Malheur River Basin Agricultural Water Quality Management Area Plan

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Developed by the

Malheur River Basin Local Advisory Committee

Oregon Department of Agriculture

With support from the

Malheur County Soil and Water Conservation District

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Acronyms and Terms Used in this Document

Ag Water Quality Program – Agricultural Water Quality Management Program
Area Plan – Agricultural Water Quality Management Area Plan
Area Rules – Agricultural Water Quality Management Area Rules
CAFO – Confined Animal Feeding Operation
cfs – cubic feet per second
CNPCP – Coastal Nonpoint Pollution Control Program
CTWS – Confederated Tribes of the Warm Springs Reservation
CWA – Clean Water Act
CZARA – Coastal Zone Act Reauthorization Amendments
DEQ – Oregon Department of Environmental Quality
DSL – Oregon Department of State Lands
GWMA – Groundwater Management Area
HUC – Hydrologic Unit Code
IPM – Integrated Pest Management
LAC – Local Advisory Committee
Management Area – Agricultural Water Quality Management Area
MOA – Memorandum of Agreement
NOAA – National Oceanic and Atmospheric Administration
NPDES – National Pollution Discharge Elimination System
NRCS – Natural Resources Conservation Service
OAR – Oregon Administrative Rules
ODA – Oregon Department of Agriculture
ODF – Oregon Department of Forestry
ODFW – Oregon Department of Fish and Wildlife
ORS – Oregon Revised Statute
OSU – Oregon State University
OWEB – Oregon Watershed Enhancement Board
PMP – Pesticides Management Plan
PSP – Pesticides Stewardship Partnership
Regulations – Agricultural Water Quality Management Area Regulations
RUSLE – Revised Universal Soil Loss Equation
SWCD – Soil and Water Conservation District
T – Soil Loss Tolerance Factor
TMDL – Total Maximum Daily Load
USDA – United States Department of Agriculture
USEPA – United States Environmental Protection Agency
USFS – United States Forest Service
WQPMT – Water Quality Pesticides Management Team

Foreword

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

The provisions of this Area Plan do not establish legal requirements or prohibitions, as described in Oregon Revised Statute (ORS) 568.912(1).

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 (Oregon Administrative Rule (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 the Oregon Department of Agriculture (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 Agricultural Water Quality Management Program.

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

Chapter 3: Local Goals, Objectives, and Implementation Strategies. Chapter 3 presents goal(s), measurable objectives and timelines, and strategies to achieve the goal(s) and objectives.

Chapter 4: Local Implementation, Monitoring, and Adaptive Management. ODA and the Local Advisory Committee (LAC) will work with partners to summarize land condition and water quality status. Trends are summarized 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), this Area Plan guides landowners and partners such as Soil and Water Conservation Districts (SWCDs) in addressing local agricultural water quality issues. The purpose of this 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 the Management Area (OAR 603-090-0000(3)) and to achieve and maintain water quality standards (ORS 561.191(2)). This Area Plan has been developed and revised by ODA, the LAC, with support and input from the SWCD and the Oregon Department of Environmental Quality (DEQ). Throughout the development and revision processes, the public was invited to participate. This included public comment at meetings and public hearings during the Area Plan approval process. This Area Plan is implemented using a combination of outreach and education, conservation and management activities, compliance, monitoring, evaluation, and adaptive management.

The provisions of this Area Plan do not establish legal requirements or prohibitions (ORS 568.912(1)). Each Area Plan is accompanied by OAR regulations 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 (OARs 603-090-0000 to 603-090-0120) and under the regulations for this Management Area (OARs 603-095-1100). The Ag Water Quality Program's general OARs guide the Ag Water Quality Program, and the OARs for the Management Area are the regulations that landowners must follow.

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

- Large commercial farms and ranches.
- Small 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

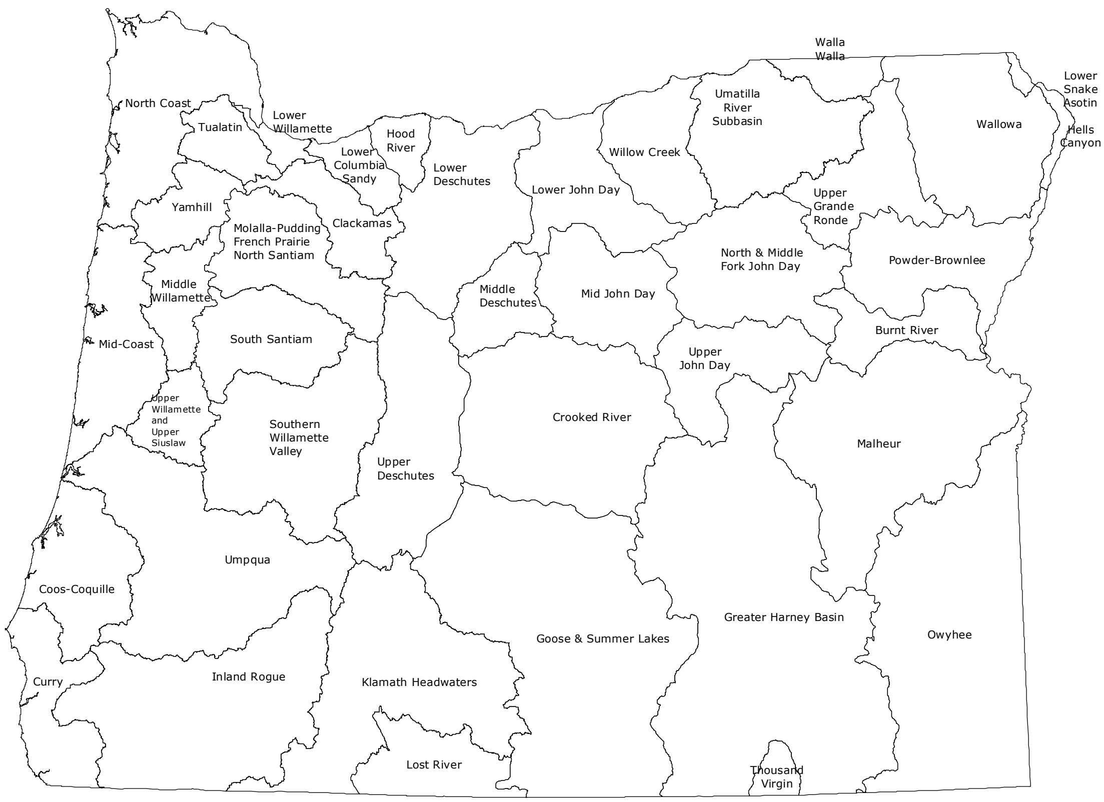
In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act, directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion, and to achieve water quality standards (ORS 568.900 through ORS 568.933). Senate Bill 502 was passed in 1995 to clarify that ODA regulates agriculture with respect to water quality (ORS 561.191). This Area Plan and its associated regulations 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 regulations 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 regulations.

- Conducting biennial reviews of Area Plans and regulations.
- Monitoring, evaluation, and adaptive management.
- Developing partnerships with SWCDs, state, federal, and tribal agencies, 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 (ODA)

ODA is the agency responsible for implementing the Ag Water Quality Program (ORS 568.900 to 568.933, ORS 561.191, OAR 603-090, and OAR 603-095). The Ag Water Quality Program is intended to meet the needs and requirements related to agricultural water pollution, including:

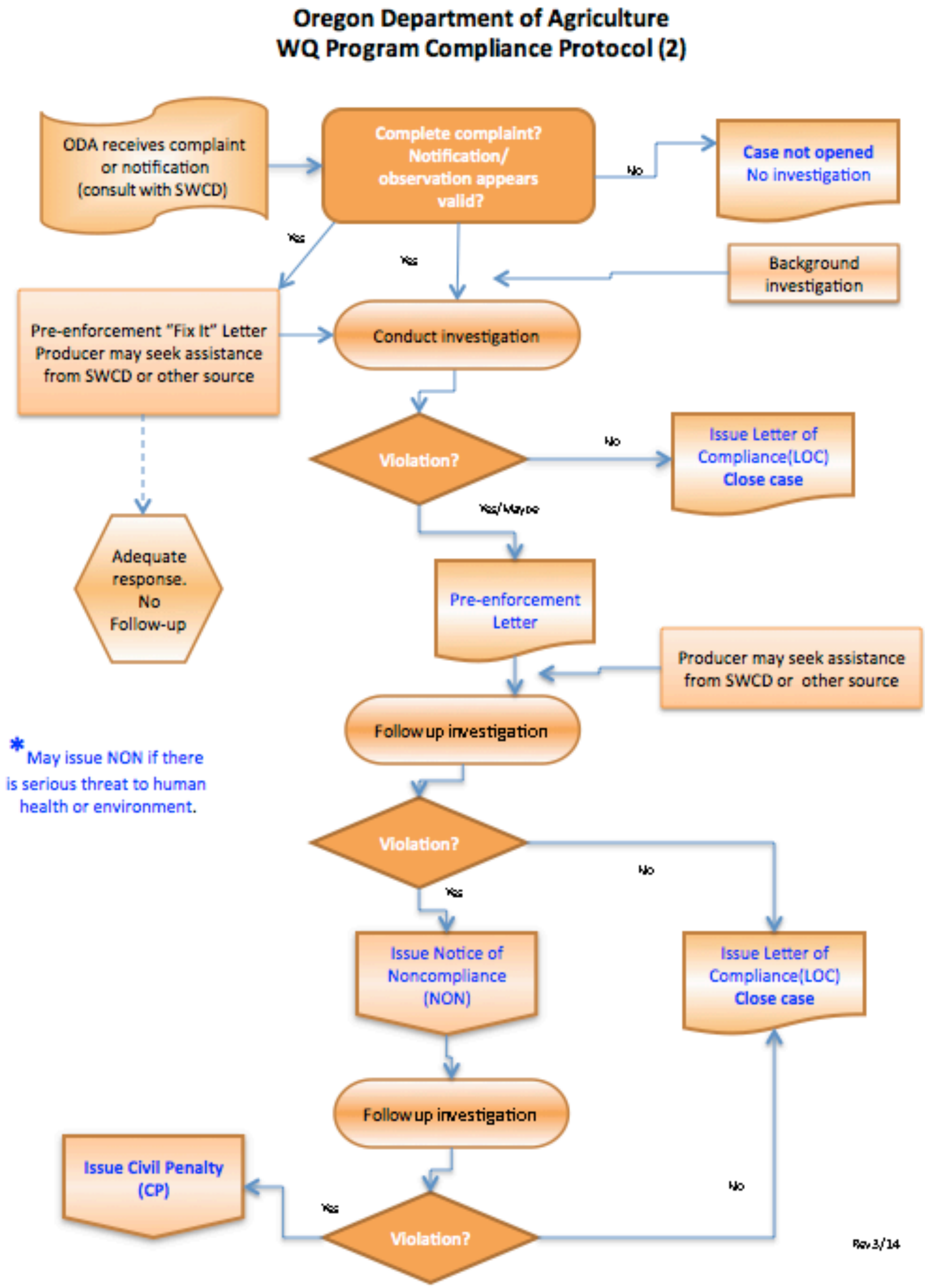
- State water quality standards.
- Load allocations for agricultural nonpoint source pollution assigned under Total Maximum Daily Loads (TMDLs) issued pursuant to the Clean Water Act (CWA), Section 303(d).
- Approved management measures for Coastal Zone Act Reauthorization Amendments (CZARA).
- Agricultural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

ODA has the legal authority to develop and implement Area Plans and associated regulations 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 will base Area Plans and regulations 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 associated regulations. ODA has responsibility for any actions related to enforcement or determination of noncompliance with regulations (OAR 603-090-0080 through OAR 603-090-0120). ORS 568.912(1) and ORS 568.912(2) give authority to ODA to adopt regulations that require landowners to perform actions necessary to prevent and control pollution from agricultural activities and soil erosion.

The emphasis of this Area Plan is on voluntary action by landowners or operators to control the factors effecting water quality in the Management Area. The regulations are outlined as a set of minimum standards that must be met on all agricultural or rural lands. Landowners and operators who fail to address these regulations may be subject to enforcement procedures, which are outlined below.

Enforcement Action—ODA will use enforcement mechanisms where appropriate and necessary to gain compliance with water quality regulations. Any enforcement action will be pursued only when reasonable attempts at voluntary solutions have failed. 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, the landowner or operator will be directed by ODA to remedy the condition through required corrective actions under the provisions of the enforcement procedures outlined in OAR 603-090-060 through OAR 603-090-120. If a landowner does not implement the required corrective actions, civil penalties may be assessed for continued violation of the regulations. See the Compliance Flow Chart for a diagram of the compliance process. If and when other governmental policies, programs, or regulations conflict with this Area Plan or associated regulations, ODA will consult with the agency(ies) and attempt to resolve the conflict in a reasonable manner.

Figure 2: Compliance Flow Chart



1.3.2 Local Management Agency

A Local Management Agency is an organization that ODA has designated to implement an Area Plan (OAR 603-090-0010). The legislative intent is for SWCDs to be Local Management Agencies 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 who voluntarily address natural resource concerns. Currently, all Local Management Agencies 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 (LAC)

For each Management Area, the director of ODA appoints an LAC (OAR 603-090-0020) with up to 12 members, to assist with the development and subsequent biennial reviews of the local Area Plan and regulations. The LAC serves in an advisory role to the director of ODA and to the Board of Agriculture. LACs are composed primarily of landowners in the Management Area and must reflect a balance of affected persons.

