

# **WILLOW CREEK AGRICULTURAL WATER QUALITY MANAGEMENT AREA PLAN**

**Guidance Document**

**developed by**

**The Willow Creek  
Local Advisory Committee**

**with assistance from**

**Oregon Department of Agriculture  
and  
Morrow Soil and Water Conservation District**

**June 11, 2003  
Revised March 5, 2008**

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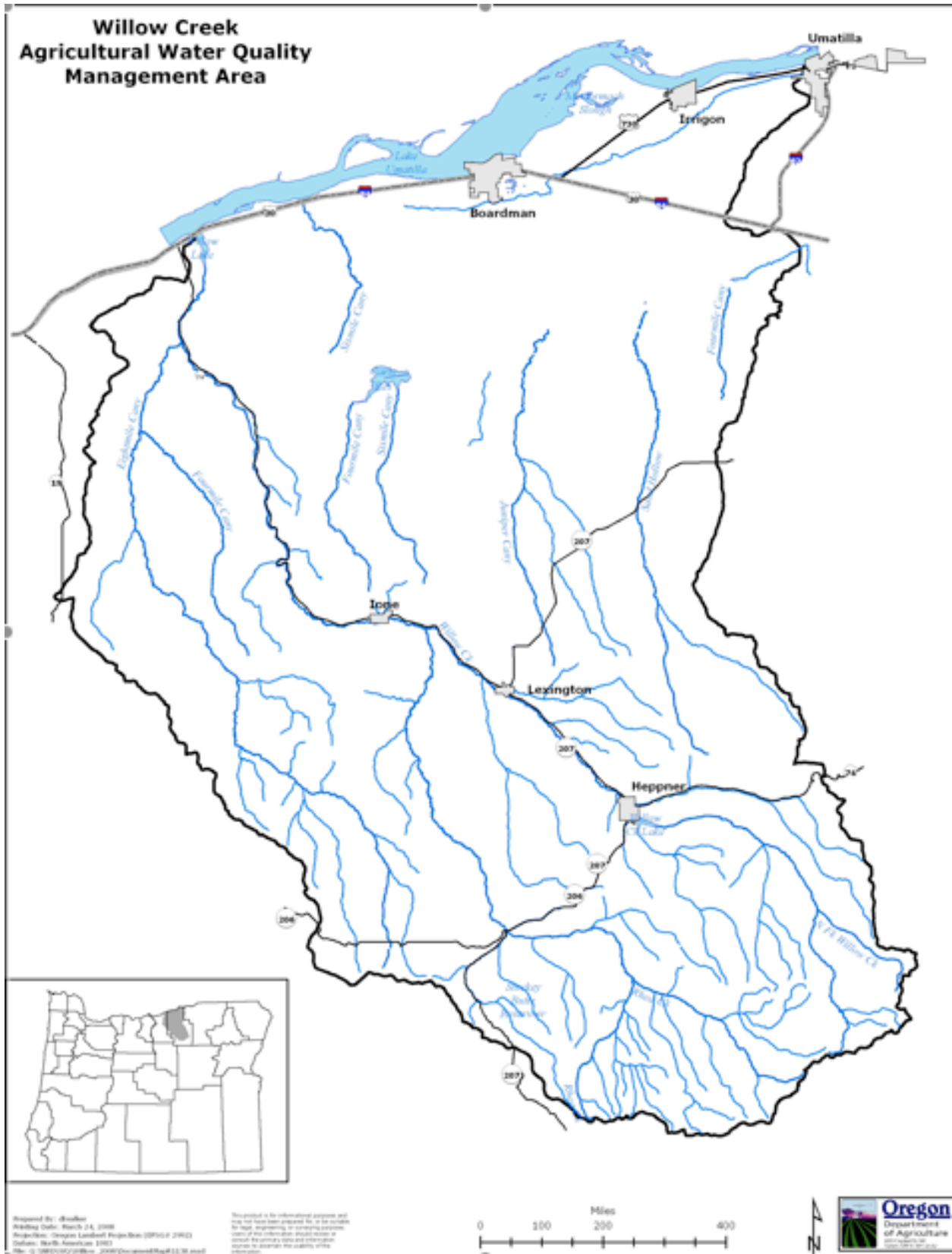
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## ACRONYMS

AFO	Animal Feeding Operation
AgWQM	Agricultural Water Quality Management
Area Plan	Willow Creek Agricultural Water Quality Management Area Plan
Area Rules	Willow Creek Administrative Rules
BLM	US Department of Interior, Bureau of Land Management
CAFO	Confined animal Feeding Operation
Cfs	cubic feet per second
CRP	Conservation Reserve Program
CREP	Conservation Reserve Enhancement program
CWA	Clean Water Act, also Federal Water Pollution Control Act
Department	Oregon Department of Agriculture
DEQ	Oregon Department of Environmental Quality
District	Soil and Water Conservation District
DOD	Department of Defense
EPA	US Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
Extension	Oregon State University Extension Service
FOTG	Field Office Technical Guide, NRCS
GWMA	Lower Umatilla Basin Groundwater Management Area
HEL	Highly Erodible Land
LA	Load Allocation
LAC	Willow Creek Local Advisory Committee
LMA	Local Management Agency
NRCS	USDA, Natural Resources Conservation Service
OACD	Oregon Association of Conservation Districts
OAR	Oregon Administrative Rules
ODA	Oregon Department of Agriculture
ODF	Oregon Department of Forestry
OCA	Oregon Cattleman's Association
OSU	Oregon State University
OWEB	Oregon Watershed Enhancement Board
RMS	Resource Management System, NRCS
RUSLE	Revised Universal Soil Loss Equation
SB1010	Senate Bill 1010, Agricultural Water Quality Management Act
SWCD	Soil and Water Conservation District
TMDL	Total Daily Maximum Loads
USACE	US Army Corps of engineers
USDA	US Department of Agriculture
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
WEID	West Extension Irrigation District
WRD	Oregon Water Resources Department



# MAP



# Willow Creek Agricultural Water Quality Management Area Plan

## I. FOREWORD

This Agricultural Water Quality Management (AgWQM) Area Plan provides guidance for addressing agricultural water quality issues in the Willow Creek AgWQM Area. 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. This Area Plan will be used by local management agencies for guiding implementation, outreach, and assistance efforts and by landowners to enhance their awareness and understanding of water quality issues.

The provisions of this Area Plan are not meant to establish legal requirements or prohibitions.

The Willow Creek Agricultural Water Quality Management Area Rules (Area Rules), Oregon Administrative Rules (OAR) 603-095-2800 through 603-95-2860, were formally adopted to implement this Area Plan in September 2003 . The Area Plan was revised during the Biennial Review in 2008 to update the temperature standard and include the TMDL target information. Area Rules ~~will~~ define the planning area, provide prevention and control measures to protect water quality, provide exceptions to the prevention and control measures and describe a complaint resolution process. Area Rules set forth the requirements and/or prohibitions that will be used by the Oregon Department of Agriculture (ODA) in exercising its enforcement authority for the prevention and control of water pollution from agricultural activities. In addition, statewide enforcement procedures provided in OAR 603-090-0120 through 603-090-0180 describe the enforcement actions that may be triggered upon the finding of a violation by ODA.

All landowners or operators should assess their operations and begin technically sound, economically feasible practices. Efforts should be progressive towards compliance with these rules in order to meet established deadlines.

**Area Rules are presented in this Area Plan for information purposes and are indicated by bold type within a border.**

## II. INTRODUCTION

The 1993 Oregon Legislature, through passage of Senate Bill 1010 (ORS 568.900 - 568.933), designated the Oregon Department of Agriculture to be the lead state agency working with agriculture to address water pollution. Oregon adopted the law to give agriculture an effective way to meet the requirements of federal and state clean water regulation. Through SB 1010, ODA is authorized to develop and carry out a water quality management plan for agricultural or rural lands, whenever a water quality management plan is required by state or federal law. In the 2001 legislative session, ORS 568.900 – 933 was amended to clarify that only the Area Rules associated with an Area Plan are enforceable, not the plan itself.

In 1995, the Oregon Legislature passed SB 502 (ORS 561.191) that stipulates that ODA shall develop and implement any program or rules that directly regulate farming practices that are for the purpose of protecting water quality and that are applicable to areas of the state designated as exclusive farm use zones or other agricultural lands. The implications of the legislation are that in Oregon, ODA is the agency solely responsible for regulating agricultural activities that affect water quality.

Recent legislation has also clarified that ODA entry onto private property must be consistent with section 9, Article I of the Oregon Constitution, and the Fourth Amendment of the United States Constitution; that ODA may not impose a civil penalty on a landowner for a first violation of any water quality rules unless certain conditions are met; and that any new fees proposed by ODA are subject to legislative approval.

Oregon's agricultural pollution management program requires Area Plans to help identify and control water pollution caused by activities on agricultural and rural lands. These plans recognize that the best way to prevent or control pollution from agricultural and rural land is to work to reduce the conditions on that land that cause pollution. The Area Plan and rules adopted to implement the plan must be based upon available scientific information.

There is a great deal of information in the scientific literature and natural resources management agency documents that describes the transport and fate of pollutants in an agricultural setting and the effectiveness of various land management practices that can be employed to limit the movement of potential pollutants into waterways.

