OREGON DEPARTMENT OF AGRICULTURE

Powder-Brownlee Agricultural Water Quality Management Area Plan

April 2022

Developed by the

Oregon Department of Agriculture

and the

Powder-Brownlee Local Advisory Committee

with support from the

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Acronyms and Terms

Ag Water Quality Program – Agricultural Water Quality Program
Area Plan – Agricultural Water Quality Management Area Plan
Area Rules – Agricultural Water Quality Management Area Rules
CAFO – Confined Animal Feeding Operation
CNPCP – Coastal Nonpoint Pollution Control Program
CWA – Clean Water Act
CZARA – Coastal Zone Act Reauthorization Amendments
DEQ – Oregon Department of Environmental Quality
GWMA – Groundwater Management Area
LAC – Local Advisory Committee
LMA – Local Management Agency
Management Area – Agricultural Water Quality Management Area
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
OHA – Oregon Health Authority
ORS – Oregon Revised Statute
OWEB – Oregon Watershed Enhancement Board
OWRI – Oregon Watershed Restoration Inventory
PMP – Pesticides Management Plan
PSP – Pesticide Stewardship Partnership
SIA – Strategic Implementation Area
SWCD – Soil and Water Conservation District
TMDL – Total Maximum Daily Load
USDA – United States Department of Agriculture
US EPA – United States Environmental Protection Agency
WPCF – Water Pollution Control Facility
WQPMT – Water Quality Pesticides Management Team

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Foreword

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

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

Required Elements of Area Plans

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

Plan Content

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

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

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

Chapter 4: Progress and Adaptive Management. Describes progress toward achieving the goal of the Area Plan and summarizes results of water quality and land condition monitoring.

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Chapter 1: Agricultural Water Quality Program

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

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

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

Each Area Plan is accompanied by Area Rules that describe local agricultural water quality regulatory requirements. ODA will exercise its regulatory authority for the prevention and control of water pollution from agricultural activities under the Ag Water Quality Program's general regulations (OAR 603-090-0000 to 603-090-0120) and under the Area Rules for this Management Area (OAR 603-095-3600). The general regulations guide the Ag Water Quality Program, and the Area Rules for the Management Area are the regulations with which landowners must comply. Landowners are encouraged through outreach and education to implement conservation and management activities.

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

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

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

1.2 History of the Ag Water Quality Program

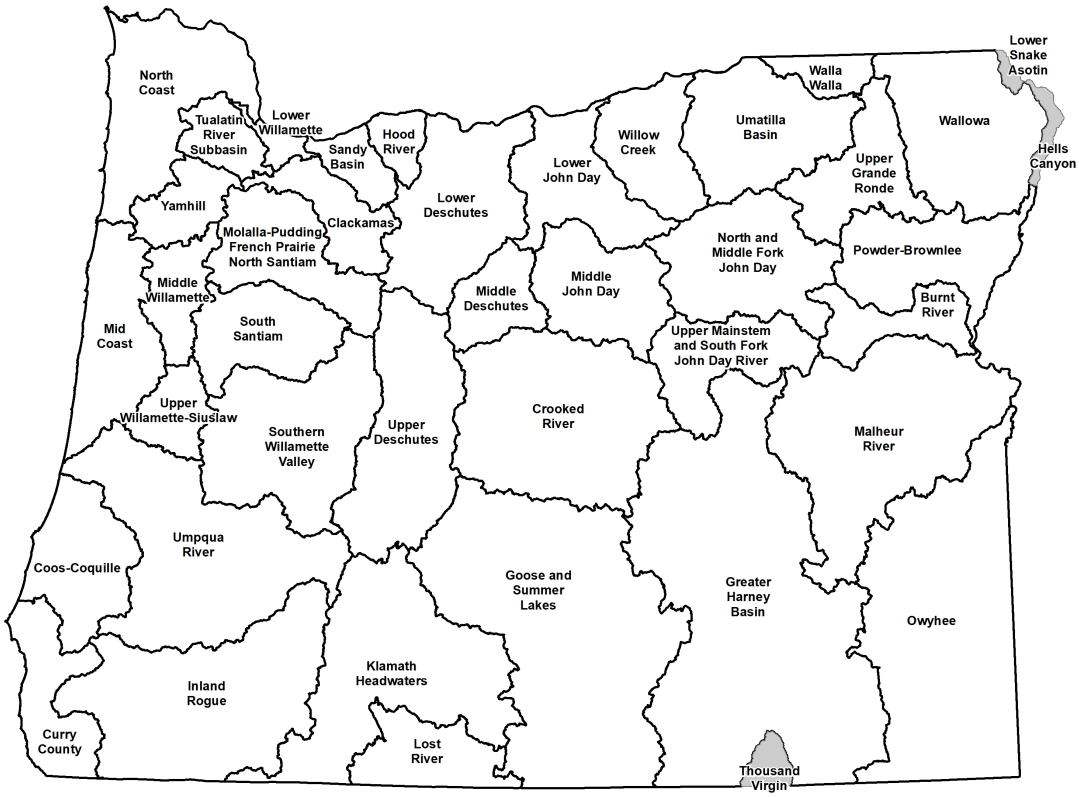
In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion and achieve water quality standards and to adopt rules as necessary (ORS 568.900 through ORS 568.933).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

561.191). The Area Plan and Area Rules were developed and subsequently revised pursuant to these statutes.

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

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

Figure 1.2 Map of 38 Agricultural Water Quality Management Areas*



*Gray areas are not included in Ag Water Quality Management Areas

1.3 Roles and Responsibilities

1.3.1 Oregon Department of Agriculture

ODA is the agency responsible for implementing the Ag Water Quality Program (ORS 568.900 to 568.933, ORS 561.191, OAR 603-090, and OAR 603-095). The Ag Water Quality Program was established to develop and implement water quality management plans for the prevention

and control of water pollution from agricultural activities and soil erosion. State and federal laws that drive the establishment of an Area Plan include:

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

ODA bases Area Plans and Area Rules on scientific information (ORS 568.909). ODA works in partnership with SWCDs, LACs, DEQ, and other partners to implement, evaluate, and update the Area Plans and Area Rules. If and when other governmental policies, programs, or rules conflict with the Area Plan or Area Rules, ODA will consult with the appropriate agencies to resolve the conflict in a reasonable manner.

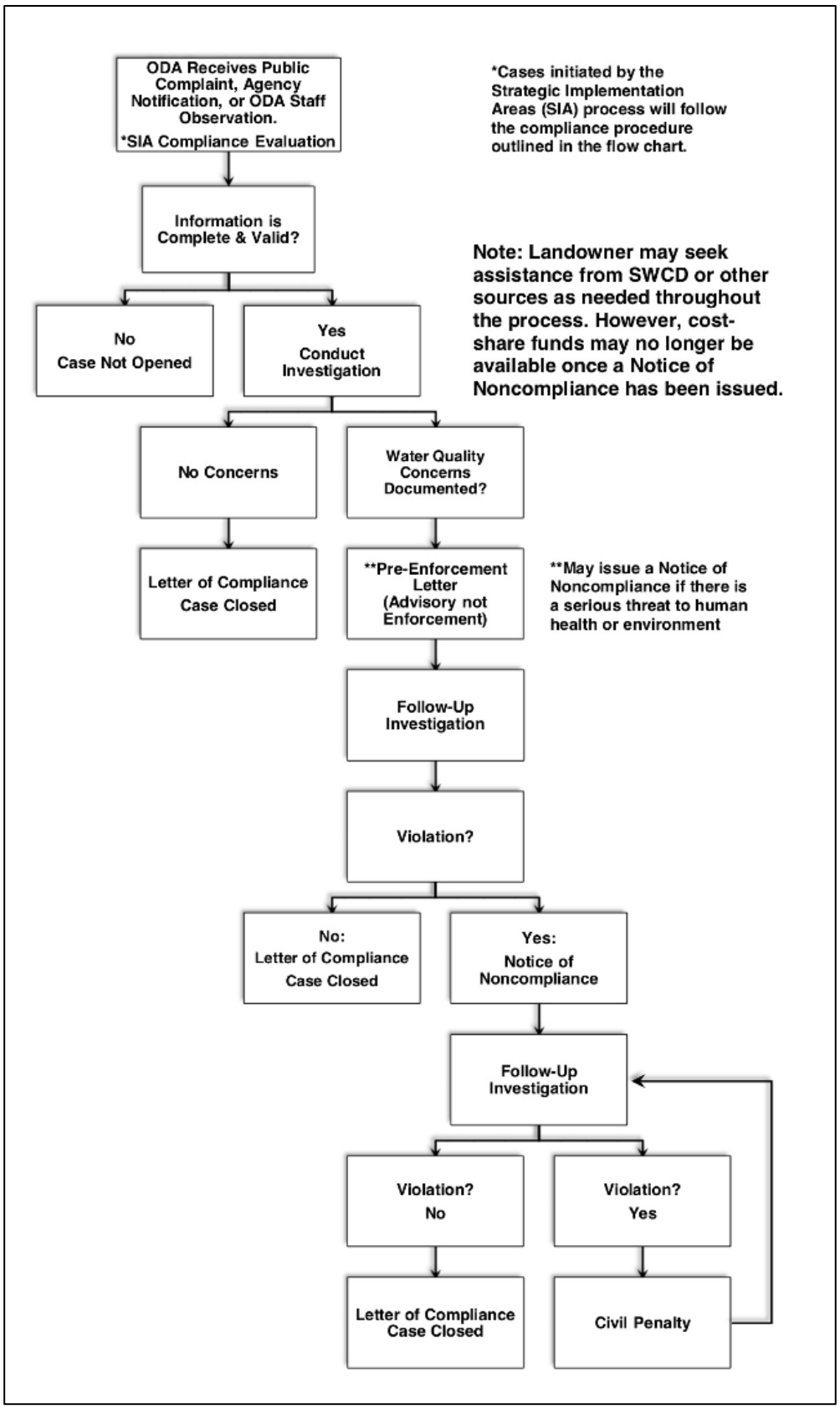
1.3.1.1 ODA Compliance Process

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

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

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

Figure 1.3.1 Compliance Flow Chart



1.3.2 Local Management Agency

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

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

1.3.3 Local Advisory Committee

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

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

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

1.3.4 Agricultural Landowners

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

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

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

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

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

1.3.5 Public Participation

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

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

1.4 Agricultural Water Quality

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

1.4.1 Point and Nonpoint Sources of Water Pollution

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

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

1.4.2 Beneficial Uses and Parameters of Concern

Beneficial uses related to water quality are defined by DEQ for each basin. The most sensitive beneficial uses usually are fish and aquatic life, water contact recreation, and public and private domestic water supply. These uses generally are the first to be impaired because they are affected at lower levels of pollution. While there may not be severe impacts on water quality from a single source or sector, the combined effects from all sources can contribute to the impairment of beneficial uses in the Management Area. Beneficial uses that have the potential to be impaired in this Management Area are summarized in Chapter 2.4.1.1.

Many waterbodies throughout Oregon do not meet state water quality standards. The most common water quality concerns statewide related to agricultural activities are temperature, bacteria, biological criteria, sediment and turbidity, phosphorous, nitrates, algae, pH, dissolved oxygen, harmful algal blooms, pesticides, and mercury. Water quality impairments vary across the state; they are summarized for this Management Area in Chapter 2.4.

1.4.3 Impaired Waterbodies and Total Maximum Daily Loads

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

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

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

The 303(d) list, the TMDLs, and the agricultural load allocations for the TMDLs that apply to this Management Area are summarized in Chapter 2.4.1.

