Willow Creek Agricultural Water Quality Management Area Plan

March 2019

Developed by the

Oregon Department of Agriculture
Willow Creek Local Advisory Committee

With support from the

Morrow Soil and Water Conservation District
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Acronyms and Terms Used in this Document

Ag Water Quality Program – Agricultural Water Quality Management Program
Area Plan – Agricultural Water Quality Management Area Plan
Area Rules – Agricultural Water Quality Management Area Rules
CAFO – Confined Animal Feeding Operation
CNPCP – Coastal Nonpoint Pollution Control Program
CWA – Clean Water Act
CZARA – Coastal Zone Act Reauthorization Amendments
DEQ – Oregon Department of Environmental Quality
DMA – Designated Management Agency
GWMA – Groundwater Management Area
HABs – Harmful Algal Blooms
IET - Integrated Erosion Tool
LAC – Local Advisory Committee
LMA – Local Management Agency
Management Area – Agricultural Water Quality Management Area
MOA – Memorandum of Agreement
NPDES – National Pollution Discharge Elimination System
NRCS – Natural Resources Conservation Service
OAR – Oregon Administrative Rules
OCA-Oregon Cattlemen’s Association
ODA – Oregon Department of Agriculture
ODF – Oregon Department of Forestry
ODFW – Oregon Department of Fish and Wildlife
OHA – Oregon Health Authority
ORS – Oregon Revised Statute
OWEB – Oregon Watershed Enhancement Board
PMP – Pesticides Management Plan
PSP – Pesticides Stewardship Partnership
RCA – Required Corrective Action
RUSLE – Revised Universal Soil Loss Equation
SIA – Strategic Implementation Area
SWCD – Soil and Water Conservation District
T – Soil Loss Tolerance Factor
TMDL – Total Maximum Daily Load
USDA – United States Department of Agriculture
US EPA – United States Environmental Protection Agency
WPCF – Water Pollution Control Facility
WQPMT – Water Quality Pesticides Management Team
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)). It references associated Agricultural Water Quality Management Area Rules (Area Rules), which are Oregon Administrative Rules (OARs) enforced by the Oregon Department of Agriculture (ODA).

Required Elements of Area Plans

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

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

Plan Content

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

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

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

Chapter 4: Local Implementation, Monitoring, and Adaptive Management. ODA and the Local Advisory Committee (LAC) will work with knowledgeable sources to summarize land condition and water quality status and trends to assess progress toward the goals and objectives in Chapter 3.
Chapter 1: Agricultural Water Quality Management Program
Purpose and Background

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

As part of Oregon’s Agricultural Water Quality Management Program (Ag Water Quality Program), the Area Plan guides landowners and partners such as Soil and Water Conservation Districts (SWCDs) in addressing water quality issues 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 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 developed to implement the Area Plan, monitoring, evaluation, and adaptive management.

The provisions of the Area Plan do not establish legal requirements or prohibitions (ORS 568.912(1)). Each Area Plan is accompanied by Area Rules that describe local agricultural water quality regulatory requirements. ODA will exercise its regulatory authority for the prevention and control of water pollution from agricultural activities under the Ag Water Quality Program’s general regulations (OAR 603-090-0000 to 603-090-0120) and under the Area Rules for this Management Area (OAR 603-095-2840). The Ag Water Quality Program’s general rules guide the Ag Water Quality Program, and the Area Rules for the Management Area are the regulations that landowners are required to follow. Landowners will be encouraged through outreach and education to implement conservation 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 a few animals or raising crops.
- Agricultural lands that lay idle or on which management has been deferred.
- Agricultural activities in urban areas.
- Agricultural activities on land subject to the Forest Practices Act (ORS 527.610).

Water quality on federal lands in Oregon is regulated by DEQ and on Tribal Trust lands 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, to 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). 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: Map of 38 Agricultural Water Quality Management Areas**
Grey areas are not incorporated into Ag Water Quality Management Areas

1.3 Roles and Responsibilities

1.3.1 Oregon Department of Agriculture

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

The Oregon Department of Agriculture has the legal authority to develop and implement Area Plans and Area Rules for the prevention and control of water pollution from agricultural activities and soil erosion, where such plans are required by state or federal law (ORS 568.909 and ORS 568.912). ODA bases Area Plans and Area Rules on scientific information (ORS 568.909). ODA works in partnership with SWCDs, LACs, DEQ, and other partners to implement, evaluate, and update the Area Plans and Area Rules. ODA 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 gain compliance with Area Rules. Figure 2 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 the condition through required corrective actions (RCAs) under the provisions of the enforcement procedures outlined in OAR 603-090-060 through OAR 603-090-120. If a landowner does not implement the RCAs, ODA may assess civil penalties for continued violation of the 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.

Any member of the public may file a complaint, and any public agency may file a notification of a violation of an Area Rule. As a result, ODA may initiate an investigation (See Figure 2).
Figure 2: Compliance Flow Chart

Oregon Department of Agriculture
Water Quality Program Compliance Process

ODA Receives Complaint, Notification, or Staff Observation

- Pre-Enforcement "Fix-it" Letter
  - YES
  - No Follow-Up If Adequate Response
  - NO
    - Case Not Opened

Information Complete? Complaint, Notification, or Observation Appears Valid?

- YES
  - Conduct Investigation
  - Violation?
    - NO
      - Letter of Compliance Close Case
    - YES or LIKELY
      - * Pre-Enforcement Letter
        - . . . . . Is an Advisory or Warning Not an Enforcement Action

- NO
  - Follow-Up Investigation
  - Violation?
    - NO
      - Notice of Noncompliance
      - Follow-Up Investigation
      - YES
        - Letter of Compliance Close Case
    - YES
      - Civil Penalty
        - NO
          - YES
1.3.2 Local Management Agency

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

The day-to-day implementation of the Area Plan is accomplished through an Intergovernmental 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 as many as 12 members. The LAC serves in an advisory role to the director of ODA and to the Board of Agriculture. The role of the LAC is to provide a high level of citizen involvement and support in the development, implementation, and biennial reviews of the Area Plan and Area Rules. The LAC’s primary role is to provide advice and direction to 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 their responsibilities, which include but are not limited to:

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

1.3.4 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. However, 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 a suite of measures to protect water quality. 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 also may 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:

- Conditions resulting from unusual weather events.
- Hot springs, glacial melt water, extreme or unforeseen weather events, and climate change.
- Septic systems and other sources of human waste.
- Public roadways, culverts, roadside ditches and shoulders.
- Dams, dam removal, hydroelectric plants, and non-agricultural impoundments.
- Housing and other development in agricultural areas.
- 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.

