Walla Walla Agricultural Water Quality Management Area Plan

Guidance Document
and
Administrative Rules

Developed by
The Walla Walla Local Agricultural Water Quality Advisory Committee

With assistance from
The Oregon Department of Agriculture
and
The Umatilla County Soil and Water Conservation District

Adopted April 17, 2002
Revised February 2007
and January 2012

Local Advisory Committee Members

Bob Lewis, chair	**Ed Leahy**	**Jerry Zahl**
Cheri Cosper	**Dennis Rea**	**Ray Williams**
Brian Wolcott	**Vern Rodighiero**	

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ACRONYMS

AFO/CAFO	Animal Feeding Operation/Confined Animal Feeding Operation
AgWQM	Agricultural Water Quality Management
CCRP	Continuous Conservation Reserve Program
cfs	Cubic Feet Per Second
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CWA	Clean Water Act
DEQ	Oregon Department of Environmental Quality
DMA	Designated Management Agency
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
HEL	Highly Erodible Land
LAC	Local Advisory Committee
LMA	Local Management Agency
NRCS	Natural Resources Conservation Service
OACD	Oregon Association of Conservation Districts
OAR	Oregon Administrative Rules
OCA	Oregon Cattleman's Association
ODA	Oregon Department of Agriculture
ODFW	Oregon Department of Fish and Wildlife
ORS	Oregon Revised Statutes
OSU	Oregon State University
RUSLE	Revised Universal Soil Loss Equation
SB 1010	Senate Bill 1010
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture

Walla Walla 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 Walla Walla 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.

The provisions of this Area Plan do not establish legal requirements or prohibitions.

The Oregon Department of Agriculture (ODA) exercises its enforcement authority for the prevention and control of water pollution from agricultural activities under administrative rules for the Walla Walla subbasin, Oregon Administrative Rule (OAR) 603-095-1700 through 603-095-1760 and statewide enforcement procedures provided in OAR 603-090-0060 through 603-090-0120.

This Area Plan is 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.

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II INTRODUCTION

The Agricultural Water Quality Management Program in the ODA's Natural Resources Division is responsible for addressing water pollution associated with agricultural lands and activities.

In 1993, the Oregon Legislature passed Senate Bill 1010, which directed ODA to be the lead state agency working with agriculture to address water pollution. The bill is codified at ORS 568.900 – 568.933 and is referred to as the Agricultural Water Quality Management Act. The ODA is authorized to develop and carry out a water quality management plan for agricultural or rural lands when state or federal law requires a water quality management plan. In 1995, the Oregon Legislature passed SB 502, now codified at 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. Under these statutes, ODA is the agency responsible for regulating agricultural activities in Oregon as they affect water quality.

AgWQM area plans help identify and control water pollution caused by activities on agricultural and rural lands. These area 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.

This Area Plan was first developed in 2002 by volunteer members of the Walla Walla AgWQM Local Advisory Committee (LAC) with assistance from the ODA and the Umatilla Soil and Water Conservation District (SWCD). It represents the efforts of the LAC, the ODA and the SWCD, in consultation with members of the community, to address water quality as it may be affected by conditions on agricultural and rural land in the planning area. Members of the LAC at that time were:

Tom Darnell: Chairman; OSU Extension; M-F	Vern Rodighiero: M-F; orchard crops, WWBWC
Craig Buchanan: M-F; dryland & irrigated crops	Brent Stevenson: M-F; irrigation district
Jim Burns: M-F; WWBWC, forestry, fruit	Ray Williams: dairy, livestock, irrigated crops
Cheri Cosper: M-F; horses, SWCD	Jerry Weidert: Athena; dryland crops
Ed Leahy: M-F; dryland crops	Jerry Zahl: College Place, WA; ag. consultant
Jessica Pottenger: Weston; Smith Foods; environmental	Bob Lewis: Alternate; M-F; irrigated crops, consultant
Dennis Rea: M-F; dryland & irrigated crops, livestock	

This Area Plan and accompanying area rules were approved by the Oregon State Board of Agriculture in 2002. Biennial reviews have been held in 2004, 2007, 2009, and 2012. The Area Plan was revised in 2007 to add TMDL information and updated in 2012 to add information about monitoring and priority areas.

The operational boundaries of this Area Plan include all private agricultural and rural land in Oregon that drains into the Walla Walla River and its tributaries. Federally managed land and those activities subject to the Oregon Forest Practices Act are exempted from this Area Plan but are subject to water quality management plans developed by the respective designated management agencies. This Area Plan applies to agricultural lands in current use and those lying idle or on which

management has been deferred. This Area Plan also applies to rural lands not in agricultural use such as private roads and rural residential properties.

Area rules have been formally adopted to implement this Area Plan. Area rules 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 are presented in this Area Plan and indicated by bold type within a border.

Administrative Rule

603-095-1700
Purpose

(1) These rules have been developed to implement a water quality management area plan for the subbasin pursuant to authorities vested in the department through ORS 568.900-568.933, and ORS 561.191-561.191. The area plan is known as the Walla Walla AgWQM area plan.

(2) The purpose of these rules is to outline requirements for landowners in the Walla Walla AgWQM Area, for the prevention and control of water pollution from agricultural activities and soil erosion. Compliance with Division 95 rules is expected to aid in the achievement of applicable water quality standards in the Walla Walla AgWQM Area.

III GEOGRAPHIC AREA AND PHYSICAL SETTING

Location

The Walla Walla River Basin, located in southeast Washington and northeast Oregon, encompasses 1,758 square miles (1,125,120 acres). The portion of the basin in Oregon is 27 percent or 480 square miles. The Oregon Walla Walla River subbasin is bounded by the Oregon-Washington state line (on the north), by the Blue Mountains (on the east and the south), and by Umatilla River Basin and the Columbia River (on the west). The Walla Walla River originates in the Blue Mountains and flows northwesterly, crossing into Washington state at river mile 40, and entering the Columbia River at Wallula, WA (RM 313). The Oregon portion of the subbasin has eight watersheds: mainstem Walla Walla River (including branches of the Little Walla Walla River), South Fork Walla Walla River, North Fork Walla Walla River, Pine Creek, Dry Creek, Birch Creek, Vansycle Canyon and Couse Creek. Two other watersheds, Cottonwood Creek and Mill Creek, lying partially in Oregon, are included in the plan area. This Area Plan applies only to the Oregon portion of the basin.

Climate

The climate in the basin is continental where winters are cold, but generally not severe, and summer days are hot, but nights are fairly cool. Average daytime high temperatures generally decrease with increasing elevation. Lower elevation area temperatures average 50° to 55° Fahrenheit (F) with extreme temperatures of 115° and -21°F recorded in recent years. Precipitation ranges from less than ten inches in a narrow band along the Columbia River to more than 40 inches at high elevations in the Blue Mountains. Most precipitation occurs between October and May with snow in the upper elevations.

Geology

Elevations in the Walla Walla River basin are about 270 feet at the Columbia River, about 3,000 feet along the base of the Blue Mountains, and up to 6,000 feet at mountain crests. The elevation of Milton-Freewater is about 950 feet. Multiple lava flows exceeding 2,500 feet in thickness, known as the "Columbia River Basalt," underlie nearly the entire subbasin. The river basin is divided into two physiographic regions, the Deschutes-Umatilla Plateau and the Blue Mountains.

The Deschutes-Umatilla Plateau is a broad upland plain formed by flow upon flow of basalt, which dip gently northward from the Blue Mountains to the Columbia River. The Blue Mountain region includes the extreme northern extension of the Blue Mountains of Oregon. It was formed by uplifting, folding, faulting, and erosion of a variety of volcanic, sedimentary and metamorphic rock and is characterized by flat-topped ridges, steep-walled canyons, and forested mountain slopes.

