

Oregon

Department
of Agriculture

Upper Deschutes Agricultural Water Quality Management Area Plan

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Developed by the

Oregon Department of Agriculture

Upper Deschutes Local Advisory Committee

With support from the

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Table of Contents

Acronyms and Terms Used in this Document	i
Foreword	iii
Required Elements of Area Plans	iii
Plan Content	iii
Chapter 1: Agricultural Water Quality Management Program Purpose and Background	1
1.1 Purpose of Agricultural Water Quality Management Program and Applicability of Area Plans	1
1.2 History of the Ag Water Quality Program	1
1.3 Roles and Responsibilities	2
1.3.1 Oregon Department of Agriculture.....	2
1.3.2 Local Management Agency.....	5
1.3.3 Local Advisory Committee.....	5
1.3.4 Agricultural Landowners	5
1.3.5 Public Participation.....	6
1.4 Agricultural Water Quality	6
1.4.1 Point and Nonpoint Sources of Water Pollution.....	6
1.4.2 Beneficial Uses and Parameters of Concern.....	6
1.4.3 Impaired Water Bodies and Total Maximum Daily Loads.....	7
1.4.4 Oregon Water Pollution Control Law – ORS 468B.025 and ORS 468B.050	7
1.4.5 Streamside Vegetation and Agricultural Water Quality.....	8
1.5 Other Water Quality Programs	9
1.5.1 Confined Animal Feeding Operation Program	10
1.5.2 Groundwater Management Areas.....	10
1.5.3 The Oregon Plan for Salmon and Watersheds.....	10
1.5.4 Pesticide Management and Stewardship.....	10
1.5.5 Drinking Water Source Protection.....	11
1.6 Partner Agencies and Organizations	11
1.6.1 Oregon Department of Environmental Quality.....	11
1.6.2 Other Partners	12
1.7 Measuring Progress	12
1.7.1 Measurable Objectives	12
1.7.2 Land Conditions and Water Quality.....	13
1.7.3 Focused Implementation in Small Geographic Areas.....	13
1.8 Monitoring, Evaluation, and Adaptive Management	14
1.8.1 Agricultural Water Quality Monitoring.....	14
1.8.2 Biennial Reviews and Adaptive Management	15
Chapter 2: Local Background	17
2.1 Local Roles	18
2.1.1 Local Advisory Committee.....	18
2.1.2 Local Management Agency	18
2.2 Area Plan and Area Rules: Development and History	18
2.3 Geographical and Physical Setting	18
2.4 Agricultural Water Quality	23

2.4.1	Water Quality Issues	23
2.4.1.1	Beneficial Uses.....	24
2.4.1.2	Most Sensitive Beneficial Use: Salmonids.....	24
2.4.1.3	WQ Parameters and 303(d) list	25
2.4.2	Basin TMDLs and Agricultural Load Allocations.....	28
2.4.3	Sources of Impairment.....	28
2.5	Voluntary and Regulatory Measures	28
2.5.1	Voluntary Measures	28
2.5.2	Regulatory Measures	30
Chapter 3:	Implementation Strategies	33
3.1	Measurable Objectives	33
3.1.1	Management Area	33
3.1.2	Focus Area.....	34
3.2	Strategies and Activities	35
3.2.1	Strategic Implementation Area.....	35
3.2.2	Strategies to Meet Goal	35
3.2.2.1	Education.....	35
3.2.2.2	Voluntary Conservation Practices.....	35
3.2.2.3	Funding	36
3.3	Monitoring and Evaluation.....	37
Chapter 4:	Implementation, Monitoring, and Adaptive Management	39
4.1	Progress Toward Measurable Objectives.....	39
4.1.1	Management Area	39
4.1.2	Focus Area.....	39
4.2	Activities and Accomplishments	39
4.2.1	Indian Ford Strategic Implementation Area	39
4.2.2	Additional activities and strategies in the Management Area:.....	39
4.3	Monitoring—Status and Trends	40
4.3.1	Water Quality	40
4.4	Biennial Reviews and Adaptive Management	42
CITED SOURCES.....		43

Acronyms and Terms Used in this Document

Ag Water Quality Program – Agricultural Water Quality Management Program

Area Plan – Agricultural Water Quality Management Area Plan

Area Rules – Agricultural Water Quality Management Area Rules

BOR – Bureau of Reclamation

CAFO – Confined Animal Feeding Operation

CCRP – Continuous Conservation Reserve Program

cfs – cubic feet per second

Corps – U.S. Army Corps of Engineers

CREP – Conservation Reserve Enhancement Program

CWA – Clean Water Act

DEQ – Oregon Department of Environmental Quality

DMA – Designated Management Agency

DO – Dissolved Oxygen

DSL – Department of State Lands

EQIP – Environmental Quality Incentive Program

GWMA – Groundwater Management Area

HABs – Harmful Algal Blooms

IWM – Irrigation Water Management

LAC – Local Advisory Committee

LMA – Local Management Agency

LWD – Large Woody Debris

Management Area – Agricultural Water Quality Management Area

MOA – Memorandum of Agreement

NPDES – National Pollution Discharge Elimination System

NRCS – Natural Resources Conservation Service

NTU – Nephelometric Turbidity Units

OAR – Oregon Administrative Rules

ODA – Oregon Department of Agriculture

ODF – Oregon Department of Forestry

ODFW – Oregon Department of Fish and Wildlife

OHA – Oregon Health Authority

ORS – Oregon Revised Statute

OSU – Oregon State University

OWEB – Oregon Watershed Enhancement Board

PMP – Pesticides Management Plan

PSP – Pesticides Stewardship Partnership

RCA – Required Corrective Action

SIA – Strategic Implementation Area

SWCD – Soil and Water Conservation District

TMDL – Total Maximum Daily Load

USDA – United States Department of Agriculture

US EPA – United States Environmental Protection Agency

WPCF – Water Pollution Control Facility

WQPMT – Water Quality Pesticides Management Team

Foreword

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

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

Required Elements of Area Plans

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

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

Plan Content

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

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

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

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

Chapter 1: Agricultural Water Quality Management Program Purpose and Background

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

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

The provisions of the Area Plan do not establish legal requirements or prohibitions (ORS 568.912(1)). Each Area Plan is accompanied by Area Rules that describe local agricultural water quality regulatory requirements. ODA will exercise its regulatory authority for the prevention and control of water pollution from agricultural activities under the Ag Water Quality Program’s general regulations (OAR 603-090-0000 to 603-090-0120) and under the Area Rules for this Management Area (OAR 603-095-3000). The Ag Water Quality Program’s general rules guide the Ag Water Quality Program, and the Area Rules for the Management Area are the regulations that landowners are required to follow. Landowners will be encouraged through outreach and education to implement conservation management activities.

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

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

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

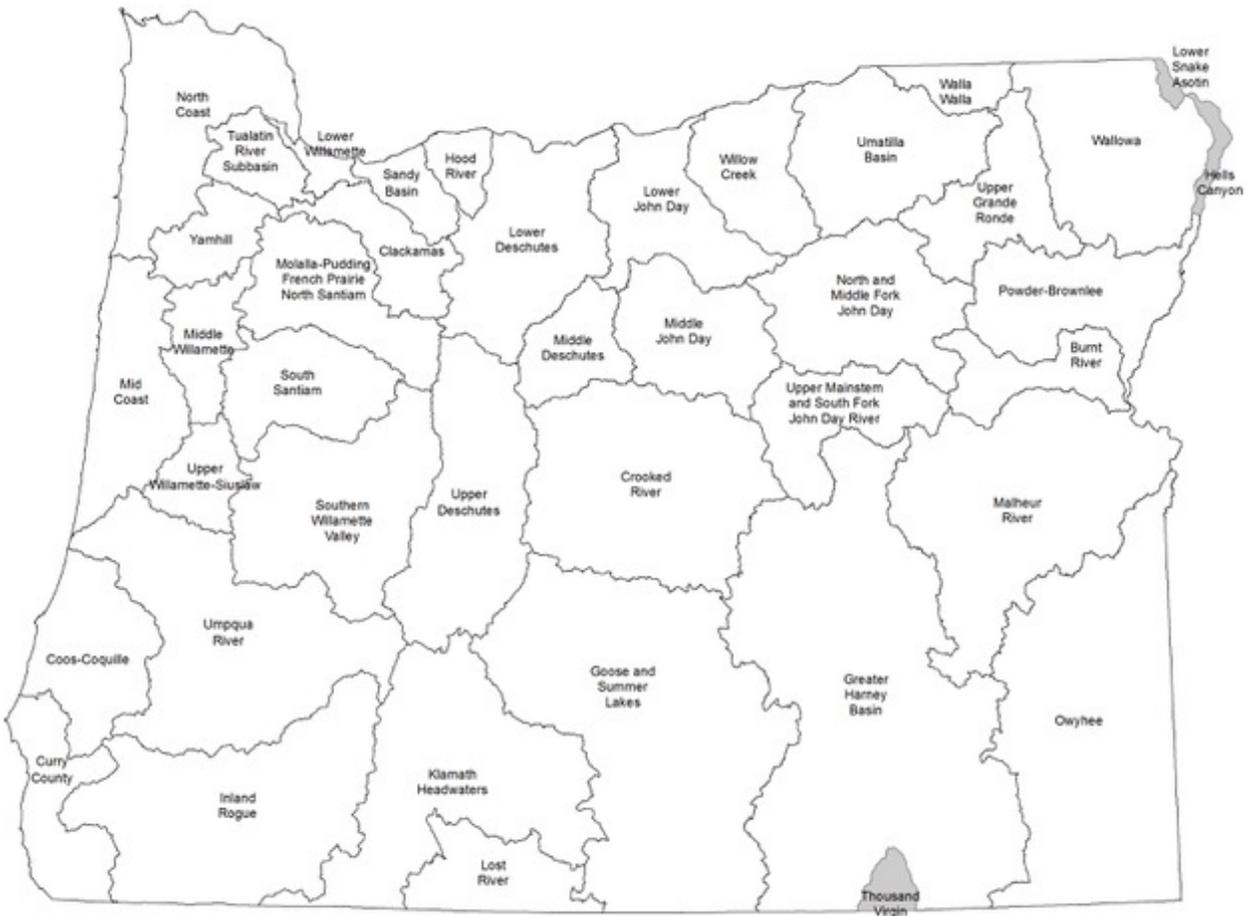
1.2 History of the Ag Water Quality Program

In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion, to achieve water quality standards, and to adopt rules as necessary (ORS 568.900 through ORS 568.933). The Oregon Legislature passed additional legislation in 1995 to clarify that ODA is the lead agency for regulating agriculture with respect to water quality (ORS 561.191). The Area Plan and Area Rules were developed and subsequently revised pursuant to these statutes.

Between 1997 and 2004, ODA worked with LACs and SWCDs to develop Area Plans and Area Rules in 38 watershed-based Management Areas across Oregon (Figure 1). Since 2004, ODA, LACs, SWCDs, and other partners have focused on implementation including:

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

Figure 1: Map of 38 Agricultural Water Quality Management Areas
 Grey areas are not incorporated into Ag Water Quality Management Areas



1.3 Roles and Responsibilities

1.3.1 Oregon Department of Agriculture

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

- State water quality standards.
- Load allocations for agricultural or nonpoint source pollution assigned under Total Maximum Daily Loads (TMDLs) issued pursuant to the federal Clean Water Act (CWA), Section 303(d).