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

- Participate in the development and ongoing revisions of the Area Plan.
- Participate in the development and revisions of regulations.
- Recommend strategies necessary to achieve goals and objectives in the Area Plan.
- Participate in biennial reviews of the progress of implementation of the Area Plan and regulations.
- 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 regulations, which set minimum standards. However, the regulations alone are not enough. To achieve water quality standards, individual landowners also need to attain land conditions that achieve the goals and objectives of the voluntary Area Plan. Each landowner or operator is not individually responsible for achieving water quality standards, agricultural pollution limits, or the goals and objectives of the Area Plan. These are the responsibility of the agricultural community collectively.

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

Area regulations only address impacts that result from agricultural activities. A landowner is responsible for only those conditions caused by activities conducted on land managed by the landowner or occupier. Conditions resulting from unusual weather events or other circumstances not within the reasonable control of the landowner or operator are considered when making compliance decisions. Agricultural landowners may be responsible for some of the above impacts under other legal authorities.

Under the Area Plan and associated regulations, agricultural landowners and operators are not responsible for mitigating or addressing factors that do not result from agricultural activities, such as:

- 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.

1.3.5 Public Participation

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

ODA, LACs, and SWCDs conduct biennial reviews of the Area Plans and regulations. Partners, stakeholders, and the general public are invited to participate in the process. Any future revisions to the regulations will include a public comment period and a 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 Confined Animal Feeding Operations (CAFOs) and pesticide applications in, over and within three feet of water. Many CAFOs are regulated under ODA's CAFO Program. Irrigation water discharges may be at a defined discharge point, but does not currently require a permit.

Nonpoint water pollution originates from the general landscape and is difficult to trace to a single source. Nonpoint sources include erosion and contaminated 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 of clean water 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 are usually fish and aquatic life, water contact recreation, and public and private domestic water supply. These uses are generally the first to be impaired as a water body is polluted, 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 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. These water bodies may or may not have established water quality management plans documenting needed 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, the DEQ is required by the federal Clean Water Act (CWA) to assess water quality in Oregon. CWA Section 303(d) requires DEQ to identify a list of waters that do not meet water quality standards. The resulting list is commonly referred to as the 303(d) list. DEQ, in accordance with the CWA, is required to establish TMDLs for pollutants on the 303(d) list.

A TMDL includes an assessment of water quality data and current conditions and describes a plan to restore polluted waterways to conditions that meet water quality standards. TMDLs specify the daily amount of pollution that a water body can receive and still meet water quality standards. Through the TMDL, point sources are assigned pollution limits as "waste load allocations" in permits, while nonpoint sources (agriculture, forestry, and urban) are assigned pollution limits as "load allocations." TMDLs are legal orders issued by the DEQ, so parties assigned waste or load allocations are legally required to meet them. The agricultural sector is responsible for meeting the pollution limit (load allocation) assigned to agriculture specifically, or to nonpoint sources in general, as applicable.

TMDLs generally apply to an entire basin or subbasin, and not just to an individual water body on the 303(d) list. Once a TMDL is developed for a basin, the basin's impaired water bodies are removed from the 303(d) list, but they remain on the list of impaired water bodies. When data show that water quality standards have been achieved, water bodies will be identified on the list of water bodies that are attaining water quality standards.

As part of the TMDL process, DEQ identifies the Designated Management Agency or parties responsible for submitting TMDL implementation plans. TMDLs designate that the local Area Plan is the implementation plan for the agricultural component of the TMDLs that apply to this Management Area. Biennial reviews and revisions to the Area Plan and regulations must address agricultural or nonpoint source load allocations from 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 Water Pollution Control Law – ORS 468B.025 and ORS 468B.050

Senate Bill 502 was passed in 1995, authorizing ODA as the state agency responsible for regulation of farming activities for the purpose of protecting water quality. A Department of Justice opinion dated July 10, 1996, states that "...ODA has the statutory responsibility for developing and implementing water quality programs and rules that directly regulate farming practices on exclusive farm use and agricultural lands." In addition, this opinion states, "The program or rule must be designed to achieve and maintain Environmental Quality Commission's water quality standards."

To implement Senate Bill 502, ODA incorporated ORS 468B into all of the Area Plans and associated regulations in the state. A Department of Justice opinion, dated September 12, 2000, clarifies that ORS 468B.025 applies to point and nonpoint source pollution.

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 (ORS 468B.005)

"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 agricultural water pollution. Streamside vegetation provides three primary water quality functions: shade for cooler stream temperatures, streambank stability, and filtration of pollutants. Other water quality functions include: water storage for cooler and later season flows, sediment trapping that builds streambanks and floodplains, narrowing and deepening of channels, and biological uptake of sediment, organic material, nutrients, and pesticides.

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

- Streamside vegetation improves water quality related to multiple pollutants, including: temperature (heat), sediment, bacteria, nutrients, toxics, and pesticides.
- Streamside vegetation provides fish and wildlife habitat.
- Landowners can improve streamside vegetation in ways that are compatible with their operation.
- Streamside vegetation condition can be monitored readily to track the status and trends of agriculture's progress in addressing water quality concerns.

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, invasive species, modified flows, past land management). Site-capable vegetation can be determined for a specific site based on: current streamside vegetation at the site, streamside vegetation at nearby reference sites with similar natural characteristics, Natural Resources Conservation Service (NRCS) soil surveys, and local or regional scientific research.

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

In some cases, for narrow streams, mature site-capable vegetation may not be needed. For example, shrubs and grass may provide shade, protect streambanks, and filter pollutants. However, on larger streams, mature vegetation is important. Limited exceptions include:

- junipers are mature site-capable vegetation in central and eastern Oregon, but they reduce bank stability and increase erosion
- upland species (such as sagebrush) can be the dominant site-capable vegetation along streams with erosional down-cutting, but they do not improve water quality

1.5 Other Water Quality Programs

1.5.1 Confined Animal Feeding Operation (CAFO)

ODA is the lead state agency for the CAFO Program. The CAFO Program was developed to ensure that operators and producers do not contaminate ground or surface water with animal manure. Since the early 1980s, CAFOs 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, ODA was directed by the 2001 Oregon State Legislature to convert the CAFO Program from a Water Pollution Control Facility permit program to a federal National Pollutant Discharge Elimination System (NPDES) program. ODA and DEQ jointly issued a NPDES CAFO Permit in 2003 and 2009. The 2009 permit will expire in May 2014, and it is expected that a new permit will be issued at that time. The NPDES CAFO Permit is compliant with all Clean Water Act requirements for CAFOs; it 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. CAFO NPDES Permits protect both surface and ground water resources.

1.5.2 Drinking Water Source Protection

Oregon implements its drinking water protection program through a partnership between DEQ and the Oregon Health Authority. The program provides individuals and communities with information on how to protect the quality of Oregon's drinking water. DEQ and the Oregon Health Authority encourage community-based protection and preventive management strategies to ensure that all public drinking water resources are kept safe from future contamination. For more information see: www.deq.state.or.us/wq/dwp/dwp.htm. Agricultural activities are required to meet those water quality standards that contribute the safe drinking water.

1.5.3 Groundwater Management Areas (GWMAs)

Groundwater Management Areas are designated by DEQ when groundwater in an area has elevated contaminant concentrations resulting, at least in part, from nonpoint sources. Once the GWMA is declared, a local groundwater management committee comprised of affected and interested parties is formed. The committee then 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. These include 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. If after a scheduled evaluation point DEQ determines that the voluntary approach is not effective, then mandatory requirements may become necessary.

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, DEQ, and the Oregon Health Authority. 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 can be addressed through multiple programs and partners, including the PSP Program described above.

Through the PSP Program, 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). DEQ, ODA, 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. There has been noteworthy progress since 2000 in reducing pesticide concentrations and detections.

ODA led the development and implementation of a Pesticides Management Plan (PMP) for the state of Oregon (www.oregon.gov/ODA/PEST/water_quality.shtml). 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. The PMP sets forth a process for preventing and responding to pesticide detections in Oregon's ground and surface water resources by managing the pesticides that are currently approved for use by the USEPA and Oregon in both agricultural and non-agricultural settings.

1.5.5 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 salmon, because they have such 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 regulations throughout Oregon.

1.6 Partner Agencies and Organizations

1.6.1 Oregon Department of Environmental Quality (DEQ)

The USEPA has delegated authority to DEQ under the CWA authority for protection of water quality in Oregon. In turn, DEQ is the lead state agency with overall authority to regulate for water quality in Oregon. DEQ coordinates with other state agencies, including ODA and Oregon Department of Forestry, to meet the needs of the CWA. DEQ sets water quality standards and develops TMDLs for impaired waterbodies. In addition, DEQ develops and coordinates programs to address water quality including National Pollution Discharge Elimination Permits (for point sources), 319 program, Source Water Protection, 401 Water Quality Certification, and GWMAs. DEQ also coordinates with ODA to help ensure successful implementation of Area Plans as part of its 319 program.

DEQ designated ODA as the Designated Management Agency for water pollution control activities on agricultural and rural lands in the state of Oregon to coordinate meeting agricultural TMDL load allocations. A Memorandum of Agreement (MOA) between DEQ and the ODA recognizes that ODA is the agency responsible for implementing the Ag Water Quality Program established under ORS 568.900 to ORS 568.933, ORS 561.191, and OAR Chapter 603, Divisions 90 and 95. The MOA between ODA and DEQ was updated in 2012 and describes how the agencies will work together to meet agricultural water quality requirements.

The MOA includes the following commitments:

- ODA will develop and implement a monitoring strategy, as resources allow, in consultation with DEQ.
- ODA will evaluate Area Plans and regulation effectiveness in collaboration with DEQ.
  - ODA will determine the percentage of lands achieving compliance with Management Area regulations.
  - 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 with the objective of determining:
  - 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 Plan.
  - Whether the rate of progress is adequate to achieve the goals of the Area Plan.

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 regulations. The petition must allege with reasonable specificity that the Area Plan or associated regulations are not adequate to achieve applicable state and federal water quality standards (ORS 568.930(3)(a)).

1.6.2 Other Partners

ODA and SWCDs work in close partnership with local, state, and federal agencies and organizations, including: DEQ (as indicated above), the United States Department of Agriculture (USDA) NRCS and Farm Service Agency, watershed councils, Oregon State University Agriculture Experiment Station and Extension Service, 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 this progress. ODA is working with SWCDs, LACs, and our partners to develop and implement objectives and strategies that will continue to produce measurable outcomes for agricultural water quality.

1.7.1 Measurable Objectives

Measurable objectives allow the Ag Water Quality Program to better evaluate progress toward meeting water quality standards and load allocations where TMDLs have been completed. Many of these measurable objectives relate to land condition and are mainly implemented through focused work in small geographic areas (section 1.7.3). The measurable objectives for this Area Plan are in Chapter 3, and progress toward achieving the objectives is summarized in Chapter 4.

At a minimum, the measurable objectives of the Ag Water Quality Program and this Area Plan are to:

- Increase the percentage of lands achieving compliance with the regulations.
- Increase the percentage of lands meeting desired land conditions outlined in the Area Plan.

1.7.2 Land Condition and Water Quality

Land conditions can serve as useful surrogates (indicators) for water quality parameters. For example, streamside vegetation is generally 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.
- It requires extensive monitoring of water quality at an intensive temporal scale to evaluate progress; it is expensive and may fail to demonstrate short-term improvements.
- Improved land conditions can be documented immediately, but there may be a significant lag time or a need for more extensive implementation before water quality improves.
- Agricultural improvements in water pollution are primarily through improvements in land and management conditions.

Water quality monitoring data may help ODA and partners to measure progress or identify problem areas in implementing the Area Plan; although, as described above, it may be less likely to evaluate 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 significant water quality or land condition concerns that are associated with agriculture. ODA's intent in selecting Focus Areas is to deliver systematic, concentrated outreach and technical assistance in small geographic areas ("Focus Areas") through the SWCDs. A key component of this approach is measuring conditions before and after implementation to document the progress made with available resources. The focused implementation 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 can provide 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 the appropriate source specific conservation practices and demonstrate the effectiveness of these conservation practices.
- A higher density of projects allows neighbors to learn from neighbors.
- A higher density of prioritized projects leads to greater connectivity of projects.
- Limited resources are used more effectively and efficiently.
- Work in one Focus Area, followed by other Focus Areas, will eventually cover the entire Management Area.

SWCDs choose 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 remainder of the Management Area will continue to be addressed through general outreach and technical assistance.

Strategic Implementation Areas

Strategic Implementation Areas are small watersheds selected by ODA, in cooperation with partners, and after review of water quality and other available information. ODA leads the assessment of current conditions and the landowner outreach. Strategic Implementation Areas and Focus Areas are both tools to concentrate efforts in small geographic areas to achieve water quality standards. As with Focus Areas, SWCDs and partners work with landowners to improve conditions that may impact water quality. However, Strategic Implementation Areas also have a compliance evaluation and assurance process that allows ODA to proactively gain compliance with Ag water quality regulations.