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

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

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

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

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

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

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

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

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

1.4.5 Streamside Vegetation and Agricultural Water Quality

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

Site-Capable Vegetation

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

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

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

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

1.4.6 Soil Health and Agricultural Water Quality

An increasingly important concept in Oregon and across the United States is soil health. The Ag Water Quality Program promotes soil health to reduce erosion and keep sediment out of surface waters, thereby helping to maintain and improve water quality. Healthy soils have relatively high organic matter and well-formed soil structure. These characteristics may resist erosion and increase water infiltration, leading to less surface runoff and greater groundwater recharge; the

resultant groundwater flows in some cases can help moderate stream water temperatures. [Note that the beneficial effects on water quality vary based on factors such as soil type and ecoregion.] According to the NRCS and others, there are four Soil Health Principles that together build highly productive and resilient soils: minimize disturbance and maximize cover, continuous living roots, and diversity above and below the surface.

Building soil health increases resiliency to extreme weather, protects water quality, and helps keep farms and ranches viable. Incorporating soil health practices can help landowners adapt and reduce risks. For more information, visit www.nrcs.usda.gov/wps/portal/nrcs/detail/or/soils/health.

1.5 Other Water Quality Programs

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

1.5.1 Confined Animal Feeding Operation Program

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

1.5.2 Groundwater Management Areas

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

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

Any GWMA in this Management Area is described in Chapter 2,4,1,5, Any Measurable Objectives for the GWMA will be described in Chapter 3.1.5.

1.5.3 The Oregon Plan for Salmon and Watersheds

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

health. ODA's commitment to the Oregon Plan is to develop and implement Area Plans and Area Rules throughout Oregon.

1.5.4 Pesticide Management and Stewardship

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

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

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

Any PSPs in this Management Area are described in Chapter 3.1.4.

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

1.5.5 Drinking Water Source Protection

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

1.6 Partner Agencies and Organizations

1.6.1 Oregon Department of Environmental Quality

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

A Memorandum of Agreement between DEQ and ODA recognizes that ODA is the state agency responsible for implementing the Ag Water Quality Program. ODA and DEQ updated the Memorandum of Agreement in 2012 and reviewed and confirmed it in 2018 (http://www.oregon.gov/ODA/shared/Documents/Publications/NaturalResources/DEQODAmoa.pdf).

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

1.6.2 Other Partners

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

1.7 Measuring Progress

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

1.7.1 Measurable Objectives

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

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

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

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

The measurable objective(s) and associated milestone(s) within the Management Area are in Chapter 3.1 and progress toward achieving the measurable objective(s) and milestone(s) is summarized in Chapter 4.1.

1.7.2 Land Conditions and Water Quality

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

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

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

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

1.7.3 Focused Implementation in Small Geographic Areas

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

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

Any Focus Areas in this Management Area are described in Chapter 3.1.2. The SWCDs will also continue to provide outreach and technical assistance to the entire Management Area.

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

Any SIAs in this Management Area are described in Chapter 3.1.3.

1.8 Progress and Adaptive Management

1.8.1 Biennial Reviews

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

ODA provides information from the Oregon Watershed Restoration Inventory (OWRI) on restoration project funding and accomplishments at biennial reviews and uses the information

for statewide reporting. The majority of OWRI entries represent voluntary actions of private landowners who have worked in partnership with federal, state, and local groups to improve aquatic habitat and water quality conditions. OWRI is the single largest restoration information database in the western United States. For more information, visit www.oregon.gov/oweb/data-reporting/Pages/owri.aspx.

1.8.2 Agricultural Water Quality Monitoring

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

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

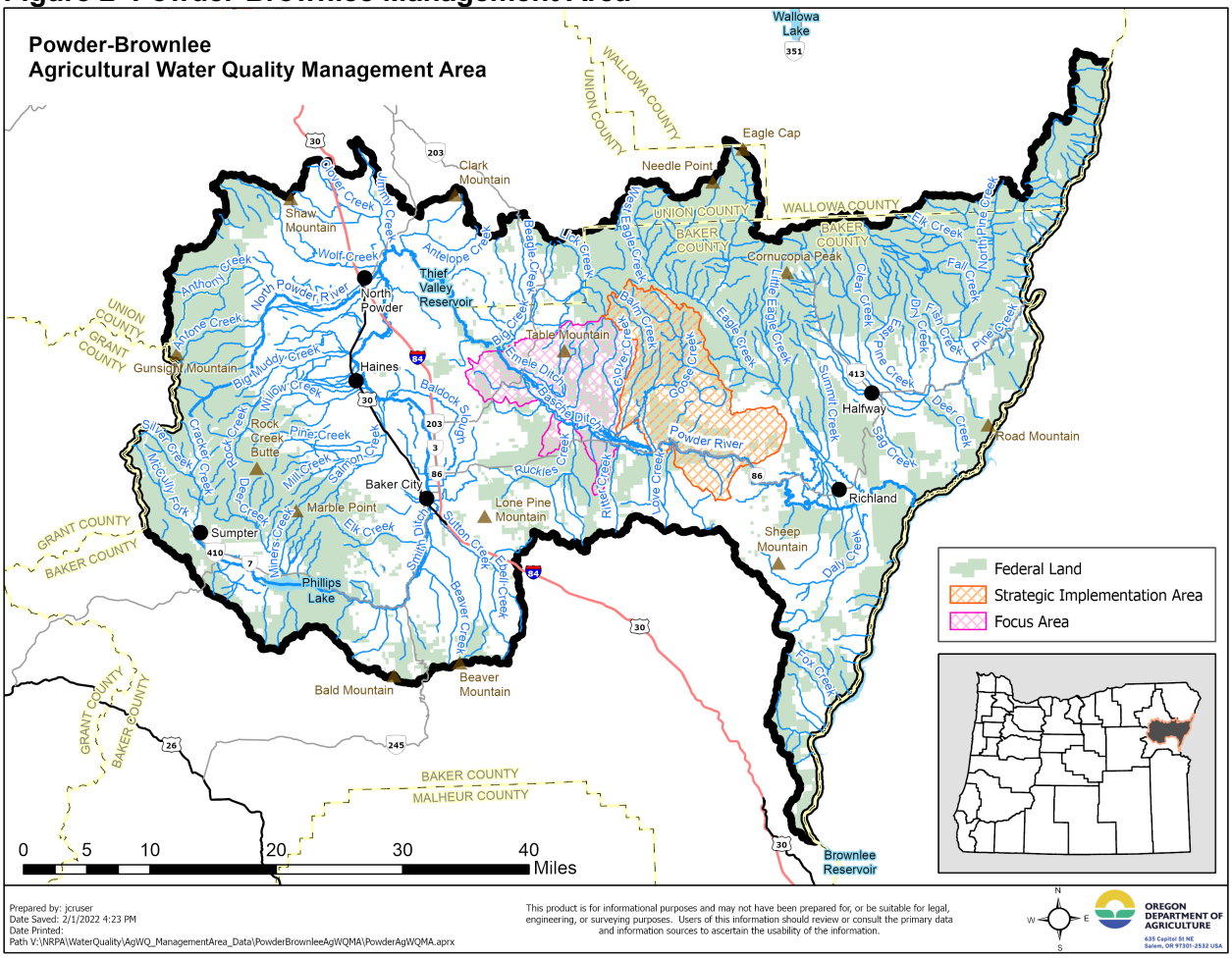
DEQ provides status and trends reports for selected parameters in relation to water quality standards. ODA will continue to work with DEQ to summarize the data results and how they apply to agricultural activities.

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

Chapter 2: Local Background

Chapter 2 provides the local geographic, water quality, and agricultural context for the Management Area. It also describes the water quality issues, Area Rules, and potential practices to address water quality issues.

Figure 2 Powder-Brownlee Management Area



2.1 Local Roles

2.1.1 Local Advisory Committee

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

Table 2.1.1 Current LAC members

Name	Geographic Representation	Description
Curtis Martin	North Powder	Baker Valley SWCD, OCA
Tim L. Kerns	Haines	Baker County Commissioner
Dean DeFrees	Sumpter	Rancher, Baker Valley
Kyle Ransom	Richland	Ag business/ESWCD

Curtis Jacobs	Baker City	Rancher, Keating Valley
Tim. A Kerns	Haines	BV SWCD
Myron Miles	North Powder	BV SWCD, OCA
Ralph Morgan	Baker City	Baker Valley Irrigation District
Clair Pickard	Baker City	Rancher, Keating
Calvin Ransom	Richland	Ag business
Dan Forsea	Richland	Rancher environmentalist
Vacant		

2.1.2 Local Management Agency

SWCDs implement Area Plans through OWEB capacity grants, with details negotiated between ODA and each SWCD. The resulting Scopes of Work define the SWCDs as the LMAs for implementation of the Ag Water Quality Program in specific Management Areas. The LMAs for this Management Area are Baker Valley, Eagle Valley, and Keating SWCDs. These SWCDs were also involved in development of the Area Plan and Area Rules.

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

2.2 Area Plan and Area Rules: Development and History

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

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

2.3 Geographical and Physical Setting

2.3.1 Geographic and Programmatic Scope

This Area Plan applies specifically to lands within the Powder/Brownlee Management Area that are not owned by the federal government and tribal governments, where actions are necessary to prevent and control water pollution from agricultural activities and soil erosion.

2.3.2 Physical Setting

Most of this Management Area lies in Baker County, but the northwestern portion of this Area lies within Union County. The county line follows the North Powder River, which joins the main stem Powder River at Thief Valley Reservoir and then the county boundary runs east overland.

Powder Subbasin
The Powder Subbasin is bounded on the north by the Grande Ronde Subbasin and the Wallowa Mountains, on the west by the Blue Mountains, on the south by the Burnt River Subbasin, and on the east by the Snake River. The Powder River is 144 miles long and drains more than 1,540 square miles before emptying into the Snake River on the Oregon-Idaho border. It begins in the city of Sumpter at the convergence of McCully Fork and Cracker Creek and continues east through Phillips Lake and turns north around Elkhorn Ridge, flowing towards

Baker City. Downstream from the town of North Powder, the river flows through Thief Valley Reservoir and turns to flow southeastwardly for its remaining 78 miles. It empties into the Brownlee Reservoir near the town of Richland. Brownlee Dam creates the Brownlee Reservoir on the Snake River (Figure 3).

Brownlee Subbasin
The Brownlee Subbasin encompasses the northeast corner of Baker County. The primary stream in this Subbasin is Pine Creek. It originates in the Eagle Cap Mountains, descends north to south into a broad plain where it passes the town of Halfway. Soon after, it takes a sharp turn to the northeast and eventually joins the Snake River below Oxbow Dam (Figure 3).

2.3.3 History of Natural Resource Management in the Management Area

Interested readers can find a description of early settlement activities in *Appendix C*. The LAC wanted to emphasize that early settlers found many mainstem rivers dry in the late summer months such as the Powder River. There are diary entries that tell of sheep being driven up the Powder River bed at night, as there was no water between Richland and Keating.

The agriculturists today have water all year due to the installation of impoundment structures. Over the years, local citizens and government agencies have constructed numerous small reservoirs and ponds for irrigation and flood control. This storage capacity has reduced flooding and prolonged the period of time that water flows in the Powder River and some of its tributaries, enhancing water quality along with increased aquatic habitat. Additional stream flows in late summer could be augmented with additional storage, providing improved water quality.

Some of the larger impoundments are:

- Phillips Reservoir with a storage capacity of 90,500 acre-feet,
- Thief Valley Reservoir with a storage capacity of 17,400 acre-feet,
- Wolf Creek Reservoir with a storage capacity of 10,800 acre-feet,
- Pilcher Creek Reservoir with a storage capacity of 5,910 acre-feet.

Right now there are several small storage facilities – Rock Creek, Pine Creek, Killamucue, and Van Patten lakes.

ODA has reserved 33,890 acre-feet for multi-purpose reservoirs in the Powder River subbasin. In the Pine Creek subbasin, 10,000 acre-feet is reserved and, in the Eagle Creek, subbasin 4,300 acre-feet is reserved.

Beneficial uses of water in the Management Area include irrigation, livestock watering, and municipal use. Irrigation is the primary beneficial use for which water rights are issued. Non-consumptive uses of water include recreation and fish and wildlife habitat. Sources of appropriated water are reservoirs, surface water and groundwater.