The Oregon Department of Agriculture, the LACs, and the SWCDs 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 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. Significant point sources are required to obtain permits that specify their pollutant limits. Agricultural operations regulated as point sources include permitted Confined Animal Feeding Operations (CAFOs), and many are regulated under ODA’s CAFO Program. Pesticide applications in, over, or within three feet of water also are regulated as point sources. Irrigation water flows from agricultural fields may be at a defined outlet but they do not currently require a permit.

Nonpoint water pollution originates from the general landscape and is difficult to trace to a single source. Nonpoint water pollution sources include runoff from agricultural and forest lands, urban and suburban areas, roads, and natural sources. In addition, groundwater can be 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 in OARs for each basin. They may include: public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality,
hydropower, and commercial navigation and transportation. The most sensitive beneficial uses usually are fish and aquatic life, water contact recreation, and public and private domestic water supply. These uses generally are the first to be impaired because they are affected at lower levels of pollution. While there may not be severe impacts on water quality from a single source or sector, the combined effects from all sources can contribute to the impairment of beneficial uses in the Management Area. Beneficial uses that have the potential to be impaired in this Management Area are summarized in Chapter 2.

Many waterbodies throughout Oregon do not meet state water quality standards. Many of these waterbodies have established water quality management plans that document needed pollutant reductions. The most common water quality concerns related to agricultural activities are temperature, bacteria, biological criteria, sediment and turbidity, phosphorous, algae, pH, dissolved oxygen, harmful algal blooms (HABs), nitrates, pesticides, and mercury. Water quality impairments vary by Management Area and are summarized in Chapter 2.

1.4.3 Impaired Water Bodies and Total Maximum Daily Loads

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

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

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

As part of the TMDL process, DEQ identifies the Designated Management Agency (DMA) or parties responsible for submitting TMDL implementation plans. TMDLs designate the local Area Plan as the implementation plan for the agricultural component of the TMDL. Biennial reviews and revisions to the Area Plan and Area Rules must address agricultural or nonpoint source load allocations from relevant TMDLs.

For more general and specific information about Oregon’s TMDLs, see: www.oregon.gov/deq/wq/tmdls/Pages/default.aspx. The list of impaired water bodies (303(d) list), the TMDLs, and the agricultural load allocations for the TMDLs that apply to this Management Area are summarized in Chapter 2.

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

In 1995, the Oregon Legislature passed ORS 561.191. This statute states that any program or rules adopted by ODA “shall be designed to assure achievement and maintenance of water quality standards adopted by the Environmental Quality Commission.”
To implement the intent of ORS 561.191, ODA incorporated ORS 468B.025 and 468B.050 into all of the 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 to prevent and control water pollution from agriculture activities and to prevent and control soil erosion. Streamside vegetation can provide three primary water quality functions: shade for cool stream temperatures, 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.

Additional reasons for the Ag Water Quality Program’s emphasis on streamside vegetation include:
- Streamside vegetation can improve water quality related to multiple pollutants, including: temperature (heat), sediment, bacteria, nutrients, and toxics (e.g., pesticides, heavy metals, etc.).
- Streamside vegetation provides fish and wildlife habitat.
- Landowners can improve streamside vegetation in ways that are compatible with their operation.
- Streamside vegetation condition is measurable and can be used to track progress in achieving desired site conditions.

Site-Capable Vegetation
The Ag Water Quality Program uses the concept of “site-capable vegetation” to describe the vegetation that agricultural streams can provide to protect water quality. Site-capable vegetation is the vegetation that can be expected to grow at a particular site, given natural site factors (e.g., elevation, soils, climate, hydrology, wildlife, fire, floods) and historical and current human influences 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 vegetation consistent with site capability 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 for narrow streams. For example, shrubs and grass may provide shade, protect streambanks, and filter pollutants. However, on larger streams, mature site-capable vegetation is needed to provide the water quality functions.

In many cases, invasive, non-native plants, such as introduced varieties of blackberry and reed canarygrass, grow in streamside areas. This type of vegetation has established throughout much of Oregon due to historic and human influences and may provide some of the water quality functions of site-capable vegetation. ODA’s statutory authority does not require the removal of invasive, non-native plants, however, ODA recognizes removal as a good conservation activity and encourages landowners to remove these plants. Voluntary programs through SWCDs and watershed councils provide technical assistance and financial incentives for weed control and restoration projects. In addition, the Oregon State Weed Board identifies invasive plants that can negatively impact watersheds. Public and private landowners are responsible for eliminating or intensively controlling noxious weeds as may be provided by state and local law enacted for that purpose. For further information, visit www.oregon.gov/ODA/programs/weeds.

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

The Oregon Department of Agriculture is the lead state agency for the CAFO Program. The CAFO Program was developed to ensure that operators do not contaminate ground or surface water with animal manure or process wastewater. Since the early 1980s, CAFOs in Oregon have been registered to a general Water Pollution Control Facility (WPCF) permit designed to protect water quality. A properly maintained CAFO must implement a site-specific suite of structural and management practices to protect ground and surface water. To assure continued protection of ground and surface water, the 2001 Oregon State Legislature directed ODA to convert the CAFO Program from a WPCF permit program to a federal NPDES program. ODA and DEQ jointly issue the NPDES CAFO permit, which complies with all CWA requirements for CAFOs. In 2015, ODA and DEQ jointly issued a WPCF general CAFO permit as an alternative for CAFOs that are not subject to the federal NPDES CAFO permit requirements. Currently, ODA can register CAFOs to either the WPCF or NPDES CAFO permit.

Both of the Oregon CAFO 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 about the CAFO program, go to www.oregon.gov/ODA/programs/NaturalResources/Pages/CAFO.aspx.

1.5.2 Groundwater Management Areas

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

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

1.5.3 The Oregon Plan for Salmon and Watersheds

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

1.5.4 Pesticide Management and Stewardship

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

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

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.

The Oregon Department of Agriculture led the development and implementation of a Pesticides Management Plan (PMP) for the state of Oregon (www.oregon.gov/ODA/programs/Pesticides/water/pages/AboutWaterPesticides.aspx). The PMP, completed in 2011, strives to protect drinking water supplies and the environment from pesticide contamination, while recognizing the important role that pesticides have in maintaining a strong state economy, managing natural resources, and preventing human disease. By managing the pesticides that are approved for use by the 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 OHA. The program provides individuals and communities with information on how to protect the quality of Oregon’s drinking water. DEQ and OHA encourage preventive management strategies to ensure that all public drinking water resources are kept safe from current and future contamination. For more information see: 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 Oregon to implement the federal CWA in our state. DEQ is the lead state agency with overall authority to implement the CWA in Oregon. DEQ coordinates with other state agencies, including ODA and ODF, to meet the requirements of the CWA. DEQ sets water quality standards and develops TMDLs for impaired waterbodies, which ultimately are approved or disapproved by the US EPA. In addition, DEQ develops and coordinates programs to address water quality including NPDES permits for point sources, the CWA Section 319 grant program, Source Water Protection, the CWA Section 401 Water Quality Certification, and GWMAs. DEQ also coordinates with ODA to help ensure successful implementation of Area Plans.