1.8 Implementation, Monitoring, Evaluation, and Adaptive Management

Implementation of the Area Plan and associated regulations will be assessed by evaluating the status and trends in agricultural land conditions. Measurable objectives will be assessed across the entire Management Area and within the Focus Area. ODA conducts land condition and water quality monitoring at the statewide level and will analyze this and other agencies' and organizations' local monitoring data. The results and findings will be summarized 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), 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 acquired specifically for this purpose. ODA focuses on land condition monitoring efforts on streamside areas because these areas have such a broad influence over water quality. Stream segments representing 10 to 15 percent of the agricultural lands in each Management Area were randomly selected for monitoring. ODA examines streamside vegetation at specific points in 90-foot bands along the stream from the aerial photos and assigns each sample stream segment a score based on ground cover. 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 one correct riparian index score. The main point is to measure positive or negative change. The results are summarized in Chapter 4 of the Area Plan.

1.8.2 Agricultural Ambient Water Quality Monitoring Assessment

ODA currently evaluates water quality data from monitoring sites in DEQ's water quality database that reflects agricultural influence on water quality. These data are also published in the DEQ water quality database and evaluated at the statewide level to determine trends in water quality at agricultural sites statewide. Results from monitoring sites in the Management Area, along with local water quality monitoring data, are described in Chapter 4.

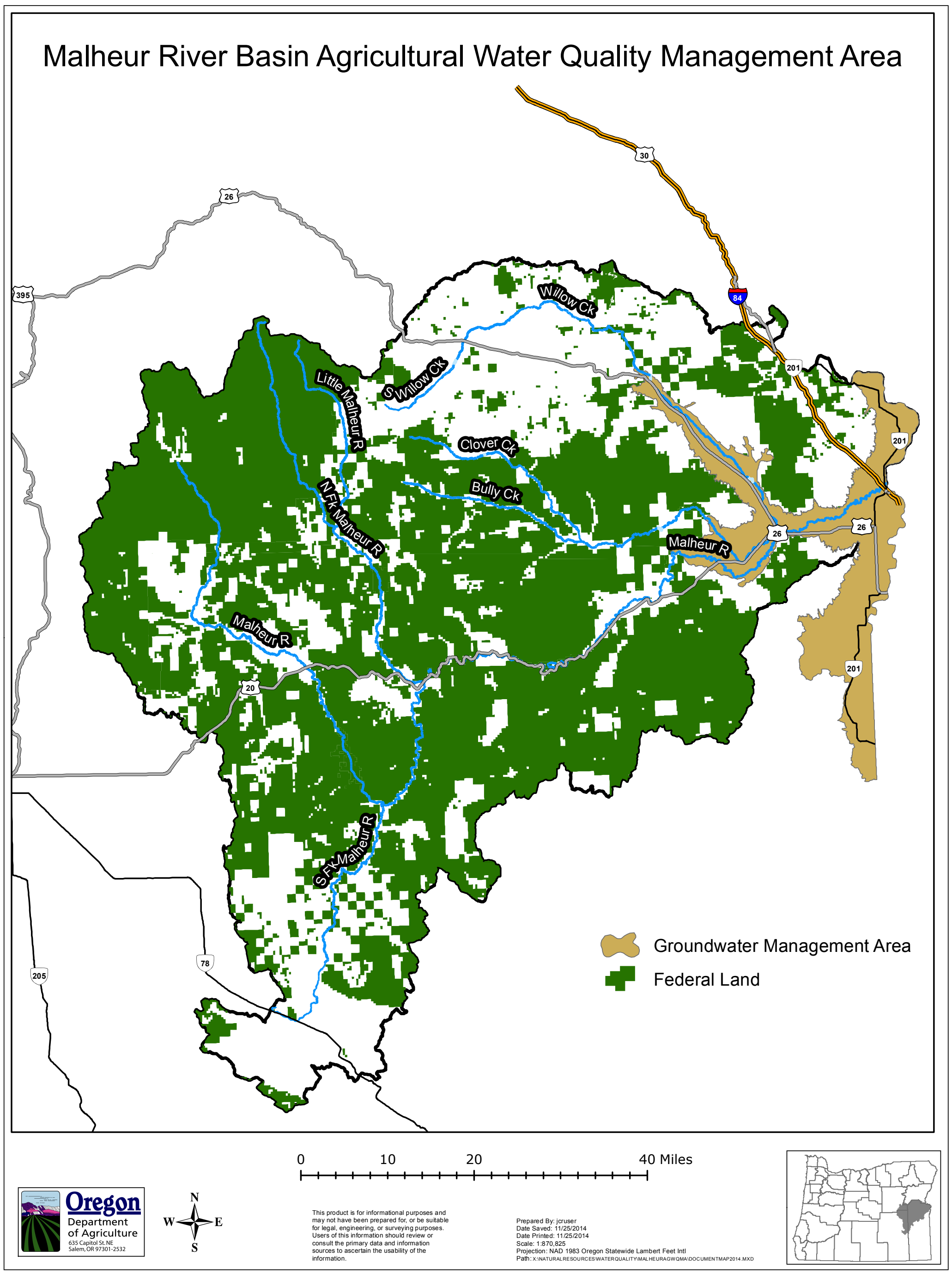
1.8.3 Biennial Reviews and Adaptive Management

The Area Plan and associated regulations 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 associated regulations. This evaluation includes enforcement actions, landscape and water quality monitoring, and outreach efforts over the past biennium across the Management Area and for the Focus Area. In addition, progress toward achieving agricultural load allocations may be documented (if a TMDL has been established). As a result of the biennial review, the LAC submits a report to the Board of Agriculture and the director of ODA. This report describes progress and impediments to implementation, and recommendations for modifications to the Area Plan or associated regulations necessary to achieve the purpose of the Area Plan. The results of this evaluation will be used to update the goal(s), measurable objectives, and strategies in Chapter 3.

Chapter 2: Local Background

The Management Area consists of the Malheur River Basin as defined by the United States Geologic Survey. The area includes the entire drainage of the Malheur River plus areas draining to the Snake River between the Burnt and Owyhee rivers, including Birch Creek, Moore's Hollow, Jacobsen Gulch, and irrigation drains near Nyssa (Figure 3).

Figure 3. Map of Management Area



2.1 Local Roles and Responsibilities

This Area Plan was developed by ODA with assistance from volunteer members of the Malheur River Basin Agricultural Water Quality Local Advisory Committee (LAC) and the Malheur County SWCD, in consultation with members of the community. All entities involved in this Area Plan are committed to maintaining and improving the economic viability of agriculture in the Management Area. Productive and profitable agriculture is the cornerstone of the local economy. Social well being is directly tied to this agricultural activity and the value-added processed goods provided. The income from these enterprises is indispensable.

The agricultural community of the Management Area has a sincere desire to protect the natural resources that everyone depends on. Most farmers and ranchers in the area have demonstrated that concern by applying environmentally friendly practices on their property. Many have implemented conservation projects to improve water quality and protect wildlife. Local growers and agencies have shown by implementing the Northern Malheur County Groundwater Protection Plan (Anon., 1991) that they can protect natural resources and maintain profitable agriculture.

2.1.1 Local Advisory Committee (LAC)

The LAC was formed in 1999 to assist with the development of the Area Plan and Regulations and with subsequent biennial reviews.

Members of the LAC represent local agricultural producers, local landowners, local environmental interests, local recreation interests, Malheur County SWCD, and the Malheur Watershed Council (Table 1).

Table 1. Current Local Advisory Committee (LAC) members.

Doug Maag, **Chair**: Jamieson, cattle & row crops	Marvin Rempel: Vale, dairy
Jim Bentz: Drewsey, cattle	Bill Romans: Westfall, rancher
Jerry Erstrom: Vale, seed producer	Darrell Standage: retired farmer
Herb Futter: retired NRCS	Marc Suyematsu, Ontario, row crops
Les Ito: Ontario, row crops	Loren Weideman: hobby farm
Bob Moore: Ontario, environmental community	

2.1.2 Local Management Agency

The Malheur County SWCD is the Local Management Agency for implementing the Area Plan. They provide meeting administration, outreach, and technical assistance to landowners.

The day-to-day implementation of this Plan is accomplished through Memoranda of Agreement between the Malheur County SWCD and ODA. The Malheur County SWCD acts as the Local Management Agency under such agreements.

2.2 Management Area Description

The Malheur River Basin lies in east-central Oregon and covers 4,610 square miles. About 63 percent of the area is in Malheur County, 27 percent in Harney County, and small areas in Grant and Baker counties. The Malheur River is 190 miles long, and its headwaters are in the Strawberry Range at an elevation of about 9,000 feet. Principal tributaries are the North Fork, the Middle Fork, and the South Fork. The Middle Fork originates in a Federally-designated wilderness area.

High Lake is the only natural lake of significant size in the basin, and it is a popular recreation area. However, there are several reservoirs; the largest are Warm Springs, Beulah, Bully, and Malheur. The South Fork has only minor dams.

Climate
The climate is semi-arid with hot, dry summers and cold winters. Summer high temperatures average between 85-95°F and can be higher than 100°F. Winter high temperatures average in the 20s and can dip to -45°F. Precipitation averages 8 to 40 inches annually, depending on location and elevation. Most precipitation falls during the winter as snow, and this mountain snowpack is an important source of water for irrigation, fish, wildlife, livestock, domestic water supply and other uses.

The area is prone to sudden, short but intense storms. These storms can cause erosion and high amounts of runoff. Despite the dams in the watershed, flooding occurs in the Vale and Ontario areas. Flooding also occurs higher up in the basin. For example, the town of Drewsey experiences floods as often as every 10 years. A primary cause of flooding is rain-on-snow events, when rain falls on snow, exceeds soil water infiltration rates, and water quickly reaches streams and rivers. Soil water infiltration rates are extremely low when the soil is wet and frozen, as occurred during the rain-on-snow event that caused the flood of 1993. Floodwaters can scour stream banks and damage riparian vegetation.

Topography/Geology
Most of the basin consists of gently sloping plateau uplands separated by river canyons or valleys. Elevations range from around 2,000 feet near the Malheur River's confluence with the Snake River to mountainous plateaus above 5,000 feet and isolated peaks above 9,000 feet. The Management Area is divided into three main geographic divisions: (1) low elevation terraces and floodplains in the irrigated eastern part, (2) grass-shrub uplands comprising the majority of the basin, and (3) forested uplands in the northwestern portion. These divisions generally correspond to the Snake River Plain, Sagebrush Steppe, and Blue Mountain Provinces.

The low-elevation terraces and flood plains that parallel the Snake River and extend up the valleys of the Malheur River and Willow Creek are important agricultural areas. These irrigated areas are intensively managed for wheat, sugar beets, onions, potatoes, corn, mint, grain, alfalfa seed, vegetable seed, irrigated pasture, and hay.

The grass-shrub uplands consist mainly of rolling, hilly terrain underlain by old sediments and volcanic basalt and ash deposits. Sagebrush and native bunchgrass communities at higher elevations dominate the Malheur River Basin. Sagebrush/bunchgrass communities are the most widespread types in southeastern Oregon. Sagebrush/annual grass communities are common at lower elevations. Perennial grasslands dominate for long periods following fire due to the reduction of overstory canopy and subsequent release of the grasses. Many of the upper sagebrush steep areas are being invaded by western juniper.

The forested uplands are located in the northwest corner of the basin. Prior to fire suppression, open ponderosa pine stands dominated. Presently, understory conifers and shrubs crowd the forests. More frequent, low intensity fires could reduce this crowding. Forested areas are used for livestock summer range, and are important for deer and elk habitat. Some native hay is produced by flooding the meadow basins at intermediate elevations.

Water Resources
The Malheur River system can be categorized into three separate zones: (1) the upper zone, above all major reservoirs, (2) a middle zone, below the reservoirs to the irrigation diversion dam at Namorf, and (3) a lower zone, from Namorf to the mouth.

Flow in the upper zone is controlled by precipitation and snowmelt patterns that result in natural cycles of high spring flows and low summer flows. Flows on the Middle Fork at Drewsey ranged from 12,000 cubic feet per second (cfs) at peak flood stage to zero during dry years between 1921 and 2012. On the North Fork above Beulah Reservoir, flows ranged from 4,000 cfs to 8.5 cfs between 1914 and 2012.

Flow in the middle zone is managed according to irrigation water demand in the lower agricultural valley during the irrigation season (April to mid-October). During the winter months, however, flows are greatly reduced to store water in reservoirs for the following irrigation season. Winter flows are limited to leakage from the reservoirs, natural springs and flows from the undammed South Fork. During the spring, water may be released from the reservoirs in accordance with the rate of snowmelt and inflow into the reservoir. Normally during the irrigation season, water released from Beulah Dam averages between 75 and 300 cfs.

Occasionally, the area experiences winter or spring floods despite the control provided by the reservoirs. This happens after heavy rains or fast snowmelt. These floods can erode streambanks and damage riparian vegetation.

Building a new dam in the Vines Hill area is one way to improve the efficiency of this system. Currently, irrigators must request water from Warm Springs Reservoir four days in advance. This causes several water quality problems. One example is if in that four-day period a storm occurs it could cause flows beyond what the channel can safely handle. A dam at Vines Hill would reduce the travel time of irrigation water to 12 hours. This greater control would reduce the chances of unexpected high flows, and match water deliveries to crop needs. This dam would also capture and store more water for later in the season and keep sediment from continuing down the Malheur River.

Another advantage of this proposed dam is to provide irrigation water if minimal pool levels are maintained in Beulah Reservoir to support bull trout.

The lower zone is characterized by several irrigation diversion dams. This zone is a mixing zone for irrigation return flows from several drain canals and from Bully Creek and Willow Creek. The summer flows vary according to irrigation water demand, amount of water diverted into the various canals, and amount of return flow.

