MALHEUR RIVER BASIN AGRICULTURAL WATER QUALITY MANAGEMENT AREA PLAN

First Revision
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Developed by the

Oregon Department of Agriculture

with assistance from

Malheur River Basin Local Advisory Committee

and

Malheur County Soil and Water Conservation District

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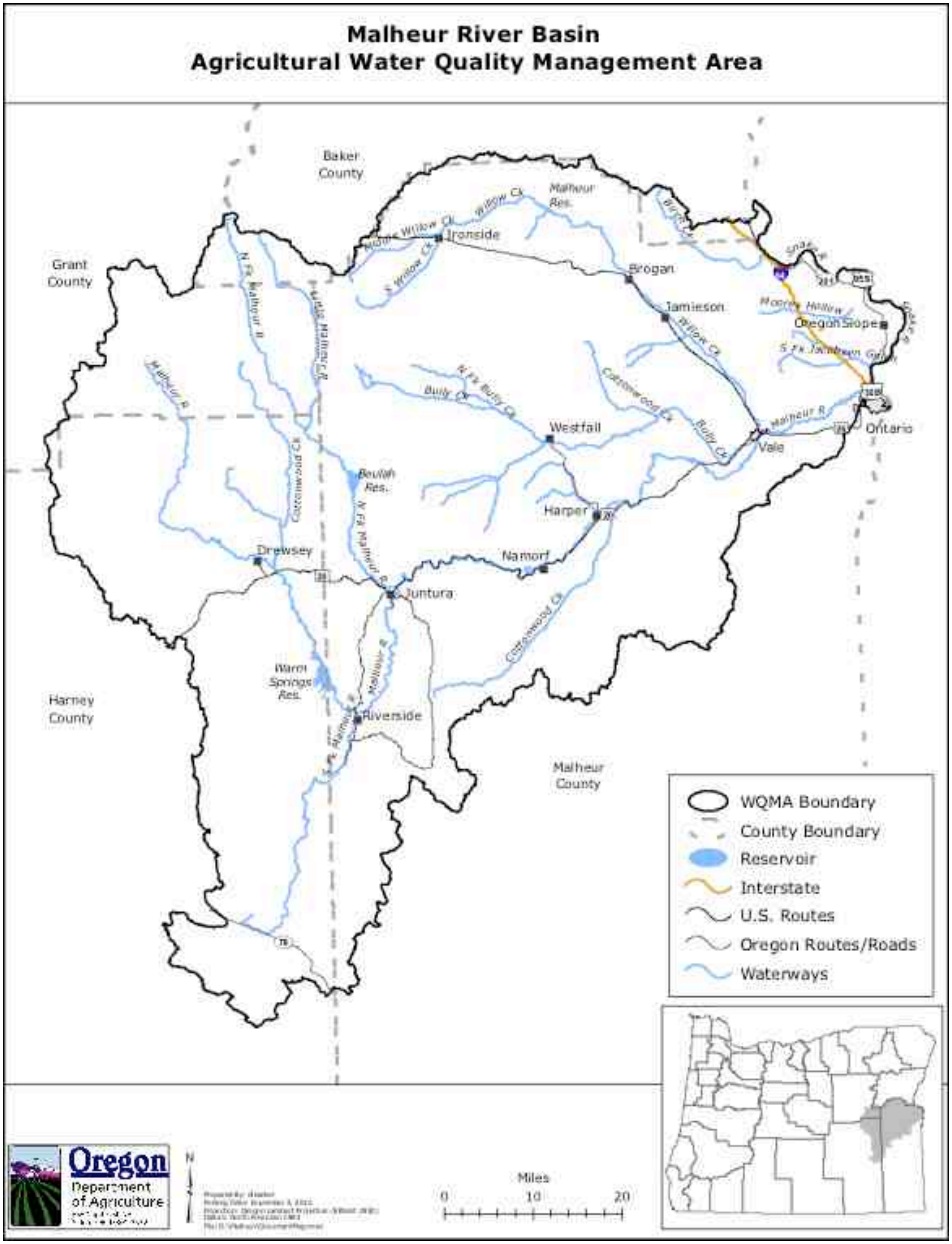
ACRONYMS

AgWQM	Agricultural Water Quality Management
CAFO	Confined Animal Feeding Operation
CFS	Cubic feet per second
CWA	Clean Water Act
DEQ	Oregon Department of Environmental Quality
EPA	United States Environmental Protection Agency
LAC	Local Advisory Committee
NRCS	Natural Resources Conservation Service
OAR	Oregon Administrative Rules
ODA	Oregon Department of Agriculture
OSU	Oregon State University
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
WQMP	Water Quality Management Plan (part of the TMDL)

MAP–MALHEUR RIVER BASIN MANAGEMENT AREA



FOREWORD

This Malheur River Basin Agricultural Water Quality Management Area Plan (Area Plan) provides guidance for addressing agricultural water quality issues in the Malheur River Basin (defined as the area drained by the Malheur River and its tributaries and the areas drained by Jacobsen Gulch and Moores Hollow).