ODA has developed a review of the literature that establishes the scientific basis for water quality protection based on landscape conditions. A reference to this document, *Relationship Between Agriculture Water Quality Management Area Plan Conditions and Water Quality Standards*, is listed in Attachment 1. The document is available for review at the Morrow Soil and Water Conservation District office.

This Area Plan was developed by volunteer members of the Willow Creek AgWQM Local Advisory Committee (LAC) with assistance from ODA and the Morrow Soil and Water Conservation District (SWCD), and in consultation with members of the community. Members were:

Bev Bridgewater	Mgr. West Extension ID	Leann Rea	Cow/Calf, Umatilla Basin Watershed Council
Travis Harrison	Dryland small grains	Mark Rietmann	Livestock / Small grains / Timber / NF John Day Watershed Council
Joe McElligott	Dryland & irrigated crops / Livestock	Dean Robinson	Teacher / Livestock
Lee Palmer	Livestock / Timber	Kyle Robinson	Livestock / Feed supplements
Dave Pranger	County Weed Supervisor	Jim Van Winkle	Wildlife Biologist
Chris Rauch	Dryland small grains / Morrow SWCD	Pam Wunderlich	Livestock / Timber / Wildlife

## Applicability

This Area Plan applies to agricultural activities on all non-Federal agricultural, rural, and forest lands in the Willow Creek AgWQM Area. This area consists of 1) all lands drained by Willow Creek and its tributaries and 2) all drainages flowing toward or into the Columbia River between Willow Creek and the Umatilla River (see map in Attachment 3). It applies to lands in current agricultural use and those lying idle or on which management has been deferred. It also applies to agricultural operations within incorporated city boundaries.

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

1. Soil erosion on uplands not exceeding acceptable rates.
2. Elimination of the placement, delivery, or sloughing of wastes into streams, in accordance with State law.
3. Adequate riparian vegetation for bank stability and stream shading consistent with vegetative site capability.

Landowners or operators are not expected to achieve all the above conditions immediately. Each condition has an associated timeline. However, landowners and operators are expected to take current action in adapting their management techniques so they can control the conditions on their property.

The intent of this Area Plan is not to tell anyone how to farm, ranch, or otherwise utilize natural resources. However, technical assistance to help landowners implement recommendations in this Area Plan is available from the Natural Resources Conservation Service (NRCS) along with SWCD personnel in the local Agriculture Service Center. For detailed information regarding management recommendations, refer to the “Prevention and Control Measures” section. Each landowner is expected to observe their property to ensure that either undesirable conditions do

not exist or that they are beginning to improve. If problems are encountered in meeting the goals of this Area Plan, landowners are encouraged to seek assistance, as they will be required to bring the land they own or operate into compliance.

This Area Plan recognizes that planning for water quality is only part of a successful plan for overall management of agricultural and rural land and that other, broader objectives must also be considered in total farm or resource management planning. Sustaining agricultural production capacity for future generations is one of those broader objectives. Conserving water and soil resources will help achieve that.

### **III. GEOGRAPHIC AREA AND PHYSICAL SETTING**

#### **A. Geographic Area**

Willow Creek is a 79-mile long stream that drains into the Columbia River at Rivermile (RM) 253. Willow Creek and its tributaries drain an area of about 880 square miles, ranging in elevation from 269 feet at its confluence with the Columbia River, to 5,775 feet at its headwaters near Bald Mountain in the Umatilla National Forest. The primary tributaries to Willow Creek are Eightmile Creek and Rhea Creek. Between Willow Creek and Umatilla River drainage lies a 472 square-mile expanse of semi-arid land. This area has seasonal streams, which seldom drain into a Columbia River tributary. These tributaries include Sixmile Canyon, Juniper Canyon and Sand Hollow. (See map in Attachment 3).

Seventy eight-percent of the Willow subbasin is in Morrow County, while 22% is in Gilliam County. Communities included in the AgWQM Area are Boardman, Irrigon, Ione, Lexington, and Heppner. The county population is approximately 9700.

#### **B. Climate**

The climate for most of the basin is semiarid, with average annual precipitation ranging from 8 inches at the mouth of Willow Creek to 34 inches in the mountainous headwaters. Yearly precipitation occurs mostly between December and March. Air temperatures during the winter can sometimes fall below 0°F, while summer air temperatures have been recorded as high as 114°F. Mean annual temperature for the entire basin is about 50°F.

#### **C. Geology and Soils**

Most of the Willow Creek subbasin lies in the Columbia Basin Ecological Province. The physiography is mainly hilly upland sloping up north to south and dissected by numerous dendritic-pattern drainages. There are two subdivisions to the province. The ancient lake basin in the north portion of the subbasin, which is largely irrigated agriculture, and the silty uplands in the southern portion, which are dryland agriculture and native rangelands.

Underlying the region is a thick sequence of lava flows known as the Columbia River Basalt. The basalts range in age from 6 to 16.5 million years old. Individual flows range in thickness from 5 to 150 feet. The basalts are thickest, possibly over 5,000 feet, near the Columbia River.

The lake basin, with its underlying strata of gravel beds, hardpans, and other materials, is geologically related to the era of glacial melt farther north following the ice age. The glacial melt resulted in flood events that deposited sand, silt, gravel, and other materials over the landscape. The soils are dominantly sand, loamy sand or sandy loam in texture.

The silty uplands consist of loess (wind deposited soil) mantled over the basalt plateaus. The soils are the moderate deep silt loam Condon and Morrow soils series.

## **D. Water Resources (Hydrology)**

The upper Willow Creek drainage has a total annual flow of approximately 30,000 acre feet; however, by RM 4, total annual flow is reduced to an estimated 23,000 ac-ft due to extensive irrigation withdrawals and stream channel losses. Peak flows in Willow Creek, near the mouth, occur in January, while further upstream near Heppner, they occur between March and April. Minimum flows typically occur during the months of July to September, during which time channels may be completely dry or run intermittently for prolonged periods.

The construction of the Willow Creek Reservoir has altered the hydrology of lower Willow Creek. High peak flows from snowmelt and cloudburst events have been eliminated and replaced with more constant flows during late winter and spring. The historic flood events allowed periodic access to floodplains and were responsible for natural channel modifications. The controlled releases from the reservoir have resulted in a stream channel that is more stable but still subject to erosion caused by prolonged high flows during reservoir drawdown.

Erosion problems occur for downstream landowners when reservoir releases are high and the flows fluctuate. Severe erosion occurs when high flows are for extended periods of time and when streambanks are saturated and then flows drop off rapidly. Channel morphology and low summer flows are not conducive to establishment and maintenance of riparian vegetation for streambank stability in some reaches. Flows from the larger, unregulated streams, Rhea Creek, Hinton Creek, and Eightmile Creek, provide natural flood flows to the lower reaches of Willow Creek.

### **Water Use**

Surface water rights for irrigation exist for 170 cfs for the entire Willow Creek subbasin. Other surface water rights for livestock, domestic, municipal and industrial uses total only about 3 cfs. The season of use varies so that the actual use of water is spread out throughout the year.

Surface water rights exist for approximately 80,000 acres of irrigation from the Columbia River. Water is lifted from the river with the use of vertical pump stations into pipelines and canals that deliver water to the irrigators. The irrigation season is March 1 through October 31.

West Extension Irrigation District (WEID) diverts water from the Umatilla River at Three Mile Dam and delivers water through a 27-mile long concrete-lined canal to 9,235 acres. All drainage

from the WEID is to the Columbia River. Water is diverted from March 15 through October 31. As part of the Umatilla Basin Project, water from the Umatilla River is sometimes exchanged with water from the Columbia River.

There are approximately 58,500 acres of primary water rights for irrigated agriculture from groundwater sources, mainly wells. Additionally, there are 15,000 acres of supplemental groundwater wells, which are mainly used to supplement irrigation from the Columbia River.

The U.S. Army Corps of Engineers (USACE) has a water right to store water in the Willow Creek Reservoir that is junior to most downstream water users.

The Port of Morrow applies effluent from food processing plants to about 5,000 acres of cropland. This application is regulated by permits issued by DEQ and the concentration is adjusted with fresh water to meet permit requirements.

## **Groundwater**

Extensive development of the basalt groundwater resource, largely for irrigation, began in the mid 1960's. Estimates of annual groundwater use and annual groundwater recharge to the basalts indicated that the available groundwater supply was being significantly overdrawn in some areas. The Oregon Water Resources Department (WRD) documented declines in many wells as well as interference between wells. Critical Groundwater Areas have been established, by order of WRD, in the Ordnance, Butter Creek, and Ella Butte areas. These orders control the amount of water pumped from wells in those areas and limits the development of new wells.

The Oregon Department of Environmental Quality (DEQ) declared the Lower Umatilla Basin, which includes part of the Willow Creek subbasin, a Groundwater Management Area (GWMA) in 1990 because nitrate-nitrogen concentrations exceed 10 mg/l (the federal safe drinking water standard) in many area groundwater samples. Under the Oregon Groundwater Protection Act (ORS 468B.180), DEQ is required to declare a GWMA if area-wide groundwater contamination is found to be caused primarily by non-point source activities. DEQ and other state agencies conducted a hydrogeologic investigation to determine the extent of the contamination and to identify the potential sources of that contamination.

In 1997, an Action Plan was approved by DEQ and ODA to address the groundwater contamination concerns in the GWMA. The Action Plan is being implemented on a voluntary basis. This voluntary approach recognizes that individuals, businesses, organizations and governments, given adequate information and encouragement, will take positive actions and adopt or modify practices and activities to reduce nitrate-nitrogen loading to groundwater.