John Fremont described Willow Creek as the "dry fork of the Malheur" in 1843, a wash that his group followed until they cut over the hills toward Farewell Bend (Fremont, 1843). During the summer months, Willow Creek was ordinarily a dry wash from Brogan to the Malheur River until irrigation projects were developed. The natural channel has been modified to facilitate farming, and the creek serves as an important drainage and irrigation canal for farmland in the area. Willow Creek, between Brogan and Malheur Reservoir, was placer-mined and dredged for gold and silver in the past. The flow in this reach of Willow Creek is controlled by water released from Malheur Reservoir. Above the reservoir, water flow is determined by natural cycles and irrigation demand.

Bully Creek is another tributary to the Malheur River. Above the reservoir, water flow is determined by natural cycles and irrigation demand. Much like Willow Creek, the lower reaches of Bully Creek have been straightened to facilitate farming, and the current creek serves as an important drainage and irrigation canal for farmland in the area.

Agriculture's Economic Importance to the Management Area

Agriculture and its related industries are the largest sector of the Malheur County economy. When measured by the percentage of total sales, food crop procurement, and processing it was the largest industry, followed by crop production; livestock production, procurement and feeding; and wholesale and retail trade. Malheur County's gross agricultural income for 2012 is estimated by Oregon State University (OSU) at $373,397,000. Cattle and onions were the top agricultural commodities, bringing in about $233,000,000. Part of the income is generated in the Owyhee Watershed.

The 2012 Census of Agriculture estimated that Malheur County had 1,113 farms on 1,076,768 acres.

Irrigation
Irrigation practices in the Management Area, particularly in the row crop areas, differ from those in most areas in Oregon.

Furrow irrigation is the primary technique and is a desirable and viable method of irrigation when managed properly. It consists of placing water in furrows and allowing the water to flow downhill by gravity. When the water reaches the end of the field, it is collected in a small ditch, which could direct it to a variety of places. Usually the water is returned to an irrigation ditch and reused by another farmer down the line. By the time the water is returned to the Malheur or the Snake River, it has been used up to seven times. As a consequence of water reuse, the cumulative efficiency of the cooperative system of furrow irrigation is vastly more efficient than calculations of furrow irrigation based on isolated fields.

The Bureau of Reclamation and private companies developed the irrigation system with this reuse of return flow in mind. The system consists of diverting water from a reservoir or from the river to a main canal then to smaller canals and laterals and finally to individual farms. The main canals are arranged one below the next to catch the return flow. During the later part of the irrigation season, the water in many of these ditches can be largely return flow. For example, by the middle of June in most years, all the water in the Nevada Ditch has been used for irrigation at least once if not many times.

In many ways, this reuse of water is efficient. It helps spread the amount of water longer in the season. This system would be difficult to change because of the complexity of its design and the need for groundwater recharge and incidental wetlands.

However, landowners are converting their furrow irrigation systems into more efficient systems where possible. Sprinklers apply water more efficiently to crops and result in less soil, fertilizer, and manure runoff to ground and surface water.

2.3 Agricultural Water Quality in the Management Area

This Area Plan addresses sediment, nutrients, bacteria, toxics, and temperature concerns related to agricultural activities.

Producers and agencies in the Malheur Watershed have a history of very high voluntary cooperative action to improve water quality. Substantial voluntary cooperative progress has resulted in steep declines in groundwater contamination by the residues of Dacthal and steady declines in groundwater nitrate (Richerson, P.M., 2014; Shock et al., 2001; Shock and Shock, 2012). Voluntary adoption of practices that protect surface and groundwater quality are widespread (Foley, 2013).

The Malheur LAC is committed to the rational use of natural resources for income and social welfare of the residents of Malheur County. The Malheur LAC is committed to conduct production practices consistent with the preservation of the natural resources of the county including water quality. In keeping with these principles, it is essential that all rules and regulations be based on sound science. Malheur County has low per capita income and high unemployment in comparison with the remainder of Oregon. As a matter of fairness, all aspects of this plan must be sound and contribute to income and employment.

2.3.1 Local Issues of Concern

Fish and aquatic life is considered one of the most sensitive beneficial uses in the basin. The fish-use designation for the lower 65 miles of the Malheur River, along with the lower portions of Willow and Bully creeks is Cool Water Species (no salmonid use). The headwaters of the mainstem Malheur River, North Fork Malheur River, and Little Malheur River are designated either Bull Trout Spawning and Rearing or Core Cold-Water habitat. The remaining streams in the basin are designated Redband or Lahontan Cutthroat Trout habitat, however, Lahontan Cutthroat are not known to exist in the basin.

The native fish that use the Snake River include bull trout and redband trout, northern pike minnow, large-scale and bridgelip suckers, mountain whitefish and white sturgeon. Adult bull trout use the river and reservoirs in and below Hells Canyon Reservoir. Bull trout are listed as threatened under the Endangered Species Act (ESA). The river and its tributaries below Hells Canyon Dam also provide habitat for the Snake River fall and spring/summer Chinook as well as steelhead, all of which are listed as threatened under the ESA.

In addition, many people receive their drinking water from wells. Well monitoring studies detected nitrate and Dacthal di-acid contamination in the shallow aquifer within the Lower Willow Creek and irrigated portion of the main Malheur River Basin. This area of the Malheur River Basin was designated a Groundwater Management Area in 1989 by Oregon DEQ for nitrate residue levels.

2.3.2 Water Quality Parameters of Concern

Data indicate that moderate-to-high nutrient and bacteria loading starts in the upper Malheur River above Warm Springs and Beulah reservoirs. Significant increases in bacteria, phosphorus, nitrate, and chlorophyll occur in the lower river below Bully and Willow creeks. Similar dramatically increasing patterns of bacteria and nutrient loading occur in Bully Creek below Bully Reservoir, and Willow Creek below Malheur Reservoir.

Table 2 consists of water quality limited streams from DEQ's 2010 303(d) list. The Malheur LAC has serious doubts about whether the contents of Table 2 are all based on sound science.

Table 2. Water-quality limited streams in the Malheur River Basin Management Area. Values given are river miles.

Stream Segment	Water Quality Parameters						
	Temperature*	*E. coli**	Dissolved Oxygen	Biological Criteria	DDT, Dieldrin	Chlorophyll a*	METALS: Arsenic (A), Iron (I), Mercury (M)
Alder Creek	0.4.1						
Basin Creek	0-8.8						
Bear Creek	0-14.7			0-14.7			
Big Creek	0-6.1						
Bluebucket Creek	0-12.1						
Bully Creek		15.9-57.1				0-12.8	A: 0-57.2
Cottonwood Creek	0-35.3						
Crane Creek	0-1.1			0-10.2			
Dry Creek	0-8.3						
Elk Creek	0-1						
Jacobsen Gulch, S Fork		0-3					
Lake Creek	0-11.9						
Little Crane Creek	0-9.3						
Little Malheur River	0-28.5			0-23.2			
Malheur River	126.98-185.9	0-67	67.1-190.3		0-67	0-67	A: 0-186.1, I: 49-126.8
Malheur River, N Fork	20.8-59.3	0-59.3	0-32.1	0-51.4			
Pine Creek	0-24.7						
Pole Creek	0-6.3						
Shepherd Gulch		0-3.6					
Stinkingwater Creek	0-27.8						

Summit Creek	**0-14.2**			**0-14.2**			
Swede Flat Creek				**0-4.1**			
Unnamed trib (Upper Malheur)			**0-1.3**				
Unnamed trib (Willow)							**M: 0-0.23**
Warm Springs Creek	**0-9**						
Willow Creek		**0-0.2**		**0-56.8**		**0-27.4**	**A: 0-56.8**

* TMDLs established for these parameters.

Most non-compliance with water quality standards, e.g. temperature and chlorophyll *a*, relate to the beneficial use of resident fish and aquatic life. In addition, excessive levels of bacteria (*E. coli*), nitrates, and toxics can cause problems for people (human contact recreation and drinking water).

Elevated stream temperatures can stress aquatic organisms and deplete oxygen from water. Low dissolved oxygen creates problems for fish and other aquatic life. The Malheur LAC believes that much of the elevated temperatures in the watershed are natural occurring.

Excessive nutrients, such as nitrogen and phosphorus, can increase plant growth, which in turn can increase pH and reduce dissolved oxygen through daily respiration and photosynthesis processes. The nitrate drinking water standard is 10 mg/L.

Nitrates are primarily carried into surface and ground water dissolved in water. Phosphorus can be either dissolved or attached to soil particles. Sediment carried in streams can also impair aquatic life by reducing light penetration and visibility, reducing water infiltration through stream substrate (harming incubating fish eggs), and irritating gill filaments.

Toxics such as arsenic have been found in drinking water wells. The source is likely naturally occurring arsenic within the volcanic rocks of the region (Phil Richerson (DEQ), personal communication, 2014). Of 42 locations (40 wells and two surface drains) sampled by DEQ, 93 percent have average arsenic concentrations exceeding the 10 ug/L drinking water standard.

"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).

2.3.3 Groundwater

DEQ developed the Northen Malheur County Groundwater Mangement Area Action Plan to reduce nitrate concentrations to 7 mg/L (http://www.deq.state.or.us/wq/groundwater/nmcgwma.htm).

Nitrate concentrations found in the groundwater are strongly influenced by agricultural fertilization, shallow depth to water table, large amounts of irrigation water applied, permeable soil types, and direction of ground water flow. Nitrates were detected in the majority of 25 wells in the Management Area that have been sampled regularly since 1991. Results through December 2012 show that 80 percent exceeded the 10 mg/L standard at least once, 64 percent had an average nitrate concentration above the 7 mg/L target, and 44 percent had an average that exceeded the 10 mg/L standard. The highest nitrate levels were around Vale and Annex.

In 2014, DEQ concluded in their DRAFT Fourth Northern Malheur County Groundwater Management Area Nitrate Trend Analysis Report that:

- The decrease in nitrate concentrations from 1991 through 2012 is statistically significant, even though some wells show increasing trends.
- The Action Plan goal of an area-wide nitrate concentration of 7 mg/L has not yet been met. Area-wide mean and median concentrations are 12.5 and 9.9, respectively.
- Continued and perhaps expanded best management practices implementation is needed.

Dacthal was a commonly used herbicide in onions for decades. It is no longer an issue because growers stopped using it in 1995-1998.

The contamination of nitrates and Dacthal di-acid is believed to have occurred over decades of irrigation. Best management practices to reduce groundwater contamination include (Action Plan; Appendix D):

- Soil, plant tissue, and water testing for precise nutrient management
- Applying nutrients at agronomic rates specific to each crop
- Pest management with products with short half-lives
- Conservation cropping sequence
- Continuing sound crop rotation
- Mulching and polyacrylamide (PAM)
- Irrigation water management, including irrigation scheduling
- Piping or lining irrigation delivery systems
- Conversion to more efficient systems of irrigation
- Capturing and reusing field runoff for irrigation

Additional information is available on the Malheur Experiment Station website (http://www.cropinfo.net/BestPractices/)

Groundwater moves an estimated 0.4 miles per year in the Cairo Junction area. Therefore, it may take over 11 years for water in the Cairo Junction area to discharge. Other estimates have indicated it will take 20 years for the groundwater to move from the upper reaches of the aquifer to the lower discharge areas. Due to this slow movement of groundwater, it will take decades to realize the full benefit of improved agronomic practices.

2.3.4 Surface Water

Cropland drainage systems in the Vale/Ontario area route irrigation discharge waters back to the Malheur and Snake rivers. These return flows are usually high in nutrients and sediment. Pastures and cropland runoff can contribute nutrients and bacteria into drainage systems and eventually rivers and streams. Local storm events and spring runoff from snowmelt accelerate this process. Recent efforts incorporating Effective Management Practices have improved surface water quality in some areas.

In 1978, the county appointed a Citizen's Water Resources Committee to develop a nonpoint source water quality management program. As part of this plan, the county conducted two years of intensive water sampling. The final report documented sediment loss, fecal coliform concentrations above acceptable levels and elevated levels of nitrogen and phosphorus in some areas (Anon., 1981). Malheur County and the Citizen's Water Resources Committee failed to receive any state agency support to start implementing the county plan at that time.

Upland watershed management is a priority. Desirable upland native vegetation functions as a water trap and filter, where rain and snowmelt is captured and incorporated into the sub-surface soil layers. Any reduction of native vegetation or replacement by undesirable species affects water infiltration rates into the sub-soil where surface runoff may supersede infiltration.

Many riparian waterways in the basin have experienced a loss of streambank vegetation due to natural scouring, excessive use by wild and domestic herbivores, road building, and many other causes. Many riparian waterways in the basin have experienced gain in riparian vegetation due to the lowering of grade and the lowering of maximum water flows due to reservoir construction and operation. Vegetation loss results in accelerated bank erosion, lowered water tables, higher stream temperatures and invasion by more drought tolerant vegetation. Damaged riparian sites constitute a significant loss of an essential component of the watershed's ecosystem. The original character and functioning ability of streams are changed through the simple mechanics of hydrology because the stream's ability to store and filter runoff has been changed.

Recharging the sub-surface aquifer with surface water has, in the past, been one of the major contributors to stream flows. With the advent of irrigation and development of reservoirs, water capture and use has greatly changed seasonal stream flow patterns over much of the Management Area. One consequence is that irrigated lands have created and developed shallow aquifers and provide perennial surface flows in streams that used to run dry late in the season. Flood irrigation in the mountain meadow areas also contributes to ground water recharge. For example, the system of dikes and levees maintained by ranchers mimic one aspect of what beavers did historically by storing and dispersing spring floodwaters.

