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<td>Area Plan</td>
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<td>Agricultural Water Quality Management Area Rules</td>
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<td>Confined Animal Feeding Operation</td>
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<td>NPDES</td>
<td>National Pollution Discharge Elimination System</td>
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<td>ORS</td>
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<td>OWEB</td>
<td>Oregon Watershed Enhancement Board</td>
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<td>OWRI</td>
<td>Oregon Watershed Restoration Inventory</td>
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<td>PMP</td>
<td>Pesticides Management Plan</td>
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<td>Pesticides Stewardship Partnership</td>
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<td>Strategic Implementation Area</td>
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<td>SWCD</td>
<td>Soil and Water Conservation District</td>
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<td>TMDL</td>
<td>Total Maximum Daily Load</td>
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<td>United States Department of Agriculture</td>
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<td>WPCF</td>
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<td>WQPMT</td>
<td>Water Quality Pesticides Management Team</td>
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Foreword

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

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

Required Elements of Area Plans

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

Plan Content

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

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

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

Chapter 4: Progress and Adaptive Management. Describes progress towards achieving the goal of the Area Plan and summarizes results of water quality and land condition monitoring.
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Chapter 1: Agricultural Water Quality Program

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

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

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

Each Area Plan is accompanied by Area Rules that describe local agricultural water quality regulatory requirements. ODA will exercise its regulatory authority for the prevention and control of water pollution from agricultural activities under the Ag Water Quality Program’s general regulations (OAR 603-090-0000 to 603-090-0120) and under the Area Rules for this Management Area (OAR 603-095-2600 to 603-095-2660). The general regulations guide the Ag Water Quality Program, and the Area Rules for the Management Area are the regulations with which landowners must comply. Landowners are encouraged through outreach and education to implement conservation and management activities.

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

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

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

1.2 History of the Ag Water Quality Program

In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion and to achieve water quality standards (ORS 568.900 through ORS 568.933). The Oregon Legislature passed additional legislation in 1995 to clarify that ODA is the lead agency for regulating agriculture with respect to water quality (ORS 561.191).

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

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

Figure 1.2 Map of 38 Agricultural Water Quality Management Areas*

1.3 Roles and Responsibilities

1.3.1 Oregon Department of Agriculture

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

• State water quality standards,
• Load allocations for agricultural or nonpoint source pollution assigned under Total Maximum Daily Loads (TMDLs) issued pursuant to the federal Clean Water Act (CWA), Section 303(d),
• Approved management measures for Coastal Zone Act Reauthorization Amendments (CZARA),
• Agricultural activities detailed in a Groundwater Management Area (GWMA) Action Plan (if DEQ has established a GWMA in the Management Area and an Action Plan has been developed).
ODA bases Area Plans and Area Rules on scientific information (ORS 568.909). ODA works in partnership with SWCDs, LACs, DEQ, and other partners to implement, evaluate, and update the Area Plans and Area Rules. If and when other governmental policies, programs, or rules conflict with the Area Plan or Area Rules, ODA will consult with the appropriate agencies to resolve the conflict in a reasonable manner.

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

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

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

ODA Receives Public Complaint, Agency Notification, or ODA Staff Observation.

*SIA Compliance Evaluation

Information is Complete & Valid?

- **No**
  - Case Not Opened

- **Yes**
  - Conduct Investigation

  - Water Quality Concerns Documented?

    - **No Concerns**
      - Letter of Compliance Case Closed

    - **Yes**
      - Follow-Up Investigation

      Violation?

      - **No**: Letter of Compliance Case Closed
      - **Yes**: Notice of Noncompliance

        Follow-Up Investigation

        Violation?

        - **No**: Letter of Compliance Case Closed
        - **Yes**: Civil Penalty

*Cases initiated by the Strategic Implementation Areas (SIA) process will follow the compliance procedure outlined in the flow chart.

**Pre-Enforcement Letter (Advisory not Enforcement)**

**May issue a Notice of Noncompliance if there is a serious threat to human health or environment**

Note: Landowner may seek assistance from SWCD or other sources as needed throughout the process. However, cost-share funds may no longer be available once a Notice of Noncompliance has been issued.
1.3.2 Local Management Agency

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

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

1.3.3 Local Advisory Committee

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

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

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

1.3.4 Agricultural Landowners

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

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

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

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

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

1.3.5 Public Participation

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

1.4 Agricultural Water Quality

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

1.4.1 Point and Nonpoint Sources of Water Pollution

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

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

1.4.2 Beneficial Uses and Parameters of Concern

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

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

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

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

As part of the TMDL process, DEQ identifies Designated Management Agencies and Responsible Persons, which are parties responsible for submitting TMDL implementation plans. TMDLs designate ODA as the lead agency responsible for implementing the TMDL on agricultural lands. ODA uses the applicable Area Plan(s) as the implementation plan for the agricultural component of the TMDL. Biennial reviews and revisions to the Area Plan and Area Rules must address agricultural or nonpoint source load allocations from relevant TMDLs.

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

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

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

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

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

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

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

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

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

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

1.4.5 Streamside Vegetation and Agricultural Water Quality

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

Site-Capable Vegetation

The Ag Water Quality Program uses the concept of “site-capable vegetation” to describe the streamside vegetation that can be expected to grow at a particular site, given natural site factors (e.g., elevation, soils, climate, hydrology, wildlife, fire, floods) and historical and current human influences that are beyond the program’s statutory authority (e.g., channelization, roads, modified flows, previous land management). Site-capable vegetation can be determined for a specific site based on: current streamside vegetation at the site, streamside vegetation at nearby reference sites with similar natural characteristics, Natural Resources Conservation Service (NRCS) soil surveys and ecological site descriptions, and/or local or regional scientific research.
The goal for Oregon’s agricultural landowners is to provide the water quality functions (e.g., shade, streambank stability, and filtration of pollutants) produced by site-capable vegetation along streams on agricultural lands. The Area Rules for each Management Area require that agricultural activities allow for the establishment and growth of streamside vegetation to provide the water quality functions equivalent to what site-capable vegetation would provide.

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

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

1.4.6 Soil Health and Agricultural Water Quality

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

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

1.5 Other Water Quality Programs

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

1.5.1 Confined Animal Feeding Operation Program

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

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

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

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

1.5.3 The Oregon Plan for Salmon and Watersheds

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

1.5.4 Pesticide Management and Stewardship

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

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

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

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

1.5.5 Drinking Water Source Protection

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

1.5.6 Oregon’s Coastal Management Program

The mission of the Oregon Coastal Management Program is to work in partnership with coastal local governments, state and federal agencies, and other partners and stakeholders to ensure that Oregon’s coastal and ocean resources are managed, conserved, and developed consistent with statewide planning goals. Oregon's Coastal Nonpoint Pollution Control Program (CNPCP) has been developed to comply with requirements of Section 6217 of the federal CZARA. The US EPA and the National Oceanic and Atmospheric Administration administer CZARA at the federal level. The federal requirements are designed to restore and protect coastal waters from nonpoint source pollution and require coastal states to implement a set of management measures based on guidance published by the US EPA. The guidance contains measures for agricultural activities, forestry activities, urban areas, marinas, hydro-modification activities, and wetlands. The geographic boundaries for the CNPCP include the North Coast, Mid-Coast, South Coast, Rogue, and Umpqua basins. Oregon has identified the ODA coastal Area Plans and Area Rules as the state’s strategy to address agricultural measures. The Area Plan and Area Rules are designed to meet the requirements of CZARA and to implement agriculture’s part of Oregon’s CNPCP. For more information, visit www.oregon.gov/lcd/OCMP/Pages/Coastal-Zone-Management.aspx.

1.6 Partner Agencies and Organizations

1.6.1 Oregon Department of Environmental Quality

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

A Memorandum of Agreement between DEQ and ODA recognizes that ODA is the state agency responsible for implementing the Ag Water Quality Program. ODA and DEQ updated the Memorandum of Agreement in 2012 and reviewed and confirmed it in 2018 (http://www.oregon.gov/ODA/shared/Documents/Publications/NaturalResources/DEQODAmoa.pdf).
The Environmental Quality Commission, which serves as DEQ’s policy and rulemaking board, may petition ODA for a review of part or all of any Area Plan or Area Rules. The petition must allege, with reasonable specificity, that the Area Plan or Area Rules are not adequate to achieve applicable state and federal water quality standards (ORS 568.930(3)(a)).

1.6.2 Other Partners

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

1.7 Measuring Progress

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

1.7.1 Measurable Objectives

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

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

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

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

The measurable objective(s) and associated milestone(s) within the Management Area are in Chapter 3 and progress toward achieving the measurable objective(s) and milestone(s) is summarized in Chapter 4.
1.7.2  Land Conditions and Water Quality

Land conditions can serve as useful surrogates (indicators) for water quality parameters. For example, because shade blocks solar radiation from warming the stream, streamside vegetation, or its associated shade, generally is used as a surrogate for water temperature. In some cases, sediment can be used as a surrogate for pesticides or phosphorus, which often adhere to sediment particles.

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

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

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

1.7.3  Focused Implementation in Small Geographic Areas

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

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

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

Strategic Implementation Areas
Strategic Implementation Areas (SIAs) are small watersheds selected by ODA, in consultation with partners, based on a statewide review of water quality data and other available information. ODA conducts an evaluation of likely compliance with Area Rules and contacts landowners with the results and next steps. The Oregon Watershed Enhancement Board (OWEB) and other partners make funding and technical assistance available to support conservation and restoration projects. These efforts should result in greater ecological benefit than relying solely on compliance and enforcement. Landowners have the option of working with the SWCD or other partners to voluntarily address water quality concerns. ODA follows up, as needed, to enforce the Area Rules. Finally, ODA completes a post-evaluation to document progress in the SIA.
Any SIAs in this Management Area are described in Chapter 3.

1.8 Progress and Adaptive Management

1.8.1 Biennial Reviews

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

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

1.8.2 Water Quality Monitoring

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

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

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

Water quality monitoring efforts in this Management Area are described in Chapter 3, and the data are summarized in Chapter 4.
Chapter 2: Local Background

The Upper Willamette and Upper Siuslaw Agricultural Water Quality Management Area includes the drainage area of the Long Tom River, Upper Siuslaw River, and several smaller streams that drain directly to the Willamette River (Figure 2.1). The Management Area generally includes the west boundary of the Willamette River. Operational boundaries for the land base include all lands in agricultural use, agricultural and rural lands that are lying idle or on which management has been deferred, and forest lands with agricultural activities, with the exception of public lands managed by federal agencies.

Figure 2.1. Map of the Upper Willamette, Upper Siuslaw Management Area
2.1 Local Roles

2.1.1 Local Advisory Committee

The Area Plan was developed with the assistance of the LAC. The LAC was formed in 2001 to assist with the development of the Area Plan and Area Rules and with subsequent biennial reviews. Table 2.1.1 lists the current members of the LAC.

Table 2.1.1 Current LAC members

<table>
<thead>
<tr>
<th>Name</th>
<th>Geographic Representation</th>
<th>Agricultural Product or Interest Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jerry Marguth, Chair</td>
<td>Junction City/Long Tom</td>
<td>Grass seed, vegetables, mint</td>
</tr>
<tr>
<td>Robin Pfeiffer, Vice-Chair</td>
<td>Junction City/Long Tom</td>
<td>Wine grapes, timber</td>
</tr>
<tr>
<td>Rick Allison</td>
<td>Noti/Long Tom</td>
<td>Pasture, livestock, timber</td>
</tr>
<tr>
<td>Brian Parker</td>
<td>Junction City/Long Tom</td>
<td>Grass seed, flower, vegetable seed</td>
</tr>
<tr>
<td>Scott Gibson</td>
<td>Monroe/Long Tom</td>
<td>Grass seed, vegetables, mint, dairy</td>
</tr>
<tr>
<td>Tom Hunton</td>
<td>Junction City/Long Tom</td>
<td>Grass seed, mint</td>
</tr>
<tr>
<td>Barbara May</td>
<td>Eugene/Long Tom</td>
<td>Small acreage</td>
</tr>
<tr>
<td>Jan Nelson</td>
<td>Crow/Long Tom</td>
<td>Farm, forest</td>
</tr>
<tr>
<td>Jeff Levy</td>
<td>Lorane/Upper Siuslaw</td>
<td>Nursery</td>
</tr>
<tr>
<td>John Reerslev</td>
<td>Junction City/Long Tom</td>
<td>Grass seed, mint, sugar beet seed</td>
</tr>
</tbody>
</table>

2.1.2 Local Management Agency

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

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

2.2 Area Plan and Area Rules: Development and History

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

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

2.3 Geographical and Physical Setting

The Management Area is located in the southernmost part of the Willamette Valley west of the Willamette River. The Management Area includes most of the Long Tom watershed and the Upper Siuslaw watershed, as well as several small streams that drain directly into the Willamette River, including Spring Creek and Flat Creek. The area includes central Lane County and a small portion of Benton County; the cities of Eugene, Junction City, Monroe, and Veneta; and the rural communities of Crow, Elmira, Lorane, and Noti. The total size of the area is approximately 495,000 acres.
**Long Tom River**

The Long Tom River’s headwaters are on the east side of the Coast Range near Noti. The river flows southeast for several miles through forestlands, rural residential areas, and small acreage farms until it reaches the Willamette Valley floor near Veneta. The river then flows northward through rural residential areas and small farms and empties into Fern Ridge Reservoir. Below Fern Ridge Dam, the river meanders northeast, mostly through large-scale commercial farms, and empties into the Willamette River at Norwood Island and Sam Daws Bend.

Coyote Creek, a major tributary to the Long Tom River, begins near Lorane and flows northwest through forest and small acreage agricultural lands before emptying into Fern Ridge Reservoir near Highway 126. Amazon Creek also supplies some of the water to Fern Ridge Reservoir. Much of the upper Amazon Creek watershed is within the city of Eugene’s Urban Growth Boundary.

Above Fern Ridge Reservoir, other major tributaries include Noti Creek and Elk Creek. Both of these watersheds are mostly forested with a few rural residential properties and mid-sized family farms.

Below Fern Ridge Dam, Ferguson and Bear creeks are major tributaries of the Long Tom. The headwaters for both streams are found in the Coast Range and much of the land in these watersheds is forested. These creeks also flow through agricultural and rural residential lands before emptying into the Long Tom River west of Junction City.

**Spring Creek and Flat Creek**

Spring and Flat creeks both begin near Santa Clara and flow north through industrial and agricultural lands before their confluence with the Willamette River. Flat Creek flows parallel to Amazon Creek and may mix with Amazon Creek and the Long Tom River during high-flow events (Thieman, 2000).

Table 2.3.1 lists major tributaries of the Long Tom and Siuslaw watersheds within the Management Area.

**Table 2.3.1. Acreages and major tributaries of watersheds in the Management Area.** (Thieman, 2000; Oregon Geospatial Data Clearinghouse, 2002)

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Area (acres)</th>
<th>Major tributaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Tom River</td>
<td>257,584</td>
<td>Amazon Creek, Bear Creek, Coyote Creek, Elk Creek, Ferguson Creek, Spencer Creek</td>
</tr>
<tr>
<td>Upper Siuslaw River</td>
<td>200,554</td>
<td>Camp Creek, Douglas Creek, Letz Creek, South Fork, Walker Creek, Wildcat Creek, Wolf Creek</td>
</tr>
</tbody>
</table>

**Upper Siuslaw River**

The Upper Siuslaw River also begins east of the Coast Range, but it flows west to the Pacific Ocean. The Upper Siuslaw is included as part of this Management Area, instead of the Mid Coast Management Area along with the Lower Siuslaw, because the climate, soils, and agricultural land uses are more similar to those in the Upper Willamette than most of the coastal watersheds.

From the confluence of the North and South forks west of Lorane, the Siuslaw River flows northwest until about Walton. The Upper Siuslaw watershed boundary hydrologically ends at Austa and becomes the Lower Siuslaw Lake Creek, a major tributary, joins the Siuslaw near Swisshome then the river flows southwest until it reaches the ocean at Florence.

Except for an agricultural area around Lorane, most of the Upper Siuslaw watershed is forested. Agricultural lands in the Lorane Valley include family livestock and hay operations, vineyards, nurseries,
and rural residential properties. Agricultural activities combined with rural residential land use are lightly distributed through lower portions of the Wildcat Creek watershed and the Chickahominy Creek drainage.