Baker County contains an estimated 176,000 irrigated acres (Oregon Water Resources Department). This includes about 20,000 acres in the Burnt River Irrigation District, which is in another agricultural water quality management area. Irrigation methods include the use of hand lines, wheel lines, and pivots. In addition, flood irrigation is still a common practice especially in livestock pastures. Irrigation withdrawals are most concentrated in the lower portions of each watershed.

Many irrigation or water control districts operate in the Powder Subbasin. The following four are the largest**:**

- Baker Valley Irrigation District,
- Lower Powder Irrigation District,
- Powder Valley Water Control District,
- Phillips-Eagle Ditch Improvement District.

Not all farmers and ranchers in the Management Area are part of irrigation districts. For example, the irrigation system on the west side of Baker Valley consists of a large network of ditches that deliver water. Neighborhood user groups maintain and repair these ditches. The farmers filed water rights and built the irrigation ditches starting in 1862 and 1863. Eventually, they filed for all the available stream flows.

2.3.4 History of Conservation in the Management Area

In recent years, private landowners, the Baker Valley, Eagle Valley, and Keating SWCDs, the Powder Watershed Council, and many others have worked cooperatively to promote and implement conservation. The SWCDs have sponsored workshops and tours dealing with irrigation management, weed control, fish screens and more. They have operated a water quality monitoring program designed to help the districts and landowners learn more about their watersheds.

The districts and their partners have sponsored numerous on-the-ground projects. They include:

- Off-stream water developments for livestock,
- Confined Animal Feeding Operation improvements,
- Soil moisture and weather measurements for irrigation management,
- Irrigation pipelines for water and energy conservation,
- Wetland and stream rehabilitation for wildlife and water quality improvements.

2.4 Agricultural Water Quality

2.4.1 Water Quality Issues

Streams in the Powder Basin are included on the 303(d) list of water quality limited waterbodies with TMDLs needed for dissolved oxygen, bacteria, temperature, turbidity, sedimentation, arsenic and mercury. Monitoring is being conducted by DEQ to support TMDL development for these parameters, as well as the total phosphorus load allocations developed in the Snake River-Hells Canyon TMDL.

The complete list of water bodies in the management area that the Environmental Quality Commission has determined to be water quality limited are in Attachment A.

DEQ has begun work to develop TMDLs for the Powder Basin to address the following pollutants:

- Bacteria
- Dissolved oxygen
- Nutrients

The temperature TMDL development work is being deferred until a new water temperature standard is prepared by DEQ and approved by U.S. EPA.

2.4.1.1 Beneficial Uses

Clean water supports many uses. Water quality standards are established to protect beneficial uses of Oregon's waters, which are defined in OAR 304-041-0002(17) and designated for water bodies the Powder/Burnt Basin in 304-041-0260 – Table 260A. Beneficial uses 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, and aesthetic quality.

The following beneficial uses have been identified as potentially adversely affected in the Management Area:

- Salmonid fish rearing and spawning,
- Resident fish and aquatic life.

2.4.1.2 Water Quality Parameters of Concern

According to the 2018/20 Integrated Report, arsenic, biological criteria, chlorophyll a, dissolved oxygen, E. coli Fecal coliform, Mercury, pH, sedimentation, temperature, and turbidity are the primary water quality parameters of concern for agriculture (https://www.oregon.gov/deq/wq/Pages/epaApprovedIR.aspx).

See Appendix A.

2.4.1.3 TMDLs and Agricultural Load Allocations

DEQ is in the process of developing a TMDL for the Powder Basin.

2.4.1.4 Drinking Water

DEQ summarizes drinking water issues in each Management Area prior to biennial reviews. Their full report is available at: https://www.oregon.gov/deq/wq/programs/Pages/Nonpoint-Implementation.aspx.

2.4.1.5 GWMA

There is no GWMA in this Management Area.

2.4.2 Sources of Impairment

Both point and nonpoint sources contribute to water pollution. The accumulation of point and nonpoint source pollution results in water quality impairment. Point sources discharge pollutants into the water through a pipe or conveyance. In contrast, nonpoint source pollution is pollution emanating from landscape scale sources and typically cannot be tracked to a single point of discharge. Nonpoint sources of pollution in the area can include the effects of weather events causing runoff and erosion from agricultural and forest lands, leaching of pollutants to groundwater, eroding streambanks, and runoff from roads and urban areas. Pollutants from nonpoint sources can be carried to the surface water or groundwater through the actions of rainfall, snowmelt, irrigation, and leaching. Increased heat input due to vegetation removal,

seasonal flow reduction, changes in channel shape, and floodplain alteration are major sources of water quality impairment. Channelization and bank instability may alter gradient, width/depth ratio, and sinuosity, thereby causing undesirable changes in sediment transport regime, erosional and depositional characteristics, and elevated temperature.

The high stream temperatures and low summer streamflows are the main water quality problems in the Powder-Brownlee subbasins. Stream temperatures can increase or decrease from various types of land management activities and natural disturbances that cause the removal of riparian vegetation or changes in channel morphology from hydrological factors such as groundwater recharge and discharge and from other factors such as high sediment loads.

Protection of riparian and streamside areas for moderation of stream temperatures is the subject of rules created from this Area Plan. Low summer streamflows often result from channel loss and water withdrawals for beneficial uses, primarily irrigation, along with normal seasonal reductions of streamflow. Water withdrawals are regulated by the Oregon Water Resources Department (WRD) and will not be addressed by rule or in this Area Plan.

2.5 Regulatory and Voluntary Measures

Under the Agriculture Water Quality Program, landowners reserve the right to have flexibility in choosing management approaches and practices to address water quality issues on their private property. This LAC recognizes that the rights of private property owners must be adhered to and respected. Landowners may choose to develop management systems to address problems on their own, or they may choose to work with the local SWCD or partnering agency.

Applicability
Under the Agricultural Water Quality Management Act (ORS 568.900 through 568.933), all landowners conducting activities on lands that border or lands that directly influence waters of the state must be in compliance with the Area Rules. A landowner is responsible for only those conditions caused by activities conducted on their land. Conditions resulting from weather events or other circumstances not within the reasonable control of the landowner are considered when making compliance decisions.

OAR 603-095-3640
Prohibited Conditions
(1) A landowner shall be responsible for only those conditions caused by activities conducted on land owned or managed by the landowner. Criteria do not apply to conditions resulting from unusual weather events or other exceptional circumstances that could not have been reasonably anticipated.

Pollution and Waste Management
The objective of this Area Plan is to prevent the introduction of waste materials into bodies of water.

Wastes include livestock manure from situations like seasonal feeding and birthing areas, gathering pastures and corrals, rangelands and pasture, and any other situations not already covered by Oregon's Confined Animal Feeding Operation laws.

Indicators of noncompliance include:
- Runoff flowing through areas of high livestock usage and carrying wastes into waters of the state,
- Livestock waste accumulated in drainage ditches or areas of flooding,
- Fecal coliform (*E. coli*) counts that exceed state water quality standards.

The LAC believes that the current water quality standards are unattainable.

OAR 603-095-3640
(2) Pollution and Waste Management
Effective upon adoption, no person subject to these rules shall violate any provision of ORS 468B.025 or ORS 46B.0b0.

Streamside Conditions
Maintaining and improving riparian vegetation through proper management is an important factor to help achieve our goal of working toward a reduction in any identified undesirable water quality issues related to agricultural activities. Healthy, functioning riparian vegetation communities in the Management Area will help stabilize stream banks, filter sediments and nutrients, and protect critical aquatic and riparian habitat.

The goal of this Area Plan for landowners and operators is to prevent and control water pollution from agricultural activities. Areas near waterbodies are especially important to water quality and are sensitive to management activities.

The streamside area is defined as the area near the stream where management practices can

most directly influence the conditions of the water.

The riparian area is a zone of transition from aquatic to a terrestrial system. Dependent upon the surface or subsurface water, existing or potential soil-vegetation complexes will persist with the influence of surface or subsurface water. A riparian area may be located adjacent to a lake, reservoir, estuary, pothole, spring, bog, wet meadow, muskeg, slough, or ephemeral, intermittent or perennial stream. OAR 603-095-0010(36) defines riparian vegetation as plant communities consisting of plants dependent upon or tolerant of the presence of water near the ground surface for at least part of the year.
Water is the distinguishing characteristic of riparian areas but soil, vegetation, and landform also exert strong influence on these systems. In a healthy riparian ecosystem, these four components interact to produce a wide variety of conditions.

Healthy riparian and streamside areas provide several important ecological functions. These include:

- Dissipation of stream energy associated with high flows and thus influencing the transport of sediment,
- Capture of suspended sediment and bedload that builds streambanks and develops floodplain function
- Retention of floodwater and recharging ground water,
- Stabilization of streambanks through plant root mass,
- Support of biodiversity.

Due to many variables, which naturally occur in eastern Oregon, such as climatic and hydrologic patterns (extreme changes in temperatures, ice jams, very high stream flows, and periods of dewatering), as well as technical and biological challenges (e.g., site capability, beaver, ungulate, and rodent damage), the LAC believes it is unlikely that any of the streams in agricultural areas of the Powder/Brownlee Management Area will meet the state numeric temperature standards.

Site-Capable Vegetation

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

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

Occasionally, mature site-capable vegetation such as tall trees may not be needed for narrow streams. For example, shrubs and grass may provide shade, protect streambanks, and filter

pollutants. However, on larger streams, mature site-capable vegetation is needed to provide the water quality functions. Limited exceptions include:

- 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.
- Junipers are mature site-capable vegetation in central and eastern Oregon, but they may reduce bank stability and increase erosion.

Livestock grazing must comply with the Streamside Condition Rule. Compliance with the riparian objectives will help keep wastes from running into waters of the state.

Due to the high percentage of public lands within the basin, the water quality entering into privately owned agriculutral lands is affected by the management practices of government entities and increased fire activity.

OAR 603-095-3640
(3) Streamside Conditions

(a) By January 1, 2006, activities will allow the establishment and development of riparian vegetation, consistent with site capability. Site capability will be determined by ODA in consultation with local resource management experts.

(b) Landowners are not responsible for browsing and grazing by wildlife.

(c) The rule does not specify any activities that must cease and does not require any particular activity to take place.

This Area Rule only applies to the streamside area of natural streams and not to authorized irrigation ditches and diversion points, which are used for the primary purpose of delivering irrigation and stock water to lands that hold a valid water right. The streamside area is defined as the area adjacent to the stream where management practices can most directly influence the conditions of the water.

Grazing, weed control and other common agricultural activities are allowed in riparian areas as long as they allow the establishment and development of riparian vegetation, consistent with site capability, to moderate solar heating, stabilize streambanks, and filter sediment and nutrients from overland flows. Minimal breaks in riparian vegetation for essential management activities and infrastructure, such as water gaps, hardened crossings, and irrigation equipment access, are allowed provided site conditions comply with the Prevention and Control Measures.

Soil Erosion and Sediment Control

An objective of this Area Plan is to implement measures that prevent and control water pollution from agricultural activities and soil erosion. This includes agricultural and rural lands that may not be in close proximity to waterbodies but have the potential to contribute to water quality degradation by runoff of sediment and wastes.

Livestock Management

An objective of this Area Plan is to implement measures that prevent and control water pollution from livestock operations.

Livestock management (including handling facilities, pastures, rangeland, and confinement areas) should be done in a manner that limits soil erosion and minimizes the delivery of sediment and animal wastes to nearby streams. A grazing management system should promote

and maintain adequate vegetative cover, for protection of water quality, by consideration of intensity, frequency, duration, and season of grazing.

Grazing near streams should be managed to prevent negative impacts to streambank stability, allow for recovery of plants, and leave adequate vegetative cover to ensure protection of riparian functions including shade and habitat. Off-stream watering systems, upland water developments, feed and salt/mineral placement are examples of methods to be considered as ways to reduce impacts of livestock to streamside areas. Establishment and spread of noxious weeds should be prevented by appropriate weed control practices and managed grazing as an appropriate tool.

