

South Santiam Agricultural Water Quality Management Area Plan

Developed by the

South Santiam Local Advisory Committee

with assistance from

The Linn Soil and Water Conservation District

and

The Oregon Department of Agriculture

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Acronyms and Terms Used in this Document

Area Plan – South Santiam Agricultural Water Quality Management Area Plan

Area Rules – South Santiam Agricultural Water Quality Management Area Rules

Beneficial Use - Existing or desired use that requires a certain level of water quality. For example; livestock water, water contact recreation, or aquatic life.

CAFO – Confined Animal Feeding Operation

CWA – Clean Water Act

DEQ - Oregon Department of Environmental Quality

EPA – Environmental Protection Agency

FSA - Farm Services Agency

GWMA – Ground Water Management Area

LAC - Local Advisory Committee

LMA - Local Management Agency

Management Area – South Santiam Agricultural Water Quality Management Area

NRCS - Natural Resources Conservation Service

OAR - Oregon Administrative Rule

ODA - Oregon Department of Agriculture

ORS - Oregon Revised Statute

OSU – Oregon State University

OSUES - Oregon State University Extension Service

OWEB - Oregon Watershed Enhancement Board

SWCD - Soil and Water Conservation District

303(d) List - The Clean Water Act, in Section 303(d), requires states to list waters that are “water quality limited.”

TMDL – Total Maximum Daily Load

USDA - United States Department of Agriculture

WSC – Watershed Council

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Foreword

This Agricultural Water Quality Management Area Plan provides guidance for addressing agricultural water quality issues in the South Santiam Agricultural Water Quality Management Area. The purpose of this plan is to identify strategies to reduce water pollution from agricultural lands through a combination of outreach programs, suggested land treatments, management activities, and monitoring.

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

The Oregon Department of Agriculture (ODA) will exercise its enforcement authority for the prevention and control of water pollution from agricultural activities under administrative rules for the South Santiam Agricultural Water Quality Management Area and Oregon Administrative Rules (OARs 603-095-2400 through 603-095-2460 and 603-090-0060 through 603-090-0120).

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1. Introduction

This Agricultural Water Quality Management Area Plan (Area Plan) was developed in response to the Agricultural Water Quality Management Act, passed in 1993 by the Oregon Legislature and codified at ORS 568.900—568.933. The Act authorizes the Oregon Department of Agriculture (ODA) to work with agriculture to address water quality issues. The intent of the Act and the Oregon Department of Agriculture Water Quality Program are to:

- Satisfy multiple federal and state water quality mandates;
- Encourage voluntary conservation;
- Promote water quality improvement through outreach and education;
- Allow flexibility in meeting local water quality standards;
- Provide enforcement provisions for landowners who refuse to work towards meeting water quality standards; and
- Involve local citizens and organizations in addressing water quality standards. The Agricultural Water Quality Management Act specifically states that Area Plans should involve local Soil and Water Conservation Districts as much as possible.

This Area Plan applies specifically to agricultural activities on all agricultural, rural, and forest lands within the South Santiam Agricultural Water Quality Management Area (Management Area) that are not owned by the federal government, are not part of an Indian Reservation, or are not Tribal Trust Lands. This Management Area consists of: (1) all lands drained by the South Santiam River, Calapooia River, Muddy Creek, and their tributaries and (2) all streams flowing directly into the Willamette River between the South Santiam and Muddy Creek watersheds (Figure 1). It applies to all lands, regardless of size, in current agricultural use and those lying idle or on which management has been deferred. It also applies to agricultural operations within incorporated city boundaries. Activities subject to the Oregon Forest Practices Act and Oregon Fill-Removal laws are not included in this Plan.

This Area Plan provides background information on the Management Area; discusses local water quality concerns; and describes goals, objectives and strategies to improve water quality. The Plan also references Area Rules, which describe conditions land users must meet on all agricultural lands they own, occupy, or manage, and describes procedures for handling complaints and enforcement actions. Finally, the Plan describes a process for evaluating plan effectiveness and updating the Plan on a regular basis.

This Plan does not hold agriculture responsible for cleaning up water quality problems from other sources; its focus is on encouraging landowners to keep water as clean when it leaves their property as when it enters. This Plan is also not intended to tell anyone how to farm, ranch, or otherwise utilize his or her natural resources. However, the Linn Soil and Water Conservation District (SWCD), U.S. Department of Agriculture - Natural Resources Conservation Service, the Oregon Department of Agriculture (ODA), and other partners are available to provide technical, financial, and educational assistance to

landowners in the Management Area to meet their conservation goals and local water quality standards.

A Local Advisory Committee (LAC) developed this Area Plan with assistance from the Linn SWCD and the ODA, and with input from members of the community. LAC members are:

LAC Member	Area/Watershed	Affiliation
Clint Bentz	Scio, South Santiam	Small woodlands, trout farm
Karren Cholewinski	Coburg, Calapooia	Horses
Roger Haffner	Albany, Calapooia	Manager, Wilbur-Ellis Co.
Matt Herb	Lebanon, South Santiam	Grass seed research director, grass seed, livestock
Charles Knoll	Albany, Calapooia & South Santiam	County Engineer, Linn Co. Road Department
Sudy Lamb	Brownsville, Calapooia	Cattle, sheep, alfalfa, grass hay
John Marble	Sweet Home, Calapooia	Beef cattle, grass, timber, drinking water/wastewater consultant
Terry Plagmann	Albany, South Santiam	Grass seed, grapes
Dave Van Essen	Lebanon, South Santiam	Nursery stock
Liz VanLeeuwen	Halsey, Calapooia	Grass seed
Lucyann Volbeda	Albany, South Santiam	Dairy
Dennis Wirth	Tangent, Calapooia	Grass seed, clover, spring wheat

2. Background

2.1. Geographical and Physical Setting

2.1.1. General Location

The South Santiam Agricultural Water Quality Management Area (Management Area) includes the South Santiam, Calapooia, and Muddy Creek watersheds, as well as several smaller watersheds that drain directly to the Willamette River. The Management Area is in Linn and Lane Counties in the central Willamette Valley. Communities in the Management Area include Albany, Brownsville, Coburg, Halsey, Harrisburg, Lebanon, Lyons, Scio, and Sweet Home, as well as several unincorporated communities mentioned in section 2.1.6.

Boundaries of the Management Area are the Cascade Mountains to the east, the North Santiam watershed boundary to the north, the Coburg Hills to the south, and the Willamette River on the west. The Management Area covers approximately 1,700 square miles, or 1.1 million acres. Elevations range from about 200 feet above sea level on the Willamette Valley floor to 5,700 feet at the crest of the Cascade Mountains.

2.1.2. Physical Features

The headwaters of the South Santiam River are in the high Cascade Mountains. The river begins at the confluence of Sheep and Sevenmile Creeks near Rooster Rock and flows generally west for several miles. The Middle Santiam joins the South Santiam at Foster Reservoir above Sweet Home. The river flows northwest from Sweet Home, passing just east of Lebanon, until it reaches its confluence with the North Santiam River south of Jefferson. The Santiam River then flows northwest into the Willamette River just south of Buena Vista.

The headwaters of the Calapooia River are on Tidbits Mountain in the Cascade Mountains near the Linn and Lane County boundary. The river flows down a steep gradient until it reaches the Willamette Valley floor near Holley. It then flows northwest toward its confluence with the Willamette River just west of Albany.

Muddy Creek's headwaters are northeast of Coburg in the Coburg Hills. The creek flows northwest parallel to the Willamette River, and flows into the Willamette near Fischer Island south of Highway 34. The creek is slow moving with many meanders because of its low gradient.

Several smaller streams, including Murder Creek, Periwinkle Creek, Cox Creek and Lake Creek, flow directly to the Willamette River.

Table 1 lists the size and major tributaries of watersheds in the Management Area.

Table 1. Area and major tributaries of Management Area watersheds.

Watershed	Area (Acres)	Major Tributaries
South Santiam River	665,600	Canyon Creek, Crabtree Creek, Hamilton Creek, Moore Creek, Pyramid Creek, Quartzville Creek, Thomas Creek, Wiley Creek.
Calapooia River	364,160	Brush Creek, Butte Creek, Courtney Creek, Lake Creek, North Fork, Oak Creek, Shedd Slough
Muddy Creek and East Channel	143,565	Bishop Creek, Coleman Creek, Daniels Creek, Dry Muddy Creek, Little Muddy Creek, Pierce Creek, Putnam Creek, Tub Run, White Creek
Periwinkle Creek	Not available	
Cox Creek	Not available	
Murder Creek and Second, Third, and Fourth Lakes	Not available	Burkhart Creek, Truax Creek
Crooks Creek and McCarthy Slough	Not available	
Lake Creek	Not available	Camous Creek, Johnson Creek

Southern Willamette Valley Groundwater Management Area (GWMA)

A portion of the GWMA is within the South Santiam Agricultural Water Quality Management Area. Starting in the south, the GWMA includes land bounded on the west by Territorial Highway from Highway 36 north to Monroe, Highway 99W from Monroe to Corvallis, and Highway 20 from Corvallis to Albany. On the east the GWMA is bounded by I-5 from just south of Coburg north to the intersection of I-5 with Muddy Creek, and then follows Muddy Creek until its confluence with the Willamette River near Corvallis. From the north the eastern boundary is the Willamette River until its intersection with Highway 20. The southern boundary of the GWMA also includes several surface roads south of Junction City. See Figure 2 for a map of the GWMA.

2.1.3. Climate

The watersheds in the Management Area experience the same general climate, with cool to cold, wet winters and dry summers. There is some variation in the climate between the Willamette Valley, foothills, and Cascade Mountains, especially during winter months. The average rainfall on the Willamette Valley floor at Albany is 42 inches annually (Langridge et al, 1987). Precipitation in the Cascade Mountains is both rain and snow

and totals approximately 88 inches annually at Detroit (Langridge et al, 1987). The summer and fall bring dry and hot conditions across the Willamette Valley and up into the foothills. The Cascades are dry and slightly cooler than the valley and foothills during the summer and fall.