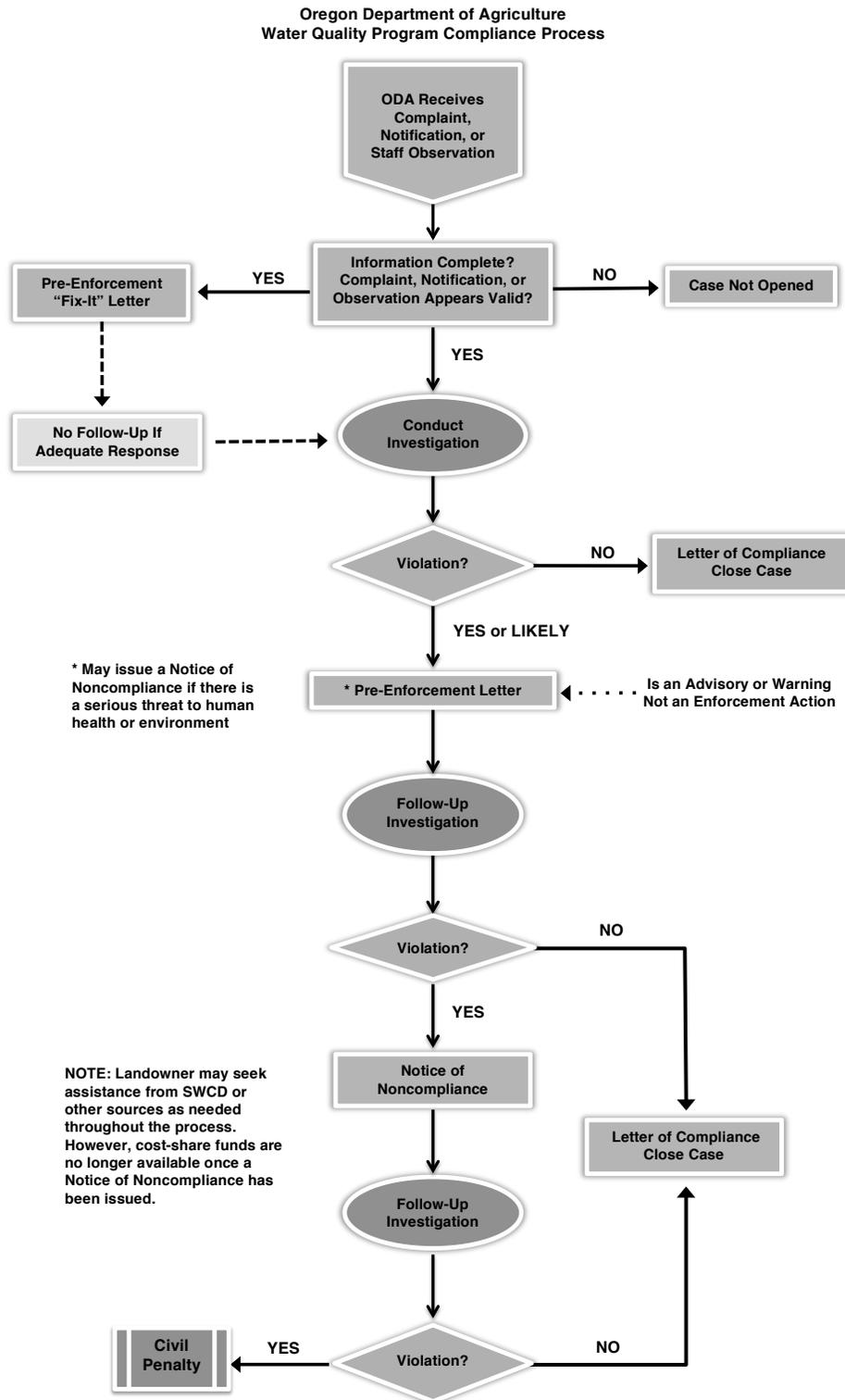
- Approved management measures for Coastal Zone Act Reauthorization Amendments (CZARA).
- Agricultural activities detailed in a Groundwater Management Area (GWMA) Action Plan (if DEQ has established a GWMA and an Action Plan has been developed).

The Oregon Department of Agriculture has the legal authority to develop and implement Area Plans and Area Rules for the prevention and control of water pollution from agricultural activities and soil erosion, where such plans are required by state or federal law (ORS 568.909 and ORS 568.912). ODA bases Area Plans and Area Rules on scientific information (ORS 568.909). ODA works in partnership with SWCDs, LACs, DEQ, and other partners to implement, evaluate, and update the Area Plans and Area Rules. ODA is responsible for any actions related to enforcement or determination of noncompliance with Area Rules (OAR 603-090-0080 through OAR 603-090-0120). ORS 568.912(1) and ORS 568.912(2) give ODA the authority to adopt rules that require landowners to perform actions necessary to prevent and control pollution from agricultural activities and soil erosion.

The Area Rules are a set of standards that landowners must meet on all agricultural or rural lands. (“Landowner” includes any landowner, land occupier or operator per OAR 603-95-0010(24)). All landowners must comply with the Area Rules. ODA will use enforcement where appropriate and necessary to gain compliance with Area Rules. Figure 2 outlines ODA’s compliance process. ODA will pursue enforcement action only when reasonable attempts at voluntary solutions have failed (OAR 603-090-0000(5)(e)). If a violation is documented, ODA may issue a pre-enforcement notification or an enforcement Order such as a Notice of Noncompliance. If a Notice of Noncompliance is issued, ODA will direct the landowner to remedy the condition through required corrective actions (RCAs) under the provisions of the enforcement procedures outlined in OAR 603-090-060 through OAR 603-090-120. If a landowner does not implement the RCAs, ODA may assess civil penalties for continued violation of the Area Rules. If and when other governmental policies, programs, or rules conflict with the Area Plan or Area Rules, ODA will consult with the appropriate agencies to resolve the conflict in a reasonable manner.

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

Figure 2: Compliance Flow Chart



1.3.2 Local Management Agency

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

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

1.3.3 Local Advisory Committee

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

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

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

1.3.4 Agricultural Landowners

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

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

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

- Conditions resulting from unusual weather events.

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

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

1.3.5 Public Participation

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

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

1.4 Agricultural Water Quality

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

1.4.1 Point and Nonpoint Sources of Water Pollution

There are two types of water pollution. Point source water pollution emanates from clearly identifiable discharge points or pipes. Significant point sources are required to obtain permits that specify their pollutant limits. Agricultural operations regulated as point sources include permitted Confined Animal Feeding Operations (CAFOs), and many are regulated under ODA's CAFO Program. Pesticide applications in, over, or within three feet of water also are regulated as point sources. Irrigation water flows from agricultural fields may be at a defined outlet but they do not currently require a permit.

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

1.4.2 Beneficial Uses and Parameters of Concern

Beneficial uses related to water quality are defined by DEQ in OARs for each basin. They may include: public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality,

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

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

1.4.3 Impaired Water Bodies and Total Maximum Daily Loads

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

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

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

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

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

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

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

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

ORS 468B.025 (prohibited activities) states that:

“(1) Except as provided in ORS 468B.050 or 468B.053, no person shall:

- (a) Cause pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.
- (b) Discharge any wastes into the waters of the state if the discharge reduces the quality of such waters below the water quality standards established by rule for such waters by the Environmental Quality Commission.

(2) No person shall violate the conditions of any waste discharge permit issued under ORS 468B.050.”

ORS 468B.050 identifies the conditions when a permit is required. A permit is required for CAFOs that meet minimum criteria for confinement periods and have large animal numbers or have wastewater facilities. The portions of ORS 468B.050 that apply to the Ag Water Quality Program state that:

“(1) Except as provided in ORS 468B.053 or 468B.215, without holding a permit from the Director of the Department of Environmental Quality or the State Department of Agriculture, which permit shall specify applicable effluent limitations, a person may not:

- (a) Discharge any wastes into the waters of the state from any industrial or commercial establishment or activity or any disposal system.”

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

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

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

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

1.4.5 Streamside Vegetation and Agricultural Water Quality

Across Oregon, the Ag Water Quality Program emphasizes streamside vegetation protection and enhancement to prevent and control water pollution from agriculture activities and to prevent and control soil erosion. Streamside vegetation can provide three primary water quality functions: shade for cool stream temperatures, streambank stability, and filtration of pollutants. Other water quality functions from

streamside vegetation include: water storage in the soil for cooler and later season flows, sediment trapping that can build streambanks and floodplains, narrowing and deepening of channels, and biological uptake of sediment, organic material, nutrients, and pesticides.

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

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

Site-Capable Vegetation

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

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

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

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

1.5 Other Water Quality Programs

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

1.5.1 Confined Animal Feeding Operation Program

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

Both of the Oregon CAFO permits require the registrant to operate according to a site-specific, ODA-approved, Animal Waste Management Plan that is incorporated into the CAFO permit by reference. For more information about the CAFO program, go to www.oregon.gov/ODA/programs/NaturalResources/Pages/CAFO.aspx.

1.5.2 Groundwater Management Areas

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

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

1.5.3 The Oregon Plan for Salmon and Watersheds

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

1.5.4 Pesticide Management and Stewardship

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

In 2007, the interagency Water Quality Pesticide Management Team (WQPMT) was formed to expand efforts to improve water quality in Oregon related to pesticide use. The WQPMT includes representation from ODA, Oregon Department of Forestry (ODF), DEQ, and Oregon Health Authority (OHA). 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 monitoring programs to assess the possible impact of pesticides on Oregon's water quality. Pesticide detections in Oregon's streams can be addressed through multiple programs and partners, including the PSP.

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

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

1.5.5 Drinking Water Source Protection

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

1.6 Partner Agencies and Organizations

1.6.1 Oregon Department of Environmental Quality

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

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

The MOA includes the following commitments:

- ODA will develop and implement a monitoring strategy, as resources allow, in consultation with DEQ.

- ODA will evaluate the effectiveness of Area Plans and Area Rules in collaboration with DEQ:
 - ODA will determine the percentage of lands achieving compliance with Area Rules.
 - ODA will determine whether the target percentages of lands meeting the desired land conditions, as outlined in the goals and objectives of the Area Plans, are being achieved.
- ODA and DEQ will review and evaluate existing information to determine:
 - Whether additional data are needed to conduct an adequate evaluation.
 - Whether existing strategies have been effective in achieving the goals and objectives of the Area Plans.
 - Whether the rate of progress is adequate to achieve the goals of the Area Plans.

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

1.6.2 Other Partners

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

1.7 Measuring Progress

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

1.7.1 Measurable Objectives

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

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

The State of Oregon continues to improve its ability to use technology to measure current streamside vegetation conditions and compare it to the vegetation needed to meet stream shade targets to keep surface waters cooler. As the State’s use of this technology moves forward, ODA will use the information

to help LACs and LMAs set measurable objectives for streamside vegetation. These measurable objectives will be achieved through implementing the Area Plan, with an emphasis on incentive programs.

