable Objective
By June 30, 2025, the Umatilla SWCD and Morrow SWCD will complete an inventory of crop and sprinkler systems in the LUBGWMA including crop type observed, irrigation method/type, cover crop (if any), and rotation crop (if known).
Activities and Accomplishments
• The Morrow SWCD received an ODA Agricultural Water Quality Support Grant to complete the inventory. • The database and data input forms are being developed and the Morrow and Umatilla SWCDs will begin the inventory in May of 2024.
Adaptive Management
None provided.

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. The four-year results for activities conducted in 2020-2023 are provided in Table 4.2a below.

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

Table 4.2a Activities conducted in 2020-2023 by Morrow SWCD and NRCS

Activity	4-year results	Description
Community and Landowner Engagement		
# active events that target landowners/ managers (workshops, demonstrations, tours)	5	Covid-19 restrictions limited active events.
# landowners/managers participating in active events	1,659	Morrow County Fair, NRCS Local Workgroup meetings, Workshops.
Technical Assistance (TA)		
# landowners/managers provided with TA (via phone/walk-in/email/site visit	976	
# site visits	271	
# conservation plans written*	38	
On-the-ground Project Funding		
# funding applications submitted	20	
# funding applications awarded	-	
* 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 Implementation funding (cash and in-kind) for projects on agricultural lands reported 1995-2021 (OWRI data include most, but not all projects, implemented in the Management Area.)

Landowners	OWEB	DEQ	NRCS*	BPA	All other sources**	TOTAL
$2,106,176	$3,171,200	$5,226	$104,857	$3,848,650	$5,646,465	$14,882,574

* This table may not include all NRCS funding due to privacy concerns.
**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 1995-2021 (OWRI data include most, but not all projects, implemented in the Management Area.)

Activity Type*	Miles	Acres	Count**	Activity Description
Upland		16,766		Plantings and grazing management
Road	0		3	
Streamside Vegetation	4	51		Riparian buffers
Wetland		106		
Instream Habitat	2			
Instream Flow	0		0 cfs	
Fish Passage	11		6	Road crossing improvement
TOTAL	**17**	**16,923**		

* This table may not include all NRCS projects due to privacy concerns.
** # hardened crossings, culverts, etc.

4.3 Additional Agricultural 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. 2022 Oregon Water Quality Status and Trends Report. www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx).

Data are from DEQ, US EPA, and USGS databases for 2001 through 2020. DEQ determined status for stations in five-year periods and trends for stations with at least eight years of data collected at the same time of year.

The following locations have sufficient data to calculate recent status and trends and are most likely to help characterize agricultural water quality (Table 4.3.1). Ambient sites are located at Willow Creek at Rhea Creek and Rhea Creek at Morter Road.

Table 4.3.1 Agricultural Water Quality Concerns: Surface Water

Site Description	Parameter					
	E. coli	pH	Dissolved Oxygen	Temperature	Total Phosphorus (mg/L)	Total Suspended Solids (mg/L)
	Attainment Status and Trend				median; maximum[1]	median; maximum[2]
Willow Ck at Heppner Junction - 10708	Yes	Unassessed	Unassessed	N/A	0.04;0.4	1;1
Willow Ck at Rhea Ck Rd - 36784	No	Yes	Yes↑	N/A	0.115;0.55	5;342
Rhea Ck at Morter Rd - 36785	Yes	Yes	Yes↑	N/A	0.08;0.48	3;374
Willow Ck at Heppner - 14034500	Unassessed	Unassessed	Unassessed	No↓	N/A	N/A
Willow Ck abv Willow Ck Reservoir - 14034470	Unassessed	Unassessed	Unassessed	No↓	N/A	N/A

[1] DEQ has no benchmark for total phosphorus in this Management Area; ODA benchmark for potential water quality concerns = 0.08 mg/L
[2] DEQ has no benchmark for total suspended solids in this Management Area
↑ Statistically significant improving trend
↓ Statistically significant degrading trend

Most of the available data sites have insufficient data for assessment.

E. coli continues to be below standards at the confluence of Willow and Rhea creeks.

Water temperature is increasing over time as highlighted in the Willow Basin TMDL. Data confirm temperatures exceed the standard every summer above the reservoir. The TMDL suggested that higher water temperatures above the reservoir are related to inadequate stream shading.

Most of the phosphorus levels measured in Rhea and Willow creeks exceeded the ODA guideline. Work by the University of Idaho indicated that the phosphorus in Willow Creek Reservoir is sourced from the forest. However, it is unclear whether the high levels of phosphorus in Rhea Creek are also due to forest practices. Regardless, the amount of phosphorus in Rhea Creek has been significantly reduced in the past 8 years (approximately 0.11 to 0.07 mg/L).

4.3.2 Land Conditions

There is no additional land condition monitoring.

4.4 Biennial Reviews and Adaptive Management

ODA, the LAC, the LMA, and other partners met February 22, 2024, 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

Progress
• Morrow SWCD continues to apply for small and grants available through OWEB for removing invasive annual grasses, removing animals off the bottomlands, beaver dam analog development, and livestock exclusion fencing. • Pre-2021 projects include livestock water development, livestock exclusion, meadow planting, and installing an onion storage facility.   o DEQ 319 nonpoint source grant to implement BMPs in Upper Willow Creek SIA. • OWRD: Groundwater recharge project to capture runoff, inject into aquifer to improve availability in late season/summer flows. • Upper Willow Creek SIA monitoring plan has been approved for *E. coli* and TSS water quality sampling on Upper Willow Creek, Hinton Creek, and Shobe Creek. • Upcoming SIA focused on groundwater in the LUBGWMA. • A Crop and sprinkler inventory project was funded by the ODA Ag Water Quality Support Grant. • The Morrow SWCD applied for a CREP technician grant through OWEB and received funding. • NRCE is working in the LUBGWMA SIA with the West Extension Irrigation District on flood to sprinkler irrigation conversion.
Impediments
• Management Area-wide assessments were not repeated for this biennial review due to staff time and resources needed for the LUBGWMA. • NRCS not having the capacity to collaborate on soil erosion Management Area-wide measurable objective. • Recruitment for vacant SWCD position has been difficult. Position has been vacant for over a year. • Permitting processes are challenging and is slowing project implementation. • Removing invasive riparian vegetation is needed to reestablish native vegetation but reduces shade. • If the cultural resource survey requirement comes down to the OWEB small grant program, it will not be cost effective as small grant of $7,000 would need a $12-$15K cultural resource survey. • Creeks in the management area are washing out. Beavers and people are influencing this issue. • It is challenging for Morrow SWCD projects to be awarded through OWEB because Willow Creek is not essential salmonid habitat and there are no major fish issues in the area.
Recommended Modifications and Adaptive Management
• Resource Assistance for Rural Environments program could help SWCD in filling vacant position. • Collaborate with NRCS to help complete soil erosion assessment for management area wide measurable objectives. • LAC would like to see more bank stability projects.

Table 4.4b Number of ODA compliance activities 1/1/2020 through 12/31/2023

Location	Cases		Site Visits	Agency Actions				
				Letter of Compliance		Pre-Enforcement Notification	Notice of Noncompliance	Civil Penalty
	New	Closed		Already in compliance	Brought into compliance			
Outside SIA	0	0	0	0	0	0	0	0
Within SIA	4	3	5	0	2	4	0	0