Irrigation Management

An objective under this Area Plan is to implement measures that prevent and control water pollution from irrigation. Diversion of water for irrigation or other uses and the return of that water to the stream are activities that have potential for contributing to water quality issues.

Irrigated lands are lands either riparian, floodplain, or upland upon which water is applied for the purpose of growing crops. Diversion of water from a water body to be applied on land for the purpose of growing crops is a recognized beneficial use of water. Irrigation water use is regulated by the Oregon Water Resources Department (WRD) in the form of water rights, which specify the rate, duty, and season that water can be applied to a particular parcel of land. Refer to WRD Rules (OAR 690 and ORS 536 through 543) for more details.

Irrigation in this basin is done by utilizing stored water, natural flows, and groundwater sources for flood irrigation, drip, or sprinkler application. Irrigation management in this basin recognizes there are positive benefits, in addition to crop growth, occurring from irrigation application - including flow augmentation as water returns back to the stream, cooling and filtering of water through underground percolation, and the recharge of shallow wells and springs due to the connectivity of surface water to groundwater sources. Irrigation water is used more than once as it returns to the stream and is available for in-stream uses or by other irrigators. Both aquatic and wildlife habitat benefit from irrigation induced in-stream flows.

An effective mechanism to improve water quality is increased storage. By capturing, storing, and safely releasing water, water temperature can be decreased, flood waters controlled; water quality enhanced and overall beneficial uses improved for the economy, wildlife, and aquatic habitats.

Chapter 3: Implementation Strategies

Chapter 3 describes efforts to make and track progress toward the goals of the Area Plan. It presents the goals, measurable objectives, strategic initiatives, proposed activities, and monitoring efforts.

Goal

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

The Goal of the Area Plan is to:
Use voluntary measures to prevent and control water pollution from agricultural activities and soil erosion, and to meet water quality standards.

The LAC believes that the water quality standards are unattainable.

The LAC established these objectives to achieve the Area Plan goal:

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

The following conditions on agricultural lands contribute to good water quality in this Management Area:

1. Sufficient site-capable vegetation is established along streams to stabilize streambanks, filter overland flow, and moderate solar heating,
2. Crop lands are covered throughout the year with either production crops, crop residues, or cover crops,
3. Pastures have minimal bare ground,
4. Irrigation runoff does not deliver sediment, nutrients, or chemicals to streams,
5. Leachate and residues from livestock manure are not entering streams or groundwater.

3.1 Measurable Objectives and Strategic Initiatives

Measurable objectives allow the Ag Water Quality Program to evaluate progress toward meeting water quality standards and TMDL load allocations. Any measurable objectives are stated here. Progress is reported in Chapter 4.1.

3.1.1 Management Area

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

3.1.2 Focus Areas

Lower Powder Focus Area

The Lower Powder Focus Area is part of ODA's Focus Area strategic initiative. The Keating, Baker Valley, Eagle Valley and Burnt River SWCDs worked with Oregon Department of Agriculture, as well as received input from other partnering agencies (Lower Powder Irrigation District, Idaho Power Company, NRCS, etc.) to select the Lower Powder Focus Area, which will be continued into the 2021-2023 biennium. There is still great potential for conservation practices to be implemented in this area, and the SWCDs continue to employ a riparian tech to carry out the Tributary Riparian Re-Vegetation Program, which is located within the Lower Powder Focus Area.

The Powder River has been a focal point for water quality improvements, with several parameters listed on DEQ's 303(d) list. The section of the Powder River directly below Thief Valley Reservoir has also been dubbed a national Wild and Scenic River, with the intent to: "preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations." As the Lower Powder Focus Area boundary begins where the Wild and Scenic boundary ends, the Keating SWCD believes that the main objectives of the focus area will align perfectly with the goals of the National Wild and Scenic River Systems Act, as the area offers potential restoration projects based on sage grouse, mule deer, fish and other wildlife habitat, as well as riparian restoration.

The Lower Powder Focus Area boundary also consists of strong landowner relationships; individuals who are involved and committed to conservation on the land.

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

Measurable Objectives and Associated Milestones: Ninety percent of the agricultural areas in the Focus Area will have streamside vegetation (shrub) likely to provide the water quality functions (shade, bank stability, and filtration of overland flow) of the area's site-capable vegetation.

- Current Condition: Shrub currently 93.72 Acres
- Milestone 1: 2% improvement by 2021
- Milestone 2: 10% improvement by 2024
- Milestone 3: 10% improvement by 2026

Results of the assessments and targeted assistance are reported to the LAC at the Biennial Review and will be summarized in Chapter 4.

3.1.3 Strategic Implementation Areas (SIA)

Lower Powder SIA (Initiated 2018)

The Lower Powder River Watershed in Baker County consists of approximately 53,900 agricultural acres. Agricultural areas of the watershed consist mostly of cattle grazing and hay

production. According to DEQ's 2012 Integrated Report, water quality concerns in the watershed have been identified for *arsenic, biological criteria, chlorophyll a, dissolved oxygen, E.coli, Fecal coliform, Mercury, pH, sedimentation, temperature, and turbidity*. Additional concerns include unrestricted livestock access to streamsides and runoff from flood irrigated pastures.

SIA Compliance Evaluation Method:
ODA evaluated all agricultural tax lots within the SIA to identify opportunities to improve water quality and ensure compliance with Area Rules. The evaluation considered the condition of streamside vegetation, areas of bare ground, and potential livestock impacts (including manure management). The process involved both a remote evaluation and field verification from publicly accessible areas. For more information see:
https://www.oregon.gov/oda/shared/Documents/Publications/NaturalResources/SIAProgressReport.pdf

Opportunity levels:

- Limited Opportunity for Improvement (LIMITED): ODA identified no likely agricultural water quality regulatory concerns.
- Low Opportunity for Improvement (LOW): ODA identified no likely agricultural water quality regulatory concerns, but there may be an opportunity for improvement through voluntary measures to reach the goals of the Area Plan,
- Opportunity for Improvement (OPP): ODA identified that agricultural activities may impair water quality or evaluation was inconclusive.
- Potential Violation (PV): ODA observed during the Field Evaluation a potential violation of the Area Rules.

Measurable Objective:
By December 4, 2022, all 3 tax lots identified as a Potential Violation or an Opportunity for Improvement will be downgraded to Low or Limited opportunities.

3.1.4 Pesticide Stewardship Partnerships (PSP)

There are no PSPs in this Management Area.

3.1.5 Groundwater Management Area (GWMA)

There is no GWMA in this Management Area.

3.2 Proposed Activities

ODA, the LAC, the LMA, and other partners have identified the following priority activities to track progress toward meeting the goals and objectives of the Area Plan (Table 3.2).

Education and cooperation are key to the success of this Plan. The SWCDs will work to provide farmers and ranchers in the Management Area with information about the goals and objectives of this Plan.

Individual farmers and ranchers in the Management Area may request assistance to determine what can be done to meet the goals and objectives of the Plan by contacting the local office of the SWCDs or the NRCS.

The Baker Valley, Eagle Valley, and Keating SWCD will:

- Participate in developing and delivering outreach and education programs designed to provide public awareness and understanding of water quality issues.
- Develop reports, projects, demonstrations and tours to showcase successful management practices and systems.
- Provide technical and financial assistance to the agricultural community to implement recommended practices, monitoring and education.

Table 3.2 Planned Activities for 2022-2025 throughout the Management Area by Baker Valley, Eagle Valley, and Keating SWCD

Activity	4-year Target	Description
Landowner Engagement		
# events that actively engage landowners (workshops, demonstrations, tours)	10	The SWCDs will hold an annual dinner (four total), open to the public, and highlighting accomplishments from the year. These are great opportunities to connect with landowners. The SWCDs are planning to host a biennial tour in each of the three districts (six total), open to the public, of completed projects within the district. Another great opportunity to reach out to landowners and get folks involved.
# landowners participating in active events	550	Based on attendance from past years, the SWCDs estimate 100 landowners attend the dinner each year, and about 25 landowners attend each conservation tour.
# outreach material produced/mailed out to actively engage landowners (postcards, newsletters, etc.)	12	The SWCDs will produce and mail out an annual spring newsletter (four total), highlighting current projects, education and outreach opportunities, potential program funding, and updated ag water quality information. There are roughly 300 people on the newsletter mailing list. The SWCDs will produce and have available to the public an annual report (four total) that highlights all project accomplishments from the previous fiscal year. Roughly 100 people would receive this report.

		The SWCDs will produce and mail out postcards on an annual basis (four total) to landowners in the district, alerting folks of water quality improvement opportunities.
Technical Assistance (TA)		
# landowners provided with TA (via phone/walk-in/email/site visit)	150	Based on landowner contact in past years, the SWCDs estimate that they will likely provide technical assistance to 150 landowners over the next four years.
# site visits	15	Based on site visits in past years, the SWCDs estimate that they will likely go on 40 initial site visits over the next four years. This does not include planned site visits for open and ongoing projects.
# conservation plans written*	4	The SWCDs estimate that at least four conservation plans will be written for future large grants.
On-the-ground Project Funding		
# funding applications submitted	28	The SWCDs will be submitting three large grants for the 2022 spring OWEB cycle. The SWCDs estimate that they will submit at least an additional 10 grants over the next four years. The SWCDs have allocated all of the current small grant biennium funding, however they hope to submit at least an additional 15 small grants within the three districts when they receive small grant funding for the next biennium.
# programs involved in to provide landowners with additional resources	2	There is an open Focus Area as well as an open Strategic Implementation Area in the Keating District. These provide additional resources and opportunities to landowners when it comes to monitoring and water quality improvements.

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

3.3 Additional Agricultural Water Quality and Land Condition Monitoring

The SWCDs, ODA, and the LAC are responsible for determining whether the goals will be met within the time frames identified in the Area Plan. Progress and success of implementation efforts will be assessed through compliance with Area Rules and voluntary activities to meet Area Plan objectives and goals, and water quality changes over time. Results will be reported in Chapter 4 at biennial reviews.

3.3.1 Water Quality

DEQ monitors two permanent sites in the Management Area as part of its ambient monitoring network.

Data collected by the SWCD at 18 sites between 1995 and 2002 documents past conditions (Appendix D). Continued monitoring is essential to determine trends in water quality over time as conditions improve due to changes in management or natural conditions.

Currently, water quality data are being collected by DEQ and Idaho Power. DEQ monitors two sites as part of its ambient program: Powder River at Highway 7 in Baker City and Powder River at the Highway 76 bridge below Keating. Idaho Power has flow and continuous temperature data from two sites on the Powder River, 11.6 and 22 miles above the mouth.

A monitoring program should include:

- Continue and expand, as necessary, water quality monitoring to establish baseline conditions and trends: (Responsible parties: local SWCDs)
- Tracking of Area Plan implementation and compliance with the Area Rules (Responsible parties: ODA, Baker Valley/Eagle Valley/Keating SWCD, Powder/Brownlee LAC)
- Evaluation of Area Plan effectiveness (improvements in water quality and land conditions)
  (Responsible parties: ODA, Baker Valley/Eagle Valley/Keating SWCD, Powder/Brownlee LAC)
- Identification of areas and annual and long-range strategies for Area Plan implementation

Trend monitoring will be used to determine long-term changes in water quality. It requires the establishment of "stable" sites and collection of a data record over time for comparison to baseline or initial information. Ideally, areas picked for baseline monitoring will also be used for trend monitoring. In the Powder/Brownlee area, most of these sites have already been established by DEQ and Idaho Power.

DEQ completed a status and trends analysis for the Management Area (http://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx). The report will be updated for future biennial reviews.

Representatives of the LAC, ODA, the SWCDs, and other agencies and groups conducting monitoring in the Basin will coordinate water quality monitoring. Area Plan success will be evaluated by the LAC, ODA, and the SWCDs.

The Oregon Plan for Salmon and Watersheds' Water Quality Monitoring Technical Guide Book (July, 1999) is the state's preferred reference manual. Specific monitoring protocols will depend on the condition being assessed.