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

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

1.7.2 Land Conditions and Water Quality

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

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

- Landowners can see land conditions and have direct control over them.
- Improved land conditions can be documented immediately.
- Reductions in water quality from agricultural activities are primarily due to changes in land conditions and management activities.
- It can be difficult to separate agriculture's influence on water quality from other land uses.
- There is generally a lag time between changes on the landscape and the resulting improvements in water quality.
- Extensive monitoring of water quality would be needed to evaluate progress, which would be cost-prohibitive and could fail to demonstrate improvements in the short term.

Water quality monitoring data will help ODA and partners to measure progress or identify problem areas in implementing Area Plans. However, as described above, water quality monitoring may be less likely to document the short-term effects of changing land conditions on water quality parameters such as temperature, bacteria, nutrients, sediment, and pesticides.

1.7.3 Focused Implementation in Small Geographic Areas

Focus Areas

A Focus Area is a small watershed with water quality concerns associated with agriculture. The Focus Area process is SWCD-led, with ODA oversight. The SWCD delivers systematic, concentrated outreach and technical assistance in the Focus Area. A key component of this approach is measuring conditions before and after implementation to document the progress made with available resources. The Focus Area approach is consistent with other agencies' and organizations' efforts to work proactively in small watersheds and is supported by a large body of scientific research (e.g. Council for Agricultural Science and Technology, 2012. *Assessing the Health of Streams in Agricultural Landscapes: The Impacts of Land Management Change on Water Quality*. Special Publication No. 31. Ames, Iowa).

Systematic implementation in Focus Areas provides the following advantages:

- Measuring progress is easier in a small watershed than across an entire Management Area.

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

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

Strategic Implementation Areas

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

1.8 Monitoring, Evaluation, and Adaptive Management

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

1.8.1 Agricultural Water Quality Monitoring

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

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

Water quality monitoring is described in Chapter 3, and the data are presented in Chapter 4.

1.8.2 Biennial Reviews and Adaptive Management

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

Chapter 2: Local Background

The Management Area encompasses approximately 3,200 square miles in Central Oregon, consisting of the Upper and Little Deschutes subbasins, as defined by the state of Oregon. Additionally, it includes lands in the Crooked River drainage south of the Crooked River and west of the range line between R12E and R13E in T14S WM to include the entire Crooked River Ranch subdivision. It is bounded to the west by the crest of the Cascades, to the south by the Klamath drainage, to the east by the Crooked River drainage, and to the north by the Reservation of the Confederated Tribes of the Warm Springs and by the Middle Deschutes Agricultural Water Quality Management Area.

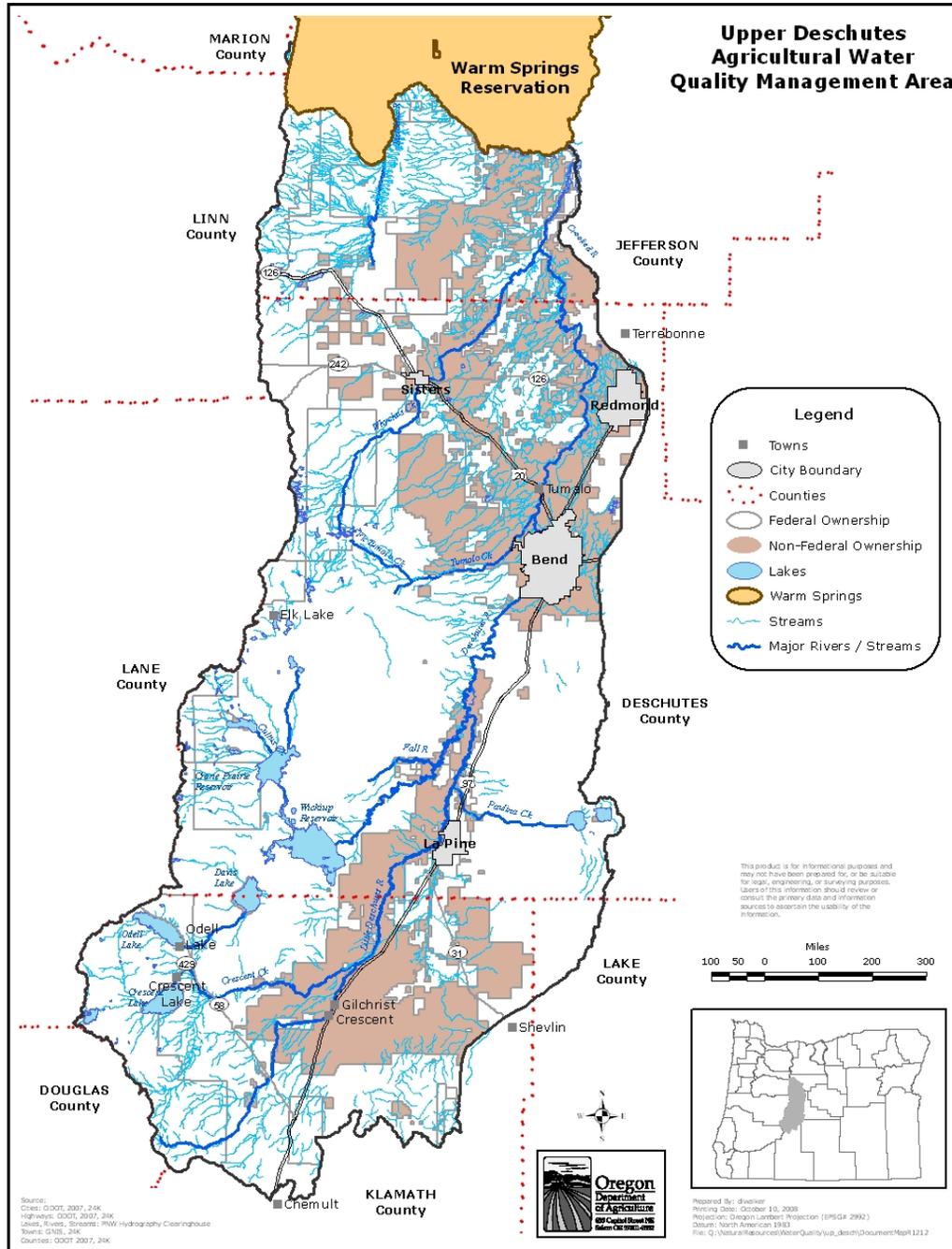


Table 2.1.1. Current LAC members	
<p>Marc Thalacker, Chair: Three Sisters Irrigation District, irrigated farm</p> <p>Rex Barber, Vice Chair: Lower Bridge, irrigated farm, DSWCD</p> <p>Todd Cleveland: Deschutes County Community Development Department</p> <p>Representative: Arnold Irrigation District</p>	<p>Ryan Houston: Watershed Council coordinator</p> <p>Rick Stowell: Retired fish biologist, Trout Unlimited</p> <p>Representative: Central Oregon Irrigation District</p> <p>Dan Sherwin: Retired noxious weed specialist</p>

2.1 Local Roles

2.1.1 Local Advisory Committee

The Upper Deschutes Local Advisory Committee (LAC) helped develop the Area Plan and Rules and participates in biennial reviews of the Area Plan and Rules. The LAC is assisted by the Deschutes Soil and Water Conservation District (SWCD) and ODA. LAC members represent the interests of local landowners, irrigation districts, conservationists, and the Deschutes SWCD.

2.1.2 Local Management Agency

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

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

2.2 Area Plan and Area Rules: Development and History

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

Since approval, the LAC 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 consists of the drainage of the Deschutes River and all its tributaries upstream of and inclusive of the Metolius River, and a fraction of the Crooked River. Major tributaries include the Metolius River, Whychus Creek, Tumalo Creek, and the Little Deschutes River and its tributaries.

The pristine nature of the area has been recognized through federal and state designations of numerous wilderness areas and the establishment of wild, scenic, and recreational river stretches on the Deschutes River, Little Deschutes River, Crescent Creek, and Whychus Creek. Several stretches of the Deschutes River around Bend have been designated Oregon Scenic Waterways.

Additionally, the Management Area includes the communities of Crooked River Ranch, Sisters, Redmond, Bend, La Pine, and Crescent. The Management Area includes half of Deschutes County and portions of Jefferson, Klamath, and Lake counties.

Approximately one-third of the land is state- or privately-owned. The remaining lands are federally owned and mostly managed by the U.S. Forest Service.

2.3.1 Climate

The Management Area is characterized by moderate days and cool nights. Typical summers are dry and hot; winters tend to be relatively dry and cold. Most precipitation falls in the winter.

Rain or snow events above 3,500 feet can cause very high peak flows in the streams and rivers, resulting in severe erosion. The likelihood of flooding increases when warm “Chinook winds” arrive in the spring. Rapid snowmelt can result from these warm, southwest winds and, when accompanied by rainfall, flooding can become severe.

2.3.2 Geology and Soils

The Management Area consists primarily of a long, wide plain ranging in elevation from 2,700 feet at the confluence of the Crooked and Deschutes rivers in the north to 4,300 feet in the south. Volcanic peaks on the western boundary exceed 10,000 feet.

The geology is complex due to several periods of volcanism, faulting, and erosion dating back at least 40 million years. More than 500 large volcanoes, cinder cones, or volcanic vents have been identified in Deschutes County alone. The four major periods of mountain building and river moving activities have been interspersed with periods of erosion and sedimentation associated with glaciation and stream runoff. The general permeability of volcanic rock allows rain and melting snow to trickle into the ground to the water table where underlying sediments play a primary role in natural spring occurrence. Groundwater flowing through adjacent volcanic rocks is forced to the surface due to much older and complex geologic structures of low permeability, creating springs.

Soils in the Upper Deschutes watershed are largely from volcanic materials, including volcanic ash, pumice and cinders. Most of the soils are uniform over large areas and cover buried soils formed of hard basalt and andesite, tuff, breccia, glacial till, and outwash gravel. Because of the relatively recent volcanic activity, soils have not had time to develop and mature. In many areas of the basin, the soil horizon is only a few feet to a few inches thick leaving much of the basalt flows, pumice fragments, and cinders exposed at the surface as if you were looking at a lava flow only a few days old.

Volcanic soils are naturally high in phosphorus. Data from the Metolius drainage suggest that natural background levels of phosphorus in the water vary between 0.05 and 0.15 mg/L.

Detailed information on soil types is found in the Upper Deschutes soil survey at <https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>

2.3.3 Hydrology

The Deschutes River and its western tributaries start high in the Cascade Mountains. The head of the Deschutes River is formed by overflow from Little Lava Lake when there is abundant water, but during dry years the source consists of large springs in Blue Pool. Along its 132-mile course to Lake Billy Chinook, the Deschutes is fed by some of the largest springs in the United States. Cultus River, Quinn River, Snow Creek, Browns Creek, Fall River, Spring River, Alder Springs, and some unnamed springs near Lake Billy Chinook are all springs that discharge the abundant groundwater that has infiltrated high in the pumice rich soils and rocks of the Cascade Mountains. Flows of many springs in the upper watershed peak in summer because of the time delay and distance from when and where the water enters the ground and where it discharges to the surface again; springs at lower elevations tend to have more constant flows. The Deschutes River is so dominated by springs that a U.S. Geological Survey concluded in 1914 that the Deschutes River at Bend was the most even-flowing river for its size of any river in the United States.