## **Reservoirs**

The U. S. Army Corps of Engineers (USACE) constructed a 160-ft high dam just upstream of Heppner in an effort to control flash flood events, which in the past have claimed both lives and property. This dam is located at the confluence of mainstem Willow Creek and the Balm Fork of Willow Creek and creates the Willow Creek Reservoir. The reservoir has an area of 157 acres and volume of 6,249 acre-feet. Storage capacity at maximum controlled pool elevation is 14,000 acre-feet.

Since the Willow Creek Reservoir is operated primarily as a flood-control project, it is operated to maintain specific capacity to fill in response to rain or snowmelt events. During late winter and spring, when reservoir waters rise above the maximum pool elevation, excess water is released. The discharge rate is limited to 500 cubic feet per second (cfs) minus the flow from Hinton and Shobe Creeks. During the dry season reservoir releases are generally reduced to less than 10 cfs. A target flow of 3 cfs is attempted to be maintained during the summer. During summer months, the reservoir is maintained at a level above the flood control level to accommodate recreational activities. About October 15, the pool level is reduced to the winter flood control level and maintained at that level during the winter by releasing larger amounts of water as needed.

Carty Reservoir is a 38,300 acre-foot reservoir located in the Sixmile drainage and is classified as an industrial pond. It provides cooling water for the coal-fired electricity generation plant and has no direct discharge to streams. The reservoir is maintained with water pumped from the Columbia River.

## **E. Land Ownership and Land Use**

The total area in the Willow Creek AgWQM Area is approximately 1500 square miles or 961,000 acres. Ninety percent of the area is privately owned; nine percent is public land, managed by federal agencies -- the US Forest Service (USFS), the Bureau of Land Management (BLM), the US Fish and Wildlife Service (USFWS) and the Department of Defense (DOD); and about 1 percent is owned by the State of Oregon.

Range, forest and shrubland cover 60% of the management area; 39% is cropland, both dry and irrigated and 1% has urban, industrial and other uses.

There are 82,375 acres of private forestland and approximately 13,530 acres of timber patches located on higher elevation grazing lands in the subbasin. Forest management activities on these lands are under the jurisdiction and management of the Oregon Department of State Forestry (ODF).

## **F. Agriculture**

Economically, the Willow Creek subbasin and Morrow County are regarded as one of the state's leading agricultural centers. Morrow County ranks 7th in agricultural commodity sales at \$249.8 million in 2006. Two-thirds of gross farm sales come from crops and one-third from livestock. The major crops grown in the irrigated northern part of the subbasin include potatoes, onions, corn, and alfalfa hay. Smaller acreages of high value crops such as mint and vegetables are also important to this area. Wheat is the major crop in the dryland central portion of the subbasin and cattle are the major commodity in the southern region. Dairy is a new commodity for the region with huge, new facilities located in the Boardman and Ione area. Also, the hybrid poplar plantation located in the same area is the largest in the world.

Approximate 143,827 acres of cropland, mainly in the south central part of the subbasin, have been removed from crop production and enrolled into the Conservation Reserve Program (CRP)

and planted to permanent vegetation. This program provides benefits to the watershed by reducing soil erosion and improving wildlife habitat.

In addition to raw commodity production, there is a large and growing food-processing industry located near the Columbia River and the transportation network. This adds value to the commodity before it is exported from the area and provides numerous jobs.

## **IV. WATER QUALITY ISSUES**

The Clean Water Act (CWA) requires that each state designate beneficial uses for every stream and lake, decide which parameters to measure to determine whether beneficial uses are being met, and to set water quality standards based on the beneficial uses and parameters. Section 303(d) of the CWA directs states to develop a list of water quality limited streams, which are streams that violate water quality standards and do not support their beneficial uses. The CWA also directs states to develop Total Maximum Daily Loads (TMDLs) for 303(d)-listed streams. These TMDLs will result in allocations of pollutant loads, e.g. degrees of temperature or tons/acre of sediment, to different sources such as private agriculture, urban areas, and federal lands.

The TMDL and Water Quality Management Plan for Willow Creek was completed by the Oregon Department of Environmental Quality (ODEQ) in 2006 and approved by the Environmental Protection Agency (EPA) on February 19, 2007. The Willow Creek TMDL addresses high summer water temperatures and pH levels and bacteria concentrations that exceed standards. The Willow Creek TWDL addresses the problems by providing an estimate of natural temperatures along much of Willow Creek and establishes numeric goals for on-the-ground conditions that would lead to more natural temperatures and bacteria and pH levels. Attachment 2 provides a summary of TMDL objectives. The TMDL document can be viewed at: <http://www.deq.state.or.us/WQ/TMDLS/UmatillaBasin.htm#WC>

Meeting the TMDL allocations will require effort associated with agriculture, forestry and Reservoir operations. For agriculture in general, this means restoring riparian and stream-side areas so that banks are stable and vegetated and decreasing stream exposure to livestock, runoff and other sources of bacteria. Specific management expectations for agricultural landowners for the promotion and protection of riparian vegetation and reduction in runoff of sediment and bacteria are established in this Area Plan and associated Area Rules. Wide-spread implementation of effective management practices for prevention and control of pollution is expected to aid in achievement of TMDL objectives and meeting water quality standards.

### **A. Beneficial Uses**

Beneficial uses in the Willow Creek AgWQM Area include public and private water supply, irrigation, industrial, livestock watering, salmonid fish rearing and spawning, resident fish and aquatic life, wildlife and hunting, boating, fishing, water contact recreation, and aesthetics (OAR 340-41-642, Table 11). Of the beneficial uses of water in the Willow Creek subbasin, the most

sensitive use for most waters is spawning and rearing of cold-water fisheries and water contact recreation.

## B. 303(d)-Listed Streams

The stream segments in the Willow Creek AgWQM Area that have been declared water quality limited by Oregon’s Department of Environmental Quality (DEQ) under Section 303(d) of the Clean Water Act are listed in the table that follows. Water quality standards are violated for temperature, pH and bacteria during the summer. Exceeding these standards indicate potential problems for fish and humans.

Stream	Segment	Parameter	Criteria
Balm Fork	Mouth to Headwaters	Bacteria	Summer - Water Contact Recreation
Willow Creek	Mouth to Reservoir	pH	6.5 – 9.0
		Temperature	Rearing – 64° F
	Reservoir to Headwaters	Temperature	Rearing – 64° F

## C. Water Quality Parameters of Concern

The following discussion of water quality parameters of concern in the watershed addresses the CWA requirements for standards to be established for the most sensitive beneficial use.

### Temperature

Water temperature is primarily a summer concern, a season characterized by low flow and high air temperature, for rearing of resident trout (salmonids). Water temperatures above 70°F can be immediately lethal to salmonids due to a breakdown in their respiration and circulation systems. Temperatures between the mid 60’s°F to 70°F are stressful to salmonids, and fish survival is reduced as the salmonids are more susceptible to a variety of other agents. The sub-lethal effects associated with higher than optimum temperatures are disease, reduced metabolic energy for feeding, and reduced growth or reproductive behavior due to avoidance of areas with high temperatures.

#### **Current Temperature Standard (OAR 340-041-0028)**

(2) Policy. It is the policy of the Commission [Environmental Quality Commission] to protect aquatic ecosystems from adverse warming and cooling caused by anthropogenic activities. The Commission intends to minimize the risk to cold-water aquatic ecosystems from anthropogenic warming, to encourage the restoration and protection of critical aquatic habitat, and to control extremes in temperature fluctuations due to anthropogenic activities. The Commission recognizes that some of the State's waters will, in their natural condition, not provide optimal thermal conditions at all places and at all times that salmonid use occurs. Therefore, it is especially important to minimize additional warming due to anthropogenic sources. In addition, the Commission acknowledges that control technologies, best management practices and other measures to reduce anthropogenic warming are evolving and that the implementation to meet these criteria will be an iterative process. Finally, the Commission notes that it will reconsider

beneficial use designations in the event that man-made obstructions or barriers to anadromous fish passage are removed and may justify a change to the beneficial use for that water body.

(3) Purpose. The purpose of the temperature criteria in this rule is to protect designated temperature-sensitive, beneficial uses, including specific salmonid life cycle stages in waters of the State.

(4) Biologically Based Numeric Criteria. Unless superseded by the natural conditions criteria described in section (8) of this rule, or by subsequently adopted site-specific criteria approved by EPA, the temperature criteria for State waters supporting salmonid fishes are as follows:

(e) The seven-day-average maximum temperature of a stream identified as having Lahontan cutthroat trout or redband trout use on subbasin maps and tables set out in OAR 340-041-0101 to 340-041-0340: ...Figure 310A [Umatilla Basin] may not exceed 20.0 degrees Celsius (68.0 degrees Fahrenheit);

(8) Natural Conditions Criteria. Where the department determines that the natural thermal potential of all or a portion of a water body exceeds the biologically-based criteria in section (4) of this rule, the natural thermal potential temperatures supersede the biologically-based criteria, and are deemed to be the applicable temperature criteria for that water body.

Determining whether the stream temperature is above or below the temperature standard is based on the average of the maximum daily water temperatures for the stream's warmest, consecutive seven-day period during the year. Water temperature measurements must be taken with continuous recording temperature sensors, in well-mixed and representative locations of streams.