3.3.2 Land Condition

Currently, the LMA is using visual assessment as the primary monitoring tool for landscape conditions. All assessments of streamside vegetation are dictated by site capability.

Results of these additional monitoring activities are presented in Chapter 4.3.

Chapter 4: Progress and Adaptive Management

Chapter 4 describes progress toward achieving Area Plan goals and measurable objectives by summarizing accomplishments and monitoring results. Tracking activities is straightforward; monitoring water quality or land conditions takes more effort; relating changes in land conditions to changes in water quality is important but more challenging.

4.1 Measurable Objectives and Strategic Initiatives

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

4.1.1 Management Area

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

4.1.2 Focus Areas

Table 4.1.2. Lower Powder Focus Area

Measurable Objective	
Ninety percent of the agricultural areas in the Focus Area will have streamside vegetation (shrub) likely to provide the water quality functions (shade, bank stability, and filtration of overland flow) of the area's site-capable vegetation.	
Milestones	
• 2% improvement by 2021 • 10% improvement by 2024 • 10% improvement by 2026	
Current Conditions	
Progress Toward Measurable Objectives and Milestones Shrub currently 93.72 Acres	
Assessment Results: Grass Ag Category went from 181.20 acres to 171.49 acres. These acres all went to shrub acres that now total 103.44 acres.	
Activities and Accomplishments	
Community and Landowner Engagement	
# active events that target landowners/ operators	**0**
# landowners/operators participating in active events	**0**
Technical Assistance (TA)	
# landowners/operators provided with TA	**34**
# site visits	**96**

# conservation plans written	**2**
Ag Water Quality Practices Implemented in the Focus Area	
	2
Comments: Irrigation upgrades	
Adaptive Management Discussion	
Yes. Within ¼ of an acre. Landowner outreach with Idaho Power incentives will help to stay the course.	

4.1.3 Strategic Implementation Areas

Table 4.1.3 2018 Lower Powder SIA

Evaluation Results		
As of December 4, 2018, 3 tax lots were identified as either a Potential Violation or an Opportunity for Improvement. LIMITED = 152, LOW = 8, OPP = 2, PV = 1		
Measurable Objective		
By December 4, 2022, all 3 tax lots identified as a Potential Violation or an Opportunity for Improvement will be downgraded to Low or Limited.		
Adaptive Management Discussion		
SIA is open and SIA work is continuing. An adaptive management discussion will be available at the next biennial review.		
Activity	**Accomplishment**	**Description**
ODA		
# acres evaluated	53,900	
# stream miles evaluated	146	
# landowners at Open House	12	
# landowners receiving outreach materials	89	
SWCD and Conservation Partners		
# landowners provided with technical assistance		
# site visits		
# conservation plans written		
SIA and Project Funding		
# funding applications submitted		$125,000 OWEB Grant for TA and monitoring
# funding applications awarded		

4.1.4 Pesticide Stewardship Partnerships

There are no PSPs in this Management Area.

4.1.5 Groundwater Management Area

There is no GWMA in this Management Area.

4.2 Activities and Accomplishments

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

Table 4.2a Activities conducted in 2018-2021 throughout the Management Area by Baker Valley, Eagle Valley, and Keating SWCDs

Activity	4-year results	Description
Landowner Engagement		
# events that actively engage landowners (workshops, demonstrations, tours)	4	The SWCDs held an annual dinner (two total) open to the public and highlighting accomplishments from the year. These are great opportunities to connect with landowners. The SWCDs hosted two tours, open to the public, of completed projects within the district. Another great opportunity to reach out to landowners and get folks involved. Due to the Covid pandemic, the districts were not able to hold dinners or tours during the 2020-21 fiscal years.
# landowners participating in active events	250	The annual dinners hosted 100 attendees each. The project tours hosted 20 and 30 landowners respectively.
# outreach material produced/mailed out to actively engage landowners (post cards, newsletters, etc.)	6	The SWCDs produced two spring newsletters, highlighting opportunities, potential program funding, and updated ag water quality information. There are roughly 300 people on the newsletter mailing list. The SWCDs presented the annual report (two total) that highlights all project accomplishments from the previous fiscal year. Roughly 100 people received this report at the dinner. The SWCDs mailed out two postcards (2018-19 fiscal years) to landowners in the district, alerting people of opportunities, including a Strategic Implementation Area in the Keating District.
Technical Assistance (TA)		
# landowners provided with TA (via phone/walk-in/email/site visit*	95	During the 2018-19 fiscal years, the SWCDs provided about 60 landowners assistance via telephone, walk-ins, etc. During the 2020-21 fiscal years, the SWCDs provided about 35 landowners with technical assistance. Note that due to the Covid pandemic, staff begun working remotely in 2020.
# site visits	40	

# conservation plans written**	4	There were three grazing management plans written for projects in the districts from 18-21.
On-the-ground Project Funding		
# funding applications submitted	32	The SWCDs submitted and received funding for 10 restoration or technical assistance projects from 2018-21. This includes 16 small grants and 16 large grants.
# funding applications awarded	2	There is an open Focus Area as well as an open Strategic Implementation Area in the Keating District. These provide additional resources and opportunities to landowners when it comes to monitoring and water quality improvements.

* Number reported likely double-counts some landowners due to tracking methods.
** Definition: any written management plan to address agricultural water quality concerns, such as: nutrients, soil health, grazing, irrigation, and streamside vegetation. Can include farm and ranch plans (including small acreages) and NRCS-certified plans. Excludes projects with weak connection to agricultural water quality.

Table 4.2b Implementation funding (cash and in-kind) for projects on agricultural lands reported 1997-2020 (OWRI data include most, but not all projects, implemented in the Management Area).

Landowners	OWEB	DEQ	NRCS*	OWRD	USFWS	Idaho Power	All other sources**	TOTAL
2,297,145	6,660,381	73,445	1,705,889	1,078,213	723,272	279,981	1,937,527	14,755,853

* This table may not include all NRCS funding due to privacy concerns.
**Includes city, county, tribal, other state and federal programs, and non-profit organizations. There were too many entities to list.

Table 4.2c Miles and acres treated on agricultural lands reported 1997-2020 (OWRI data include most, but not all projects, implemented in the Management Area).

Activity Type*	Miles	Acres	Count**	Activity Description
Upland		20,869	0	
Road	0		20	
Riparian	39	426		
Wetland		65		
Instream	31		7cfs	
Fish Passage	41		18	
TOTAL	111	21,360	18	

* This table may not include all NRCS projects due to privacy concerns.
** # of hardened crossings, culverts, etc.

4.3 Additional Agricultural Water Quality and Land Condition Monitoring

4.3.1 Water Quality

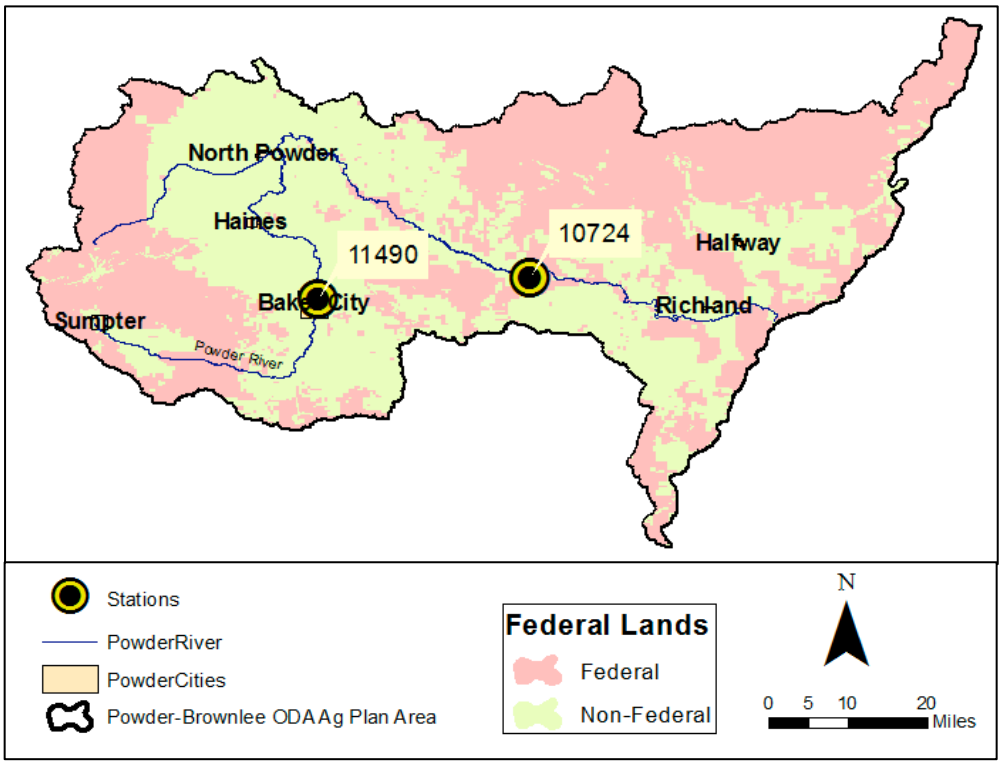
DEQ analyzed data for dissolved oxygen, *E. coli*, pH, total phosphorus, temperature, and total suspended solids in the Management Area. (DEQ. 2020 Oregon Water Quality Status and Trends Report; https://www.oregon.gov/deq/wq/programs/Pages/wqstatustrends.aspx).

DEQ's ambient monitoring sites are at: (*Powder River at HWY 7 (in Baker City) and Powder River at Hwy 86 (below Keating*).

Water quality in this basin is directly dictated by the time of year and the volume of water in streams. (See Appendix D). The LAC recognizes there are often factors that are not being considered when collecting data, including:

- Volume of water,
- Point source inputs,
- Elevation and topography,
- Location within the basin,
- Historical on-the-ground knowledge of fish species known to inhabit streams i.e.; historical evidence contradicts that certain fish species ever existed in certain streams,
- Competing species habitats.

For this biennial review, DEQ reviewed data from over 65 sites used by DEQ, BLM, and Baker SWCD. Two had sufficient data for status and trends analysis (Powder River at Highway 86 and Highway 7). (DEQ Powder-Brownlee AgWQ Management Area: DEQ's Water Quality Status and Trends Analysis for the Oregon Department of Agriculture's Biennial Review of Agricultural Area Rules and Plan. 36pp. 2017.)



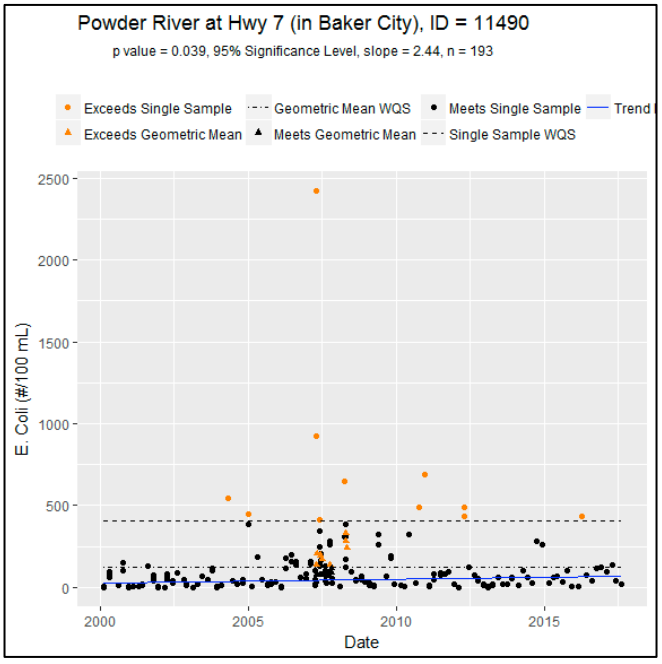
The Department of Environmental Quality's report shows that concerns are related to *E. coli* and phosphorus (highlighted in grey and discussed below).

