Oregon
Department
of Agriculture

Upper Deschutes Agricultural Water Quality Management Area Plan

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Developed by the:

Upper Deschutes Local Advisory Committee

Oregon Department of Agriculture

With support from the:

Deschutes Soil and Water Conservation District

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

Deschutes SWCD
625 SE Salmon Ave. #7
Redmond, OR 97756
Phone: (541) 923-2204

www.oregon.gov/ODA/programs/NaturalResources/Pages/AgWaterQuality.aspx

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Acronyms and Terms Used in this Document

Ag Water Quality Program – Agricultural Water Quality Management Program
Area Plan – Agricultural Water Quality Management Area Plan
Area Rules – Agricultural Water Quality Management Area Rules
BOR – U.S. Bureau of Reclamation
CAFO – Confined Animal Feeding Operation
CNPCP – Coastal Nonpoint Pollution Control Program
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 – Oregon Department of State Lands
EPA – US Environmental Protection Agency
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
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
WQPMT – Water Quality Pesticides Management Team

Foreword

This Agricultural Water Quality Management Area Plan (Area Plan) provides guidance for addressing water quality due to agricultural activities in the Agricultural Water Quality Management Area (Management Area). The purpose of the Area Plan is to identify 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) that are enforced by the Oregon Department of Agriculture (ODA).

Required Elements of Area Plans

Area Plans must describe a program to achieve the water quality goals and standards necessary to protect designated beneficial uses related to water quality as required by 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, Agricultural Water Quality Management Area Rules (Area Rules), and available or effective practices to address water quality issues.

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

Chapter 4: Local Implementation, Monitoring, and Adaptive Management. Summarizes 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 local agricultural water quality issues. The purpose of the Area Plan is to identify strategies to prevent and control water pollution from agricultural activities and soil erosion (ORS 568.909(2)) on agricultural and rural lands for the area 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 Agricultural Water Quality Management Area Local Advisory Committee (LAC), with support and input from the SWCD and the Oregon Department of Environmental Quality (DEQ). The public was invited to participate in the original development and approval of the Area Plans and is invited to participate in the biennial review process. 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.

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

- Farms and ranches.
- Rural 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).

1.2 History of the Ag Water Quality Program

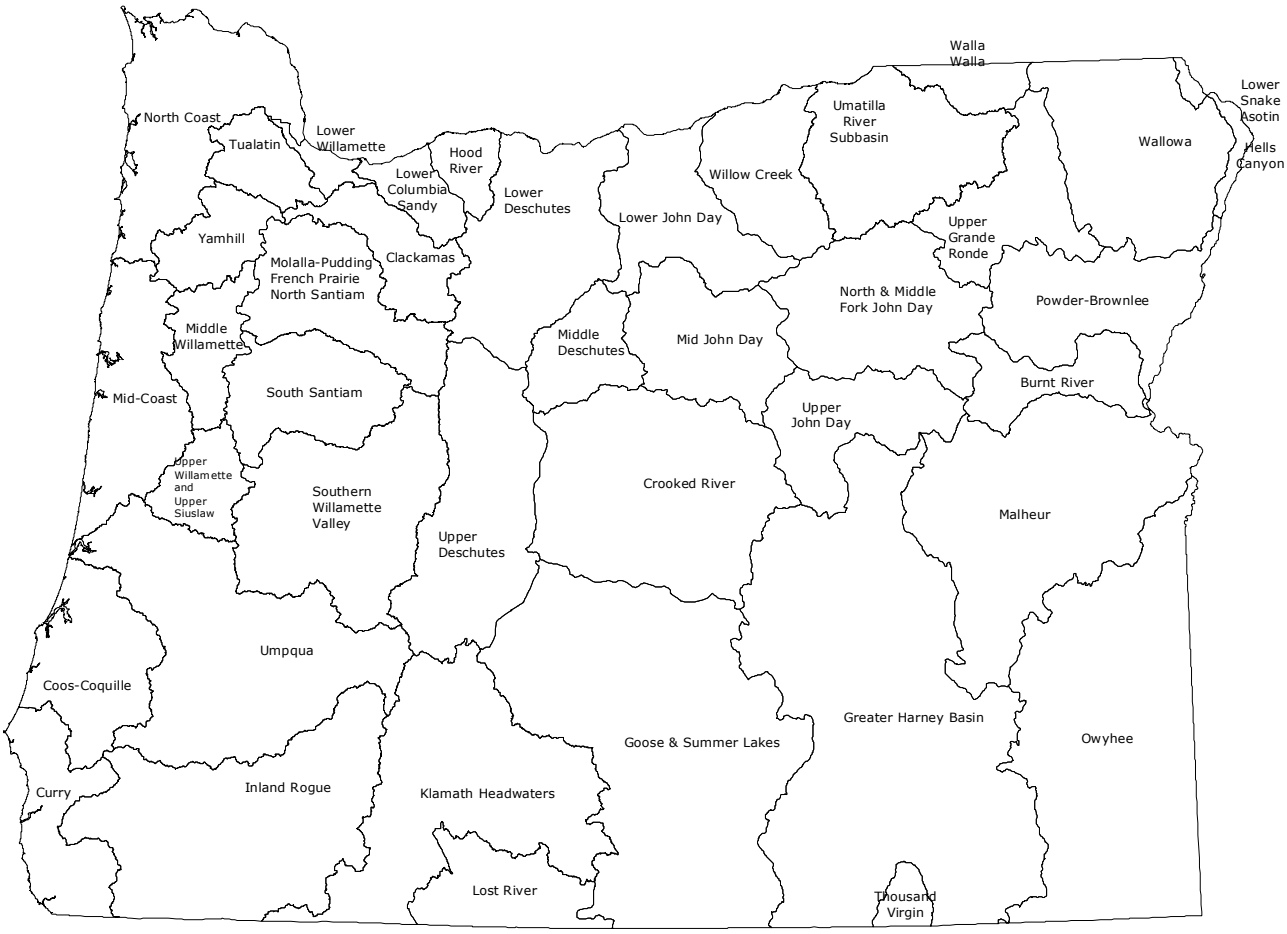
In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act (formerly known as "Senate Bill 1010") directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion, and to achieve water quality standards (ORS 568.900 through ORS 568.933). Senate Bill 502 was passed in 1995 to clarify that ODA regulates agriculture with respect to water quality (ORS 561.191). The Area Plan and its associated 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 associated 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 associated Area Rules.
- Monitoring, evaluation, and adaptive management.
- Developing partnerships with SWCDs, state and federal agencies, tribes, watershed councils, and others.

Figure 1: Map of 38 Agricultural 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 are drivers for establishing an Ag Water Quality Management Plan include:

- State water quality standards.