Whychus Creek and Tumalo Creek are quite a contrast to the spring-fed tributaries to the Deschutes River. Their source is very high in the Cascade Mountains at the toes of glaciers around Broken Top and the Three Sisters mountains. These two creeks typically peak at the height of snowmelt and large rain events, usually in May and June, and then reach minimum flows in late fall and winter. When there is a moderate to heavy snowpack and a warm Chinook wind, these creeks can increase in flow 20 times over in one day. These streams are also a good source of cold water to the Deschutes River.

To increase the supply of water for irrigation, several reservoirs (Crane Prairie, Crescent Lake, and Wickiup) were built high in the headwaters of the Deschutes River. All together, these three reservoirs store 341,050 acre-feet for irrigation of approximately 105,000 acres.

The flow regime of the Deschutes River changed dramatically below Wickiup Reservoir after the dam was built. During very dry years, the river is reduced to 20 to 30 cfs in the winter and in the summer time during the height of irrigation season, the flow has been increased to 2,000 cfs. Presently, the maximum is around 1,700 cfs with the new required minimum being 100 cfs.

The water released from the reservoir travels down the Deschutes to Bend where nearly all of it is diverted into six major canals. The flow below these canals during the summer is very low. Until recently, the lowest flow in dry years was around 30 cfs. Recent instream transfers and conservation work has brought that minimum to approximately 130 cfs. The canals themselves are mostly unlined and were dug through the very recent volcanic lava flows and leak a substantial amount of water. Some estimates have put the overall transmission losses at 50 percent. Some of the irrigation districts in the Management Area are working on lining and piping projects to conserve water. For example, North Unit Irrigation District has lined the first 12 miles of its canal to prevent this seepage so that the irrigators can use the saved water on their farms.

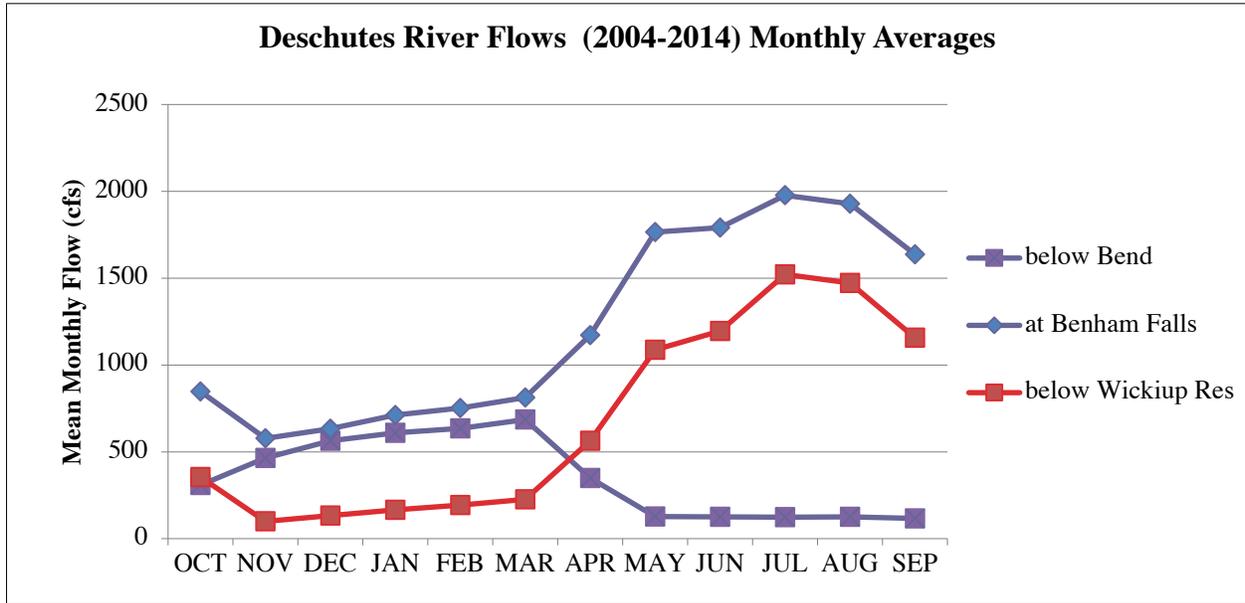
The vast majority of water diverted from the Deschutes River is taken out by the irrigation districts (Table 2.2.3). All other private diversions add up to less than 100 cfs.

Canal	Maximum Water Right (cfs)	Usual Maximum (cfs)
Arnold	150	95
Central Oregon and North Canal	1,385	1,000
Bend Feed	150	125
North Unit Main	1,100	800
Swalley	85	85
Tumalo Feed	230	180
Three Sisters	185	150
Crooked River Feed	400	180

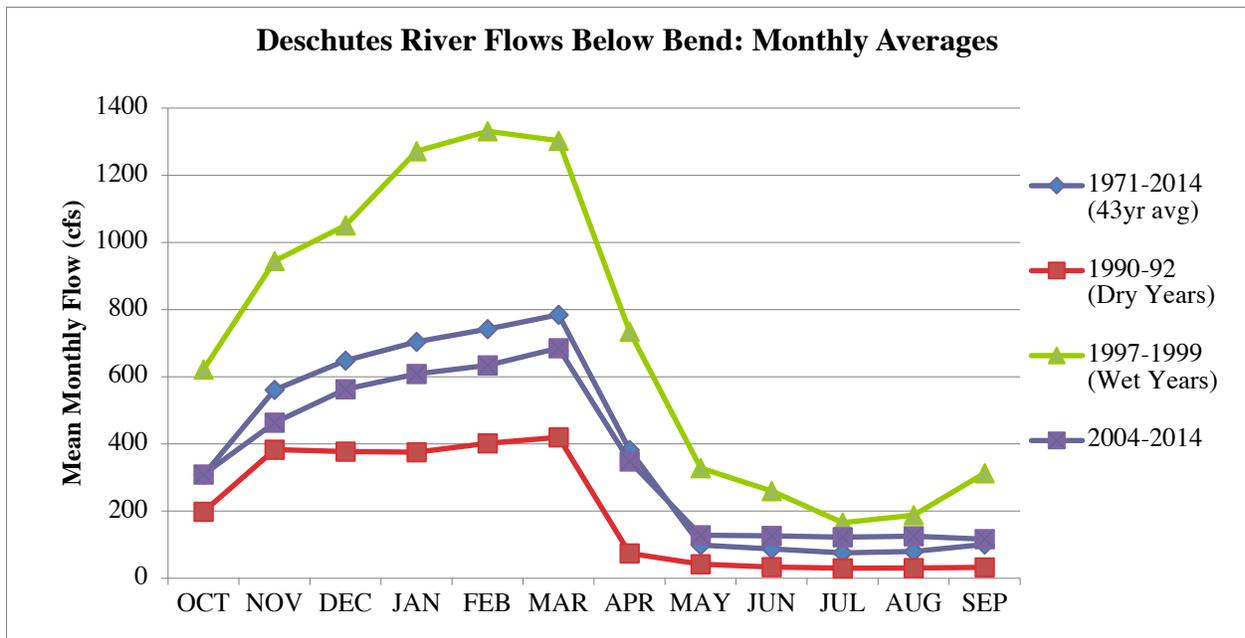
The following graphs illustrate the major flow regime of the Deschutes River. Wickiup Reservoir is managed to provide stored water and live flow to users downstream. Lowest flows below Wickiup Dam are in the fall and winter, while the reservoir fills; greatest releases are during the spring and summer irrigation season (graph 1). Flows at Benham Falls (44 miles downstream from Wickiup) reflect the addition of the tributaries Fall River and Spring River, which are unregulated and have relatively stable flows due to being spring-fed. Contributions from the Little Deschutes also add flow to the river above Benham Falls. Streamflow from the Little Deschutes is snow-melt/runoff driven, but also reflects storage releases from Crescent Lake for Tumalo Irrigation District, which diverts water in Bend. Flows measured below Bend are downstream of the irrigation district diversions and reflect summer diversions to the irrigation district delivery systems (graph 1). The flows below Bend (graph 2) reflect both streamflow

improvements in the summer due to conservation efforts over the last decade (2004-2014) and supply variability throughout the year due to wet (1997-1999) and dry (1990-1992) climate periods compared to a 43-year based period (1971-2014).

Graph 1: Deschutes River Flow Monthly Averages



Graph 2: Deschutes River Flow Monthly Average Below Bend



Tumalo Creek has one major diversion now, aside from the city of Bend diversion high in the drainage on Bridge Creek. The Tumalo Irrigation District (TID) diverts water through the Tumalo Feed Canal at River Mile 2.5. Tumalo Creek below the Feed Canal was dry during late summer nearly every year from 1913 to 1992. However, conservation efforts by the Tumalo Irrigation District restored 2.5 cfs between this diversion and the mouth between 1992 and 2005. In 2005, the state approved a senior instream water right for 5.82 cfs from the Feed Canal to the mouth. More recently, with several large conserved water projects, the flow below the Feed Canal can be as high as 15 cfs of protectable water (i.e. water flow with a water right priority date).

The Little Deschutes River, above Crescent Creek is unregulated and, with few irrigation withdrawals, resembles as close to a natural stream as any in the basin. Crescent Lake is a natural lake, but its depth has been increased and its outflow regulated by the TID. This management has little effect on winter flows in the Little Deschutes River. The average summertime flows exceed natural flows but are significantly lower than the average high flows that would occur naturally during April, May and June. The stored water released from Crescent Lake actually benefits the flows in the Little Deschutes River in that summer flows generally are higher than they would be naturally, yet peak flows on Crescent Creek have been reduced by 75 percent.

Whychus Creek is used heavily for irrigation and consequently suffers low flows between the Three Sisters Irrigation District canal (River Mile 23.5) and where the springs near Camp Polk Road contribute about 7 cfs (River Mile 17). In the lower reach of Whychus Creek, Alder Springs (River Mile 2) contribute about 20 cfs, and at the mouth nearly 100 cfs discharges to the Deschutes River because of groundwater springs. Until 1998, the stream through town used to dry up. With the work of the Upper Deschutes Watershed Council, Deschutes River Conservancy, and Three Sisters Irrigation District, flows can exceed 32 cfs during the summer time through a segment that frequently was dry.

Crooked River is a very flashy stream and contrasts significantly to the Deschutes River due to the clay-rich soils and differing geology. The river is used heavily for irrigation. In the very lowest stretch of the Crooked River, large springs contribute 1,100 cfs in flow just before it enters Lake Billy Chinook. Two reservoirs authorized for flood control and irrigation are located on Ochoco Creek and Crooked River. Those two reservoirs provide cool consistent flows throughout the summertime when, historically, flows were low through the Prineville Valley during summer. They also protect the town from devastating floods during the winter when flood flows into the reservoirs can easily be triple what the outflows are held.

2.3.4 Vegetation

Vegetation is dominated by mixed conifer stands of ponderosa and lodgepole pine, fir, juniper, grasses, and shrubs. Forest habitat is characterized by ponderosa pine with old-growth characteristics, interspersed with dense lodgepole thickets of old- and new-growth characteristics and thinned young pine/ponderosa stands. Meadows comprised of dry bunch grass, primarily Idaho fescue, needle grasses, or sedges, are scattered throughout the forest understory.