2.1.4. Geology and Soils

Western and High Cascade Mountains

The Cascade Mountains formed from both uplift and volcanic eruptions. Most of the soils in the Cascades formed from volcanic rock, but other parent materials include sedimentary rock and volcanic ash. With a few exceptions, most of the soils in the Cascades are well-drained silt loams (Langridge et al, 1987).

Willamette Valley

Much of the soils on the Willamette Valley floor were deposited by the Willamette River and its tributaries, or by catastrophic floods that swept down the Columbia Gorge and through the Willamette Valley between 13,000 to 15,000 years ago. Depending on the composition of the deposited material, soils in Willamette Valley bottomlands and terraces range from excessively drained gravelly sandy loam to poorly drained silty clay loam and silty clay (Langridge et al, 1987).

2.1.5. Biological Resources

A variety of plants and animals depend on the diverse aquatic habitats in the Management Area. Each of the following plant community types exist in the Management Area: submerged and floating, marshy shore, wetland prairie, shrub swamp, and wooded wetland (Guard, 1995). Trees include Douglas-fir, grand fir, western redcedar, bigleaf maple, vine maple, red alder, Oregon ash, black cottonwood, and willow. Shrubs include Pacific ninebark, elderberry, Indian-plum, snowberry, serviceberry, wild rose, thimbleberry, and Douglas spirea. Sedges, rushes, horsetails, grasses and forbs such as slough sedge, one-sided sedge, common rush, common horsetail, field horsetail, tufted hairgrass, California oatgrass, meadow barley, bleeding heart, blue-eyed grass, Oregon iris, and common camas are common in wetland and riparian areas (Guard, 1995). Invasive plant species, including Himalayan blackberry, Canada thistle, and reed canary grass have become established in many wetland and riparian areas.

Although many of the lowland aquatic habitats in the Management Area have been significantly modified, they support a diversity of wildlife (Csuti et al, 1997). Resident wildlife include beaver, river otter, shrew, great blue heron, green heron, black-crowned night heron, belted kingfisher, mallard, and wood duck. A variety of migratory waterfowl, including tundra swan, greater yellowlegs, lesser yellowlegs, dunlin, and least sandpiper, use seasonal wetlands on agricultural fields. Canada geese winter and feed in the seasonal wetlands and surrounding agricultural fields. Depending on the habitat conditions, neotropical migratory birds such as Wilson's warbler, yellow warbler, willow

flycatcher, and gray vireo may forage and nest in riparian areas. Riparian- and wetland-obligate reptiles and amphibians include the Pacific garter snake, Western pond turtle, Pacific tree frog, and red-legged frog.

Native resident fishes in lowland aquatic habitats include redbside shiner, leopard dace, Oregon chub, sculpin, three-spined stickleback, sucker, and cutthroat trout. Migratory fish that spawn, rear, or migrate in the rivers and their tributaries are Pacific lamprey, summer and winter steelhead, and fall and spring chinook (Oregon Department of Fish and Wildlife, 2001).

2.1.6. Land Use

Agriculture and Forestry

Agriculture and forestry are the predominant land uses in the Management Area (Table 2). The area is roughly split between agriculture and forestry. The headwaters and steep sections of the watersheds are located in the forestlands, while the slower-moving mainstems flow predominantly through agricultural lands.

The top agricultural commodities in the Management Area in 2009 were perennial ryegrass, annual ryegrass, tall fescue, dairy products, beef cattle and calves, and grass and grain straw (Mellbye et. al., 2009b). Other significant commodities include Christmas trees, broilers, hay wheat, white clover and ladino, peppermint for oil, processed vegetables, sheep, tree fruit and nuts, and berries. Linn County’s agriculture industry gross sales in 2009 were \$237 million, down from 2007 sales of \$295 million, but consistent with 2004 sales of \$229 million (Mellbye et. al 2009a).

Tables 3 and 4 provide more detail on some of the seed and livestock types in the Management Area.

Table 2. Land use in Linn County by acres (Oregon Geospatial Data Clearinghouse, 2001). Please note that these figures are for Linn County, rather than the South Santiam Management Area.

Land Use	Acres of Management Area in Land Use	Percent of Management Area in Land Use
Cropland – Irrigated	35,152	2.7
Cropland – non-irrigated	258,943	20
Pasture/rangeland	76,251	5.9
Forest	881,656	69
Urban	13,522	1.1
Water	8,212	.7
Other	8,138	.6
Total	1,281,874	100

Table 3. Acres of grass grown for seed in Linn County (Mellbye et al., 2009).

Crop	Acres of Crop	% Change from 2007
Annual ryegrass	89,200	-4%
Perennial ryegrass	35,500	-32%
Orchardgrass	4,200	+1%
Fescue	38,270	+2%
Bentgrass	1,900	-8%
Total	179,880	-5%

Table 4. Livestock in Linn County (Mellbye et. al, 2009).

Livestock type	Number of animals	% Change from 2007
Cattle/calves	30,700	+11%
Beef cattle	11,700	-3%
Dairy cattle	6,000	-2%
Sheep	60,100	+2%
Swine	500	No Change
Horses	3,000	-12%

Cities/Urban Areas

Most of the cities in the Management Area are located along rivers or their tributaries. The cities of Albany, Harrisburg, and Millersburg, as well as the community of Peoria, are along the Willamette River. The Calapooia River passes through the city of Brownsville, and Halsey and Tangent are both located along tributaries of Muddy Creek. Rural communities in the Calapooia and Muddy Creek watersheds include Calapooia, Cartney, Crawfordsville, Fayetteville, Holley, Miller, Mitchell, Munson, Plainview, Potter, Rowland, and Shedd. In the South Santiam, the cities of Lebanon, Sodaville, Sweet Home, and Waterloo are located along the mainstem, and Scio is along Thomas Creek. Unincorporated communities in the South Santiam watershed include Cascadia, Draperville, Foster, Fry, Narrows, Rock Hill, and Santiam Terrace.

2.1.7. Land Ownership

Private lands make up the largest portion of the Management Area. Other major landowners include the United States Forest Service and the Bureau of Land Management. Table 5 summarizes land ownership in the Management Area.

Table 5. Land Ownership in the Management Area (Oregon Geospatial Data Clearinghouse, 2001).

Landowner/Manager	Acres	Percent of Land
Private landowners	866,000	78.7
U.S. Forest Service	150,000	13.6
Bureau of Land Management	75,000	6.8
State of Oregon	500	.04
U.S. Army Corps of Engineers	500	.04
U.S. Fish and Wildlife	350	.02
Other	7,650	.8
Total	1.1 million	100

2.2. Water Resources

2.2.1. Water Availability

Both rainwater and snowmelt contribute to surface and groundwater supplies in the Management Area. Summary flow data for the South Santiam are listed in Table 6.

Table 6. Average annual, summer, and winter flows in cubic feet per second (cfs) for the South Santiam and Calapooia watersheds (U.S. Geological Survey, 2000).

Watershed	Average Annual Flow (cfs)	Average Summer Flow (cfs)	Average Winter Flow (cfs)
Calapooia River @ Albany	902	117.5	1,950
South Santiam River @ Waterloo	2,961	926	5,326

Groundwater is most plentiful in the Management Area in areas with deposits of coarse alluvial material. The most productive areas are along the South Santiam River. Some groundwater is also available from the alluvial material along the Calapooia River and Muddy Creek; however, this material contains more silt and has less capacity to transmit water.

Dams and Reservoirs

Foster and Green Peter dams and reservoirs, the two major projects within the Management Area, are managed by the Army Corps of Engineers. The projects are used for flood control, irrigation, power generation, recreation, and navigability improvement on the Willamette River. Green Peter Reservoir has full pool and summer storage capacities of 428,100 and 249,900 acre-feet. Foster Reservoir, which reregulates the water released from Green Peter Reservoir during power generation to maintain more

constant stream flow in the South Santiam River, has full pool and summer storage capacities of 60,700 and 24,800 acre-feet (Oregon Water Resources Department, 1999).

2.2.2. Water Use

Consumptive uses of water in the Management Area include irrigation, livestock watering, municipal use, and industrial use. Irrigation is the primary consumptive use for which water rights are issued. Non-consumptive uses of water include recreation, power generation, and fish and wildlife habitat. Sources of appropriated water are reservoirs, surface water, and groundwater. Table 7 summarizes water allocations in the three watersheds.

Irrigation

Irrigation in the Management Area has changed over the past ten to fifteen years, especially in the lower South Santiam and Calapooia watersheds. Hand lines and wheel lines are now commonly used for irrigation, in addition to linear and center pivot systems. Some growers have also installed low-pressure systems or drip irrigation systems on crops such as wine grapes, berries, and nursery stock.

Irrigation withdrawals are most concentrated in the lower portions of each watershed. In addition to water withdrawals by individuals, several canals transport irrigation water to users. In the South Santiam watershed, Lacombe Ditch diverts water from Crabtree Creek to Beaver Creek.

Municipal Use

The cities of Albany, Lebanon, and Sweet Home withdraw water from the South Santiam River for municipal supply. Millersburg receives its water from the mainstem Santiam River. Water from the South Santiam is transferred to Albany and Lebanon through the Lebanon-Santiam Canal. Scio receives water from the South Santiam through the Peters Ditch. The city of Brownsville does not withdraw water directly from the Calapooia, but receives its water from wells approximately 30 feet from the river.

The Brownsville ditch, or mill race, is an important part of the city's winter stormwater management system. The city of Brownsville has the main water rights to the mill race, and there are a few rights for livestock watering. The mill race water comes from the Calapooia mainstem.

Table 7. Water allocations in several water bodies in the Management Area. Allocations are in cubic feet per second (cfs) or in acre-feet (af). (Oregon Water Resources Department, 2001).