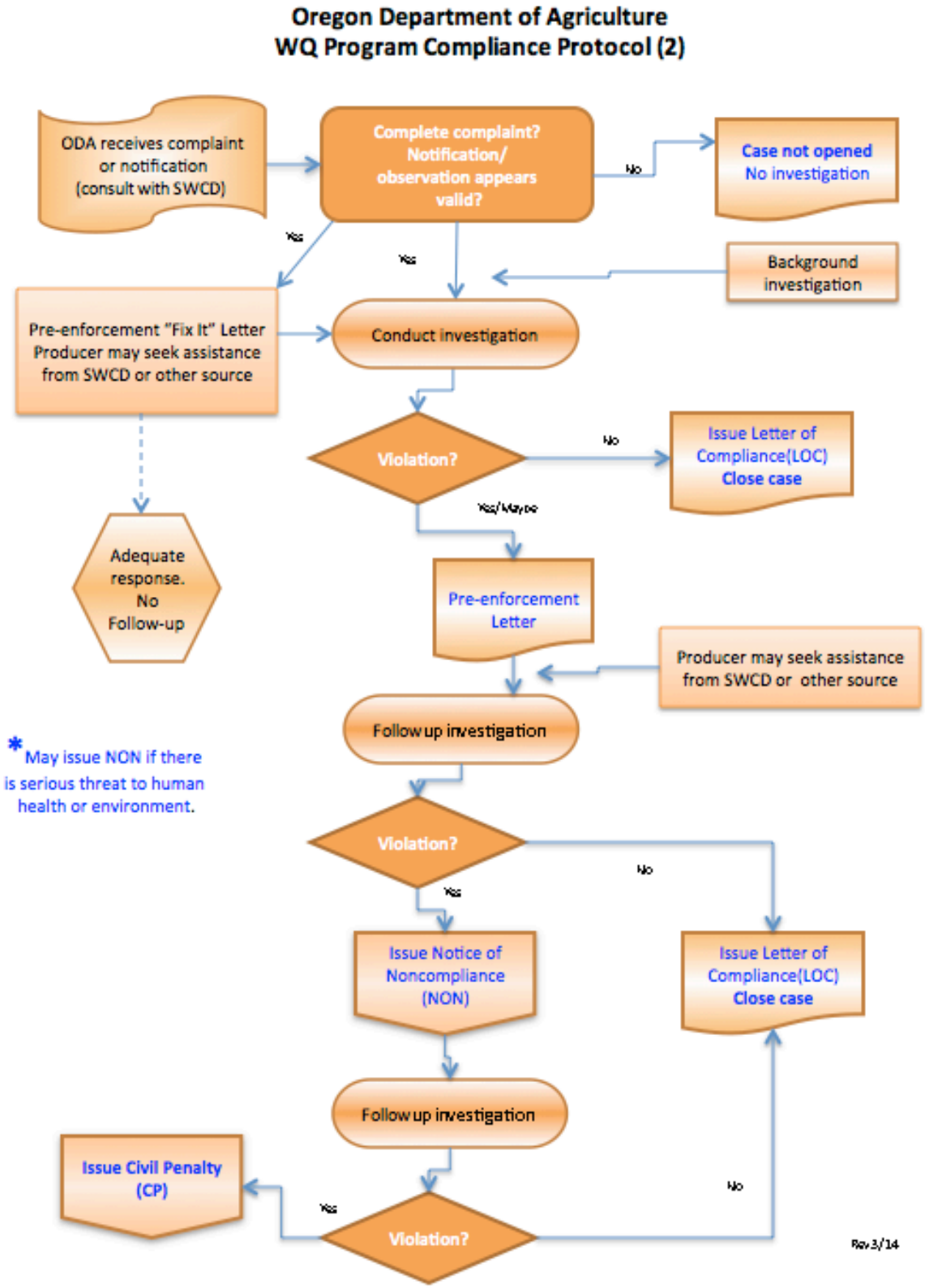
- Load allocations for agricultural nonpoint source pollution assigned under Total Maximum Daily Loads (TMDLs) issued pursuant to the Clean Water Act (CWA), Section 303(d).
- Approved management measures for Coastal Zone Act Reauthorization Amendments (CZARA).
- Agricultural activities detailed in a Groundwater Management Area (GWMA) Action Plan (if a GWMA has been established and an Action Plan developed).

The Oregon Department of Agriculture has the legal authority to develop and implement Area Plans and associated 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 has responsibility for any actions related to enforcement or determination of noncompliance with 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 emphasis of the Area Plan is on voluntary action by landowners or operators to control the factors affecting water quality in the Management Area. The Area Rules are outlined as a set of minimum standards that landowners and operators must be meet on all agricultural or rural lands.

ODA will use enforcement where appropriate and necessary to gain compliance with agricultural water quality rules. Figure 2 outlines ODA's compliance process. Any enforcement action will be pursued 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 Order such as a Notice of Noncompliance. If a Notice of Noncompliance is issued, ODA will direct the landowner or operator 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, civil penalties may be assessed for continued violation of the rules. See the Compliance Flow Chart for a diagram of the compliance process. If and when other governmental policies, programs, or rules conflict with the Area Plan or associated Area Rules, ODA will consult with the appropriate agency to resolve the conflict in a reasonable manner.

Figure 2: Compliance Flow Chart



1.3.2 Local Management Agency

A Local Management Agency (LMA) is an organization that ODA designated to implement 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 agreement between ODA and each SWCD. 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 associated regulations 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 to assist with the development and subsequent biennial reviews of the local Area Plan and associated Area Rules. The LAC serves in an advisory role to the director of ODA and to the Board of Agriculture. LACs are comprised primarily of agricultural landowners in the Management Area and must reflect a balance of affected persons.

The LAC may meet as frequently as necessary to carry out its responsibilities, which include but are not limited to:

- Participate in the development and ongoing revisions of the Area Plan.
- Participate in the development and 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 Agriculture's Role

Each individual landowner or operator in the Management Area is required to comply with the Area Rules, which set minimum standards. However, the rules alone may not be enough in every Management Area. Each landowner and operator in the Management Area is required to comply with the Area Rules. Landowners also are encouraged to engage in restoration activities to achieve the goals and objectives of the Area Plan. Each landowner and operator's actions will contribute toward achievement of the water quality standards.

Technical and financial assistance is available to landowners who want to work with SWCDs (or other local partners) 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 associated Area Rules, agricultural landowners and operators are not responsible for mitigating or addressing factors that do not result from agricultural activities, 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.
- Other circumstances not within the reasonable control of the landowner or operator.

However, agricultural landowners or operators 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 Plans 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 Plans and Area Rules, as needed, to address comments received. The director of ODA adopted the Area Plans and Area Rules in consultation with the Board of Agriculture.

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

1.4 Agricultural Water Quality

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 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 discharges from agricultural fields may be at a defined discharge point 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 impacted from 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 impacted in this Management Area are summarized in Chapter 2.

Many water bodies throughout Oregon do not meet state water quality standards. Many of these water bodies have established water quality management plans that document needed pollutant reductions. The

most common water quality concerns related to agricultural activities are temperature, bacteria, biological criteria, sediment and turbidity, phosphorous, algae, pH, dissolved oxygen, harmful algal blooms, nitrates, pesticides, and mercury. These parameters vary by Management Area and are summarized in Chapter 2.

1.4.3 Impaired Water Bodies and Total Maximum Daily Loads (TMDLs)

Every two years, DEQ is required by the federal CWA to assess water quality in Oregon. Clean Water Act 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 is required to establish TMDLs for pollutants specific to the pollutants that led to the placement of a waterbody on the 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 water body 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 NPDES waste discharge permits, while a "load allocation" is attributed to nonpoint sources (agriculture, forestry, and urban). The agricultural sector is responsible for helping achieve the pollution limit by meeting 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, and not just to an individual water body 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 this Management Area. Biennial reviews and revisions to the Area Plan and associated regulations must address agricultural or nonpoint source load allocations from relevant TMDLs.

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 into all of the Area Rules.

ORS 468B.025 states that:

> "(1) ... 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."