The west to east transition shifts from ponderosa pine/bitterbrush/Manzanita to juniper/sage/bitterbrush/Idaho fescue plant communities. Numerous rare plant species are scattered throughout the area; several are candidates for listing as Endangered or Sensitive species.

Fire exclusion has significantly modified vegetation. Junipers, once limited to areas not burned by fire under natural conditions, now crowd and displace conifers and rangeland vegetation, while other shrubs displace native grasses and forbs.

Noxious weeds are on the rise and have become a serious management issue. Within the past 20 years, periodic drought cycles, the lack of a coordinated control and abatement program in the Deschutes Basin, and expanding commercial and residential development, have fostered an explosion of invasive noxious weeds. Riparian and agricultural lands within the Management Area are rapidly transforming from diverse native plant communities and productive farmlands to weed-choked monocultures. Areas infested with spotted and diffuse knapweed; bull, Canada, and/or Russian thistle; Dalmatian toadflax; and other unwelcome species contribute to higher soil erosion and runoff from agricultural and riparian lands, thereby boosting levels of sedimentation, turbidity, and other water quality-limiting parameters in the Management Area.

2.3.5 Land Use

Most of the Management Area is comprised of federal forest and rangelands. The US Forest Service manages the majority of Paulina Creek land, all the lands in the headwaters of the Deschutes River and its western tributaries, and lands surrounding mountain lakes and reservoirs. The Bureau of Land Management manages primarily small, sporadic areas directly adjacent to the waterways.

Approximately one quarter of the Management Area is privately owned. Private owners manage the majority of the land adjacent to the Deschutes and Little Deschutes rivers and over half of the lands adjacent to Tumalo and Whychus creeks. Use of agricultural lands varies throughout the Management Area. Most grazed timberland and sub-irrigated pasture is around La Pine. Irrigated cropland is concentrated around Lower Bridge. Irrigated pastures and hay lands occur throughout the Management Area.

The Deschutes County Weed Board has developed a comprehensive vegetation management plan to control and eliminate weed infestations and restore those areas to native species.

In the late 1800s and early 1900s, settlers realized the Deschutes River and its tributaries could irrigate thousands of acres if the water could be diverted from the river and onto potential farmland. During the first few years of the 20th century, irrigation companies dug many of the canals that divert water from the Deschutes River at Bend. Most of these companies were subsequently reorganized into irrigation districts.

Forage, cereal, and seed crops comprise the majority of crops grown on irrigated lands, with irrigated pasture and alfalfa accounting for most of the consumptive use of water. The subdivision of large farms and ranches into “hobby” farms resulted in increased livestock numbers. Livestock include llamas, horses, beef and breeding cattle, poultry, sheep, goats, and a few dairy cows.

The population of Deschutes County in 1980 was 62,142. By 2017, 182,930 individuals resided in the county. Deschutes County is one of the fastest growing counties in Oregon.

The Management Area continues to undergo changes in its social and economic character. Historically, agriculture and timber sectors played a major role, but they have been replaced by an urban economy based on service, trade, and government.

2.4 Agricultural Water Quality

2.4.1 Water Quality Issues

The Area Plan and Rules address temperature, sediment, turbidity, chlorophyll, pH, dissolved oxygen, biological criteria, mercury, aquatic weeds/algae, and bacteria concerns related to agricultural activities on private lands in the Management Area. All these parameters are on DEQ’s 2012-303(d) list of “water quality limited” streams in the Management Area. Inadequate fish habitat and low streamflows are also

concerns. Total Maximum Daily Loads (TMDLs) have not yet been developed for any of these listings in the Management Area.

Water quality standards for surface water are not designed to provide water of sufficient purity for direct human consumption or food preparation. It may be hazardous to human health to use agricultural water for direct human consumption.

In September 2011, DEQ published the Deschutes Basin Water Quality Status and Action Plan. It discussed water quality concerns and emphasized the following actions related to agriculture:

1. Surface Water Actions

- Reduce temperatures, improve flow volume and patterns, and improve habitat through:
 - *Better land management and conservation*
 - *Increasing native, streamside vegetation*
 - *Improved water conservation*
 - *Increased instream flows*
 - *Channel restoration*
 - *Juniper reduction*
 - *Combating invasive weeds*
- Reduce erosion and nutrient and pesticide levels in water through better land and crop management.

2. Groundwater Actions

- Minimize nitrate contamination from agriculture and other sources.
- Assess effects of groundwater pumping and irrigation efficiency projects on stream flows.
- Assess cause, extent, and magnitude of risks associated with bacteria and other parameters in groundwater.

2.4.1.1 Beneficial Uses

Beneficial uses of water in the Management Area include domestic and industrial water supplies, crop irrigation, livestock watering, aquatic life, recreation, aesthetics, and hydropower. Of these, “domestic water supply,” “fish and aquatic life,” and “water contact recreation” are the most sensitive uses. Bacterial contamination is the greatest concern for swimming and other types of human water contact with drinking water primarily affected by toxics and nitrates. However, aquatic life is affected by temperature, sedimentation, turbidity, toxics, nutrients, pH, and dissolved oxygen.

In addition, Management Area rivers provide habitat for the following federally listed species: Oregon spotted frog (endangered), summer steelhead (threatened), and bull trout (threatened).

2.4.1.2 Most Sensitive Beneficial Use: Salmonids

Migratory (anadromous) fish were eliminated from the Management Area following construction of the Pelton-Round Butte Hydropower complex^o. Anadromous fish species in the Management Area were spring Chinook salmon, summer steelhead, and sockeye salmon. These species were found in the Metolius River, Deschutes River upstream to Big Falls, the Crooked River, and tributaries to these rivers. Whychus Creek and the Crooked River were especially important for steelhead production, while the majority of Chinook salmon production occurred in the Metolius River. Sockeye salmon were found in the Metolius and used Suttle Lake as part of their life history requirement for lake rearing.

Anadromous fish are currently being reintroduced. Releases of summer steelhead fry began in 2007 and will continue with annual spring releases into Whychus Creek and the lower Crooked River. Spring

Chinook salmon fry releases were initiated in 2008 and will continue annually into the Metolius River, Whychus Creek, and the Lower Crooked River. Fry releases are supplemented by annual smolt releases of steelhead and Chinook salmon. The goal of the reintroduction effort is to have naturally producing, self-sustaining populations of all three species.

Resident fish species in the Management Area were redband trout, bull trout, mountain whitefish, and other non-game species. Bull trout were eliminated from most of the area due to increased water temperatures from reservoir management, increased passage barriers resulting from human activities, and harvest. Bull trout currently are found in the Deschutes River between Lake Billy Chinook and Big Falls (below Lower Bridge), the Lower Crooked River below Opal Springs Dam, the Metolius River and tributaries, Odell Lake and some tributaries, and rarely in Davis Lake.

Lake Billy Chinook and the Metolius River supports one of the healthiest bull trout populations in the state. The trout migrate to the reservoir from the tributaries and feed on the reservoir fish. These bull trout are fluvial fish (i.e. live in rivers) that have adapted to reservoir life and become adfluvial (i.e. live in rivers and lakes). They depend on the clean, cold waters of the Metolius River and its tributaries, which contain ample gravel suitable for spawning. Currently, Lake Billy Chinook is the only harvestable bull trout fishery allowed within the state. The Endangered Species Act allows for a limited fishery to continue for species under a threatened status, provided these actions do not threaten recovery of the species and are consistent with state law. Consequently, a signed agreement between Oregon and the U.S. Fish and Wildlife Service provides for a limited bull trout harvest to continue within Lake Billy Chinook.

2.4.1.3 WQ Parameters and 303(d) list

The following water bodies have been designated by DEQ as water-quality limited in the Management Area. In addition, East Lake has been listed for mercury.

Table 2.3.1.2. Water-quality limited waters in the Upper Deschutes Management Area							
Source: 2012 303(d) list							
Stream Segment	Water Quality Parameters						
	Temperature	pH	Dissolved Oxygen	Chlorophyll a or Algae	Biological Criteria	<i>E. coli</i>	Sediment and/or Turbidity
Deschutes River/Lake Billy Chinook (River Mile 110.1–118.7)		X		X			
Deschutes River; Lake Billy Chinook to Steelhead Falls (116-126.4)	X		X				
Deschutes River: Steelhead Falls to Central Oregon Canal (126.4-168.2)	X	X	X				
Deschutes River: Central Oregon Canal to Little Deschutes River (168.2-189.4)	X		X	X			X
Deschutes River: Little Deschutes River to Wickiup Reservoir (189.4-222.2)	X		X				X
Deschutes River: Wickiup Reservoir to Crane Prairie Reservoir (223.3-244.8)	X						
Deschutes River/Wickiup Reservoir (222.2-229.7)				X			

Deschutes River/Crane Prairie Reservoir (230.6-235.6)				X			
Abbot Creek (0-7.4)							X
Crystal Creek (0-2.8)			X				
Fall River (0.5-11.2)	X						
First Creek (3.6-12.1)	X						
Indian Ford (0-12.3)	X						
Lake Creek (0-5.9)	X						
Lake Creek, Middle Fork, South Fork (0-1.7)	X						
Lake Creek, Middle Fork (0-2.2)	X						
Lava Lake			X				
Link Creek (0-2.5)	X						
Metolius River (8.5-39.6)	X						
North Fork Whychus Creek (0-5.3)					X		
Odell Creek (3.4-16.3)	X		X				
Odell Lake /Odell Creek (0-16.3)		X	X	X			
Rosary Creek (-)-1.9)			X				
Tumalo Creek (0-12.5)	X						
Whychus Creek (0-40.3)	X						
LITTLE DESCHUTES SUBBASIN							
Big Marsh Creek (0-15.6)	X						
Crescent Creek (0-30/1)	X						
Hemlock Creek (0-5.9)	X						
Little Deschutes River (0-92.4)	X						
Little Deschutes River (0-73.6)			X				
Paulina Creek to Paulina Lake (0-15)	X				X		
Paulina Lake				X			
CROOKED RIVER SUBBASIN							
Crooked River/Lake Billy Chinook (0-5)				X			
Crooked River to High Bridge (1-18)	X	X	X		X	X	

1. **Water temperatures** are critical to salmonid growth and survival at all life stages, and to other aquatic life. Warm stream temperatures increase stress and disease, raise metabolism, lower growth rates, and enhance conditions for introduced non-native predators. Temperature affects the dissolved oxygen potential in water - the warmer the water, the less dissolved oxygen it can hold.

Biologically based numeric **temperature** criteria support the different life stages and species of salmonid fish (<http://www.deq.state.or.us/wq/standards/temperature.htm>). The standard includes maps that designate the water body and time of year where the criteria apply.

2. Excessive aquatic plant or **algal growth** can harm fish and other aquatic life by creating extremes in water **pH** and low levels of **dissolved oxygen**. These conditions can be stimulated by the availability of nutrients, warm temperatures, and light, which in turn are often caused by low stream flow and lack of protective vegetative cover. Excessive algal growth can also result in the posting of health advisories for people and pets.
3. **“Biological Criteria”** listings indicate waters that don’t adequately support aquatic insects and similar invertebrates (benthic macroinvertebrates). These organisms are important as the basis of the food chain and are very sensitive to changes in water quality. To assess a stream’s biological health, the community of benthic macroinvertebrates is sampled and compared to the community expected if the stream were in good shape (“reference community”). If the difference is too great, the stream section is designated as ‘water-quality limited.’ This designation does not identify the actually limiting factor (e.g. sediment, excessive nutrients, temperature).
4. **Sediments** carried in basin streams can adversely affect aquatic life by reducing light penetration and visibility, reducing water infiltration through stream substrate (harming incubating fish eggs), and irritating gill filaments. **Turbidity** is a measure of the cloudiness of water and is often used as a surrogate measure for suspended sediment.