Major tributaries of the Siuslaw River within the Management Area include Wolf, Wildcat, and Chickahominy creeks. There are also many small tributaries that flow directly into the Upper Siuslaw River from steep Coast Range slopes.

Geology and Soils

Coast Range
The Coast Range was created by compression and uplift as the Juan de Fuca, Kula, and Farallon plates subducted under the North American plate along the Pacific Coast. The mountains are composed primarily of sedimentary rocks such as shale, sandstone, and siltstone, as well as some volcanic material (Patching et al, 1987).

Soils in the Coast Range Mountains are formed primarily from sedimentary material as well as some volcanic material. They are relatively unstable and subject to puddling and active erosion. Soils in the Coast Range foothills formed from alluvial and colluvial deposits, which have been weathered extensively. They are less subject to slumping than soils in steeper areas.

Willamette Valley
Willamette Valley lowlands are composed of alluvial material deposited during the Missoula floods and by the rivers and their tributaries. The alluvial material is underlain by sedimentary and volcanic formations, deposited through erosion as uplift processes created the Coast Range. Depending on the composition of the deposited material, soils in bottomlands and terraces range from excessively drained loams and well-drained gravelly loams to poorly drained silty clay loams and silt loams (Patching et al, 1987).

Climate
Like most of Western Oregon, the climate of the Management Area is relatively mild throughout the year. Temperatures rarely fall below zero during the winter and exceed 90° F for only a few days during the summer each year (Patching, 1987). Average summer temperatures range from the low 50s to low 80s, and average temperatures in the winter are generally between the low 30s to about 40° F. The mean growing season (the number of days between 32° F temperatures) is 150 to 180 days on the valley floor to 110 to 130 days in the foothills (Patching, 1987).

Precipitation in the Management Area ranges from approximately 40 to 45 inches on the valley floor to 60 to 120 inches in the foothills and Coast Range. Approximately 70 percent of the precipitation falls during November through March. Most of the precipitation is in the form of rain on the Willamette Valley floor. The amount of snowfall increases with elevation.

Biological Resources
A variety of species depend on the Management Area’s aquatic and upland habitats. In foothill and Coast Range forests, vegetation includes Douglas fir, western hemlock, grand fir, western red cedar, bigleaf maple, and Oregon white oak (Pojar and MacKinnon, 1994). Forest wildlife species include Roosevelt elk, blacktail deer, black bear, porcupine, voles, and a variety of resident and neotropical migratory songbirds and raptors (Csuti et al, 1997). Much of the lowland areas were historically wet prairie or oak savannah and remnants of these areas are scattered throughout the lower Long Tom watershed and Lorane Valley. Vegetation in these habitats includes Oregon white oak, California black oak, red alder, Oregon
ash, and a variety of grasses, rushes and sedges, and wildflowers. Wildlife species include the acorn woodpecker, western bluebird, sharp-tail and ring neck snakes, and several species of shrew. Lowland riparian and wetland vegetation in the Management Area includes Oregon ash, willow, red osier dogwood, black cottonwood, snowberry, serviceberry, Pacific ninebark, and wild rose (Guard, 1995). Aquatic and riparian-obligate species in the Management Area include beaver, western pond turtle, northern red-legged frog, Pacific tree frog, Oregon chub (Long Tom watershed, historically present), steelhead (Siuslaw watershed), cutthroat trout, Coho (Siuslaw watershed), Pacific and brook lamprey, and other resident fish species. Migratory waterfowl, shorebirds, raptors, and songbirds are seasonally abundant throughout the area as well.

**Land Use/Land Ownership**

**Agriculture and Forestry**

Forestry and agriculture are the predominant land uses in the area. There are approximately 324,310 acres of forestlands in the area (Oregon Geospatial Data Clearinghouse, 2002). Most of the forestlands are in the Coast Range and foothills. Major forest landowners and managers include the Bureau of Land Management, U.S. Forest Service, and many large and small private landowners.

Forest management on both federal and private lands has changed significantly in the past few decades. In federal forests, management objectives have diversified in recent years, and fish and wildlife habitat are now a greater priority. While timber harvest still occurs, there is less emphasis on timber production. Private landowners, from industrial timber companies to small woodland owners, are not only regulated by the Oregon Forest Practices Act, but have also made voluntary efforts to manage forestlands for multiple objectives including water quality.

Agricultural lands account for approximately 121,000 acres, or 25 percent of the Management Area (Oregon Geospatial Data Clearinghouse, 2002). Agriculture in the area includes grass seed, row crops, sheep, cattle, horses, and other livestock, hay, Christmas trees, vineyards, orchards, and nurseries. Farm sizes range from five acres with pasture and horses to diverse farms of several thousand acres.

**Limited Use Areas**

There are several large natural areas in the Management Area. In the Upper Siuslaw watershed, the Bureau of Land Management manages several large tracts of forestland. Between Eugene and Veneta, federal and local agencies, nonprofit organizations, and private landowners manage several thousand acres of natural and constructed wetlands, native prairie remnants, oak savannah, and other habitats. This area includes Fern Ridge Reservoir and associated wildlife areas, the West Eugene Wetlands, and the Willow Creek Preserve.

**Urban**

Eugene is the largest urban area in the Management Area. There are also several smaller cities and rural communities, including Crow, Elmira, Junction City, Lorane, Monroe, Noti, and Veneta. The total population of the incorporated communities in the Management Area in 2006 was estimated to exceed 219,000 (Population Research Center, 2007).

**Water Resources**

**Water Availability**

As with most streams with headwaters in the Coast Range, rainfall provides much of the surface water supply in Management Area watersheds. Seasonal fluctuations in stream flow are much more
pronounced in the Long Tom and Siuslaw watersheds than in streams with headwaters in the Cascade Mountains because snowmelt supplies a relatively small portion of the stream flow. Flow in the Siuslaw River during its highest flow month is 35 times the flow during the lowest flow month, while the high flow month low flow month ratio for the Long Tom River is 116 times, much “flashier” than the high flow low flow difference of just five times in the McKenzie River (Bastasch, 1998). Table 2.3.2 lists minimum, maximum, and average flows for several waterbodies in the area.

Groundwater resources in much of the Coast Range and foothills are relatively meager because there are few porous, permeable geologic formations to absorb and transmit water. Alluvial materials along major streams and rivers are the most abundant source of groundwater, with some of these wells capable of providing over 300 gallons per minute.

**Water Use**

Consumptive uses of water in the Management Area include irrigation, private and public drinking water, municipal use, and commercial use. Non-consumptive uses include recreation, power generation, and fish and wildlife habitat. Sources of appropriated water are reservoirs, surface water, and groundwater. Table 2.3.3 summarizes surface water allocations in the area. Allocations in cubic feet per second (cfs) represent the maximum amount of water that may be withdrawn at any given time; allocations in acre-feet (af) represent the total amount of water that may be withdrawn during a water year. In this table, “agriculture” appropriations are for agricultural uses other than irrigation, such as livestock watering.

**Table 2.3.2. Minimum, maximum, and average flow in several waterbodies in the Management Area.**

Flow is in cfs. Figures are derived from either U.S. Geological Survey stream gage data, gathered from the year the gage was installed until the present, or from Oregon Water Resources Department projections of stream flow based on water availability (U.S. Geological Survey, 2001, Oregon Water Resources Department, 1990).

<table>
<thead>
<tr>
<th>Waterbody</th>
<th>Average Summer Flow (cfs)</th>
<th>Average Winter Flow (cfs)</th>
<th>Minimum Flow (cfs)</th>
<th>Maximum Flow (cfs)</th>
<th>Average Annual Flow (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Tom @ Noti</td>
<td>38</td>
<td>542</td>
<td>.04</td>
<td>6,990</td>
<td>233</td>
</tr>
<tr>
<td>Long Tom @ Alvadore (just below Fern Ridge reservoir)</td>
<td>63</td>
<td>1,211</td>
<td>2</td>
<td>11,500</td>
<td>520</td>
</tr>
<tr>
<td>Long Tom River @ Monroe</td>
<td>70</td>
<td>1,842</td>
<td>7</td>
<td>19,300</td>
<td>760</td>
</tr>
<tr>
<td>Coyote Creek @ Crow</td>
<td>7</td>
<td>468</td>
<td>Not available</td>
<td>Not available</td>
<td>177</td>
</tr>
</tbody>
</table>

**Table 2.3.3. Water allocations in several waterbodies in the Management Area.**

Allocations are in cubic feet per second (cfs) or acre-feet (af) (Oregon Water Resources Department, 2003).

<table>
<thead>
<tr>
<th>Waterbody</th>
<th>Irrigation</th>
<th>Agriculture</th>
<th>Domestic</th>
<th>Industrial</th>
<th>Municipal</th>
<th>Fish and Wildlife/ Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat Creek</td>
<td>52 cfs</td>
<td>.08 cfs</td>
<td>.05 cfs</td>
<td>2 cfs</td>
<td>8 cfs</td>
<td>0 cfs</td>
</tr>
<tr>
<td></td>
<td>230 af</td>
<td>0 af</td>
<td>0 af</td>
<td>0 af</td>
<td>0 af</td>
<td>2 af</td>
</tr>
<tr>
<td>Long Tom</td>
<td>355 cfs</td>
<td>.2 cfs</td>
<td>.6 cfs</td>
<td>34 cfs</td>
<td>4 cfs</td>
<td>6 cfs</td>
</tr>
<tr>
<td></td>
<td>8,000 af</td>
<td>285 af</td>
<td>3 af</td>
<td>370 af</td>
<td>0 af</td>
<td>644 af</td>
</tr>
<tr>
<td>Upper Siuslaw</td>
<td>14 cfs</td>
<td>1 cfs</td>
<td>.4 cfs</td>
<td>1 cfs</td>
<td>0 cfs</td>
<td>245 cfs</td>
</tr>
<tr>
<td></td>
<td>17 af</td>
<td>34 af</td>
<td>0 af</td>
<td>0 af</td>
<td>0 af</td>
<td>154 af</td>
</tr>
</tbody>
</table>
Drinking Water Sources

Several communities obtain domestic drinking water from surface and groundwater sources in the Management Area. The Willamette portion of the Management Area contributes to two surface water drinking water source areas: The city of Monroe and Cascade Pacific Pulp, LLC. These two water systems serve over 1,400 people. In addition, 54 active public water systems use groundwater wells in the Management Area serving approximately 15,500 people. Community water systems using groundwater include the cities of Junction City and Veneta, Lakeshore Water District, and several mobile home park and home owners’ association water systems. Numerous schools, workplaces, and non-community water systems also rely on groundwater wells. Recommended actions to protect drinking water sources are integrated into Chapter 2.5.

2.4 Agricultural Water Quality

2.4.1 Water Quality Issues

The DEQ evaluated data from its own monitoring program, the Lane Council of Governments, the U.S. Geological Survey, and data collected in other local studies to determine the listing status of stream segments in the Management Area. Several stream segments exceed state standards for temperature, bacteria, dissolved oxygen, and turbidity.

Many water quality concerns occur seasonally throughout the Management Area. Temperature and dissolved oxygen violations occur during the summer months. When storm-related runoff and discharges are most likely to occur from a variety of sources, bacteria problems mainly occur during the fall, winter, and spring.

Many factors may affect water quality in the Management Area. Wastewater treatment plants, industrial operations, removal of riparian vegetation, seasonal reductions in stream flow, and stream channel and floodplain alteration may increase water temperature. Contributors to bacteria and nutrient levels include wastewater treatment plants, applications of municipal wastewater, legal and illegal waste dumping sites, leaching septic systems, runoff from residential areas, runoff from agricultural lands, and background sources such as geese and elk. Contributors to sediment and turbidity in waterways include bank erosion, channel modifications, and runoff from unvegetated areas including ditches and riparian zones, compacted soils and sites with poor manure management.

2.4.1.1 Beneficial Uses

Beneficial uses impaired by these water quality concerns include fish and aquatic life, drinking water, and water contact recreation.

Temperature

DEQ developed the temperature TMDL to protect salmon and trout spawning, rearing, and passage as the most sensitive beneficial uses in the Upper Willamette Subbasin. On agricultural lands, absence of streamside vegetation, water withdrawals, and land management that leads to widened stream channels contribute to elevated stream temperatures. DEQ has identified the existing nonpoint source pollution sources as solar heating of the Area’s waterways due to a lack of riparian vegetation from forestry, agriculture, rural-residential, and urban activities.

Bacteria

As the most sensitive beneficial use, DEQ developed the Upper Willamette bacteria TMDL to protect human water contact recreation (risk of infection and disease to people who come in contact with fresh
water while fishing, swimming, or boating). On agricultural lands, \textit{E. coli} generally comes from livestock waste, either deposited directly into waterways or carried to waterways via runoff and soil erosion. Runoff and soil erosion from agricultural lands may also carry bacteria from other sources. There are multiple potential sources of bacteria in streams, including humans (from recreation or failing septic systems) and wildlife.

\textit{Mercury}

Human fish consumption is the most sensitive beneficial use for which DEQ developed the Willamette mercury TMDL. Primary sources of mercury include air deposition from national and international sources, discharge from specific legacy mining sites, and erosion of soils containing mercury. Mercury contributions from agricultural lands originate primarily through soil erosion and transport. The goal for the revised TMDL is to lower mercury levels in rivers, lakes, and streams throughout the basin allowing for the safe eating of fish and shellfish.


\textit{Dissolved Oxygen}

The Willamette dissolved oxygen TMDL was developed to protect cool water aquatic life and salmonid spawning and rearing in the Amazon Diversion Channel and Coyote Creek. An interaction of high water temperatures and nutrient levels create low dissolved oxygen levels that threaten fish survival. DEQ has identified multiple sources of pollutants, including storm water discharges, agricultural run-off, and insufficient riparian vegetation.

\textit{Turbidity}

As the most sensitive beneficial uses, DEQ developed the turbidity TMDL for Fern Ridge Reservoir to address trout rearing, resident fish and aquatic life, and water supply and aesthetics. For potential sources of turbidity and fine sediment, DEQ has identified urban storm water discharge, urban and agricultural run-off, and bank erosion from areas where the riparian vegetation has been removed.

2.4.1.2 \textbf{WQ Parameters and 303(d) list}

Every two years, DEQ is required to assess water quality and report to the U.S. EPA on the condition of Oregon’s waters. DEQ prepares an Integrated Report in accordance with Clean Water Action (CWA) Sections 303(d), 305(b), and 314. The Integrated Report includes an assessment of each water body where data are available, the list of waters identified under Section 303(d) as water quality limited and needing a TMDL, as well as waters with established TMDLs that are expected to improve water quality.

An update to the Integrated Report is currently going through final review at DEQ. DEQ anticipates submittal to EPA by April 2020. Until final EPA approval, the most current, active Integrated Report is the 2012 version. The 2012 Report can be found at \textit{http://www.oregon.gov/deq/wq/Pages/2012-Integrated-Report.aspx}.

2.4.1.3 \textbf{TMDLs and Agricultural Load Allocations}

DEQ has completed the Willamette Basin TMDLs for temperature, bacteria, and mercury and the US EPA approved the TMDLs in September of 2006. These TMDLs include temperature, bacteria, and
mercury loads specific to the Upper Willamette Subbasin. In addition, DEQ defined two additional TMDLs: dissolved oxygen for Amazon Diversion Channel and Coyote Creek and turbidity for Fern Ridge Reservoir.

Table 2.4.1.3. Agricultural load allocations that apply to the Management Area.