A one-time measurement above the standard is not a violation of the standard. When stream flow is exceptionally low or air temperature is exceptionally high the temperature criteria are waived (an example is when the flow is less than the expected ten year low flow or the air temperature is above the 90th percentile of a seven day average).

## **Sediment**

Sediment includes fine silt and organic particles suspended in the water column, settled particles, and larger gravel and boulders that move at high flows. Sediment movement and deposition is a natural occurrence but high levels of sediment can degrade fish habitat by filling pools, creating a wider and shallower channel and covering spawning gravels. Suspended sediment or turbidity in the water can cause physical damage to fish and other aquatic life, modify behavior and increase temperature by absorbing incoming sunlight. Sediment comes from erosion on range, forestland and croplands, erosion from streambanks and streambeds, and runoff from roads and developed areas. Nutrients, pesticides and toxic substances can also be attached to sediment particles.

## **pH**

Extremes in water pH and low levels of dissolved oxygen can harm fish and other aquatic life. Both conditions can be caused by the availability of nutrients, warm temperatures and light, all of which stimulate aquatic plant or algae growth. Excessive aquatic plant growth can increase water pH, which may harm fish. The death and subsequent decomposition of aquatic plants can

deplete the water of dissolved oxygen resulting in the death of fish and other aquatic animals. These conditions are usually aggravated by low stream flow. The water quality standard for pH (hydrogen ion concentrations) values range from 6.5 to 9.0. (OAR 340-041-645)(2)(d).

## **Bacteria**

Bacteria are used to determine the safety for human contact recreation and domestic water supplies. High levels of *E. coli* bacteria can cause severe gastric illness and even death. Potential sources of bacteria include animal manure and septic systems. Streams may be listed as violating this criterion during the summer period (the highest use period for water contact recreation), or for fall-winter-spring. The DEQ standard sets a maximum level allowable over a 30-day period, as well as a single sample maximum of 406 *E. coli* organisms per 100 ml. (OAR 340-041-645)(2)(e).

## **D. Sources of Water Quality Impairment**

Sources of water pollution can be generalized into two types: point source pollution and nonpoint source pollution. Point source pollution emanates from clearly identifiable discharge points such as wastewater treatment plants, piped effluent from industrial operations and other discrete conveyances. Permits are required for significant point source discharges. These permits, administered by DEQ require that certain effluent standards be met or require a zero discharge level. Certain Confined Animal Feeding Operations (CAFO) require permits, which are administered by ODA.

Nonpoint source pollution is pollution emanating from landscape scale sources and cannot be traced to a single point. Probable nonpoint sources of pollution in the Willow Creek subbasin include eroding agricultural and forest lands, eroding streambanks, runoff and erosion from roads and urban areas, and runoff from livestock and other agricultural operations. Pollutants from nonpoint sources are carried to the surface water or groundwater through the action of rainfall, snowmelt, irrigation and urban runoff, and seepage.

A major nonpoint source of water quality impairment is heat input that results in high water temperatures. Water temperature naturally fluctuates with air and soil temperatures on a daily and seasonal basis. Temperature increases may be caused by both natural and man-caused events resulting in vegetation removal, low seasonal flows, changes in channel shape and alteration to the floodplain. Channelization or alteration of stream courses can alter gradient, width/depth ratio and sinuosity, causing sediment and temperature increases.

While there may not be severe impacts on water quality from a single source or activity, the combined effects from all sources contribute, along with impacts from other land uses and activities, to the impairment of beneficial uses of Willow Creek.

Since its completion in 1984, Willow Creek Reservoir has been the most problematic reservoir, in terms of water quality, in the Portland District of the US Army Corps of Engineers (USACE). Water quality, including inflow, outflow and in-lake, has been continuously monitored by the USACE. Water releases from the shallow levels of the reservoir led to high water temperatures in Willow Creek below Heppner. Changes to the depth of water withdrawal produced

undesirable water quality in the outflow due to eutrophication of the lake water. The recent addition of aeration devices to reverse the eutrophication have apparently resulted in an increase in algal blooms which are sometimes toxic and cause problems with recreation. The USACE is increasing the level of monitoring to address the identified TMDL issues. This water quality information will be used to achieve the best management strategies for nutrient control, eutrophication reversal, and bacteria reduction in Willow Creek Reservoir.

## V. PURPOSE, GOALS, AND OBJECTIVES

### Purpose

The purpose of this Area Plan is to establish a framework to minimize agriculture's impact on water quality within the Willow Creek AgWQM Area. The Area Plan establishes procedures to identify and control factors that contribute to pollution originating on agricultural and rural lands. It also describes a program designed to achieve the goals of this Area Plan.

### Goal

The goal of this Area Plan is to bring the Willow Creek watershed into balance between practical, economical, agricultural use and environmental responsibility and protection to achieve applicable water quality standards

### Objectives

To achieve the Area Plan purpose and goal, the following water quality related objectives are established:

- Control soil erosion on uplands to acceptable rates.

*Intent: While all soil lost from fields through erosion may not necessarily enter streams, due to distance from stream or practices such as sediment basins, the reduction in such erosion will reduce the likelihood that soils will enter streams. Acceptable rates of soil erosion are consistent with the soil erosion control requirements of the current USDA Farm Bill and will be applied to all soil types.*

- Prevent pollution caused by the introduction of wastes into waters of the state.

*Intent: This ensures that high nutrient concentrations, pathogens associated with high animal density areas, high sediment concentrations in run-off, or other potential pollutants are not readily transported to streams and groundwater. It is also consistent with existing state statutes.*

- Provide adequate riparian vegetation, consistent with site capability, for streambank stability and stream shading.

*Intent: By providing sufficient vegetation near streams and in riparian areas for streambank stability and stream shading, landowners will be creating conditions that could result in less sediment being produced from eroding streambanks and moderation of water temperature. Management changes that result in increased riparian vegetation will take time to accomplish. Landowners will be expected to make every feasible effort to achieve properly functioning conditions in their streamside areas.*

## **VI. STRATEGIES TO ACHIEVE GOALS AND OBJECTIVES**

To achieve clean water, an effective strategy must increase awareness of the problem and the range of potential solutions, motivate appropriate voluntary action, and provide for technical and financial assistance to plan and implement effective conservation practices.

The following strategies will be employed at the local level, by the Morrow SWCD, through a workplan and Memorandum of Agreement with ODA, in cooperation with landowners and other agencies and organizations.

1. Work to improve the quality of water in the Management Area through planning and implementation of technically sound and economically feasible conservation practices that contribute to meeting Area Plan objectives.
  - A. Limit soil erosion and pollution caused by agricultural activities, as close to the source as possible, by achieving soil erosion targets and sediment control.
  - B. Show progress in reduction of pollution from agricultural and rural lands through periodic surveys of stream reaches and associated lands. Methods will be selected as targets become better understood and quantified.
  - C. Implement successful practices for streambank stabilization, reduction in high summer water temperatures, and restoration and enhancement of wetlands and riparian areas, while avoiding adverse fish habitat modification.
  - D. Implement on-farm irrigation practices to conserve water and to reduce the potential of polluted return flows.
  - E. Improve conveyance system efficiencies to conserve water and thus lessen the impact of season flow modification on streams resulting from water withdrawals.
  - F. Consult regularly with the USACE regarding the management of the reservoir and releases that impact stream conditions below the reservoir.
2. Create a high level of awareness and an understanding of water quality issues among the agricultural community and rural public in a manner that minimizes conflict and encourages cooperative efforts through education and technical assistance activities.
  - a. Incorporate implementation of the Area Plan as a priority element in the Morrow SWCD Annual Work Plan and Long Range Plan with support from partner organizations.
  - b. Inform landowners of the Area Plan and Rules and encourage landowners to make such changes as may be needed.

- c. Showcase successful practices and systems and conduct annual tours for landowners and media.
  - d. Recognize successful projects and practices through appropriate media and newsletters.
  - e. Promote cooperative on-the-ground projects to solve critical problems identified by landowners/operators and in cooperation with partner organizations.
  - f. Conduct educational programs to promote public awareness of water quality issues and their solutions.
  - g. Examine current research and monitoring results and conduct such monitoring as may be necessary to better quantify current conditions and objectives contained in this Area Plan in preparation for biennial Area Plan reviews.
3. Encourage active participation by the agricultural community and rural public in the process of solving our water quality problems.
- i. Encourage development of individual conservation plans by assisting landowners with plans that address water quality and with the implementation of conservation practices adopted in those plans.
  - ii. Promote the continued development, evaluation, and adoption of practices and technologies that enhance water quality in an efficient, effective, and economic manner.
  - iii. Promote incentive and cost-share programs to assist with implementation of Area Plans and related practices, by annually identifying water quality funding needs with agencies providing cost-share and technical assistance to agricultural operations.
4. Encourage adequate funding and administration of the program to achieve Area Plan goals and objectives.
- A. Implement systematic, long range planning
  - B. Coordinate efforts on full-scale, watershed-based approaches
  - C. Work with landowners to identify needs, develop projects and actively seek funding
  - D. Ensure successful implementation of funded projects.

In addition to these voluntary strategies, required measures (Area Rules) are included as a secondary implementation strategy. ODA will use enforcement where appropriate and necessary to gain compliance with Prevention and Control Measures in the Rules. Any enforcement action will be pursued only when reasonable attempts at a voluntary solution have failed (See Resolution of Complaints and Enforcement Action section).