This Area Plan applies to agricultural activities on all agricultural, rural, and forestry lands within the Management Area that are neither Federal nor held in Tribal Trust. The Area Plan also applies to agricultural lands in current use, those lying idle or on which management has been deferred, and lands (like private roads) not strictly in agricultural use but that support agricultural activities.

The purpose of this Area Plan is to identify strategies to reduce water pollution from agricultural lands through a combination of educational programs, suggested land treatments, management activities, and monitoring.

The provisions of this Area Plan do not establish legal requirements or prohibitions. However, the Area Plan cites associated Oregon Administrative Rules (OARs) for the Management Area (known as the Area Rules) that establish legal requirements.

The Oregon Department of Agriculture (ODA) exercises its enforcement authority for the prevention and control of water pollution from agricultural activities under the Area Rules (OAR 603-095-0900 through 603-095-0960) and OAR 603-090-0060 through 603-090-0120.

OAR 603-090-0030(1) states, "Agricultural water quality management area plans must describe a program to achieve the water quality goals and standards necessary to protect designated beneficial uses related to water quality, as required by state and federal law. An area plan shall include but not be limited to:

- A description of the geographical area and physical setting to which the area plan applies,
- A listing of water quality issues of concern,
- A listing of current designated beneficial uses that are being adversely affected,
- A statement that the goal of the area plan is to prevent and control water pollution from agricultural activities and soil erosion and to achieve applicable water quality standards,
- A statement of the water quality objectives of the area plan,
- A description of the pollution prevention control measures deemed necessary by the department to achieve the goal,
- A schedule for implementation of the necessary measures that is adequate to meet applicable dates established by law,
- Guidelines for public participation, and,
- A strategy for ensuring the necessary measures are implemented.

1. INTRODUCTION

The 1993 Oregon Legislature, in passing Senate Bill 1010, provided for ODA to be the lead state agency working with agriculture to address water pollution. The Federal Clean Water Act (CWA) requires each state to develop and implement a program to control water pollution. Oregon adopted Senate Bill 1010 to give agriculture an effective way to meet the requirements of federal and state clean water regulations.

The CWA requires each state to identify beneficial uses for each water body, designate parameters to monitor for each beneficial use, establish a standard for each parameter, report findings to Congress every two years, and correct water quality problems.

Section 303(d) of the CWA requires each state to develop a list of water bodies that do not meet the standards designed to protect the most sensitive beneficial uses. These water bodies are placed on the 303(d) water quality limited list.

The CWA also requires each state to develop a strategy and Total Maximum Daily Load (TMDL) to reduce pollution on each water body on the 303(d) list. A TMDL refers to the total amount of a pollutant a stream can accept and still support beneficial uses. In Oregon, the Department of Environmental Quality (DEQ) is responsible for determining beneficial uses, standards, and whether beneficial uses are being supported. DEQ also has the authority to develop TMDLs for point and nonpoint source pollution. ODA develops agricultural water quality management area plans and regulations to control pollution arising from agricultural activities. These plans also serve as ODA's implementation plan for the TMDL. DEQ finalized the Malheur River Basin TMDL in September 2010.

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

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

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

1. Sediment in irrigation return flows within acceptable levels.
2. Stream bank erosion within acceptable levels.
3. Elimination of placement, delivery, or sloughing of wastes into streams.
4. Adequate riparian vegetation for bank stability and stream shading consistent with vegetative site capability.

5. Sufficient vegetation on rangelands and pastures to filter sediment, utilize nutrients, control soil erosion, optimize infiltration of water into the soil profile, and minimize the rate and maximize the duration of runoff from precipitation.

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

The purpose of this Area Plan is not to tell anyone how to farm, ranch, or otherwise utilize their natural resources. However, the Natural Resources Conservation Service (NRCS) along with SWCD personnel in local offices can provide technical assistance to farmers, ranchers, and other agricultural land users to meet the goals of the Area Plan and requirements in the Area Rules.

2. MISSION AND GOALS

MISSION STATEMENT

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

GOALS

PRIMARY GOAL

Encourage voluntary compliance by agricultural producers with federal and state requirements to solve water pollution through planning, technical assistance, financial assistance and educational programs to increase awareness.

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

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

Goal 1: Secure adequate funding for administration and implementation of the program to achieve the Area Plan's mission and goals.

Tasks:

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

Goal 2: Enhance the level of awareness and understanding of water quality issues in the public and the agribusiness community.

Tasks:

1. Conduct education programs to promote public awareness of water quality issues and their solutions.
    a. Conduct workshops on water quality issues and the conservation practices that will help improve water quality.

b. Develop demonstration projects to showcase successful conservation practices and systems.
c. Organize tours of demonstration projects for agricultural managers and producers.
d. Produce and distribute brochures about water quality issues.

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

3. Involve the agricultural community in conservation education.
   a. Create and maintain a list of experienced agricultural operators willing to share their Effective Management Practices with other interested people by speaking, leading tours, and providing tour sites.

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

Goal 3: Determine site capabilities of riparian areas in the Management Area

Tasks:

1. Determine site capabilities of rangelands, streams, and riparian areas to support water quality.
   a. Seek funding to determine and map site capabilities.
   b. Map riparian site capabilities for the Management Area.

2. Publicize better understanding of southeastern Oregon ecosystems and their site capabilities to the general public and to the agricultural community in particular.