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

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

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

1.6.2 Other Partners

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

The AgWQ 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 implemented through focused work in small geographic areas (section 1.7.3), with a long-term goal of developing measurable objectives and monitoring methods at the Management Area scale.

The State of Oregon continues to improve its ability to use technology to measure current streamside vegetation conditions and compare it to the vegetation needed to meet stream shade targets to keep surface waters cooler. 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 incentive programs.

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

The measurable objectives and associated milestones for the Area Plan are in Chapter 3 and progress toward achieving the measurable objectives and milestones is summarized in Chapter 4.

1.7.2 Land Conditions and Water Quality

Land conditions can serve as useful surrogates (indicators) for water quality parameters. For example, streamside vegetation generally is used as a surrogate for water temperature, because shade blocks solar radiation from warming the stream. In addition, sediment can be used as a surrogate for pesticides and phosphorus because they 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.
- Reductions in water quality 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 cost-prohibitive and could fail to 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 less likely to document the short-term effects of changing land conditions on water quality parameters such as temperature, bacteria, nutrients, sediment, and pesticides.

1.7.3 Focused Implementation in Small Geographic Areas

Focus Areas

A Focus Area is a small watershed with water quality concerns associated with agriculture. The Focus Area process is SWCD-led, with ODA oversight. The SWCD delivers systematic, concentrated outreach and technical assistance in the Focus Area. A key component of this approach 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 and is supported by a large body of scientific research (e.g. Council for Agricultural Science and Technology, 2012. Assessing the Health of Streams in Agricultural Landscapes: The Impacts of Land Management Change on Water Quality. Special Publication No. 31. Ames, Iowa).

Systematic implementation in Focus Areas provides the following advantages:

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

Soil and Water Conservation Districts select a Focus Area in cooperation with ODA and other partners. The scale of the Focus Area matches the SWCD’s capacity to deliver concentrated outreach, technical assistance, and to complete projects. The current Focus Area for this Management Area is described in Chapter 3. The SWCD will also continue to provide outreach and technical assistance to the entire Management Area.

Strategic Implementation Areas
Strategic Implementation Areas (SIAs) are small watersheds selected by ODA, in cooperation with partners, based on a statewide review of water quality data and other available information. ODA conducts an evaluation of likely compliance with Area Rules, and contacts landowners with the results and next steps. Landowners have the option of working with the SWCD or other partners to voluntarily address water quality concerns. ODA follows up, as needed, to enforce the Area Rules. Finally, ODA completes a post-evaluation to document progress made in the watershed. Chapter 3 describes any SIAs in this Management Area.

1.8 Monitoring, Evaluation, and Adaptive Management

The Oregon Department of Agriculture, the LAC, and the LMA will assess the effectiveness of the Area Plan and Area Rules by evaluating the status and trends in agricultural land conditions and water quality (Chapter 4). This assessment will include an evaluation of progress toward measurable objectives. ODA will utilize other agencies’ and organizations’ local monitoring data when available. ODA, DEQ, SWCDs, and LACs will examine these results during the biennial review and will revise the goal(s), measurable objectives, and strategies in Chapter 3 as needed.

1.8.1 Agricultural Water Quality Monitoring

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

At each biennial review, DEQ assesses the status and trends of water quality in relation to water quality standards. Parameters included in the analysis are temperature, pH, and bacteria. DEQ will add additional parameters as the data become available, depending on the water quality concerns of each Management Area. ODA will continue to work with DEQ to cooperatively summarize the data results and how they apply to agricultural activities.
Water quality monitoring is described in Chapter 3, and the data are presented in Chapter 4.

1.8.2 Biennial Reviews and Adaptive Management

All Area Plans and Area Rules around the state undergo biennial reviews by ODA and the LAC. As part of each biennial review, ODA, DEQ, SWCDs, and the LAC discuss and evaluate the progress on implementation of the Area Plan and Area Rules. This evaluation includes discussion of enforcement actions, land condition, water quality monitoring, strategic initiatives, and outreach efforts over the past biennium. ODA and partners evaluate progress toward achieving measurable objectives and milestones, and revise implementation strategies as needed. The LAC submits a report to the Board of Agriculture and the director of ODA describing progress and impediments to implementation, and recommendations for modifications to the Area Plan or Area Rules necessary to achieve the goal of the Area Plan. ODA and partners will use the results of this evaluation to update the measurable objectives and implementation strategies in Chapter 3.
Chapter 2: Local Background

The 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 and 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.

This document recognizes that planning for water quality is only part of a successful approach for overall management of agricultural and rural land, and that other personal and public objectives must also be considered in total farm or resource management planning.

Figure 3: Willow Creek Management Area

2.1 Local Roles and Responsibilities

2.1.1 Local Advisory Committee

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joe McElligott, Chair</td>
<td>Ione area</td>
<td>Wheat/cattle</td>
</tr>
<tr>
<td>Bev Bridgewater</td>
<td>Irrigation district in Boardman/Irrigon area</td>
<td>WEID manager</td>
</tr>
<tr>
<td>Travis Harrison</td>
<td>Lexington</td>
<td>Wheat/cattle/irrigation</td>
</tr>
<tr>
<td>Larry Lutcher</td>
<td>Morrow County</td>
<td>OSU Extension</td>
</tr>
<tr>
<td>Jim McElligott</td>
<td>Ione area</td>
<td>SWCD chair Wheat/cattle</td>
</tr>
<tr>
<td>Jake Neiffer</td>
<td>Lexington</td>
<td>Cattle</td>
</tr>
<tr>
<td>Leann Rea</td>
<td>Heppner</td>
<td>Morrow County Commissioner</td>
</tr>
<tr>
<td>Mark Reitmann</td>
<td>South Heppner/ Hardman</td>
<td>Wheat/cattle</td>
</tr>
<tr>
<td>Kyle Robinson</td>
<td>East Heppner</td>
<td>Cattle/hay</td>
</tr>
<tr>
<td>Terry Felda</td>
<td>Ione/Heppner</td>
<td>Sheep, Llama, Cattle</td>
</tr>
<tr>
<td>Mark McElligott</td>
<td>Rhea Creek</td>
<td>Cattle/Wheat Farmer</td>
</tr>
<tr>
<td>Erin Heideman</td>
<td>Ione North</td>
<td>Local 4H Youth Program Manager and Wheat Farmer</td>
</tr>
</tbody>
</table>

2.1.2 Local Management Agency

The implementation of this Area Plan is accomplished through an Intergovernmental Grant Agreement between ODA and the Morrow SWCD. This Intergovernmental Agreement defines the SWCD as the LMA for implementation of the Area Plan. The SWCD was also involved in development of the Area Plan and Rules.