## **A. Prevention and Control Measures**

A landowner or operator's responsibility under this Area Plan is to implement measures that prevent and control the sources of water pollution associated with agricultural and rural lands and activities. A landowner or operator is not responsible for conditions caused by other landowners or for circumstances not within their reasonable control, including unusual weather events.

**603-095-2840**

**Prevention and Control Measures**

**(1) Limitations: All landowners or operators conducting activities on agricultural lands are provided the following exemptions from the requirements of OAR 603-095-2840 (Prevention and Control Measure).**

**(a) A landowner or operator shall be responsible for water quality resulting from conditions caused by the management of the landowner or operator.**

**(b) Rules do not apply to conditions resulting from unusual weather events or other circumstances not within the reasonable control of the landowner or operator. Reasonable control of the landowner means that technically sound and economically feasible measures must be available to address conditions described in Prevention and Control Measures**

**(c) The Department may allow temporary exceptions when a specific integrated pest management plan is in place to deal with certain weed or pest problems.**

The sections that follow describe more detailed information related to potential agricultural water quality concerns, provides definitions of commonly used terms, provides dates when rules are effective, and provides some exemptions to the rules.

To implement proper management practices and ensure an area is healthy or functioning properly, the capability and potential of a site must be understood. Site capability is the highest ecological status a site can attain given political, social, or economic constraints or limiting factors. Potential is the highest ecological status a site can attain given no political, social, or economic constraints and is often referred to as the “potential natural community.” Examples of constraints would include natural disturbances such as floods and fires, the location of roads, levees or bridges, and the costs of management changes.

## **Waste Management**

A landowner or operator’s responsibility under this Area Plan is to prevent the introduction of waste materials into nearby bodies of water. There are existing statutes and rules that regulate water quality that remain in effect and are enforced by other designated management agencies.

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

Current Oregon Law, Oregon Revised Statute (**ORS 468B.025** states that:

(1) “...no person shall:

(a) Cause pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.

(b) Discharge any wastes into the waters of the state if the discharge reduces the quality of such waters below the water quality standards established by rule for such waters by the Environmental Quality Commission.”

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

**ORS 468B.050** identifies the conditions when a permit is required. A permit is required for Confined Animal Feeding Operations that meet minimum criteria for confinement periods and have large animal numbers or have wastewater facilities. OAR 603-074-0005 through 0080 contains the rules that apply to animal feeding operations (AFO) and CAFOs.

**Definitions (ORS 468B.005)**

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

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

“Water or the waters of the state” include lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creek, 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 effect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction.

Wastes include livestock manure from situations like seasonal feeding and birthing areas, gathering pastures and corrals, rangelands and pasture, in addition to wastes already covered by Oregon’s Confined Animal Feeding Operation laws. Indicators of noncompliance include 1) runoff flowing through areas of high livestock usage and carrying wastes into waters of the state, 2) livestock waste accumulated in drainage ditches or areas of flooding, and 3) fecal coliform (E. Coli) counts that exceed State water quality standards. Livestock grazing is allowed to the extent it does not cause conditions that violate State water quality standards and complies with the Prevention and Control Measures in the Area Rules. Livestock facilities located near streams should employ an adequate runoff control system. Compliance with the riparian objectives will help keep wastes from running into waters of the state. Landowners can contact the NRCS and appropriate SWCD for assistance with complying with this rule.

## **Upland Management and Soil Erosion**

A landowner or operator's responsibility under this Area Plan is to implement measures that prevent and control water pollution from upland agricultural activities and soil erosion. This includes agricultural, rural lands and road management 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. Careful management of areas used for grazing, feeding and handling are critical to the success of livestock operations and have potential to affect water quality by the runoff of sediment and animal wastes.

Upland areas are the rangelands, forests and croplands, upslope from the riparian areas. These areas extend to the ridge tops of watersheds. With a protective cover of crops and crop residue, grass (herbs), shrubs or trees, consistent with site capability, these areas will capture, store and safely release precipitation thereby reducing the potential of excessive soil erosion or delivery of soil or pollutants to the receiving stream or other body of water. Vegetation is dependent on physical characteristics including soil, geology, landform, water and other climate factors. Proper management of upland vegetation considers physical and biological conditions, controls soil erosion and minimizes transport of soil and nutrients to the stream. Upland management also considers livestock production while, at the same time, should consider forest health and protection of fish and wildlife habitat. Healthy uplands maintain productivity over time and are resilient to stresses caused by variations in physical conditions such as climatic changes.

Healthy upland areas provide several important ecological functions. These include:

- Capture, storage and safe release of precipitation
- Provide for plant health and diversity that support habitat (cover and forage) for wildlife and livestock
- Filtration of sediment
- Filtration of polluted runoff
- Provide for plant growth that increases root mass that utilizes nutrients and stabilizes soil against erosion

Indicators of these conditions include:

- Recruitment of beneficial plant species
- Groundcover to limit runoff of nutrients and sediment
- Cropland cover that is sufficient to limit movement of nutrients and sediment
- Roads and related structures designed, constructed and maintained to limit sediment delivery to streams
- Noxious weed and insect pest populations contained (see state weed laws and county weed regulations to determine weed species that must be controlled)

Factors to evaluate upland area condition may include:

- Vegetation utilization through stubble height measurements
- Plant species composition to measure plant health and diversity
- Groundcover (live plants, standing plant litter and ground litter) as a measure of potential erosion
- Evidence of overland flow (pattern and quantity)
- Site productivity (domestic livestock and wildlife carrying capacity)

- Soil erosion potential through prediction models available through NRCS

Noxious weeds present a challenge to establishing upland and streamside vegetation. These weeds can harm water quality in many ways. Some examples are:

- Reduced ground cover resulting in increased erosion
- Reduced infiltration of precipitation into the soil
- Crowding out of vegetation appropriate to each site

Landowners and public land managers need to be vigilant in their weed control efforts. The Morrow County Weed Control District policy requires all landowners that have “A” listed weeds to have a written weed management plan approved by the Morrow SWCD/ Weed Advisory Board.

**(3) Upland Management and Soil Erosion: By January 1, 2008, landowners must control upland soil erosion using practical and available methods.**

**(a) Landowners must control active channel (gully) erosion to protect against sediment delivery to streams.**

**(b) On croplands, a landowner may demonstrate compliance with this rule by:**

**(A) Operating consistent with a Soil and Water Conservation District (SWCD)-approved conservation plan that meets Resource Management Systems (RMS) quality criteria for soil and water resources; or**

**(B) Operating in accordance with an SWCD-approved plan for Highly Erodible Lands (HEL) developed for the purpose of complying with the current US Department of Agriculture (USDA) farm program legislation; and farming non-HEL cropland in a manner that meets the requirements of an approved USDA HEL compliance plan for similar cropland soils in the county; or**

**(C) Farming such that the predicted sheet and rill erosion rate does not exceed 5 tons/acre/year, as estimated by the Revised Universal Soil Loss Equation (RUSLE); or**

**(D) Constructing and maintaining terraces, sediment basins, or other structures sufficient to keep eroding soil out of streams.**

**(c) On rangelands, a landowner may demonstrate compliance with this rule by:**

**(A) Operating consistent with a Soil and Water Conservation District (SWCD)-approved conservation plan that meets Resource Management Systems (RMS) quality criteria for soil and water resources, or**

**(B) Maintaining sufficient live vegetation cover and plant litter to capture precipitation, slow the movement of water, increase infiltration, and reduce excessive movement of soil off the site; or**

**(C) Minimizing visible signs of erosion, such as pedestal or rill formation and areas of sediment accumulation.**

This Area Plan does not prescribe specific practices to landowners for management of upland areas to reduce runoff of sediment and other wastes. Site specific recommendations for management to protect water quality, including grazing management systems, desirable

vegetation types and road construction and maintenance, can be obtained from sources listed in the Implementation Strategies section of this Area Plan. Examples of practices that alone or in combination with other practices may be effective in controlling soil erosion are listed here for consideration.

#### **Effective management practices for controlling soil erosion and sediment delivery**

- Conservation tillage (Crop residue management) - reduced tillage, minimum tillage, direct seeding, modified conventional tillage, reservoir tillage, sub-soiling, or deep chiseling
- Nutrient management – soil testing and fertilizer placement
- Cover crops – perennial or annual
- Contour farming practices - strip cropping, divided slopes, terraces (level and gradient), cross-slope tillage
- Crop rotations
- Early or double seeding in critical areas
- Vegetative buffer strips -filter strips, grassed waterways, field borders, contour buffer strips
- Irrigation scheduling - soil moisture monitoring and application rate monitoring
- Prescribed burning
- Weed control
- Road design and maintenance
- Sediment retention basins and runoff control structures
- Reforestation
- Tree thinning - commercial and pre-commercial
- Streambank protection

Livestock management must 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.

#### **Effective management practices for prevention and control of impacts from livestock**

- Grazing management or scheduling based on intensity, duration, frequency, and season of use; pasture rotation including resting and deferrals; riparian pastures
- Vegetation management - grass seeding, weed control, controlled burning
- Fencing – including temporary, cross, and exclosures
- Watering facilities - spring development, water gaps, off-stream water, (may require water rights, refer to ORS 537.141)
- Salt and mineral distribution
- Waste management systems - clean water diversions; waste collection, storage, and utilization; facilities operation and maintenance
- Safe diversion of runoff
- Protection of clean water sources
- Lot maintenance - smoothing, mounding, seeding, filter strips, catch basins, berms

## **Riparian and Streamside Area Management**

A landowner or operator's responsibility under this Area Plan is to implement measures, as needed, that prevent and control water pollution from agricultural activities. Areas near waterbodies are especially important to water quality and 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. This area usually ranges from 10 feet to 100 feet from the water, depending on the slope, soil type, stream size and morphology.