Goal 4: Foster the development of new so that Effective Management Practices are viewed as a changing array rather than a static set of practices. Innovations in science are needed to improve and broaden practice options.

Tasks:

1. Continue developing innovations in drip and other types of irrigation.

2. Determine the effects on stream flows and on grazing of the conversion from sage and juniper dominated communities to communities dominated by herbaceous plants.

3. Determine the season and intensity of grazing in riparian zones compatible with the maintenance and vigorous recovery of riparian vegetation and stream functions.

4. Determine which combination of treatments is needed to achieve effective weed control on public and private land to protect agriculture and water quality.
   a. Continue existing educational programs promoting weed identification and control.
   b. Determine what forage species could be combined with biological and/or herbicide control measures to compete with noxious weeds.
   c. Apply for grant money to supplement private landowner weed control efforts.

5. Examine how to manage constructed wetlands placed within surface drainage ditches and at the ditch outlets to prevent and control sediment and nutrient inputs into rivers and creeks.

Goal 5: Increase the adoption of Effective Management Practices to improve water quality

Tasks:

1. Identify Effective Management Practices that will protect and improve water quality in the Management Area.
    a. Develop and distribute a list of Effective Management Practices.
    b. Access ongoing research into Effective Management Practices.
    c. Obtain practical knowledge from agricultural producers.

2. Encourage agricultural producers to implement Effective Management Practices.
    a. Promote the benefits of having an individual farm conservation plan that incorporates Effective Management Practices.
    b. Showcase positive and effective conservation practices through workshops and tours of demonstration projects.

Goal 6: Monitor and evaluate the effectiveness of the Area Plan.

Tasks:

1. Establish how to measure plan success.
    a. Inventory and assess baseline watershed conditions and sources of pollution in the Management Area.
    b. Establish a plan of monitoring streams and surface water areas that accurately reflects current water quality conditions.
    c. Use water quality conditions from the pre-European settlement era in the Management Area as a baseline.
    d. Access and evaluate all monitoring data acquired by the local watershed council or other agencies.
    e. Inform landowners of monitoring results.

2. Determine number of producers implementing Effective Management Practices.
    a. Document the number of plans written and the acreage involved.

3. ODA monitors prohibited conditions in the Management Area.
    a. Document the number of complaints.
    b. Inventory key areas in the watershed for prohibited conditions.
    c. Monitor the availability of cost-share funds compared to the demand for conservation planning.

4. Revise the Area Plan and Rules as necessary based on biennial reviews of the Area Plan.

Some water quality goals have already been met, for example the construction and management of reservoirs resulted in downstream late-season flows that benefit fish and farmers.

3. GEOGRAPHIC SETTING

The Management Area includes the drainage area of the Malheur River and all its tributaries from the headwaters to the mouth, and the Moores Hollow and Jacobsen Gulch subbasins.

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

High Lake is the only natural lake of significant size in the basin, and it is a popular recreation area. However, there are several reservoirs; the largest are Warm Springs, Beulah, Bully, and Malheur. The South Fork is not dammed.

Climate

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

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

Topography/Geology

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

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

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

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

Water Resources

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

Flow in the upper zone is controlled by natural climatic cycles resulting in high spring flows and low summer flows. Flows on the Middle Fork at Drewsey range from 12,000 cubic feet per second (cfs) at peak flood stage to zero during dry years. On the North Fork above Beulah Reservoir, flows range from 4,000 cfs to 8.5 cfs.

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

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

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

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

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

Willow Creek has been straightened from the mouth to Brogan to facilitate farming. The natural channel has been modified, and the creek serves as an important drainage and irrigation canal for farmland in the area. Willow Creek between Brogan and Malheur Reservoir was placer mined and dredged for gold and silver in the past. The flow in this reach of the river is controlled by water released from Malheur Reservoir. Above the reservoir, water flow is controlled by natural cycles and irrigation demand.

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

Agriculture's Economic Importance to the Management Area

Agriculture and its related industries are the largest sector of the Malheur County economy. When measured by the percentage of total sales, food crop procurement and processing was the largest industry, followed by crop production; livestock production, procurement and feeding; and wholesale and retail trade. Malheur County's gross agricultural income for 2009 is estimated by Oregon State University (OSU) at $277,982,000. Cattle and onions were the top agricultural commodities, bringing in about $130,000,000.

The 2007 Census of Agriculture estimated that Malheur County had 1,250 farms on 1,170,664 acres. The average market value of the land and buildings was $1,028,826 per farm.

Irrigation

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

Furrow irrigation is the primary technique and is a desirable and viable method of irrigation when managed properly. It consists of placing water in furrows and allowing the water to flow downhill by gravity. When the water reaches the end of the field, it is collected in a small ditch, which could direct it to a variety of places. Usually the water is returned to an irrigation ditch and reused by another farmer down the line. By the time the water is returned to the Malheur or the Snake River, it has been used up to seven times.