<table>
<thead>
<tr>
<th>Geographic Scope in Management Area</th>
<th>TMDL</th>
<th>Load Allocation for Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter: Temperature</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mainstem Willamette</td>
<td>Willamette TMDL (2006), Chapter 4</td>
<td>All nonpoint sources collectively (agriculture’s allocation is not specified): 0.05°C of the 0.3°C human use allocation (with a surrogate of effective shade)</td>
</tr>
<tr>
<td>Coyote Creek</td>
<td>Willamette TMDL (2006), Chapter 9</td>
<td>All nonpoint sources collectively (agriculture’s allocation is not specified): 0.05°C of the 0.3°C human use allocation (with a surrogate of effective shade)</td>
</tr>
<tr>
<td><strong>Parameter: Bacteria</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mainstem Willamette</td>
<td>Willamette TMDL (2006), Chapter 4</td>
<td>66% to 83% reduction from agricultural areas compared to average loads in 2006</td>
</tr>
<tr>
<td>Lower Long Tom Watershed (below Fern Ridge Reservoir)</td>
<td>Willamette TMDL (2006), Chapter 10</td>
<td>47% reduction compared to average loads in 2006</td>
</tr>
<tr>
<td>Upper Long Tom Watershed (above Fern Ridge Reservoir)</td>
<td>Willamette TMDL (2006), Chapter 10</td>
<td>77% reduction compared to average loads in 2006</td>
</tr>
<tr>
<td>Coyote Creek Watershed</td>
<td>Willamette TMDL (2006), Chapter 10</td>
<td>66% reduction compared to average loads in 2006</td>
</tr>
<tr>
<td>Upper Amazon</td>
<td>Willamette TMDL (2006), Chapter 10</td>
<td>58% reduction compared to average loads in 2006</td>
</tr>
<tr>
<td>A-3 Drain</td>
<td>Willamette TMDL (2006), Chapter 10</td>
<td>33% reduction compared to average loads in 2006</td>
</tr>
<tr>
<td>Fern Ridge Reservoir Watershed</td>
<td>Willamette TMDL (2006), Chapter 10</td>
<td>64% reduction compared to average loads in 2006</td>
</tr>
<tr>
<td><strong>Parameter: Dissolved Oxygen</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amazon Creek</td>
<td>Willamette TMDL (2006), Chapter 10</td>
<td>40% reduction in loads of BOD, nutrients, and volatile suspended solids</td>
</tr>
<tr>
<td>Coyote Creek</td>
<td>Willamette TMDL (2006), Chapter 10</td>
<td>20% reduction in loads of BOD, nutrients (including ammonia), and volatile suspended solids</td>
</tr>
<tr>
<td><strong>Parameter: Mercury</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entire Management Area</td>
<td>Willamette TMDL (2006), Chapter 3</td>
<td>Agriculture: 27% reduction compared to average loads in 2006</td>
</tr>
</tbody>
</table>

2.4.1.4 Drinking Water

Many public water systems in the management area have recent alerts for total coliform and/or *E. coli* in finished drinking water. In addition, untreated water from the Long Tom River at the city of Monroe's drinking water treatment plant has historically elevated turbidity. The city of Monroe is a community system using surface water with recent fecal bacteria alerts. Many public water systems in the management area have recent alerts for total coliform and/or *E. coli* in finished drinking water. Fecal bacteria and nitrate contaminants are often related to animal and cropland agriculture; fecal bacteria are present throughout the Management Area. Nitrate alerts (generated when nitrate in finished drinking water exceeds 5 mg/l) exist for Junction City. Most of the public water systems have agricultural land
uses (irrigated crops, pasture, and/or livestock) within their source areas, although intensity of use varies, and sources of contamination may come from other land uses.

Oregon Health Authority rated most of the community and non-transient non-community public water sources in the Management Area for contaminant susceptibility. All of the evaluated public water sources have a high to moderate susceptibility rating for land use impacts to drinking water sources. The majority of those evaluated have a high susceptibility rating based on Source Water Assessments, aquifer characteristics, well locations, and construction.

2.4.1.5 Southern Willamette Valley Groundwater Management Area (SWV GWMA)

In May 2004, DEQ declared a portion of the Southern Willamette Valley a GWMA because of elevated groundwater nitrate levels. A portion of the Upper Willamette and Upper Siuslaw Agricultural Water Quality Management Area is within the SWV GWMA (Figure 2.4.1.5). Starting in the south, the GWMA includes land bounded on the west by Territorial Highway from Highway 36 north to Monroe, Highway 99W from Monroe to Corvallis, and Highway 20 from Corvallis to Albany. From the east, the GWMA is bounded by I-5 from just south of Coburg north to the intersection of I-5 with Muddy Creek and then follows Muddy Creek until its confluence with the Willamette River near Corvallis. From the north, the eastern boundary is the Willamette River until its intersection with Highway 20. The southern boundary of the GWMA also includes several surface roads south of Junction City. Section 2.4.5 provides additional information about the GWMA and a map.

Although low background levels of nitrate (2 to 3 ppm) can be naturally occurring, a variety of human activities have caused high nitrate concentrations in the groundwater. Currently, 93 percent of the land area within the GWMA is in agricultural use. Although agricultural use makes up the vast portion of land area, there are also many non-agricultural potential sources of nitrate such as urban or rural residential land uses. Detailed information about the SWV GWMA can be found at http://gwma.oregonstate.edu. A new DEQ story map can be found at https://areg.is/1H4ynu that provides information and new analysis of the ground water nitrate trends.

The SWV GWMA stakeholder committee Action Plan for the SWV GWMA was finalized in 2009. The SWV GWMA Action Plan is not a regulatory document but includes many recommendations and voluntary strategies to address the issue of excess nitrate in regional groundwater. To address this, the SWV Action Plan provides recommendations and strategies to reduce nitrate inputs from four focus sectors: (1) agricultural, (2) residential, (3) commercial / industrial / municipal, and (4) public water supplies. The agricultural portion of the action plan is carried out by many partners. A cross-walk to identify actions that are implemented by ODA and the Upper Willamette SWCD is provided in Appendix D. Agricultural practices to address nitrates in groundwater are integrated into 2.5.

There are eleven public water systems within the GWMA that are also within the Agricultural Water Quality Management Area (Table 2.4.1.5). Five of these have reported detections of nitrate above background levels.
Table 2.4.1.5. Water Providers in the SWV GWMA

<table>
<thead>
<tr>
<th>Water System ID</th>
<th>Water System Name</th>
<th>Type</th>
<th>Nitrate Detections</th>
<th>Pop</th>
</tr>
</thead>
<tbody>
<tr>
<td>4191860</td>
<td>Shadow Hills Golf/Country Club</td>
<td>Non-community</td>
<td>Nitrate above background (3 to 4 ppm)</td>
<td>100</td>
</tr>
<tr>
<td>4195085</td>
<td>Diamond Woods Maintenance</td>
<td>State regulated</td>
<td>No</td>
<td>10</td>
</tr>
<tr>
<td>4100418</td>
<td>Junction City Water Utilities</td>
<td>Community</td>
<td>Emergency well has high nitrate (at times over MCL)</td>
<td>3011</td>
</tr>
<tr>
<td>4101003</td>
<td>Tivoli Mobile Home Park</td>
<td>Community</td>
<td>No</td>
<td>95</td>
</tr>
<tr>
<td>4101002</td>
<td>Kountry Village</td>
<td>Community</td>
<td>Well #1 now offline, had nitrate between 4 and 6 ppm</td>
<td>60</td>
</tr>
<tr>
<td>4195009</td>
<td>Roseburg Forest Product - JCR</td>
<td>State regulated</td>
<td>Nitrate regularly 4 to 6.5 ppm</td>
<td>24</td>
</tr>
<tr>
<td>4100423</td>
<td>Prairie Winds of Junction City</td>
<td>Community</td>
<td>No</td>
<td>60</td>
</tr>
<tr>
<td>4100419</td>
<td>Shadow Hills Water Co-op</td>
<td>Community</td>
<td>No</td>
<td>45</td>
</tr>
<tr>
<td>4100422</td>
<td>Harwoods Mobile Manor</td>
<td>Community</td>
<td>Nitrate regularly 6 to 8 ppm</td>
<td>65</td>
</tr>
<tr>
<td>4195026</td>
<td>Diamond Woods GC</td>
<td>Non-community</td>
<td>No</td>
<td>75</td>
</tr>
<tr>
<td>4100991</td>
<td>Grandview MHP</td>
<td>Community</td>
<td>No</td>
<td>99</td>
</tr>
</tbody>
</table>

Figure 2.4.1.5. Map of the SWV GWMA
Nitrate concentrations and trends in the SWV GWMA (2006-2018). Size of the dot illustrates the concentration range, and color indicates the long-term trend. Wells that are stable did not have a significant (p<0.10) change over time (from Piscitelli 2019).
2.4.2 Sources of Impairment

Many factors may affect surface and groundwater quality in the Management Area. Sources impacting temperature include wastewater treatment plants, industrial operations, removal and/or lack of riparian vegetation, seasonal reductions in stream flow, and stream channel and floodplain alteration. Contributors to bacteria and nutrient concerns include wastewater treatment plant overflows during heavy rains, legal and illegal waste dumping sites, leaching from septic systems and other sources to groundwater, runoff from residential areas, runoff and leaching from agricultural lands, and natural sources such as wildlife. Mercury can enter waterbodies from industrial and municipal wastewater discharges, erosion of soils that naturally contain mercury, runoff of atmospherically deposited mercury, and runoff from abandoned mines.

In the Management Area, conditions and activities on agricultural lands that may affect temperature are predominantly streamside vegetation. Vegetation may either be in poor condition, improving condition, or providing expected water quality benefits.

Activities on agricultural lands that may affect temperature, dissolved oxygen, bacteria, and phosphorus levels include:

- Cover over the soil, which can either prevent erosion or allow erosion of soil and attached nutrients;
- Streamside vegetation conditions – streamside vegetation may either be in poor condition, improving condition, or providing expected water quality benefits;
- Management of livestock access to streams;
- Nutrient management.

2.5 Regulatory and Voluntary Measures

The Agricultural Water Quality Management Act also provides for a regulatory backstop to ensure prevention and control of water pollution from agricultural sources in cases where landowners or operators refuse to correct problem conditions. Agricultural Water Quality Management Area Rules serve as this backstop while allowing landowners flexibility in how they protect water quality. Area Rules are goal-oriented and describe characteristics that should be achieved on agricultural lands, instead of practices that must be implemented.

This LAC developed Area Rules to protect water quality and prevent and control water pollution from agriculture. While developing the Area Rules that were adopted for the first time in 2003, the LAC also considered the time and expense that would be involved for area landowners to meet the rules. As a result, each Rule has an implementation date the LAC believed would be acceptable to area landowners. These implementation dates are now passed and all landowners are expected to be in compliance with these Area Rules.

This Area Plan serves as a guidance document and, as stated in the Foreword, does not establish provisions for enforcement. The Area Rules developed with input from the LAC (OAR 603-095-2600 to 603-095-2660) are enforceable and are included in this document only as a reference for landowners.

Each Area Rule relates directly to water quality concerns identified on the 303(d) list in the Management Area, and addresses the Upper Willamette TMDLs as required under the federal Clean Water Act. The concerns addressed in the Area Rules are described below.
Landowners in the Management Area are required to achieve the conditions outlined in the Area Rules below. Each Rule has a box around it and appears in italics. Relevant definitions are included after each Rule. The applicable rule is provided within each section below.

**OAR 603-095-2640**

(1) All landowners or operators conducting activities on lands in agricultural use shall comply with the following criteria. A landowner shall be responsible for only those conditions caused by activities conducted on land controlled by the landowner. A landowner is not responsible for violations of the Prevention and Control Measures resulting from actions by another landowner. Conditions resulting from unusual weather events (equaling or exceeding a 25-year, 24-hour storm event) or other exceptional circumstances are not the responsibility of the landowner. Limited duration activities may be exempted from these conditions subject to prior written approval by the department.

The following preferred management tables are intended as recommendations for landowners to meet Area Rules and generally maintain and enhance natural resources on their property. The practices below benefit a variety of water quality parameters, not just those parameters of concern within the Management Area. The tables provide some idea of the water quality benefits of each practice as well as potential costs and benefits to landowners. The tables are organized by resource, such as nutrients and manure.

Landowners who want more information on any of the following practices, or who are looking for other ideas for water quality improvement and conservation on their lands, may contact several agencies and organizations that provide technical assistance (Appendix C) or read some of the publications cited on the next page. Also, please consult Appendix B for a list of cost-sharing programs that cover many of these practices.

### 2.5.1 Nutrients and Manure Management

**Bacteria**

The most commonly used indicator of fecal pollution in freshwater is the organism *Escherichia coli* (*E. coli*). It is a type of fecal coliform bacteria. These bacteria reside in the intestines of warm-blooded animals, including humans, livestock, wild birds, and mammals. Not all *E. coli* are pathogenic; however, the presence of *E. coli* indicates contamination by sewage or animal manure and the potential for health risks.

Numerous factors influence the nature and amount of bacteria that reach waterways. Some of these factors are climate, topography, soil types, infiltration rates, animal species, and animal health. Typically, bacteria levels in streams are elevated after the first major storm event of the rainy season.

Bacteria also settle into sediments in a streambed and can live there for an extended period. If sediments are disturbed by increased stream turbulence following a runoff event, human or animal traffic, or other means, sediment-bound bacteria may be re-suspended into the water column (Sherer et al 1992). Sediment disturbance may account for erratic bacteria levels typically measured in water quality monitoring programs.

There are three separate fecal indicator bacteria criteria to protect three separate beneficial uses. For marine and fresh water, the beneficial use is recreational contact and for estuarine the beneficial use is shellfish growing (direct consumption).
Nitrate
Nitrate is a form of nitrogen that is dissolved in water (usually an issue in groundwater, but can impact surface water as well). Oregon public drinking water systems must adhere to the EPA standard for nitrate of 10 mg/L, which was established because of health concerns. There are no established drinking water standards for private drinking water sources, nor any requirements to test those wells or intakes unless the property is transferred. The standard for declaring a GWMA based on nitrate is the area-wide presence of wells with nitrate levels greater than 7 mg/L.

Nitrate is highly soluble in water, easily mobile in the soil, and can potentially leach through the soil and into the groundwater. Shallow ground water is hydrologically connected to surface water in many areas, and is more or less so at certain times of the year depending on water availability (usually precipitation). Potential sources of nitrate pollution include fertilizer, animal waste, septic systems, and wastewater. In the recent analysis of groundwater nitrate trends in the SWV GWMA, important factors in explaining the nitrate concentrations in the long-term monitoring sites included water source, estimated fertilizer input, and proximity to a dairy operation (Piscitelli 2019). The full report can be found at https://ir.library.oregonstate.edu/concern/graduate_thesis_or_dissertations/cr56n703s.

Waste, Nutrients, and Other Pollutants Rule

<table>
<thead>
<tr>
<th>OAR 603-095-2640(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) Effective upon rule adoption, no person subject to these rules shall violate any provision of ORS 468B.025 or 468B.050.</td>
</tr>
<tr>
<td>(c) Corralled or enclosed livestock areas will be managed to control runoff of sediment and animal waste. Application and storage of manure will be done in a manner that minimizes the introduction of nutrients and bacteria to waterways.</td>
</tr>
</tbody>
</table>

Wastes has the meaning given in ORS 468B.005(7): 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.