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

2.2 Area Plan and Rules: Development and History

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

Since approval, the LAC has met biennially to review the Area Plan and Rules. The review process included assessment of the progress of Area Plan implementation toward achievement of plan goals and objectives.

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 Rivermile (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, while 22 percent is in Gilliam County. Communities included in the Management Area are Boardman, Irrigon, Ione, Lexington, and Heppner. The county population is approximately 11,336.
2.3.2 Climate
The climate for most of the basin is semi-arid, with average annual precipitation ranging from eight inches at the mouth of Willow Creek to 34 inches 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 five to 150 feet. The basalts are thickest, possibly over 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 further upstream near Heppner, they occur between March and April. During the months of July to September, minimum flows typically occur during which time channels may be completely dry or run intermittently for prolonged periods.

The construction of the 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, Rhea Creek, Hinton Creek, and Eightmile Creek, 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 the 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. Their 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 are typically used to cool the air inside the facility. Electronics such as servers generate a large thermal load and require cooling above and beyond what 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 75° 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 Million Gallons (MG) to 9 MG per building depending on its design, the newer data centers are more efficient and thus use less water on an annual basis. Most of the water volume is focused in the summer months due to the warmer air temperature outside. Winter water usage is typically very low or non-existent outside of typical uses beyond cooling needs.

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 Ordinance, 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.

In 1997, an Action Plan was approved by DEQ and ODA to address the groundwater contamination concerns in the GWMA. The Action Plan is being implemented on a voluntary basis. This voluntary approach recognizes that individuals, businesses, organizations, and governments, given adequate information and encouragement, will take positive actions and adopt or modify practices and activities to reduce nitrate-nitrogen loading to groundwater.

2.3.7 Reservoirs
The USACE constructed a 160-ft high dam just upstream of Heppner in an effort 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 the 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 AgWQM Area is approximately 1,500 square miles or 961,000 acres. Ninety percent of the area is privately owned; nine 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 one 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 one 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
Beneficial uses in the Willow Creek AgWQM 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, 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 WQ Parameters and 303(d) list

WQ Parameters
The following discussion of water quality parameters of concern in the watershed addresses the CWA requirements for standards to be established for the most sensitive beneficial use.

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 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 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 failing or improperly operating septic systems. Streams may be listed as violating this criterion during the summer period (the highest use period for water contact recreation), or for fall-winter-spring. **The DEQ bacteria standard states that organisms of the coliform group commonly associated with fecal sources shall not exceed a 90-day log mean of 126 *E. coli* organisms per 100 ml, based on a minimum of five samples and no single sample shall exceed 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.

In 2017, one health advisory was issued by the Oregon Department of Health on August 7 thru November 2. Additionally, one advisory was issued in 2018 from July 26 thru September 17. Due to the cost of testing required to issue and list an advisory, OHA has drastically reduced the number of advisories issued that lasted 14 days for the Willow Creek Reservoir (WCR). The advisories recommend avoidance of water contact, the treatment of drinking water, and taking of certain precautions before consumption of fish, crayfish, or mussels. The Oregon Department of Health no longer issues health advisories for water bodies due to the cost of sampling required to lift the advisory. It states on their website “If in doubt, stay out.”

Cyanobacterial blooms cause taste and odor problems, decreased aesthetics, depleted DO 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.

Preliminary research conducted by graduate students from the University of Idaho conclude that a primary cause of the HABs in the WCR is the large amount of sediment and nutrients that enter the reservoir from Upper Willow Creek (Research in the Willow Creek watershed: Estimates of sediment and phosphorus loads from sub-catchments; gauging public response to a constructed wetland; and a quantitative assessment of a conceptual constructed wetland, Univeristy of Idaho, 2014). Nutrients, primarily nitrogen (N) and phosphorus (P), are attached to sediments and are introduced through the upland erosion processes. The ratio of these nutrients is critical to the growth of cyanobacteria. When the N:P ratio is 7:1 or higher, algal growth is limited.

Possible solutions to the problem include: reduction of erosion and sediment runoff in the uplands and construction of wetlands above the reservoir to treat the water before it enters the reservoir.

303(d) List
The stream segments in the Willow Creek AgWQM Area that were declared water quality limited by Oregon’s DEQ under Section 303(d) were reclassified upon completion of the Willow Creek TMDL and placed in Category 4, Water Quality Limited, TMDL Approved status. Category 5 includes parameters and streams that still need a TMDL.
Table 1: 2012 303(d) Water Quality Limited List

<table>
<thead>
<tr>
<th>Category 4 – TMDL Approved</th>
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<tbody>
<tr>
<td>Stream</td>
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<tr>
<td>Balm Fork</td>
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<tr>
<td>Willow Creek</td>
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<td>Willow Creek</td>
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</tbody>
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<table>
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<tr>
<th>Category 5 – TMDL Needed *</th>
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<tbody>
<tr>
<td>Stream</td>
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<td>Willow Creek</td>
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<tr>
<td>Willow Creek/Willow Creek Reservoir</td>
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</tbody>
</table>

* Added in 2010

2.4.2 Basin 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. Attachment 2 provides a summary of TMDL objectives. The TMDL document can be viewed at: [http://www.deq.state.or.us/WQ/TMDLS/UmatillaBasin.htm#WC](http://www.deq.state.or.us/WQ/TMDLS/UmatillaBasin.htm#WC)

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, 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.

2.4.3 Sources of Impairment

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 or groundwater 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.

While there may not be severe impacts on water quality from a single source or activity, the combined effects from all sources contribute, along with impacts from other land uses and activities, to the impairment of beneficial uses of Willow Creek.

Since its completion in 1984, Willow Creek Reservoir has been the most problematic reservoir, in terms of water quality, in the Portland District of the USACE. Water quality, including inflow, outflow and in-lake, has been continuously monitored by the USACE. Water releases from the shallow levels of the reservoir led to high water temperatures in Willow Creek below Heppner. Changes to the depth of water withdrawal produced undesirable water quality in the outflow due to eutrophication of the lake water. The recent addition of aeration devises to reverse the eutrophication have apparently resulted in an increase in algal blooms which are sometimes toxic and cause problems with recreation. The USACE is increasing the level of monitoring to address the identified TMDL issues. This water quality information will be used to achieve the best management strategies for nutrient control, eutrophication reversal, and bacteria reduction in Willow Creek Reservoir.