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

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

4. WATER QUALITY ISSUES

The following rivers and streams on DEQ's 2004/2006 303(d) list do not meet water quality standards for:

- water temperature
- bacteria
- toxics
- dissolved oxygen
- chlorophyll a

WATERBODY	River Mile*	PARAMETER
Alder Creek	0-4.1	Temperature
Basin Creek	0-8.8	Temperature
Bear Creek	0-14.7	Temperature
Big Creek	0-6.1	Temperature
Bluebucket Creek	0-12.1	Temperature
Bully Creek	-0-12.8	Chlorophyll a
Bully Creek	15.9-57.1	Bacteria
Cottonwood Creek	0-35.3	Temperature
Crane Creek	0-1.1	Temperature
Dry Creek	0-8.3	Temperature
Elk Creek	0-1	Temperature
Jacobsen Gulch, South Fork	0-3	Bacteria
Lake Creek	0-11.9	Temperature
Little Crane Creek	0-9.3	Temperature
Little Malheur River	0-28.5	Temperature
Malheur River	0-67	Bacteria, Chlorophyll a, DDT, Dieldrin
Malheur River	93.4-119.9	Bacteria
Malheur River	126.3-185.9	Temperature
Malheur River	0-186.1	Dissolved oxygen
Malheur River, North Fork	0-18	Bacteria
Malheur River, North Fork	20.8-59.3	Temperature
Pine Creek	0-24.7	Temperature
Pole Creek	0-6.3	Temperature
Shepherd Gulch	0-3.6	Bacteria
Stinkingwater Creek	0-27.8	Temperature
Summit Creek	0-14.2	Temperature
Warm Springs Creek	0-9	Temperature
Willow Creek	0-027.4	Bacteria, chlorophyll a

*River miles measured from the mouth; the mouth is designated as Mile 0.

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

Special Status Species

Bull trout are found in the North and Middle forks of the Malheur River. In 1998, the federal government listed the bull trout as a threatened species. Redband trout may be proposed for federal listing in some watersheds within the state. It is now a state of Oregon sensitive species.

Beneficial Uses Not Supported in the Management Area

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

Elevated stream temperatures can stress aquatic organisms and deplete oxygen from water. Oregon's temperature standard states that, "for farming and ranching operations on state or private lands, water quality standards are intended to be attained and are implemented through the Agricultural Water Quality Management Act (ORS 568.900 to 568.933) and rules thereunder, administered by ODA. Therefore, farming and ranching operations that are in compliance with the Agricultural Water Quality Management Act requirements will not be subject to DEQ enforcement under this rule."

Excessive nutrients, such as nitrogen and phosphorus, can increase plant growth, which in turn can increase pH and reduce dissolved oxygen through daily respiration and photosynthesis processes.

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

Malheur River Basin Total Maximum Daily Load (TMDL)

The TMDL was finalized by DEQ in September 2010 and submitted to the Environmental Protection Agency (EPA) for approval. The TMDL focuses primarily on phosphorus, bacteria, and temperature. According to the TMDL, total phosphorus in the Malheur River at Ontario must be reduced by 81-87 percent to meet standards in the Snake River, primarily through reduction in sediment in irrigation return flows. Cleaner return flows will also reduce bacteria levels. High water temperatures are to be moderated primarily through improvements in riparian vegetation. Streams that are on the 303(d) list for dissolved oxygen are to be delisted.

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

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

<u>4.3 Goals and Objectives</u>
The goal of this WQMP is to reduce nonpoint source pollution in the form of nutrient, bacteria, pesticide and solar heating to the Malheur River and its tributaries. This goal will be achieved through the implementation of best management practices in agricultural as well as urban areas, and the implementation of riparian vegetation restoration projects. With regard to riparian vegetation restoration, land managers should use the information in the TMDL and referenced documentation as a resource but defer to site specific conditions when establishing site potential vegetation.

<u>4.4 Proposed Management Strategies</u>
DEQ recognizes that restoration efforts have been underway in the Malheur River Basin for many years. It is also widely recognized that much more work is needed, and that success depends on a united pro-active approach that involves all stakeholders in the basin. DEQ is reliant upon Designated Management Agencies for programs and projects that will address sources of non-point pollution. The following is a list of conditions that need to be addressed by TMDL implementation plans:

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

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

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

DEQ expects that the next biennial review will incorporate measures to ensure achievement of the TMDL load allocations and surrogate measures for the Malheur River Basin and Middle Snake-Payette Subbasin. The biennial review will also include a timeline and milestones for progress toward achievement of the surrogate measures and load allocations, and how progress will be monitored.

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

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

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

4.12 Monitoring and Evaluation
It is anticipated that monitoring efforts will consist of some of the following types of activities:

- *Reports on the numbers, types and locations of projects, BMPs [Best Management Practices] and educational activities completed.*
- *Water quality monitoring for parameters such as temperature, sediment, nutrients, bacteria and pesticides.*
- *Monitoring of riparian condition, percent effective shade, channel type, and channel width/depth to assess progress toward achieving system potential targets established in the temperature TMDL.*

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

Examples of Best Management Practices for Flood Irrigated Lands are listed below:

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

- *Improved Confined Animal Feeding Operation (CAFO) Practices*[1]

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

5.2 Temperature and Flow Related Mitigation Activities

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

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

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

5. RESOURCE CONDITION/ASSESSMENT

The following discusses historical, existing and potential resource conditions in the Management Area and how they may relate to water quality and watershed health.