Waters of the state has the meaning given in ORS 468B.005(8): 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 effect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction.
### Nutrient and Manure Management

<table>
<thead>
<tr>
<th>Practice</th>
<th>Resource Concerns Addressed</th>
<th>Benefits to Producer</th>
<th>Costs to Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Apply nutrients according to soil test results (Hart, Pirelli, and Cannon, 1995; Marx, Hart, and Stevens, 1999; Natural Resources Conservation Service, 1997i; Sullivan, 1998; Waskom, 1994).</td>
<td>Helps prevent nutrient runoff into waters of the state and leaching into groundwater.</td>
<td>May help reduce fertilizer costs; ensures that plants receive needed nutrients for growth; makes plants more competitive against weeds. Practice may be eligible for cost-sharing programs.</td>
<td>Costs of soil testing; time associated with taking soil samples. Practice may be eligible for cost-sharing programs.</td>
</tr>
<tr>
<td>b. Store manure under a tarp or roof; preferably on an impervious surface such as concrete or plastic (Gamroth and Moore, 1996; Godwin and Moore, 1997; Moore and Wilrich, 1993).</td>
<td>Helps prevent nutrient and bacteria runoff into waters of the state and leaching into groundwater.</td>
<td>Prevents nutrient leaching so manure applied on crops or pasture has higher nutrient content; may save some fertilizer costs; producers may be eligible for cost-sharing programs.</td>
<td>Cost of constructing manure storage facilities. Practice may be eligible for cost-sharing programs.</td>
</tr>
<tr>
<td>c. Establish animal heavy-use areas where animals are confined during the winter to protect other pastures from trampling and compaction. Limit livestock access to pastures when soils are saturated; cover heavy-use areas with rock, hogged fuel, and/or geotextile. Clean manure regularly from heavy-use area (Natural Resources Conservation Service, 1997d).</td>
<td>Helps prevent sediment, nutrient and bacteria runoff into waters of the state and leaching into groundwater. Helps protect streamside areas.</td>
<td>Protects pastures from compaction during the winter, improving growth. May improve animal health by covering heavy-use areas with material so animals are not wading in mud. Practice may be eligible for cost-sharing programs.</td>
<td>Cost of fencing heavy-use area; cost of feeding hay during the winter; cost of materials for protecting heavy-use area. Practice may be eligible for cost-sharing programs.</td>
</tr>
<tr>
<td>d. Site barns and heavy-use areas away from streams (Godwin and Moore, 1997).</td>
<td>Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.</td>
<td>Helps prevent flooding in barns and heavy-use areas. Practice may be eligible for cost-sharing programs.</td>
<td>Need either off-stream watering facility or other source of water for livestock. Practice may be eligible for cost-sharing programs.</td>
</tr>
<tr>
<td>e. Prevent silage leaching and/or store and manage leachate from silage and other vegetative materials (Bruneau, Hodges, and Lucas, 1995; Feise, Adams, and LaSpina, 1993).</td>
<td>Helps prevent nutrient runoff into waters of the state and leaching into groundwater.</td>
<td>Preventing leaching maintains higher nutrient content of ensiled feed material. Practice may be eligible for cost-sharing programs.</td>
<td>May require cost of facility development and purchase of moisture-absorbing materials. Practice may be eligible for cost-sharing programs.</td>
</tr>
<tr>
<td>f. Installing gutters and downspouts in areas with high livestock use. Connect downspout water to drainage system or, if possible, route</td>
<td>Helps prevent sediment, nutrient and bacteria runoff into waters of the state. Helps protect streamside areas.</td>
<td>May improve animal health by lessening mud during the winter, so animals are not wading in mud. Practice may be</td>
<td>Cost of installation and maintenance of gutters and downspouts. Practice</td>
</tr>
<tr>
<td>Practice</td>
<td>Resource Concerns Addressed</td>
<td>Benefits to Producer</td>
<td>Costs to Producer</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------</td>
<td>----------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>clean downspout to a location where it can soak into the ground (Natural Resources Conservation Service, 1997f).</td>
<td>eligible for cost-sharing programs.</td>
<td>may be eligible for cost-sharing programs.</td>
<td></td>
</tr>
<tr>
<td>g. Cover heavily used animal walkways with sand, rock, and/or geotextile (Natural Resources Conservation Service, 1997c).</td>
<td>Helps prevent sediment, nutrient and bacteria runoff into waters of the state. Helps protect streamside areas.</td>
<td>Can improve animal health because animals are not wading in mud. Can help prevent animal health problems such as scratches, hoof or foot rot, and worms. Practice may be eligible for cost-sharing programs.</td>
<td>Cost of sand, rock or other materials. Owners should be aware that feeding equine species on sand may result in sand colic. Practice may be eligible for cost-sharing programs.</td>
</tr>
</tbody>
</table>

## 2.5.2 Streamside Area Management

### Temperature

Oregon’s temperature standard and associated numeric criteria were established to protect coldwater aquatic life, the most sensitive beneficial use affected by stream temperature.

For many years, researchers have investigated factors that influence stream temperatures. Many studies highlight the significance of streamside shade in the maintenance of stream temperatures (Brown, 1969; Beschta, 1997). Several authors emphasize that the capture of precipitation in the soil profile and the eventual flow of groundwater into streams is key to maintaining stream temperatures (Krueger et al, 1999; Moore and Miner, 1997; Naiman and Decamps, 1997). (Clark 1998) explains that upland and riparian conditions strongly influence stream temperatures by affecting the infiltration of precipitation and the storage and release of water. Adequate ground cover in upland areas increases the likelihood of precipitation infiltrating into the soil profile and decreases the possibility of overland flow, soil loss, and resulting sediment delivery to streams. Other influences on stream temperature include stream channel width, stream depth, channel substrate, air temperature, and elevation (Bilby, 1984; Chen et al, 1998; Ward, 1995).

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

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

- Streamside vegetation improves water quality related to multiple pollutants, including: temperature (heat), sediment, bacteria, nutrients, toxics, and pesticides;
- Streamside vegetation provides fish and wildlife habitat;
- Landowners can improve streamside vegetation in ways that are compatible with their operation;
- Streamside vegetation condition can be monitored readily to track the status and trends of agriculture’s progress in addressing water quality concerns.
Site Capable Vegetation
The Ag Water Quality Program uses the concept of “site-capable vegetation” to describe the vegetation that agricultural streams can provide to protect water quality. Site-capable vegetation is the vegetation that can be expected to grow at a particular site, given natural site factors (e.g., elevation, soils, climate, hydrology, wildlife, fire, floods) and historical and current human influences (e.g., channelization, roads, modified flows, past land management). Site-capable vegetation can be determined for a specific site based on: current streamside vegetation at the site, streamside vegetation at nearby reference sites with similar natural characteristics, Natural Resources Conservation Service (NRCS) soil surveys and ecological site descriptions, and local or regional scientific research. ODA does not consider invasive, non-native plants such as introduced varieties of reed canary grass and blackberry to be site-capable vegetation.

The goal for Oregon’s agricultural landowners is to provide the water quality functions (e.g., shade, streambank stability, and filtration of pollutants) produced by site-capable vegetation along all streams flowing through agricultural lands. The agricultural water quality regulations for each Management Area require that agricultural activities provide the water quality functions equivalent to what site-capable vegetation would provide.

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

Riparian Areas Rule

\[OAR\ 603\-095\-2640(1)\]

(a) Effective upon rule adoption, agricultural activities shall allow the establishment and development of riparian vegetation along perennial and intermittent streams for streambank stability, shading, and proper riparian function, consistent with site capability.

(A) Legally constructed drainage and irrigation ditches are exempt from OAR 603-095-2640(1)(a).

Riparian vegetation means plant communities consisting of plants dependent upon or tolerant of the presence of water near the ground surface for at least part of the year (OAR 603-095-0010(36)).

Site capability means the ability of a site to provide for the development of potential structural and functional properties. Structural properties include, among other things, vegetation and soil characteristics. Functional properties include processes such as energy and nutrient flow. Capabilities to produce and sustain these properties are site-specific.
### Riparian Areas and Streams

<table>
<thead>
<tr>
<th>Practice</th>
<th>Resource Concerns Addressed</th>
<th>Potential Benefits of Practice to Producer</th>
<th>Potential Costs of Practice to Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Light rotational grazing in riparian area; timed when growth is palatable to animals and when riparian areas are not saturated (Adams, 1994; Chaney, Elmore and Platts, 2003; Rogers and Stephenson, 1998).</td>
<td>Helps establish desirable riparian vegetation, promotes streambank integrity; helps filter nutrients and sediment from runoff; helps reduce stream temperatures by providing shade.</td>
<td>May lessen streambank erosion and loss of pastures; allows limited use of riparian area for grazing, improves wildlife habitat, and may control weeds. Practice may be eligible for cost-sharing programs.</td>
<td>May require time and financial investment for livestock control and off-stream watering facilities. Practice may be eligible for cost-sharing programs.</td>
</tr>
<tr>
<td>b. Livestock exclusion from riparian area; establish off-stream watering facilities (Natural Resources Conservation Service, 1997g and 1997h).</td>
<td>Helps promote desirable riparian vegetation; promotes streambank integrity; helps filter nutrients and sediment from runoff; may help narrow channel and reduce erosion in channel.</td>
<td>May lessen streambank erosion and loss of pastures; less time involved in managing livestock grazing in riparian area, improves wildlife habitat. Practice may be eligible for cost-sharing programs.</td>
<td>May require higher weed control costs than seasonal riparian grazing. May require financial investment for livestock control and off-stream watering facilities. Practice may be eligible for cost-sharing programs.</td>
</tr>
<tr>
<td>c. Plant perennial vegetation in riparian area. Recommend using native vegetation, or if using non-native vegetation, avoid using invasives (Guard, 1995; Pojar and MacKinnon, 1994).</td>
<td>Helps establish perennial riparian vegetation rapidly; promotes streambank integrity; may help narrow channel and reduce erosion in channel.</td>
<td>May lessen streambank erosion and loss of pastures. If livestock are excluded from riparian area, area may be eligible for federal cost-share programs. Some alternative perennial agricultural products may be harvested from riparian areas.</td>
<td>Costs of vegetation and weed control. May require financial investment for riparian fencing and off-stream watering facilities while vegetation establishes. Practice may be eligible for cost-sharing programs.</td>
</tr>
</tbody>
</table>

### 2.5.3 Soil Erosion Prevention and Control

**Mercury**

Mercury is a metal, liquid at room temperature, commonly used in the recent past for thermometers. It continues to have many dental, medical, and industrial uses. It is found naturally in the soils of the Willamette Valley. It is also found in fossil fuels and is released into the air upon combustion. In the air, mercury can travel over continents and oceans to be deposited on land, added to naturally occurring mercury, and are carried by storm water and soil erosion into Oregon’s waterways. Fish consumption is the most common way humans are exposed to elevated levels of mercury (Oregon Department of Environmental Quality, 2007).

Mercury is also a severe poison. According to the DEQ (2007), small children and fetuses are most sensitive to mercury’s toxic effects.

Mercury binds to soil and sediment particles; when particles runoff into water bodies the mercury that is attached to the particles can be methylated and then bioaccumulate in fish. Reducing sediment and erosion can help to limit the amount of mercury that is available for methylation in rivers, streams and other bodies of water. In the 2019 Mercury TMDL, in the 2006 Willamette Basin Mercury TMDL, DEQ concluded that approximately 47.8 percent of the mercury load in the basin came from erosion of mercury containing soils. Some industrial facilities and domestic wastewater treatment facilities also discharge...
mercury, but at relatively low levels. The 2006 Willamette Basin Mercury TMDL interim targets and allocations remain in effect until EPA issues a revised mercury TMDL, slated for 2020.

**Dissolved Oxygen**

Dissolved oxygen refers to the amount of oxygen that is dissolved in water. Oregon’s dissolved oxygen standards protect cool and cold-water aquatic life, which require relatively high levels of dissolved oxygen to breathe.

Dissolved oxygen levels can vary over the course of the day based on algal growth and decay. An increase in available nutrients may result in elevated algal production, eventually depleting dissolved oxygen when algae decay. Temperature and dissolved oxygen exhibit an inverse relationship; as water temperature falls, dissolved oxygen levels rise; as water temperature rises, dissolved oxygen levels fall. Elevated stream temperatures, in addition to affecting the metabolic processes of aquatic animals, cause further physical stress by lowering the dissolved oxygen available for respiration.

**Turbidity**

Turbidity refers to the clarity of a waterbody. It includes the amount of suspended solids in the water column. Sediment, algae, and other particles contribute to turbidity.

Oregon’s turbidity standard was established to protect beneficial uses including fish and aquatic life as well as drinking water. High turbidity levels can negatively affect aquatic life by consuming dissolved oxygen, clogging gills and other respiratory organs, reducing water infiltration through stream substrate (harming incubating fish eggs) and reducing animals’ ability to see predators and prey. In addition, high turbidity can increase the difficulty and cost of adequately treating drinking water.

**Erosion and Sediment Control Rules**

<table>
<thead>
<tr>
<th>OAR 603-095-2640(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(d) Effective January 1, 2004, agricultural activities will not cause the following visual indicators of erosion where erosion may cause sediment runoff into waters of the state:</td>
</tr>
<tr>
<td>(A) Sheet erosion; noted by scoured surfaces or pedestals of soil at the base of plants on sparsely vegetated or bare ground;</td>
</tr>
<tr>
<td>(B) Visible active gullies;</td>
</tr>
<tr>
<td>(C) Multiple rills, which have the form of gullies, but are smaller in cross-sectional area than one foot.</td>
</tr>
<tr>
<td>(D) This prevention and control measure applies to farm roads and staging areas, pastures, cropland, and other areas where agricultural activities occur.</td>
</tr>
</tbody>
</table>

**Erosion, sheet** means the removal of a fairly uniform layer of soil from the land surface by runoff water (OAR 603-095-0010(15)).

(e) Construction, maintenance, and use of surface drainage field ditches or surface irrigation field ditches shall cause no pollutant delivery to waters of the state from soil erosion induced by excessive channel slope, unstable channel cross section or placement of disposed spoils.

(f) Agricultural activities shall not cause pollution from active channel erosion or other means of sediment delivery from intermittent streams and drainage ways.

**Active channel erosion** means gullies or channels which at the largest dimension have a cross-sectional area of at least one square foot and which occur at the same location for two or more consecutive years (OAR 603-095-0010(1)).
## Erosion and Sediment Control

<table>
<thead>
<tr>
<th>Practice</th>
<th>Resource Concerns Addressed</th>
<th>Benefits to Producer</th>
<th>Costs to Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Grazing management: graze pasture plants to appropriate heights, rotate animals between several pastures; provide access to water in each pasture (Ko, 1999; Lundin, 1996; Hirschi, 1997).</td>
<td>Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.</td>
<td>May improve pasture production; easy access to water may increase livestock production as well. May improve composition of pasture plants and help prevent weed problems. Practice may be eligible for cost-sharing programs.</td>
<td>Cost of installing fencing, watering facilities for rotational grazing system; time involved in moving animals through pastures. Practice may be eligible for cost-sharing programs.</td>
</tr>
<tr>
<td>b. Farm road construction: construct fords appropriately, install water bars or rolling dips to divert runoff to roadside ditches (Binn, 1998; U.S. Forest Service, 1998).</td>
<td>Helps prevent sediment runoff to waters of the state.</td>
<td>May help prevent water damage on farm roads. Practice may be eligible for cost-sharing programs.</td>
<td>Cost of installation and maintenance. Practice may be eligible for cost-sharing programs.</td>
</tr>
<tr>
<td>c. Plant appropriate vegetation along drainage ditches; seed ditches following construction (Natural Resources Conservation Service, 1997a).</td>
<td>Helps prevent sediment runoff into waters of the state.</td>
<td>May help prevent ditch bank erosion and slumping. Practice may be eligible for cost-sharing programs.</td>
<td>Costs of establishing vegetation. Practice may be eligible for cost-sharing programs.</td>
</tr>
<tr>
<td>d. Plant cover crops on erosion-sensitive areas (Natural Resources Conservation Service, 1997b; Hirschi, 1997).</td>
<td>Helps prevent sediment runoff into waters of the state; filters nutrients and slows runoff.</td>
<td>May reduce weed problems; prevents loss of applied nutrients. Practice may be eligible for cost-sharing programs.</td>
<td>Costs of establishing cover crops; cover crops may compromise primary crop. Practice may be eligible for cost-sharing programs.</td>
</tr>
<tr>
<td>e. Irrigate pasture or crops according to soil moisture and plant water needs (Hansen and Trimmer, 1997; Trimmer and Hansen, 1994).</td>
<td>Helps prevent irrigation return flow and associated nutrients and sediment to waters of the state.</td>
<td>May reduce costs of irrigation; may help crop or pasture production. Practice may be eligible for cost-sharing programs.</td>
<td>Installation/ maintenance cost. Monitoring time. Practice may be eligible for cost-sharing programs.</td>
</tr>
<tr>
<td>f. Install/maintain diversions or French drains to prevent unwanted drainage into barnyards and heavy-use areas (Natural Resources Conservation Service, 1997e).</td>
<td>Helps prevent nutrient runoff into waters of the state.</td>
<td>Decreases muddiness and shortens saturation period in protected areas. Practice may be eligible for cost-sharing programs.</td>
<td>Cost of installation. Practice may be eligible for cost-sharing programs.</td>
</tr>
<tr>
<td>g. In areas where gullies repeatedly appear, install underground outlet or grassed waterway to capture and convey water (Natural Resources Conservation Service).</td>
<td>Prevents gully erosion and sediment runoff to waters of the state.</td>
<td>Prevents loss of soil and fertilizers, lessens inconvenience of driving equipment over gullies. Practice may be eligible for cost-sharing programs.</td>
<td>For underground outlet, costs of installing inlets and plastic pipe; for grassed waterways, costs of installation, seeding, weed control, and any land put out of use.</td>
</tr>
</tbody>
</table>
2.5.4 Pesticides

Oregon has strict laws and regulations related to pesticide use, storage, and reporting, and that improper application and storage may lead to surface or groundwater quality problems. All pesticide users are required to apply and store pesticides according to the label (ORS 634.372). Users of restricted-use pesticides are required to obtain certification from ODA’s Pesticides Division.