2.4.4 Drinking Water

There are 17 public water systems using groundwater wells in the plan area serving approximately 9,900 people. All public water systems in the management area have recent alerts for total coliform and/or E. coli with the exception of Boardman and Lamb Weston. Nitrate alerts or exceedances exist for Boardman (7.5mg/L), Irrigon (up to 15mg/L), Country Garden Estates (up to 7mg/L), the Port of Morrow (>8mg/L after dilution with water from Boardman), and Lamb Weston (up to 6.9mg/L). The drinking water standard for nitrates is 10 mg/L. These contaminants are present throughout the Ag WQMA and are often related to animal and cropland agriculture. All of the public groundwater systems except Black Mountain have agricultural land uses (e.g. irrigated crops, pasture, and/or livestock) within their source areas, although intensity of use varies.

There are also numerous private groundwater wells for domestic use. Real Estate Testing data for 1989-2015 indicates significant detections of nitrate in private household wells: 37 detections >7mg/L (28.7% of 129 wells tested) with 23 of those (17.8%) being ≥10mg/L, the drinking water contaminant limit.

DEQ recommends ODA and the SWCDs include a task in the plan to further evaluate agricultural land uses in and upgradient of the groundwater source areas of the Columbia shore communities of Boardman, Irrigon, Country Garden Estates, Port of Morrow and Lamb Weston. This is also the area where higher nitrate levels were detected in residential wells. Implementation of best management practices in this area may reduce the potential for agricultural sources to impact drinking water sources.

The LAC suggested they wait until there is landowner representation from north county, where many of the drinking water concerns were identified, to develop a task to further evaluate agricultural land uses in the groundwater source areas. The 2021 Biennial Review will be held in the north county region where agricultural landowners will be invited to attend.

2.5 Voluntary and Regulatory Measures

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.
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.

The sections that follow describe more detailed information related to potential agricultural water quality concerns, provide definitions of commonly used terms, provide dates when Rules are effective, and provide some exemptions to the Rules.

2.5.1 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.

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

The text of ORS 468B can be found in Section 1.4.4.

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. OAR 603-074-0005 through 0080 contains the rules that apply to animal feeding operations (AFO) and CAFOs.

Wastes include livestock manure from situations like seasonal feeding and birthing areas, gathering pastures and corrals, rangelands and pasture, in addition to wastes already covered by Oregon’s CAFO laws. Indicators of noncompliance include 1) runoff flowing through areas of high livestock usage and carrying wastes into waters of the state; 2) livestock waste accumulated in drainage ditches or areas of flooding; and 3) fecal coliform (*E. coli*) counts that exceed State water quality standards. Livestock grazing is allowed to the extent it does not cause conditions that violate State water quality standards and complies with the Prevention and Control Measures in the Area Rules. Livestock facilities located near streams should employ an adequate runoff control system. Compliance with the riparian objectives will help keep wastes from running into waters of the state. Landowners can contact the NRCS and appropriate SWCD for assistance with complying with this rule.

2.5.2 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, 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,
  - Ground cover 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 ground cover 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.
(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.

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 exclosures,
• 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.

2.5.3 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 ten 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 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.

(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.

2.5.4 Irrigation Management

A landowner or operator’s responsibility under this Area Plan is to implement measures that prevent and control water pollution from irrigation. Diversion of water for irrigation or other uses and the return of that water to the stream 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 this 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 have an effect on stream flows and thus, indirectly affect water quality. Irrigation management in this basin recognizes there may be some positive benefits, in addition to crop growth, occurring from irrigation application - including flow augmentation as water returns back to the stream, cooling and filtering of water through underground percolation, and the recharge of shallow wells and springs due to the connectivity of surface water to groundwater sources. Irrigation water may be used more than once as it returns to the stream and is available for instream uses or by other irrigators. Ultimately, stream flows will be enhanced by upland and riparian management practices promoting natural upstream storage and properly functioning floodplains that catch, store, and safely release precipitation for beneficial uses during summer months.

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

- 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).
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.

(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**
Chapter 3: Strategic Initiatives

Goal

The goals of this Area Plan are:

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

3.1 Measurable Objectives

Measurable objectives allow the Ag Water Quality Program to better evaluate progress toward meeting water quality standards and TMDL load allocations.

To achieve the Area Plan goals, the following water quality related objectives are established:

- **Control soil erosion on uplands to acceptable rates.**

  Intent: While all soil lost from fields through erosion may not necessarily enter streams, due to distance from stream or practices such as sediment basins, the reduction in such erosion will reduce the likelihood that soils will enter streams. Acceptable rates of soil erosion are consistent with the soil erosion control requirements of the current USDA Farm Bill and will be applied to all soil types.

- **Prevent and control pollution caused by the introduction of wastes into waters of the state.**

  Intent: This ensures that high nutrient concentrations, pathogens associated with high animal density areas, high sediment concentrations in run-off, or other potential pollutants are not readily transported to streams and groundwater. It is also consistent with existing state statutes.

- **Provide adequate riparian vegetation, consistent with site capability, for streambank stability and stream shading.**

  Intent: 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.

3.1.1 Management Area

To achieve those long-term objectives, the following milestones and timelines will be developed to guide the evaluation of the effectiveness of the strategies outlined in Section 3.2 for achievement of the objectives:

- **Control soil erosion on uplands to acceptable rates.**

  By 2021, uplands will be evaluated for erosion potential. The method consists of RUSLE2 evaluations based on average slopes for conventional and direct seed management practices. Soil loss will be estimated for 2015 and previous years.
These results will help the LAC develop long-term targets at the 2021 Biennial Review. Likely targets include:

- **Prevent and control pollution caused by the introduction of wastes into waters of the state.**

  By 2021, livestock operations along streams will be evaluated for likelihood of pollution from bacteria. The method consists of: looking for likely sources (manure piles and heavy use areas) during riparian vegetation survey and follow up with landowner to do site visit, with follow up by technical assistance if needed.

These results will help the LAC develop long-term targets at the 2021 Biennial Review. Likely targets include:

- **Provide adequate riparian vegetation, consistent with site capability, for streambank stability and stream shading.**

  By 2021, perennial stream reaches will be evaluated for vegetative water quality function (shading, bank stability, and filtration of potential pollutants in overland flows). The method consists of a combination of aerial photo evaluation and local knowledge to determine how similar the ground cover and canopy cover/shade are to what could be provided by site capable vegetation.