Storms contribute large flows into Ontario's storm drain system. At times, runoff from agricultural areas can flow into drains that run under the city. At one time, these drains were strictly agricultural drains. The city grew over them and they were covered. All flows that enter these storm drains reach the Snake River untreated.

2.3.5 Basin TMDLs and Agricultural Load Allocations

The TMDL was finalized by DEQ in September 2010 and submitted to the Environmental Protection Agency (EPA) for approval. The TMDL focuses primarily on phosphorus, bacteria, and temperature and contains load allocations for these pollutants. The goal is to meet these load allocations, however, the LAC questions whether the 1) phosphorus target is achievable due to naturally occurring phosphorus in local volcanic-based soils, and 2) shade targets are based on sound science.

Agricultural Load Allocations

Total phosphorus in the Malheur River at Ontario must be reduced by 81-87 percent to meet standards in the Snake River, primarily through reduction in sediment in irrigation return flows. Cleaner return flows will also reduce bacteria levels.

The TMDL sets a goal of reducing bacteria in the Malheur River at Ontario by 83% during low flows and 34% during high flows. Bacteria at the mouths of Jacobson and Shepherd Gulch must be reduced by 89-99%. The load allocations are assigned to nonpoint sources of bacteria collectively including agriculture, wildlife, urban and residential land uses. Large bacteria contributions to the Lower Malheur River occur in Vale where Bully Creek and Willow Creek discharge to the Malheur River, along with significant contributions from irrigation return drains in the area. The bacteria load from Willow Creek actually exceeds the load capacity for the Malheur River in Ontario, and Bully Creek had a bacteria load approximately half the load capacity of the Malheur River.

The TMDL states that high water temperatures are to be moderated primarily through improvements in riparian vegetation. The goal of the TMDL is to reduce the amount of solar radiation that reaches the waterway to natural levels. The amount of "load" of solar radiation is measured by DEQ in langleys per day. For the non-scientist, these loads have been translated into 'percent effective shade' targets. The LAC questions whether the temperature and shade targets are achievable due to naturally occurring heat load and historic scarcity of tall riparian vegetation capable of shading streams (Clark and Keller, 1966).

The TMDL contains Percent Effective Shade Targets for the Management Area. **Landowners may use these targets as a guide to determine if they have sufficient riparian vegetation.** DEQ does not expect the potential target to be met at all locations due to natural vegetation disturbance.

Percent effective shade is the amount of shade that reaches the stream. For example, 70 percent effective shade means that topography (hillsides) and canopy cover have kept 70 percent of the sunshine on an August day from reaching the stream. DEQ developed these targets by evaluating the solar radiation load associated with native riparian communities that have not been altered by human activities.

DEQ modeled current and potential percent effective shade along 100 miles of the upper portions of the Malheur River and North Fork Malheur River. DEQ also created shade targets for 'non-modeled' stream reaches. The targets are presented in 25 'shade curves' based on expected native vegetation in different eco-regions.

Historic vegetation is not required along streams, although the shade and function provided by historic vegetation should be targeted. As a general guideline, landowners are encouraged to maintain the widest possible band or buffer of native vegetation along the stream. Streamside vegetation buffers also absorb fertilizer and manure runoff, reduce flood erosion, filter sediment, provide habitat for birds and other wildlife, and may help protect streams from pesticide drift.

TMDL Water Quality Management Plan

Excerpts from the *Malheur River Basin TMDL Water Quality Management Plan (WQMP), September 2010* are italicized below:

4.2 Condition Assessment and Problem Description

The Malheur River system is characterized by high levels of nutrients, which trigger algae blooms and depressed oxygen levels that are particularly acute downstream in the Snake River. The lower portion of the river and its tributaries also contain elevated levels of bacteria and the legacy pesticides, dieldrin and DDT. The upper portions of the Malheur River system do not meet water quality standards for temperature.

4.3 Goals and Objectives

The goal of this WQMP is to reduce nonpoint source pollution in the form of nutrient, bacteria, pesticide and solar heating to the Malheur River and its tributaries. This goal will be achieved through the implementation of best management practices in agricultural as well as urban areas, and the implementation of riparian vegetation restoration projects. With regard to riparian vegetation restoration, land managers should use the information in the TMDL and referenced documentation as a resource but defer to site-specific conditions when establishing site potential vegetation.

4.4 Proposed Management Strategies

DEQ recognizes that restoration efforts have been underway in the Malheur River Basin for many years. It is also widely recognized that much more work is needed, and that success depends on a united pro-active approach that involves all stakeholders in the basin. DEQ is reliant upon Designated Management Agencies for programs and projects that will address sources of non-point pollution. The following is a list of conditions that need to be addressed by TMDL implementation plans:

- *Healthy riparian vegetation.*

- *Stable and natural stream channels along with increases in sinuosity and functioning floodplains.*
- *Upland land management that will support the development of natural stream channels.*
- *Reductions in nutrient loading (particularly phosphorus) throughout the basin.*
- *Reductions in bacteria loading.*
- *Reductions in sediment loading, which will lead to reductions in bacteria, phosphorus, and toxics (legacy pesticides) loading.*
- *A less "flashy" hydrograph with a reduction in storm-induced runoff along with increased summer base flows above the major reservoirs, and winter base flows below the major reservoirs.*

<u>4.5 Timeline for Implementing Management Strategies</u>
DEQ recognizes that it may take from several years to several decades after full implementation of the TMDL before management practices identified in a TMDL implementation plan become fully effective in reducing and controlling forms of pollution such as heat loads from lack of riparian vegetation.

<u>4.9 Identification of Existing Sector-Specific Implementation Plans</u>
Providing information, education, technical assistance, and grant writing assistance to landowners is the primary strategy for ODA and the Soil and Water Conservation Districts to achieve water quality improvement in the Malheur River Basin. The Malheur County and Harney County SWCDs, acting as the Local Management Agencies, are the lead organizations responsible for implementing this strategy of education and assistance.

<u>4.11 Reasonable Assurance</u>
TMDL implementation plans are not required for irrigation districts within the Malheur River Basin as long as the districts agree to participate in the implementation of the Malheur River Basin [Area Plan].

An implementation plan for the Malheur River Basin TMDL is not required as long as the City of Ontario agrees to support the implementation of the TMDL while conducting activities, which have the potential to impact water quality.

TMDL implementation plans are not required… [from Harney and Malheur Counties] …at this time, as long as the counties agree to support implementation of the TMDL and the Malheur River and Harney [Area Plans].

<u>4.12 Monitoring and Evaluation</u>
It is anticipated that monitoring efforts will consist of some of the following types of activities:
- *Reports on the numbers, types and locations of projects, BMPs [Best Management Practices] and educational activities completed.*
- *Water quality monitoring for parameters such as temperature, sediment, nutrients, bacteria and pesticides.*
- *Monitoring of riparian condition, percent effective shade, channel type, and channel width/depth to assess progress toward achieving system potential targets established in the temperature TMDL.*

<u>5.1 Nutrient, Bacteria and Sediment Load Reduction Activities</u>
Best Management Practices for irrigated agriculture have been developed and implemented on a wide scale. In addition, irrigation systems have been improved by installing concrete-lined irrigation ditches, and piped water delivery systems. Wetlands and sediment ponds have been constructed to trap sediment and reduce nutrient and bacteria concentrations. As described in Section 4.0 of the TMDL document, these actions have resulted measurable reductions in sediment and bacteria concentrations. Reductions in nutrient concentrations have been difficult to document, but the work continues.

Examples of Best Management Practices for Flood Irrigated Lands are listed below (Shock, 2011):

- *Irrigation Schedule Optimization*
- *Sediment Basin and Tail Water Recovery (Pump-Back Systems)*
- *Polyacrylamide (PAM)*
- *Mechanical Straw Mulching*
- *Water Conservation Methods*
- *Filter Strips*
- *Gated Pipe*
- *Surge Irrigation*
- *Laser Leveling*
- *Turbulent Fountain Weed Screens*
- *Underground Outlets for Field Tail Water*
- *Nutrient Management*
- *Improved Confined Animal Feeding Operation (CAFO) Practices*[1]

It is unlikely that the 81-87% reduction in total phosphorus calculated for the Lower Malheur River can be practically achieved without very significant commitments of resources to BMP implementation throughout the basin over several decades. However, incremental progress toward the goal will likely have significant benefits to water quality for not only phosphorus but also sediment, pesticides, riparian condition, shade and stream habitat. The goal can be reassessed during 5-year review cycles and modified if deemed appropriate.

5.2 Temperature and Flow Related Mitigation Activities

Possible public and private land non-point source temperature TMDL implementation activities might include some of the following actions:

- *Development of alternative forage for livestock displaced by changes in management strategies for riparian recovery and/or fire recovery.*
- *Development of water reservoirs using reserved water rights.*
- *Integration of fuel management strategies with riparian vegetation restoration projects.*
- *In-stream flow restoration related to projects, which increase irrigation system efficiency.*
- *Aquifer storage projects, which allow the beneficial release of water in late irrigation season.*
- *Juniper management as a component of watershed restoration.*
- *Invasive Species Management.*
- *Feral Horse Management.*

2.3.6 Resource Conditions/Assessments

Native American Activities

Humans have influenced resource conditions in the basin for thousands of years. Prior to European settlement, ancestors of the Burns-Paiute people sustained themselves with local natural resources. They were called the Wadatika Band, one of several bands of Northern Paiute.

Archeological evidence indicates that native peoples lived primarily near Malheur and Harney lakes 10,000 years ago. They made seasonal migrations in search of food. Small family groups would travel separately. Throughout the year, the groups would hunt deer, elk, mountain sheep, small animals, and

[1] The LAC also recommends activities that improve efficiency of irrigation water delivery and on-farm distribution systems.

birds. In the spring, they would gather roots on the hillsides and meadows, and fish for salmon in the Middle Fork of the Malheur River.

The Wadatikas first encountered European fur trappers in the 1820s and Oregon Trail pioneers in the 1840s. Europeans began permanent settlements in the area by the early 1860s. The bands continued their migrations until the U.S. army broke the seasonal pattern.

By the 1840s, the Northern Paiute bands had acquired horses (Jerofke, 1999). Some reports by early explorers indicate that at least some Paiute bands, in what is now Nevada, had horses before the 1820s. Clearly, horses and other European goods were introduced into the surrounding area by the mid-to-late 1700s (Fowler and Liljeblad, 1986).

After many years and many disputes, the Burns Paiute Reservation was established. Today, individual Tribal members own more than 11,000 acres scattered in areas to the east of the reservation.

Soil Erosion

Historically, upland soils and drainage channels eroded in the basin due to some land use practices and natural causes such as catastrophic storms. Ephemeral drainages (those flowing only during spring runoff and intense summer storms) were deeply incised by gully erosion many years ago. Erosion caused by natural processes, such as flooding, and by concentrated uses still occurs.

Past and current land use management practices have reduced erosion and begun the healing process. Poor agricultural management, both past and present, contributes excessive topsoil and sediment to the Snake River system. However, improved tillage, irrigation, and harvest practices reduce sediment in Management Area waterways. Recent practices of laser leveling, straw mulching, polyacrylamide, filter strips, sediment ponds, and conversion to more efficient irrigation all help retain cropland topsoil, thus reducing and controlling water pollution.

Early livestock use of the Vale-Ontario-Nyssa valleys and surrounding bench lands degraded many range sites. The impacts of continuous livestock use in the 1890s to 1930s caused major shifts in the composition of rangeland vegetation. In addition, low precipitation range sites (9 to 10 inches or less) are very sensitive, and are slow to recover.

Riparian Areas

In upper reaches, Kentucky bluegrass and annual grasses have replaced many of the native sedges, rushes and grasses. Some native riparian areas have been overused by livestock and wildlife and are in poor condition. Many drainages have been invaded by juniper and sagebrush, in many cases due to lowering of the water table and fire suppression. Recent efforts are protecting valuable reaches of riparian habitats through activities such as improved grazing systems.

Road building has influenced streams in the basin. When roads were built next to streams, riparian vegetation was often removed, and these roads limit the ability to re-establish this vegetation. Reduction of streamside vegetation and road building near streams has caused some loss of proper hydrologic function.

Water diversions and irrigation return flows from agriculture have modified the lower reaches of many streams to accommodate agriculture. Dams and irrigation have altered the natural flow regime of the basin. This has several consequences, some of which are positive. For example reservoir storage means higher flows late in the year, and dams capture peak flows, which reduces the potential for stream bank erosion from spring run-off. With less scouring and higher late season flows, riparian vegetation will have a better chance to establish and develop, especially in the areas that have eroded, incised channels.

Healthy riparian vegetation benefits farmers and ranchers. Some benefits include increased forage production, reduced streambank erosion, increased late season flows, and stable stream channels.

Noxious Weeds

Noxious weeds are a threat to native ecosystems, competing with native vegetation and changing forage availability for wildlife and livestock. Noxious weeds degrade watershed conditions, often leading to increased runoff and erosion. Weed management is critical in riparian areas to protect water quality. Invasive plant species are also a serious threat to agriculture, impacting both livestock and croplands. Many private landowners are actively controlling or eliminating infestations on their own lands. However, control efforts on federal lands lag behind.