The Walla Walla syncline (a broad u-shaped fold) forms the center of the Walla Walla subbasin and forms a deposition basin between the upland areas. These numerous sedimentary deposits include both areas of clay and gravels deposited on top of the basalt. Younger sedimentary deposits overlie the clay and gravel units. (Umatilla Basin Report, 1988)

Hydrology

The Walla Walla River and its tributaries drain about 480 square miles in Oregon. Water availability in the Walla Walla River basin is dependent on high-elevation snowpack in the Blue Mountains. Runoff occurs anytime during the precipitation period of October through May, with peaks occurring in April. Flows diminish rapidly after May, reaching their lowest levels in August and September. Streamflows increase in late fall and winter in response to storms migrating in from the Pacific Ocean.

Soils

An extensive deposit of silty clay known as the Palouse Formation covers much of the uplands. Recent alluvium, consisting of clay, silt, sand, and gravel deposited by present-day rivers and streams is common in river valleys and flood plains. (Umatilla Basin Report, 1988)

A deep deposit of loess (windblown silt and fine sand) covers much of the subbasin that is used for agricultural purposes. Loess is highly erodible, yielding sediment, particularly in the middle and lower reaches of the main stem Walla Walla River. (Watershed Assessment, Upper Walla Walla River Subbasin, 1997).

See Attachment 1 for more detailed description of general soil types. The *Soil Survey of Umatilla County Area, Oregon, 1988,* provides more information about the characteristics of specific soil types found in the area.

Vegetation

Currently, vegetation in the headwaters of the drainage is primarily evergreen forest, dominated in the higher elevations by Douglas fir and grand fir with an understory of shrubs, grasses, and forbs. In the lower elevation, there is a more open forest dominated by ponderosa pine.

Mid-elevation lands are characterized by stands of timber changing into brush and grass as the elevation declines. Past land management has eliminated much of the native sagebrush and bunchgrass; these have widely been replaced by noxious weeds and other undesirable grasses, shrubs, and broadleaf weeds. Large mid-lower elevation areas have been converted into dryland farming. This is a transition zone, where farmland is intermingled with range. Often, the north slopes will be farmed while the west and south slopes, with shallower soils, are used as range.

A riparian community dominated by cottonwood, alder, willow, and various shrubs occurs throughout the river basin. Cultivation, logging, domestic livestock grazing, residential and commercial development, and flood control activities have affected riparian vegetation throughout much of the mid-lower elevation reaches of the subbasin.

Land Ownership and Land Use

According to the Umatilla Basin Report, 1988, the total acreage in the Oregon portion of the Walla Walla basin is 311,982 acres. Land in private ownership is 256,111 acres (81.7%), mostly in cropland or rangeland. The public owns 55,871 acres (17.8%). Of these public lands, 53,588 acres are managed by US Forest Service, 1,942 acres are managed by the Bureau of Land Management, and 41 acres by the state. The US Forest Service has 136 acres of land in the Wenaha-Tucannon Wilderness Area that lie within the Walla Walla River basin.

Agriculture and related trades and industries are the economic base for the area. Production of a number of important food crops has led to the development of a large food-processing complex in the valley. Since farm-gate value is reported for Umatilla County as a whole ($250 million), it is difficult to determine an exact economic value for agriculture in the Walla Walla River basin alone. 1999 statistics, from the Oregon State University (OSU) Extension Information Office, indicate the value of tree fruit crops and alfalfa seed, which are grown almost exclusively in the Walla Walla basin, at $8.2 million.

There are about 133,000 acres of cropland in the Walla Walla River basin. Grains, predominantly wheat, account for about 50 percent of crops grown and are located primarily on the higher dryland areas. Green peas account for about 13 percent and are grown on the drylands where the rainfall is adequate, usually in rotation with wheat. Commercial vegetable and fruit production, concentrated north of Milton-Freewater account for about 9 percent of the acreage; pasture, alfalfa and other hay account for about 15 percent; and the remainder is idle or fallow. Approximately 20,000 acres are irrigated with water that is withdrawn from wells and from surface sources.

Livestock production is important in the valley. Most of the estimated 4,800 cow-calf pairs are raised on irrigated pastures with summer grazing on the slopes of the Blue Mountains. There are some small feedlots and dairies in the subbasin.

Forested land in the subbasin is about 88,200 acres. National forests comprise about 54 percent, private holdings about 43 percent and state and local government less than 3 percent. Most forestland has been logged at least once.

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have treaty rights and interests in their traditional homeland, which includes the entire Walla Walla Basin, and those relating to natural resources and water quality, such as fishing and subsistence activities.

Water Yield and Flow

The hydrology of the Walla Walla drainage is complex due to its geology and extensive development. The Walla Walla River's flow in Oregon comes largely from two tributaries: the North and South Forks Walla Walla River. Both forks emerge from deep basaltic canyons and join to form the Walla Walla River mainstem about five miles southeast of Milton-Freewater.

Active gauges are maintained on the North and South Forks of the Walla Walla River. The South Fork is the larger of the two streams. Average annual yield of the South Fork is more than three times that of the North Fork. Together, they yield about 198,000 acre feet per year.

The Walla Walla River has created an extensive alluvial fan from the gravels supplied by its forks and its channel. Once it flows out of the bedrock canyons of its headwaters, the Walla Walla dissipates a portion of its flow into the deposited gravels. Historically, the mainstem dispersed into multiple channels spreading across the valley floor. The multiple channels, including the Little Walla Walla River, are now used as natural irrigation ditches to carry water to the farms and orchards. (Umatilla Basin Report, 1988)

On an average year, prior to 2001, by June or early July, the Walla Walla River was dry near the state line because of irrigation withdrawals, seasonally low flows, channel bed water losses and evaporative losses. Irrigation and groundwater return flows yield live flow in the Washington section of the Walla Walla River. Increases noted in some wells that pump from the shallow gravel aquifer during the irrigation season are attributed to groundwater recharge from irrigation ditches.

Water Use

The first irrigation was believed to have occurred in 1846. The earliest water rights of record date to the early 1860's. Some of these rights were established by court decree in the Walla Walla adjudication in 1933. In 1986, the Water Resources Commission withdrew the Walla Walla River and tributaries from further appropriation from the Little Walla Walla diversion to the state-line. Ground water development for irrigation dates back to the early 1900's.

A general provision of law, ORS 537.811, prohibits out-of-state diversions of water without consent of the Oregon Legislature. A 1936 U. S. Supreme Court decision allows Oregon users with senior water rights to divert the entire flow of the Walla Walla River before it enters Washington. Other judicial stipulations require water distribution on interstate tributaries as if the state line did not exist.

Approximately 70 percent of the surface irrigation water in the Oregon portion of the basin is delivered through two irrigation districts - the Walla Walla River Irrigation District (WWRID) and the Hudson Bay District Improvement Company (HBDIC). The combined water rights for the two districts is approximately 280 cubic feet per second (cfs) with the combined diversion rate peaking at about 150 cfs during June and drops to approximately 60 cfs in September.

The WWRID was formed in 1995 by the consolidation of five existing irrigation companies. Almost 500 water rights with priority dates in the late 1800's make up the WWRID that allow for year around diversion. It delivers water to 3,600 acres with water rights from the Walla Walla River. It maintains four diversion sites and ten canals and ditches totalling 30.4 miles. The irrigation season is from mid-March to mid-October. Irrigation water is applied mostly by sprinklers. This application method is most efficient in the prevalent coarse soils. In general, water rights in the WWRID provide for a diversion of 16.8 gallons per minute per acre though modern application methods and current crops may require less water.