The aspects 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:

"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. Additionally, OAR 603-095-0010(53) includes but is not limited to commercial fertilizers, soil amendments, composts, animal wastes, vegetative materials, or any other wastes.

"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.

"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.

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 cooler stream temperatures, streambank stability, and filtration of pollutants. Other water quality functions from streamside vegetation include: water storage 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 improves water quality related to multiple pollutants, including: temperature (heat), sediment, bacteria, nutrients, toxics, and pesticides.
- Streamside vegetation provides fish and wildlife habitat.
- Landowners can improve streamside vegetation in ways that are compatible with their operation. Streamside conditions may be improved without the removal of the agricultural activity, such as with managed grazing.
- Streamside vegetation condition is measureable 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 (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 local or regional scientific research. ODA does not consider invasive, non-native plants such as introduced varieties of reed canary grass and blackberry to be site-capable vegetation.

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

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

1.5 Other Water Quality Programs

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

1.5.1 Confined Animal Feeding Operation Program

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. Since the early 1980s, CAFOs in Oregon have been registered to a general Water Pollution Control Facility permit designed to protect water quality, while allowing the operators and producers to remain economically viable. A properly maintained CAFO does not pollute ground or 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 Water Pollution Control Facility permit program to a federal National Pollutant Discharge Elimination System (NPDES) program. Oregon Department of Agriculture and DEQ jointly issue the NPDES CAFO Permit, which complies with all CWA requirements for CAFOs. This permit does allow discharge in certain circumstances as long as the discharge does not violate water quality standards.

Oregon NPDES CAFO permits require the registrant to operate according to a site-specific, ODA-approved, Animal Waste Management Plan that is incorporated into the NPDES CAFO permit by reference.

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: the Lower Umatilla Basin GWMA, the Northern Malheur County GWMA, and the Southern Willamette Valley GWMA. Each GWMA has a voluntary action plan to reduce nitrate concentrations in groundwater. After a scheduled evaluation period, if DEQ determines that the voluntary approach is not effective, then 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 associated 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 program.

Through the PSP, state agencies and local partners work together to monitor pesticides in streams and to improve water quality (www.deq.state.or.us/wq/pesticide/pesticide.htm). ODA, Department of Environmental Quality, 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.

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 United States Environmental Protection Agency (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 resources.

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. Department of Environmental Quality 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.deq.state.or.us/wq/dwp/dwp.htm.

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. The DEQ sets water quality standards and develops TMDLs for impaired waterbodies, which ultimately are approved or disapproved by the EPA. In addition, DEQ develops and coordinates programs to address water quality including NPDES permits for point sources, the CWA Section 319 grant program, Source Water Protection, the CWA Section 401 Water Quality Certification, and GWMAs. DEQ also coordinates with ODA to help ensure successful implementation of Area Plans.

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

The MOA includes the following commitments:

- ODA will develop and implement a monitoring strategy, as resources allow, in consultation with DEQ.
- ODA will evaluate the effectiveness of Area Plans and associated Area Rules in collaboration with DEQ.
    - ODA will determine the percentage of lands achieving compliance with Management 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 its associated 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.

1.7 Measuring Progress

Agricultural landowners and operators 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. ODA is working with SWCDs, LACs, and other partners to develop and implement strategies that will produce measurable outcomes. ODA also is 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.

After ODA, the LAC, and the LMA establish measurable objectives and associated milestones, they will evaluate progress toward the milestones at each biennial review of the Area Plan. Using adaptive management, the biennial review 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 keep on track for achieving the longer-term measurable objective(s), and will revise strategies to address obstacles and challenges.

Measurable objectives allow the Ag Water Quality Program to better evaluate progress toward meeting water quality standards. 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 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 nutrients, because many pesticides and nutrients 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.
- It can be difficult to separate agriculture's influence on water quality from other land uses.
- Extensive monitoring of water quality is needed to evaluate progress, which is expensive and may fail to demonstrate improvements in the short term.
- Improved land conditions can be documented immediately, but there may be significant lag time before water quality improves or water quality impacts may be due to other sources.
- Reductions in water quality from agricultural activities are primarily through changes in land conditions and management activities.

Water quality monitoring data may 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 or land condition concerns associated with agriculture. Through the Focus Area process, the SWCD delivers systematic, concentrated outreach and technical assistance in a small geographic area. A key component of this approach is measuring land 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 geographic areas, and is supported by a large body of scientific research (e.g., Council for Agricultural Science and Technology, 2012).

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. In some cases, a Focus Area is selected because of efforts already underway or landowner relationships already established. The scale of the Focus Area matches the SWCD's capacity to deliver concentrated outreach and technical assistance, and to complete (or initiate) projects over a biennium. The current Focus Area for this Management Area is described in Chapter 3.

Working within a Focus Area is not intended to prevent implementation within the remainder of the Management Area. 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 agricultural water quality regulations, 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 agricultural water quality regulations. Finally, ODA completes a post-assessment to document progress made in the watershed. Chapter 3 describes any SIAs that are underway in this Management Area.

1.8 Monitoring, Evaluation, and Adaptive Management

ODA, the LAC, and the LMA will assess the effectiveness of the Area Plan and associated Area Rules by evaluating the status and trends in agricultural land conditions and water quality data. This assessment will include an evaluation of progress toward measurable objectives on agricultural lands across the entire Management Area and within the Focus Area. ODA will utilize other agencies' and organizations' local monitoring data when available. The Area Plan summarizes the results and findings in Chapter 4 for each biennial review. 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 Statewide Aerial Photo Monitoring of Streamside Vegetation

Starting in 2003, ODA began evaluating streamside vegetation conditions using aerial photos. Stream segments representing 10 percent to 15 percent of the agricultural lands in each Management Area were randomly selected for long-term aerial photo monitoring. Stream segments are generally 3-5 miles long. ODA evaluates streamside vegetation at specific points within 30-, 60-, and 90-foot bands along both sides of stream segments from the aerial photos and assigns each segment a score based on streamside vegetation. The score can range from 70 (all trees) to 0 (all bare ground). The same stream segments are re-photographed and re-scored every five years to evaluate changes in streamside vegetation conditions over time. Because site-capable vegetation varies across the state, there is no single "correct" streamside vegetation index score. The purpose of this monitoring is to measure positive or negative change. The results for this Management Area are summarized in Chapter 4.