Turbidity in the Deschutes River between Wickiup Reservoir and the Central Oregon Canal increases as much as 300 percent (from < 1 to 31 NTUs) when irrigation water is released from Wickiup Reservoir in early spring and remains to twice background until late July. The state standard allows only a 10 percent increase in turbidity.

5. **Bacteria** numbers exceeded state standards in the Crooked River, but at a sampling point about 4 miles upstream of the Management Area. Crooked River Ranch is the only portion of the Management Area that drains into the Crooked River. Crooked River Ranch consists mostly of non-irrigated, 5-acre lots, with a few horses. The lack of significant agricultural activities in Crooked River Ranch makes this area an unlikely contributor to agriculture-related water quality problems in the Crooked River. According to Bonnie Lamb at DEQ, DEQ sampled the Crooked River for *E. coli* near Crooked River Ranch in 2005 and the highest measurement was 15.8 organisms, well below the *E. coli* standard. Bacteria sampling in the Upper Deschutes drainage has not warranted 303(d) listing.

Bacteria from livestock manure are a source of pollution to some canals and groundwater.

Nitrate levels are increasing in drinking water in wells in the rural area around La Pine in southern Deschutes and northern Klamath counties and around Redmond. According to DEQ’s Deschutes Basin Watershed Analysis, nitrate contamination of groundwater is one of the most widespread groundwater issues in the Management Area. The primary source appears to be contamination from septic tanks.

Stream flows have been modified throughout the Management Area, primarily related to irrigation diversions. Low flows contribute to warmer water, increased pH, reduced dissolved oxygen, a general reduction in available habitat, and, in extreme cases, interferes with fish migration. Instream leasing programs have helped increase flows in reaches of the Deschutes River and its tributaries.

Modification of physical habitat can directly harm aquatic life. Channelization reduces both the amount and complexity of habitat. Loss of streamside vegetation often destabilizes streambanks, resulting in increased erosion, and decreases shade that could help reduce stream temperatures.

Adequate riparian vegetation helps:

- Minimize streambank erosion by increasing the cohesiveness and structural strength of streambanks and by reducing flow velocities.
- Reduce increases in summer water temperature.
- Maintain late season flows by increasing the ability of the adjacent soils to store water during runoff seasons.
- Moderate winter stream temperatures through the inflows of relatively warmer ground water from adjacent soils.
- Filter out and process excess nutrients, bacteria, and sediment in runoff that could pollute adjacent streams.

The LAC has the following recommendations regarding water quality assessment:

- Continue monitoring water quality at permanent sampling stations.
- Determine what stream reaches are naturally warmer than water quality temperature criteria.
- Determine whether Oregon's turbidity standard is meaningful when natural turbidities run less than five Nephelometric Turbidity Units (NTUs), which is the case for the Deschutes River.
- Determine what flows (in cubic feet per second (cfs)) would be needed to meet water quality standards.

2.4.2 Basin TMDLs and Agricultural Load Allocations

Currently, there are no Basin TMDLs and Agricultural Load Allocations developed for the Management Area. DEQ has started development of TMDLs in the Upper and Little Deschutes subbasins, with data collection in 2016.

2.4.3 Sources of Impairment

Land conditions associated with the following agricultural activities were identified as sources of water quality impairment through their effects on streambank stability, soil erosion, vegetation on uplands and along streams, and the amount and content of runoff to ground or surface water:

1. Livestock grazing and areas of concentrated livestock.
2. Irrigation water use and drainage.
3. Illegal in-stream and off-stream ponds.

The following non-agricultural sources likely contribute to water quality issues in the Management Area: the cities of La Pine, Bend, Sisters, urban and suburban developments, sewage treatment plants, activities on federal lands, and high concentrations of deer, elk, and antelope.

2.5 Voluntary and Regulatory Measures

2.5.1 Voluntary Measures

To help achieve water quality standards in the Management Area, an effective strategy should:

- Maintain adequate streamside vegetation,
- Minimize streambank erosion,
- Minimize runoff to ground and surface water that contains potential pollutants.

The following conservation practices (Table 2.4) address the objectives of the Area Plan and help improve and protect water quality while being economical and practical. Widespread adoption of these practices addresses the water quality parameters of concern in the Management Area. These practices should also maintain the economic viability of agriculture in the area. While recommended, they are not required.

Table 2.4. Some recommended conservation practices for the Upper Deschutes Agricultural Water Quality Management Area.

MANAGEMENT	OBJECTIVES	RECOMMENDED CONSERVATION PRACTICES
STREAMS	<p><i>Achieve adequate riparian vegetation</i></p> <p><i>Reduce streambank erosion</i></p> <p><i>Minimize stream temperature extremes beyond natural variation</i></p> <p><i>Minimize pollutants from surface runoff</i></p>	<ul style="list-style-type: none"> • Encourage plants that 1) Provide shade, 2) Trap or filter out excess nutrients, bacteria, and sediment in overland or shallow subsurface flow, 3) Provide vegetative cover to protect the streambank during high flows, and 4) Have root masses that will stabilize streambanks. • Stabilize streambanks, preferably with bioengineering techniques. • Maintain vegetative buffer: continuous Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), riparian buffers, weed control (see below). • Manage livestock (see below). • Properly place, design, and maintain roads, culverts, bridges, and crossings. Use heavy equipment in streamside areas at appropriate times of year; contact Oregon Department of Fish and Wildlife (ODFW) for sensitive locations and seasons. • Leave large woody debris (LWD) in streams. If it must be removed, don't destabilize the streambank. Time the removal of LWD to minimize disturbance to stream and streambank. • Contact ODFW for timing and technical assistance for instream activities. Oregon's Department of State Lands and the federal government require permits for some types of fill or removal activities. Deschutes County requires a fill and removal permit for removal or placement of any instream materials, including LWD. Oregon's Parks and Recreation Department administers activities in the scenic waterway.
LIVESTOCK	<p><i>Reduce soil erosion</i></p> <p><i>Limit nutrients and bacteria in surface runoff</i></p> <p><i>Achieve adequate riparian and upland vegetation</i></p>	<ul style="list-style-type: none"> • Improve riparian buffers. • Harrow pastures at least once per year. • Clean manure out of irrigation ditches before receiving irrigation water that will continue off property to another user. • Install adequate waste management systems: clean out water diversions; collect, store, and utilize wastes; properly operate and maintain facilities. • Control runoff from concentrated feeding areas and irrigated pastures. • Control livestock access to water that flows off-property: <ul style="list-style-type: none"> - Manage the timing and intensity of livestock access to streams by using a grazing strategy that addresses livestock distribution and the duration and season of riparian area use - Provide off-stream drinking water (stock tanks, nose pumps, etc.) - Place salt licks and supplemental feeding stations away from streams or ditches - Provide shade and shelter for livestock away from the stream - Install fencing (temporary, exclusion, etc.) - Use a herder to encourage livestock to use uplands on large properties - Pipe irrigation water conveyances
WEEDS	<p><i>Minimize soil erosion</i></p>	<ul style="list-style-type: none"> • Remove existing weeds; replace with desirable vegetation. An integrated vegetation plan may include: herbicides, grazing, mowing, bio-control, cultivating, or pulling.

	<i>Improve riparian and upland vegetation</i>	<ul style="list-style-type: none"> • Control the spread of weeds near moving water; weeds are transported by water. • Seed areas susceptible to weeds with desirable competitors. • Use weed-free hay for forage and mulch. • Wash equipment to remove weed seeds. • Apply herbicides at appropriate rates, times, and locations; follow the pesticide label.
IRRIGATION	<i>Reduce unnatural fluctuations in stream flows</i> <i>Reduce runoff</i> <i>Minimize pollutants</i> <i>Reduce soil erosion</i>	<ul style="list-style-type: none"> • Inform irrigation districts of water needs in a timely manner so appropriate amount of water can be provided. • Schedule irrigation based on crop needs, soil type, climate, topography, infiltration rates. • Improve irrigation efficiency through sprinkler conversion, pressurized delivery, gated pipe, rotating pooling agreements. • Minimize return flows through the use of cover crops, straw mulch, grass filter strips. • Grade and slope property to retain runoff. • Line ponds to minimize water loss from seepage. • Pipe or line surface water delivery systems. • Manage tailwater. • Lease water rights for instream use.
CROP NUTRIENTS & FARM CHEMICALS	<i>Reduce potential for surface and groundwater pollution</i> <i>Reduce runoff</i>	<ul style="list-style-type: none"> • Develop nutrient application plans (“nutrient budgets”) based on water and soil testing, tissue testing, plant needs. • Apply appropriate amounts at proper times; dispose of containers properly. • Avoid potential spills and their effects: have cleanup plan, store tanks away from water, check valves on delivery trucks. • Apply non-farm chemicals appropriately on landscaping and lawns.
WASTES	<i>Reduce potential for water pollution</i>	<ul style="list-style-type: none"> • Store and manage waste hay, chemicals, compost, or organic wastes away from streams or flowing waters. • Compost or use organic wastes. • Don’t pump wastes into dry wells.

Contact your local SWCD for guidance on selecting appropriate management practices or for assistance with developing a voluntary, individual conservation plan.

2.5.2 Regulatory Measures

OAR 603-95-3040(1)

Landowners must comply with OAR 603-95-3040(2) through (3) within the following limitations:
(a) A landowner is responsible for only those conditions resulting from activities controllable by the landowner. A landowner is not responsible for conditions resulting from activities on other lands.

Streamside Vegetation: OAR 603-95-3040(2)

(a) Effective January 1, 2005, agricultural activities must allow the establishment and development of appropriate vegetation along natural and channelized streams, consistent with site capability. Noxious weeds are not appropriate. Vegetation must be adequate to prevent unnatural streambank erosion, moderate water temperature, and filter sediment and nutrients from surface runoff.
(b) Part (a) does not apply to irrigation water conveyance systems, including but not limited to irrigation canals, ditches, and laterals.

This rule addresses stream temperature, sediment, nutrients, and bacteria. It addresses the moderation of water temperature. Riparian vegetation can help reduce water temperatures in the summer and increase water temperatures in the winter.

Any type of vegetation other than noxious weeds qualifies as long as it assists the functions required in the rule. The rule does not specify any activities that must cease and does not require any particular activity to take place. Landowners are not responsible for the destruction of vegetation by wildlife browsing and grazing.

This rule also does not require that all sediment be kept out of streams. This rule refers to the filtration of sediment caused by agricultural activities, not sediment resulting from natural processes. Sufficient vegetation to filter out sediment also helps reduce the number of bacteria and nutrients entering streams; nutrients can bind to sediments and can be carried into waterways in greater proportions than by water flow without sediments.

Wastes: OAR 603-95-3040(3)

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

Compliance with this rule ensures that concentrated nutrients, pathogens associated with high animal density areas, high sediment concentrations in run-off, toxics, or other potential pollutants are not readily transported to waters of the state.