Water Body	Irrigation	Fish and Wildlife	Agriculture	Industrial	Municipal
Calapooia	136 Cfs 27,180 Af	1 Cfs 21 Af	3 Cfs 56 Af	184 Cfs 9 Af	3 Cfs 0 Af
South Santiam	376 Cfs 75,215 Af	49 Cfs 235 Af	4 Cfs 69 Af	470 Cfs 488 Af	135 Cfs 2 Af
Muddy Creek and East Channel	26 Cfs 5,627 Af	1 Cfs 49 Af	.3 Cfs 225 Af	2 Cfs 0 Af	2 Cfs 0 Af
Periwinkle Creek	7 Cfs 1380 Af	0 Cfs 0 Af	0 Cfs 1 Af	0 Cfs 0 Af	0 Cfs 0 Af
Cox Creek	8 Cfs 1,571 Af	.5 Cfs 0 Af	0 Cfs 0 af	1 Cfs 0 Af	0 Cfs 0 Af
Fourth Lake and Murder Creek	8 Cfs 1,642 Af	0 Cfs 4 Af	.2 Cfs 0 af	1 cfs 5 af	0 cfs 0 af
Crooks Creek and McCarthy Slough	44 Cfs 8,735 Af	0 Cfs 0 Af	1 Cfs 28 Af	0 Cfs 0 Af	0 Cfs 0 af
Lake Creek	18 Cfs 3,687 Af	0 Cfs 0 Af	0 Cfs 0 Af	0 Cfs 0 Af	0 Cfs 0 Af

Agricultural Water Control Districts

Several state-recognized districts in the Management Area provide irrigation, flood control, drainage, water improvement, and diking services for their members. The Calapooia, Lacombe, and Queener Irrigation Districts deliver water for irrigation and construct and maintain irrigation water delivery infrastructure. The Muddy Creek Irrigation Project also provides these services within the Management Area, although its water is diverted from the McKenzie River. The Beaver Creek, Dever-Conner, Grand Prairie, North Lebanon, and Santiam Water Control Districts operate surface water control works such as dikes and drainage ditches to prevent flooding damage to agricultural lands and other property. The Fertile and Liberty District Improvement Companies and the North Harrisburg Improvement District deliver irrigation water and construct and maintain water delivery facilities (Oregon Water Resources Department, 1987). For more information, contact the Water Resources Department office listed in Appendix C.

2.3. Water Quality

2.3.1. Clean Water Act

The federal Clean Water Act requires states to monitor water quality and identify water bodies that do not meet water quality standards. In Oregon, these tasks are the responsibility of the Department of Environmental Quality (DEQ). Water bodies that are

identified as “water quality limited” are placed on the state “303(d)” list (named after the section of the Clean Water Act that requires the list be maintained).

DEQ has established state water quality standards for several water quality parameters, such as bacteria, temperature, dissolved oxygen, and nutrients. The standards protect “beneficial uses” associated with waterbodies. Beneficial uses in Oregon include public domestic water supply, irrigation, livestock watering, salmonid fish rearing, spawning, and migration, water contact recreation, fish consumption, and aesthetic quality. A waterbody is placed on the 303(d) list for a particular parameter when water quality is deemed no longer adequate to protect the most sensitive beneficial use.

Once 303(d) waterbodies are identified, DEQ is responsible for developing Total Maximum Daily Loads (TMDLs), which specify the amount of pollution a waterbody can receive without exceeding water quality standards. Sources of pollution, such as wastewater treatment plants, industrial plants, urban and rural storm water runoff, agricultural lands, and forest lands, are identified and each assigned loads for the necessary reductions under the TMDLs.

2.3.2. Water Quality and Total Maximum Daily Loads in the Management Area

The DEQ evaluated data from its own monitoring program, the South Santiam Watershed Council, the U.S. Geological Survey, and the U.S. Bureau of Land Management to determine the listing status of stream segments in the Management Area. Eighteen stream segments were determined to exceed state standards for temperature. One waterbody, the Calapooia River up to river mile 42.8, was listed for bacteria in the fall, winter, and spring and for dissolved oxygen from January 1st to May 15th. Beneficial uses impacted by these water quality concerns include salmonid spawning, rearing, and migration, and water contact recreation.

DEQ completed the Willamette Basin TMDLs for temperature, bacteria, and mercury, and the US Environmental Protection Agency (EPA) approved the TMDLs in September of 2006. These TMDLs include temperature, bacteria and mercury loads specific to the South Santiam Management Area. The TMDLs apply to all waterbodies in the Management Area.

Temperature

DEQ endeavored to set the TMDL for temperature to protect salmon spawning, rearing, and migration as the most sensitive beneficial uses in the South Santiam Area. DEQ has identified the existing nonpoint source pollution as sources of solar heating of the Area’s waterways due to a lack of riparian vegetation from forestry, agriculture, rural residential, and urban activities.

Bacteria

DEQ has set the bacteria TMDL to protect human water contact recreation as the most sensitive beneficial use. Urban stormwater discharge and agricultural run-off are two potential sources of bacteria.

Mercury

Human fish consumption is the most sensitive beneficial use for which DEQ has set the Mercury TMDL. Primary sources of mercury include air deposition from national and international sources, discharge from specific legacy mining sites, and erosion of soils containing mercury.

2.3.3. Southern Willamette Groundwater Management Area

In 2004, DEQ declared a Groundwater Management Area (GWMA) for the Southern Willamette Valley because monitoring data showed elevated nitrate levels in groundwater (Figure 2).

In December 2006, after significant debate and research, the GWMA stakeholder committee Action Plan for the GWMA was finalized and accepted. This action plan is not a regulatory document, but includes many recommendations and voluntary strategies to address the issue of excess nitrate in regional groundwater. Currently, 93 percent of the land area within the GWMA is in agricultural use. Although agricultural use makes up the vast portion of land area, there are also many non-agricultural potential sources of nitrate. To address this, the action plan provides recommendations and strategies to reduce nitrate inputs as related to four focus sectors: (1) agricultural, (2) residential, (3) commercial / industrial / municipal and (4) public water supplies. Some of the agricultural recommendations and strategies are already accomplished by or included in this document, and some will likely be incorporated and developed over time.

DEQ is currently conducting quarterly sampling of 38 groundwater-monitoring locations in the GWMA for nitrate. This program includes monitoring 24 shallow monitoring wells and 14 domestic wells. The domestic wells are generally installed deeper than the monitoring wells. As of October 2009, there appears to be some downward contamination trends, although there were some areas where nitrate levels were still increasing. In the spring of 2009, DEQ completed a synoptic sampling event, where approximately 100 domestic wells in the GWMA were tested at the same time as the long-term monitoring wells. The mean nitrate concentration for the event was 5.5 mg/L, while the highest level of nitrate was close to 35 mg/L.

2.3.4. Factors Affecting Water Quality

Many factors may affect surface and groundwater quality in the Management Area. Sources impacting temperature include wastewater treatment plants, industrial operations, removal of riparian vegetation, seasonal reductions in stream flow, and stream channel and floodplain alteration. Contributors to bacteria and nutrient concerns include wastewater treatment plant overflows during heavy rains, legal and illegal waste dumping sites, leaching from septic systems and other sources to groundwater, runoff from residential areas, runoff and leaching from agricultural lands, and natural sources such as wildlife. Mercury can enter waterbodies from industrial and municipal wastewater discharges, erosion of soils that naturally contain mercury, runoff of atmospherically deposited mercury, and runoff from abandoned mines.

2.3.5. Water Quality Research, Monitoring, and Enhancement Efforts

Several individuals and organizations are working to research, monitor, and improve or maintain water quality in the Management Area. The South Santiam Watershed Council conducts monitoring in several tributaries of the South Santiam River and completed an assessment of the lower South Santiam watershed in 2000. The assessment identified several streams as high priority for restoration activities because of the restoration opportunities and high likelihood of project success. Monitoring data generally suggested that water quality meets or exceeds water quality standards in the lower South Santiam watersheds, although bacteria and turbidity were both identified as potential concerns. The Calapooia Watershed Council has developed its own assessment and monitoring program in the Calapooia watershed. The Bureau of Land Management, U.S. Forest Service, and Weyerhaeuser have completed several watershed assessments within the Management Area.

On agricultural lands, the U.S. Department of Agriculture-Agricultural Research Service (USDA-ARS) and Oregon State University Extension Service (OSU Extension) have completed several research projects in the area related to riparian areas, groundwater quality, and fertilizer and pesticide use in grass seed. Studies in grass seed fields found nutrients and pesticides at lower than expected levels in shallow groundwater, both in the grass seed field and in the riparian area. Researchers concluded that grass seed production practices at the study sites, such as proper nitrogen fertilizer application rates and timing, which are representative of grass seed production practices in the Willamette Valley, are effective in protecting surface water and groundwater from nutrient and pesticide contamination (Griffiths et al, 1997; Jenkins et al, 1994; Young et al, 2000; Mellbye et al, 2001). OSU Extension and USDA-ARS plan to conduct additional studies in the near future to evaluate the practicality and effectiveness of grass seed conservation practices.

3. Mission, Goals, and Objectives

3.1. Mission

The mission of the South Santiam Local Area Plan is to implement and evaluate an outcome-based plan that will promote and support agricultural activities, while preserving water quality.

3.2. Goals

- Limit water pollution from soil erosion and agricultural activities to achieve applicable water quality standards.
- Implement the Area Plan through the education and outreach activities detailed in section 4.

3.3. Objectives

To address temperature and near stream area issues:

- Promote site-appropriate riparian vegetation in order to minimize stream bank erosion and moderate solar heating.
- Limit irrigation runoff and leaching.
- Improve the watershed's ability to capture, store, and release moisture to limit runoff.

To address bacteria and nutrient issues:

- Reduce contaminants in runoff and leaching from agricultural lands.

4. Strategies for Achieving Goals and Objectives

The LAC has identified the following as high priority strategies or tasks for improving water quality and achieving the Goals and Objectives in the Management Area. The LAC recommends that the Linn SWCD, ODA, Watershed Councils, and any other agencies or organizations wishing to aid in addressing water quality issues implement these strategies. For a complete list of organizations that provide educational and technical assistance in the Management Area, please consult Appendix C.