1.8.2 Agricultural Ambient Water Quality Monitoring

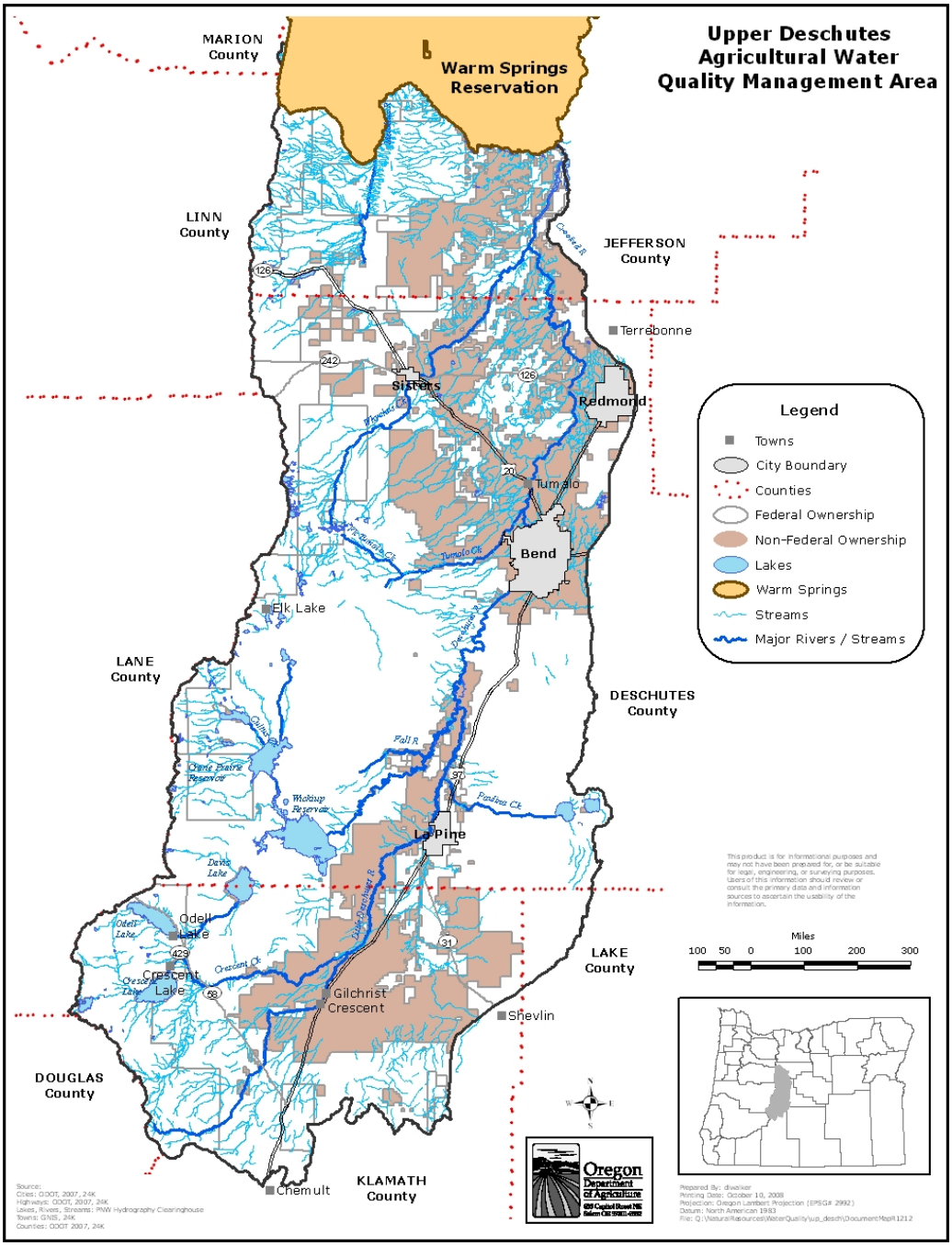
The Oregon Department of Agriculture evaluates water quality data from DEQ's long-term monitoring sites to determine trends in water quality at agricultural sites statewide. Results from monitoring sites in this Management Area, along with local water quality monitoring data, are described in Chapter 4.

1.8.3 Biennial Reviews and Adaptive Management

This and all Area Plans and associated Area Plans 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 and water quality monitoring, and outreach efforts over the past biennium. ODA and partners evaluate progress toward achieving measurable objectives, 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 associated Area Plans 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.



2.1 Local Roles and Responsibilities

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.

Table 2.1.1. Current LAC members

Marc Thalacker, Chair: Three Sisters Irrigation District, irrigated farm	**Ryan Houston:** Watershed Council coordinator
Rex Barber, Vice Chair: Lower Bridge, irrigated farm, DSWCD	**Terry Penhollow:** Retired Sunriver land manager
Todd Cleveland: Deschutes County Community Development Department	**Larry Roofener**: Central Oregon Irrigation District, Deschutes SWCD
Gordon DeArmond: Crescent, citizen	**Dan Sherwin:** Retired noxious weed specialist
Bill Grafton: Bend, Arnold Irrigation District, small farm	**Rick Stowell:** Retired fish biologist, Trout Unlimited

2.1.2 Local Management Agency

The implementation of the Area Plan is accomplished through an Intergovernmental Agreement between ODA and the Deschutes SWCD. This Intergovernmental Agreement defines the SWCD as the LMA for implementation of the Area Plan. The SWCD was also involved in development of the Area Plan and associated regulations.

2.2 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.

2.2.1 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[1]. 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.

2.2.2 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[1]. 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[1]. 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[3]. 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[4]. 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 *http://www.or.nrcs.usda.gov/soil/mlra.html*.

2.2.3 Hydrology[3]

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, 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.

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.

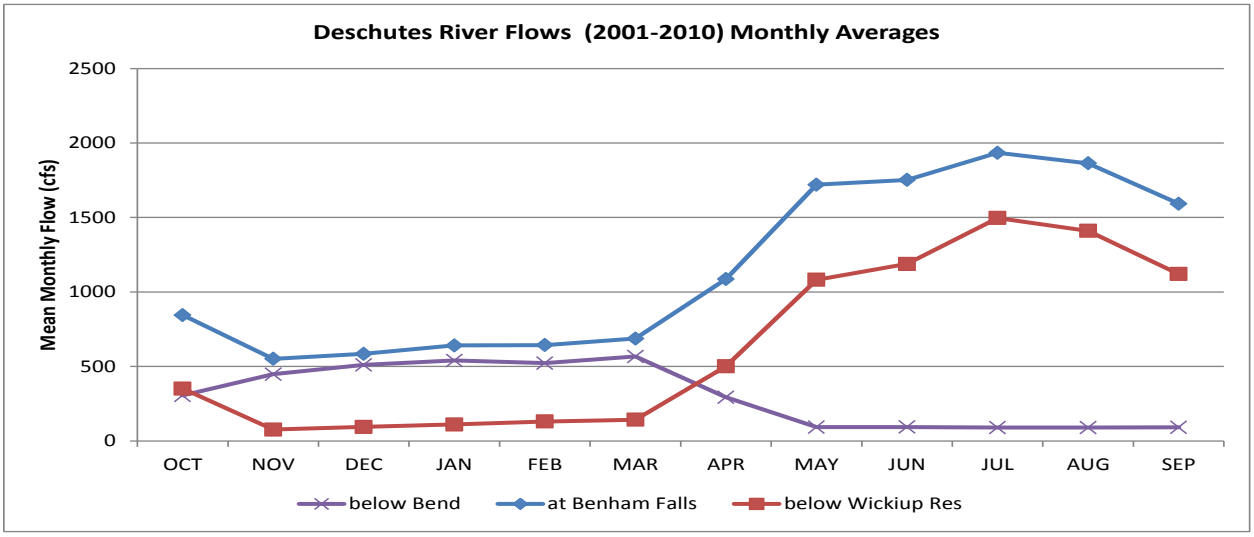
The vast majority of water diverted from the Deschutes River is taken out by the irrigation districts (Table 2.2.3). All other private diversions add up to less than 100 cfs.

Table 2.2.3. Irrigation District diversions and flow rates in the Management Area.