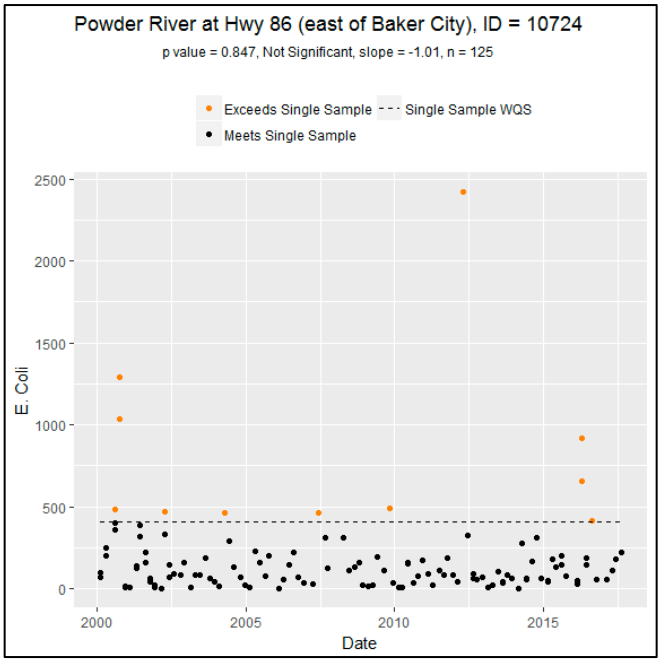
Site ID	Site Description	*E. coli*	pH	Dissolved Oxygen	Total Suspended Solids	Total Phosphorus
		# exceeding standard/N*			# >50 NTU/N**	# > 0.07 mg/L**
11490	**Powder River @ Hwy 7 (in Baker City)**	10/129 9/15***	1/110	0/103	4/103	23/110
10724	**Powder River @ Hwy 86 (below Keating)**	9/99	1/104	1/103	3/101	98/100

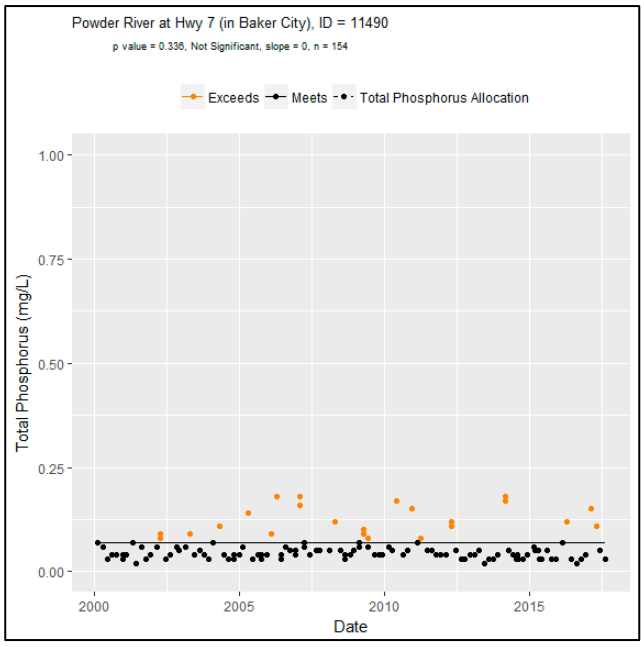
* N = # of observations
** TMDL load allocations
*** Bacteria standard: 30-day log mean of 126 per 100 milliliters, based on a minimum of five samples

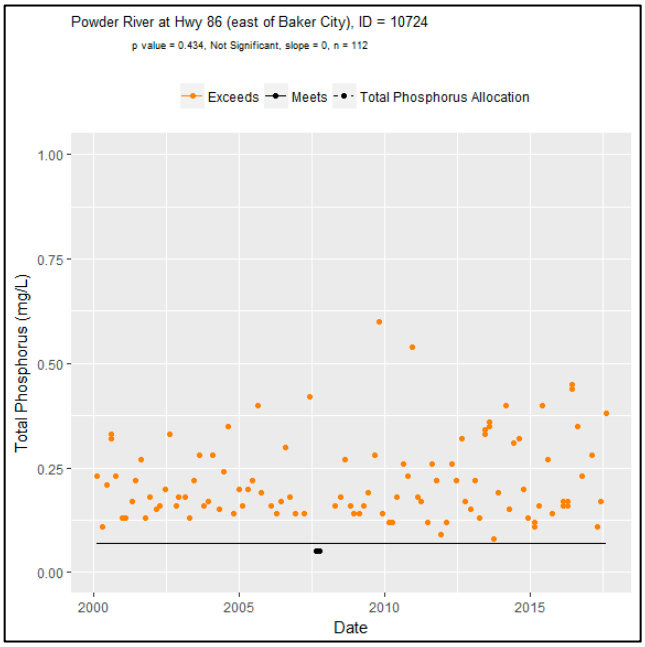
Graphs of the highlighted analyses were discussed at the biennial review to get more insight into the data.

Both *E. coli* and phosphorus increase between Baker and Keating. But the number of scope of exceedances of the *E. coli* standard were small compared to exceedances of the phosphorus load allocation. Total phosphorus is lowest in headwater streams and increases as it flows through agricultural lands toward Keating.









4.3.2 Land Conditions

Aerial photographs from 2007 and 2012 were analyzed for 11 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 4.3.2 Riparian Index Scores from Analysis of Aerial Photographs for 2007 and 2012

Stream	Measured Scores		% Difference (if notable)	Comments about Analyzed Reach
	2007	2012		
Beagle Creek	44.76	43.13	- 4	Narrow channel with good flow. Three diversions present along this reach. Most of the reach has a dense cover of riparian trees, except for the bottom 5%.
Daly Creek	33.96	35.72	+ 5	Stream was running bank full with some large wood visible in channel. Entire reach is stable and in good condition. Two diversions present.
Ebell Creek	34.87	35.43		Narrow channel, mostly stable. One diversion visible.
Gentry Creek	31.12	31.40		Mostly an engineered channel, with multiple impoundments. Lower and middle reaches are ditched. Some non-ditched areas show bank erosion.
Houghton Creek	32.81			Upper 75% is a narrow meandering stream, but lower section widens out and is incised. Only intermittent flow visible.
Love Creek	31.82	31.95		Narrow, slightly sinuous stream. Large numbers of cattle visible and appear to have free access to the creek. Stream banks generally look stable.
Magpie Creek	45.45	45.22		Upper 60% is a dry, partially indistinct channel. Lower section has visible water, a wider channel, and many cattle in the stream and along riparian grasslands.
Ruckles Creek	32.98	33.17		Middle section of the stream barely has a channel. Upper section flows through irrigated fields, lower section is ditched but with riparian trees.
Sag Creek	33.25	33.79		Nearly all of this stream has been channelized. May be used as an irrigation conveyance.
Second Creek	36.03			Upper 50% is a narrow channel, lower half is a series of impoundments connected by a poorly defined channel that was dry when photographed.
Sutton Creek	36.32	37.06		Most of this reach is stable and in good condition though some areas show damage due to cattle access, and cattle are visible.

A total of 11 streams were assessed in this basin in 2007. Riparian index scores for these streams ranged from a high of 45.45 for Magpie Creek, to a low of 31.12 for Gentry Creek. Beagle Creek had the largest percentage of tree cover, with one band at 56 percent. Two of the streams had essentially no tree coverage. Second Creek had the highest percentage of bare land with one band at 11 percent, while two streams had no bare land. Sag Creek had the greatest amount of bare/agriculture land with one band at 13 percent. Most of the streams were dominated by grass/agriculture cover, except Magpie Creek, which was dominated by shrub/agriculture (52 percent to 90 percent).

Of the nine streams assessed in the Powder Basin in 2012, only two had notable changes in landscape cover. Beagle Creek showed a 4 percent decrease in Riparian Index Score due to loss of tree cover in both the left and right bands. Daly Creek had a significant increase in shrub and shrub/agriculture cover, with a corresponding decrease in grass/agriculture. Aerial photographs will be analyzed for the last time in 2017 due to funding. Results will be presented at the next biennial review.

4.4 Biennial Reviews and Adaptive Management

ODA, the LAC, the LMA, and other partners met on April 13, 2022, to review implementation of the Area Plan and provided recommendations for the future (Tables 4.4a and 4.4b).

Table 4.4a Summary of biennial review discussion

Progress
• Good networking and coming up with solutions. • Landowners have healthy relationship with SWCD. • Some increase in water quality monitoring. • LAC meeting and discussions are helpful.
Impediments
• State agencies don't communicate enough among themselves. • Landowners don't get credit for the work they are doing on their own. • Lack of water quality monitoring data to show status of agricultural streams. • Lack of data to show improvements in either land conditions or water quality.
Recommended Modifications and Adaptive Management
• Collect baseline data to determine and set realistic goals. • Need a monitoring strategy, probably led by ODA an DEQ

Table 4.4b Number of ODA compliance activities in 2018-2021

Location	Cases		Site Visits	Agency Actions				
				Letter of Compliance		Pre-Enforcement Notification	Notice of Noncompliance	Civil Penalty
	New	Closed		Already in compliance	Brought into compliance			
Outside SIA	1	2	4	0	1	1	0	0
Within SIA	0	0	0	0	0	0	0	0

Appendix A: Waterbodies on the 2018/2020 303(d) List

POWDER RIVER SUBBASIN

Waterbody	River Miles	Season	Parameter
Anthony Creek	0 - 16	Summer	Temperature – Bull Trout (10.0^0 C)
California Gulch	0 – 4.4	Summer	Temperature - Rearing (17.8^0 C)
Cracker Creek	0 – 10.3	Jan 1 – May 15	Dissolved Oxygen
Dean Creek	.4 – 5.2	Summer	Temperature - Rearing (17.8^0 C)
Dutch Flat Creek	0 - 9.2	Year Round	Biological Criteria
Eagle Creek	0 – 21.1	Summer	Bacteria – E.Coli
East Fork Goose Creek	0 – 2.7	Spring/Summer	Turbidity
Elk Creek	0 - 7.7	Summer	Temperature - Rearing (17.8^0 C)
Indian Creek	0 – 5.2	Summer	Temperature –Bull Trout (10.0^0 C)
North Powder River	0 – 18.3	Summer	Temperature - Rearing (17.8^0 C)
North Powder River	0 – 24.3	Year Round	Bacteria – E.Coli
Phillips Reservoir	130 – 138.2	Year Round	Dissolved Oxygen
Phillips Reservoir *	***130 – 138.2***	***Year Round***	***Mercury***
Powder River	0 – 146.3	Year Round	Arsenic
Powder River	0 - 69	Summer	Temperature - Rearing (17.8^0 C)
Powder River	71.9 – 115.6	Summer	Temperature - Rearing (17.8^0 C)
Powder River	0 - 130	Year Round	Bacteria – E.Coli
Powder River	115.6 - 130	Year Round	Bacteria – Fecal Coliform
Powder River	0 - 130	Jan 1 – May 15	Dissolved Oxygen
Sawmill Creek	0 – 2.5	Year Round	Sedimentation
Sawmill Creek	0 – 2.5	Year Round	Temperature – Redband (20.0^0 C)
Silver Creek	0 – 6.1	Summer	Temperature - Bull Trout (10.0^0 C)
Sutton Creek	0 – 15.9	Year Round	Temperature - Redband (20.0^0 C)

*** Added In 2012**

BROWNLEE RESERVOIR SUBBASIN

Waterbody	River Miles	Season	Parameter
Aspen Creek	0 – 1.6	Summer	Temperature – Bull Trout (10.0^0 C)
Beecher Creek	0 - 2.4	Summer	Temperature – Rearing (17.8^0 C)
Big Elk Creek	0 – 2.1	Summer	Temperature - Bull Trout (10.0^0 C)
Clear Creek	0 – 8.7	Summer	Temperature - Bull Trout (10.0^0 C)
East Pine Creek	0 – 12.2	Summer	Temperature - Rearing (17.8^0 C)
East Pine Creek	12.2 – 18.7	Summer	Temperature - Bull Trout (10.0^0 C)

Elk Creek	0 – 9.5	Summer	Temperature - Bull Trout (10.0^0 C)
Lake Fork Creek	0 – 10.4	Summer	Temperature - Rearing (17.8^0 C)
Meadow Creek	0 – 3.3	Summer	Temperature - Bull Trout (10.0^0 C)
Morgan Creek	0 – 6.1	Year Round	Temperature – Redband (20.0^0 C)
Okanogan Creek	0 – 1.3	Summer	Temperature - Rearing (17.8^0 C)
Pine Creek	0 – 30.2	Year Round	Temperature – Redband (20.0^0 C)
Quicksand Creek	0 – 3.6	Year Round	Temperature – Redband (20.0^0 C)
Trail Creek	0 – 1.6	Summer	Temperature - Bull Trout (10.0^0 C)

Appendix B: Definitions

"Pollution" has the meaning given in ORS 468B.005(3) which states: 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 conveyance 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.