### Pest Management

<table>
<thead>
<tr>
<th>Practice</th>
<th>Resource Concerns Addressed</th>
<th>Benefits to Producer</th>
<th>Costs to Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Apply pesticides and herbicides according to the label. Use the correct rate and timing. Comply with label restrictions and precautions.</td>
<td>Reduces risk of pesticide runoff to streams or other water resources.</td>
<td>Compliance with federal and Oregon law; reduces health risks to applicator, may decrease costs.</td>
<td>N/A</td>
</tr>
<tr>
<td>b. Triple rinse pesticide application equipment; apply rinsates to sites; dispose of or recycle clean containers according to Oregon law</td>
<td>Reduces risk of pesticide runoff to streams.</td>
<td>Dilutes pesticide residues; correct disposal or rinsate ensures compliance with federal and Oregon law; eliminates disposal costs of collected rinsates identified as hazardous waste.</td>
<td>Triple rinsing creates more volume that must be disposed of.</td>
</tr>
<tr>
<td>c. Calibrate, maintain, and correctly operate application equipment.</td>
<td>Reduces risk of pesticide runoff to streams.</td>
<td>Helps protect drinking water and aquatic habitat; may reduce use and therefore cost of pesticides; reduces health risks to applicator.</td>
<td></td>
</tr>
<tr>
<td>d. Integrated pest management practices such as pheromone traps, beneficial insect release, and field monitoring.</td>
<td>Reduces risk of pesticide runoff to streams, may reduce loss of non-target species.</td>
<td>May improve effectiveness of pest control system. Practice may be eligible for cost-sharing programs.</td>
<td>Time involved to scout fields is usually offset by reduced or more effective pesticide use.</td>
</tr>
<tr>
<td>e. Store and mix pesticides on leak-proof facilities.</td>
<td>Reduces risk of pesticide runoff to streams.</td>
<td>Helps protect drinking water and aquatic habitat.</td>
<td>Cost of installation and maintenance.</td>
</tr>
<tr>
<td>Store petroleum products such as fuel and oil in leak proof containers and facilities; clean up spills of petroleum products properly.</td>
<td>Reduces risk of runoff of petroleum products to streams or soil contamination.</td>
<td>Helps protect drinking water and aquatic habitat; reduces health risks to landowner or operator.</td>
<td></td>
</tr>
</tbody>
</table>

Hirschi, 1994 and 1997
2.5.5 Optional Issues: Upland, Irrigation, and Livestock Management

Role of Upland Vegetation to Prevent and Control Pollution

Upland areas are the rangelands, forests, and croplands located upslope from streamside areas. Upland areas extend to the ridge-tops of watersheds. With a protective cover of crops and crop residue, grass (herbs), shrubs, or trees, 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.

Healthy upland areas provide several important ecological functions, including:
- Capture, storage, and moderate release of precipitation reflective of natural conditions;
- Plant health and diversity that support cover and forage for wildlife and livestock;
- Filtration of sediment;
- Filtration of polluted runoff;
- Plant growth that increases root mass, utilizes nutrients, and stabilizes soil to prevent erosion.

Nutrient and Irrigation Efficiencies

<table>
<thead>
<tr>
<th>Practice</th>
<th>Resource Concerns Addressed</th>
<th>Benefits to Producer</th>
<th>Costs to Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply fertilizer at the correct rate and time applications for crop uptake.</td>
<td>Reduces the risk of excess nitrogen in the soil at the end of the growth season.</td>
<td>Precise application saves the producer money in fertilizer costs.</td>
<td>Time related to precision application.</td>
</tr>
<tr>
<td>Sample soil prior to fertilizer application to know existing nutrients.</td>
<td>Prevents the application of excess nutrients.</td>
<td>Precise application saves the producer money in fertilizer costs.</td>
<td>Cost of soil sampling and analysis.</td>
</tr>
<tr>
<td>Plant winter cover crops to take up excess nitrogen left over after crops are harvested.</td>
<td>Takes up extra nitrogen and limits potential for leaching into ground water.</td>
<td>Stores extra nitrogen in plant matter for later release when cover crop is incorporated into the soil.</td>
<td>Cost of seed and fuel to plant cover crop.</td>
</tr>
<tr>
<td>Properly maintain irrigation systems to prevent over-irrigation.</td>
<td>Prevents leaching of excess nitrogen past the root zone.</td>
<td>Uniform irrigation application and save producer money on nitrogen costs.</td>
<td>Replacement nozzles at least every four years is recommended.</td>
</tr>
<tr>
<td>Monitor soil water content and adjust irrigation schedules to maintain soil water content in an appropriate range in the root zone.</td>
<td>Prevents over-irrigation and leaching of excess nitrogen past the root zone.</td>
<td>Allows accurate irrigation application and keeps nutrients available to crops.</td>
<td>Soil monitoring equipment and time to evaluate soil water content.</td>
</tr>
<tr>
<td>Schedule irrigation applications based on expected evapotranspiration rates.</td>
<td>Prevents over-irrigation and leaching of excess nitrogen past the root zone.</td>
<td>Allows accurate irrigation application and keeps nutrients available to crops.</td>
<td>Time to evaluate expected evapotranspiration rates.</td>
</tr>
</tbody>
</table>

Selker et al, 2004
Chapter 3: Implementation Strategies

Goal

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

To achieve the goals of the Area Plan the LAC established these objectives:

- Prevent runoff of agricultural wastes: agricultural activities will not discharge any wastes or place waste where it is likely to run off into waters of the state;
- Prevent and control upland and cropland soil erosion using practical and available methods;
- Control active channel erosion to protect against sediment delivery to streams;
- Prevent bare areas due to livestock overgrazing near streams;
- Allow streamside vegetation along streams on agricultural properties to establish and grow, to provide streambank stability, filtration of overland flow, and moderation of solar heating.

LAC Mission

The mission of the LAC is to advise ODA on the development of methods to improve water quality directly related to agricultural practices in the Management Area.

3.1 Measurable Objectives and Strategic Initiatives

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

3.1.1 Management Area

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

3.1.2 Focus Areas

3.1.2.1 Upper Siuslaw Focus Area

Work in the Upper Siuslaw Focus Area was initiated in June 2015 and closed in June 2019. The basis for selection included demographics, past assessments, land use characteristics and SWCD and partner capacity. The watershed encompasses 16,000 acres and primary crops include hay, pasture, livestock and a nursery (Figure 3.1.2.1).
**Assessment Method:** Streamside vegetation was evaluated with ODA’s Streamside Vegetation Assessment (SVA) to characterize the type of ground cover within 35 feet of the stream. The metric is the percent of different types of land cover viewed on aerial photographs. Categories are: agricultural infrastructure; water; and bare ground, grass, shrubs, and trees (designated as agricultural or not).

**Measurable Objectives and Associated Milestones:**

Measurable objectives were not identified for this Focus Area; however, milestones were established for the 2015-2017 and 2017-2019 biennia.

**Focus Area Milestone for 2015-2017**
- By June 30, 2017: Bare Ag + Grass + Grass Ag = 12.68 acres
- By June 30, 2017: Shrub Ag + Shrub + Tree = 51.365 acres

**Focus Area Milestone for 2017-2019**
- By June 30, 2017: Bare Ag + Grass + Grass Ag = 13 acres
- By June 30, 2017: Shrub Ag + Shrub + Tree = 51 acres

Results for this Focus Area are provided in Chapter 4.

**3.1.2.2 Bear Creek – Long Tom River Focus Area**

Work in the Bear Creek – Long Tom River Focus Area was initiated at the beginning of the 2019 fiscal biennium. The Upper Willamette SWCD’s established partnerships in this area make it an ideal place to focus efforts to improve streamside conditions. The selection was based on assessments, demographics, land use characteristics, resources and capacity considerations. The watershed is over 30,000 acres with 33 percent of the area in an agricultural use. Primary crops include hay, pasture, livestock, vineyards, grass seed, Christmas trees, row crops, and peppermint (Figure 3.1.2.2).
Assessment Method:

Streamside vegetation was evaluated with ODA’s Streamside Vegetation Assessment (SVA) to characterize the type of ground cover within 35 feet of the stream. The metric is the percent of different types of land cover viewed on aerial photographs. Categories are: agricultural infrastructure; water; and bare ground, grass, shrubs, and trees (designated as agricultural or not).

Measurable Objectives and Associated Milestones:

The Upper Willamette SWCD is in the process of using the ODA SVA method for the Bear Creek – Long Tom Focus Area River Focus Area A pre-assessment of vegetation types is planned to be completed during 2019. Measurable objectives and milestones will be identified following the pre-assessment.

3.2 Proposed Activities

ODA, the LAC, the LMA, and other partners have identified the following priority activities, described in Table 3.2, to track progress toward meeting the goal and objectives of the Area Plan.
Table 3.2 Planned Activities for 2019-2022.

<table>
<thead>
<tr>
<th>Activity</th>
<th>4-year Target</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community and Landowner Engagement</td>
<td></td>
<td></td>
</tr>
<tr>
<td># active events that target landowners/managers (workshops, demonstrations, tours)</td>
<td>6</td>
<td>A Joint LAC and GWMA Committee field trip is tentatively planned for summer/fall of 2021. Potential topics include SWV GWMA BMPs, research and monitoring, soil health and hazelnut sustainability guidelines. The field trip would include the Upper Willamette, Middle Willamette and South Santiam Management Area LACs. 4 landowner shops shall be held within the focus area. Topics shall include agricultural water quality program information, soil health information, agency program information for both state and federal conservation agencies, Riparian health and proper function information. 1 demonstration workshop shall be held bringing the NRCS soils health trailer to conduct a demonstration of the effects of conservation cover to improve soil health and reduce run-off and erosion.</td>
</tr>
<tr>
<td># landowners/managers participating in active events</td>
<td>125</td>
<td>It is anticipated that the active events conducted within the focus area shall average 25 attendees per event.</td>
</tr>
<tr>
<td>Technical Assistance (TA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td># landowners/managers provided with TA (via phone/walk-in/email/site visit)</td>
<td>200</td>
<td>Past tracking of T/A provided to landowners via phone, walk-in, and email indicate the average stated.</td>
</tr>
<tr>
<td># site visits</td>
<td>32</td>
<td>Past tracking of site visits conducted along with estimated response from increased outreach.</td>
</tr>
<tr>
<td># conservation plans written*</td>
<td>10</td>
<td>This figures in the number of small grants targeted for the focus area as well as 2 certified plans developed through the NRCS.</td>
</tr>
<tr>
<td>On-the-ground Project Funding</td>
<td></td>
<td></td>
</tr>
<tr>
<td># funding applications submitted</td>
<td>6</td>
<td>Number of potential small grant projects available to District</td>
</tr>
<tr>
<td># funding applications awarded</td>
<td>6</td>
<td>Based on historic success of proposed grant projects to funded projects</td>
</tr>
</tbody>
</table>

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

3.3.1  Water Quality

3.3.1.1  DEQ Monitoring

DEQ monitors five sites in the Management Area as part of their ambient monitoring network (Figure 7) and collaborates with the Siuslaw Watershed Council on two monitoring sites in the Upper Siuslaw.

Figure 7: Upper Siuslaw Ambient Monitoring Sites
3.3.1.2 ODA Temperature Monitoring

In 2017, ODA began working with 14 local organizations around the state to collect data on stream temperature, air temperature, stream flows, and riparian vegetation on agricultural lands. This monitoring will be carried out for 20 years. Data will be used by ODA to determine whether improved stream temperatures can be measured as a result of improved riparian vegetation on agriculture lands. DEQ will use the data to assess whether the monitored stream reaches are meeting water temperature standards. Two stations were selected that are within the Management Area:

<table>
<thead>
<tr>
<th>Organization</th>
<th>Watershed</th>
<th># HUCs</th>
<th># T Loggers</th>
<th>Reason Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Tom WC</td>
<td>Ferguson Creek</td>
<td>1</td>
<td>4</td>
<td>Willamette Model Watershed</td>
</tr>
<tr>
<td>Long Tom WC</td>
<td>Owens Creek</td>
<td>1</td>
<td>4</td>
<td>Willamette Model Watershed</td>
</tr>
</tbody>
</table>

3.3.1.3 Siuslaw Watershed Council Monitoring

The Siuslaw Watershed Council facilitates a wide variety of monitoring projects in the basin and the Siuslaw Volunteer Water Quality Monitoring Program (VWQMP) is one of those projects. Once a month, trained volunteers collect and process surface water samples from sites throughout the watershed; a map is provided below. Continuous temperature monitoring sites were implemented in spring 2014. The data obtained in the VWQMP is baseline data. The watershed council currently measures clarity, salinity (in the estuary), dissolved oxygen, turbidity, bacteria, temperature, and weather conditions. The council’s report on water quality data from 2014 can be found at http://www.siuslaw.org/monitoring.

Figure 8. Siuslaw Watershed Council Monitoring Locations
3.3.1.4 GWMA Monitoring

DEQ currently collects quarterly samples from 12 groundwater monitoring wells installed in the southern Willamette Valley, in addition to annual well sampling at 27 locations and six surface water locations. Some locations are also sampled for chloride and phosphorous. This program includes monitoring 23 shallow monitoring wells, 16 domestic wells, and six surface water sites. The domestic wells are generally installed deeper than the monitoring wells. EPA continues to provide stable isotopic analyses on surface and groundwater samples collected by DEQ’s laboratory. Data from nitrogen isotope ratios will assist in identifying nitrate contamination sources and help to focus efforts at reducing nitrate levels in the SWV GWMA. Monitoring locations are shown in Chapter 2, Figure 4, above.

3.3.1.5 Amazon PSP Monitoring

LTWC has been leading a collaborative effort to identify and reduce pesticides and other toxins in Amazon Creek and the Upper Willamette River (Figure 9). A cleaner urban stream improves conditions for fish and wildlife, protects sources of drinking water, and fosters an overall healthier community. In 2011, LTWC teamed with the Oregon Department of Environmental Quality to form a PSP. This partnership is one of nine designated PSPs in the state with a significant urban focus. LTWC has support from key business and agricultural constituents, SureCrop Farm Service, the city of Eugene, Meyer Memorial Trust, and others.

The goal of the PSP is to monitor for pesticides in Amazon Creek to determine what chemicals are impacting water quality in the area. Using these data, LTWC can direct our outreach to address commonly found pesticides and their sources. Because of the unique characteristics of PSP area (flows from urban areas to agricultural lands), a significant amount of resources is dedicated to outreach to urban residents and commercial operations engaged in pesticide use. The LTWC has developed the “Trout Friendly Landscapes” program to work with local landscape companies, businesses, and commercial property owners to voluntarily reduce or eliminate pesticide use on their properties. Additionally, the LTWC conducts outreach to local agricultural growers to share our data and identify ways to reduce pesticide loss to local waterways.

LTWC and its partners test for the presence and concentration of pesticides in the water and the soil of the stream bed. Testing locations were carefully selected to provide different land use signature impacts from residential to industrial to agricultural – all of which have been proven to have different, measurable impacts. This high-quality data is analyzed and shared among citizens, the scientific community, and habitat specialists. These folks identify and implement practices such as storm water management strategies, “green infrastructure,” and other habitat projects. Feedback from the process informs continued data gathering. With eight years of local data thus far for our PSP, we hope to see continual learning, positive impacts instream and continue to find which areas need more attention. A review of water quality data from 2017-19 indicates one pesticide of high concern, imidacloprid, a general use insecticide commonly found in a variety of homeowner and agricultural formulations.

Beginning in 2020, the LTWC will begin development of a PSP Strategic/Operational Plan for the implementation of the Pesticide Stewardship Partnership. Development of this Plan will require an assessment of all land use and water quality (pesticide) data, formation of a coordinating council, and development of appropriate management measures to include changes in operation practices along with enhanced education and outreach activities.
Figure 9: Map of Pesticide Stewardship Partnership Monitoring Locations

3.3.2 Land Conditions

The following section describes the process DEQ used to assess streamside vegetation and shade conditions in the Southern Willamette Basin. Results of the assessment are summarized in Section 4.3.2 of this Area Plan. The results show where conditions may be sufficient, as well as where ODA and partners should focus efforts to improve conditions in the future.

In 2019, DEQ hosted a Willamette TMDL implementation workshop, which included a presentation, “Assessing the Status of Riparian Restoration, Protection, and Shading in the Southern Willamette Basin” (presentation and results are posted at: www.oregon.gov/deq/wq/tmdls/Pages/TMDLs-Willamette-
In this study, DEQ assessed nonpoint source solar heating along streams in the southern half of the Willamette Basin (including the Willamette portion of this Management Area; see Figure 3.3.2a), to compare current conditions to targets established in the TMDL. DEQ assessed current levels of “effective shade” (shade), which measures the percent of a stream that is shaded by streamside vegetation plus topography. Shade helps reduce the rate of stream warming from solar radiation.