Livestock wastes can include manure from pastures draining to or bisected by irrigation ditches and any other situations not already covered by Oregon's Confined Animal Feeding Operation laws. Indicators of potential noncompliance include: 1) Runoff flowing through areas of livestock usage and entering waters of the state, 2) Livestock waste located in drainage ditches or areas of flooding, or 3) *E. coli* counts that exceed state water quality standards. Livestock facilities located near streams must employ an adequate runoff control and waste management system.

Wastes can also include excess sediment discharges. Indicators of potential noncompliance with this rule include:

- 1) Visible active erosion scars,
- 2) Sediment-laden runoff, or
- 3) Obvious deposits of sediment on the stream or canal bottom that can be traced to a specific source.

The following Area Rule provides for resolution of complaints:

Complaints and Investigations (OAR 603-095-3060)

- (1) When the department receives notice of an alleged occurrence of agricultural pollution through a written complaint, its own observation, through notification by another agency, or by other means, the department may conduct an investigation. The department may, at its discretion, coordinate inspection activities with the appropriate Local Management Agency.**
- (2) Each notice of an alleged occurrence of agricultural pollution will be evaluated in accordance with the criteria in ORS 568.900 to 568.933 or any rules adopted thereunder to determine whether an investigation is warranted.**
- (3) Any person allegedly being damaged or otherwise adversely affected by agricultural pollution or alleging any violation of ORS 568.900 to 568.933 or any rules adopted thereunder may file a complaint with the department.**
- (4) The department will evaluate or investigate a complaint filed by a person under section OAR 603-095-3060(3) if the complaint is in writing, signed and dated by the complainant and indicates the location and description of:
 - (a) The waters of the state allegedly being damaged or impacted; and**
 - (b) The property allegedly being managed under conditions violating criteria described in ORS 568.900 to 568.933 or any rules adopted thereunder.****
- (5) As used in section OAR 603-095-3060(4), “person” does not include any local, state or federal agency.**
- (6) Notwithstanding OAR 603-095-3060, the department may investigate at any time any complaint if the department determines that the violation alleged in the complaint may present an immediate threat to the public health or safety.**
- (7) If the department determines that a violation of ORS 568.900 to 568.933 or any rules adopted thereunder has occurred, the landowner may be subject to the enforcement procedures of the department outlined in OARs 603-090-0060 through 603-090-0120.**

Chapter 3: Implementation Strategies

Goal

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

This Area Plan addresses conditions resulting from agricultural management that may affect water quality. These activities include, but are not limited to, the management of:

- Streambanks
- Cultivated lands
- Nutrients, farm chemicals, and pesticides
- Livestock
- Agricultural wastes
- Irrigation water and surface drainage
- Invasive plants (noxious weeds)

LAC Mission

Promote voluntary agricultural practices that improve and protect water quality while sustaining a healthy agricultural economy

The LAC used the following guiding principles to develop the Area Plan:

- Protect beneficial uses of the water in the Management Area.
- Control pollution as close to its source as possible.
- Base recommended actions on best available scientific information.
- Develop cost-effective, practical, flexible, and realistic site-specific solutions that work.
- Recognize that landowners are not responsible for naturally occurring water quality conditions that violate state standards.

Objectives

1. Maintain adequate streamside vegetation.
2. Minimize streambank erosion.
3. Minimize runoff to ground or surface water that contains potential pollutants.
4. Minimize soil erosion on uplands.
5. Use irrigation water efficiently.

Achieving the following land conditions on agricultural lands throughout the Management Area will contribute to good water quality:

- Sufficient streamside vegetation to stabilize streambanks, filter overland flow, and moderate solar heating.
- Minimal sediment from irrigation return flows enters streams.
- Minimal bare areas of significant size within 50 feet of streams on agricultural lands.
- Livestock do not access canals or ditches that convey water to neighbors.
- Livestock manure is managed to minimize risk to surface and groundwater.
- Irrigation water is used efficiently on agricultural lands.

3.1 Measurable Objectives

3.1.1 Management Area

The LAC expects the Management Area to eventually achieve the following conditions:

- By _____, 90% of streamside areas will comply with the streamside vegetation rule.
- By _____, 90% of streamside areas provide the riparian functions of shade, stabilizing streambanks, and filtering overland flows, based on site capability.
- By _____, 90% of livestock operations will comply with the Waste Rule.
- By _____, 90% of irrigation water return-flows to streams will comply with the Waste Rule.

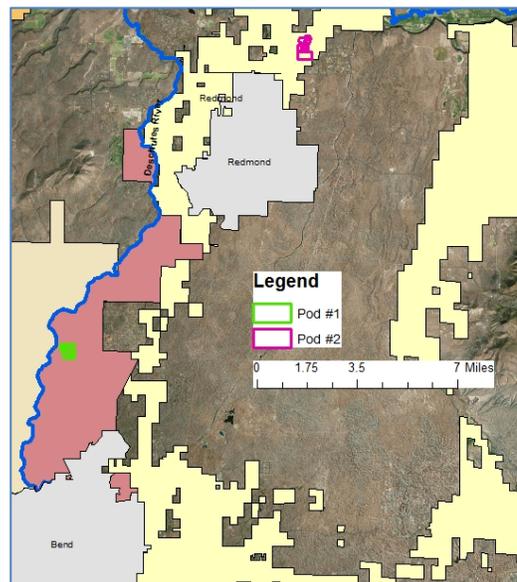
The 2013 version of the Area Plan included ambitious plans for developing milestones and timelines for achieving these objectives. However, baseline assessments were not done at the Management Area scale due to limited resources; ODA is working to refine measurable objectives at the management area scale to show progress. Measurable objectives will be developed when more complete process becomes available.

3.1.2 Focus Area

Deschutes Irrigation Water Management (IWM)

Irrigation water in Deschutes County used to be delivered to larger acreages by irrigation districts. The Point of Delivery (POD) consisted of some kind of headgate for the acreage. From there, water was delivered throughout the property in earthen ditches, primarily to flood-irrigate fields. Over time, most of these properties were subdivided, and a 160-acre farm could now consist of thirty-two 5-acre properties that have one POD and some kind of rotation system for delivering water amongst the properties. This kind of set-up is fraught with wasteful water use and tension amongst neighbors.

In 2009, the grassroots IWM-CO group formed in Central Oregon with a mission to accelerate the adoption of on-farm IWM. This group realized that success would necessitate working with these landowners that share a POD; they named these groups ‘Pods.’ Over the years, this group worked to identify all the challenges with working successfully with Pods to improve IWM.



The SWCD has strategically selected a Pod (magenta on map) within the Central Oregon Irrigation District (COID) (pale yellow) a couple miles northeast of Redmond. The SWCD also selected a second Pod (lime green) within the Swalley Irrigation District (SID) (coral).

The SWCD will track:

1. Acre-feet delivered to POD for the use of the entire Pod
2. Average acre-feet/acre delivered to POD

Milestones:

COID Pod

Current Status: 1,120 acre feet delivered to POD

Milestone: By June 30, 2019, reduce acre feet delivered to POD from 1,120 acre feet to 795 acre feet (71%)

Current Status: 7 average acre feet to POD

Milestone: By June 30, 2019, reduce average acre feet delivered to POD from 7 average acre feet to 5 average acre feet (71%)

SID Pod

Current Status: 880 acre feet delivered to POD

Milestone: By June 30, 2019, reduce acre feet delivered to POD from 880 acre feet to 624 acre feet (71%)

Current Status: 7 average acre feet to POD

Milestone: By June 30, 2019, reduce average acre feet delivered to POD from 7 average acre feet to 5 average acre feet (71%)

3.2 Strategies and Activities

3.2.1 Strategic Implementation Area

The ODA completed an evaluation of agricultural management activities and landscape conditions with potential to contribute to or cause water pollution in the Indian Ford Creek Watershed in Deschutes County. The Upper and Lower Indian Ford Creek watersheds (approximately 37,000 acres; approximately 2,600 agricultural acres) include two 6th field HUC watersheds north and west of Sisters. Agricultural areas of the watershed consist mostly of pasture and small acreage livestock facilities. Water quality concerns in the watershed are for temperature but this is limited to available data.

3.2.2 Strategies to Meet Goal

The SWCD activities are delineated in Memoranda of Agreement with ODA. The success of the Area Plan relies on landowners voluntarily using conservation measures.

3.2.2.1 Education

Objective: Create a high level of awareness and understanding of water quality issues related to agriculture.

SWCDs coordinate the education efforts and work with partners such as ODA, Natural Resources Conservation Service (NRCS), Oregon State University (OSU) Extension Service, watershed councils, agribusiness partners, and other interested parties to carry out these education strategies. The educational effort includes:

- Prevent water pollution from legacy or current agricultural activities.
- Showcase regulations related to water quality.

Strategies include:

1. Educational programs -
 - Hold workshops and demonstration projects on water quality issues and the agricultural practices that improve water quality.
 - Work collaboratively with other land stewardship organizations and landowners.
 - Produce and distribute brochures about water quality issues.
2. Media program -
 - Submit news articles and public service announcements to area newspapers, radio stations, and newsletters.
 - Invite media to conservation tours and workshops.

3.2.2.2 Voluntary Conservation Practices

Objective: Increase the voluntary adoption of conservation practices to improve water quality.

The LAC recommends that landowners develop a conservation plan to resolve current problems and avoid future ones. To adequately address water quality issues, conservation plans outline specific measures necessary to enhance water quality where agricultural activities exist or existed.

Conservation plans may contain any of the following elements or additional elements not listed here, depending on the site and the condition for which preventive or corrective measures are being implemented:

- Soil erosion and sediment control
- Streamside area management
- Livestock management
- Waste management
- Potential cost-share funds
- Nutrient and farm chemical management
- Streambank/riparian restoration
- Irrigation water management

Strategies include:

1. Encourage agricultural producers to develop and implement conservation plans
 - Provide assistance in planning and implementation from the SWCDs, NRCS, and partner organizations.
 - Showcase positive and effective conservation practices through workshops and tours of demonstration projects.
2. Identify conservation practices that will protect and improve water quality in the Management Area
 - Develop and distribute a list of conservation practices.
 - Access ongoing research into effective conservation practices.
 - Obtain practical knowledge from agricultural producers.

3.2.2.3 Funding

Objective: Secure funding for administration and successful implementation of the Area Plan.

Landowners may need financial assistance to meet Area Plan objectives and area rule requirements. Cost-sharing assistance may be available through current USDA conservation programs such as the Environmental Quality Incentive Program (EQIP) and CREP. Other potential funding sources include, but are not limited to, OWEB, EPA Section 319 grants, Bonneville Power Administration, Deschutes River Conservancy, Deschutes Basin Land Trust, and Freshwater Trust.

SWCDs and watershed councils provide direction and help seek funding to implement the Area Plan:

- a. Education — to fund education programs such as workshops, tours, and development of published materials.
- b. Technical assistance—to hire staff to help agricultural producers develop and implement voluntary conservation plans.
- c. Restoration — of legacy agricultural activity along stream banks with active erosion.
- d. Implementation assistance — to provide cost-share dollars to assist producers.