"Wastes" has the meaning given in ORS 468B.005(7) which states: 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. Other substances, which will or may cause pollution, include commercial fertilizers, soil amendments, composts, animal wastes and vegetative materials.

"Adaptive management" means making adjustments in management based on feedback from monitoring.

Compliance Definitions

A **Letter of Compliance (LOC)** tells the owner/operator that at the time of the inspector's site visit, the property was in compliance with all Area Rules and there were no conditions observed during the investigation, that are likely to cause a water quality problem in the near future.

A **Water Quality Advisory (WQA)** means the owner/operator is in compliance because there were no violations of Area Rules documented at the time of the inspector's visit, but the conditions on the property have the potential to violate the Area Rules in the future.

A Water Quality Advisory letter includes a description of the conditions that have the potential to violate the Area Rules, the statute or rule that may be violated, consequences of future documented violations, and a schedule of recommended corrective actions. The letter may also refer the landowner to other sources of technical assistance, and summarize other issues discussed during the investigation. The inspector will usually follow up to see if the changes effectively reduced the potential for a water quality problem.

A **Letter of Warning (LOW)** means the inspector found a violation of Area Rules during the investigation, but the pollution-causing activity was not egregious and was not done intentionally to cause water pollution. The Letter of Warning is an unofficial compliance action (not defined in Administrative Rule) that gives the landowner or operator at least one opportunity to correct the problem before he/she receives a Notice of Noncompliance. A Letter of Warning is not considered an enforcement action by the State.

A **Letter of Warning** includes a description of the conditions that violate the Area Rules, the statute or rule that is violated, consequences of future documented violations, and a schedule of recommended corrective actions. The letter may also refer the landowner to other sources of technical assistance, and summarize other issues discussed during the investigation. Although the landowner has the flexibility to choose the recommended actions or other practices best

suited to correct the problem on the operation, the inspector will follow up to see if the violation has been addressed.

A Notice of Noncompliance (NON) means the inspector found a violation of Area Rules during the investigation, and the violation was either (1) egregious or done to intentionally cause water pollution, or (2) a second violation after being issued a Letter of Warning. A Notice of Noncompliance includes a description of the conditions that violate the Area Rules, the statute or rule that is violated, consequences of current documented violations, and a schedule of required corrective actions. The letter may also refer the landowner to other sources of technical assistance, and summarize other issues discussed during the investigation.

A Plan of Correction (POC) usually accompanies a NON if the corrective actions require more than 30 days and directs the landowner to take specific steps to correct the problem. An inspector will follow up to confirm the landowner completed the required corrective actions and effectively addressed the violation.

A **Civil Penalty (CP)** is a fee that is assessed to a landowner whose agricultural activities caused either a willful and intentional violation of Area Rules, or who repeatedly failed to take steps to correct a violation. Oregon Department of Agriculture's Division 90 rules include a matrix for calculating the value of civil penalties for the Water Quality Program.

Sources of Impairment - from the DEQ Powder Basin Water Quality Status Report and Action Plan Summary - October 2013

Bacteria
Recent water quality data from sites located throughout the Powder Basin indicate that excessive bacteria levels are a widespread problem. Irrigation season bacteria levels are generally higher than non-irrigation season levels, with the exception of the two North Powder River sites where non-irrigation season levels are higher. High bacteria levels in water bodies are a concern because they pose a human health risk by enabling the spread of disease. Many projects have already been implemented in the basin to reduce bacteria loading from livestock and other sources.

Nutrients
The Snake River Hells Canyon TMDL established a limit on phosphorus concentrations at the mouths of the Powder and Burnt Rivers. Conservation projects in the Powder Basin have addressed impacts from excess nutrients and algae growth through projects such as nutrient management practices on farms, irrigation system improvements, and feedlot improvements. The phosphorus limits will be further examined and developed in the Powder basin TMDL.

Temperature
Increases in temperature, changes in stream flow, and stream habitat degradation can harm fish and other aquatic life, and have been identified as basin-wide concerns. Temperature monitoring is being conducted in the basin by DEQ and other stakeholders such as the U.S. Forest Service and the Powder Basin Watershed Council, with the goal of providing data for a temperature TMDL. Stakeholders in the basin have implemented projects to address temperature impacts by restoring stream channels, stabilizing stream banks, planting riparian vegetation, changing livestock management, and thinning juniper stands.

Sedimentation and Turbidity

Stream channels in portions of the Powder Basin have been observed to have embedded gravel conditions where the space between gravel particles is filled with fine sediment and one stream segment is 303(d) listed for excess turbidity caused by excess suspended sediment load. Many of these streams were originally identified as having water quality concerns related to non-point source pollution in DEQ's 1988 Assessment of NPS-Related Water Quality Problems. The major nonpoint source water quality problems identified in this report were related to riparian vegetation removal and associated high stream temperatures, and increased erosion leading to sedimentation. Excess sedimentation can be controlled through Best Management Practices (BMP) that can reduce erosion on farms, forests, roads, and urban areas.

Toxics

Sources of arsenic and mercury in the basin include natural geologic deposits and historic mining areas. Aerial deposition from local and global sources is also a major source of mercury in the basin.

Appendix C: History of Irrigation Management in the Management Area

People have been irrigating crops in the Powder/Brownlee Management Area for many years. Isaac Hiatt, writing a history of the county in 1893, said that a limited amount of irrigation had occurred since the first pioneers settled in the area in the early 1860s but that no extensive irrigation projects had been started up to that time. He speculated that "when the time comes that water is no longer needed for mining purposes, the ditches may be of more permanent value to the county by using the water for irrigating the land to which it can be conveyed." This is indeed what happened. The early miners dug an extensive array of ditches, and when mining stopped, farmers and ranchers used these ditches to bring water to their fields. Some of the ditches are still used today.

Hiatt envisioned a series of reservoirs at the head of the ditches to supply water through the growing season. His writings contain lengthy discussions of flooding and drought. For example, in June 1862 a party of settlers came to the junction of the North Powder and Powder Rivers and could not cross because of the water flowing out over the valley. They had to move upstream and constructed the first bridge across the Powder River, which soon became a toll bridge. However, the next spring in 1863 water was so short the miners were squabbling over the supply. Because of this shortage, Hiatt reported that the first "right to water" was filed in 1863 by a group of miners. They claimed 250-inches from Elk Creek.

The early settlers recognized the potential for agriculture in the management area if water could be brought to where it was needed. For example Hiatt (1893) wrote that some farmers in the Powder River Valley had converted sagebrush and greasewood into "the best meadow land. These are examples of what can be done by cultivating and irrigating." He estimated the potential number of irrigated acres could be 221,000, which is very close to today's 176,000 acres under irrigation.

The Baker Irrigation project was begun by private entities in the 1890s. This initial work consisted of building several small canals to deliver water to the fields. The Baker Irrigation District was formed in the 1930s and one of the first projects was to construct the Lilley Canal and the Lilley Pumping plant, which are located about 10 miles north of Baker City on the Powder River. In most years, irrigation water ran short by the end of the season; in 1967, Mason Dam was constructed and it created Phillips Reservoir.

In the lower Powder River area, irrigators began organizing ditch companies in the 1880s. The first was the Basche Ditch. The Lower Powder Irrigation District is thought to have been established in the 1930s. The districts' purpose was to distribute irrigation water to the farmlands in the Keating Valley. The Thief Valley Dam, the irrigation districts' only storage facility, was constructed in the early 1930s. Thief Valley was the first dam built on the Powder River. It is not considered to be a multi-purpose reservoir. The irrigators can completely drain the reservoir if they want.

The irrigation district delivers water from the reservoir via the lower Powder River where there are three smaller dams used to divert water into canals. Currently, the District includes 32 users and supports 7,300 irrigated acres.

The Powder Valley Water Control District was formed in 1962. It incorporates property in both Baker and Union Counties and covers about 350 square miles. Its function is to provide irrigation water to roughly 15,000 acres.

Much of the water for the Powder Valley Water Control District is supplied by Wolf Creek and Pilcher Creek reservoirs. The Wolf Creek dam is five miles northwest of North Powder; construction was completed in 1975. Pilcher Creek dam impounds Pilcher Creek about seven miles west of North Powder. Several pipelines are part of the district and they help distribute water to the irrigators. Using pipelines allows gravity pressure to run sprinklers.

When water runs short, it is divided among the irrigators by priority date. The earliest dates have the highest priority. Those irrigators on the west side of Baker Valley with priority dates of 1874 or older generally have water nearly all irrigation season. Those with 1880 through 1890 water rights have water early in the season during high stream flow times. Generally, the later water rights, 1900 and after, are served for only a short time and do not necessarily get served every year. Late in the summer, on some creeks, water becomes so scarce that only small heads of water are put into each ditch to provide drinking water for livestock.

History of natural resource management in the Powder/Brownlee Management Area

One of the earliest recorded explorations of the Powder River area was in 1811. Wilson Price Hunt led the John Jacob Astor overland expedition and passed through Baker Valley known then as The Lone Tree Valley. Hunt is responsible for the first crossing of the Blue Mountains to the Columbia thus establishing a passage for the western end of the Oregon Trail the major travel route to the West. He arrived in Astoria in 1812.

The purpose of these early expeditions was to find beaver and establish trading posts. Beaver populations declined rapidly during this time but have since recovered to some extent in recent years.

From 1841 through 1869, more than 250,000 Americans took the Oregon Trail to the West starting their journey in Independence, Missouri. Nearing the end of their journey, they arrived at Farewell Bend on the Snake River and proceeded to conquer the treacherous Burnt River Canyon. The trail ahead led them across Virtue Flat to Flagstaff Hill and into Powder River Valley.

In August 1845, a group of wagons led by Stephen Meek left the Oregon Trail for a shortcut to western Oregon. After suffering many hardships and deaths, the survivors reached The Dalles in October. While camped at a tributary of the John Day River, small yellow pebbles were found along the water's edge. Not realizing that the pebbles were gold, they were left behind in an old blue bucket and the legend of the "Lost Blue Bucket Mine" was born.

In 1861, gold was discovered in Baker County. Four men, searching for the fabled "Lost Blue Bucket Mine," found gold in Griffin Gulch, south of where Baker City is now located.

In the spring of 1862, the town of Auburn was laid out in Blue Canyon and soon grew to a population of about 5,000 people. Several other towns were founded in the same year.

At roughly this same time, the first farms and ranches were established in the area to feed the miners and town people. Some examples of the early agricultural activities follow.

Cowboys named Knight, Abbott, and Packwood drove a herd of cattle to supply beef to people in the area in the summer 1861. They crossed the Snake River in the Brownlee area and came upon a major tributary to the Powder River. They happened to shoot an eagle here and named the tributary Eagle Creek (Hiatt, 1893).

On June 16, 1862, Hardin Estes and Fred Dill filed the first claim to the Powder River Valley and they started a ranch near Washington Gulch. William Baldock arrived in September 1862 and saw an abundance of wild grass. He found a market for hay and cut many tons by hand that fall and winter. He charged between $50 and $60 per ton and he had $400 in cash after expenses and providing for his family that winter (Hiatt, 1893).