In Oregon, noxious weeds have been declared a menace to public welfare. Noxious weeds are present in large enough numbers to be a serious problem in many portions of the Management Area, growing along all segments of the Malheur River and its tributaries. They are also found along many roadsides because roads are a primary avenue for spreading weeds.

Higher elevations were relatively free of noxious weeds in the past. However, whitetop and knapweed are presently gaining a foothold in many areas. Yellow star thistle, skeleton weed and tamarisk pose new threats. Perennial pepperweed grows widely along the South and Middle Forks of the Malheur River, Scotch thistle poses a danger to the Middle and North Forks of the Malheur River, and Russian knapweed occurs on the North Fork Malheur River.

Along the middle portion of the Malheur River from Juntura to Harper, Scotch thistle and water hemlock are increasing and present real threats of further expansion. Whitetop has become established on many range sites from Juntura to Riverside.

Medusahead rye is commonly found in lower elevation clay soils and has infested many such sites along the South and Main forks of the Malheur River.

Bully Creek is contaminated by Russian knapweed along Indian Creek to Dahle Bridge (over 60 acres). Scotch thistle infests Bully Creek from its headwaters all the way to its mouth at Vale, including the edges of Bully Creek Reservoir. Whitetop also infests thousands of valuable acres of rangeland in this watershed.

Willow Creek is heavily infested with whitetop around Ironside. Scotch thistle grows along the county roads, and it is just starting to move off these roads and into the rangeland. Scotch thistle infests Willow Creek from Malheur Reservoir all the way downstream to Vale where it joins the Malheur River. Leafy spurge contaminates Willow Creek from Basin Creek to the diversion dam for the Brogan Ditch. Scotch thistle also infests the land around Pole Creek Reservoir.

The lower portion of the Malheur River is heavily infested with noxious weeds. Perennial pepper weed has taken over some riparian zones. Whitetop, Scotch thistle, Canada thistle, water hemlock, bull thistle, and some Russian knapweed compete with native vegetation. Scotch thistle infests most ditches and adjacent rangeland.

Land managers must use a variety of tools to prevent and control weed infestations in these areas. Some tools available include:

- Livestock grazing,
- Fire,
- Chemical,

- Mechanical, and
- Biological controls.

Juniper Expansion
Although western juniper is a native plant, wide expansion of juniper stands threaten the integrity of plant and animal communities and late summer stream flows throughout eastern Oregon. Juniper was naturally restricted to rocky ridges and cliffs where there was little grass to fuel fires, and thus they were protected from fire. Recent efforts to suppress fires have allowed juniper stands to expand and replace more diversified plant and animal communities. Juniper populations are high in parts of the northern and western uplands of the Management Area. Age-class studies conducted elsewhere confirm that most junipers are recent invaders into the landscape.

The more diverse plant communities replaced by juniper support more wildlife and help to provide cleaner, cooler water for streams and forage for livestock. Juniper domination leaves the soil more exposed to rapid runoff and erosion. Juniper may use enough water during the summer to reduce aquifer recharge, an indispensable factor in maintaining late season stream flows. Increased late season flows would help improve water quality.

Only a minority of the land area at the upper elevations in the Management Area may have the potential for storing late winter and early spring precipitation in shallow aquifers. These aquifers slowly release water to upland stream throughout the year, including critical periods in late summer. These same upland areas are being progressively invaded by juniper. OSU Extension in Central Oregon is researching the role of juniper in reducing the capacity of rangelands to store water. Management that emphasizes fire suppression leads to greater juniper invasion and potentially less aquifer recharge. In the Management Area, some areas critical for recharge are already infested with juniper, and adjacent areas are full of small trees that could be poised to emerge as major users of deep soil water. Oregon's commitment to water quality will need to encompass effective juniper control.

Private Forest Lands
Forests are located in the northwest corner of the basin. Prior to fire suppression, open ponderosa pine stands dominated. Presently, understory conifers and shrubs crowd the forests. Unnaturally dense stands of trees prevent snowdrift and the deep recharge of aquifers. More frequent fires would reduce this crowding. Thinning is an economically viable option when fire cannot be implemented.

Livestock
Gold rushes, mining in southwestern Idaho, and immigration along the Oregon Trail brought settlers into the region. Horses were needed for transportation, and cattle and sheep were needed for food. Locally, heavy stocking of domestic livestock probably began with the discovery of gold in 1863. By 1875, cattle, sheep, and horses occupied the grazing land of the basin. Cattle herds expanded in the latter decades of the 1800s as the railroads were extended. By the turn of the century, rangeland deterioration was severe adjacent to areas of settlement at Vale, Harper, Westfall, Brogan, and other settlements along the Malheur River. Land adjacent to these settlements was often grazed year-round including the spring growing season. In addition, historical trailing routes to shipping points at Burns, Riverside, Juntura, Harper, and Vale were used heavily by large numbers of animals.

Higher elevation rangelands were only available for summer use and then only where adequate water was available. Because of the additional livestock management required to use these areas, the intensity of livestock use and resulting impacts were often less than in areas closer to settlements. Many areas remained unavailable to livestock due to lack of water or limited accessibility.

The impacts of livestock grazing from the 1860s through the 1940s were concentrated at low elevations where temperatures were hottest, rainfall the lowest, and the dry season the longest. In these areas, native vegetation communities were replaced with introduced annuals and weedy species. Today, these areas continue to have the greatest need for reestablishment of perennial vegetation.

An account of a trip in 1901 from Winnemucca, Nevada to Ontario, Oregon written by Dr. David Griffiths gives some perspective of what range conditions were and how much progress has been made since this time. He noted that sheepherders and some cattlemen ran large numbers of animals in the area and that management consisted of competition to get to the best grass first. According to Griffiths, quarrels over pasturage were common, and when feed was short, some areas were grazed more than once per season. During this era, large numbers of livestock were in the area. Griffiths estimated that more than 180,000 sheep were in the Steens Mountain area alone, in addition to cattle. Needless to say, feed was short.

Numerous range improvements to enhance livestock distribution patterns have taken place since the 1930s and continue today. The authorization of the Taylor Grazing Act in 1934 spurred many of these changes. Under this Act, the Secretary of the Interior was to create and enforce rules for using the public lands with the following goal: "to preserve the land and its resources from destruction or unnecessary injury, to provide for the orderly use, improvement, and development of the range."

A special appropriations bill passed in 1962 funded the Vale Project, a countywide program of land treatments to rehabilitate rangeland resources. Through the end of the Vale Project in 1973, brush control treatments covered 506,570 acres and seedings were implemented on 267,193 acres. Additionally, 1,994 miles of fence were built, 583 small water-retention reservoirs built, 440 springs developed, 28 wells drilled, 463 miles of pipeline laid (including 537 troughs), and 360 cattle guards installed.

Vegetation treatment projects in Malheur County between 1999 and passage of the 1978 Public Rangelands Improvement Act controlled brush on 678,976 acres. Seedlings were established on 393,424 acres. Most of these numbers account for what occurred on federal land. The improvements on private land have been extensive, but accurate records are not available.

2.4 Prevention and Control Measures

This Area Plan provides farmers, ranchers, and other agricultural land users in the Management Area a tool to achieve the following conditions on the land they occupy and manage:

1. Minimize delivery of sediment, nutrients, and bacteria to streams.
2. Minimize delivery of nitrates and pesticides to groundwater.
3. Sediment in irrigation return flows within acceptable levels.
4. Stream bank erosion within acceptable levels.
5. Adequate riparian vegetation for bank stability and stream shading consistent with vegetative site capability.
6. Sufficient vegetation on rangelands and pastures to filter sediment, utilize nutrients, control soil erosion, optimize infiltration of water into the soil profile, and minimize the rate and maximize the duration of runoff from precipitation.

Voluntary efforts are the focus of the ODA, Malheur County SWCD and Local Advisory Committee. However, a landowner may refuse to take advantage of voluntary compliance opportunities. In this case, the ODA has enforcement authority to ensure pollution control. According to the Management Area Regulations (OAR 603-095-0940), “A landowner shall be responsible for only those conditions caused by agricultural activities conducted on land controlled by the landowner. A landowner is not responsible for prohibited conditions resulting from actions by another landowner. Conditions resulting from unusual weather events (equaling or exceeding a 25-year storm event) or other exceptional circumstances are not the responsibility of the landowner. Limited duration activities may be exempted from these conditions subject to prior approval by the department."

#1 - Pollution Control and Waste Management

Agricultural activities can affect surface water nutrient concentrations in many ways. Improper application of fertilizer can contaminate shallow groundwater, which in turn can pollute domestic wells and surface water. Surface water can be polluted directly by irrigation return flows carrying high levels of nutrients or bacteria. Improper management of accumulated manure can contribute bacteria and nutrients to surface water.

Objective: Reduce waste discharge to the maximum extent practicable.

Performance Criteria

1. Runoff is diverted away from accumulated waste or areas of high animal usage.
2. Accumulated manure is placed on low-permeability surfaces, such as concrete, clays, or compacted silts where water does not pond.
3. Animals are confined where there is little chance of transporting pollutants to waters of the state.
4. Crop nutrients are applied at agronomic rates.
5. Irrigation water is cleaned or captured before it enters streams.

Prohibited Condition (OAR 603-095-0940(2)

Effective upon adoption: No person subject to these rules shall violate any provision of ORS 468B.025 or ORS 468B.050.

#2 – Sediment in Irrigation Return Flows

Sediment is defined as soil particles, both mineral and organic, that are in suspension, are being transported, or have been moved from the site of origin by flowing water or gravity.

Excessive levels of sediment in tailwater discharges can harm aquatic life and can carry nutrients, particularly phosphorus, into streams and rivers.

The LAC and ODA worked hard to develop a reasonable approach to controlling sediment levels in irrigation return flows. This is a particular concern in the Management Area because of the existing primarily furrow irrigation system.

Objective: Control irrigation surface water return flows so they minimize adverse water quality impact on the stream into which they flow.

Performance Criterion

Sediment is captured from irrigation runoff before it enters rivers and streams.

Prohibited Condition (OAR 603-095-0940(3)

(a) After January 1, 2006, irrigation surface water return flow to waters of the state shall not cause an excessive, systematic, or persistent increase in sediment levels already present in the receiving waters, except where the return flows do not cause the receiving waters to exceed established sediment standards.
(b) A landowner conducting irrigation activities in accordance with a plan approved in writing by the department or its designee shall be deemed to be in compliance with this rule.

#3 - Riparian Area Management
Vegetation, both in the uplands and in the riparian area, plays a critical role in water quality. Generally, healthy plant communities:

- Hold soil in place,
- Protect streambanks,
- Capture, store and safely release precipitation,
- Filter nutrients from both the groundwater and surface runoff, and
- Provide shade to moderate water temperatures.

Stable streambanks reduce sedimentation and nutrient inputs into streams. They help moderate water temperatures because average water depth is greater, and banks in good condition provide cover and resting places for fish as well.

In addition to the water quality benefits, healthy terrestrial vegetation contributes to improved fish habitat. Riparian vegetation protects spawning, rearing and holding areas by trapping sediment that could smother eggs and by improving the recruitment of large woody debris. This debris helps to create pools for fish to rest in, provides hiding cover and habitat diversity. Vegetation provides organic debris to feed aquatic insects, which are an essential element in the diets of many fish.

Riparian vegetation, consistent with site capability, is a cost-effective means of reducing stream bank erosion and heating from solar radiation. Research and practical examples have shown that land managers can maintain riparian health and conduct agricultural activities as well.

<u>Objectives:</u> Riparian vegetation provides 1) sufficient root mass for stream bank stability and 2) shading to reduce the solar heating rate of surface water. Riparian systems withstand a 25-year event.

<u>Performance Criteria</u>
An effort to systematically assess current conditions and determine vegetative site capability in the planning area will be done at a future date.

Technical criteria to determine attainment of this condition include but are not limited to:

1. Ongoing natural recruitment of riparian vegetation is evident.
2. Management activities minimize the degradation of established native vegetation.
3. Management activities maintain at least 50% of each year's growth of woody vegetation - both trees and shrubs.
4. Management activities maintain streambank integrity through 25-year flood events.

Prohibited Conditions (OAR 603-095-0940(4) and (5)

(4)(a) By January 1, 2006, no person may cause active streambank erosion beyond the level that would be anticipated from natural disturbances given existing hydrologic characteristics.
(5)(a) By January 1, 2006, no conditions are allowed that prevent the establishment and development of adequate riparian vegetation consistent with vegetative site capability to control water pollution by providing control of erosion, filtering of sediments, moderation of solar heating and infiltration of water into the soil profile.

#4 - Rangeland and Pasture Management
Desirable upland native vegetation functions as a water trap and filter, where rain and snowmelt is captured and incorporated into the sub-surface soil layers. Any decline in range condition, as measured by the NRCS's site guides, affects water infiltration rates into the sub-soil where surface runoff may supersede infiltration. Reducing infiltration rates lead to damaging floods, erosion and lower late season flows. Although riparian areas are vital to water quality, they comprise only a small

percentage of the landscape. It is important for water quality purposes to maintain and improve the condition of all vegetation in the watershed.

Objective: Protect and improve range conditions.

Performance Criteria

1. Plant community is dominated neither by invasive annual plant species nor by overgrowth of native woody species.
2. Plant cover (plants plus plant litter) is adequate to protect site.
3. Distribution and amount of bare ground does not exceed what is expected for site.
4. Livestock utilization patterns do not exhibit excessive sustained use in key areas.
5. Plant vigor levels and regeneration are sufficient to protect long term site integrity.