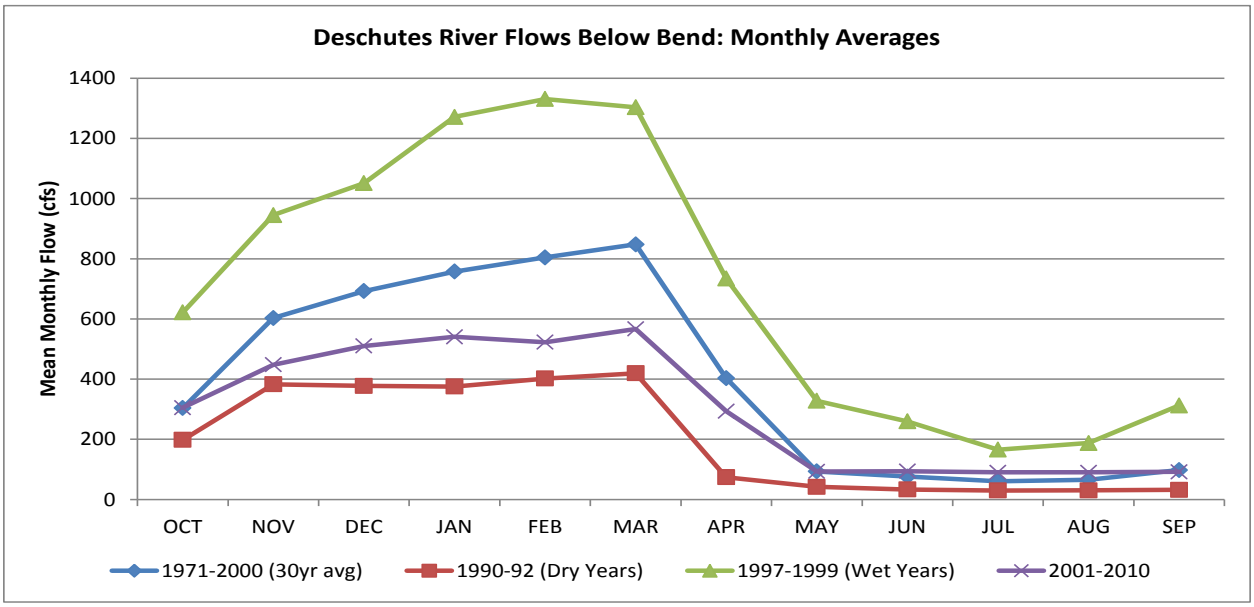
Canal	Maximum Water Right (cfs)	Usual Maximum (cfs)
Arnold	150	95
Central Oregon and North Canal	1,385	1,000
Bend Feed	150	135
North Unit Main	1,100	800
Swalley	120	105
Tumalo Feed	230	180
Three Sisters	185	150
Crooked River Feed	400	180

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 (2001-2010) and supply variability throughout the year due to wet (1997-1999) and dry (1990-1992) climate periods compared to a 30-year based period (1971-2000).

Graph 1



Graph 2



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 had been 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 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.

2.2.4 Vegetation

Vegetation is dominated by mixed conifer stands of ponderosa and lodgepole pine, fir, juniper, grasses, and shrubs[1]. 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[1]. 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[1]. 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[5]. 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.

2.2.5 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[1]. 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[6]. 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[1]. The subdivision of large farms and ranches into "hobby' farms has resulted in increased livestock numbers. Livestock include llamas, horses, beef and breeding cattle, poultry, sheep, goats, and a few dairy cows.

Approximately 20,629 acres were harvested in Deschutes County in 2013, of which 19,500 acres consisted of hay and pasture[7]. Cropland production in 2013 in Deschutes County was valued at $10,455,000; specialty crops brought in $3,430,000; and livestock brought in $12,134,000. Most of the livestock income is accrued from cattle.

The population of Deschutes County in 1980 was 62,142. By 2014, 170,388 individuals resided in the county[8]. 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.

2.3 Agricultural Water Quality in the Management Area

2.3.1 Local Issues of Concern

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).

2.3.1.1 Most Sensitive Beneficial Use: Salmonids

Migratory (anadromous) fish were eliminated from the Management Area following construction of the Pelton-Round Butte Hydropower complex[9]. 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. 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 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 and the Metolius River are the only bull trout fisheries 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.

2.3.1.2 Water Quality

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 2010-303(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.

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: 2010 303(d) list

Stream Segment	Water Quality Parameters						
	Temperature	pH	Dissolved Oxygen	Chlorophyll *a* or Algae	Biological Criteria	*E. coli*	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						
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 Prevention and Control 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	*Achieve adequate riparian vegetation* *Reduce streambank erosion* *Minimize stream temperature extremes beyond natural variation* *Minimize pollutants from surface runoff*	• 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	*Reduce soil erosion* *Limit nutrients and bacteria in surface runoff* *Achieve adequate riparian and upland vegetation*	• 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: - 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	*Minimize soil erosion* *Improve riparian and upland vegetation*	• Remove existing weeds; replace with desirable vegetation. An integrated vegetation plan may include: herbicides, grazing, mowing, bio-control, cultivating, or pulling. • 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	*Reduce unnatural fluctuations in stream flows* *Reduce runoff* *Minimize pollutants* *Reduce soil erosion*	• 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	*Reduce potential for*	• Develop nutrient application plans ("nutrient budgets") based on water and soil testing, tissue testing, plant needs.

NUTRIENTS & FARM CHEMICALS	*surface and groundwater pollution* *Reduce runoff*	• 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	*Reduce potential for water pollution*	• 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.

2.4.1 Area Rules

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 amount 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: Measurable Objectives and Strategic Initiatives

PLAN 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

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. Instead, the SWCD assessed vegetation along the Little Deschutes and Deschutes rivers south of Sunriver. In addition, they evaluated dry lots in the La Pine area for proper management of livestock manure. Measurable objectives will be developed when more complete assessments become available.

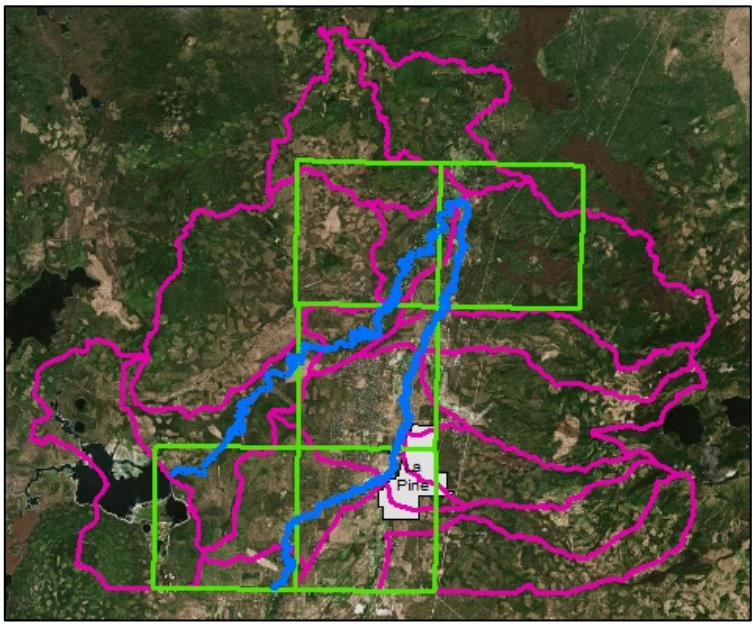
3.2 Strategic Initiatives

3.2.1 Focus Area(s)

The SWCD has been working in two distinct geographic and agricultural areas.