These results will help the LAC develop long-term targets at the 2021 Biennial Review. Likely targets include:

- **Programmatically, ODA has a long-term milestone to achieve 90% of site capable vegetation throughout all agricultural lands in the state. Achieving site capable vegetation does not guarantee that all water quality functions are present.** (Section 1.4.5)

### 3.1.2 Focus Area(s)

#### 2015-2019 Lower Willow Creek Focus Area

The current Focus Area is Lower Willow Creek that includes HUC 17070701040502 in Morrow County encompassing 29,610 total acres, and HUC 1707040503 in Gilliam County encompassing 15,380 total acres. The Focus Area will focus mainly on the ag lands associated with the stream area. Ag land includes irrigated and dryland, and livestock grazing.

**Assessment Method:**
The Districts use ODA’s Streamside Vegetation Assessment (SVA) Tool to assess streamside conditions. The SVA is used throughout the state by many districts, which provides a consistent way to assess...
progress at various scales. Using geographic information system (GIS) remote imagery, vegetation types within a 35-foot assessment area are mapped. Outreach and project implementation follow the initial assessment. Post-project assessments can be done periodically to gauge whether streamside vegetation is providing additional benefits.

For a description of assessment results, see Chapter 4.

### 3.1.3 Lower Umatilla Basin (LUB) GWMA

Oregon’s 1989 Groundwater Quality Protection Act (Act) [ORS 468B.180] requires DEQ to declare a GWMA if groundwater contamination, resulting at least in part from nonpoint source activities, exceeds certain threshold levels. For most contaminants, the threshold level is 50 percent of a federal drinking water standard. In the case of nitrate, the threshold level is 70 percent of the 10 milligrams per liter (mg/L) federal drinking water standard (i.e., 7 mg/L).

DEQ declared the Lower Umatilla Basin a Groundwater Management Area in 1990 because nitrate concentrations exceeded 7 mg/L in many area groundwater samples. After the GWMA was declared, a four-year interagency hydrogeologic investigation was conducted to determine the extent of contamination and to identify the potential sources of that contamination.

### 3.2 Strategies and Activities

To achieve clean water, an effective strategy must increase awareness of the problem and the range of potential solutions, motivate appropriate voluntary action, and provide for technical and financial assistance to plan and implement effective conservation practices.

The following strategies will be employed, at the local level, by the Morrow SWCD, through an annual Scope of Work and Memorandum of Agreement with ODA, in cooperation with landowners and other agencies and organizations.

The following guidelines will apply for public participation in implementation and review of the Area Plan. ODA and the SWCD intend to encourage participation in this water quality improvement program by:

- Providing educational programs to raise public awareness and understanding of water quality issues and solutions,
- Providing incentives for the development and implementation of Voluntary Water Quality Plans,
- Offering technical assistance for the development and implementation of effective agricultural management practices for pollution control,
- Identifying focus areas for pollution source identification and determining areas for implementing restoration activities including reasonable timelines for management strategies targeting TMDL attainment,
- Developing a monitoring program to identify current and potential water quality problems,
- Following up on any water quality complaints and provide assistance in solving identified problems, and
- Evaluating Area Plan progress and effectiveness.

#### 3.2.1 Education Programs

As resources allow, the SWCD, and OSU Extension Service (Extension), in partnership with other agencies and local organizations, will develop educational programs to improve the awareness and understanding of water quality and quantity issues. The objective of the educational programs is to promote the programs in a manner that reduces conflict and encourages cooperative efforts through education and technical assistance activities by:
• Incorporating implementation of the Area Plan as a priority element in the Morrow Soil and Water Conservation Districts’ Annual Work Plan and Long-Range Plan with support from partner organizations,
  • Showcase successful practices/systems and conduct annual tours for landowners/media,
  • Recognize successful projects and practices through appropriate media and newsletters,
  • Promote cooperative on-the-ground projects to solve critical problems identified by landowners and in cooperation with partner organizations,
  • Conduct educational outreach to promote public awareness of water quality issues,
  • Coordinate the review of information and education materials with agencies or organizations as appropriate.

3.2.2 Voluntary Water Quality Plans
Landowners and operators have flexibility in choosing management approaches and practices to address water quality issues on their lands. They may implement management systems on their own without a plan or may develop a plan that suits the needs of their operation. The local management agencies recommend that voluntary water quality plans be developed to assist the landowners and operators to assess the conditions on their lands, identify problems or potential problems on their land, and to describe measures and resources needed to address those problems. Voluntary water quality plans describe the management systems and schedule of conservation practices that the landowner will use to conserve soil, water, and related plant and animal resources on all or part of a farm or ranch unit.

Voluntary water quality plans may be developed by landowners, operators, consultants, or technicians available through SWCD or USDA/NRCS. An effective voluntary water quality plan will outline specific measures necessary to prevent or control water pollution and soil erosion from agricultural activities and address the "Prevention and Control Measures” outlined in this Area Plan.

Farm planning assistance is available from these and other sources:
  • Technical Assistance,
    o NRCS - planning, design, implementation,
    o SWCD – planning, design, implementation, grant writing,
    o Watershed councils –planning, implementation, grant writing,
    o Workbooks and Publications,
      ▪ Voluntary Conservation On Your Land, NRCS/Oregon Association of Conservation Districts (OACD),
      ▪ Oregon Small Acreages Conservation Toolbox, NRCS/OACD,
      ▪ WEST Program Workbook, Oregon Cattleman’s Assoc. (OCA)/OSU,
      ▪ Ranch Water Quality Planning Workbook, OSU Extension,
      ▪ The Oregon Plan Toolbox, Oregon Watershed Enhancement Board (OWEB).

3.2.3 Technical and Financial Assistance
It is not the intent of this Area Plan to impose a financial hardship on any individual. It is the responsibility of the landowner or operator to request technical and/or financial assistance, if needed, and to develop a reasonable time frame for addressing potential water quality problems.

As resources allow, the Morrow and Gilliam SWCDs, USDA-NRCS, area watershed councils, ODA, and other natural resource agency staff are available to assist landowners in evaluating effective practices for improving streamside vegetation and reducing runoff and soil erosion on their farms and incorporating these practices into voluntary individual water quality plans. Personnel in these offices can also design and assist with implementation of practices, and assist in identifying sources of cost-sharing funds for the
construction and/or use of some of these practices.

Technical and cost-sharing assistance for installation of certain management practices may be available through current USDA conservation programs such as Environmental Quality Incentive Program (EQIP), CREP, Continuous Conservation Reserve Program (CCRP); EPA's non-point source implementation grants (Section 319); or state programs such as OWEB, the Riparian Tax Incentive Program, and the Wildlife Habitat Conservation and Management Program. Other agencies may also be available to provide technical assistance or financial assistance to private landowners.