The riparian area, as defined in OAR 141-110-0020(28), is a zone of transition from an aquatic to a terrestrial system, dependent upon surface or subsurface water, that reveals through the zone's existing or potential soil-vegetation complex the influence of such 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.

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 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
- Development of diverse channel characteristics providing pool depth, cover, and variations in water velocity necessary for fish production
- Support of biodiversity
- Shade for moderation of solar heat input
- Recruitment of large woody debris for aquatic habitat

Indicators to determine improvement of this condition include:

- Recruitment of desirable riparian plant species
- Maintenance of established beneficial vegetation
- Maintenance or recruitment of woody vegetation -- both trees and shrubs
- Streambank integrity capable of withstanding 25-year flood events

Factors used to evaluate improvement of the riparian area condition could include:

- Expansion of riparian area as evidenced by development of riparian vegetation and plant vigor
- Reduction in actively eroding streambank length beyond that expected of a dynamic stream system
- Community composition changes reflecting an upward trend in riparian condition (Increases in grass-sedge-rush, shrubs, and litter and decreases in bare ground)

- Plant community composition reflecting an upward trend as indicated by decreases in noxious plant species
- Stream channel characteristics show upward trend consistent with landscape position (i.e. a decrease of width to depth ratio of the channel)
- Shade patterns consistent with site capability
- Stubble height of herbaceous species and leader growth of shrubs and trees

**(4) Streamside Management: By January 1, 2008, landowners must promote the establishment and development of adequate riparian vegetation for streambank stability, filtering sediment and shading, consistent with site capability.**

Streamside management addresses many of the water quality parameters of concern identified in the 303(d) list. Streamside vegetation influences water temperature through shade, stream width-to-depth ratio, groundwater recharge and discharge, and other hydrologic factors. Sediment reductions improve fish and invertebrate habitat. Bacteria reductions improve the safety of water for human consumption and contact recreation. Healthy riparian condition improves water quality by reducing stream disturbances and preventing excessive heat and contaminant inputs.

Grazing near streams must 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. Offstream watering systems, upland water developments, feed, salt and mineral placement are examples of methods to be considered as ways to reduce impacts of livestock to streamside areas.

Healthy streamside areas are directly influenced by management of surrounding areas. This Area Plan does not prescribe specific practices to landowners for management of streamside areas. Site specific recommendations for management to protect water quality, including buffer width, vegetation types, and grazing timing, can be obtained from sources listed in the Implementation Strategies section of this Area Plan.

**Effective management practices for prevention and control of impacts to streamside areas:**

- Critical area planting
- Vegetative buffer strips - Continuous CRP, CREP, riparian buffers, riparian forest buffers
- Livestock management - seasonal grazing; fencing - exclusion, temporary; riparian pastures
- Water developments - off-stream watering, water gaps, spring development
- Conservation tillage practices
- Weed control
- Nutrient and chemical application scheduling
- Road, culvert, bridge, and crossing maintenance
- Wildlife management

**Irrigation Management**

A landowner or operator's responsibility 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 problems.

Irrigated lands are either riparian, floodplain or upland upon which water is applied for the purpose of growing crops. Diversion of water from a waterbody 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 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 flooding, drip, or sprinkler application. Water usually is diverted from surface sources (stream or pond) and from groundwater sources. Water withdrawals have an affect on stream flows and thus, indirectly affect water quality. Irrigation management in this basin recognizes there may be some 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 may be used more than once as it returns to the stream and is available for instream uses or by other irrigators. Ultimately, streamflows will be enhanced by upland and riparian management practices promoting natural upstream storage and properly functioning floodplains that catch, store, and safely release precipitation for beneficial uses during summer months.

Characteristics of an irrigation system that has minimal effect on water quality include:

- Delivery of water efficiently to the land within legal water rights
- Minimal overland return flows
- Return flow routing that provides for settling, filtering and infiltration
- Minimal effect on stability of streambanks and minimal soil erosion
- Scheduling of water application appropriate to the site including consideration of soil conditions, crop needs, climate and topography
- Installation and management of diversion structures that control erosion and sediment delivery, and protect the stability of streambanks
- Diversions that are adequately screened and which provide for fish passage. (Refer to ORS 498.268 for screening requirements)

Contamination of groundwater is a major concern in the northern part of the Willow Creek management area. Many area groundwater samples indicate nitrate-nitrogen concentrations that exceed the federal safe drinking water standard. Irrigated agriculture is the dominant land use in the area and is a source of nitrate-nitrogen from agricultural activities coming from fertilizers and mineralization of organic matter as well as residential activities such as septic systems, lawn over-fertilization, and livestock. Nitrogen not utilized by plant growth is stored in the soil and can be leached to groundwater if sufficient water is available to move it through the soil profile. (*Lower Umatilla Basin Groundwater Management Area Action Plan, 1997*)

**(5) Irrigation Management: By January 1, 2008, irrigation must be done in a manner that limits the amount of pollutants in the runoff from the irrigated area or that leaches into groundwater**

### **Effective management practices for prevention and control of impacts from irrigation**

- Irrigation scheduling based on crop needs, soil type, climate, topography, infiltration rates
- Irrigation system efficiency and uniformity monitoring
- Diversion maintenance - push-up dam management, fish screens
- Return flow management
- Flow measuring devices
- Backflow devices
- Reservoir tillage
- Cover crops

## **B. Implementation Strategies**

The following guidelines will apply for public participation in implementation and review of the Area Plan. The department and the SWCD intend to encourage participation in this water quality improvement program by:

- Providing educational programs to raise public awareness and understanding of water quality issues and solutions
- Providing incentives for the development and implementation of Voluntary Water Quality Plans
- Offering technical assistance for the development and implementation of effective agricultural management practices for pollution control
- Developing a monitoring program to identify current and potential water quality problems
- Following up on any water quality complaints and provide assistance in solving identified problems

### **Educational Programs**

As resources allow, the SWCD, watershed council, and OSU Extension Service (Extension), in partnership with other agencies and local organizations, will develop educational programs to improve the awareness and understanding of water quality and quantity issues. The objective of the educational programs is to promote the programs in a manner that reduces conflict and encourages cooperative efforts through education and technical assistance activities by:

- Incorporating implementation of the Area Plan as a priority element in the Morrow Soil and Water Conservation Districts' Annual Work Plan and Long Range Plan with support from partner organizations.
- Showcase successful practices and systems and conduct annual tours for landowners and media.
- Recognize successful projects and practices through appropriate media and newsletters.
- Promote cooperative on-the-ground projects to solve critical problems identified by landowners and in cooperation with partner organizations.
- Conduct educational outreach to promote public awareness of water quality issues.
- Coordinate the review of information and education materials with agencies or organizations as appropriate.

## **Voluntary Water Quality Plans**

Landowners and operators have flexibility in choosing management approaches and practices to address water quality issues on their lands. They may implement management systems on their own without a plan or may develop a plan that suits the needs of their operation. The local management agencies recommend that voluntary water quality plans be developed to assist the landowners and operators to assess the conditions on their lands, identify problems or potential problems on their land and to describe measures and resources needed to address those problems.

Voluntary water quality plans describe the management systems and schedule of conservation practices that the landowner will use to conserve soil, water, and related plant and animal resources on all or part of a farm or ranch unit. Voluntary water quality plans may be developed by landowners, operators, consultants, or technicians available through a SWCD or the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). An effective voluntary water quality plan will outline specific measures necessary to prevent or control water pollution and soil erosion from agricultural activities and to address the "Prevention and Control Measures" outlined in this Area Plan.

Farm planning assistance is available from these and other sources:

### Technical Assistance

NRCS - planning, design, implementation

SWCD – planning, design, implementation, grant writing

Watershed councils –planning, implementation, grant writing

### Workbooks and Publications

*Voluntary Conservation On Your Land*, NRCS/Oregon Association of Conservation Districts (OACD)

*Oregon Small Acreages Conservation Toolbox*, NRCS/OACD

*WESt Program Workbook*, Oregon Cattleman's Assoc. (OCA)/OSU

*Ranch Water Quality Planning Workbook*, OSU Extension

*The Oregon Plan Toolbox*, OWEB

### Programs

Farm\*A\*Syst Program, OSU Extension

Stream\*A\*Syst Program, OSU Extension

Home\*A\*Syst Program, OSU Extension

## **Technical & Financial Assistance**

It is not the intent of this Area Plan to impose a financial hardship on any individual. It is the responsibility of the landowner or operator to request technical and/or financial assistance, if needed, and to develop a reasonable time frame for addressing potential water quality problems.

As resources allow, the Morrow and Gilliam SWCDs, USDA-NRCS, area watershed councils, ODA, and other natural resource agency staff are available to assist landowners in evaluating effective practices for improving streamside vegetation and reducing runoff and soil erosion on their farms and incorporating these practices into voluntary individual water quality plans.

Personnel in these offices can also design and assist with implementation of practices, and assist in identifying sources of cost-sharing funds for the construction and/or use of some of these practices.