La Pine Resource Conservation Area (LRCA)
Southern Deschutes County has two agricultural water quality issues: 1) Inadequate riparian (streamside) vegetation along the Little Deschutes River, connected sloughs and/or wetlands and its tributaries, 2) *E. coli* and nitrates from livestock manure polluting groundwater around La Pine or contained in runoff that flows directly into streams. Transport of pesticides to groundwater is also of concern. Groundwater is very shallow in this area and is the focus of efforts by DEQ to address septic systems. Conservation partners, especially ODA, Upper Deschutes River Coalition, Deschutes River Conservancy, Deschutes County, Upper Deschutes Watershed Council, OWEB, NRCS, and DEQ, are very interested in improving streamside conditions and water quality in the south county.

The LRCA consists of twelve 6th field HUC watersheds (magenta outlines on map). The La Pine Basin is a part of a unique ecosystem in Oregon dominated by wetland habitats that support the endangered Oregon spotted frog. The majority of riparian/wetland habitat in the Little Deschutes River watershed is privately owned.



The LRCA includes 16,000 private properties within 436 square miles. Of these, 1,900 are two acres or larger, encompassing approximately 47,000 acres. It also includes 40 miles of the Deschutes River and 45.4 miles of the Little Deschutes River. Very little of the Deschutes River (left blue line on

map) flows through agricultural properties.

The LAC evaluated 50.5 miles of stream along the Little Deschutes (right blue line).

Table 3.2.1a. Streamside condition classifications in the Hood River Management Area			
Class I	**Class II**	**Class III**	**Class IV (non-ag)**
Vegetation on agricultural lands likely sufficient to moderate solar heating, stabilize streambanks, and filter out pollutants consistent with site capability.	Agricultural activities allowing plant growth, but vegetation likely insufficient to moderate solar heating, stabilize streambanks, or filter out pollutants consistent with site capability.	Agricultural activities likely not allowing vegetation to moderate solar heating, stabilize streambanks, or filter out pollutants consistent with site capability.	Non-agricultural land, e.g. roads, rural residential, forest land.

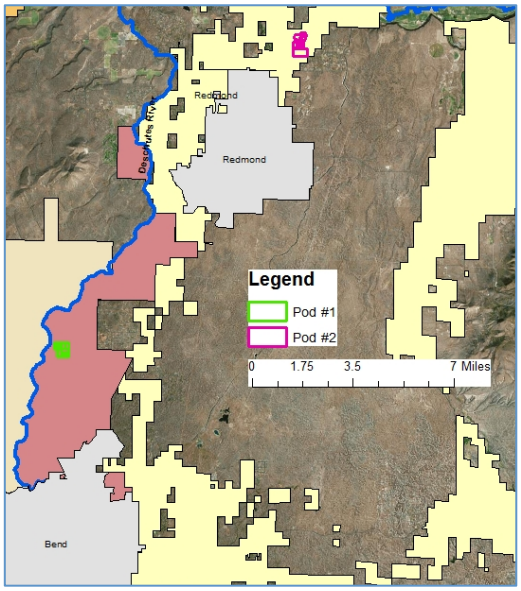
The DSWCD focused on five townships (green outlines) for its manure assessment

Table 3.2.1b. Classification criteria for lands zoned for Farm Deferral	
Category	**Criteria**
1. Ag activities not likely contributing bacteria or sediment to ground or surface water	No or low livestock numbers. No evidence of manure piles or heavy use.
2. Ag activities possibly contributing bacteria or sediment to ground or surface water	Ditches and animal trails present. Property in shallow groundwater area (<2 feet up to 6 feet of groundwater area mapped).
3. Ag activities likely contributing bacteria or sediment to ground or surface water	Erosion from livestock use; heavy use areas are visible from aerial imagery in Bing Maps. Property in shallow groundwater area (< 2 feet of groundwater area mapped).

Table 3.2.1c. Classification criteria for lands zoned Rural Residential	
Category	**Criteria**
1. Ag activities not likely contributing bacteria or nitrates to ground water	Depth to groundwater > 75 feet (based on well logs). Livestock use visible on aerial imagery.
2. Ag activities possibly contributing bacteria or nitrates to ground water	Depth to groundwater 6-75 feet. Livestock use visible on aerial imagery.
3. Ag activities likely contributing bacteria or nutrients to ground or surface water	Depth to groundwater < 6 feet. Livestock use visible on aerial imagery.

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 (pale yellow) a couple miles northeast of Redmond. The SWCD also selected a second Pod (lime green) within the Swalley Irrigation District (coral).

The SWCD will track:
1. Acre-feet delivered to Pod
2. Acre-feet/acre used for productive use

Measurable objectives and milestones will be determined after the pre-assessments are completed.

3.2.2 Strategic Implementation Area

The ODA recently 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.

ODA evaluated 278 tax lots, of which 101 were agricultural. Preliminary results from ODA's compliance evaluation are:

- No concern = 65 properties
- Low Concern = 12
- Moderate Concern = 17
- Significant Concern = 7

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

3.3 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.

3.3.1 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.

3.3.2 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
- Nutrient and farm chemical management
- Streambank/riparian restoration
- Irrigation water management
- Potential cost-share funds

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.

3.3.3 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.

3.4 Monitoring

The SWCD has been focusing on monitoring land conditions.

Water quality is monitored primarily by DEQ and the Upper Deschutes Watershed Council. ODA does not consider any of the sites monitored regularly by DEQ to be influenced by agriculture, other than by low flows due to irrigation withdrawals.

The watershed council focuses its efforts on Whychus Creek and the Deschutes River below Bend.

Chapter 4: Implementation, Monitoring, and Adaptive Management

4.1 Progress Toward Measurable Objectives

All measurable objectives are related to Focus Areas. No repeat assessments have been done yet to measure progress.

4.2 Activities and Accomplishments

4.2.1 Focus Areas

La Pine Conservation Area

The SWCD evaluated conditions in the La Pine Conservation Area related to riparian conditions and likelihood of manure polluting ground and surface water.

Table 4.2.1a. Results of riparian vegetation pre-assessment along 65.5 miles of the Little Deschutes River

Class	Description	Miles in each class.	
		2013	2015
I	Vegetation likely sufficient to moderate solar heating, stabilize streambanks, and filter out pollutants consistent with site capability.	10.45	10.45
II	Agricultural activities not impairing riparian growth, but vegetation likely insufficient to moderate solar heating, stabilize streambanks, or filter out pollutants consistent with site capability.	3.1	3.1
III	Agricultural activities likely not allowing vegetation to moderate solar heating, stabilize streambanks, or filter out pollutants consistent with site capability.	1.05	1.05
IV	Non-agricultural	50.9	50.9
	NOT YET ASSESSED	16	16

The SWCD also assessed properties in six townships for the likelihood of manure contamination.