4.1. Education and Outreach

- Host public information sessions about the Area Plan and Rules.
- Contact county livestock association, the South Santiam and Calapooia Watershed Councils, county Farm Bureau, Oregon State Grange and other organizations.
- Host meetings about water quality issues and optional management practices.
- Maintain a current version of the Area Plan and Rules on the ODA website.
- Compile a list of existing demonstration project sites around the South Santiam/Calapooia area. Evaluate existing sites to determine if some high priority practices, management systems, or geographic locations are not covered. Establish any additional needed demonstration sites and use existing demonstration sites to showcase Optional Management Practices for agricultural commodities specific to the South Santiam/Calapooia area.
- Conduct tours of demonstration sites and typical agricultural operations to discuss what might be typical water quality concerns and some options for addressing each concern in cooperation with OSU Extension.
- Host booths, or put information at someone else's booth, at the Linn county fair or other events with typical water quality concerns for different operations and ways to address water quality concerns.
- Provide information to realtors in the South Santiam/Calapooia area and if possible, deliver presentations at realtor meetings.
- Submit articles about water quality issues, the Area Plan and Rules, and optional management practices to local livestock associations, Small Farmer Magazine etc, Farm Bureau chapters, and other commodity groups, Extension newspapers, watershed council and SWCD newsletters, Farm Services Agency newsletters, and other publications.
- Provide one-on-one technical assistance to landowners, letting them know the Area Plan and Rules exist.
- Provide information on federal and local cost-sharing programs to landowners.
- Disseminate information to schools about agriculture, water quality, and the plan and rules.
- Disseminate information to county commissioners and other elected officials about implementation and progress regarding the plan and rules and work of the LAC.

4.2. Targets

The following targets were developed based on the 2010-2011 and 2011-2012 scopes of work with the Linn SWCD. The scope of work is developed as an agreement between ODA and the Linn SWCD with tasks related to implementation of the Area Plan. The targets are for the time period from July 2010 to July 2012 and are only for the Linn SWCD. Watershed councils and other groups may make additional efforts that fit within the mission and goals of the Area Plan. The Linn SWCD is not obligated to these targets; they only serve as direction from the LAC as activities that they would like to see accomplished.

- Host two workshops on specific topics such as irrigation management or small acreage land stewardship.
- Give at least five presentations events hosted by other organizations on agricultural water quality issues.
- Develop a list of demonstration sites and conduct at least two tours of these sites highlighting best management practices.
- Staff or supply educational information for booths at a minimum of four events.
- Develop a rural living handbook highlighting agricultural water quality concerns and provide copies to realtors to give to new landowners.
- Write and publish fifteen articles about agricultural water quality issues for local newspapers and newsletters.
- Provide one-on-one information about the Area Plan to a minimum of 100 landowners.
- Provide information to at least 30 landowners on federal and local cost-share programs.
- Develop and deliver agricultural water quality educational materials to local schools.
- Work with five landowners to implement best management practices limiting run-off and leaching from agricultural lands.
- Work with five landowners to plan and implement practices that improve the function of riparian vegetation.

5. Prevention and Control Measures

The focus of the Agricultural Water Quality Management Program is on voluntary and cooperative efforts by landowners, SWCDs, ODA, and others to protect water quality. However, the Agricultural Water Quality Management Act also provides for a regulatory backstop to ensure prevention and control of water pollution from agricultural sources in cases where landowners or operators refuse to correct problem conditions. Agricultural Water Quality Management Area Rules (Area Rules) serve as this backstop while allowing landowners flexibility in how they protect water quality. Area Rules are goal-oriented and describe characteristics that should be achieved on agricultural lands, rather than practices that must be implemented.

In this section, there are four Prevention and Control Measures that describe water quality issues, relevant definitions, and water quality concerns affected. Area Rules are referenced, when appropriate, in each Prevention and Control Measure. Each Area Rule has a border around it and appears in italics.

The Prevention and Control Measures and Area Rules relate directly to water quality concerns identified on the 303(d) list in the Management Area, and for the bacteria, mercury and temperature TMDLs that were established in September 2006. In addition, nitrate is discussed because of potential impacts to groundwater. Rules are not developed specifically for mercury, but the Area Rules in the bacteria and temperature prevention and control measures are also effective for the control of mercury.

5.1. Prevention and Control Measure: Bacteria

Issue:

Animal and human wastes are a potential source for many diseases (Terrell and Perfetti, 1989). The most commonly used indicator of biologic pollution in a waterbody, the organism *Escherichia coli* (*E. coli*), is a member of a group of fecal coliform bacteria. These bacteria reside in the intestines of warm-blooded animals, including humans, livestock, and wild birds and mammals. The presence of *E. coli* alone does not confirm the contamination of waters by pathogens, but it can indicate contamination by sewage or animal manure and the potential for health risks.

Sources of *E. coli* include discharge from wastewater treatment plants, leakage from failing septic systems, runoff of domestic animal manure from agricultural lands, yards, and other facilities, and runoff of manure from wild animals such as geese and elk. Daily bacteria production estimates have been calculated for several sources, including domestic and wild animals, and are summarized in Appendix F.

Numerous factors influence the nature and amount of bacteria that reach waterways. Some of these factors are climate, topography, soil types and infiltration rates, and animal species and animal health.

When bacteria reach a waterway, they may settle into sediments in a streambed and can live there for an extended period of time. If sediments are disturbed by increased stream turbulence following a runoff event, human or animal traffic, or other means, sediment-bound bacteria may be re-suspended into the water column (Sherer et al 1992). Sediment disturbance likely accounts for erratic bacteria levels typically measured in water quality monitoring programs.

Oregon's water quality standard for bacteria was established to protect the most sensitive beneficial use affected by bacteria levels, which is water contact recreation. Appendix B includes detailed information about the bacteria standard. Within the Management Area, the Calapooia River exceeds state water quality standards for bacteria during the fall, winter, and spring.

Livestock manure is a potential source of bacteria and is also a potential source of nutrients and vegetative material. If stored properly and applied at agronomic rates, manure can be a beneficial source of nitrogen and phosphorus, as well as organic matter (Mikkelsen and Gilliam, 1995). Nothing in this Prevention and Control Measure is intended to discourage the use of manure or other amendments; rather, it seeks to insure that they are applied correctly. Also, this Prevention and Control Measure is not intended to hold landowners responsible for water quality problems beyond their control, such as runoff of wildfowl manure from agricultural lands into waterways.

This Prevention and Control Measure does not prohibit grazing in riparian areas. As long as grazing is conducted at appropriate times of year, stocking rates, duration, and intensity, and in compliance with the riparian Prevention and Control Measure, it should not violate this Prevention and Control Measure. However, unlimited or concentrated livestock access to streams resulting in waste accumulation may lead to violations.

Landowners with livestock should be aware that new rules for CAFOs may apply to their facilities if they confine animals for part of the year. For more information, please contact the ODA.

The following Prevention and Control Measure references Oregon Revised Statutes (ORS) 468B.025 and 468B.050. ORS 468B.025 is existing statute developed to address water pollution from all sources. A Department of Justice Opinion dated September 12, 2000, clarifies that ORS 468B.025 applies to point and non-point source pollution as that term is commonly applied.

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

To implement Senate Bill 502, ODA incorporated ORS 468B.025 and 468B.050 into all of the Agricultural Water Quality Management Area Rules in the state.

Area Rule

OAR 603-095-2440

(1)(a) Effective upon rule adoption, no person subject to these rules shall violate any provision of ORS 468B.025 or ORS 468B.050.

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. In agriculture, under state rules, these are referred to as CAFO and are operations that confine animals on prepared surfaces to support animals in wet weather, have wastewater treatment works, discharge any wastes into waters of the state, or meet the federal definition of a CAFO (40 CFR § 122.23). Permitted facilities are inspected regularly by the ODA.

Definitions

“Pollution” has the meaning given in ORS 468B.005(3) which states: such alteration of the physical, chemical or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such 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.

“Wastes” has the meaning given in ORS 468B.005(7) which states: sewage, industrial wastes, and all other liquid, gaseous, solid, radioactive or other substances which will or may cause pollution or tend to cause pollution of any waters of the state.

Other substances that will or may cause pollution include commercial fertilizers, human wastes, soil amendments, composts, animal wastes, and vegetative materials.

“Waters of the state” has the meaning given in ORS 468B.005(8) which states: lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the state of Oregon and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private, (except those private waters which do not combine or effect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction.

Parameters That May Be Affected by this Prevention and Control Measure:

303(d)-Listed Parameters: bacteria

Other Parameters: dissolved oxygen, nutrients, sedimentation, turbidity, toxics, and mercury.

5.2. Prevention and Control Measure: Temperature

Issue

Oregon’s temperature standard, which is described in detail in Appendix B, was set to protect coldwater aquatic life, the most sensitive beneficial use affected by stream temperature. The importance and effect of stream temperatures on aquatic life, including salmonids, has been the subject of much debate in recent years. There is general agreement that salmonids and other coldwater aquatic organisms require cool water temperatures to survive, and that levels of dissolved oxygen, also a requirement of aquatic life, increase with cooler temperatures.

However, it is difficult to determine the exact temperature requirements of coldwater aquatic life in natural settings, where temperatures may vary several degrees in a stream reach. McCullough et al (2001) prepared a literature review of the physiological effects of temperature on several salmonid species. Norris et al (2000) suggest ways fish could exist in temperatures above those shown to be healthy in laboratory or field experiments: (1) fish may have adaptations to survive exposure to high temperatures; (2) fish may occupy cooler microhabitats as a refuge from high stream temperatures; (3) various temperatures may influence cumulative effects of environmental stressors on fish; and (4) fish responses in laboratory experiments may be difficult to apply in the field. The authors also suggest further research to investigate the above hypotheses.

For many years, researchers have investigated factors that influence stream temperatures. Several authors emphasize the importance of water stored in the landscape and its importance in maintaining stream temperatures (Krueger et al, 1999; Moore and Miner, 1997; Naiman and Decamps, 1997). Clark (1998) explains that upland conditions strongly influence stream temperatures by affecting the infiltration of precipitation and the storage and release of water. Adequate ground cover in upland areas increases the likelihood of precipitation infiltrating the soil profile and decreases the possibility of overland flow, soil loss and resulting sediment delivery to streams. Many studies also

highlight the significance of streamside shade in the maintenance of stream temperatures (Brown, 1969; Beschta, 1997). Other influences on stream temperature include stream channel width, stream depth, channel substrate, air temperature, and elevation (Bilby, 1984; Chen et al, 1998; Larson and Larson, 1996; Krueger et al, 1999; Ward, 1995). For a more complete list of factors that affect stream temperature, please consult Appendix G.

Area Rule

OAR 603-095-2440

(1)(b) By January 1, 2003, agricultural activities along perennial streams shall allow for the establishment and maintenance of riparian vegetation consistent with site capability that promotes infiltration of overland flows, moderation of solar heating, and streambank stability.