The HBDIC was formed in 1952 and took over existing irrigation facilities. It delivers water to approximately 6,900 acres with Walla Walla River surface rights. The water is diverted at the Little

Walla Walla diversion and redistributed at the "frog", a centralized distribution facility. The HBDIC maintains five canals and ditches with a combined length of 35.6 miles.

The Little Walla Walla River is a former braided stream section of the Walla Walla River and is used as a primary component of the district's water delivery system. It is considered by court order to be a natural stream even though the flows are regulated by headgates and fish screens that are present.

Water diverted by other basin users, above Milton-Freewater, is done by individual or small group diversions that do not have organized irrigation districts. These diversions account for about 30 cfs. Current projects are being implemented to improve the efficiency of these diversions including improved headgates and flow measuring devices, fish screens, removal or modification of gravel push-up dams, conversion to pump systems and conversion from flood to sprinkler systems. These projects are being carried out by local citizens, irrigation districts, the Walla Walla Basin Watershed Council, the Water Resources Department (WRD), Bonneville Power Administration, and the CTUIR.

Groundwater

Fractured basalt provides a major ground-water source throughout the river basin. The basalt aquifer is thought to contain ancient water with limited recharge occurring mainly in the Blue Mountains. A major alluvial or gravel aquifer underlies approximately 120,000 acres of the central river subbasin (the Milton-Freewater/Walla Walla area).

Gravels are the major water-conducting material overlying the basalts in the Walla Walla subbasin. Recharge to the gravels occurs from precipitation, infiltration from riverbeds, canals, ditches, and irrigation loss. The water moves down gradient, which is usually down slope along porous and permeable zones in the gravels. Approximately 50,000 acre feet of water moved through the gravels in an average year during the 1930's and 1940's (Umatilla Basin Report, 1988).

The gravel aquifer provides both domestic and irrigation water. Ground water levels vary from near land surface in the winter to as low as 50 feet below land surface in late summer. Annual fluctuations of 20 to 25 feet are common in some wells (Umatilla Basin Report, 1988).

Because the gravel aquifer is shallow and the soils are highly permeable, it is susceptible to degradation from fertilizers, pesticides, septic systems and urban runoff (Umatilla Basin Report, 1988). A groundwater quality study, conducted in April 1999 by the Oregon Department of Environmental Quality (DEQ) in the area north and west of Milton-Freewater, found no levels of contaminants at or above drinking water standards. However, occasional elevated levels of bacteria and nitrates do indicate a need for further study and awareness.

Fish Resources

The Walla Walla River subbasin is home to several anadromous and resident fish species, of which steelhead and bull trout are listed as threatened under the federal Endangered Species Act. Channelization, low streamflow and high water temperature are factors limiting the production of

fish in this subbasin. Measures are being taken by local irrigators, tribes, and agencies to develop a Bi-State Habitat Conservation Plan for protection of these wild fish. The Walla Walla Basin Watershed Council, irrigation districts and producers are actively promoting irrigation efficiency projects to reduce the amount of water diverted from the Walla Walla River. Yearly agreements are being negotiated between the irrigation districts and the US Fish and Wildlife Service to protect irrigation district patrons from liability and to leave adequate water instream to protect and improve fish habitat.

Most major migration barriers have been removed or altered, but passage at push-up dams is still a potential problem. Completion of the new Nursery Bridge Dam fish ladder, in 2001, removed the last permanent structural barrier in the Walla Walla River. All ditches and diversions in the mainstem are screened and diversion structures are being improved to make them more efficient and fish friendly.

Resident and anadromous fish habitat and water temperatures are good in the headwaters of the North and South Forks. Fish habitat quality decreases and water temperature increases as the river flows down through the valley. Water quality remains fairly high, but because of levees to protect property, fish habitat quality (stream complexity and large organic debris) decreases. Mainstem habitat is limited between Milton-Freewater and the state-line because of low flows, U.S. Army Corps of Engineers flood control levees, and diversions.

Steelhead are present with adult and juvenile migration coinciding with the higher streamflows of November through June. Annually, a ten-year average of 621 adult steelhead return to the upper Walla Walla River (ODFW communication, 2/2012). This suggests that the steelhead population is near the carrying capacity of 658 fish under current conditions. Most spawning occurs in March through May and smolt out-migration takes place during winter and spring.

Bull trout are found in the Upper Walla Walla River and Mill Creek. Adult bull trout move downstream from headwater tributaries after spawning in the fall, over-winter mostly in the mainstem, and return to the headwaters as waters warm in the spring. Based on spawning surveys, bull trout numbers are increasing with a population of 4,000 estimated in the entire Walla Walla River system.

Small numbers of Western Brook lampreys are present. Lampreys are anadromous and migrate as juveniles, returning to the headwaters to spawn.

Resident fish include redband trout, mountain whitefish and margined and paiute sculpin in the upper watershed and northern pikeminnows, chiselmouth, redside shiners, largescale suckers and speckled dace in the lower basin.

Spring chinook were indigenous historically to the basin, but were extirpated by the 1920's. The CTUIR successfully reintroduced spring chinook salmon to the basin in September 2000 and August 2001. Adult chinook began returning to the Walla Walla River in 2004. Since re-introduction, the average chinook return is 263 adults with 1,193 in 2010.

Geographic and Programmatic Scope

The operational boundaries of this Area Plan include all agricultural and rural lands that drain to the Walla Walla River and its tributaries within Oregon, except federally managed land and activities subject to the Oregon Forest Practices Act. This Plan also applies to agricultural lands in current use and those lying idle or on which management has been deferred. This Area Plan applies to rural lands not in agricultural use such as private roads, and addresses soil erosion on recreational areas and residential property. The operational boundaries of the plan area are defined in rule OAR 603-095-1720.

603-095-1720
Geographic and Programmatic Scope
(1) The Walla Walla AgWQM Area includes the area in Oregon that drains into the Walla Walla River. The physical boundaries of the Walla Walla River Subbasin are indicated on the map included as Appendix 1 of these rules (Attachment 5 in the plan).
(2) Operational boundaries for the land base under the purview of these rules include all lands within the Walla Walla AgWQM Area in agricultural use and agricultural and rural lands which are lying idle or on which management has been deferred, with the exception of public lands managed by federal agencies and activities that are subject to the Oregon Forest Practices Act.
(3) The provisions of these rules apply to all agricultural land whether or not in current productive agricultural use.
(4) The provisions and requirements outlined in these rules may be adopted by reference by Designated Management Agencies with appropriate authority and responsibilities in other geographic areas of the Walla Walla River Subbasin.
(5) For lands in agricultural use within other Designated Management Agencies' or state agency jurisdictions, ODA and the appropriate Local Management Agency (LMA) shall work with these Designated Management Agencies to assure that provisions of these rules apply, and to assure that duplication of any services provided or fees assessed does not occur.

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IV WATER QUALITY ISSUES

The Federal Clean Water Act (CWA) requires that each state designate beneficial uses, decide which parameters to measure to determine whether beneficial uses are being met, and to set criteria for those 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 (TMDL) for 303(d) listed streams. These TMDLs will result in allocations of pollutant loads, e.g. degrees of temperature or milligrams/liter of sediment, to different sources such as private agriculture, urban areas, and federal lands. The TMDL for the Oregon portion of the Walla Walla Basin was approved by EPA in 2005. The Walla Walla TMDL issued temperature targets and an improvement plan to address stream heating in the basin.