Prohibited Condition (OAR 603-095-0940(6)

(a) By January 1, 2006, vegetative condition on rangelands and pasturelands shall be managed such that the functionality of the watershed is not impaired. Watershed function includes the ability of vegetation to filter sediment, utilize nutrients, control soil erosion, optimize infiltration of water to the soil profile, and minimize the rate and maximize the duration of runoff from precipitation.

(b) A landowner conducting range and pasture management activities in accordance with a plan approved in writing by the department or its designee shall be deemed to be in compliance with this rule.

The following regulations provide for resolution of complaints.

Complaints and Investigations (OAR 603-095-1160)

(1) When the department (ODA) receives notice of an apparent 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 603-095-1160(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 603-095-1160(4), "person" does not include any local, state or federal agency.

(6) Notwithstanding OAR 603-095-1160, 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: Goals, Objectives, and Strategies

3.1 Area Plan Goal

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

The primary methods to protect water quality in the Management Area are:

- Keep soil in place on both crop and rangelands
- Keep streambanks vegetated

Landowners are expected to achieve the following conditions on the land they occupy and manage:

1. Minimize delivery of sediment, nutrients, and bacteria to streams.
2. Minimize delivery of nitrates and pesticides to groundwater.
3. Sediment in irrigation return flows within acceptable levels.
4. Stream bank erosion within acceptable levels.
5. Adequate riparian vegetation for bank stability and stream shading consistent with vegetative site capability.
6. Sufficient vegetation on rangelands and pastures to filter sediment, utilize nutrients, control soil erosion, optimize infiltration of water into the soil profile, and minimize the rate and maximize the duration of runoff from precipitation.

While emphasizing commodity production, partners must ensure that surface water and groundwater influenced by agricultural activities comply with or are making measurable progress toward achieving water quality standards.

Progress towards the goal depends on increased public support to landowners to implement projects and to the agencies and other entities that support these efforts.

Farmers, ranchers, and other agricultural land users have made much progress towards meeting these conditions, and they must continue to adapt their management techniques so that they can control the conditions on their property.

3.2 Measurable Objectives

To measure progress, ODA, in consultation with the LAC, DEQ, and the Malheur County SWCD will identify timelines and interim benchmarks for agriculture to strive for over designated time periods and at a scale suitable for measuring progress. The benchmarks will be documented in the Area Plan and reported in the biennial reports prepared for the Board of Agriculture. ODA will consult with DEQ on the adequacy of the Area Plan in making significant progress toward meeting the pollutant reduction targets set in the TMDLs.

Preliminary measurable objectives have been identified for the Focus Areas (see section 3.3); these objectives will be refined over time. Measurable Objectives for the Management Area will be determined in the future.

3.3 Focused Work

There are two Focus Areas and one Special Emphasis Area in this Management Area. The Focus Areas are in the 'baseline water quality data' collection and analysis process.

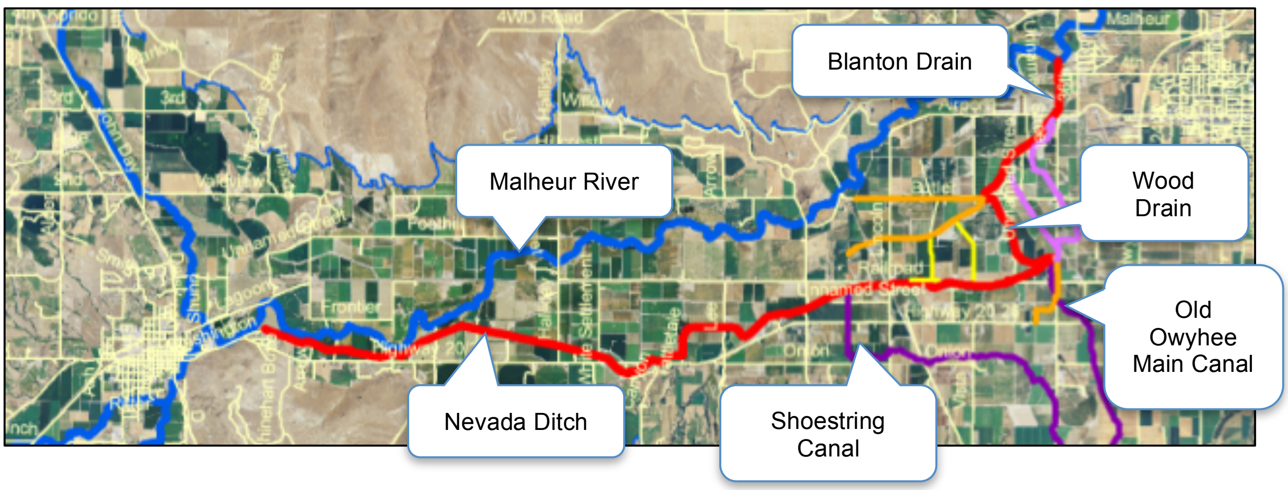
3.3.1 Nevada-Blanton Focus Area (Malheur County SWCD)

This Focus Area consists of approximately 6,000 acres between the Malheur River, Nevada Ditch, and Blanton Drain. The Blanton Drain contributes high amounts of phosphorus and sediment to the Malheur River, second only to Willow Creek.

The Blanton Drain receives water from multiple sources:

- Nevada Ditch, which diverts 1/3 to 1/2 of the flow of the Malheur River just downstream of Vale
- Wood Drain, which connects the Nevada Ditch to the Blanton Drain
- Two major branches of the Blanton Drain (Main Blanton and the Harris)
- Three discrete discharges from the Owyhee Irrigation District that contribute to the Nevada Ditch, the largest being the Shoestring Canal.
- Old Owyhee Main Canal that discharges into the Nevada Ditch at its end
- Field runoff from WID, Owyhee, and from Old Owyhee Irrigation Districts

The 50,000-acre Blanton drainshed includes a large portion of the Old Owyhee and Owyhee Irrigation Districts that drains to the Shoestring Drain and the Old Owyhee Main Canal.



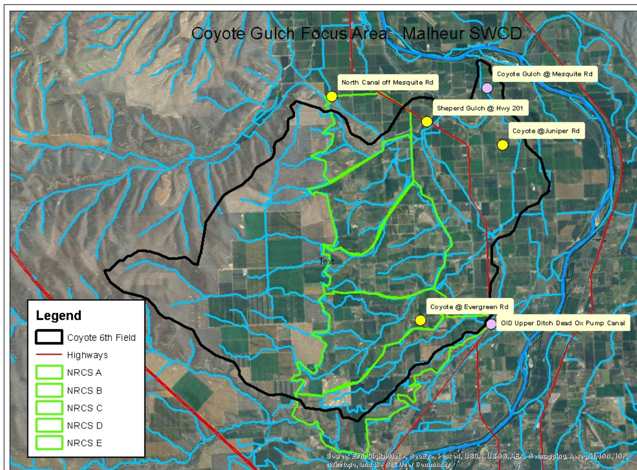
Due to the extreme complexity of the irrigation system, current attempts consist only of monitoring water quality of the Nevada Ditch, Blanton Drain (and contributors to both) to better understand the dynamics of the system in this Focus Area. These data are currently being analyzed by the SWCD and ODA.

The goal is to reduce sediment and phosphorus inputs into the Malheur River from the Blanton Drain by 50 percent by an as-yet-undetermined date.

3.3.2 Coyote Gulch Focus Area (Malheur County SWCD)

The Coyote Gulch Watershed (HUC 170501150203) consists of 15,300 acres draining to the Snake River, primarily via Shepherd and Coyote gulches. Water quality has been monitored at the locations shown on the map below.

The portion between the Owyhee Irrigation District Main Canal and Highway 201 makes up the NRCS Hyline Bench Conservation Implementation Strategy Area (CIS). This area will be addressed in five phases, starting in the south. Each of the five areas drains to a specific lateral. Laterals will be piped and landowners will improve irrigation water management to minimize runoff and use irrigation water most efficiently. The northern areas drain to Shepherd Gulch. Water quality monitoring locations will be adjusted to correspond to the phases. The SWCD plans to continue to do work throughout the Focus Area after the NRCS CIS Area is completed. It is hoped that work in the entire Focus Area will be completed in about 12 years.



All irrigated acreage is assessed as indicated in Tables 3 and 4.

Table 3. Sediment: Categories for assessing likelihood of contributing sediment to irrigation runoff.			
	Visible signs of field irrigation-induced erosion	**Irrigation water leaving the control of the landowner and/or entering commingled water**	**Notes**
Class 1	None or minimal	None	
Class 2	Yes	Clear or none	
	None	Dirty	Water entering field from neighbor
Class 3	Yes	Dirty	

Table 4. Livestock manure: Categories for assessing likelihood of contributing bacteria to irrigation runoff.			
	Vegetated buffer zone	**Timing of grazing in relation to wet periods (rain and irrigation)**	**Bare areas in pasture within 50 feet of waterbody**
Class 1	Yes	Timed to avoid runoff of potential pollutants	No
Class 2	Yes	Shortly before wet periods, resulting in potential runoff	No
Class 3	No	During wet periods resulting in runoff	Yes

A primary question for the Coyote Gulch Focus Area is: how much will pollution at the mouth of Coyote Gulch be reduced after all Class 3 acreage improves to Class 2?

By June 30, 2018, the goals are to accomplish the following in the first two phases of the NRCS CIS:
1. Move all Class 3 acreage to Class 2.
2. Reduce nitrogen, sediment, orthophosphorus, and total phosphorus loads by at least 20%.
3. Reduce *E. coli* concentration below 406 colonies/100 mL.

3.3.3 Willow Creek Special Emphasis Area (Malheur Watershed Council)

The Willow Creek Working Group, Malheur Watershed Council, irrigators, city of Vale, Warm Springs, Owyhee, and Orchard Irrigation Districts, and many other partners have been working on water quality improvement projects in the Willow Creek watershed for over a decade. Landowners in the watershed have been very open to completing a variety of projects, including irrigation system efficiency upgrades, pump back systems, polyacrylamide applications for erosion control, manure management, no-till and strip-till cropping systems, rotational grazing, streamside fencing, off-stream watering, and other projects that improve water quality. Funding agencies have invested several million dollars in improvements in the watershed, and additional "shovel-ready" projects exist if more funding becomes available. They are in the process of working with NRCS, DEQ, and other conservation partners on a comprehensive 'post-implementation' assessment. Those results will be available by the next biennial review.

3.4 Strategies for Area Plan Implementation

Conservation partners plan to achieve the Area Plan goal by:

> Encouraging voluntary compliance by agricultural producers with federal and state requirements through educational programs, conservation planning, technical assistance, and financial assistance.

The strategy relies on existing and expanded programs, while focusing on proactive planning for conditions that are the most significant controllable sources of nutrients, sediment, bacteria, and other sources of pollution.

Education and conservation planning are the heart of the implementation strategy. However, if a situation occurs where a landowner's management is causing a water quality problem and all attempts at encouraging voluntary correction fail, the ODA also has enforcement authority to ensure correction of the problem.

3.4.1 Education

The Malheur County SWCD coordinates education efforts, and works with partner agencies such as the ODA, NRCS, OSU Extension Service, Malheur Experiment Station and Malheur Watershed Council to carry out the education strategies outlined in this plan. The focus of the educational effort is:

- Describing historical changes in land management practices,
- Conservation planning,
- Prevention, restoration, and enhancement using Effective Management Practices,
- Proper management of small acreages,
- Programs and project funds available for conservation efforts,
- Riparian areas – issues and considerations, and
- Water quality conditions.

Tasks:

1. Conduct education programs to promote awareness of water quality issues and their solutions.
    a. Conduct workshops on water quality issues and the conservation practices that will help improve water quality.
    b. Develop demonstration projects to showcase successful conservation practices and systems.
    c. Organize tours of demonstration projects for agricultural managers and producers.
    d. Produce and distribute brochures about water quality issues.
    e. Encourage agricultural operators to share their Effective Management Practices with others by speaking at meetings and participating in tours.

2. Develop an ongoing media program to inform Management Area public and agricultural operators of conservation issues and events.
    a. Submit news articles and public service announcements to area newspapers, radio stations, and newsletters. In particular, target the agricultural programs on the radio.
    b. Invite media to conservation tours and workshops.

3. Build partnerships with agribusiness to promote conservation.
    a. Co-sponsor workshops and tours.
    b. Share education materials with agribusiness field representatives.

3.4.2 Conservation Practices and Technical Assistance

While the success of the plan depends on the cooperation of agencies and volunteer organizations, only individual producers can adopt conservation measures to improve water quality. Many producers are already preventing and controlling water pollution. However, more people need to adopt better management strategies. The LAC has chosen to call these strategies Effective Management Practices. Our definition is:

- Effective and practicable means of preventing or reducing the amount of pollution to a level compatible with watershed plan goals. Effective Management Practices may include structural and nonstructural practices, conservation practices, and operation and maintenance procedures.

- Actions taken by each individual agricultural operation to achieve production and water quality goals. Landowners are encouraged to develop and implement conservation plans.

Landowners have flexibility in choosing management approaches and practices to address water quality issues on their lands. Landowners may choose to develop management systems to address problems on their own, or they may choose to develop Conservation Plan.

A Conservation Plan is a comprehensive land management plan formulated by the farm operator and used for making decisions about applying Effective Management Practices to conserve soil, water, plant, and animal resources on all or part of a farm. The Conservation Plan addresses site-specific problems through the selection of individual Effective Management Practices or Effective Management Systems to be implemented for the protection of natural resources.