Strategies include:

1. Obtain financial assistance for implementation of conservation practices; and funding for conservation planning assistance and conservation education.
 - Develop and submit grant proposals to ODA, OWEB, USDA, US EPA, DEQ, and other agencies and private organizations.
 - Form partnerships with the business sector for additional funding.
 - Promote USDA incentive-based cost-share programs to assist producers with conservation.
2. Ensure adequate administration of the Area Plan.
 - Include implementation of the Area Plan in the annual and long-range work plans for the appropriate SWCDs.

3.3 Monitoring and Evaluation

The Upper Deschutes Watershed Council has maintained a monitoring program since 1999, with an emphasis on Whychus Creek. They publish reports every few years summarizing results.

DEQ has conducted multiple studies in the Upper Deschutes. Some of their data are presented in *Upper Deschutes AgWQ Management Area: DEQ's Water Quality Status and Trends Analysis for the Oregon Department of Agriculture's Biennial Review of Agricultural Area Rules and Plan* (<http://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx>). The report will be updated for future biennial reviews.

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

Chapter 4: Implementation, Monitoring, and Adaptive Management

4.1 Progress Toward Measurable Objectives

4.1.1 Management Area

Measurable objectives will be developed when more complete assessments become available.

4.1.2 Focus Area

Irrigation Water Management

The SWCD selected two private laterals that included about 16 landowners on 250 acres. Two grants were approved and engineering has been completed for the two pods. All landowners are in the process of submitting applications for funding through the NRCS Water Conservation Initiative. Results will be provided during the next biennial review.

4.2 Activities and Accomplishments

4.2.1 Indian Ford Strategic Implementation Area

ODA evaluated 277 tax lots, of which 100 were agricultural. The results from ODA’s compliance evaluation are:

Pre and Post Compliance Evaluation Results:

Total Parcels in Assessment Area = 277
 - 177 (N/A) (Federal Land, Not Ag, etc.)
 100 Parcels Evaluated

<u>Evaluation Categories</u>		<u>Pre-evaluation (2015)</u>	<u>Post-evaluation (2017)</u>
No Concern	=	77 parcels	97 parcels
Low Concern	=	3 parcels	3 parcels
Moderate Concern	=	12 parcels	0 parcels
Significant Concern	=	8 parcels	0 parcels
Serious Concern	=	0 parcels	0 parcels
Total	=	100 Parcels	100 Parcels

The SWCD is working closely with landowners in the SIA on various restoration activities along Indian Ford, including riparian vegetation planting and manure storage facilities.

4.2.2 Additional activities and strategies in the Management Area:

	Projects	Outreach/Education
Streamside Conditions	Landowner outreach in Strategic Implementation Area for Indian Ford Creek to initiate grant writing for cost share. Landowners agreed to discontinue grazing for 5 years and plant riparian plants. Partnered with Oregon Youth Challenge program to cut willows on FS to bundle and plant along Indian Ford Creek in Oct and Nov 2016 on private land for a total of 750 volunteer hours and approximately 1 mile of the creek that had been grazed; moved fencing to create a larger enclosure on the other mile of creek.	Distributed 350 Rural Living Handbooks and developed display board to utilize project activity, manure composting, streamside vegetation management strategies.

Potential Pollutants	Worked with irrigation districts and Deschutes County Vegetation Manager to fund elimination of sediment and pollutants on 224 acres along irrigation canals within urban area of Bend. Manure management to eliminate excess nutrients and sediment in the Indian Ford Creek watershed. Working on manure composting facility implementation.	Technical assistance for juniper clearing project on 550 acres adjacent to the Crooked River. Held 5 workshops for pasture management and irrigation with OSU extension. Developed website and email contact list sending out 540 emails. Technical assistance for improved grazing practices and riparian area improvements
Irrigation Efficiency	Wrote and rewrote applications for irrigation efficiency. Assessed six landowners' property for improved irrigation practices. Utilized COID small grant program for financial assistance to some landowners. Assessed 16 landowners properties for irrigation improvements within the PODs identified in Central Oregon Irrigation District and Swalley Irrigation District.	Two workshops held for irrigation efficiency; booth at Living on A Few Acres landowner workshop in March 2014 and 2015; approximately 500 people contacted via phone or email.

Table 4.2.3 Deschutes County NRCS applied practices 2015-2017		
Irrigation pipeline	6.4	miles
Irrigation Meters	13.	each
Forest stand Improvement	150.6	acres
Brush Management	10.	acres
Forest Slash treatment	152.5	acres
Sprinkler system	151.1	acres
Irrigation water management	272.7	acres

4.3 Monitoring—Status and Trends

4.3.1 Water Quality

Upper Deschutes Watershed Council

Temperature monitoring started in 1995 and riparian restoration projects started in 1999. Key findings in their *2015 Whychus Creek Monitoring Report* (Mork L, Houston R, Eds. 2016. Upper Deschutes Watershed Council. Bend, OR. 144pp) include:

- Stream flows have steadily increased since 2001 (Table A), mostly due to irrigation efficiency projects,
- Number of days with stream temperatures meeting the standard has increased since 2000 (Table B),
- 62 cfs of instream flow is needed to meet the 18 degrees C standard to protect fish,
- Removal of fish barriers has increased connectivity from 15.5 miles to 26.8 miles from the mouth,
- Benthic macroinvertebrates show a greater abundance and/or diversity of taxa that thrive in conditions characterized by cooler temperatures and fewer fine sediments,
- Low flows are still experienced in late spring/early summer and late summer/early fall, but extreme flows appear to be decreasing during both periods.

Table A.

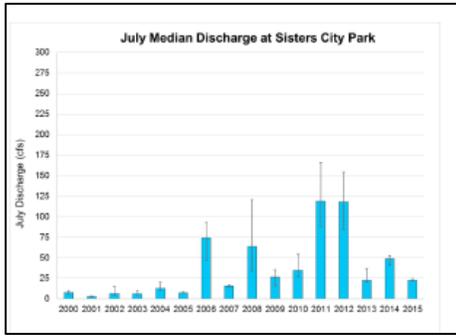
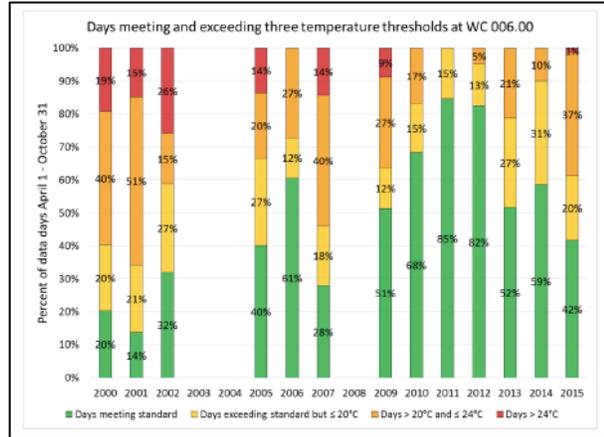
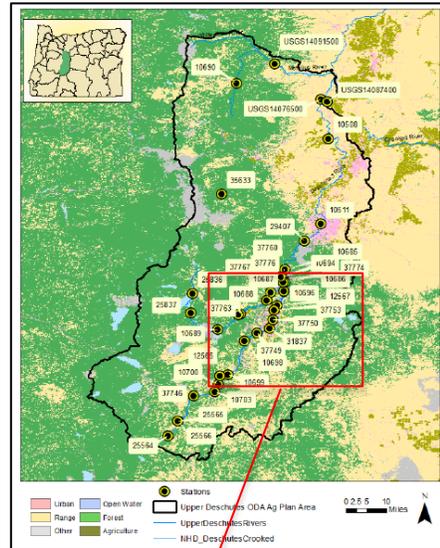


Table B.



DEQ

For this biennial review, DEQ reviewed data from 327 monitoring sites, of which 36 had sufficient data for status and trends analysis (DEQ. *Upper Deschutes AgWQ Management Area: DEQ’s Water Quality Status and Trends Analysis for the Oregon Department of Agriculture’s Biennial Review of Agricultural Area Rules and Plan. 193pp. 2018*). ODA’s evaluation for this Area Plan focuses on those sites in DEQ’s analysis that could be influenced directly by agricultural activities; those sites are along the Little Deschutes between Gilchrist and the mouth just south of Sunriver. However, these sites can also be influenced by septic systems in the heavily rural residential areas. The results provided in DEQ’s report do not allow any evaluation of the effects of agricultural activities on water quality in the Little Deschutes.



Site ID	Little Deschutes Site Description
10696	Little D @ Hwy 42
12567	Little D @ State Park Rd
37753	Little D @ Bridge Rd
37750	Little D @ Timber Lane
31837	Little D @ OWRD Gauge near La Pine
37749	Little D @ Dorrance Meadow Rd
10698	Little D @ Masten Rd
10699	Little D @ Road 2320 below Gilchrist



All sites upstream of Hwy 42 met the guidelines for total phosphorus and total suspended solids (0.07 and 25-50 mg/L, respectively). *E. coli* was only measured at Hwy 42; it met the standard. All the stations met the pH standard. Temperature was measured two summers at USFS road 2320 and one summer at the OWRD gauge near La Pine; temperatures exceeded the standard throughout the summers.

4.4 Biennial Reviews and Adaptive Management

The March 22, 2018, biennial review consisted mostly of a discussion of updating language in Chapters 3 and 4. ODA presented the program updates from the past two years. This included Focus Areas, Strategic Implementation Areas, examples of compliance cases, and ODA water quality monitoring program. ODA presented major edits of the Area Plan to the LAC.

There were no water quality complaints outside of the SIA since the last biennial review.

Impediments identified by the LAC:

- Projects are being denied from OWEB for not legally protecting the conserved water with instream water right certificate. This is not required by statute but required by OWEB policy.
- Funding for on farm irrigation improvements.
- Projects are being held up by permitting and NEPA. Permitting needs to be completed in a timely manner (streamlined).
- Local land use permit approvals are holding up projects and are increasing in price.

Recommendations from the LAC:

- Capacity funding for SWCDs.

CITED SOURCES

- ¹ *Upper Deschutes Subbasin Assessment*. Upper Deschutes Watershed Council. 2003.
- ² Oregon Climate Data (Oregon State University). www.ocs.orst.edu
- ³ Kyle Gorman and Jeremy Giffin, Oregon Water Resources Department, Bend. Personal communications.
- ⁴ *Restoring Oregon's Deschutes River. Developing Partnerships and Economic Incentives to Improve Water Quality and Instream Flows*. Deborah Moore, Zach Willey, and Adam Diamant. Environmental Defense Fund. 1995.
- ⁵ Dan Sherwin, Deschutes County Weed Program Manager. Personal communication.
- ⁶ Todd Peplin, USDA Natural Resources Conservation Service, Redmond. Personal communication.
- ⁷ Oregon State University Extension Service, Oregon Agricultural Information Network. <http://oain.oregonstate.edu/SignIn.asp>
- ⁸ Population Research Center – Portland State University. <https://www.pdx.edu/prc/population-reports-estimates>
- ⁹ Brett Hodgson, Oregon Department of Fish and Wildlife Biologist, Bend. Personal communication.
- ¹⁰ *Oregon's 2010 Section 303(d) List of Water Quality Limited Waterbodies*. Oregon Department of Environmental Quality. 2012.