The strategies identified in this Area Plan for reducing pollution from agricultural and rural lands are consistent with goals for non-point source pollution reduction established in the Walla Walla Subbasin Basin TMDL. This Area Plan serves as the implementation plan for agriculture's load allocation and may be revised to address the load allocations as they are implemented. It is expected that adoption of management practices aligned with the Prevention and Control Measures will, over time, result in achievement of TMDL goals and meeting water quality standards.

Beneficial Uses

Water quality in the Walla Walla Management Area is managed to protect recognized beneficial uses. Beneficial uses of water in the Walla Walla basin are: public and private water supply, industrial water supply, irrigation, livestock watering, anadromous fish passage, salmonid fish rearing and spawning, resident fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation and aesthetic quality (OAR 340-041-682, table 12). Beneficial uses that are adversely affected, according to current data, include: salmonid fish rearing and spawning, anadromous fish passage, resident fish and aquatic life, irrigation, and fishing.

Water Quality Parameters of Concern

The Federal CWA requires each state to determine water quality by: 1) identifying beneficial uses for each water body; 2) designating parameters to monitor for each beneficial use; and 3) establishing a standard for each parameter. The state is also required to report findings to Congress every two years, and to correct water quality problems.

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

Four river segments in the Walla Walla subbasin were declared "water quality limited," for temperature and one for flow modification under section 303(d) of the CWA when the DEQ updated the listing in 1998. TMDLs were approved for temperature in 2005 and flow modification was dropped as a pollutant requiring a TMDL. In addition, most assessments of the conditions of

the Walla Walla subbasin indicate that sediment is a water quality concern affecting beneficial uses. Management that addresses the conditions described in the Prevention and Control Measures section of this Area Plan will aid in preventing future water quality listings.

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

Temperature

Temperature is primarily a summer concern for rearing of anadromous fish species, resident trout and for bull trout. 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° 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. High water temperatures can also create barriers to migration and prevent normal movement of both juvenile and adult fish.

The Oregon temperature standard is defined in OAR 340-041-0028. The applicable biologically based temperature thresholds (numeric criteria) in the subbasin are:

- Salmon and trout rearing and migration (18.0 ºC (64.4 ºF)) applicable at all times when not superseded by a cooler criterion below.
- Core cold water habitat criterion (16 ºC (60.8 ºF)), applicable year round in waters draining to the mainstem while still in Oregon; except where cooler criteria apply simultaneously.
- Salmon and steelhead spawning criterion (13 ºC (55.4 ºF)), applicable above the state border to the upstream part of the city of Milton-Freewater from January 1 through June 15.
- Bull trout spawning and juvenile rearing criterion (12 ºC (53.6 ºF)), applicable above the state border during times of spawning and rearing.

Where DEQ determines that the natural thermal potential of all or a portion of a water body exceeds the biologically-based criteria, the natural thermal potential temperatures supersede the biologically-based criteria, and are deemed to be the applicable temperature criteria for that water body.

Computer simulation of heating of the Walla Walla River indicates that these criteria are not attainable in much of the subbasin in the summer even at conditions approaching natural. In such situations, the temperature standard specifies that the target of the TMDL is "natural thermal potential temperatures" within 0.3 ºC human use allowance. The TMDL defines natural thermal potential as the best estimate of vegetation, channel shape, stream flow and other thermal controls that would occur without past and present human disturbance. (*Walla Walla Subbasin TMDL, 2005)*

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 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.

Ongoing efforts are being carried out by land managers to reduce soil erosion and sediment delivery to streams. However, current U.S. Department of Agriculture (USDA) farm programs do not require soil erosion reduction on the majority of Walla Walla area soils because they are not classified as "highly erodible" and are capable of maintaining productivity while losing up to five tons per acre per year. To maintain adequate water quality for beneficial uses, this Area Plan addresses soil erosion and sediment by extending USDA farm program soil erosion control requirements to all soil types.

Sources of Impairment and Conditions Affecting Water Quality

Both point and nonpoint sources contribute to water pollution. Point sources discharge pollutants into the water through a pipe or conveyance. In contrast, nonpoint source pollution is pollution emanating from landscape scale sources and typically cannot be tracked to a single point of discharge. Nonpoint sources of pollution in the area include runoff and erosion from agricultural and forest lands, leaching of pollutants to groundwater, eroding stream banks, and runoff from roads and urban areas. Pollutants from nonpoint sources can be carried to the surface water or groundwater through the actions of rainfall, snowmelt, irrigation, and leaching. Increased heat input due to vegetation removal, seasonal flow reduction, changes in channel shape, and floodplain alteration are major nonpoint sources of water quality impairment. Channelization and bank instability may alter gradient, width/depth ratio, and sinuosity, thereby causing undesirable changes in sediment transport regime, erosional and depositional characteristics, and elevated temperature.

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

Protection of riparian and streamside areas for moderation of stream temperatures are addressed in Area Rules. Low summer streamflows often result from channel loss and water withdrawals for beneficial uses, primarily irrigation, along with normal seasonal reductions of streamflow. Water withdrawals are regulated by the Oregon WRD.

Total Maximum Daily Loads *(excerpted from DEQ Fact Sheet-September 2005)*

DEQ developed the TMDL for temperature in partnership with the Walla Walla Basin Watershed Council and in collaboration with the various affected organizations and watershed managers. This effort advanced their understanding of the river.

The lower portions of the Walla Walla River and its tributaries are not cool enough in the summer to fully protect salmon and trout (salmonids) when they rear and spawn. The Walla Walla Basin salmonids that are most sensitive to this heating are: Chinook salmon, steelhead trout and bull trout, present in much of the Basin. During the summer and early fall, low stream flows and high solar input cause the water temperature to rise to levels that can be deadly to cold water species. At temperatures above 65-70 ºF, these fish are inefficient at hunting, hiding and processing food. In addition, warmer water can also harm salmonids by increasing the incidence of disease, impairing their ability to spawn, reducing growth rates, and decreasing survival of eggs.

In the Walla Walla Basin, a substantial cause of stream heating results from the removal of trees and other shade-producing vegetation adjacent to the stream. This allows direct sunlight to heat the water. In addition, vegetation disturbance and stream straightening are common causes of bank erosion in the Basin, resulting in wider channels with more solar heating.

The TMDL addresses the problem in several ways:

1. *Provides an estimate of near-natural temperatures along the length of the Walla Walla River*. 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*. The TMDL identifies vegetation heights and stable channel widths that would provide for lessened, more natural heating. Potential increased stream flow is also estimated, along with the 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.
3. *The TMDL is accompanied by a management plan designed to establish a cooling trend*. 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 Bureau of Land Management. These designated management agencies (DMAs) will provide TMDL water quality management planning and implementation for the area each administers.

V STRATEGIES FOR ACHIEVING PLAN GOALS AND OBJECTIVES

Goal

The goal of this Area Plan is to establish a framework to protect and maintain beneficial uses, to minimize agriculture's impact on water quality, and to achieve applicable water quality standards within the Walla Walla AgWQ Area. The Area Plan establishes procedures to identify and control factors that may contribute to pollution originating on agricultural and rural lands.

Objectives

To maintain water quality, an effective strategy must increase awareness of the problems and the range of potential solutions, motivate appropriate voluntary action, and provide for technical and financial assistance to plan and implement effective water pollution prevention and control measures. The following objectives will be employed at the local level by SWCD and the Walla Walla Basin Watershed Council in cooperation with landowners, and other agencies and organizations.

1. Work to maintain and improve the quality of water in the Management Area through planning and implementation of technically sound and economically feasible management practices that contribute to meeting plan goals.