Native American Activities

Humans have influenced resource conditions in the basin for thousands of years. Prior to European settlement, ancestors of the Burns-Paiute people sustained themselves with local natural resources. They were called the Wadatika Band, one of several bands of Northern Paiute. Archeological evidence indicates the Wadatikas lived primarily near Malheur and Harney Lakes 10,000 years ago. But as the climate changed and the lakes dried up, they began to make seasonal migrations in search of food. Small family groups would travel separately. Throughout the year, the groups would hunt deer, elk, mountain sheep, small animals, and birds. In the spring, they would gather roots on the hillsides and meadows, and fish for salmon in the Middle Fork of the Malheur River.

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

By the 1840s, the Northern Paiute bands had acquired horses (Jerofke, 1999). Some reports by early explorers indicate that at least some Paiute bands, in what is now Nevada, had horses before the 1820s. Clearly, horses and other European goods were introduced into the surrounding area by the mid-to-late 1700s (Fowler and Liljeblad, 1986). The LAC believes that grazing is protected under the Federal Antiquities Act because it was initiated by the Northern Paiute so long ago.

After many years and many disputes, the Burns Paiute Reservation was established. Today, individual Tribal members own more than 11,000 acres scattered in areas to the east of the reservation, and there are 383 enrolled Tribal members.

Soil Erosion

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

Some poor agricultural management in the past contributed to excessive loss of topsoil and sediment flows into the Snake River system. However, improved tillage, irrigation, and harvest practices have reduced lowland soil and sediment loads in the Management Area's waterways. Recent practices of laser leveling, straw mulching, polyacrylamide, filter strips, sediment ponds and incorporation of sprinkler and drip irrigation in place of surface furrow irrigation retain cropland topsoil, thus reducing and controlling water pollution.

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

Public land livestock grazing today is less than half of what it was in the early history of settlement in the west. Vegetation problems that occur on the range now are due to a variety of causes. Some examples are:

- The invasion of noxious weeds and fire suppression, which have altered the historic vegetation composition.
- Building access roads and highways, which changed the valleys, drainage ways, streams, and vegetation.
- Re-channeling of streams to accommodate human traffic has also influenced vegetative changes. Most native vegetation in the arid, lower elevation valleys has been replaced by agricultural crops.
- Overgrazing by feral horses.

Noxious Weeds

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

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

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

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

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

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

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

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

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

- livestock grazing,
- fire,
- chemical,
- mechanical, and
- biological controls.

Juniper Expansion

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

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

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

In the Malheur River Basin, there is a need to:

- Determine the role of juniper in limiting soil water storage and aquifer recharge, modifying the pattern of water yield from sustained year-round flow to high spring runoff followed by minimal summer and fall flows,
- Quantify the competitive impacts of juniper on other species,
- Document the expansion of juniper,
- Model the watershed in terms of water delivery with and without controlling juniper, and
- Establish effective juniper control practices in the basin.

Forest Lands

Forested uplands are located in the northwest corner of the basin. Prior to fire suppression, open ponderosa pine stands dominated. Presently, understory conifers and shrubs crowd the forests. Unnaturally dense stands of trees prevent snow drift and the deep recharge of aquifers. More frequent fires would reduce this crowding.

Riparian Areas

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

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

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

Healthy riparian vegetation benefits farmers and ranchers. Some benefits include increased forage production, reduced streambank erosion, increased late season flows and stable stream channels. Techniques that improve riparian area management can lead to economic benefits as well. One example is Bear Creek on the Bureau of Land Management's Prineville District. Prior to 1976, the area was a single pasture licensed for 72 animal unit months. Riparian vegetation and stream channel conditions were poor. After the Bureau of Land Management and the permittee changed their management, animal unit months are now almost 360 and the permittee is spending less money on his annual hay bill. Riparian vegetation has recovered, streambank erosion has decreased, and the quality and quantity of the flow has improved to the point that trout use the area (Leonard et al., 1997).

Livestock

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

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

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

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

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

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

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

Groundwater

Well monitoring studies by state and federal agencies detected nitrate and Dacthal di-acid contamination in the shallow aquifer within the Lower Willow Creek and irrigated portion of the main Malheur River Basin. This area of the Malheur River Basin was designated a Groundwater Management Area in 1989 by Oregon DEQ for nitrate and Dacthal residue levels.

Nitrate concentrations found in the groundwater are strongly influenced by agricultural fertilization, shallow depth to water table, large amounts of irrigation water applied, permeable soil types, and direction of ground water flow. Although nitrates were detected in the majority of wells, only some wells were above EPA maximum contamination level for drinking water (10 mg/l for nitrate-nitrogen). The highest nitrate levels were around Cairo Junction, Vale, Annex, and Nyssa .

Dacthal was a herbicide commonly used in onions for decades until 1998 when it was discontinued. Dacthal residue levels ranged from no detection to several hundred parts per billion. A lifetime health advisory level of 4,000 parts per billion has been established by the EPA for Dacthal and its breakdown products.

Groundwater moves an estimated 0.4 mile per year in the Cairo Junction area. Therefore, it may take over 11 years for water in the Cairo Junction area to discharge. Other estimates have indicated it will take 20 years for the groundwater to move from the upper reaches of the aquifer to the lower discharge areas.