Technical and cost-sharing assistance for installation of certain management practices may be available through current USDA conservation programs such as Environmental Quality Incentive Program (EQIP), Conservation Reserve Enhancement Program (CREP), Continuous Conservation Reserve Program (CRP); EPA's non-point source implementation grants (Section 319); or state programs such as Oregon Watershed Enhancement Board (OWEB), the Riparian Tax Incentive Program, and the Wildlife Habitat Conservation and Management Program. Other agencies may also be available to provide technical assistance or financial assistance to private landowners.

### **Water Quality Management Practices**

Effective agricultural management practices for pollution control, are those management practices and structural measures that are determined to be the most effective, practical means of controlling and preventing pollution from agricultural activities.

Appropriate management practices for individual farms may vary with the specific cropping, topographical, environmental, and economic conditions existing at a given site. Due to these variables, it is difficult to recommend any uniform set of management practices to improve water quality relative to agricultural practices.

Management practices and land management changes are most effective when selected and installed as integral parts of a comprehensive resource management plan based on natural resource inventories and assessment of management practices. The result is a system using the management practices and land management changes which are designed to be complementary, and when used in combination are more technically sound than each practice separately.

A detailed listing of a number of specific practices and management measures which can be employed to control or reduce the risk of agricultural pollution are contained in other documents such as the Field Office Technical Guide, available for reference at the local NRCS office.

### **Monitoring and Evaluation**

The progress and success of implementation efforts will be assessed through determination of changes in land management systems and the measurement of water quality improvement over time. Monitoring activities are integral components of the Area Plan. For the purposes of this Area Plan, three main types of monitoring are appropriate. These are:

#### Baseline condition monitoring

Baseline condition monitoring provides a starting point for assessing water quality trends and for future evaluation of the effectiveness of water quality improvement efforts. Baseline condition monitoring typically includes identification and analysis of data previously and currently collected in the area according to accepted protocols.

#### Water quality trend monitoring

Water quality trend monitoring can help to track how water quality (typically on a watershed or sub-watershed scale) is changing over time, including after implementation of an Area Plan. It is recommended that trend monitoring follow recommendations in the Oregon Plan Water Quality Monitoring Technical Guide. This guide book describes accepted procedures and protocols for most activities that would be used to conduct baseline condition and trend monitoring on a watershed scale, including development of quality assurance/quality control plans to assure quality of data and protocols for data collection.

#### Effectiveness monitoring

- a) Evaluate the effectiveness of specific management practices in reducing losses or loadings of components such as sediment or nutrients. The NRCS has a good amount of information about the effectiveness of various practices in protecting surface water and groundwater quality.
- b) Evaluate the net effect of the implementation of an Area Plan and watershed improvement activities on water quality trends.

When effectively used, monitoring activities can provide valuable information on how much effect a plan is having, how extensively it is being implemented, and where more efforts are needed in a basin.

### **Biennial Review**

This Area Plan and the associated Area Rules are subject to a biennial review process. Two years after adoption, ODA, in cooperation with SWCDs and the LAC, will assess the progress of Area Plan implementation toward achievement of Area Plan goals and objectives. These assessments will include:

- An accounting of the numbers and acreage of operations with Voluntary Water Quality Plans and the calculated amount of soil erosion and pollution prevented.
- Identification of additional sources of sediment, heat inputs and other contributors to non-attainment of all applicable water quality standards.
- An evaluation of available current water quality monitoring data.
- An evaluation of outreach and education programs designed to provide public awareness and understanding of water quality issues.
- A review of projects, demonstrations, and tours used to showcase successful management practices and systems.
- An evaluation of the effectiveness of technical and financial assistance sources available to the agricultural community.
- Review of load allocations and effectiveness of this plan in meeting load allocations as described in the TMDL for the Willow Creek subbasin.

Based on these assessments, the ODA, SWCD, LAC, and the State Board of Agriculture will consider making appropriate modifications to the Area Plan and Rules. Any future amendments to the administrative rules will be subject to public participation process as defined in Oregon law.

## **Resolution of Complaints and Enforcement Action**

ODA will investigate complaints against landowners or operators who are alleged to be out of compliance with the Rules associated with this Area Plan. If the landowner is in non-compliance, ODA will consult with the landowner/operator and the SWCD using the Field Office Technical Guide to develop solutions and timelines. The authority and procedures for complaint investigation rests with the ODA under provisions of OAR 603-095-2860.

ODA will use enforcement mechanisms where appropriate and necessary to gain compliance with the prevention and control measures. Any enforcement action will be pursued only when reasonable attempts at voluntary solutions have failed. Landowners with chronic or egregious violations of Area rules will be subject to enforcement action by ODA under authority provided in OAR 603-090-0060 through 603-090-0120.

Entry onto private property is authorized for the purpose of investigating lands within the Willow Creek AgWQM Area to determine sources of pollution (ORS 568.915). ODA may investigate lands within the AgWQM Area to determine those actions that may be required of landowners under the Area Rules and to determine whether the landowner is carrying out the required actions. ODA will not enter onto private lands to gather information without first seeking landowner consent.

### **603-095-2860**

#### **Complaints and Investigations**

**(1) When the Department receives notice of an alleged occurrence of agricultural pollution through a written complaint, its own observation, through notification by another agency, or by other means, the department may conduct an investigation. The department may coordinate inspection activities with the appropriate Local Management Agency.**

**(2) Each notice of an alleged occurrence of agricultural pollution shall be evaluated in accordance with the criteria in ORS 568.900 to 568.933 or any rules adopted thereunder to determine whether an investigation is warranted.**

**(3) Any person allegedly being damaged or otherwise adversely affected by agricultural pollution or alleging any violation of ORS 568.900 to 568.933 or any rules adopted thereunder may file a complaint with the department.**

**(4) The department will evaluate or investigate a complaint filed by a person under section OAR 603-095-2860(3) if the complaint is in writing, signed and dated by the complainant and indicates the location and description of:**

**(a) The waters of the state allegedly being damaged or impacted; and**

**(b) The property allegedly being managed under conditions violating criteria described in ORS 568.900 to 568.933 or any rules adopted thereunder.**

**(5) As used in section OAR 603-095-2860(4), “person does not include any local, state or federal agency.**

**(6) Notwithstanding OAR 603-095-2860(4), the department may investigate at any time any complaint if the department determines that the violation alleged in the complaint may present an immediate threat to the public health or safety.**

**(7) If the department determines that a violation of ORS 568.900 to 568.933 or any rules adopted thereunder has occurred, the landowner may be subject to the enforcement procedures of the department outlined in OAR 603-090-0060 through 603-090-0120.**

## **VII. ADMINISTRATIVE ROLES AND RESPONSIBILITIES**

### **A. Designated Management Agency**

The Oregon Department of Agriculture is the Designated Management Agency for water pollution control activities on agricultural and rural lands in the Willow Creek AgWQM Area. The department is authorized to develop and carry out a water quality management plan for any agricultural or rural lands where such a plan is required by state or federal law.

Morrow Soil and Water Conservation District is the Local Management Agency (LMA) designated by the department for development and implementation of the AgWQM Area Plan and projects in the AgWQM Area. The Gilliam SWCD will assume responsibility for the implementation of the Area Plan and related projects within that district under agreement with the LMA. Area watershed councils may assist the LMA in implementation and review of the Area Plan and related projects. Implementation priorities will be established on a periodic basis through annual work plans developed jointly by the SWCD and ODA with input from partner agencies.

The director of ODA appointed a Local Advisory Committee representing local agricultural producers, and owners, agencies, tribes, environmental organizations and the SWCD for the purpose of assisting with the development of this Area Plan and the associated Oregon Administrative Rules to implement core elements of the Area Plan.

### **B. Total Maximum Daily Loads**

The Oregon Department of Environmental Quality is required by federal law to establish formal "Total Maximum Daily Loads" (TMDLs) for pollutants in waters designated as "water quality limited." The TMDL will set maximum limits on the amount of pollutants allowed to enter in the AgWQM Area waters. This loading capacity is calculated to achieve water quality standards.

Each jurisdiction in the Willow Creek subbasin will be allotted a portion of the TMDLs, representing the maximum amount of pollutant, which may be discharged daily from the lands managed by the respective jurisdiction to Willow Creek. This amount is the jurisdiction's "Load Allocation." The DEQ has requested the appropriate Designated Management Agencies in the basin to develop pollution control plans and programs designed to achieve the load allocations. Oregon Administrative Rules Chapter 340, Division 41, paragraph 026,120 and 642 requires these Water Quality Management Plans and sets the water quality standards.

Consistent with this Area Plan and the memorandum of understanding between DEQ and ODA, an objective of this plan is to meet Willow Creek basin load allocations. At the time of publication of this Area Plan, these loads are not available. The TMDL will be completed in 2002. Assessments done in neighboring basins (Umatilla and Grande Ronde) indicate that system potential vegetation will be needed to sufficiently reduce stream temperatures. The periodic two year review for this Area Plan will enable modifications as needed to implement management that reduces pollutants related to load allocations.

## **Attachment 1**

# **REFERENCES TO INFORMATION USED IN THE DEVELOPMENT OF THE AREA PLAN**

Agricultural Commodity Sales - Morrow County, Extension Economic Information Office, OSU, 2001

Influences of Human Activity on Stream Temperatures and Existence of Cold-Water Fish in Streams with Elevated Temperature: Report of a Workshop, Interagency Multidisciplinary Science Team, November 8, 2000.