Joseph Kinnison came to the Powder River Valley in July 1862 and according to Hiatt (1893), he was the first to “plow a furrow” in Baker County the following spring of 1863. He had 40 acres in cultivation and grew a variety vegetables and other produce. Despite a late spring frost, he had a successful first year and made $4,000.

To facilitate mining, agricultural activities, and transportation, settlers began to build roads and ditches. For example, in 1863 the Sisley Toll Road was built from Weatherby to connect with the Old's Ferry Toll Road to the Snake River and the Old's Ferry. In the same year, the 125 mile long Eldorado Ditch, probably the world's longest hand-dug ditch, was surveyed and started.

For the next 20 years or so, the work of development continued at a steady pace. The local economy got a boost when in 1884 prospectors discovered gold near Cornucopia and the transcontinental railroad reached Baker City. By 1890, the population of Baker City was 6,663; larger than either Boise or Spokane.

Settlers had been logging from the beginning to build their houses with some land clearing for farming and for mining activities. Commercial logging began growing in the 1880s and 90s. Evidence of this is from 1890 the Sumpter Valley Railway was incorporated to carry logs from Sumpter Valley to the Baker City sawmills, and in 1892, the Oregon Lumber Company completed a sawmill in Baker City. By 1896, the Sumpter Valley Railroad reached Sumpter. By 1901, the population of Sumpter was 3,000 with over 80 businesses.

Agriculture in the area was expanding. As noted in the irrigation section, the Baker irrigation project was begun in the 1890s. An example of the importance of agriculture was the extension of the Sumpter Valley Railroad to Prairie City in 1910 to serve ranchers and farmers as well as lumber and mining.

Grazing

Skinner Kirby (1989) and Ernest Hudspeth (1979) have written personal accounts of ranching life in the early 1900’s. Both of these memoirs are rich in detail about every day life. The summary that follows highlights some of their relevant observations.

They describe activities of homesteaders clearing small plots of land to grow vegetables and some hay. They sold or traded excess produce to stores in town, and in return, they got flour, salt, sugar, and other items they could not produce themselves. Each family raised a few pigs, chickens, and cows for meat.

Kirby (1989) wrote about his father working for several cattle operations in addition to running his own small place. The herds were large - a 1,000 head or more. It was also common for

people like the Kirby family to buy cows from the Malheur area and drive them into the Baker Valley to graze in the summer and be sold that fall. As Kirby said, “The range was wide open and grass was plentiful.”

Kirby described the range conditions prior to 1916 as the grass being stirrup high with very little sagebrush and no cheat grass. He said, “its hard for people today to imagine how the grass and flowers were at that time.”

In time, cattle and sheep herds became so large that intense competition for range occurred. Livestock were harassed and killed, fistfights were common and a few people were murdered because of the range wars. Kirby attests that the Homestead Act of 1916 made things worse. More people arrived and sheep and cattle herds grew.
The grass was being overgrazed and cheat grass was increasing. Kirby called this the beginning of the “Great Change.”

> “No one seemed to care anything about it, just dog-eat-dog, and grab here and there to get along until the hills were crawling with cattle, sheep, and horses.”

Kirby estimated that in the 1920s and 30s there were about 100 bands of sheep in Baker County. If a typical band was around 1,200, that means there were more than 100,000 sheep in the area.

However, Kirby attributed as much as 50% of the damage to uncared for horses roaming the range year round. Thousands of horses were loose and many began to suffer from starvation. In 1926, the Humane Society pushed to have the horses gathered. In the spring of 1927, local ranchers worked together to gather the horses. Kirby participated in a roundup of nearly 7,000 animals.

Range conditions were getting so bad in the west that in 1934 Congress passed the Taylor Grazing Act. One of the main purposes of the Act was to stop transient livestock operators from grazing the public lands. The range was divided into allotments and each allotment assigned to an operator with an allowable number of livestock. Kirby, writing in 1989, felt that much progress had been made in restoring the range but much more work remained to be done.

Crop production
The livestock industry has always been the dominant agricultural industry in the management area. However, ever since Joseph Kinnison started his small produce farm in 1863, a variety of crops have been grown in the Baker area. The first farmers, like Kinnison, grew produce for local markets or for their own consumption. Hiatt (1893) said that farmers were called “begas” because they sold rutabagas to the miners the second winter after the first gold discovery. The next year the farmers produced too many rutabagas and ruined the market.

Homesteaders arriving at the turn of the century continued this style of farming. Kirby (1989) recalled his mother and father growing a wide variety of crops on their small homestead mostly for themselves to eat. Potatoes were their main cash crop.

Some produce was shipped out of the area. Hiatt (1893) wrote about orchards shipping thousands of boxes of fruit out on the Snake River. The main orchard producing areas were along the Snake River, north and south from what is now Huntington.

As more and more irrigation projects were completed, more acres of rangeland were converted to cropland. Hay was the primary crop. Farmers also grew a significant amount of dry land crops such as winter wheat.

Thirty to 40 years ago there were many more acres of wheat grown in the management area than there are today. As of 2001, wheat accounted for only three percent of agricultural commodity sales in Baker County. Local residents believe that climate change has caused some of the reduction in wheat production. Hiatt (1893), Kirby (1989), and Hudspeth (1979) described frequent heavy snows and very cold temperatures that are rarely seen today. So it may be that the climate has shifted to be warmer and dryer.

Mining Industry

The mining industry was beginning to have trouble in the 1910s. Miners began looking for new ways of extracting gold and other minerals. Dredging in the Sumpter Valley began in 1913, temporarily revitalizing the industry. Evidence of past mining is still seen in the dredge tailings lining the lower stretches of McCully Fork and Cracker Creek and covering the flood plain of the Powder River from Sumpter to Phillips Lake.

Besides the dredge tailings, the effects of the dredging are still felt today. A tremendous amount of silt was transported through the river system because of the dredging. Long time residents observed that the Powder ran muddy all year when the dredge was in operation. Much of the silt in Thief Valley Reservoir came from the dredging operations. The irrigation district has worked with DEQ to reduce turbidity problems when the reservoir is emptied. The silt collected in other parts of the valley too and has changed the configuration of the river.

A fire, which started in the kitchen of the Capital Hotel, destroyed much of Sumpter. The town's water supply failed thirty minutes after the start of the fire and dynamite was finally used to stop the flames. The fire, combined with the shutdown of the gold mines, ended the boom in Sumpter. The year was 1917.

The Sumpter Valley Railroad stayed to serve the agricultural and lumbering needs of the communities, and with the more modern machinery, they were able to re-work some of the huge dumps of rock. The community also was shortly revived during the 30s depression period when the price of gold rose and some of the mining activity returned, but with the advent of World War II, the prosperity of the old mining regions began to fade.

The source of the material in this section was the Dictionary of Oregon History and the Baker County Historical Society.

Appendix D: Summary of SWCD Monitoring Data

The SWCDs have maintained a database of water quality information during 1995-2002. Water temperature and other water quality information were collected at six sites on the upper Powder River mainstem between Phillips Reservoir and North Powder, Oregon; seven sites on the lower Powder River mainstem located below Thief Valley Reservoir to a site approximately 100 meters above the confluence of the Powder River with Brownlee Reservoir. Four sites were located on Pine Creek, and during 2002, sites were also established on Eagle Creek at two places.

The baseline inventory incorporates a sampling design that allows statistical testing with objective results that separate differences between sites located throughout the Basin. Differences in water quality samples between sites were stratified for influences due to elevation and distance between sites.

A total of 18 permanent sites were evaluated to determine the natural heating cycle and increases in water temperatures that occur above the expected natural thermal cycle. Thermal gradients were calculated for sites based on topographic elevation and rates of thermal increase and decrease during the summer periods June, July, and August. The detailed temperature records (by hours and days) were compared by sites on a daily, monthly, and annual basis using several types of statistical analyses.

Testing results indicate that each site responded to the natural heating and cooling cycle described by the laws of thermodynamics. The Powder River main stem, Wolf Creek, Pine Creek and Eagle Creek maintained a ubiquitous thermal pattern during each year when the sites were compared.

Stream temperatures increased during the summer months as elevation decreased. The rate of heating below Mason Dam was significantly different than other sites located downstream. Water entering the river system from Mason Dam outlet displays little temperature variation between daytime and nighttime temperatures. In the first 20 miles downstream, water temperatures are at or near the temperature standard of 68ºF on a daily basis.

A similar pattern was recorded below Thief Valley Reservoir. Water temperatures remained fairly consistent on a daily basis with minimal variation between the overnight low and maximum temperatures throughout the years 1995-2002.

Monthly water temperature differences in 1995 through 2002 were strongly associated with air temperature differences. Water temperature patterns followed air temperature patterns consistent with the decrease in elevation and decreases in stream velocity through reaches with high sinuosity. All sites displayed stream temperatures patterns reflective of the climatic influences associated with the Baker Valley geographic location.

The data indicated that the minimum overnight water temperatures are a major factor governing water temperatures. If the 5 a.m. water temperatures are above 64ºF, it is not possible for the daily maximum to cool and drop below 64ºF during the day. Overnight temperatures are governed by the air temperatures over the area during the 5 p.m. to 5 a.m. period.

Meteorological conditions were dominant when compared to existing anthropogenic attributes that may influence water temperature in the Powder River watershed. Climatic conditions determine the feasible range of water temperature and are a dominant component of the equilibrium temperature for the environment.

None of the segments were identified as having skewed patterns outside of the natural heating limits. It is likely that the state temperature standards are inappropriate for the Baker SWCD area and needs to be refined to better reflect the local environment and focus on the land activities; it should be replaced with a focus on water conditions exhibited in the sampling records caused by natural factors.

Thermal pollution due to insufficient riparian vegetation within the study area was not verified in the data testing. There was no evidence of a thermal pollution problem when sites were tested for the time involved in temperature increases at each site. Water temperature increases are not equal to the air temperature increases but are proportional.

Daily increases in water temperature were summarized by periods during the day: 5 a.m. to 9 a.m., 9 a.m. to 1p.m. and 1 p.m. to 5 p.m. The results of the statistical testing for the daily changes on the Powder Basin sites indicated that the water temperatures generally did not increase until the air temperatures increased 15ºF or more after 5 a.m. when the minimum low water temperature was established. The pattern was consistent throughout the study years at each site throughout the summer months.

The result of air temperatures increasing at least 15ºF before water temperatures increase 1ºF after the overnight low at 5 a.m. is consistent with the thermodynamic principles. The law establishes that a heating process takes place at a measurable rate when a large thermal reservoir is available for the exchange of energy from the highest concentration to the lowest.

The Baker Valley, Keating, and Eagle Valley District stream temperature patterns are similar to the results noted on the Burnt River (Borman and Larson, 2002) and other watersheds in Oregon (Larson and Larson, 1997 & 2002).

The Burnt River Study incorporated a model and field data, which demonstrated that flood irrigation and dam management enhances stream characteristics desirable in the Snake River Province watersheds. Without reservoir storage, the stream flows during the summer and fall would be much lower than current levels.

The Baker Valley, Keating, and Eagle Valley District data inventories of nutrients were examined but analyses were not conducted on the data due to the variability and insufficient number of samples required for comparison of the means. Oregon DEQ data was also examined; both data sets lack an adequate number of samples to be able to place a 90 percent confidence in the data.

A different strategy for sampling in future years is recommended. The “grab” type field sampling should be conducted in a way that will account for daily variations and assure a 90 percent confidence that the sample is not a sampling anomaly.

The effect of the stream temperature and water quality parameters such as phosphate, nitrates, pH, and dissolved oxygen on fish and aquatic life are best evaluated through the research studies focused on adaptations and physiological responses of species to changing stream conditions on a daily basis. Continued monitoring of the streams is needed to establish natural nutrient and stream chemistry levels that will meet the basin beneficial uses.

The SWCDs, acting as LMAs, will create a new monitoring plan in conjunction with the focus area and seek partners and funding to facilitate the monitoring.