The contamination of nitrates and Dacthal di-acid is believed to have occurred over decades of irrigation. Through voluntary implementation of improved practices such as irrigation water and nutrient management, the shallow aquifer has started showing declines in nitrate and Dacthal residue levels (Shock, et al., 2000). Due to the slow movement of the groundwater in the shallow aquifer, it will take decades to realize the full benefit of improved agronomic practices. DEQ concluded in 2010 that “there has been overall improvement in groundwater nitrate concentrations from 1991 through 2009” and recommends that “continued and perhaps expanded BMP implementation is needed to attain and maintain water quality improvements”.

Surface Water

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

A summary of accomplishments can be found in the Ontario Hydrologic Unit Area Final Report 1990 - 1997 (Anon., 1998). This report documents significant reductions in soil loss, increases in acres under nutrient management plans, and gradual declines in average groundwater nitrate levels.

In 1978, the county appointed a Citizen’s Water Resources Committee to develop a nonpoint source water quality management program. As part of this plan, the county conducted two years of intensive water sampling. The final report documented sediment loss, fecal coliform concentrations above acceptable levels and elevated levels of nitrogen and phosphorus in some areas (Anon., 1981). The TMDL cites improvements in E. coli and sediment levels, but indicates that they and nutrient levels are still concerns.

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

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

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

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

6. WATER QUALITY OBJECTIVES

Resource Concern #1 - Pollution Control and Waste Management

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

Objective
Reduce waste discharge to the maximum extent practicable.

Performance Criteria
1. Runoff is diverted away from accumulated waste or areas of high animal usage.
2. Waste accumulations are placed on low-permeability surfaces, such as concrete, clays, or compacted silts where water does not pond.
3. Animals are confined where there is little chance of transporting pollutants to waters of the state.

Resource Concern #2 – Sediment in Irrigation Return Flows

Connection To Water Quality & Beneficial Uses

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

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

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

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

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

Resource Concern #3 - Riparian Area Management

Connection To Water Quality & Beneficial Uses
Vegetation, both in the uplands and in the riparian area, plays a critical role in water quality. Generally, healthy plant communities:

- Hold soil in place,
- Protect streambanks,
- Capture, store and safely release precipitation,
- Filter nutrients from both the groundwater and surface runoff, and

- Provide shade to moderate water temperatures.

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

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

Objective
Riparian vegetation to provide 1) sufficient root mass for stream bank stability and 2) shading to reduce the solar heating rate of surface water.

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

Technical criteria to determine attainment of this condition include but are not limited to:
1. Ongoing natural recruitment of riparian vegetation is evident.
2. Management activities minimize the degradation of established native vegetation.
3. Management activities maintain at least 50% of each year's growth of woody vegetation - both trees and shrubs.
4. Management activities maintain streambank integrity through 25-year flood events.

Resource Concern #4 - Streambank Stability

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

Objective
Riparian systems withstand a 25-year event.

Performance Criterion
Bank stability assessment methods will be patterned after EPA or Rosgen monitoring protocols.

Resource Concern #5 - Rangeland and Pasture Management

Connection To Water Quality & Beneficial Uses Affected
Desirable upland native vegetation functions as a water trap and filter, where rain and snowmelt is captured and incorporated into the sub-surface soil layers. Any decline in range condition, as measured by the NRCS's site guides, affects water infiltration rates into the sub-soil where surface runoff may supersede infiltration. Reducing infiltration rates lead to damaging floods, erosion and lower late season flows. Although riparian areas are vital to water quality, they comprise only a small percentage of the landscape. It is important for water quality purposes to maintain and improve the condition of all vegetation in the watershed.

Objective
Protect and improve range conditions.

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

7. PROHIBITED CONDITIONS

Voluntary efforts are the focus of the ODA, Malheur County SWCD and Local Advisory Committee. However, a landowner may refuse to take advantage of voluntary compliance opportunities. In this case, the ODA has enforcement authority to ensure pollution control. At the same time, the ODA does not mandate or prohibit any specific agricultural activity. To maintain this flexibility, the Administrative Rules describe the following Prohibited Conditions:

603-095-0940: Prohibited Conditions

(1) All landowners or operators conducting activities on lands in agricultural use shall comply with the following criteria. A landowner shall be responsible for only those conditions caused by agricultural activities conducted on land controlled by the landowner. A landowner is not responsible for prohibited conditions resulting from actions by another landowner. Conditions resulting from unusual weather events (equaling or exceeding a 25-year storm event) or other exceptional circumstances are not the responsibility of the landowner. Limited duration activities may be exempted from these conditions subject to prior approval by the department. The intent of these rules, in accordance with the Clean Water Act, is to protect clean water while also maintaining the economic viability of individual farming enterprises.

(2) Placement, Delivery, or Sloughing of Wastes: Effective upon adoption:
No person subject to these rules shall violate any provision of ORS 468B.025 or ORS 468B.050.

(3) Irrigation Surface Water Return Flow

(a) After January 1, 2006, irrigation surface water return flow to waters of the state shall not cause an excessive, systematic, or persistent increase in sediment levels already present in the receiving waters, except where the return flows do not cause the receiving waters to exceed established sediment standards.