    A. Control pollution that may be caused by agricultural activities, as close to the source as possible, by controlling soil erosion and sediment delivery to streams.
    B. Demonstrate reduction in potential sources of pollution from agricultural and rural lands through scientifically valid monitoring and periodic surveys of stream reaches and associated lands, as funds are available.
    C. Promote implementation of successful practices for: streambank stabilization; reduction in high summer water temperatures, where economically and biologically practical; restoration and enhancement of wetlands and riparian areas; and improved fish habitat.
    D. Promote implementation of conservation practices to improve irrigation water use and conveyance efficiency to reduce the potential of polluted return flows.
    E. Promote adaptive management, which encourages adjustments in management based on feedback, or monitoring and changing environmental and economic conditions.
    F. Identify priorities for pollution source identification and determining areas for implementing restoration activities including reasonable timelines for management strategies targeting TMDL attainment.

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 by providing education and technical assistance activities.

A. Incorporate implementation of the Area Plan as a priority element in the SWCD Annual Work Plan and Long-Range Plan and the Walla Walla Basin Watershed Council Action Plan, with support from partner organizations.
B. Showcase successful practices and systems and conduct annual tours for landowners and media.
C. Recognize successful projects and practices through appropriate media and newsletters.
D. Promote cooperative on-the-ground projects to solve critical problems identified by landowners and operators and in cooperation with partner organizations.
E. Conduct educational programs to promote public awareness of water quality.
F. Evaluate current research and scientifically valid 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 biannual plan reviews.

3. Encourage active participation by the agricultural community and rural public in the process of solving water quality problems.

   A. Provide assistance to landowners in development of individual water quality plans and the implementation of best management practices adopted in those plans.
   B. Review research and development needs with agriculture assistance agencies and consultants to promote the continued development, evaluation, and adoption of practices and technologies that enhance water quality in an efficient, effective, and economic manner.
   C. Annually identify water quality funding needs with agencies providing cost-share and technical assistance to agricultural operations and promote incentive and cost-share programs to assist implementation of plans and related practices.

4. Achieve plan goals and objectives by encouraging adequate funding and administration of the program to support systematic, long-range planning and focusing of coordinated efforts on full-scale, watershed-based approaches, identifying needs, developing projects, actively seeking funding, and ensuring successful implementation of funded projects.

The ODA and the SWCD's primary strategies to reduce amounts of pollution from agricultural and rural lands lie in the reduction of runoff and erosion through a combination of educational programs, riparian area enhancement, implementation of sound land use and irrigation management practices, and monitoring of implementation effectiveness. This will be accomplished by the adoption and compliance with Prevention and Control Measures directly related to water quality.

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 activities and rural lands. The sections that follow describe more detailed information related to potential agricultural water quality concerns, provides definitions of commonly used terms, provides dates when landowner compliance

should be achieved and provides some exemptions to the rules. Criteria will be applied with consideration of agronomic, horticultural and economic impacts.

603-095-1740

Prevention and Control Measures
(1) Limitations:
(a) All landowners or operators conducting activities on agricultural lands are provided the following exemptions from the requirements of OAR 603-095-1740 (Prevention and Control Measures).
(A) A landowner or operator shall be responsible for only those conditions caused by activities conducted on land managed by the landowner or operator.
(B) A landowner or operator is not responsible for conditions resulting from unusual weather events or other uncontrollable circumstances.
(C) The Department will allow temporary exceptions when a specific integrated pest management plan is in place to deal with certain weed or pest problem.
(b) These rules may be modified as a result of the biennial review of the progress of implementation of the Walla Walla AgWQM area plan.

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. These requirements are consistent with existing water quality regulations and are enforceable by 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, ORS 468B.025(1) states:
...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.

ORS 468B.050 identifies the conditions when a permit is required. A permit is required for certain livestock confinement areas, defined as animal feeding operations or concentrated animal feeding operations (AFO/CAFO), under rules currently being drafted, which are consistent with the federal definitions.

ORS 468B.005 provides the following definitions:

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

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

"Water or the waters of the state" include lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, 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.

Stream-Side and Riparian Area Management

Areas near water bodies are especially important to water quality and sensitive to management activities because of the natural ecological functions performed there such as water infiltration, waste filtration, erosion control, water storage, and moderation of temperature. Good riparian management provides habitat for fish and may yield more water in the channel in the summer.

Summer water temperatures at sub-optimal levels for aquatic species survival are a concern in some reaches of the Walla Walla subbasin. Moderation of high summer water temperatures is an objective of this Area Plan. Water temperature can best be influenced by activities that encourage the development and protection of vegetation along streams to provide shade, narrowing and deepening of the channel, and water infiltration and storage within the streambanks. Increasing summer streamflows would also lead to reduced water temperatures. However, issues dealing directly with increasing streamflow are beyond the scope of this Area Plan.

(3) Streamside and Riparian Area Management
(a) Except as provided in OAR 603-095-1740(3)(b), effective January 1, 2006, streamside area management must have allowed the establishment, growth and maintenance of riparian vegetation to promote habitat and protect water quality by filtering sediment, stabilizing streambanks, naturally storing water, and providing shade consistent with the vegetative capability of the site.
(b) OAR 603-095-1740(3)(a) does not apply to irrigation water conveyance systems, including,

but not limited to, irrigation canals, ditches, laterals, and waterways, such as the Upper Little Walla Walla system, that in the normal course of operation have no return flow into perennial streams where coldwater fish species are present.

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 these 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:

- Floodwater retention and ground water recharge,
- 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,
- Moderation of solar heat input by shade,
- 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 available to evaluate improvement of the streamside 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,
- Plant community composition changes reflecting increases in grass-sedge-rush, shrubs, and litter and decreases in bare ground,
- Plant community composition reflecting decreases in noxious plant species,
- Stream channel characteristics showing a narrowing and deepening of the channel,
- Shade patterns consistent with site capability,
- Stubble height of herbaceous (grass) species and leader (new) growth of shrubs and trees.

Characteristics of a healthy riparian area condition evaluation:

- Actively eroding streambank of no more than 20-25 percent of total streambank length,
- Shade levels of 50-70 percent at midday on 4th order or less streams,
- Stubble height measurements, dependent on species, of four to six inches of herbaceous species left prior to spring runoff,
- Growth and recruitment of shrubs and trees - no more than 50 percent utilization of annual growth of shrubs and trees.

The LAC has determined that the irrigation canals and ditches in the area served by the WWRID and the HBDIC should be exempt from the riparian vegetation requirement. These waterways are maintained for the delivery of irrigation water to cropland within the boundaries of the Districts. There is minimal flow of water from these irrigation canals and ditches back into perennial streams and the ditches are screened to prevent the introduction of fish. Therefore, since there are no known impacts to fish spawning and rearing streams within the canal system, moderation of water temperature is not required. Water that does infiltrate into the gravel aquifer and recharges groundwater or re-emerges as streamflow usually is cooler than the receiving stream water. Maintenance of riparian vegetation along ditches and canals within the intense fruit growing areas would create a hazard by providing host vegetation for fruit pests and would result in increased use of pesticides.

All other irrigation diversions in the Walla Walla River basin must prevent overland return flows that may carry pollutants into the receiving streams.

Uplands Management and Soil Erosion

A landowner or operator must implement measures that prevent and control water pollution from upland runoff and soil erosion. This includes agricultural and rural lands that may not be in close proximity to water bodies.

Soil erosion on uplands must be within acceptable limits. While soils lost through erosion may not necessarily enter waters of the state, due to distance from the stream or to practices such as terraces and filter strips, the reduction in such erosion will reduce the likelihood that soils will enter area streams.

(4) Soil Erosion and Sediment Control
(a) Effective on January 1, 2006, landowners must control upland soil erosion using practical and available methods.
(b) Landowners must control active channel erosion to protect against sediment delivery to streams.
(c) On croplands, a landowner may demonstrate compliance with this rule by:
(A) operating consistent with a 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);
(D) constructing and maintaining terraces, sediment basins, or other structures sufficient to keep eroding soil out of streams.
(d) 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 or 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.