### 3.2.4 Water Quality Management Practices

Effective agricultural management practices for pollution control, are those management practices and structural measures that are determined to be the most effective, practical means of controlling and preventing pollution from agricultural activities.

Appropriate management practices for individual farms may vary with the specific cropping, topographical, environmental, and economic conditions existing at a given site. Due to these variables, it is difficult to recommend any uniform set of management practices to improve water quality relative to agricultural practices.

Management practices and land management changes are most effective when selected and installed as integral parts of a comprehensive resource management plan based on natural resource inventories and assessment of management practices. The result is a system using the management practices and land management changes which are designed to be complementary, and when used in combinations, are more technically sound than each practice separately.

Detailed listings of a number of specific practices and management measures which can be employed to control or reduce the risk of agricultural pollution are contained in other documents such as the Field Office Technical Guide, available for reference at the local NRCS office.

### 3.3 Monitoring and Evaluation

DEQ monitors two sites in the Management Area as part of their ambient monitoring network (Willow Creek at Rhea Creek Road and Rhea Creek near Morter Road).

DEQ evaluated data from DEQ, EPA, and USGS databases for January 1, 2000 to July 1, 2018 for the Management Area. DEQ determined status for stations with data from 2016 through 2018 and trends for stations with at least eight years of data. Their report is summarized in Chapter 4 and can be found at [http://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx](http://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx). The report will be updated for future biennial reviews.

For a description of monitoring and evaluation results, see Chapter 4.
Chapter 4: Implementation, Monitoring, and Adaptive Management

4.1 Progress Toward Measurable Objectives

4.1.1 Management Area
Management Area-Wide Measurable Objectives will be completed during the 2021 Biennial Review.

4.1.2 Focus Area

Table 2: Lower Willow Creek - Streamside Vegetation Assessment Results

<table>
<thead>
<tr>
<th>SVA Map Category (Alphabetical)</th>
<th>2015</th>
<th>2017</th>
<th>2019</th>
<th>Change Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag Infrastructure</td>
<td>1.18</td>
<td>1.18</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>Bare</td>
<td>5.46</td>
<td>5.46</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>Bare Ag</td>
<td>0.71</td>
<td>0.71</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>Grass</td>
<td>135.29</td>
<td>135.29</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>Grass Ag</td>
<td>1.79</td>
<td>1.79</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>Not Ag</td>
<td>1.13</td>
<td>1.13</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>Shrub</td>
<td>54.02</td>
<td>54.02</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>Shrub Ag</td>
<td>0</td>
<td>0</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>Tree</td>
<td>25.79</td>
<td>25.79</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>Tree Ag</td>
<td>0</td>
<td>0</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>25.53</td>
<td>25.53</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL ACRES</strong></td>
<td><strong>250.89</strong></td>
<td><strong>250.89</strong></td>
<td><strong>250.89</strong></td>
<td></td>
</tr>
</tbody>
</table>

Currently, the SWCD is continuing with their educational programs and partnerships. A monthly water quality/riparian article is planned. Currently, the SWCD has a Russian knapweed bio-control grant through ODA to increase bio-control numbers in the Focus Area and across eastern Oregon to control the infestation and spread of the weed. The 2019 results will be reported during the 2021 Biennial Review.

Milestone: By 2021, decrease Grass Ag [1.79 acres] + Bare Ag [.71] by 1.5 acres
2015 Conditions: [Grass Ag] 1.79 + [Bare Ag] .71 = 2.5 acres

4.1.3 LUB GWMA
The ultimate goal of the Local Action Plan is to improve the overall groundwater quality by obtaining declining nitrate concentrations of less than 7 mg/L throughout the region. The achievement of this goal necessitates active involvement from many difference entities, assessment of progress in implementing strategies, and finally, measuring groundwater quality.

Implementation of the strategies identified in the Local Action Plan is critical to the overall success of the Plan and the eventual decline of nitrate levels in the GWMA. Implementation relies on voluntary actions among the agencies and land use groups in the region. This voluntary approach is built on the belief that local jurisdictions in the area are best suited to develop and implement actions to reduce risks to groundwater quality.

A copy of the Local Action Plan and implementation strategies can be found at: [http://lubgwma.org](http://lubgwma.org)
4.2 Activities and Accomplishments

Many conservation activities and implementation monitoring tracks have been implemented to benefit water quality. The SWCD and NRCS track activities that have been implemented through quarterly reports to ODA and through a NRCS database, respectively. Projects that have received funding from the OWEB are tracked in OWEB’s restoration database. In addition, partner agencies can submit reports of projects and activities in the Management Area that improve water quality.

2017-2018 Educational Programs

- A Watershed Field Day is held each spring for county 5th graders with education stations dealing with water quality, weather, weed/plant identification, riparian planting stations, wildlife identification and soils.
- A free spray day was held in Boardman, Irrigon and Heppner in May of 2017 and 2018 to provide mixed chemical to homeowners for weed control along with information on clean water and watershed information.

2017-2018 Technical Assistance

- Provided funding information and field visits for grant writing to landowners: 61 individuals
- Provided application and final reporting for 16 small grants


- Livestock pipeline/spring development/watering facility: 81
- Fence: 4 – 9,715 ft.
- CRP practices: 8,430.1 AC
- Forest stand improvement: 700.5 AC
- Irrigation improvement: 1,575.9 AC
- Range planting acres: 211.6 AC
- Brush mgmt/herbaceous weed control: 1,057.6 AC
- Direct seed/no-till/reduced till: 1,487.8 AC
- Habitat improvement: 17,457.7 AC
- Livestock mgmt improvements: 234.1 AC

2017-2018 Financial Assistance

- Morrow County has provided $110,000 in the last biennium in support of our programs.
- ODA/OWEB support to LAC was approved in the amount of $151,162 to accomplish the annual Scope of Work.
- OWEB Small Grants: $36,170
- OWEB Large Grants: $47,901
- CTWS Project: $37,125

4.3 Monitoring—Status and Trends

4.3.1 Water Quality

DEQ

For this biennial review, DEQ reviewed data from 23 monitoring stations, of which four had sufficient data for this status and trends analysis (DEQ. Willow Creek AgWQ Management Area: DEQ’s Water Quality Status and Trends Analysis for the Oregon Department of Agriculture’s Biennial Review of Agricultural Area Rules and Plan. 27pp. 2018).
See the DEQ report for all maps and graphs (https://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx).