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

(4) Active Streambank Erosion

(a) By January 1, 2006, no person may cause active streambank erosion beyond the level that would be anticipated from natural disturbances given existing hydrologic characteristics.

(5) Riparian Vegetation

(a) By January 1, 2006, no conditions are allowed that prevent the establishment and development of adequate riparian vegetation consistent with vegetative site capability to control water pollution by providing control of erosion, filtering of sediments, moderation of solar heating and infiltration of water into the soil profile.

(6) Range and Pasture Management

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

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

The 'Waste Rule' (603-095-0940(2)) currently is state law (ORS 468B.025 and ORS 468B.050). ORS 468B.025 states that no person shall:

(1) (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) Violate the conditions of any waste discharge permit issued under ORS 468B or ORS 568.

ORS 468B.050 refers to situations when permits are required, such as for certain confined animal feeding operations.

Definitions:

Wastes include manure, commercial fertilizers, soil amendments, composts, vegetative materials, or any other substances that will or may cause water pollution (OAR 603-095-0010(53)).

Waste discharge means the discharge of waste, either directly or indirectly, into waters of the state (OAR 603-095-0010(54)).

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(7)).

Waters of the state include lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, marshes, inlets, canals, and all other bodies of surface or underground waters, natural or artificial, public or private (except those private waters which do not connect to natural surface or underground waters) within Oregon (from ORS 468B.005(8)).

8. IMPLEMENTATION STRATEGY

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

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

Education

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

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

Conservation Planning

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

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

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

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

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

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

Monitoring

Based on funding, the Malheur County SWCD will lead monitoring efforts that determine water quality of drains to area rivers, prioritizing areas for water quality improvement projects, and tracking improvements in water quality over time.

ODA accepts water quality results from samples collected and analyzed using state-approved protocols. The LAC expects DEQ to do likewise.

9. SCHEDULE FOR IMPLEMENTATION

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

Implementation of this Area Plan began as soon as the Area Plan was approved by ODA, and built on activities already underway.

For example, since 2003, the following have been accomplished in the Willow Creek watershed:

Accomplishments
Individual projects (excluding laterals) = 56
Acres converted from furrow to sprinkler = 1, 692
Feet of laterals piped = >190,000
Feet of mainlines piped = 81,575
Feet of drains and canals piped = 21,859
Number of pumpback systems = 15 systems serving 1,175 acres
Number of off-stream water troughs installed = 19
Feet of pipe for troughs = 10,210
Feet of cross-fencing = 13,200
Feet of riparian and wetland protection fencing = 70,330
Riparian plantings = 4,000
Number of constructed wetlands = 3
Acres of rangeland improved = 755
Acres served by piped laterals = >6,500

Funding

Oregon Watershed Enhancement Board	$4,398,998
Bureau of Reclamation	375,000
Malheur Watershed Council	12,672
Vale-Oregon Irrigation District	1,499,470
Owyhee Irrigation District	165,250
Warmsprings Irrigation District	16,060
Lower Willow Creek Working Group	3,890
Malheur County Weed Advisory Board	300
Oregon Department of Fish and Wildlife	300
ODA	14,030
Pheasants Forever	1,050
Private landowners	1,315,080
TOTAL	**$7,852,100**

To measure progress, the ODA, in consultation with the LAC, DEQ, and SWCD will identify interim benchmarks for agriculture to strive for over designated time periods and at a scale suitable for measuring progress. The benchmarks will be documented in the Area Plan and reported in the biennial reports prepared for the Board of Agriculture. ODA will determine the tasks in the scopes of work in consultation with the SWCD and may consult with DEQ staff to review the adequacy of that scope to make significant progress toward meeting the pollutant reduction targets set in the TMDLs.

With sufficient funding, the following will be accomplished by the 2015 Biennial Review of this Area Plan.			
	Monitoring	**Outreach/Education**	**Implementation**
Irrigation-induced erosion	WQ: Create and implement monitoring strategy; delineate drainage basins for WID, VOID and OID; define priority basins for WID. Implementation: Track miles of pipeline installed, pumpback systems, wetlands, etc.	Share information from monitoring with agricultural community. Get their input on priorities.	1. Implement 6+ projects that include projects such as piping laterals, upgrading on-farm irrigation systems, constructing sediment basins (with or without pumpback systems) and wetlands 2. Develop restoration plan for WID, begin implementation based on 2011 drainage delineation 3. Identify VOID and OID priority drain areas
Riparian conditions in the upper watershed	Riparian conditions: No monitoring yet. First do outreach. Review existing riparian info to identify priority stream reaches Implementation: Track #, miles, and acreage of riparian improvement projects	4 PFC/WQ trainings (Drewsey, Juntura, Brogan)	3 streamside vegetation projects
Bacteria/nutrients from livestock	WQ: Continue monitoring in the lower watershed	4 PFC/WQ trainings (Drewsey, Juntura, Brogan) Distribute NRCS practices for livestock use of hay meadows	8 projects to contain manure and restore riparian vegetation

10. MONITORING

Contingent on funding, a monitoring plan will be implemented to:

1. Characterize baseline conditions:
   - Existing water quality
   - Prohibited land conditions
     - percent of eroding streambank on a named-tributary basis
     - excessive sediment, nutrients, and E. coli in irrigation return flows
   - Site potentials of riparian vegetation throughout the Management Area. A map of site potentials will be created.
2. Track Area Plan implementation
3. Evaluate Area Plan effectiveness

With this knowledge, the LAC, the SWCD, and ODA will refine and improve this plan in the future. We need the means to determine where our problems are and what we can do to correct them. This is part of our adaptive management strategy.