Lower Umatilla Basin Groundwater Management Area Action Plan, DEQ, 1997  
NRCS Field Office Technical Guide, NRCS

Oregon Final 1998 Water Quality Limited Streams - 303(d) List, DEQ, Nov. 1998

Oregon Revised Statutes, Chapter 340, Division 41, DEQ, March 1996

Oregon Revised Statutes, Chapter 603, Divisions 90 and 95, ODA

Oregon Revised Statutes, 468B

Oregon Revised Statutes, 561.191  
Oregon Revised Statutes, 568.900 through 568.933

Oregon Small Acreages Conservation Toolbox, NRCS /OACD, 1999  
Questions and Answers About DEQ's Temperature Standards, DEQ, February 1998

Ranch Water Quality Planning Workbook, OSU Extension,

Relationship Between Agriculture Water Quality Management Area Plan Conditions and Water Quality Standards, ODA, Sept. 2000

Restoring Water Quality Throughout Oregon, DEQ, February 1998

Riparian Area Management; A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas, BLM/USFS/NRCS, 1998

Riparian Area Management; Process for Assessing Proper Functioning Condition, BLM, 1995

Riparian Area Responses to Changes in Management, BLM/OSU, 1999

The Ecological Provinces of Oregon, Oregon Agricultural Experiment Station, May 1998

The Oregon Plan Toolbox, Oregon Watershed Enhancement Board

Umatilla Basin Report, Oregon Water Resources Department, 1988

Umatilla Subbasin / Willow Creek Subbasin Summary, prepared for the Northwest Power Planning Council, 2001

Water Quality Monitoring: Technical Guide Book, OWEB, July 1999

WESt Program Workbook, Oregon Cattleman's Association, 1998

Willow Creek Lake, Limnological and Water-quality Studies, Final Report, Larson, Portland State University, 1997

## Attachment 2

### Willow Creek Subbasin: Water Quality Objectives for Temperature, pH and Bacteria

#### Water Quality Concerns

Willow Creek does not meet water quality standards for temperature in the summer. Bacteria concentrations and pH levels in the subbasin have exceeded standards as well. The resulting impaired beneficial uses of area streams are (1) contact recreation such as fishing, wading and swimming, and (2) healthy populations of fish and other aquatic life.

Willow Creek and its tributaries are not cool enough in the summer to fully support resident redband trout and other species. At temperatures above 65-70 °F, redband trout and other cold water fish are inefficient at hunting, hiding and processing food. In addition, warmer water can also harm these fish by increasing the incidence of disease, impairing their ability to spawn, reducing growth rates, and decreasing survival of eggs.

Wide daily pH fluctuations are also dangerous to fish in Willow Creek. And the third impairment being addressed, elevated bacteria levels, can make contact recreation unsafe. Balm Fork, the stream assessed as having high coliform bacteria levels, drains into Willow Creek Reservoir, which is used for recreational purposes.

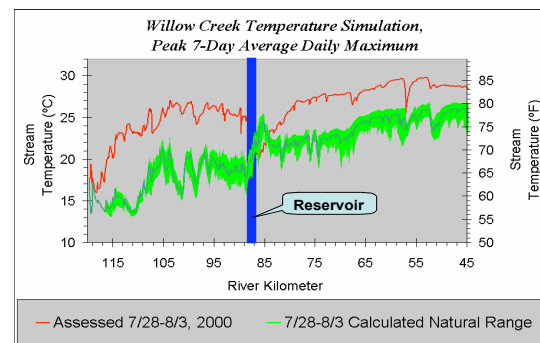
High temperature is associated with solar radiation. Large daily changes in pH are related to heat and light as well. Bacteria can be introduced by various human and animal sources, including natural, livestock and septic and sewer sources.

#### Total Maximum Daily Load

Water body pollution assessment and mitigation is carried out through the Total Maximum Daily Load (TMDL) process. When water quality standards are not met on an ongoing basis, the federal Clean Water Act requires a TMDL to be established. A TMDL is the maximum amount of pollution that can be present in a water body while meeting standards. It identifies where pollution comes from and limits the amount of pollutant, such as heat, allowed to enter a water body.

#### Temperature Standard

The applicable target in the Oregon water quality standard for temperature (revised in 2004) for the Willow Creek TMDL is referred to as the *natural condition criteria*. The TMDL assessment found that natural temperatures would be several degrees cooler than the present condition (Figure 1).



**Figure 1.** Typical July/August Afternoon Peak Temperature. Current temperature (upper line) and the estimated natural temperature (lower line with range for uncertainty) are shown.

## Other Standards

In the Willow Creek Subbasin, the applicable numeric targets from the pH and bacteria standards are 6.0-9.0 standard units for pH and a 30-day log mean (minimum of 5 samples) of 126 *E. coli* per 100 milliliters for bacteria

## Addressing the Problem

The TMDL addresses the problem in several ways:

1. *Provides an estimate of natural temperatures along much of Willow Creek.* This allows managers to see where the greatest room for improvement is.
2. *Establishes numeric goals for on-the-ground conditions that would lead to more natural temperatures and bacteria and pH levels.* Along much of Willow Creek, the TMDL identifies vegetation heights and stable channel widths that would provide for lessened, more natural, heating. Potential increased flow in Willow Creek is also estimated, along with a resultant temperature profile. However, it is important to recognize that DEQ does not regulate flow, nor is the TMDL intended to diminish existing water rights. Bacteria reduction is called for in the Balm Fork watershed. Reservoir and point source controls will lead to decreased summer afternoon pH in and below the Willow Creek Reservoir.
3. *The TMDL is accompanied by a management plan designed to establish bacteria and heat reduction trends, and pH stabilization.* A TMDL Water Quality Management Plan (WQMP) provides a framework with placeholders for various authorities: Oregon Departments of Agriculture and Forestry, the US Forest Service and US Army Corps of Engineers. These designated management agencies (DMAs) will provide TMDL water quality management planning for the area each administers. Cities are also asked to

minimize stream heating. In this initial effort, formal planning and evaluation is not expected of them.

## TMDL Analysis

DEQ has worked in partnership with the Morrow Soil and Water Conservation District and in collaboration with the various affected organizations and watershed managers. This effort advanced the understanding of Willow Creek.

Natural temperature conditions were estimated for 77 miles of Willow Creek. This was based on historical information, literature and existing areas with little disturbance. Temperature profiles were generated to account for varying quantities of shade, channel width and flow. Seasonal and stream-length patterns were assessed for bacteria on Balm Fork and pH on Willow Creek. Highlights of the study are summarized here:

- Increased vegetation, increased flow and decreased channel width would all lead to reductions in stream heating. Stream shade plays the largest role. Shade-producing vegetation has been compromised or removed along 90% of the length of Willow Creek.
- Substantial solar heating occurs from Heppner to several miles below Ione, partly related to an unusually wide channel in this section.
- Typically during late July through August, Willow Creek becomes a dry streambed at some point below Lexington or Ione. Increased Reservoir outflow for irrigation has occurred in recent years, pushing this point further downstream, and giving the flowing stream more thermal assimilative capacity.
- Approximately 57 percent of the existing solar heating of the River is caused by

human activities such as vegetation and bank disturbance.

- Reservoir mixing through its aeration program can eliminate the pH problem in Willow Creek near Heppner, where the 303(d) listing originated. Deeper withdrawal can eliminate the temperature concern in the Reservoir outflow – however, the latter is only true without mixing via aeration. Strategic timing of these controls is needed to address both pH and temperature.
- Bacteria appear to be multi-sourced and controlled by timing and type of land use within the Balm Fork watershed rather than precipitation events or flow levels.

Meeting the TMDL allocations will require effort associated with agriculture, forestry, and Reservoir operations. In general, this means (1) restoring stream-side areas so that banks are stable and vegetated, (2) decreasing Balm Fork's exposure to livestock, runoff and residential sources of bacteria and (3) controlling Reservoir outflow properties through methods such as in-Reservoir artificial aeration and selective depth withdrawal. Where feasible, floodplains, sinuosity and channel complexity should be restored to more natural conditions. The TMDL management plans and land use authorities should provide guidance, planning, incentives and rules to implement these measures.

### **TMDL Documentation & Implementation**

The TMDL and management plan is a single document, about 125 pages in length. The

technical appendix for temperature is a separate electronic file, 86 pages in length. The TMDL document can be viewed at the Department's website ([www.oregon.gov/DEQ/](http://www.oregon.gov/DEQ/)).

Designated management agencies are generally expected to respond within 18 months of TMDL issuance, with implementation plans.

The TMDL was issued by DEQ on January 31, 2007 and approved by the US EPA on February 19, 2007.

### **Adaptive Management**

"Adaptive management" involves ongoing tracking and evaluation of actions taken to reduce pollution. If TMDL implementation efforts prove to be inadequate, DMAs will need to revise their TMDL Implementation Plans.

If DEQ, in consultation with DMAs, concludes that all feasible steps have been taken to meet the TMDL and attainment of a standard is not practicable, DEQ will reopen and revise the TMDL as appropriate. DEQ will also reopen the TMDL if new information indicates that up-dating is needed.

### **For more information**

For more information, contact Don Butcher at (541) 278-4603, Mitch Wolgamott at (541) 278-4619 or use the toll-free number in Oregon at (800) 304-3513.