**Figure 3.3.2a: Southern Willamette study area; Willamette portion of this Management Area is shown**

DEQ assessed shade along perennial and intermittent streams in the U.S. Geological Survey’s National Hydrography Dataset (NHD). DEQ included all NHD streams because of known inaccuracies in stream flow classification. Many streams classified as intermittent streams are actually fish-bearing, with aquatic life using residual pools in the dry season. When and where more accurate stream classification is provided, DEQ will revise the shade assessment. DEQ recommends using the methods described by EPA in 2015 ([www.epa.gov/measurements-modeling/streamflow-duration-assessment-method-pacific-northwest](http://www.epa.gov/measurements-modeling/streamflow-duration-assessment-method-pacific-northwest)) to determine stream flow duration.

DEQ used Lidar data, computer mapping and computer modeling to calculate current shade levels (as of the date Lidar was acquired, which ranges from 2009 to 2014 in this Management Area). DEQ set up sampling nodes to model shade every 656 feet (200 meters) along streams (red dots in Figure 3.3.2b). For each sampling node, DEQ used the Heat Source model to calculate effective shade (amount of sun blocked) throughout a mid-summer day, using vegetation and topographic heights from Lidar.
Figure 3.3.2b: A - Background shows Lidar imagery, color-coded by vegetation height; for each sampling node (red dot), DEQ calculated vegetation and topographic heights in seven directions (white dots), out to a distance of 246 feet (75 m); B - Cross section, west and east of the sampling node, shows vegetation and topographic heights.
Chapter 4: Progress and Adaptive Management

4.1 Measurable Objectives and Strategic Initiatives

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

4.1.1 Management Area

ODA is working with SWCDs and LACs throughout Oregon towards establishing long-term measurable objectives to achieve desired conditions. Currently, ODA and the Upper Willamette SWCD are using Focus Area measurable objectives and the Camp Creek SIA to show progress in this Management Area.

4.1.2 Focus Areas

4.1.2.1 Upper Siuslaw Focus Area

Table 4.1.2.1 Upper Siuslaw Focus Area

<table>
<thead>
<tr>
<th>Measurable Objective</th>
<th>Measurable objectives were not identified for this Focus Area.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Milestones</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focus Area Milestone for 2015-2017</strong></td>
<td></td>
</tr>
<tr>
<td>• By June 30, 2017: Bare Ag + Grass + Grass Ag = 2.68 acres</td>
<td></td>
</tr>
<tr>
<td>• By June 30, 2017: Shrub Ag + Shrub + Tree = 51.365 acres</td>
<td></td>
</tr>
<tr>
<td><strong>Focus Area Milestone for 2017-2019</strong></td>
<td></td>
</tr>
<tr>
<td>• By June 30, 2017: Bare Ag + Grass + Grass Ag = 13 acres</td>
<td></td>
</tr>
<tr>
<td>• By June 30, 2017: Shrub Ag + Shrub + Tree = 51 acres</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current Conditions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Progress Toward Measurable Objectives and Milestones</strong></td>
<td></td>
</tr>
<tr>
<td>Assessment Results</td>
<td>There were no changes in the vegetation types.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activities and Accomplishments</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Stakeholder engagement activities included mailings, an informational meeting at the Lorane Grange with 18 attending,</td>
<td></td>
</tr>
<tr>
<td>• Many site visits were conducted with new landowners to discuss soil health and streamside management of areas degraded by livestock presence.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adaptive Management Discussion</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Landowners in the Focus Area received communications about soil health, pasture management, and invasive species management. Although site visits were done with many of the landowners they were not interested in participating. Some reasons included not living in the area or taking care of parents in another state.</td>
<td></td>
</tr>
<tr>
<td>The Siuslaw Watershed Council assisted with building relationships and potential projects were identified. These initial relationships may result in future projects. However, the SWCD is shifting focus to a new area where relationships have already been established and landowners are wanting to do projects on their farms.</td>
<td></td>
</tr>
</tbody>
</table>
4.1.2.2 Bear Creek and Long Tom River Focus Area

Table 4.1.2.1 Bear Creek and Long Tom River Focus Area

<table>
<thead>
<tr>
<th>Measurable Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>This focus area began in July 2019. A measurable objective and milestones will be chosen after the pre-assessment using the ODA SVA has been completed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Milestones</th>
</tr>
</thead>
<tbody>
<tr>
<td>To be determined in 2020 after the SVA pre-assessment is completed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progress Toward Measurable Objectives and Milestones</td>
</tr>
<tr>
<td>A progress report will be available for the 2023 biennial review full review.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activities and Accomplishments</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
</tr>
</tbody>
</table>

- SVA pre-assessment under way
- Developing stakeholder engagement materials

Adaptive Management Discussion
NA

4.2 Activities and Accomplishments

ODA, the LAC, the LMA, and other partners identified the following priority activities to track progress toward meeting the goal and objectives of the Area Plan. ODA will review the two-year results and then provide a report at the end of the 2022-2023 Biennium.

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

Table 4.2a Activities conducted in 2016-2018

<table>
<thead>
<tr>
<th>Activity</th>
<th>4-year results</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community and Landowner Engagement</td>
<td></td>
<td></td>
</tr>
<tr>
<td># active events that target landowners/ managers (workshops, demonstrations, tours)</td>
<td>9</td>
<td>The District conducted or participated in 8 landowner workshops and provided 1 public tour. (3) workshops in Lorane as part of the UW/US focus area focused on the Ag water quality program. 2 in Veneta focusing on ag water quality and District services. 1 in Junction City for ag landowners for conservation programs. 1 in Monroe in coordination with the LTWSC. 1 in Harrisburg in coordination with OSU extension. The District also conducted one public tour of the Bauman conservation property.</td>
</tr>
<tr>
<td># landowners/managers participating in active events</td>
<td>204</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>District manned a informational booth at the “get outdoors” celebration at Green Island in 2018 and 2019. The booth provided conservation information including the water quality information for the UW/US ag water quality program plan and rules. 515 attendees visited the booth.</td>
<td></td>
</tr>
</tbody>
</table>
### Technical Assistance (TA)

<table>
<thead>
<tr>
<th>#/description</th>
<th>number</th>
<th>details</th>
</tr>
</thead>
<tbody>
<tr>
<td># landowners/managers provided with TA</td>
<td>262</td>
<td>District staff provided technical assistance via phone calls, walk-in, email, and site visits. T/A consisted of ag water quality information, soils health to reduce erosion, riparian enhancement, Pasture health, rotational grazing, rotational cropping, exclusion fencing, manure management, cover crop, irrigation water management.</td>
</tr>
<tr>
<td># site visits</td>
<td>75</td>
<td>Staff conducted 75 landowner site visits over the biennium. Site evaluations included erosion concerns, manure management, surface water run-off,</td>
</tr>
<tr>
<td># conservation plans written*</td>
<td>12</td>
<td>Most of the plans were developed for the OWEB small grant program (10) with 2 in development, 2 certified plans were developed for the NRCS EQIP program.</td>
</tr>
</tbody>
</table>

### NWQI Proposal

- Staff has developed a pre-proposal and submitted to the NRCS National Headquarters for the National Water Quality Initiative (NWQI) program.

### On-the-ground Project Funding

<table>
<thead>
<tr>
<th>#/description</th>
<th>number</th>
<th>details</th>
</tr>
</thead>
<tbody>
<tr>
<td># funding applications submitted</td>
<td>11</td>
<td>8 developed plans were submitted to the OWEB small grant program for ag water quality concerns on small acreage farms. 2 NRCS plans were developed to address irrigation water management, soil health, cover cropping, and riparian enhancement. 1 application has been submitted to the NRCS to develop a strategic plan for the Long Tom river in conjunction with the Monroe drinking water protection program.</td>
</tr>
<tr>
<td># funding applications awarded</td>
<td>10</td>
<td>All of the OWEB small grant projects (8) were funded, 6 have been completed during the biennium. (2) NRCS plans have been awarded contracts to be completed. The NRCS/NWQI strategic plan is being reviewed and expected to be funded in 2020.</td>
</tr>
</tbody>
</table>

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

Table 4.2b and 4.2c summarize information from the OWRI on restoration project funding and accomplishments in the Management Area. The majority of OWRI entries represent voluntary actions of private landowners who have worked in partnership with federal, state and local groups to improve habitat and water quality conditions.

<table>
<thead>
<tr>
<th>Landowner</th>
<th>OWEB</th>
<th>DEQ</th>
<th>NRCS</th>
<th>OTHER*</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>$448,165 (includes $338,781 in kind)</td>
<td>$2,438,235</td>
<td>$10,000</td>
<td>$3,150,000</td>
<td>$1,590,873</td>
<td>$7,189,108</td>
</tr>
</tbody>
</table>

* Includes city, county, tribal, other state and federal programs, and non-profit organizations.
Table 4.2c Miles and acres treated on agricultural lands reported 1997-2018 (OWRI data include most, but not all projects, implemented in the Management Area).

<table>
<thead>
<tr>
<th>Activity Description</th>
<th>Miles</th>
<th>Acres</th>
<th>Count*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetation Planting, Invasive Plant Removal and Livestock Fencing</td>
<td>104.24</td>
<td>741.54</td>
<td>-</td>
</tr>
<tr>
<td>Culvert and Ford Replacement</td>
<td>88.41</td>
<td>-</td>
<td>22</td>
</tr>
<tr>
<td>Alcoves, Channel Modification and Large Wood Placement</td>
<td>8.62</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wetland Enhancement</td>
<td>-</td>
<td>125.95</td>
<td>-</td>
</tr>
<tr>
<td>Livestock Manure Management and Erosion Control</td>
<td>0</td>
<td>-</td>
<td>0 NA</td>
</tr>
<tr>
<td>Livestock Manure Management and Erosion Control</td>
<td>-</td>
<td>353.46</td>
<td>-</td>
</tr>
<tr>
<td>Livestock Manure Management and Erosion Control</td>
<td>201.27</td>
<td>1,220.85</td>
<td>22</td>
</tr>
</tbody>
</table>

*# of structures, logs, boulders, hardened crossings, culverts, etc.

4.3 Water Quality and Land Condition Monitoring

4.3.1 Water Quality

DEQ’s 2019 statewide water quality status and trends report can be found at [https://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx](https://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx). The analysis is intended to answer these four questions:

- What is the status of water quality in Oregon? Are waterbodies attaining water quality standards for bacteria, dissolved oxygen, pH, and temperature?
- Where applicable, are TMDL targets established for total phosphorus or total suspended solids being attained?
- What are the trends in water quality?
- What watershed restoration or protection actions have been implemented?

The DEQ Status and Trends Report is a tool for our use to help identify where we would like to focus our work to test various practices. Keep in mind that many factors and land uses contribute to results at a particular location or watershed unit.

Key Conclusions

- The DEQ results validate our focus on efforts within the Long Tom, Bear Creek and Amazon Creek watersheds to improve streamside vegetation and address soil health and nutrient management. Over time we can test various practices and future Status and Trends Reports will help us evaluate our progress.

- The southern watershed above Wolf Creek is consistently showing attainment of various standards. An evaluation of what is occurring there may help inform growers about what practices may be useful in other parts of the management area. However, the Long Tom, Bear Creek and Amazon Creek watershed are more complex and challenging in terms of being more populated areas.

Temperature

Four stations within the Management Area are attaining the temperature standard. Two of these are in the northwest area and representative of a forested area. One is at the north edge of Fern Ridge Reservoir and although it is attaining the temperature standard, it is also showing a degrading trend. Shade targets established to meet the temperature TMDL have not yet been achieved. The shade assessment results
(Figure 4.3.2) show that there remains a need to increase stream shading in the management area. The results of the Streamside Vegetation Assessment (to be completed in 2019) for the Bear Creek-Long Tom Focus Area will help ODA and partners identify priority areas for improving riparian conditions and increasing shade on streams within the FA. Additional shading on streams outside of the FA will be important for meeting the temperature TMDL shade targets.

*E. coli*

There are three stations where the Escherichia coli standard is being exceeded. Two of these are along Amazon Creek and one is east of Eugene. The standard is being attained at four stations higher in the watershed, south of Eugene. While upstream monitoring locations are currently meeting water quality standards for bacteria, the data were insufficient for completing a trend analysis. In other words, it is not known at this time whether these stations will continue to meet the standard or if conditions at these locations may be getting worse over time.

**Dissolved oxygen**

Twelve stations are not attaining the DO standard with a mix of both improving and degrading trends. Several within the northern area are attaining the DO standard but these are intermixed with stations where the standard is not attained. Efforts to improve riparian and stream shade conditions will also benefit dissolved oxygen levels in streams.

**pH**

Many stations are attaining the pH standard, but these are intermixed with some that are not. Multiple stations had sufficient data to complete a trend analysis, which shows that some locations are currently meeting the standard but are trending toward worse conditions.

**SWV GWMA Monitoring and Research**

Because nitrate is a human health concern and high concentrations have been observed in the SWV, the State of Oregon declared the SWV a Groundwater Management Area (GWMA) in 2004. From 2006 to 2019, 33% of the mean well nitrate concentrations in the SWV GWMA exceeded the State of Oregon’s 7 mg nitrate-N L\(^{-1}\) Action Level, and 12% exceeded the U.S. Environmental Protection Agency’s Maximum Contaminant Level (MCL) of 10 mg nitrate-N L\(^{-1}\). Approximately 57% of the wells showed an overall increase in nitrate throughout the total study period, and the total mean nitrate-N concentration increased from the 2006 through 2011 mean of 5.41 mg nitrate-N L\(^{-1}\) to a mean of 6.28 mg nitrate-N L\(^{-1}\) from 2012 to 2019. The findings indicate despite the greater public awareness of the issue of groundwater nitrate contamination in the SWV GWMA, concentrations have increased over the last 14 years. Statistical analyses identified the presence of confined animal feeding operations, well recharge source, and surface nitrogen fertilizer inputs to be significant drivers of nitrate concentrations. It is not clear why the nitrate concentrations are increasing. To address this nitrate contamination problem, future efforts may need to find new and different approaches to improve drinking water quality in the SWV GWMA.
Figure 4.3.1. Box and whisker plot of the nitrate concentrations in 34 well water monitoring sites over time in the SWV GWMA. The box represents the 25th to the 75th percentile of the data, while the whiskers represent the 5th and 95th percentile. The horizontal line is the median concentration, which has increased over time. From Piscitelli (2019).

4.3.2  Land Conditions

See DEQ’s presentation, “Assessing the Status of Riparian Restoration, Protection, and Shading in the Southern Willamette Basin,” for results (www.oregon.gov/deq/FilterDocs/DMA191pres040319.pdf). The following section describes the results of DEQ’s assessment of streamside vegetation and shade in the Southern Willamette Basin. The assessment shows that conditions are sufficient in some areas and highlights where ODA and partners should focus efforts in the future.

In the 2019 presentation, “Assessing the Status of Riparian Restoration, Protection, and Shading in the Southern Willamette Basin,” DEQ summarized stream shading within 246 feet (75 m) of perennial and intermittent streams in the southern half of the Willamette Basin. The presentation and results are posted at: www.oregon.gov/deq/wq/tmdls/Pages/TMDLs-Willamette-Basin.aspx#implementation.

For all land uses in the Southern Willamette study area, the average current shade is 66 percent, and the average target shade in the TMDL is 92 percent. The difference between the current shade and the target shade, or “shade gap” (additional shade needed to achieve the target) is 26 percent.

For agricultural streams in the Southern Willamette study area, the average current shade is 33 percent, the average target shade in the TMDL is 82 percent, and the shade gap (additional shade needed to achieve the target) is 49 percent.
Figure 4.3.2a shows the model results for current shade (blue) and target shade (gray) for agricultural streams only: for the entire study area, for the Willamette portion of this Management Area, and for the two partial watersheds in the Willamette portion of this Management Area. The shade gap on agricultural streams is very consistent (48-49%) in these four areas, which means that the shade gap in this Management Area is representative of the shade gap in the full Southern Willamette study area. In the 13 smaller sub-watersheds in the Willamette portion of this Management Area, the shade gaps on agricultural lands vary considerably, from 25 percent in the Spring Creek-Willamette River sub-watershed to 78 percent in the Amazon Creek sub-watershed.