(A) Minimal breaks in shade vegetation for essential management activities are considered appropriate.

(B) Management within the riparian area is allowed provided it does not compromise achieving the conditions described in (1)(b).

Definitions

Perennial stream – Natural channel in which water flows continuously and which is shown on a United States Geological Survey quadrangle map (OAR 603-095-0010(32)).

Riparian vegetation – Plant communities consisting of plants dependent upon or tolerant of the presence of water near the ground surface for at least part of the year (OAR 603-095-0010(36)).

Parameters That May Be Affected by this Measure:

303(d)-Listed Parameters: temperature

Other Parameters: dissolved oxygen, sedimentation, turbidity, nutrients, bacteria, and mercury.

5.3. Prevention and Control Measure: Mercury

Issue

Mercury is a metal, liquid at room temperature, commonly used in the recent past for thermometers. It continues to have many dental, medical, and industrial uses. It is found naturally in the soils of the Willamette Valley. It is also found in fossil fuels and is released into the air upon combustion. In the air, mercury can travel over continents and oceans to be deposited on land, added to naturally occurring mercury, and is carried by stormwater and erosion into Oregon's waterways. Fish consumption is the most common

way humans are exposed to elevated levels of mercury (Oregon Department of Environmental Quality, 2007).

Mercury is also a severe poison. According to the DEQ (2007), small children and fetuses are most sensitive to mercury's toxic effects.

Mercury from point and non-point sources is bioaccumulating in fish tissue to levels that adversely affect public health. Mercury binds to particles; thus, there are both higher levels of total suspended solids as well as higher mercury levels in the wet season. In setting the TMDL for mercury, DEQ has found that erosion of native soil makes up almost 48 percent of the mercury in the Willamette Basin. Some industrial facilities and domestic wastewater treatment facilities also discharge mercury, but at low levels.

The current DEQ mercury TMDL consists of interim targets and allocations. Sometime in 2011, DEQ plans to finalize these after additional data collection and public outreach (Oregon Department of Environmental Quality, 2007).

Existing Area Rules help control mercury from agricultural sources by limiting erosion, filtering sediment, and controlling pollution. No specific rule to control mercury from agricultural activities is necessary at this time. Refer to the prevention and control measure for bacteria and temperature for the Area Rules that address mercury in this area.

5.4. Nitrate

Nitrate is a form of nitrogen that is dissolved in water (mainly an issue in groundwater). Oregon does not have a standard for nitrate, but public drinking water systems must adhere to the EPA standard of 10 mg/L, which was established due to health concerns. Individuals with household wells are not required to adhere to drinking water standards.

Nitrate is highly soluble in water, easily mobile in the soil, and can potentially leach through the soil and into the groundwater. Potential sources of nitrate pollution include fertilizer, animal waste, septic systems, and wastewater.

6. Menu of Optional Management Practices

The focus of the Area Rules is on achieving desired conditions, leaving landowners the flexibility to choose the most feasible and effective practices for their property. The following tables are intended as suggestions for landowners who want ideas on how to meet Area Rules and generally maintain and enhance natural resources on their property. The tables provide some idea of the water quality benefits of each practice as well as potential costs and benefits to landowners. The tables are organized by resource, such as nutrients and manure.

Landowners who want more information on any of the following practices, or who are looking for other ideas for water quality improvement and conservation on their lands, may contact several agencies and organizations that provide technical assistance, including the Linn SWCD, the NRCS, and the OSU Extension Service (see Appendix C). Also, please consult Appendix E for a list of publications describing water quality improvement practices for agricultural landowners and Appendix D for cost-sharing programs to cover some of these practices.

6.1. Riparian Areas and Streams

Practice	Resource Concerns Addressed	Potential Benefits of Practice to Producer	Potential Costs of Practice to Producer
a. Rotational grazing in riparian area; timed when growth is palatable to animals and when riparian area soils are not saturated.	Helps establish desirable riparian vegetation, promotes streambank integrity; helps filter nutrients and sediment from runoff; promotes channel narrowing.	May lessen streambank erosion and loss of pastures; allows limited use of riparian area for grazing, improves wildlife habitat.	May require time and financial investment for livestock control and off-stream watering facilities.
b. Livestock exclusion from riparian area; establishing off-stream watering facilities.	Helps promote desirable riparian vegetation; promotes streambank integrity; helps filter nutrients and sediment from runoff; may help narrow channel and reduce erosion in channel.	May lessen streambank erosion and loss of pastures; less time involved in managing livestock grazing in riparian area, improves wildlife habitat.	May require higher weed control costs than seasonal riparian grazing. May require financial investment for livestock control and off-stream watering facilities.

Practice	Resource Concerns Addressed	Potential Benefits of Practice to Producer	Potential Costs of Practice to Producer
c. Planting perennial vegetation in riparian area.	Helps establish perennial riparian vegetation rapidly; promotes streambank integrity; may help narrow channel and reduce erosion in channel; provides appropriate shade necessary to moderate solar heating and address water temperature TMDLs.	May lessen streambank erosion and loss of pastures. If livestock are excluded from riparian area, area may be eligible for federal cost-share programs. Some alternative perennial agricultural products may be harvested from riparian areas.	Costs of vegetation and weed control. May require financial investment for riparian fencing and off-stream watering facilities while vegetation establishes.

6.2. Nutrient and Manure Management

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
a. Apply nutrients and irrigation water according to soil test results and agronomic requirements.	Helps prevent nutrient loss to waters of the state.	May help reduce fertilizer costs; ensures that plants receive needed nutrients for growth; makes plants more competitive against weeds.	Costs of soil testing; time associated with taking soil samples.

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
b. Establish animal heavy use areas, where animals are confined during the winter to protect other pastures from trampling and compaction. Limit livestock access to pastures when soils are saturated; cover animal heavy use areas with rock, hog fuel, and/or geotextile.	Helps prevent sediment, nutrient and bacteria loss to waters of the state. Helps protect streamside areas.	Protects pastures from compaction during the winter, improving growth. May improve animal health by covering animal heavy use areas with material so animals are not wading in mud.	Cost of fencing animal heavy use area; cost of feeding hay during the winter; cost of materials for protecting heavy use area.
c. Site barns and animal heavy use areas away from streams.	Helps prevent sediment, nutrient, and bacteria runoff into waters of the state. Helps protect streamside areas.	Helps prevent flooding in barns and animal heavy use areas.	Need either off-stream watering facility or other source of water for livestock.
d. Prevent silage leaching and/or store and manage leachate from silage and other vegetative materials.	Helps prevent nutrient loss to waters of the state.	Preventing leaching maintains higher nutrient content of ensiled feed material.	May require cost of facility development and purchase of moisture-absorbing materials.
e. Installing gutters and downspouts on buildings in areas with high livestock use.	Helps prevent sediment, nutrient and bacteria runoff into waters of the state. Helps protect streamside areas.	May improve animal health by lessening mud during the winter, so animals are not wading in mud.	Cost of installation and maintenance of gutters and downspouts.

6.3. Erosion, Sediment, and Mercury Control

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
a. Grazing management: graze pasture plants to appropriate heights, rotate animals between several pastures; provide access to water in each pasture.	Helps prevent sediment, nutrient, mercury and bacteria runoff into waters of the state. Helps protect streamside areas.	May improve pasture production; easy access to water may increase livestock production as well. May improve livestock health because of better nutrition and parasite control. May improve composition of pasture plants and help prevent weed problems.	Cost of installing fencing, watering facilities for rotational grazing system; time involved in moving animals through pastures.
b. Farm road construction: construct fords appropriately, install water bars or rolling dips to divert runoff to roadside ditches.	Helps prevent sediment and mercury runoff to waters of the state.	May help prevent water damage on farm roads.	Cost of installation and maintenance.
c. Plant appropriate vegetation along drainage ditches; seed ditches following construction.	Helps prevent sediment and mercury runoff into waters of the state.	May help prevent ditch bank erosion and slumping.	Costs of establishing vegetation.
d. Plant cover crops on erosion-sensitive areas.	Helps prevent sediment and mercury runoff into waters of the state; helps filter nutrients and slow runoff.	May reduce weed problems; prevents loss of applied nutrients.	Costs of establishing cover crops; cover crops may compromise primary crop.
e. Irrigate pasture or crops according to soil moisture and plant water needs.	Helps prevent irrigation return flow and associated nutrients, sediment, and mercury to waters of the state.	May reduce costs of irrigation; may help crop or pasture production.	Installation/maintenance cost. Monitoring time.

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
f. Install/maintain diversions or French drains to prevent unwanted drainage into barnyards and animal heavy use areas.	Helps prevent nutrient and mercury runoff into waters of the state.	Decreases muddiness and shortens saturation period in protected areas.	Cost of installation.

6.4. Pest Management

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
a. Apply pesticides according to the label. Comply with label restrictions and precautions.	Reduces risk of pesticide runoff to streams or other water resources.	Compliance with Oregon law; reduces health risks to applicator, may decrease costs.	
b. Triple rinse pesticide application equipment and apply rinsates to sites; dispose of or recycle clean containers according to Oregon law.	Reduces risk of pesticide runoff to streams.	Compliance with Oregon law. Eliminates disposal costs of collected rinsates identified as hazardous waste.	
c. Calibrate, maintain, and correctly operate application equipment.	Reduces risk of pesticide runoff to streams.	May reduce use and therefore cost of pesticides; reduces health risks to applicator.	
d. Integrated pest management practices such as pheromone traps, beneficial insect release, and field monitoring. (Either in combination with pesticide use or as a replacement to pesticide use)	Reduces risk of pesticide runoff to streams, may reduce loss of non-target species.	May improve effectiveness of pest control system.	Time involved by producer to scout fields is usually offset by reduced or more effective pesticide use.

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
e. Store and mix pesticides in leak-proof facilities.	Reduces risk of pesticide runoff to streams or soil contamination.	Helps protect drinking water; reduces health risks to applicator.	Cost of installation and maintenance.