Upland areas are the rangelands, forests and croplands upslope from the riparian areas. These areas extend to the ridge tops of watersheds. Vegetation and soils are distinguishing characteristics of upland areas. With a protective cover of crops, 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 waters. Vegetation is dependent on physical characteristics including soil, geology, landform, water and other climate factors. Healthy uplands maintain productivity over time and are resilient to stresses caused by variations in physical and climatic conditions.

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, particularly 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,
- Ground cover (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 Natural Resources Conservation Services (NRCS).

Cropland management systems must be designed to control sheet and rill erosion and gully erosion on all cropland, not just land designated as Highly Erodible Land (HEL). The Revised Universal Soil Loss Equation (RUSLE) can estimate average annual sheet and rill erosion rates over a cropping rotation, with supporting data from the NRCS Field Office Technical Guide and similar data from other credible sources.

Rangeland and pasture management must allow vegetation sufficient to protect water quality by providing water infiltration, filtering of sediment and animal wastes, and controlling soil erosion within the capability of the site.

Private roads on rural lands or roads used for agricultural activities should be constructed and maintained to limit runoff of sediment into waters of the state. Roads used for activities subject to the Oregon Forest Practice Act are regulated by Forest Practice Act rules. Homesteads, farmsteads and other non-crop areas should be managed to control runoff of sediment and animal wastes into waters of the state.

For more information on effective management practices for prevention and control of runoff from upland areas, see Attachment 2**.**

Irrigation Management

A landowner or operator must implement measures that prevent and control water pollution from irrigation activities. Diversion of water for irrigation and the return of water to the stream are activities that have potential for contributing to water quality problems by affecting channel stability and carrying pollutants to the stream through overland return flows.

OAR 603-095-1740(2) is applicable to any pollution caused by irrigation practices which allow wastes to enter waters of the state through overland return flows.

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 WRD in the form of water rights, which specify the rate and amount of water that can be applied to a particular parcel of land. Refer to Oregon WRD laws and rules (OAR Divison 690 and ORS Chapters 536 through 543) for more details.

Irrigation in this basin is done primarily by sprinkler application though there is some flood, furrow and drip irrigation. Water usually is diverted from a surface source (stream or pond) but may also be from groundwater sources. Irrigation management in this basin recognizes there may be some positive benefits that occur 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 ground water sources. Irrigation water may be used more than once as it returns to the stream or irrigation conveyance ditch 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:

- Efficient application of water 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
- Appropriate scheduling of water application to the site considering soil conditions, crop needs, climate and topography
- Diversion structures that are installed and managed in a way that controls erosion and sediment delivery and protect the stability of streambanks. If funding becomes available, temporary diversions, which must be reinstalled every year, should be replaced with suitable permanent diversions (i.e. pumping stations, infiltration galleries, ponds, dams).
- Diversions that are adequately screened and provide fish passage. (Refer to ORS 498.268)

Refer to Attachment 2 for more information on effective management for protection of irrigation return flows.

Livestock Management

A landowner or operator must implement measures as needed to prevent and control water pollution from livestock enterprises. 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 containing bacteria, nutrients, and pathogens.

OAR 603-095-1740(2) and (3) apply to runoff of animal waste and streamside or riparian vegetation conditions.

Grazing of livestock can 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 will promote and maintain adequate vegetative cover, for protection of water quality, by consideration of intensity, frequency, duration, and season of grazing.

Managed grazing near streams will 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 effective ways to reduce impacts of livestock to streamside areas.

Livestock confinement areas need adequate measures to prevent and control runoff of sediment and animal waste. Certain confinement areas, as defined in ORS 468B.200 - 230, are required to have permits issued by ODA.

Factors used to evaluate effectiveness of management may include:

- Safe diversion or containment of runoff,
- Protection of clean water sources,
- Off stream watering systems,
- Lot maintenance - smoothing, mounding, seeding,
- Structural measures -i.e. filter strips, catch basins, berms,
- Waste collection, storage and application methods.

For more information on effective management practices for prevention and control of pollution from livestock operations refer to Attachment 2.

Implementation Strategies

The following guidelines will apply for public participation in implementation and review of the Area Plan. The ODA 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 effective agricultural management practices for prevention and control of agricultural pollution
- Offering technical assistance for the development and implementation of Voluntary Water Quality Farm Plans
- 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

- Identify water quality parameter(s) of concern within the priority area, and compile available baseline data
    - Map baseline land conditions within the priority area(s)
    - Conduct educational programs and one-on-one landowner contacts in the priority area(s) to promote public awareness of water quality issues and their solutions
    - Provide one-on-one voluntary technical assistance to landowners in the priority area(s) to achieve land conditions that contribute to good water quality
    - Secure necessary resources to help landowners in the priority area(s) achieve land conditions that contribute to good water quality
    - Map land conditions within the priority area(s) again prior to the next biennial review of the Area Plan, and quantify changes from the baseline
    - Compile updated available water quality data in the priority area(s) with basline water quality data, and quantify changes from the baseline

Education Programs

As resources allow, the SWCD, Watershed Council, and OSU Extension Service, in partnership with other agencies and local organizations, will develop educational programs to improve the awareness and understanding of water quality and quantity issues. They will strive to provide the most current information in a manner which avoids conflict and encourages cooperative efforts to solve problems. The following is a list of action items that will be considered in developing educational programs.

- 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/operators and in cooperation with partner organizations,
- Conduct educational programs to promote public awareness of water quality,
- Evaluate current research and scientifically valid 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 bi-annual plan reviews.

Implementation of this Area Plan is a priority element in the SWCD Annual Work Plan and Long-Range Plan and the Walla Walla Basin Watershed Council Action Plan. Both organizations hold regular monthly public meetings, publish newsletters, and sponsor special events that will often focus on water issues. In cooperation with OSU Extension and the irrigation districts, community meetings will continue to be encouraged, as needed, to provide a forum for current water issues.

Water Quality Management Practices

Effective water quality management practices for water 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 that 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 that 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. While not exhaustive or all-inclusive, Attachment 2 contains a list of practices that may typically be used in the Walla Walla River basin for effective prevention and control of soil erosion, sediment delivery to streams, and water pollution from agricultural activities.

Voluntary Water Quality Farm Plans

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 personal and public objectives must also be considered in total farm or resource management planning.

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 agency (LMA) recommends 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 or operators, consultants, or technicians available through the SWCD or NRCS. An effective individual 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 AgWQM Area Plan.

Technical and 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 and to develop a reasonable timeframe for addressing potential water quality problems.

As resources allow, the SWCD, NRCS, and other natural resource agency staff are available to assist landowners in evaluating effective practices for 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 or grant funds for the construction and use of some of these practices.

Technical and financial assistance for installation of certain management practices may be available through current USDA conservation programs such as the Environmental Quality Incentives Program (EQIP), Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Continuous CRP (CCRP), Environmental Protection Agency's (EPA) non-point source implementation grants, or state programs such as the Oregon Watershed Enhancement Board grant program, the Riparian Tax Incentive Program, and the Wildlife Habitat Conservation and Management Program. The Walla Walla Basin Watershed Council and several other federal and state agencies are also available to provide technical assistance and/or financial assistance to private landowners.