The LAC strongly expressed a desire to see more extensive analysis of existing data and collection of new data to more precisely determine agriculture's contribution to water quality problems in this subbasin. What follows is an outline of the monitoring and assessment process the Malheur County SWCD, with funding and cooperation from DEQ, ODA, and the Oregon Watershed Enhancement Board will conduct to address the LAC's concerns.

A. Existing Water Quality

1. Locate existing water quality data for the Management Area. Sources for existing information include the Malheur County SWCD, the local watershed council, DEQ, EPA, USDA Forest Service, and Bureau of Land Management.

2. Analyze existing data for trends in water quality, and for indications of background concentrations. Background concentrations can be determined by looking at chemical concentrations in water samples taken in areas upstream of any land development.

3. After identifying data gaps in the information collected, use a hierarchical design of sampling to focus at the watershed level. Secondary sites will be chosen to monitor potential contributing sources and to follow up on the effectiveness of adaptive management changes.

B. Land Condition Monitoring

1. Active Streambank Erosion

Several protocols exist to assess stream bank stability, including Rosgen (1996) and the EPA monitoring protocol for bank stability after Platts, et al., (1983). No monitoring is currently planned.

2. Placement, Delivery of Sloughing of Wastes

Initial monitoring for this Prohibited Condition will be visual inspection. If visual inspection discloses a potential problem, then an appropriate monitoring protocol may be selected to determine the extent of water pollution. The nature of the waste involved will determine which monitoring protocol is appropriate.

3. Irrigation Surface Water Return Flow

Turbidity at the site of return flow should be measured periodically to ensure that return flow turbidities do not exceed those of the stream into which the return flows. Bacteria should be measured to ensure that *E. coli* levels don't violate standards. Nutrients should be measured to show that nutrients have not been added to the concentration already present in the irrigation water delivered.

4. Riparian Vegetation

Photographic records with a time sequence of photographs taken from the same point are the simplest method for qualitative assessments and for monitoring of trends. The greenline transect provides a more quantitative measurement of riparian vegetation. A protocol for mapping riparian vegetation site capability will be developed.

5. Groundwater

The current groundwater monitoring program should be continued.

C. Track Plan Implementation

- Track the reduction of soil erosion and water temperature from agricultural land in the basin
  - Improvement of bank stability
  - Improvement of riparian conditions
  - Improvement of nutrient, animal waste and irrigation management
- Promote landowner stewardship by encouraging the adoption of Effective Management Practices
  - Track the number of Effective Management Practices being used in the basin
- Increase public awareness and understanding of agriculture's contributions to improving water quality
  - Track the number of participants in outreach activities
- Pursue funding for private landowners to implement water quality improvement projects
  - Track the number of successful grant applications

D. Evaluate Area Plan Effectiveness

The ultimate measurement of success will be a continuation of the ongoing improvement of water quality in this basin. More work needs to be done to establish baseline data and determine if water quality can be improved. However, it must be recognized that in many areas the water quality is good now and probably cannot get any better, due to improvements already made by landowners, e.g. removal of manure and pushup dams, improvements in irrigation methods, and miles of riparian restoration.

11. PUBLIC PARTICIPATION

The director of ODA appointed the LAC to represent:

- Local agricultural producers
- Local landowners
- Local environmental interests
- Local recreation interests
- Malheur County SWCD
- Malheur Watershed Council

They helped develop this Area Plan and the associated Area Rules and participate in biennial reviews of the Area Plan and Rules. The public is invited to participate in the biennial reviews of the Area Plan and its implementation.

REFERENCES

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

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

Anon. 1998. Ontario Hydrologic Unit Area Final Report 1990-1997. Malheur County Soil and Water Conservation District. Ontario, Oregon 15 p. Plus appendices.

Anon. 1999. Malheur Basin Action Plan. Malheur-Owyhee Watershed Council. Malheur Soil and Water Conservation District. Ontario, Oregon. 57 p. Plus appendices.

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

Census of Agriculture. www.agcensus.usda.gov

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

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

Leonard, S., G. Kinch, V. Elsbernd, M. Borman, S. Swanson. 1997. Riparian area management. Grazing management for riparian-wetland areas. U.S.D.I. Bureau of Land Management. Technical Reference 1737-14.

Platts, W.S., W.F. Megahan, and G.W. Minshall. 1983. Methods for evaluating stream, riparian, and biotic conditions. Gen. Tech. Rep. INT-138. USDA Forest Service, Intermountain Forest and Range Experiment Station. Ogden, Utah.

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

Richerson, P.M. 2010. Third Northern Malheur County Groundwater Management Area Nitrate Trend Analysis Report. Oregon Department of Environmental Quality.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO.

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