6.5. Nutrient and Irrigation Efficiencies

Practice	Resource Concerns Addressed	Benefits to Producer	Costs to Producer
Apply fertilizer at the correct rate and time applications for crop uptake.	Reduces the risk of excess nitrogen in the soil at the end of the growth season.	Precise application saves the producer money in fertilizer costs.	Time related to precision application.
Sample soil prior to fertilizer application to know existing nutrients.	Prevents the application of excess nutrients.	Precise application saves the producer money in fertilizer costs.	Cost of soil sampling and analysis.
Plant winter cover crops to take up excess nitrogen left over after crops are harvested.	Takes up extra nitrogen and limits potential for leaching into ground water.	Stores extra nitrogen in plant matter for later release when cover crop is incorporated into the soil.	Cost of seed and fuel to plant cover crop.
Properly maintain irrigation systems to prevent over-irrigation.	Prevents leaching of excess nitrogen past the root zone.	Uniform irrigation application and save producer money on nitrogen costs.	Replacement nozzles at least every four years is recommended.
Monitor soil water content and adjust irrigation schedules to maintain soil water content in an appropriate range in the root zone.	Prevents over-irrigation and leaching of excess nitrogen past the root zone.	Allows accurate irrigation application and keeps nutrients available to crops.	Soil monitoring equipment and time to evaluate soil water content.
Schedule irrigation applications based on expected evapotranspiration rates.	Prevents over-irrigation and leaching of excess nitrogen past the root zone.	Allows accurate irrigation application and keeps nutrients available to crops.	Time to evaluate expected evapotranspiration rates.

Selker et al, 2004

7. Administrative Roles and Responsibilities

7.1. Total Maximum Daily Loads

The Oregon DEQ, in accordance with the Federal Clean Water Act (CWA), is required to list polluted streams (section 303(d) of the CWA) and establish TMDLs for waterbodies on the 303(d) list. The 303(d) list consists of streams that violate state water quality standards. TMDLs identify the maximum amount (load) of each pollutant that a listed waterbody can receive and still meet state water quality standards. Once a TMDL is established for a particular pollutant, each source of pollution in the area will be assigned a portion of that load, and each source must develop or modify pollution control plans and programs designed to achieve their load.

DEQ approved the TMDLs for the Willamette in 2006. The Area Plan and Rules seek to satisfy agriculture's load under the TMDLs for these waterbodies. When TMDLs are completed for a Management Area, ODA and DEQ analyze the TMDLs and Area Plan and Rules to determine if any adjustments need to be made to the Area Plan and Rules to achieve agriculture's load allocations.

7.2. Designated Management Agency/Local Management Agency

The ODA is the "Designated Management Agency" for addressing agricultural water quality issues in the Management Area. In turn, through Memoranda of Agreement, ODA designated the Linn SWCD as Local Management Agency to assist with the development and implementation of the South Santiam Agricultural Water Quality Management Area Plan.

SWCDs are legal, independent subdivisions of state government, and are led locally by an elected board of directors who serve four-year terms without pay. For several decades, SWCDs in Oregon have worked with landowners to promote the good stewardship of natural resources. SWCDs in Oregon serve as Local Management Agencies for Area Plan development and implementation within their district boundaries.

During the Area Plan and Rules development process, the Linn SWCD provided support to the LAC, conducted outreach and education about the Area Plan and Rules development process, and provided technical assistance to landowners in the Management Area who requested assistance addressing water quality and other natural resource issues on their property. The LAC also received a great deal of assistance from Linn County OSU Extension Service, both on technical issues and education and outreach programs.

During implementation of the Area Plan and Rules, the Linn SWCD, the NRCS, OSUES, and other partners will continue conducting education and outreach programs, providing technical assistance to producers in evaluating and implementing resource management practices, and securing additional funds for plan implementation as resources allow.

Implementation priorities will be established and reviewed regularly through annual work plans developed by the SWCD and Memoranda of Agreement with ODA, with input from partner agencies.

ODA and the SWCD will provide information to individual landowners and interested groups on an ongoing basis.

7.3. Resolution of Complaints and Enforcement Action

ODA will investigate complaints against landowners or occupiers who are reported to be out of compliance with OAR 603-095-2400 through 603-095-2460. The complaint must relate to a specific site and contain a thorough description of the problem. ODA staff may also initiate an inspection if they directly observe violations of conditions or measures outlined in the Area Rules adopted to implement an Area Plan or if they are alerted to a violation by another agency.

Before conducting a complaint investigation, ODA will make every attempt to establish contact with the operator to schedule a site visit.

ODA will use professional judgment to determine if a violation of a condition exists. Based on this determination, appropriate action will be taken by the department to assure that the condition is remedied.

ODA will use enforcement mechanisms where appropriate and necessary to gain compliance with the conditions. Any enforcement action will be pursued only when reasonable attempts at voluntary solutions have failed.

A landowner or operator shall be responsible for only those conditions caused by activities conducted on land managed by the landowner or occupier. Criteria do not apply to conditions resulting from unusual weather events or other exceptional circumstances that could not have been reasonably anticipated, such as fire, natural disaster, or other extreme weather conditions. ODA recognizes that every farm and situation is different and will take into account each individual situation when enforcing the rules.

7.4. Plan Evaluation and Modification

ODA and the Linn SWCD will evaluate the effectiveness of the Area Plan in improving water quality and land conditions as resources allow. Information considered in the evaluation will include, but not be limited to: water quality monitoring data collected by the Oregon DEQ, area watershed councils, and other agencies and organizations monitoring water quality in the Management Area; results of compliance surveys of land conditions conducted by the ODA (this sampling is for information purposes only and does not result in enforcement); and results of random surveys of Management Area landowners to determine awareness of water quality issues. Results of effectiveness evaluations will be presented to the LAC on a biennial basis.

Three years after approval of the Area Plan and adoption of the Area Rules in 2002, the LAC met to review and update the Area Plan and Rules. The LAC added educational information to the Area Plan about new water quality parameters of concern and updated information about sources of technical and financial assistance. The LAC agreed that the existing Area Rules were adequate to address water quality concerns within the area.

The LAC met again in 2008 to review the Area Plan and Rules. The LAC felt that the Area Plan was working well to address agricultural pollution issues and that a voluntary, outcome-based approach with an enforcement backstop is the best method to work with landowners in the Management Area. The LAC also emphasized that the partnerships within the Management Area between the Linn SWCD, ODA, OSU Extension Service, and the watershed councils are key in the successful implementation of the Area Plan.

The LAC met on September 29, 2010. The LAC updated information in the Area Plan related to the Southern Willamette Valley GWMA, added targets, and added optional management practices for nutrient and irrigation efficiencies. At the review, the LAC recognized that there is a need for funding for monitoring. Monitoring is needed to determine baseline conditions and agricultural contributions to water quality. The LAC again concluded that the existing Area Rules were adequate to address water quality concerns within the area.

The LAC will meet again in two years to review the Area Plan and Rules. Based on the results of the effectiveness evaluation of the South Santiam Area Plan and Rules, as well as any additional water quality concerns identified in the South Santiam Management Area, the LAC, ODA, and the Linn SWCD will consider making appropriate modifications to the South Santiam Area Plan and Rules in consultation with the State Board of Agriculture.

8. Public Participation

ODA, the Linn SWCD, and other partners began soliciting community participation before the development of the South Santiam Agricultural Water Quality Management Area Plan and Rules. The SWCD prepared press releases to encourage participation on the LAC, and also spoke about the Area Plan and Rules development process at meetings of local organizations such as watershed councils and agricultural groups. The Linn County OSU Extension Service and Linn SWCD hosted an information session in early 2000 to inform grass seed growers that the Area Plan and Rules development process would begin soon.

During the Area Plan and Rules development process, interested members of the public received announcements of all committee meetings. Meetings were publicized in local newspapers and publications, and ODA and SWCD staff provided updates on the process to local watershed councils and other organizations.

When the LAC completed a draft Area Plan and Rules, the Linn SWCD hosted two public information sessions and submitted press releases and radio announcements to local media. The draft plan and rules were available on ODA's website, and were also mailed to interested parties throughout the Management Area.

In September and October 2002, ODA conducted a public comment period on the draft Area Plan and Rules, which included a public hearing in Albany. After the public comment period, the LAC met again to discuss the comments with ODA and determine how to address the comments in the final Area Plan and Rules.

Once the Area Plan and the Area Rules are evaluated as part of the periodic review process, ODA, the Linn SWCD, and other partners will continue to conduct outreach and education to the public and especially to agricultural producers. For more information on outreach and education efforts to take place after Area Plan and Rules completion, please consult Section 4 of the Area Plan.

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Appendices

- A. 2004/2006 Water Quality Assessment List and Decision Matrix for Water Bodies in the Management Area
- B. Water Quality Parameters List and Affected Beneficial Uses
- C. Sources of Information and Technical Assistance
- D. Conservation Funding Programs
- E. References on Water Quality Improvement Practices for Agricultural Landowners
- F. Average Daily Fecal Coliform Production Rates for Wildlife and Domestic Animal Species
- G. Factors that Affect Stream Temperature

Appendix A: 2004/2006 Water Quality Assessment List and Decision Matrix for Water Bodies in the South Santiam Management Area

“TMDL” means a TMDL has been established for the waterbody and approved by EPA, and is being implemented. The water is considered Water Quality Limited until it meets the water quality standard. These waters get de-listed from the 303 (d) list and are identified as having a TMDL on the water quality assessment list or other measure to support the TMDL needed reductions.

“303(d) List” means the waterbody exceeds listing criteria and is placed on the 303(d) List.

“Potential concern” means data indicate a waterbody may typically meet water quality standards except under unusual circumstances (e.g. unusual weather circumstances) or in situations where toxics exceed levels of concern but do not exceed definitions used for the 303(d) List. In these cases, the waterbodies are identified as being of potential concern and the DEQ will seek more data to verify the assessment.

Bacteria (Criteria: 30-day log mean > 126 organisms/100 mL based on at least 5 samples or single sample > 406 organisms/100 mL)

DEQ has set the bacteria TMDL to protect human water contact recreation, the most sensitive beneficial use. Urban stormwater discharge and agricultural run-off are two potential sources of bacteria. The bacteria TMDL addresses the entire area.