Table 3: Main Agricultural Water Quality Concerns Identified (Highlighted in Grey)

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Site Description</th>
<th>E. coli (mpn/100mL)</th>
<th>pH</th>
<th>Dissolved Oxygen (mg/L)</th>
<th>Temperature (deg C)</th>
<th>Total Phosphorus (mg/L)</th>
<th>Total Suspended Solids (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>36784</td>
<td>Willow Ck at Rhea Ck Rd</td>
<td>-/41</td>
<td>7/41</td>
<td>0/41</td>
<td>-</td>
<td>0.11; 41&lt;sup&gt;4,5&lt;/sup&gt;</td>
<td>7; 41&lt;sup&gt;4,5&lt;/sup&gt;</td>
</tr>
<tr>
<td>36785</td>
<td>Rhea Ck at Morter Rd</td>
<td>3/41</td>
<td>4/41</td>
<td>11/41</td>
<td>-</td>
<td>0.08; 41&lt;sup&gt;4,5&lt;/sup&gt;</td>
<td>5; 38</td>
</tr>
<tr>
<td>USGS-14034470</td>
<td>Willow Ck abv Willow Ck Reservoir</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>502/2893</td>
<td>-</td>
</tr>
<tr>
<td>USGS 14034500</td>
<td>Willow Ck at Heppner</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>36/3100&lt;sup&gt;4,5&lt;/sup&gt;</td>
<td>-</td>
</tr>
</tbody>
</table>

1 N = total # of observations
2 DEQ has no benchmark for total phosphorus in this Management Area; ODA benchmark for potential water quality concerns = 0.08 mg/L
3 DEQ has no benchmark for TSS in this Management Area
4 Statistically significant improving trend
5 Statistically significant seasonal patterns

Water quality in Willow Creek below Heppner is driven by releases from Willow Creek reservoir. 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 from both agricultural and forest practices; considering the stream length in the forest, probably more to forest practices.

Willow Creek at Rhea Creek Road: few issues were identified in this analysis, and any trends are improving. In addition, the seven E. coli exceedances were scattered across six years. Even though total phosphorus values were generally higher than ODA’s benchmark, the TMDL does not consider phosphorus to be the source of other water quality problems in the mainstem of Willow Creek. High total phosphorus values correspond to peaks in total suspended solids, suggesting that much of the phosphorus is entering Willow Creek via soil erosion. Accordingly, soil erosion BMPs should address the relatively high phosphorus concentrations.

Rhea Creek at Morter Road: all E. coli exceedances were in 2012. The main concerns are dissolved oxygen and total phosphorus. Dissolved oxygen values drop below the criterion every summer. If temperature data had been collected here, they would likely show a correlation with the low dissolved oxygen values. Determining the cause of degraded dissolved oxygen on Rhea Creek would require further investigation. Half the phosphorus values still exceed the ODA benchmark. High total phosphorus values correspond to peaks in total suspended solids, suggesting that much of the phosphorus is entering Willow Creek via soil erosion. Given the local land use, the cause is likely agriculture, forestry, or road-associated erosion.

### 4.3.2 Land Conditions

Willow Creek was first photographed and evaluated as part of the aerial photo monitoring program in 2007. Segments of Hinton, Rhea, and Willow creeks were randomly selected and photographed. These streams had similar landscape conditions, resulting in similar riparian index scores. Willow Creek had the highest riparian index score, while Hinton had the lowest. Hinton had the largest percentage of bare ground or agricultural use, ranging from 11 to 33 percent. Both Rhea and Willow had between one and six percent bare/agricultural land. No stream had more than 3 percent tree cover.

The evaluated section of Hinton Creek was mostly ditched, with about six small impoundments. Two areas flowed through fenced, bare dirt corals. The lower 25 percent appears to be regaining some sinuosity.
The upper reach of Rhea Creek appeared to have many cattle with direct access to the stream. Most of this area has been channelized, but the lower 50 percent of the reach appears to have a mostly natural channel.

Most of the Willow Creek reach evaluated has been channelized; four diversions are visible. The uppermost diversion had a severely eroded channel adjacent to it. Algae or other aquatic vegetation was visible in many stretches of the creek.

**Table 4: Land Condition Scores**

<table>
<thead>
<tr>
<th>Stream</th>
<th>2007 Score</th>
<th>2012 Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinton Creek</td>
<td>26.31</td>
<td>26.31</td>
</tr>
<tr>
<td>Rhea Creek</td>
<td>30.29</td>
<td>29.83</td>
</tr>
<tr>
<td>Willow Creek</td>
<td>31.80</td>
<td>32.13</td>
</tr>
</tbody>
</table>

None of the three streams assessed in this basin had appreciable change in RIS from 2007 to 2012. Qualitative assessment of the landscape/stream conditions did not show any notable changes in the five years since previously monitored.

### 4.4 Biennial Reviews and Adaptive Management

The eighth Biennial Review of the Willow Creek Agricultural Water Quality Plan was held on March 20, 2019 at the Ag Service Center in Heppner. Six members of the LAC were present as well as representatives of the Morrow SWCD, DEQ, and ODA.

The SWCD presented a report of the implementation activities of the SWCD and partners during the past two years. They presented the results of the Focus Area assessment and landowner contacts.

The Area Plan updates were presented and discussed. Discussion was held regarding Focus Area, DEQ monitoring trend and status report, and the proposed measurable objectives, timelines, and milestones.
Appendix 1: References


NRCS Field Office Technical Guide, NRCS Oregon, 2018

Water Quality Limited Streams - 303(d) List, DEQ, 2012

Oregon Revised Statutes, Chapter 340, Division 41, DEQ, March 1996

Oregon Revised Statutes, Chapter 603, Divisions 90 and 95, ODA Oregon Revised Statutes, 468B Oregon Revised Statutes, 561.191 Oregon Revised Statutes, 568.900 through 568.933

Oregon Small Acreages Conservation Toolbox, NRCS /OACD, 2017

Questions and Answers About DEQ’s Temperature Standards, DEQ, February 2013

Ranch Water Quality Planning Workbook, OSU Extension

Research in the Willow Creek watershed: Estimates of sediment and phosphorus loads from subcatchments; gauging public response to a constructed wetland; and a quantitative assessment of a conceptual constructed wetland, University of Idaho, 2014


Riparian Area Management; Process for Assessing Proper Functioning Condition, BLM, 2015

The Ecological Provinces of Oregon, Oregon Agricultural Experiment Station, May 1998

The Oregon Plan Toolbox, Oregon Watershed Enhancement Board Umatilla Basin Report, Oregon Water Resources Department, 1988

Umatilla Subbasin / Willow Creek Subbasin Summary, prepared for the Northwest Power Planning Council, 2001


WESt Program Workbook, Oregon Cattleman’s Association, 1998

Willow Creek Lake, Limnological and Water-quality Studies, Final Report, Larson, Portland State University, 1997