Table 4.2.1b. Progress in reducing likelihood of manure contamination of water over time. Identified using tax lot information for *Farm Deferral*

	# of acres					
	2014			2019		
	T22S, R10E	T22S, R9E	T21S, R10	T22S, R10E	T22S, R9E	T21S, R10
# Acres with livestock	1499	1402	1492			
# Livestock (estimated)	150+	100+	100+			
Category 1: unlikely pollution	105	771	1194			
Category 2: possible pollution	1319	603	179			
Category 3: likely pollution	75	28	119			

Table 4.2.1c. Progress in reducing likelihood of manure contamination of water over time. Identified using tax lot information for *Rural Residential* small acreages						
	# of acres					
	2014			2019		
	T20S R10/11E	T21S, R10E	T22S, R10E	T20S R10/11E	T21S, R10E	T22S, R10E
# Acres with livestock	441	374	134			
# Livestock (estimated)	200	150	100			
Category 1: unlikely pollution	40	266	70			
Category 2: possible pollution	207	67	51			
Category 3: likely pollution	194	41	13			

Table 4.2.1d. Summary: Progress in reducing likelihood of manure contamination of ground and surface water over time.		
	# of acres (%)	
	2014	2019
# Acres with livestock	5,342	
# Livestock (estimated)	800+	
Category 1: unlikely pollution	2,446 (46%)	
Category 2: possible pollution	2,426 (45%)	
Category 3: likely pollution	470 (9%)	

SWCD activities since the 2013 assessment:

- Identified landowners bordering 45 miles of the Little Deschutes using the county website creating a contact list for landowners.
- Sent letters to landowners eligible for CREP.
- Held a composting class in the LRCA at a plant nursery.
- Wrote and submitted a grant for composting manure – rejected by the reviewers because they were not convinced that landowners in the LRCA would make use of it.
- Three classroom discussions at La Pine middle and high schools on water quality.
- Acquired landowner agreements for streambank planting on Little Deschutes.
- Planned and funded fencing off 1,000 feet of degraded bank from livestock damage.
- Developed a grazing plan that was implemented on 46 acres.
- Coordinated a fire fuels reduction project on 80 acres.

The SWCD but did not have the resources to do intensive work with the hundreds of landowners in this Focus Area.

Irrigation Water Management

The SWCD selected two private laterals that included about 20 landowners on 200 acres. The SWCD met three times with landowners and submitted two grant proposals for irrigation assistance. The SWCD is awaiting approval of those two proposals

4.2.2 Indian Ford Strategic Implementation Area

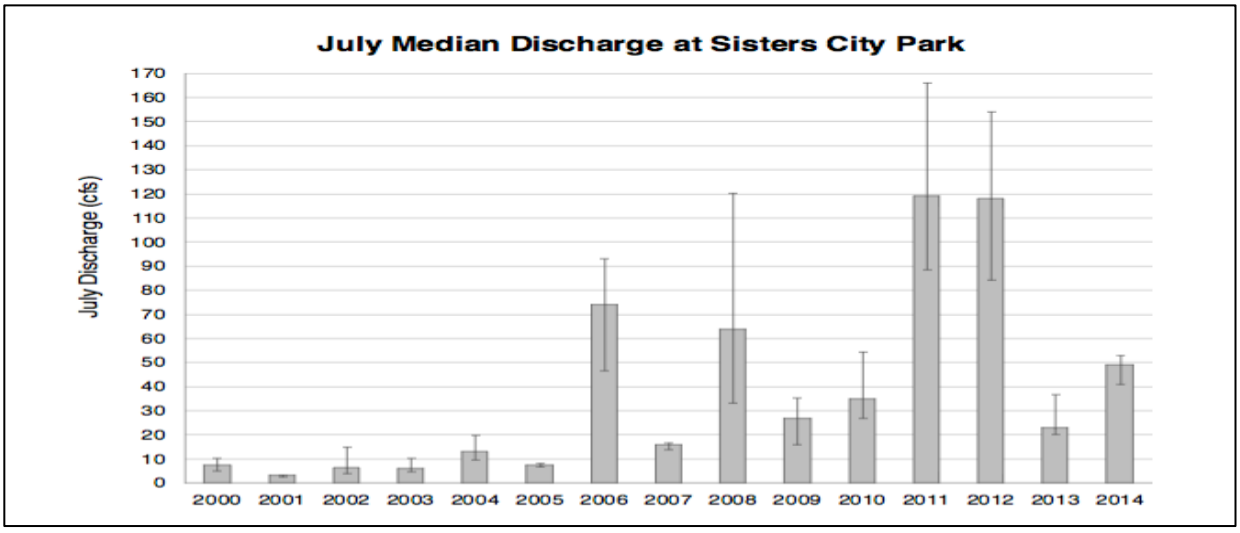
As a result of the SIA, the SWCD is working on stream bank restoration along 1½ miles of Indian Ford and Whychus creeks. The district met with eight landowners, introduced CREP, and invited CREP technician to join in where landowners were open to it.

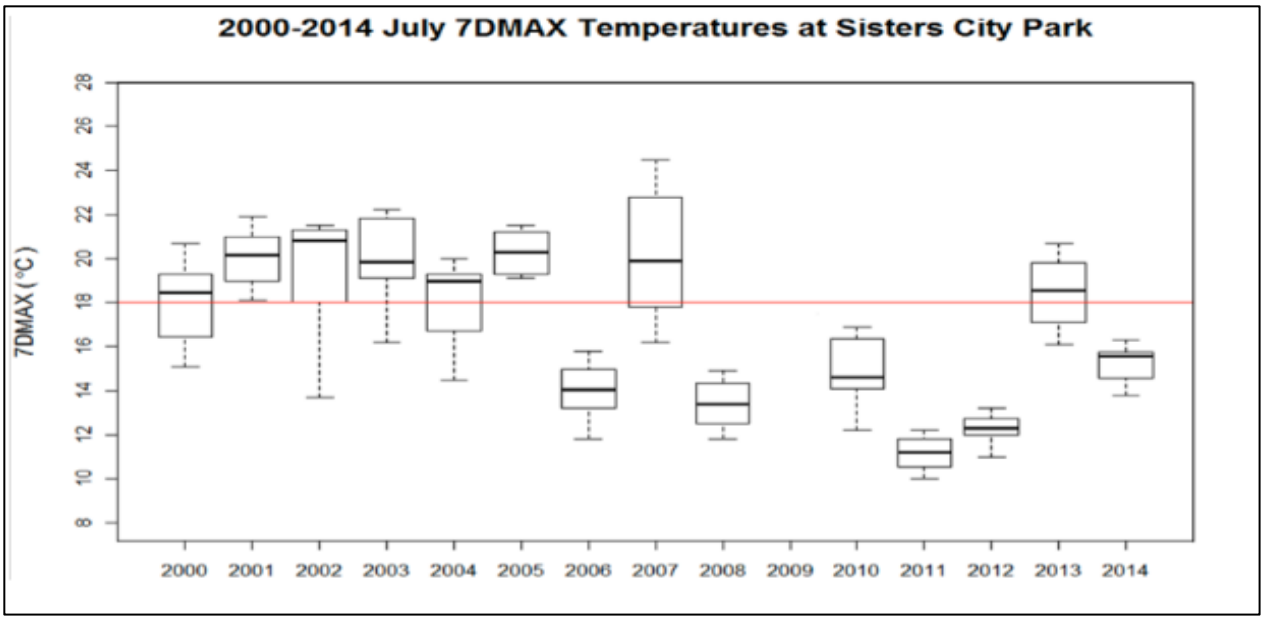
Table 4.2.2. Additional projects outside of focus and strategic implementation areas		
	Projects	Outreach/Education
Streamside Conditions		Distributed 350 Rural Living Handbooks and developed display board to utilize project activity, manure composting, streamside vegetation management strategies.
Potential 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.	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.
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.	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.