303 (d) List/TMDL Approved September 2006 Calapooia River, River Mile (RM) 0 to 42.8

Mercury TMDL

Human fish consumption is the most sensitive beneficial use for which DEQ has set the Mercury TMDL. Primary sources of mercury include air deposition from national and international sources, discharge from specific legacy mining sites, and erosion of soils containing mercury. The Mercury TMDL has a basin wide strategy for mercury reduction.

Temperature (Criteria: rearing and migration 64 F, spawning 55 F)

DEQ set the TMDL for temperature to protect salmon spawning, rearing, and passage as the most sensitive beneficial uses in the South Santiam Area. DEQ has identified the existing nonpoint source pollution sources as solar heating of the Area's waterways due to a lack of riparian vegetation from forestry, agriculture, rural residential, and urban activities. The temperature TMDL applies to all waterways in the area.

303 (d) List/TMDL Approved September 2006

Beaver Creek, RM 0 to 16
Cedar Creek, RM 0 to 1.3
Crabtree Creek, RM 0 to 37.3
Hamilton Creek, RM 0 to 16.1
McDowell Creek, RM 0 to 11.3
Middle Santiam River, RM 0 to 37.2
Moose Creek, RM 0 to 9.2
Neal Creek, RM 0 to 10.1
Quartsville Creek, RM 3.3 to 26.8
Scott Creek, RM 0 to 3
South Santiam River, RM 0 to 63.4
Sucker Slough, RM 0 to 9.8
Thomas Creek, RM 0 to 40
Wiley Creek, RM 0 to 17.2
Little Muddy Creek, RM 0 to 12.2
Muddy Creek, RM 0 to 33.4
North Fork Calapooia River, RM 0 to 4.3
Calapooia River, RM 0 to 78

Dissolved Oxygen (Criteria: DO < 8 mg/L for Cold Water Aquatic Life)

303 (d) List

Calapooia River, RM .1 to 31.2

Metals

303(d) List

Iron

Calapooia River, RM 0 to 78

Manganese

Calapooia River, RM 0 to 42.8

Potential Concern

Calapooia River, RM 0 to 42.8: Arsenic, Chromium, Copper, and Nickel

Muddy Creek, RM 0 to 56.1: Iron and Manganese

Truax Creek, RM 0 to 11.3: Iron and Manganese

Murder Creek, RM 0 to 2.8: Iron and Manganese

South Santiam River, RM 0 to 63.5: Manganese

Additional Parameters of Potential Concern

Alkalinity

Potential concern

Canyon Creek, RM 0 to 13.1

Cedar Creek, RM 0 to 1.3

Coal Creek, RM 0 to 2.2

Crabtree Creek, RM 0 to 37.3

Elk Creek, RM 0 to 1.7

Fitt Creek, RM 0 to 2.2

Rock Creek, RM 0 to 3.4

Wiley Creek, RM 0 to 17.3

Calapooia River, RM 0 to 78

Phosphorus

Calapooia River, RM 0 to 77.9

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Appendix B: Water Quality Parameters List Parameters and Affected Beneficial Uses

The following is a list of parameters used by DEQ in establishing the 303(d) list, developing TMDLs, and identifying the beneficial uses of water impacted by these parameters. This is an abbreviated summary and does not contain detailed descriptions of the standards. Specific information about these standards can be found in the Oregon 303(d) List or in Oregon Administrative Rule 340-041-0445. Listed parameters in the Management Area are indicated in boxes.

The 303(d) List and TMDLs can be obtained from the DEQ website at <http://www.deq.state.or.us/wq/catlist.htm#w> or by calling the Water Quality Division of the DEQ at (503) 229-5279.

Parameters

Aquatic Weeds or Algae

Standard – The development of fungi or other growths having a deleterious effect on stream bottoms, fish, or other aquatic life, or which are injurious to health, recreation, or industry shall not be allowed.

Beneficial Uses Affected - Public and Private Domestic Water Supply, Irrigation, Industrial Water Supply, Livestock Watering, Fishing, Water Contact Recreation, Aesthetic Quality.

Bacteria

Standard - Fecal bacteria levels shall not exceed a 30-day log mean of 126 *E. Coli* organisms per 100 ml, based on a minimum of 5 samples and no single sample shall exceed 406 *E. coli* organisms per 100 ml. Bacterial pollution or other conditions deleterious to waters used for domestic purposes, livestock watering, irrigation, bathing, or shellfish propagation, or otherwise injurious to public health, shall not be allowed.

Beneficial Uses Affected - Public and Private Domestic Water Supply, Livestock Watering, Water Contact Recreation.

Biological Criteria

Standard – Waters of the State shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.

Beneficial Uses Affected - Salmonid Spawning, Rearing, and Migration, Resident Fish and Aquatic Life.

Chlorophyll a

Standard – The following average Chlorophyll a values shall be used to identify water bodies where phytoplankton may impair the recognized beneficial uses:

1. Natural lakes, which thermally stratify: 0.01 mg/l
2. Natural lakes, which do not thermally stratify, reservoirs, rivers, and estuaries: 0.015 mg/l

Beneficial Uses Affected - Water Supply, Fishing, Water Contact Recreation, Aesthetic Quality.

Dissolved Oxygen

Standard - For waterbodies identified as salmonid spawning, dissolved oxygen must not be less than 11.0 mg/l. For waterbodies supporting cold water aquatic life, dissolved oxygen must not fall below 8 mg/l. For water bodies supporting cool water aquatic life, dissolved oxygen must not fall below 6.5 mg/l. For water bodies supporting warm water aquatic life, dissolved oxygen must not be less than 5.5 mg/l.

Beneficial Uses Affected - Salmonid Spawning, Rearing, and Migration, Resident Fish and Aquatic Life.

Flow Modification

Standard – The creation of tastes or odors or toxic or other conditions that are deleterious to fish or other aquatic life or affect the potability of drinking water or the palatability of fish or shellfish shall not be allowed.

Beneficial Uses Affected - Salmonid Spawning, Rearing, and Migration, Resident Fish and Aquatic Life.

Habitat Modification

Standard – The creation of tastes or odors or toxic or other conditions that are deleterious to fish or other aquatic life or affect the potability of drinking water or the palatability of fish or shellfish shall not be allowed.

Beneficial Uses Affected – Salmonid Spawning, Rearing, and Migration, Resident Fish and Aquatic Life.

Nutrients

Standard - see standards for aesthetics, pH, dissolved oxygen, chlorophyll a, and aquatic weeds or algae.

Beneficial Uses Affected - Aesthetics or use identified under related parameters.

pH

Standard - pH shall not fall outside 6.5 to 8.5. The following exception applies: waters impounded by dams existing on January 1, 1996, which have pHs that exceed the criteria shall not be considered in violation of the standard if the Department of Environmental Quality determines that the exceedance would not occur without the impoundment and that all practicable measures have been taken to bring the pH in the impounded waters into compliance with the criteria.

Beneficial Uses Affected - Salmonid Spawning, Rearing, and Migration, Resident Fish and Aquatic Life, Water Contact Recreation.

Sedimentation

Standard – The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry shall not be allowed.

Beneficial Uses Affected - Salmonid Spawning, Rearing, and Migration, Resident Fish and Aquatic Life.

Temperature

Standard – The seven day average maximum temperature is: 64F for water bodies with salmonid fish rearing and migration, 61F for core cold water habitat, 55F for water bodies with salmonid fish spawning, 54F for water bodies with bull trout. Following a temperature TMDL, temperature water quality limited waters cannot be warmed more than 0.3 degrees Celsius (0.5 degrees F) by sources of anthropogenic (human) heating.

Beneficial Uses Affected - Salmonid Spawning, Rearing, and Migration, Resident Fish and Aquatic Life.

Total Dissolved Gas

Standard – The concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection shall not exceed 110 percent of saturation, and the liberation of dissolved gases, such as carbon dioxide, hydrogen sulfide, or other gases, in sufficient quantities to cause objectionable odors or to be deleterious to fish or other aquatic life, navigation, recreation or other reasonable uses made of such waters shall not be allowed.

Beneficial Uses Affected - Salmonid Spawning, Rearing, and Migration, Resident Fish and Aquatic Life.

Toxics

Standard - Toxic substances shall not be introduced above natural background levels in the waters of the state in amounts, concentrations, or combinations which may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely impact public health, safety, or welfare; aquatic life; wildlife; or other designated beneficial uses. Standards for specific toxic substances may be viewed on the Oregon DEQ website at

<http://waterquality.deq.state.or.us/wq/wqrules/340Div41Tb120.pdf>.

Beneficial Uses Affected - Public, Private and Industrial Water Supply, Irrigation, Livestock Watering, Resident Fish and Aquatic Life, Fishing, Water Contact Recreation.

Turbidity

Standard – No more than ten percent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activities.

Beneficial Uses Affected - Resident fish and Aquatic Life, Aesthetics.

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Appendix C: Sources of Information and Technical Assistance

Farm Services Agency (FSA)

33630 McFarland Rd.
Tangent, OR 97389
(541) 967-5925

Maintains agricultural program records and administers federal cost-share programs.
Maintains up-to-date aerial photographs and slides of agricultural and forest lands.

Soil and Water Conservation Districts (SWCDs)

Provide technical assistance in a wide variety of agricultural and natural resource areas and assists landowners in accessing federal and local funding programs.

Linn SWCD

33935 HWY 99E, Suite C
Tangent, OR 97389
(541) 926-2483

East Lane SWCD

780 Bailey Hill Rd., Suite 5
Eugene, OR 97402
(541) 465-6436 ext. 3

Natural Resources Conservation Service (NRCS)

Provides information on soil types, soils mapping, and interpretation. Administers and provides assistance in developing conservation plans for federal programs such as the Conservation Reserve Program, Conservation Reserve Enhancement Program, the Environmental Quality Incentives Program, and the Wetlands Reserve Program. Makes technical determinations on wetlands and highly erodible lands.

Linn County

33630 McFarland Rd.
Tangent, OR 97389
(541) 967-5925

Lane County

780 Bailey Hill Rd., Suite 5
Eugene, OR 97402
(541) 465-6443

Oregon Department of Agriculture (ODA)

635 Capitol St NE
Salem, OR 97301
Natural Resources Division: (503) 986-4700
Pesticides Division: (503) 986-4635

The Natural Resources Division is responsible for developing and implementing Area Plans and Rules across Oregon, the CAFO Program, the Smoke Management Program, and for providing support to Oregon's SWCDs.