Farm planning assistance is available from these and other sources:

- Technical Assistance
  - Natural Resources Conservation Service
  - Umatilla County SWCD
  - Walla Walla Basin Watershed Council
- 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 Association/Extension
  - Ranch Water Quality Planning Workbook, Extension
  - The Oregon Plan Toolbox
- Programs
  - Farm*A*Syst Program, OSU Extension
  - Stream*A*Syst Program, OSU Extension
  - Home*A*Syst Program, OSU Extension

Monitoring and Evaluation

ODA conducts monitoring at a statewide level and analyzes other agencies' and organizations' monitoring data to answer several monitoring questions related to agriculture and water quality.

- What are current water quality and landscape conditions in agricultural areas in Oregon?
- What are water quality trends?
- How well does the existing monitoring network assess agricultural water quality trends and streamside conditions in Oregon?

- What are riparian vegetation trends along agricultural lands in Oregon?
- How do riparian conditions compare with site capabilities?
- How do riparian vegetation conditions change in aerial photos of selected stream reaches?
- How do changes in riparian vegetation condition compare with trends in water quality in monitored watersheds?

To answer these questions, ODA evaluates water quality data from existing sites in DEQ's Laboratory Analytical Storage and Retrieval (LASAR) database (http://deq12.deq.state.or.us/lasar2) that reflect agricultural influence on water quality. In 2011, ODA received funding from the Oregon Legislature to fund water quality sampling at 19 additional sites around Oregon. These data, once sampling begins, will also be published in the LASAR database and evaluated at the statewide level to determine trends in water quality at agricultural sites statewide.

In addition, ODA evaluates aerial photos of stream segments in each management area that are selected at random along agricultural lands. Based on the streamside vegetation present at the time of the assessment, each stream segment receives a score. The same stream segments are re-photographed and re-scored every five years to track changes in streamside vegetation conditions.

When used effectively, 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.

Currently, the Walla Walla Basin Watershed Council, in cooperation with DEQ, the CTUIR and other agencies, are conducting a comprehensive monitoring program to gather water quality data to be used in development of the TMDL. This data will be available to establish baseline conditions for determining effectiveness of the Area Plan.

Biennial Review

This Area Plan and the associated area rules are subject to a two-year review process. The ODA, with the cooperation and assistance of the SWCD, the LAC, and DEQ, will assess the progress of Area Plan implementation toward achievement of plan goals and objectives. These assessments will include:

1. Identification of additional sources of sediment, heat inputs, and other contributors to non-attainment of all applicable water quality standards.
2. An evaluation of available current water quality monitoring data.
3. An evaluation of outreach and education programs designed to provide public awareness and understanding of water quality issues.
4. A review of projects, demonstrations, and tours used to showcase successful management practices and systems.

5. An evaluation of the effectiveness of technical and financial assistance sources available to the agricultural community.
6. Review of load allocations as found in the Walla Walla subbasin TMDL and effectiveness of this Area Plan in meeting load allocations as described in the TMDL for the Walla Walla River basin.

Based on these assessments, the LAC, SWCD, and the ODA, in consultation with the State Board of Agriculture will consider making appropriate modifications to the Area Plan and the associated administrative Rule.

Resolution of Complaints and Enforcement Action

The ODA will investigate complaints against landowners and operators who are alleged to be out of compliance with the rules associated with this Area Plan. If the landowner is found to be out of compliance, ODA will consult with the landowner/operator and the SWCD. The Field Office Technical Guide will be the main tool to develop solutions and timelines. The authority and procedures for complaint investigation rests with the ODA under provisions of OAR 603-095-1760.

Landowners with chronic or egregious violations of area rules will be subject to enforcement action by ODA. Any enforcement action will be pursued only when reasonable attempts at voluntary solutions have failed. ODA will not enter onto private lands without first seeking landowner consent. Authority for any enforcement action rests with ODA under provisions in OAR 603-090-0060 through 603-090-0120.

603-095-1760
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, at its discretion, coordinate inspection activities with the appropriate LMA.

(2) Each notice of an alleged occurrence of agricultural pollution shall be evaluated in accordance with the criteria in ORS 568.900 through 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 through 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 603-095-1760(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 through 568.933 or any rules adopted thereunder.

(5) As used in section OAR 603-095-1760(4), "person does not include any local, state or federal agency.

(6) Notwithstanding OAR 603-095-1760(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 through 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.

Priority Areas

ODA believes that its agricultural water quality program can effectively prevent and control water pollution from agricultural lands and activities. ODA relies predominantly on improvements in agricultural land conditions to show that agriculture is fulfilling its responsibility to protect water quality. ODA is using several strategies to track changes in land conditions to evaluate program effectiveness, and one important strategy is the use of 'priority areas'.

Priority areas are relatively small areas within each agricultural water quality management area that are identified jointly by ODA, LMAs, LACs, and other partners. Outreach and technical assistance will be focused in these areas, and every landowner with potential land condition concerns will be contacted with an offer of voluntary assistance. ODA will evaluate the success of these efforts on a regular basis (currently every two years) by assessing how much progress it can show in implementing the Area Plan by assessing land conditions in a focused area.

The priority area concept evolved from conversations with LACs and other stakeholders, who encouraged ODA and local SWCDs to develop better ways to document effectiveness. ODA believes that more focused outreach and technical assistance will lead to more measurable progress and allow ODA and LMAs to make better use of limited resources. Focused, one-on-one outreach efforts are often more effective in reaching landowners than general outreach, and we are also more likely to show progress over a short period of time by focusing voluntary technical assistance efforts within a specific area.

Stakeholders ranging from LAC members to DEQ have also expressed interest in land condition or water quality monitoring data that shows landscape or water quality improvements. This information will assist LACs and other stakeholders to better evaluate the effectiveness of area plans, compared with reports of implementation efforts such as outreach or water quality improvement projects scattered throughout a management area.

Priority areas are generally small, 6th-field watersheds with a significant amount of agricultural land. They are generally chosen because (1) there are significant water quality concerns likely associated with agricultural activities in the priority area, (2) the LMAs and other partners are

already working with many landowners within the priority area, and/or (3) the size of the priority matches local capacity to work in the entire area in a relatively short time frame.

After ODA, the LMAs, and other partners identify a priority area, land condition measures are selected for which baseline and post-project data will be collected. These land condition measures act as surrogates for the water quality parameters of concern in the priority area. For example, streamside vegetation is generally used as a surrogate land condition measure for stream temperature.

ODA believes that it is generally more appropriate to focus on land conditions, rather than water quality data, for several reasons.

- It can be difficult to separate agriculture's influence on water quality data from other influences such as septic systems.
- Other factors such as climate change will have long-term impacts on water quality beyond agriculture's control.
- It can be expensive to monitor water quality at the scale that would be needed to evaluate progress.
- Changes in land conditions such as streamside vegetation will take a long time to translate into water quality improvements.

However, water quality monitoring may help evaluate the effects of changing land conditions on water quality parameters such as sediment and bacteria.

After land condition measures are identified and baseline conditions are mapped, an action plan is developed for intensive outreach, technical assistance, and project implementation with landowners in the priority area to voluntarily improve identified measures.

During the biennial review process, the partners will evaluate post-project data to determine if the selected land condition measures have improved. For example, after two years of the LMAs working in the priority area with landowners to establish streamside vegetation, the LMA and ODA will re-evaluate streamside vegetation data and information from landowners to determine if streamside conditions are improving. They will provide a report to the LAC during the biennial review of progress made in terms of changing land conditions.

ODA and the LMA will ask for the LAC's input into the priority area concept, their suggestions for an initial priority area (and future priority areas) within the management area, and input into measurable objectives and timelines that will allow us to achieve and measure progress in the priority area.

ODA expects that the priority area process will help answer several questions about the effectiveness of the agricultural water quality program. For example, how much can we reduce erosion or improve streamside vegetation through focused outreach and technical assistance in two years? If we see significant improvements in land condition measures in the priority areas, does this allow us to show a significant improvement in water quality parameters such as sediment?