4.3 Water Quality Monitoring — Status and Trends

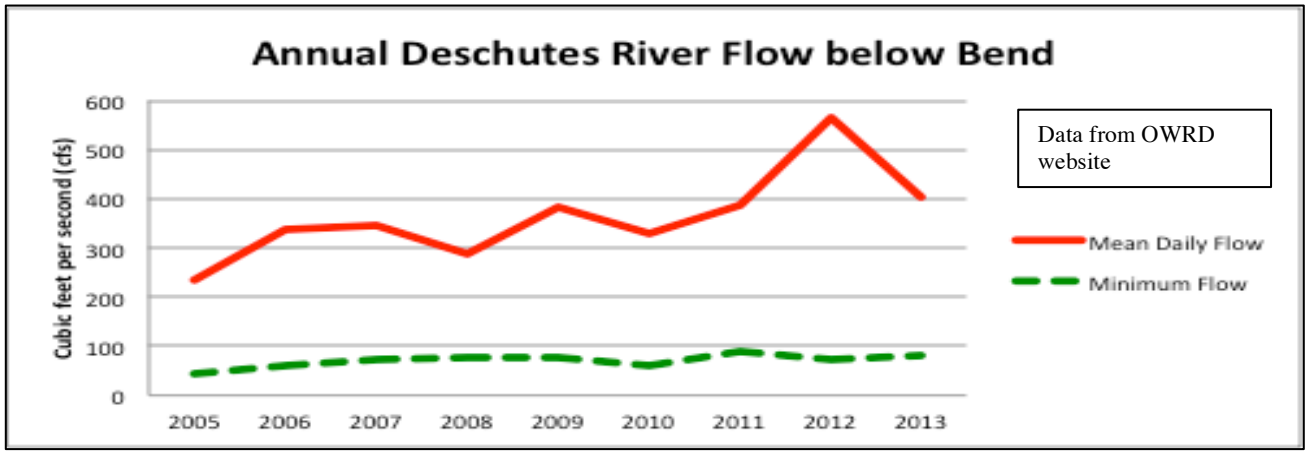
Water flows in both Wychus Creek and the Deschutes River have been increasing as stream temperatures are decreasing.

The following are from the *Upper Deschutes Watershed Council Technical Report: 2014 Whychus Creek Monitoring Report*. Mork, L and R. Houston, eds.

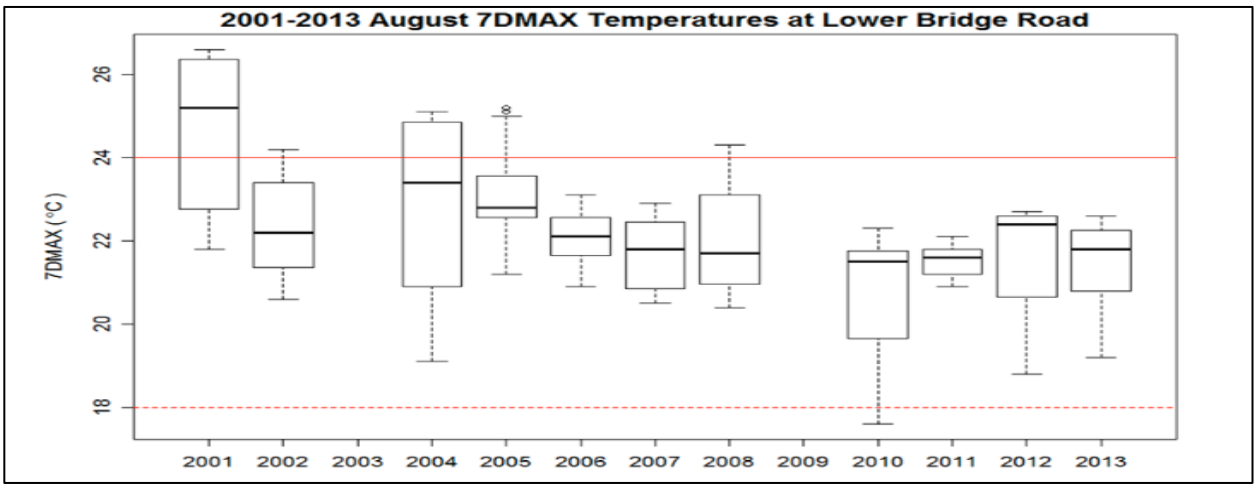




- "Whychus Creek still experiences low flows during both late spring/early summer and late summer/early fall flow, two periods when irrigation demands generally exceed water availability. Extreme flows, however, appear to be decreasing in magnitude during both of these periods."
- "Temperatures exceeded the state rearing and migration temperature standard of 18°C at five monitoring sites in 2014 for a total of 59 days, down from 81 days in 2013 but higher than or equivalent to any other year since 2007. Temperatures exceeded the state spawning criteria for salmon and steelhead trout at six sites for 3-13 days (6-39% of data days) between January 1 and May 15 in 2014. Temperatures never exceeded the 24°C lethal threshold for salmon and steelhead in 2014, for the fifth consecutive year."
- "Overall, the Whychus Creek benthic macroinvertebrate community saw the greatest changes from 2005 to 2009, but the community has continued to change in a direction that strongly indicates a response to lower temperature and fine sediment levels."



The following excerpts from the *Upper Deschutes Watershed Council Technical Report: Middle Deschutes Instream Flow Restoration and Temperature Responses 2001-2013*. Mork, L.



- July temperatures downstream of Bend exceeded the 18°C state standard at all four monitoring locations downstream of Bend. Temperatures at the most impaired site, Lower Bridge Road, exceeded 18°C for 102 days, and were above the 24°C lethal threshold for 10 days. Temperatures exceeded 18°C along 31 miles of the Middle Deschutes River, between North Canal Dam and Lower Bridge Road, for 29 days. These data represent some of the most extreme temperatures, and worst flow conditions, observed since 2007. Although stream flow restoration has resulted in far better flow conditions in the Deschutes than occurred previously, 2013 flows were rarely higher than the instream water rights protected through stream flow restoration, and were the lowest recorded since 2007, with the smallest proportion of cooler Tumalo Creek flow.
- Comparison of mean temperatures at three different sites at the lowest and highest flows recorded from 2001 to 2013 show that increased July flows produced substantially lower temperatures.

4.4 Biennial Reviews and Adaptive Management

The April 27, 2016, biennial review consisted mostly of a discussion of the Focus and Strategic Implementation Areas.

ODA investigated three complaints since the last biennial review. One consisted of a flock of chickens in a pen bisected by an irrigation lateral; monitoring showed a violation of the *E. coli* standard. The chickens were moved away from the lateral. Another consisted of piling horse manure along a property line. The third involved livestock manure and disposal of carcasses and offal from a mobile butcher facility.

ODA finished up a multi-year investigation related to livestock access to the Little Deschutes; the streambank was eventually protected via fencing and was funded by the U.S. Fish and Wildlife Service; and willows planted by students from La Pine.

Impediments identified by the LAC:

- Lack of landowner cooperation to make voluntary changes.
- Lack of funding for on-farm irrigation water management from the State of Oregon.
- New landowners don't know how to manage farms; small acreages turn over every 3-5 years on average.
- Lack of landowner knowledge of Area Plan.

- Absentee landowners.
- Rental properties.
- Concern about Endangered Species Act implementation through litigation unravels local cooperative conservation processes.
- SWCD can't get funding from OWEB for properties within the Deschutes Focused Investment Partnership.

Recommendations from the LAC:

- Pursue funding to help fund SWCD projects and staff.
- Increase financial incentives for landowners to participate.
- SWCD should focus efforts where they can make the most difference (biggest bang for the buck).
- OWEB should allow exceptions for funding in a Focused Investment Partnership.
- Develop outreach targeted towards smartphone users.

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. *http://www.pdx.edu/prc/oregon-census-state-data-center*

[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.