*Figure 4.3.2a: Shade results for agricultural lands, across the entire study area, the Willamette portion of this Management Area, and the two partial watersheds in the Willamette portion of this Management Area*

![Effective Shade (%): Current/Recent and Target](image)

Figure 4.3.2b shows the model results for the number of agricultural stream miles in each of the 13 sub-watersheds, and the number of stream miles that have smaller to larger shade gaps. The Bear Creek-Long Tom River sub-watershed has the highest number of agricultural stream miles (94 miles) and the second highest number of stream miles with a shade gap between 51 percent and 100 percent (52 miles), making this sub-watershed an excellent choice as the Upper Willamette SWCD’s current Focus Area. The results by sub-watershed can also be used to help prioritize future implementation, e.g. to select future SIAs or Focus Areas.
Figure 4.3.2b: Number of stream miles on agricultural lands with smaller to larger shade gaps, by sub-watershed in the Willamette portion of this Management Area; sub-watersheds are arranged by number of agricultural stream miles (lowest to left, highest to right)

Completed streamside vegetation restoration projects in the Willamette Basin portion of this Management Area (Table 4.2c) have contributed to current shade levels, and as the vegetation grows, it will contribute additional shade over time. Instream restoration projects that add channel complexity also help to reduce stream temperatures.

ODA and partners plan to use the information from the DEQ assessment to identify where to focus work in the future. The assessment also helps ODA and partners to understand how changes to land conditions improve water quality, and how much remains to be done. This will help ODA and partners to set objectives for future improvements. ODA, DEQ, the LMA, and the LAC recognize that TMDL implementation is a community effort that may take decades. DEQ is interested in calculating updated shade levels within the next few years, to document additional progress.

### 4.4 Biennial Reviews and Adaptive Management

ODA, the LAC, the LMA, and other partners met on January 29, 2019 to review implementation of the Area Plan and provided recommendations for the future (Tables 4.4a and 4.4b).
Table 4.4a Summary of biennial review discussion

<table>
<thead>
<tr>
<th>Summary of Progress and Impediments</th>
</tr>
</thead>
<tbody>
<tr>
<td>The UW SWCD, Long Tom WC and Siuslaw WC have been successfully building relationships with producers and have begun focused work in areas where there is a need to improve water quality. Many producers in these areas have expressed interest in conducting water quality improvement projects.</td>
</tr>
<tr>
<td>The LAC highlighted that these partners are successful because of the way they communicate with landowners.</td>
</tr>
<tr>
<td>We are optimistic about the work that is occurring in the Management Area.</td>
</tr>
<tr>
<td>The LAC is appreciative of the work that EPA and DEQ are conducting in the SWV GWMA. Producers are key partners to test management practices to reduce nitrates in the GWMA.</td>
</tr>
<tr>
<td>The Long Tom WC is working to address pesticide issues in the Amazon PSP and has a successful trend occurring within the urban portions of Amazon Creek.</td>
</tr>
</tbody>
</table>

**Recommended Modifications and Adaptive Management**

Continued work in the Bear Branch Focus Area, Amazon PSP and SWV GWMA.

Conduct a joint field trip between the SWV GWMA and the three Agricultural Water Quality Management LACs in 2021/2022 to consider measurable objectives for upland soil health, discuss current management practices to reduce erosion, reduce nitrates in ground water and learn about the Hazelnut Commission’s work to develop sustainability guidelines.

Table 4.4b Number of compliance actions in 2017 - 2019

<table>
<thead>
<tr>
<th>Actions</th>
<th>Letter of Compliance</th>
<th>Pre-Enforcement Notification</th>
<th>Notice of Noncompliance</th>
<th>Civil Penalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside SIA(s)</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Compliance Actions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within SIA(s)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Of the three cases which received Letters of Compliance, ODA and the SWCD worked with these landowners to achieve compliance. These cases include manure management and fertilizer application and streambank erosion associated with tile line maintenance. The Pre-Enforcement Notification, Notice of Noncompliance, and Civil Penalty all relate to the same case, which is a horse boarding facility with a manure management issue.

At the current time, there are no SIAs in this Management Area.
References


Hart, J. 1995. How to take a soil sample...and why. Oregon State University, Corvallis, Oregon.


Appendix A: Common Agricultural Water Quality Parameters of Concern

The following parameters are used by DEQ in establishing the 303(d) List and assessing and documenting waterbodies with TMDLs. Note: This is an abbreviated summary and does not contain all parameters or detailed descriptions of the parameters and associated standards. Specific information about these parameters and standards can be found at: www.deq.state.or.us/wq/assessment/assessment.htm or by calling (503) 229-6099.

Parameters

**Bacteria:** *Escherichia coli (E. coli)* is measured in streams to determine the risk of infection and disease to people. Bacteria sources include humans (recreation or failing septic systems), wildlife, and agriculture. On agricultural lands, E. coli generally comes from livestock waste, which is deposited directly into waterways or carried to waterways by livestock via runoff and soil erosion. Runoff and soil erosion from agricultural lands can also carry bacteria from other sources.

**Biological Criteria:** To assess a stream’s ecological health, the community of benthic macro invertebrates is sampled and compared to a reference community (community of organisms expected to be present in a healthy stream). If there is a significant difference, the stream is listed as water quality limited. These organisms are important as the basis of the food chain and are very sensitive to changes in water quality. This designation does not always identify the specific limiting factor (e.g., sediment, nutrients, or temperature).

**Dissolved Oxygen:** Dissolved oxygen criteria depends on a waterbody’s designation as fish spawning habitat. Streams designated as salmon rearing and migration are assumed to have resident trout spawning from January 1 – May 15, and those streams designated core cold water are assumed to have resident trout spawning January 1 – June 15. During non-spawning periods, the dissolved oxygen criteria depends on a stream’s designation as providing for cold, cool or warm water aquatic life, each defined in OAR 340 Division 41.

**Harmful Algal Blooms:** Some species of algae, such as cyanobacteria or blue-green algae, can produce toxins or poisons that can cause serious illness or death in pets, livestock, wildlife, and humans. As a result, they are classified as Harmful Algae Blooms. Several beneficial uses are affected by Harmful Algae Blooms: aesthetics, livestock watering, fishing, water contact recreation, and drinking water supply. The Public Health Department of the Oregon Health Authority is the agency responsible for posting warnings and educating the public about Harmful Algae Blooms. Under this program, a variety of partners share information, coordinate efforts and communicate with the public. Once a water body is identified as having a harmful algal bloom, DEQ is responsible for investigating the causes, identifying sources of pollution and writing a pollution reduction plan.

**Mercury:** Mercury occurs naturally and is used in many products. It enters the environment through human activities and from volcanoes, and can be carried long distances by atmospheric air currents. Mercury passes through the food chain readily, and has significant public health and wildlife impacts from consumption of contaminated fish. Mercury in water comes from erosion of soil that carries naturally occurring mercury (including erosion from agricultural lands and streambanks) and from deposition on land or water from local or global atmospheric sources. Mercury bio-accumulates in fish, and if ingested can cause health problems.
Nitrate: A low level of nitrate can be naturally occurring in groundwater and surface water. However, the use of synthetic and natural fertilizers, and animal manure management practices are potential sources of excess nitrate in drinking water (ground and surface water). When fertilizer containing nitrate is applied to crops, any amount that plants cannot take up can readily percolate down to groundwater or run off to nearby streams. Nitrate in uncovered manure piles can easily move to groundwater or streams and rivers during the rainy months or during snow-melt events. Irrigation and precipitation events can accelerate the movement of nitrate on the landscape to groundwater and surface water. High nitrate levels in drinking water cause a range of human health problems, particularly with infants, the elderly, and pregnant and nursing women.

Pesticides: Agricultural pesticides of concern include substances in current use and substances no longer in use but persist in the environment. Additional agricultural pesticides without established standards have also been detected. On agricultural lands, sediment from soil erosion can carry these pesticides to water. Current use agricultural pesticide applications, mixing-loading, and disposal activities may also contribute to pesticide detections in surface water. For more information, see: www.deq.state.or.us/wq/standards/toxics.htm.

Phosphorous/Algae/pH/Chlorophyll a: Excessive algal growth can contribute to high pH and low dissolved oxygen. Native fish need dissolved oxygen for successful spawning and moderate pH levels to support physiological processes. Excessive algal growth can also lead to reduced water clarity, aesthetic impairment, and restrictions on water contact recreation. Warm water temperatures, sunlight, high levels of phosphorus, and low flows encourage excessive algal growth. Agricultural activities can contribute to all of these conditions.

Sediment and Turbidity: Sediment includes fine silt and organic particles suspended in water, settled particles, and larger gravel and boulders that move at high flows. Turbidity is a measure of the lack of clarity of water. Sediment movement and deposition is a natural process, 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 physically damage fish and other aquatic life, modify behavior, and increase temperature by absorbing incoming solar radiation. Sediment comes from erosion of streambanks and streambeds, agricultural land, forestland, roads, and developed areas. Sediment particles can transport other pollutants, including bacteria, nutrients, pesticides, and toxic substances.

Temperature: Oregon’s native cold-water aquatic communities, including salmonids, are sensitive to water temperature. Several temperature criteria have been established to protect various life stages and fish species. Many conditions contribute to elevated stream temperatures. On agricultural lands, inadequate streamside vegetation, irrigation water withdrawals, warm irrigation water return flows, farm ponds, and land management that leads to widened stream channels contribute to elevated stream temperatures. Elevated stream temperatures also contribute to excessive algal growth, which leads to low dissolved oxygen levels and high pH levels.
Appendix B: Conservation Funding Programs

The following is a list of some conservation funding programs available to landowners and organizations in Oregon. For more information, please refer to the contact agencies for each program. Additional programs may become available after the publication of this document. For current information, please contact one of the organizations listed below. Contact information is provided in Appendix C.

<table>
<thead>
<tr>
<th>Program</th>
<th>General Description</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation Reserve Enhancement Program (CREP)</td>
<td>Provides annual rent to landowners who enroll agricultural lands along fish-bearing streams. Also cost-shares conservation practices such as riparian tree planting, livestock watering facilities, and riparian fencing. May provide several bonuses to landowners who enroll.</td>
<td>NRCS, SWCDs, Oregon Department of Forestry</td>
</tr>
<tr>
<td>Conservation Reserve Program (CRP)</td>
<td>Competitive CRP provides annual rent to landowners who enroll highly erodible lands. Continuous CRP provides annual rent to landowners who enroll agricultural lands along seasonal or perennial streams. Also cost-shares conservation practices such as riparian plantings.</td>
<td>NRCS, SWCDs</td>
</tr>
<tr>
<td>Conservation Stewardship Program</td>
<td>Provides cost-sharing to landowners who adopt or maintain a wide range of management, vegetative, and land-based structural practices that address resource concerns such as water quality and wildlife habitat.</td>
<td>NRCS, SWCDs</td>
</tr>
<tr>
<td>Emergency Watershed Protection Program (EWP)</td>
<td>Available through the USDA-Natural Resources Conservation Service. Provides federal funds for emergency protection measures to safeguard lives and property from floods and the products of erosion created by natural disasters that cause a sudden impairment to a watershed.</td>
<td>NRCS, SWCDs</td>
</tr>
<tr>
<td>Environmental Protection Agency Section 319 Grants</td>
<td>Fund projects that improve watershed functions and protect the quality of surface and groundwater, including restoration and education projects.</td>
<td>Oregon DEQ, SWCDs, Watershed Councils</td>
</tr>
<tr>
<td>Environmental Quality Incentives Program (EQIP)</td>
<td>Cost-shares water quality and wildlife habitat improvement activities, including conservation tillage, nutrient and manure management, fish habitat improvements, and riparian plantings.</td>
<td>NRCS, SWCDs</td>
</tr>
<tr>
<td>Federal Reforestation Tax Credit</td>
<td>Provides federal tax credit as incentive to plant trees.</td>
<td>Internal Revenue Service</td>
</tr>
<tr>
<td>Forestry Incentives Program (FIP)</td>
<td>Provides cost-sharing for several forest stand improvement practices.</td>
<td>NRCS, SWCDs, Oregon Department of Forestry</td>
</tr>
<tr>
<td>Forest Resource Trust</td>
<td>State assistance up to 100 percent of the costs to convert non-stocked forest land to timber stands. Available to non-industrial private landowners.</td>
<td>Oregon Department of Forestry</td>
</tr>
<tr>
<td>Program</td>
<td>General Description</td>
<td>Contact</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Grassland Reserve Program</td>
<td>Provides long-term contracts and easements to landowners who maintain or enhance high-priority grassland resources including pasture and rangeland.</td>
<td>NRCS, SWCDs</td>
</tr>
<tr>
<td>Oregon Watershed Enhancement Board (OWEB)</td>
<td>Provides grants for a variety of restoration, assessment, monitoring, and education projects, as well as watershed council staff support. Also has small grant program that provides up to $10,000 for restoration projects. 25% match requirement on all grants.</td>
<td>SWCDs, Watershed Councils, OWEB</td>
</tr>
<tr>
<td>Partners for Wildlife Program</td>
<td>Provides financial and technical assistance to private and non-federal landowners to restore and improve wetlands, riparian areas, and upland habitats in partnership with the U.S. Fish and Wildlife Service and other cooperating groups.</td>
<td>U.S. Fish and Wildlife Service (503) 231-6179, NRCS, SWCDs</td>
</tr>
<tr>
<td>Public Law 566 Watershed Program</td>
<td>Program available to state agencies and other eligible organizations for planning and implementing watershed improvement and management projects. Projects should reduce erosion, siltation, and flooding; provide for agricultural water management; or improve fish and wildlife resources.</td>
<td>NRCS, SWCDs</td>
</tr>
<tr>
<td>State Forestation Tax Credit</td>
<td>Provides for reforestation of under-productive forest land not covered under the Oregon Forest Practices Act. Situations include brush and pasture conversions, fire damage areas, and insect and disease areas.</td>
<td>Oregon Department of Forestry</td>
</tr>
<tr>
<td>State Tax Credit for Fish Habitat Improvements</td>
<td>Provides tax credit for part of the costs of voluntary fish habitat improvements and required fish screening devices.</td>
<td>Oregon Department of Fish and Wildlife</td>
</tr>
<tr>
<td>Stewardship Incentive Program (SIP)</td>
<td>Cost-sharing program for landowners to protect and enhance forest resources. Eligible practices include tree planting, site preparation, pre-commercial thinning, and wildlife habitat improvements.</td>
<td>NRCS, SWCDs, Oregon Department of Forestry</td>
</tr>
<tr>
<td>Wetlands Reserve Program (WRP)</td>
<td>Provides cost-sharing to landowners who restore wetlands on agricultural lands.</td>
<td>NRCS, SWCDs</td>
</tr>
<tr>
<td>Wildlife Habitat Tax Deferral Program</td>
<td>Maintains farm or forestry deferral for landowners who develop a wildlife management plan with the approval of the Oregon Department of Fish and Wildlife.</td>
<td>Oregon Department of Fish and Wildlife, SWCDs, NRCS</td>
</tr>
</tbody>
</table>
Appendix C: Sources of Information and Technical Assistance

Soil and Water Conservation Districts (SWCDs)
Provide technical assistance in a wide variety of agricultural and natural resource disciplines and help landowners in access federal and local funding programs.

**Benton SWCD**
456 SW Monroe Ave., Suite 110
Corvallis, OR 97333
(541) 753-7208
office@bentonswcd.org

**Upper Willamette SWCD**
780 Bailey Hill Rd., Suite 5
Eugene, OR 97402
(541) 465-6436 Ext. 102
office@uwwgcd.org

**Linn SWCD**
33935 Hwy. 99E, Suite C
Tangent, OR 97389
(541) 926-2483
linn.swcd@oacd.org

**Siuslaw SWCD**
1525 12th St., Suite 10A
Florence, OR 97439
(541) 997-1272
siuswcd@qwestoffice.net

Natural Resources Conservation Service (NRCS)
Provides information on soil types, soils mapping, and interpretation. Administers and provides assistance in developing conservation plans for federal programs such as the Conservation Reserve Program, Conservation Reserve Enhancement Program, the Environmental Quality Incentives Program, and the Wetlands Reserve Program. Makes technical determinations on wetlands and highly erodible lands.

**Benton County Lane County Linn County**
31978 N. Lake Creek Drive 780 Bailey Hill Rd., Suite 5 31978 N. Lake Creek Dr.
Tangent, OR 97389 Eugene, OR 97402 Tangent, OR 97389
(541)-967-5927 (541) 465-6443 (541) 967-5927

Cascade-Pacific Resource Conservation and Development
33630 McFarland Rd.
Tangent, OR 97389
(541) 967-5929

Farm Services Agency (FSA)
Maintains agricultural program records and administers federal cost-share programs. Maintains up-to-date aerial photographs and slides of agricultural and forest lands.