While the priority area approach is relatively new, it is consistent with other agencies' and organizations' efforts to work in targeted geographic areas. This approach has support in the research community as well. For example, many recent studies evaluating conservation practice effectiveness have encouraged future research to focus on the cumulative effects at the watershed scale in addition to effects at the farm scale.

ODA looks forward to working with LMAs, LACs, DEQ, watershed councils and other partners to identify priority areas, set goals, focus implementation efforts there, and report results.

At the 2012 biennial review, LAC members suggested priority area status for the Mainstem Walla Walla River (city to forks), Big Springs Creek, Couse Creek and the South Fork Walla Walla River.

VI ADMINISTRATIVE ROLES AND RESPONSIBILITIES

Designated Management Agency

The ODA is the DMA for water pollution control activities on agricultural and rural lands in the Walla Walla Water Quality Management Area. The ODA is authorized to develop and carry out a water quality management plan for any agricultural or rural lands where state or federal law requires such a plan.

The SWCD is the LMA designated by ODA for development and implementation of the AgWQM Area Plan and projects in the Management Area. The Walla Walla Basin Watershed Council will 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 the ODA, in consultation with the State Board of Agriculture, appointed an LAC representing local agricultural producers, landowners, agencies, tribes, environmental organizations and the District, for the purpose of assisting with the development of this Area Plan and the associated area Rule to implement core elements of the Area Plan.

The LMA and LAC will participate in biennial review of Area Plan implementation progress. Any future amendments to the administrative rules will be subject to the public participation process outlined in Oregon law.

Pesticide Management Plan

The ODA Pesticides Division holds the primary responsibility for pesticide registration and use regulation within the state of Oregon under the Federal Insecticide Fungicide Rodenticide Act. As the EPA designated the state as the lead agency for pesticides, ODA is responsible for overseeing the development and implementation of a Pesticide Management Plan (PMP) for the state of Oregon as stipulated in the annual EPA/ODA Consolidated Pesticide Cooperative Agreement. The PMP sets forth a process for preventing and responding to pesticide detections in Oregon's ground and surface water resources by managing the pesticides that are currently approved for use by EPA in both the agricultural and non-agricultural settings. Pesticides that are no longer marketed, also called "legacy" pesticides, are regulated through a separate process under the CWA. The PMP strives to protect drinking water supplies and the environment from pesticide contamination while recognizing the important role that pesticides have in maintaining a strong state economy, managing natural resources and preventing human disease.

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ATTACHMENT 1– SOILS

Alluvial soils are on nearly level to gently sloping valley bottoms near the rivers and creeks, fanning northwest from Milton-Freewater. They vary from excessively to poorly drained. These soils are often irrigated and are adapted to a wide variety of crops. Several unconsolidated sedimentary layers have been deposited. A clay layer up to 500 feet thick was deposited on top of the basalts in the central portion of the subbasin. A thick (10-300 feet) composite alluvial fan was deposited directly on the basalts along the margins of the Walla Walla subbasin. Composed mainly of gravel, the fan material becomes finer toward the center of the basin where it interfingers with the clay unit. The gravel is composed mainly of well-rounded pebble, cobble, and boulder sized basaltic material. Compaction of the alluvial fan with a mixture of silt and sand make the gravels semi-consolidated. In places, calcareous cement also bonds the gravels.

Athena-Palouse-Waha association of soils occur east of Milton-Freewater on the lower slopes of the Blue Mountains. Most of the Athena and Palouse and a part of Waha are cultivated in annual cropping rotation of winter wheat and green peas or other legumes. The remainder of these soils are in range with a dominant native vegetation of Idaho Fescue and bluebunch wheatgrass. These soils are well adapted to irrigation except in areas of unfavorable topography.

Ritzville-Starbuck association of soils is developed from loess and found mostly on the northwestern end of the subbasin. Most of the Starbuck and some Ritzville are used for range. Ritzville soils are well adapted for irrigation.

Sagemoor-Quincy-Taunton association of soils is formed on the medium-textured glacial sediments and also located in the northwestern corner of the subbasin. Winter range for sheep is the principal use of these soils with the vegetation being bluebunch wheatgrass, annual grasses, and sagebrush. A small portion of Sagemoor is producing wheat successfully. These soils are reasonably well adapted to irrigation.

Tolo-Klicker association occurs in the eastern subbasin, in the high country of the Blue Mountains with nearly level to gently sloping uplands, which break off to very steeply sloping canyon walls. Most of these soils support forest or mixed-forest-grass type vegetation, which is used for summer grazing of livestock. Minor areas of all the deep soils are cultivated and produce small grains, legumes, grass, and berries. The shallow, stony soils are used for range.

Waha-Snipe association is found on the lower slopes of the Blue Mountains from nearly level to very steep slopes. These soils are used mostly for relatively high-producing range. The major vegetation is Idaho fescue, bluebunch wheatgrass, and shrubs.

The **Walla Walla** series of soils has four phases, each developed from loess. Two are present in the subbasin - Walla Walla and Walla Walla high rainfall - and are used for wheat production in both a wheat-fallow rotation and a wheat-green pea rotation. Both would be very well adapted for irrigation.

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ATTACHMENT 2 - EFFECTIVE WATER QUALITY MANAGEMENT PRACTICES

These practices and many others may be considered in development of a management system that is appropriate for prevention and control of pollution caused by agricultural activities on an individual parcel of land. 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 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.

For soil erosion and sediment control

- Conservation Tillage (Crop Residue Management)
    - reduced tillage, minimum tillage, direct seeding, modified conventional tillage, reservoir
    - tillage, sub-soiling, or deep chiselling
- Cover Crops
    - perennial, annual
- Contour Farming Practices
    - Strip cropping, divided slopes, terraces (level and gradient), contour 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
    - Application rate monitoring
- Prescribed Burning
- Weed Control
- Grazing Management Plans
- Range Plantings
- Livestock Distribution
- Road Design and Maintenance
- Sediment Retention Basins and Runoff Control Structures

For prevention and control of impacts to stream side areas:

- Critical area planting
- Vegetative Buffer Strips
    - Continuous CRP, CREP, riparian buffers, riparian forest buffers
- Livestock Management
    - fencing - exclusion, temporary
    - seasonal grazing
- 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

For prevention and control of impacts from livestock

- Grazing Management or Scheduling
    - intensity, duration, frequency, season
    - pasture rotations, rest/deferral
- Vegetation Management
    - grass seeding, weed control, controlled burning
- Fencing
    - temporary, cross, exclosure
- 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

For prevention and control of impacts from irrigation

- Irrigation Scheduling
    - crop needs, soil type, climate, topography, infiltration rates
- Irrigation System Efficiency and Uniformity
    - flood, sprinkler, drip, pivot
- Diversion Maintenance
    - push-up dam management, screens
- Return Flow Management
- Backflow Devices
- Reservoir Tillage
- Cover Crops

For nutrient and farm chemical application

- Nutrient Budgeting
    - soil testing, tissue testing, plant needs
    - water testing
- Application Methods
- Application Timing
- Tail Water Management
- Hydraulic Connectivity
- Label Requirements
- Irrigation Scheduling

- Integrated Pest Management Practices

For channel and drain management

- Vegetation Management
  - Burning, chemical, clipping
- Streambank Stabilization
  - structural, bio-engineered
- Critical area planting
- Channel Management
- Obstruction Removal
- Wetland Development
- Outfall Protection
- Offstream or Headwater Storage

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ATTACHMENT 3 – REFERENCES TO INFORMATION USED IN THE DEVELOPMENT OF THIS PLAN

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