The Pesticides Division regulates the sale and use of pesticides; tests and licenses all users of restricted-use pesticides, is responsible for fertilizer registration, and investigates incidents of alleged pesticide misuse.

Oregon Department of Environmental Quality (DEQ)

1102 Lincoln St., Suite 210

Eugene, OR 97401

(541) 686-7838

Responsible for protecting Oregon's water and air quality, cleaning up spills and releases of hazardous materials, and managing the proper disposal of solid and hazardous wastes. Maintains a list of water quality limited streams and establishes TMDL for water quality limited water bodies.

Oregon Department of Fish and Wildlife (ODFW)

South Willamette Watershed District Office

7118 NE Vandenberg Avenue

Corvallis, OR 97330

(541) 757-4186

<http://www.dfw.state.or.us>

Works with landowners to protect and enhance habitat for a variety of fish and wildlife species, manages recreational fishing and hunting programs, monitors fish and wildlife populations, conducts education and information programs, and administers wildlife habitat tax deferral program.

Oregon Department of Forestry (ODF)

4690 Hwy 20

Sweet Home, OR 97386

(541) 367-6108

<http://www.odf.state.or.us>

Implements Oregon forest practices laws, administers Oregon forestry property tax programs, provides forest management technical assistance to landowners, and administers or assists with several federal and local cost-sharing programs.

Oregon Department of State Lands (DSL)

775 Summer Street NE Suite 100

Salem, OR 97301-1279

(503) 986-5200

<http://oregon.gov/DSL/index.shtml>

Administers Oregon fill and removal law and provides technical assistance to landowners.

Oregon State University Extension Service (OSUES)

4th and Lyons

P.O. Box 765

Albany, OR 97321

(541) 967-3871

<http://extension.oregonstate.edu/linn/index.php>

Offers educational programs, seminars, classes, tours, publications, and individual assistance to guide landowners in meeting natural resource management goals.

Oregon Water Resources Department (WRD)

Provides information on streamflows and water rights, issues water rights, and monitors water use.

Regional office

Central Lane Justice Court

220 North Fifth

Springfield, OR 97477

(541) 682-3620

State Office

725 Summer Street NE, Suite A

Salem, OR 97301

(503) 986-0900

<http://www.wrd.state.or.us>

Oregon Watershed Enhancement Board (OWEB)

775 Summer St. NE, Suite 360

Salem, OR 97301-1290

(503) 986-0178

<http://oregon.gov/OWEB/>

Provides funding for a variety of watershed enhancement, assessment, monitoring and educational activities. Provides support to watershed councils throughout Oregon.

Watershed Councils

Bring diverse interests together to cooperatively monitor and address local watershed conditions. Collect watershed condition data, conduct education programs, and train and involve volunteers.

South Santiam Watershed Council

4431 Highway 20

Sweet Home, OR 97386

(541) 367- 5564

sswc@centurytel.net

<http://www.sswc.org/>

Calapooia Watershed Council

PO Box 844

Brownsville OR 97327

(541) 812-7622

calapooia@peak.org

www.calapooia.org

Appendix D: Conservation Funding Programs

The following is a list of some conservation funding programs available to landowners and organizations in Oregon. For more information, please refer to the contact agencies for each program. Additional programs may become available after the publication of this document. For more current information, please contact one of the organizations listed below.

Program	General Description	Contact
Conservation Planning and Implementation Grants	Provides grants to SWCDs and to landowners for on-the-ground conservation projects.	Soil and Water Conservation Districts, Oregon Department of Agriculture
Conservation Reserve Enhancement Program (CREP)	Provides annual rent to landowners who enroll agricultural lands along water quality limited streams. Also cost-shares conservation practices such as riparian tree planting, livestock watering facilities, and riparian fencing.	Natural Resources Conservation Service, Soil and Water Conservation Districts, Oregon Department of Forestry
Conservation Reserve Program (CRP)	Competitive CRP provides annual rent to landowners who enroll highly erodible lands. Continuous CRP provides annual rent to landowners who enroll agricultural lands along seasonal or perennial streams. Also cost-shares conservation practices such as riparian plantings.	Natural Resources Conservation Service, Soil and Water Conservation Districts.
Emergency Watershed Protection Program (EWP)	Available through the USDA-Natural Resources Conservation Service. Provides federal funds for emergency protection measures to safeguard lives and property from floods and the products of erosion created by natural disasters that cause a sudden impairment to a watershed.	Natural Resources Conservation Service, Soil and Water Conservation Districts.

Program	General Description	Contact
Environmental Protection Agency Section 319 Grants	Fund projects that improve watershed functions and protect the quality of surface and groundwater, including restoration and education projects.	Oregon Department of Environmental Quality, Soil and Water Conservation Districts, Watershed Councils.
Environmental Quality Incentives Program (EQIP).	Cost-shares water quality and wildlife habitat improvement activities, including conservation tillage, nutrient and manure management, fish habitat improvements, and riparian plantings.	Natural Resources Conservation Service, Soil and Water Conservation Districts.
Federal Reforestation Tax Credit	Provides federal tax credit as incentive to plant trees.	Internal Revenue Service
Forestry Incentives Program (FIP)	Provides cost-sharing for several forest stand improvement practices.	Natural Resources Conservation Service, Soil and Water Conservation Districts, Oregon Department of Forestry
Forest Resource Trust	State assistance up to 100 percent of the costs to convert non-stocked forest land to timber stands. Available to non-industrial private landowners.	Oregon Department of Forestry.
Oregon Watershed Enhancement Board (OWEB).	Provides grants for a variety of restoration, assessment, monitoring, and education projects, as well as watershed council staff support. 25% local match requirement on all grants.	Soil and Water Conservation Districts, Watershed Councils, Oregon Watershed Enhancement Board.
Oregon Watershed Enhancement Board Small Grant Program.	Provides grants up to \$10,000 for priority watershed enhancement projects identified by local focus group.	Soil and Water Conservation Districts, Watershed Councils, Oregon Watershed Enhancement Board.

Program	General Description	Contact
Partners for Wildlife Program.	Provides financial and technical assistance to private and non-federal landowners to restore and improve wetlands, riparian areas, and upland habitats in partnership with the U.S. Fish and Wildlife Service and other cooperating groups.	U.S. Fish and Wildlife Service (503) 231-6179, Natural Resources Conservation Service, Soil and Water Conservation Districts.
Public Law 566 Watershed Program	Program available to state agencies and other eligible organizations for planning and implementing watershed improvement and management projects. Projects should reduce erosion, siltation, and flooding; provide for agricultural water management; or improve fish and wildlife resources.	Natural Resources Conservation Service, Soil and Water Conservation Districts.
Resource Conservation & Development (RC & D) Grants	Provides assistance to organizations within RC & D areas in accessing and managing grants.	Resource Conservation and Development, (541) 757-6709.
State Forestation Tax Credit	Provides for reforestation of under-productive forest land not covered under the Oregon Forest Practices Act. Situations include brush and pasture conversions, fire damage areas, and insect and disease areas.	Oregon Department of Forestry
State Tax Credit for Fish Habitat Improvements	Provides tax credit for part of the costs of voluntary fish habitat improvements and required fish screening devices.	Oregon Department of Fish and Wildlife

Stewardship Incentive Program (SIP).	Cost-sharing program for landowners to protect and enhance forest resources. Eligible practices include tree planting, site preparation, pre-commercial thinning, and wildlife habitat improvements.	Natural Resources Conservation Service, Soil and Water Conservation Districts, Oregon Department of Forestry
Wetlands Reserve Program (WRP)	Provides cost-sharing to landowners who restore wetlands on agricultural lands.	Natural Resources Conservation Service, Soil and Water Conservation Districts
Wildlife Habitat Tax Deferral Program	Maintains farm or forestry deferral for landowners who develop a wildlife management plan with the approval of the Oregon Department of Fish and Wildlife.	Oregon Department of Fish and Wildlife, Soil and Water Conservation Districts, Natural Resources Conservation Service

Appendix E: References on Water Quality Improvement Practices for Agricultural Landowners

Below is a list of some selected references with more specific information on water quality and natural resources improvement practices. Copies of many of these publications are available from the local Oregon State University Extension office or local Soil and Water Conservation District. Underlined publications are also available online on the publishing agency's website.

General Water Quality Protection

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Appendix F: Average Daily Fecal Coliform Production Rates for Wildlife and Domestic Animal Species

The following daily production rates for fecal coliform were developed by the Virginia Department of Conservation and Recreation and the Virginia Department of Environmental Quality and included in Total Maximum Daily Load documents. While the averages do not specify *E. coli* production rates, the proportions would likely be the same between species.

Species	Average Daily Production of Fecal Coliforms (in millions)
Human	1,950
Pet (dog)	450
Horse	420
Beef Cattle	33,000
Dairy Cattle	25,200
Heifer	11,592
Sheep	27,000
Deer (whitetail)	347
Raccoon	113
Muskrat	25
Beaver	.2
Goose	799
Duck (mallard)	2,430
Wild Turkey	93

(Virginia Tech Department of Biological Systems Engineering, 2000.)

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Appendix G: Factors that Affect Stream Temperature

(Krueger et al, 1999)

Physical

Weather
Season
Year
Climate
Cloudiness
Wind
Position on the landscape
Microclimate
Time of day/angle of the sun
Sunlight, shade, reflection
Daytime/nighttime temperatures
Morning temperature
Elevation
Soil temperature
Air temperature
Latent heat
Time of exposure
Penetration of light (short vs. long waves)

Stream Structure

Morphology (differing potentials)
Flow
Gradient
Depth
Volume

Width
Sinuosity
Ponds, glides, riffles (mixing)

Local

Storage (dams)
Effluent (interflow)
Influent
Hyporrheic
Soil structure
Soil physics/geology
Streambed
Temperature at the source
Physical limits to heating
Roughness
Debris
Refugia (variation in stream)
Catastrophic events
Condition of uplands
Vegetation +/- (potentials)
Bank stability
Turbidity/pollution

Management

Land uses (roads, agriculture, forestry)
Water management (regulated flows)