**Lane County Benton County Linn County**
Eugene, OR 97402 Tangent, OR 97389 Tangent, OR 97389
(541) 465-6443 ext. 2 (541) 967-5927 (541) 967-5927
Oregon Department of Agriculture (ODA)
635 Capitol St NE
Salem, OR 97301
Natural Resources Division: (503) 986-4700
Pesticides Division: (503) 986-4635

The Natural Resources Division includes the Agricultural Water Quality Program, the Confined Animal Feeding Operation Program, the Smoke Management Program, and the SWCD Program. The Pesticides Division regulates the sale and use of pesticides; tests and licenses all users of restricted-use pesticides, is responsible for fertilizer registration, and investigates incidents of alleged pesticide misuse.

Oregon Department of Environmental Quality (DEQ)
165 E. 7th Ave, Suite 100
Eugene, OR 97401
(541) 646-7838
http://www.deq.state.or.us

Southern Willamette Valley Groundwater Management Area
c/o DEQ
221 Stewart Ave, Suite 201
Medford, OR 97501
(541) 776-6029
http://gwma.oregonstate.edu/

Responsible to protect Oregon’s water and air quality, clean up spills and releases of hazardous materials, and manage the proper disposal of solid and hazardous wastes. Maintains a list of water quality limited streams and establishes Total Maximum Daily Loads for water quality limited waterbodies.

Oregon Department of Fish and Wildlife (ODFW)
3150 E Main St.
Springfield, OR 97478
(541) 726-3515
http://www.dfw.state.or.us

Works with landowners to protect and enhance habitat for a variety of fish and wildlife species, manages recreational fishing and hunting programs, monitors fish and wildlife populations, conducts education and information programs, and administers wildlife habitat tax deferral program.

Oregon Department of Forestry (ODF)
PO Box 157
87950 Territorial Hwy
Veneta, OR 97487
(541) 935-2283

Implements Oregon forest practices laws, administers Oregon forestry property tax programs, provides forest management technical assistance to landowners, and administers or assists with several federal and local cost-sharing programs.

Oregon Department of State Lands (DSL)
Administers Oregon fill and removal law and provides technical assistance to landowners.
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
http://statelands.dsl.state.or.us
Oregon State University Extension Service (OSUES)
Offers educational programs, seminars, classes, tours, publications, and individual assistance to help landowners meet natural resource management goals.

Benton County  Lane County  Linn County
4077 SW Research Way  783 Grant Street  104 SW 4th Avenue
Corvallis, OR 97333  Eugene, OR 97402  PO Box 756
(541) 766-6750  (541) 344-5859  Albany, OR 97321

Oregon Water Resources Department (WRD)
125 E. 8th Ave
Eugene, OR 97401
(541) 682-3620
http://www.wrd.state.or.us
Provides information on streamflows and water rights, issues water rights, and monitors water use. Administers in-stream leasing and temporary water rights transfer programs.

Oregon Watershed Enhancement Board (OWEB)
775 Summer St. NE, Suite 360
Salem, OR 97301-1290
(503) 986-0178
http://www.oweb.state.or.us
Provides funding for a variety of watershed enhancement, assessment, monitoring and educational activities. Provides support to watershed councils throughout Oregon.

Watershed Councils
Bring diverse interests together to cooperatively monitor and address local watershed conditions. Collect watershed condition data, conduct education programs, and train and involve volunteers.

Long Tom Watershed Council
751 S. Danebo Ave.
Eugene, OR 97402
(541) 338-7055
http://www.longtom.org

Siuslaw Watershed Council
P.O. Box 422
Mapleton School District Campus
10868 E. Mapleton Road
Mapleton, OR 97453
(541) 268-3044
watershed@siuslaw.org
Appendix D: SWV GWMA Agricultural Action Plan and Crosswalk to the Agricultural Water Quality Management Area Plan

This table provides information about the Goals, Objectives and Actions identified in the SWV GWMA. These actions are carried out by many different partners. The crosswalk column indicates the sub-set of actions that are implemented as part of the Upper Willamette-Upper Siuslaw Ag WQ MAP by ODA and the Upper Willamette SWCD.

<table>
<thead>
<tr>
<th>Goals for Agricultural Lands in the SWV GWMA</th>
<th>Crosswalk to UWUS Area Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal 1</strong>: Prevent and control pollution of groundwater from agricultural activities and achieve applicable water quality standards that protect beneficial uses through voluntary management actions.</td>
<td>The goals of the GWMA and the Agricultural Water Quality Management Area Plan are very similar. The UWUS Area Plan goal can be found at the beginning of Chapter 3.</td>
</tr>
<tr>
<td><strong>Goals 2</strong>: Reduce existing concentrations of nitrate and prevent further contamination from agricultural sources of groundwater in the GWMA. Identify: practices contributing to contamination, best management practices to prevent nitrogen inputs to groundwater, and a schedule for implementation of actions.</td>
<td>Practices related to GWMA Goal 2 are identified in Chapter 2.5 of this Plan.</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Objective 1: Education and Outreach</th>
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</thead>
<tbody>
<tr>
<td><strong>Strategy 1.1</strong> Within the GWMA, coordinate agricultural surface and groundwater pollution control efforts. Coordinate groundwater pollution control efforts among the various agriculture-related organizations and plans in the GWMA.</td>
<td>The SWCD Scopes of Work are reviewed as part of the OWEB Capacity Grant. The SWV GWMA SWCD’s Scopes of Work include tasks that relate to the SWV GWMA Action Plan. This is accomplished on an ongoing basis.</td>
</tr>
<tr>
<td><strong>Actions</strong></td>
<td>The SWV GWMA Agricultural Actions are identified in Chapter 2.5, 3.2, 4.2 and in this Appendix.</td>
</tr>
<tr>
<td>• Annually evaluate the Benton, Upper Willamette, and Linn SWCD Scopes of Work to include groundwater quality tasks. These tasks should focus on nitrogen use efficiency, irrigation use efficiency, and manure management.</td>
<td>ODA and the SWCDs participate annually on NRCS Local Work Groups to advocate for funding for SWV GWMA implementation.</td>
</tr>
<tr>
<td>• During biennial reviews of the South Santiam, Middle Willamette, and Upper Willamette Agricultural Water Quality Management Area Plans, update groundwater quality items in the Goals and Objectives. The Area Plans Goals and Objectives sections should include a focus on nitrogen use efficiency, irrigation efficiency, and manure management.</td>
<td></td>
</tr>
<tr>
<td>• Communicate to NRCS local work groups the priority of spending funds on nutrient use efficiency, irrigation efficiency, and manure management within the GWMA.</td>
<td></td>
</tr>
</tbody>
</table>

| Strategy 1.2 Organize and deliver workshops and demonstration projects aimed at producers to show BMP implementation and increase BMP adoption. At the workshops, educate producers about groundwater conditions, populations at risk from high nitrate levels, federal assistance programs, and sustainable agriculture opportunities. | See Chapter 3.2 and 4.2 for targets and results. |
| **Actions** | A Joint LAC and GWMA Field Tour is being considered for summer or fall of 2021. GWMA demonstrations projects are intended to be included in the tour. |
| • Each SWCD develop one demonstration project showcasing successful BMPs and systems. | |
| • Organize one tour (field or virtual) of each demonstration project for agricultural managers and producers. Partner with agribusiness for tours of demo projects. | |
| • Each year partners sponsor two small acreage resource management workshops that provide presentations (either as a | |
- Include information on sustainable practices, incentive programs, and third-party certification at the workshops. The goal is to attract 100 producers annually to the demonstrations and workshops.

### Strategy 1.3 Write and publish articles to promote/improve the agricultural community’s awareness of water quality issues in the GWMA.

**Actions**
- Once per year, provide an update on the status of the GWMA and associated water quality data in the Benton SWCD newsletter. The Linn and Upper Willamette SWCDs do not have a newsletter, and therefore, should provide an update to be included in a partner newsletter or other media source. This may include OSU Extension for the Linn SWCD.
- Publish two media articles or public service announcements per year in the GWMA about successful agricultural resource management practices.

### Strategy 1.4 Share information and coordinate with agribusiness, producers, and producer groups to promote practices and conditions that protect and improve water quality.

**Actions**
- Follow-up meeting with agribusiness field representatives active in the GWMA to review the groundwater nitrate issue and share appropriate outreach materials. This should occur in 2012 and once every three years thereafter. Possible ways to meet with field representatives include:
  - Grower meetings
  - Individual company meetings
  - Oregon Agriculture Chemical and Fertilizer safety training workshops
- Each SWCD will deliver one groundwater quality presentation (either as a stand-alone presentation or part of a broader presentation) at one agribusiness or producer group meeting per year.
- Make at least 100 contacts (total) with landowners about groundwater quality per year within the areas served by the Benton, Upper Willamette, and Linn SWCDs.
- Provide or develop outreach materials for producers that summarizes practical resource management for groundwater quality.

### Objective 2: Resource Management—Implement BMPs in the GWMA to improve groundwater quality.

### Strategy 2.1 Work with agricultural producers in the GWMA to implement practices to improve groundwater quality.

**Actions**
- Provide technical assistance to producers in the GWMA. Each SWCD will have a minimum of ten contacts with producers within the GWMA annually promoting irrigation efficiency, and nutrient and manure management.
- Promote proper nutrient management, irrigation efficiencies, and manure management to reduce nitrogen loss to groundwater. Each SWCD will work with two producers within the GWMA annually to design and implement best management practices.

### Table 3.2 indicates what the Upper Willamette SWCD plans to do over the next four years. Note that some of these actions are completed and some can be carried out on an ongoing basis.

### Table 4.2 indicates what the Upper Willamette SWCD implemented over the past two years.
<table>
<thead>
<tr>
<th>Strategy 2.2 Obtain sufficient financial assistance to support technical assistance to producers and implementation of resource management practices.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actions</strong></td>
</tr>
<tr>
<td>• Include tasks in the SWCDs Scopes of Work for technical assistance to producers and to seek funds for implementation of practices related to groundwater quality.</td>
</tr>
<tr>
<td>• Communicate to NRCS local work groups the priority of spending funds on nutrient use efficiency, irrigation efficiency, and manure management within the GWMA.</td>
</tr>
<tr>
<td>• Include the promotion and support of USDA programs such as the Environmental Quality Incentives Program and the Conservation Reserve Enhancement Program into SWCD work plans and Scopes of Work.</td>
</tr>
<tr>
<td>• Seek funds from USDA incentive based financial assistance programs to assist producers to implement groundwater protection practices.</td>
</tr>
<tr>
<td>• Seed DEQ 319 funds to assist with agricultural on-the-ground projects and management practices that minimize groundwater nitrate pollution.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategy 2.3 Develop and target a priority area within the GWMA to evaluate progress related to implementation of the Agricultural Water Quality Plans and GWMA Action Plan. (The purpose of the priority area is to evaluate the area before and after targeting and demonstrate progress. Progress is a measurement of improvement of water quality parameters or surrogates.) As resources and time allows, multiple priority areas will be identified for targeting.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actions</strong></td>
</tr>
<tr>
<td>• Identify a priority area to target education, outreach, and other resources. This area should be identified by July 2013.</td>
</tr>
<tr>
<td>• Identify BMPs that will be promoted for improvement of groundwater quality.</td>
</tr>
<tr>
<td>• Identify management practices or conditions that assure agricultural contributions of nitrate to groundwater are at acceptable levels.</td>
</tr>
<tr>
<td>• Measure soil nitrate levels at enough sites in the priority area to assess potential of nitrate leaching.</td>
</tr>
<tr>
<td>• Contact all landowners within the priority area with information on the GWMA and best management practices to reduce nitrate inputs.</td>
</tr>
<tr>
<td>• Develop targets and milestones specific to the priority area.</td>
</tr>
<tr>
<td>• Implement management practices with all willing landowners in the priority area.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategy 2.4 Obtain adequate funding for implementation of desired practices within the priority area.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actions</strong></td>
</tr>
<tr>
<td>• Develop implementation and funding plan for the identified priority area.</td>
</tr>
<tr>
<td>• Work with producers in the priority area to determine interest in implementation of specific practices.</td>
</tr>
<tr>
<td>• Work with partners to submit funds proposals to cost-share implementation of practices.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SWCD Scopes of Work include tasks for providing technical assistance to producers and for seeking funding for the implementation of resource management practices.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The SWCD and ODA participate on annual NRCS Local Work Groups to communicate the need for SWV GWMA implementation consideration.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ODA Focus Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>The SWCD’s Bear Creek and Long Tom River Focus Area provides an opportunity for the SWCD to provide targeted education, outreach and other resources to producers who manage lands within the Focus Area.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neighborhoods Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>In 2017 SWV GWMA partners identified an area within the GWMA where nitrates have been persistently high. ODA is working with producers in this area on an ongoing basis to identify potential practices to test ideas that may lead to reduced nitrates.</td>
</tr>
</tbody>
</table>

| An ODA fertilizer grant was sought for the Neighborhoods Project during 2019 but was not funded. |
### Objective 3: Monitoring and Research

Monitor groundwater quality in agricultural areas to evaluate the impacts of agricultural management practices. Research best management practice effectiveness, adoption of best management practices, and priority research needs.

### Strategy 3.1 Evaluate current domestic and monitoring wells to determine monitoring needs in agricultural areas.

**Actions**
- Coordinate with local, state, and federal partners to evaluate current surface and groundwater monitoring network and identify additional monitoring needs, by January 2013.
- Evaluate aquifer characteristics to determine whether the existing monitoring wells provide comprehensive data on nitrate concentrations or if additional wells are necessary to monitor nitrate levels in the GWMA.
- Evaluate LiDAR (light detection and ranging) data to understand connections between wells.

This evaluation was completed. See SWV GWMA web page for details.

### Strategy 3.2 Measure the success of BMPs implementation efforts.

**Actions**
- Measure producer (within the priority area from Strategy 2.3):
  - Awareness of groundwater quality issues,
  - Level of BMPs implementation,
  - Ease of implementing BMPs, and
  - Barriers to BMPs implementation.
- This measurement should be completed in the fall of 2013 and repeated two years later to determine any changes. Target: 50% of the producers surveyed in 2013 using groundwater protection BMPs as identified by groundwater staff and agricultural partners.

See SWV GWMA web page for additional information.

### Strategy 3.3 Document groundwater related investigations and violations of Agricultural Water Quality Management Area Rules and CAFO permit conditions within the GWMA.

**Actions**
- Document the number, issue, validity, and outcome investigations regarding potential violations of Agricultural Water Quality Management Area Rules where the violations could impact groundwater.
- Document CAFO violations and outcomes.

See Table 4.4.b for a summary of water quality investigations and violations of the Agricultural Water Quality Management Area Rules. None of the violations within the biennium were related to groundwater issues.

### Strategy 3.4 Research, document and coordinate BMP effectiveness. Implement priority research identified at February 2010 researchers meeting.

**Actions**
- Follow-up to the February 2010 researchers meeting to track progress related to identified priority research and funding needs. Research needs identified include:
  - Nitrogen budgets and BMPs for other and nontraditional crops (such as specialty seed crops)
  - Nitrogen mineralization under different crop scenarios
  - Bioreactors on tile lines
  - Time of groundwater travel (data needs improved)
  - No till vs. conventional (difference in cost and potential leaching)
  - Study nitrate sources and how nitrate moves

See SWV GWMA web page for research and monitoring results.
- Impact of tile lines on nitrate concentration and movement
  - Maintain a prioritized research plan and identified sources of funding.
  - Work with OSU or other partners to design a nitrate leaching study to further characterize potential nitrate leaching from various agricultural sources in the GWMA.
  - Implement research to measure BMP and systems effectiveness and identify factors affecting groundwater nitrate levels from agricultural practices.
  - Research and document effectiveness and impacts of specific BMPs on nitrate leaching.

**Strategy 3.5 Obtain sufficient funding to support priority research needs.**

**Actions**
- Submit research grant applications to support high priority research needs. Potential grant sources include the DEQ 319 program, ODA’s fertilizer research funds, EPA, the USDA, and other agencies and private organizations.

See SWV GWMA web page for information about funding.

An ODA fertilizer research grant was applied for to assist with the Neighborhoods Project, but was not funded.