Conservation Plans may be drawn up by landowners or operators, consultants, or technicians available through the SWCD, NRCS or other conservation partners. A Conservation Plan does not guarantee compliance with the Area Rules, unless it is submitted to ODA and approved as containing sufficient specific measures to prevent and control the prohibited conditions described in the Area Rules.

Tasks:
1. Foster the development of new Effective Management Practices
    a. Continue developing innovations in drip and other types of irrigation.
    b. Determine the effects on stream flows and on grazing of the conversion from sage and juniper dominated communities to communities dominated by herbaceous plants.
    c. Determine site capabilities of riparian areas to support water quality.
        i. Determine and map riparian site capability.
        ii. Publicize better understanding of southeastern Oregon ecosystems and their site capabilities to the general public and to the agricultural community in particular.
    d. Determine the season and intensity of grazing in riparian zones compatible with the maintenance and vigorous recovery of riparian vegetation and stream functions.
    e. Determine which combination of treatments is needed to achieve effective weed control on public and private land to protect agriculture and water quality.
        i. Continue existing educational programs promoting weed identification and control.
        ii. Determine what forage species could be combined with biological and/or herbicide control measures to compete with noxious weeds.

        iii. Apply for grant money to supplement private landowner weed control efforts.
    f. Examine how to manage constructed wetlands placed within surface drainage ditches and at the ditch outlets to prevent and control sediment and nutrient inputs into rivers and creeks.

3.4.3 Financial Assistance

Conservation partners, including landowners, need adequate funding for administration and implementation of the program.

Tasks:

1. Ensure adequate administration of the Area Plan.
    a. Malheur County SWCD includes Area Plan implementation in its annual and long-range work plans.
    b. Find funding to implement projects.
        i. Obtain funding for implementation of Effective Management Practices, research into developing new Effective Management Practices, conservation planning assistance, conservation education, and water quality monitoring.
        ii. Submit grant applications to USDA, EPA, DEQ, ODA, and other funding sources for demonstration and conservation projects.
        iii. Submit progress reports to grant sources.
        iv. Form partnerships with the agribusiness sector for additional funding.
        v. Promote USDA incentive-based cost-share programs to assist producers with conservation plan implementation.

3.4.4 Monitoring

The Malheur County SWCD will coordinate monitoring efforts with conservation partners that determine status and improvements in:

- Water quality of drains to area rivers,
- Riparian conditions, and
- Nutrient, animal waste, and irrigation management.

The Malheur County SWCD, Malheur Watershed Council, Oregon State University, NRCS, ODA, and conservation partners will work together on the following tasks to support landowner efforts:

Tasks:

1. Evaluate changes in land and water quality conditions.
    a. Inventory and assess baseline watershed conditions and sources of pollution in the Management Area.
    b. Establish a plan of monitoring streams and surface water areas that accurately reflects current water quality conditions.
    c. Access and evaluate all monitoring data acquired by the local watershed council or other agencies.
    d. Inform landowners of monitoring results.
2. Determine number of producers implementing Effective Management Practices.
    a. Document the number of plans written and the acreage involved and the types of practices implemented.
3. ODA monitors prohibited conditions in the Management Area.
    a. Document the number of complaints.
    b. Inventory key areas in the watershed for prohibited conditions.

Chapter 4: Implementation, Monitoring, and Adaptive Management

4.1 Implementation and Accomplishments

The goal of this Area Plan is to improve water quality by reducing sediment, nutrient, and bacteria and improving riparian vegetation. As DEQ indicates in their TMDL, improvements in water quality may take years to document.

Cooperative actions:
The various agencies working in the Malheur Watershed cooperate with ranchers on initiatives to control juniper and invasive weeds and provide noxious weed identification and weed control education.

Malheur County has the most active irrigation education program in Oregon with many research studies, field demonstrations, field days, workshops, and new publications for growers and ranchers.

Table 5. Malheur County SWCD accomplishments: 2013-2014.

Condition Addressed	Monitoring	Outreach/Education	Implementation
Irrigation-induced erosion	Added Coyote Gulch as a Focus Area Continued sediment and nutrient monitoring in the lower watershed	Coyote Gulch: four meetings with NRCS, OID, and a total of 40 landowners to discuss monitoring information and need for projects Shared water quality data with 4 irrigation districts. Two landowner meetings on Vale Bench for Laterals 230 and 227 projects (30 landowners total) in conjunction with NRCS, MWC, and VOID No-till drill tour (6 attendees)	4 projects completed totaling 3.5 miles of installed pipeline, 1pumpback system, 2 pivots, 2 k-lines.
Riparian conditions in the upper watershed	None yet. Focusing on irrigation-induced erosion.	Not yet.	Implementing 3 projects that will stabilize one mile of streambank.
Bacteria/nutrients from livestock	Continued monitoring in the lower watershed	Not yet.	

In addition, the Harney County SWCD accomplished the following in the upper portion of the Management Area in 2013 and 2014.

- Cottonwood Project: Cut and excavator piled 354 acres of juniper-developed one spring w/exclosure fence and installed a 1,500-gallon water trough.
- Otis Project: Cut 420 acres of juniper in preparation for BLM broadcast burn and cut and excavator piled 67 acres of juniper.
- Blue Bucket Project: Cut 111 acres of juniper-developed a spring w/1,500 gallon water trough, installed solar pump with two 700-gallon water troughs, built 12,900 feet of fence.
- Van Project: Constructed 34,807 feet of riparian fence, developed one spring with 1,500 gallon water trough, 24 acres protection fence for aspen and spring, cut conifers from 101 acres, cut and excavator piled 61 acres, cut and lopped 88 acres, and cut and hand piled 22 acres of juniper.

The Malheur Watershed Council did the following projects and activities:

- Converted 468 acres from flood irrigation to sprinkler.
- Dismantled and moved a 300-head feed lot ½ mile away from Rose Creek.

- Piped 115,825 feet of open ditches and mainlines.
- Built 10,384 feet of fence to exclude livestock from riparian areas.
- Installed 5,640 feet of water pipe for off-stream troughs, 5 new troughs and 1 storage tank.

4.2 Monitoring—Status and Trends

In the next two years, the SWCD will continue to focus water quality efforts on reducing irrigation-induced erosion in the lower Malheur River watershed, primarily Coyote Gulch, Nevada-Blanton drainshed, and Vale Bench. The SWCD will also continue the Snake River Agricultural Drains monitoring project.

4.2.1 Water Quality

Staff from the Malheur Watershed Council, Malheur Co SWCD, DEQ, and ODA have worked for the last two years to gather all flow and water quality data collected in the Management Area. The result is almost 11,000 samples collected from over 150 locations since 1960. These data are in the process of being analyzed to determine:

- Long-term water quality trends
- Priority areas for on-the-ground projects
- Background levels of nutrients and sediment
- Data gaps
- Future monitoring activities

These data will be evaluated and presented to the LAC at their 2017 biennial review.

The current groundwater-monitoring program should be continued.

With this knowledge, the LAC, the SWCD, and ODA will refine and improve this plan in the future, including the addition of Measurable Objectives at the next biennial review. Landowners need the means to determine where the problems are and what they can do to correct them. This is part of our adaptive management strategy.

4.2.2 Land Conditions

Both upland and streamside conditions were identified by the LAC as contributing to water quality. ODA has a protocol for mapping current vegetative cover along streams. There are no plans to map or assess upland conditions.

Table 7. Malheur Watershed Council activities funded by OWEB in the Willow Creek watershed.

Activity	Total number
Acres converted from flood to sprinkler	2,000
Miles of laterals piped	56
Miles of mainlines & delivery systems piped	17.86
Miles of drains and canals piped	4.97
Number of pumpback systems	15 (serving 1,175 acres)
Number of off stream water troughs installed	20
Miles of pipe for troughs	1.93
Miles of cross-fencing	3.85
Miles of riparian & wetland protection fencing	15.26
Riparian Plantings	4,000
Number of wetland filter ponds	3
Acres of improved rangeland	755
Acres served by piped laterals	6,500
Riparian feedlots relocated	1 (300 head capacity)

4.2.3 Focus Areas

The two focus areas are in the first stages of data collection and analysis. Results will be used to incorporate measureable objectives in the 2017 update of this Area Plan.

The Malheur Watershed Council has compiled Table 7. Additional work has been done with other funding. Overall, 38 percent of the irrigated acres have been converted to sprinklers. Activities will be compared to water quality improvements at the next biennial review.

4.3 Progress Toward Measurable Objectives

Progress will be reported starting with the 2017 biennial review.

4.4 Aerial Photo Monitoring of Streamside Vegetation

Aerial photographs from 2007 and 2012 were analyzed for seven stream reaches per the methodology presented in Section 1.8.1. The higher the score, the more trees and shrubs compared to grass and bare ground. The length of each reach varied from about three to four miles.

Table 8. Riparian index scores from analysis of aerial photographs, 2007 and 2012.

Stream	Scores		Comments About Analyzed Reach
	2007	2012	
Crane Creek	31.0	31.2	Some large diversions; part of reach flows through a corral with bare soil; channel braiding near mouth.
Gum Creek	43.6	42.9	Sinuous channel, middle reach is dry. Lower 15% has eroding banks, partly incised.
North Clover Creek	34.8	34.9	Mostly very stable, but lower 10% is ditched and eroding.
South Fork Malheur River	30.6	30.8	Mostly stable, but lower reach has four diversions that divert large amounts of flow.
Stinkingwater Creek	30.8	31.2	Channel is stable, but water is green as though too much algae or other aquatic vegetation is present.
Swamp Creek	40.2	40.0	Lower 10% has large point bars that are becoming vegetated, indicating past erosion problems. Upper portion is relatively stable. Few small diversions.
Wolf Creek	33.4	33.6	Sinuous channel with some cut-off meanders. Historic channels visible are even more sinuous. One large diversion. Channel in very good condition.

Riparian index scores in 2007 ranged from a low for the South Fork Malheur River to a high for Gum Creek. Tree cover never exceeded 4 percent in any bands. Bare ground was greatest in one band of Crane Creek (16 percent), though one band in the South Fork Malheur had 10 percent bare ground. Bare/agriculture was also highest in one band of the South Fork Malheur. About half the streams were dominated by grass/agriculture, while the other half were dominantly shrub/agriculture.

The 2012 data showed no significant changes (generally, ODA considers a 5 percent change as significant). Gum Creek had a decrease in bare cover, resulting in an increase in grass/agriculture, but it also had a decrease in shrub cover, leading to a 2 percent decline.

4.5 Biennial Reviews and Adaptive Management

The February 20, 2015, biennial review consisted mostly of a discussion of ODA's proposed changes to the Area Plan, especially the addition of TMDL load allocations, which the LAC believes are not based on sound science. Some LAC members encouraged assessments to establish current landscape conditions.

There has been one compliance investigation in the Management Area in the last two years. A landowner removed large trees along a mile of an intermittent stream to allow a center pivot to cross. He also graded the channel to turn it into a grassed waterway. ODA responded with a Notice of Noncompliance and a Plan of Correction that required him to recreate a channel capable of carrying winter flows and to replant the banks with shrubs and grasses.

REFERENCES

Anon. 1981. Malheur County Nonpoint Source Water Quality Management Planning Program Final Report. Malheur County Citizen's Water Resources Committee, Malheur County Planning Office, Vale, Oregon. 151 p. Plus appendices.

Anon. 1991. Northern Malheur County Groundwater Management Action Plan. Malheur County Groundwater Management Committee, Oregon Department of Environmental Quality, Salem, Oregon. 60 p. Plus appendices.

Anon. 2010. Malheur River Basin TMDL: September 2010. Oregon Department of Environmental Quality.

Census of Agriculture. www.agcensus.usda.gov

Clark, K. and L. Keller. 1966. Terrible trail, the Meek Cutoff 1845. Maverick Publications. Bend, Oregon.

Fowler, C.S. and S. Lijeblad. 1986. Northern Paiute. In Great Basin, ed. Warren L. d'Azevedo, pp. 435-65. Handbook of North American Indians, vol. 11. William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Jerofke, L. 1999. Paiute Wadatika. The history and cultural background of the Burns Paiute Tribe. (Personal Communication)

Kelly M. Foley, K.M. 2013. Examining the Voluntary Adoption of Agricultural Conservation Practices in Northern Malheur County, Oregon. Thesis for Master of Science in Water Resources Policy and Management, Oregon State University.

Oregon Agricultural Information Network. http://oain.oregonstate.edu

Richerson, P.M. 2014. Fourth Northern Malheur County Groundwater Management Area Nitrate Trend Analysis Report. Oregon Department of Environmental Quality.

Shock, C.C., E.B.G. Feibert, L.B. Jensen, R.L. Jones, G.W. Capps and E. Gheen. 2001. Changes toward sustainability in the Malheur-Owyhee watershed. In W.A. Payne, D.R. Keeney, and S. Rao (eds). Sustainability in Agricultural Systems in Transition Proceedings, ASA Special Publication. American Society of Agronomy, Madison, WI. pp. 97-106.

Shock, C.C. 2011. Malheur County Best Management Practices. Malheur Experiment Station, Oregon State University. http://cropinfo.net/BestPractices/

Shock, C.C. and C.B. Shock. 2012. Research, extension, and good farming practices improve water quality and productivity. Journal of Integrative Agriculture 11(1):14-30.