Molalla-Pudding-French Prairie-North Santiam Subbasins Agricultural Water Quality Management Area Plan

Developed by the:

Molalla-Pudding-French Prairie-North Santiam Local Advisory Committee

Oregon Department of Agriculture (ODA)

With support from:

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2014 Review and Update

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Table of Contents

Acronyms and Terms Used in this Document 3

Foreword 4

Chapter 1: Agricultural Water Quality Management Program Purpose and Background 6

- 1.1 Purpose of Agricultural Water Quality Management Program and Applicability of Area Plans 6
- 1.2 History of the Ag Water Quality Program 7
- 1.3 Roles and Responsibilities 8
- 1.4 Agricultural Water Quality 11
- 1.5 Other Water Quality Programs 14
- 1.6 Partner Agencies and Organizations 16
- 1.7 Measuring Progress 17
- 1.8 Implementation, Monitoring, Evaluation, and Adaptive Management 18

Chapter 2: Local Background 20

- 2.1 Local Roles and Responsibilities 20
- 2.2 Area Plan and Regulations: Development and History 20
- 2.3 Geographical and Physical Setting 20
- 2.4 Agricultural Water Quality in the Management Area 38
- 2.5 Prevention and Control Measures 42

Chapter 3: Goals, Objectives, and Strategies 52

- 3.1 Goal 52
- 3.2 Measurable Objectives 53
- 3.3 Strategies for Area Plan Implementation 55

Chapter 4: Implementation, Monitoring, and Adaptive Management 62

- 4.1 Implementation and Accomplishments 62
- 4.2 Water Quality Monitoring—Status and Trends 62
- 4.3 Progress Toward Measurable Objectives 63
- 4.4 Aerial Photo Monitoring of Streamside Vegetation 63
- 4.5 Biennial Reviews and Adaptive Management 63

Appendices 68

- Appendix A: Public Funding Sources for Landowner Assistance 68
- Appendix B: Educational and Technical Services for Natural Resource and Farm Management 72
- Appendix C: Waterbodies with Approved TMDL and Waterbodies on 2010, 303(d) List 74
- Appendix D: Description of Healthy Riparian Management 78
- Appendix E: Erosion Visual Indicators and Measurement 80
- Appendix F: Silver Creek Focus Area Action Plan 82
- Appendix G: The Conservation Planning Process 88
- Appendix H: Instructions and Guidelines for a Voluntary Conservation Plan 90
- Appendix I: Common Agricultural Water Quality Parameters of Concern 92
- Appendix J: Willamette River Basin Water Quality Study 94
- Appendix K: Molalla-Pudding Monitoring Summary 96
- Appendix L: Summary of Area Plan Goals and Progress of Area Plan Implementation. 100
- Appendix M: Definitions 102

Acronyms and Terms Used in this Document

Ag Water Quality Program – Agricultural Water Quality Management Program
Area Plan – Agricultural Water Quality Management Area Plan
Area Rules – Agricultural Water Quality Management Area Rules
CAFO – Confined Animal Feeding Operation
CREP – Conservation Reserve Enhancement Program
CRP – Conservation Reserve Program
CWA – Clean Water Act
DEQ – Oregon Department of Environmental Quality
GWMA – Groundwater Management Area
HUC – Hydrologic Unit Code
LAC – Local Advisory Committee
LMA – Local Management Agency
Management Area – Agricultural Water Quality Management Area
MOA – Memorandum of Agreement
NPDES – National Pollution Discharge Elimination System
NRCS – Natural Resources Conservation Service
OAR – Oregon Administrative Rules
ODA – Oregon Department of Agriculture
ODFW – Oregon Department of Fish and Wildlife
ORS – Oregon Revised Statute
OWEB – Oregon Watershed Enhancement Board
PMP – Pesticides Management Plan
PSP – Pesticides Stewardship Partnership
Regulations – Agricultural Water Quality Management Area Regulations
RUSLE – Revised Universal Soil Loss Equation
SWCD – Soil and Water Conservation District
T – Soil Loss Tolerance Factor
TMDL – Total Maximum Daily Load
USDA – United States Department of Agriculture
US EPA – United States Environmental Protection Agency
Voluntary Plans – Voluntary Water Quality Farm Plans
WQPMT – Water Quality Pesticides Management Team

Foreword

This Molalla-Pudding-French Prairie-North Santiam agricultural water quality management area plan (Area Plan) provides guidance for addressing agricultural water quality issues in the Molalla-Pudding-French Prairie-North Santiam Agricultural Water Quality Management Area (Management Area). The purpose of this Area Plan is to identify strategies to prevent and control water pollution from agricultural lands through a combination of educational programs, suggested land treatments, management activities, and monitoring.

The provisions of this Area Plan do not establish legal requirements or prohibitions, as described in Oregon Revised Statute (ORS) 568.912(1).

Message to Landowners and Operators from the Local Advisory Committee

The Area Plan and the administrative rules for this management area convey agriculture's role in the statewide Oregon effort for achieving water quality standards and the protection of beneficial uses. It is intended that, combined with other efforts throughout the planning area with other land uses -- urban, rural residential, forestry, industrial -- implementation of this Plan will aid in achievement of water quality standards. It is important that landowners are aware that "waters of the state" (described on page 38) are public waters, and landowners have a responsibility to assure that they are not causing pollution.

The focus of this Area Plan is on education and incentives to promote voluntary actions to protect and improve water quality. This means that each landowner/operator will have to do their part. Each landowner/operator must make a commitment to include water quality considerations as part of their land management decisions. It will take a high degree of landowner/operator responsibility to make this Area Plan work for everyone in agriculture.

This Area Plan and the administrative rules will be reviewed and adapted every two years and will become part of the management area strategy to address the Total Maximum Daily Loads (TMDLs). TMDLs are established through a public process by the Oregon Department of Environmental Quality (DEQ) for waterbodies that violate state water quality standards. DEQ acknowledged the Plan and Rules and plans for the other land uses in the Water Quality Management Plans that accompanied the TMDLs when the TMDLs were submitted to EPA for approval. The TMDL Water Quality Management Plan is DEQ's plan to meet the TMDLs and improve water quality. EPA approved the Molalla-Pudding TMDL in December 2008, and the Willamette, Middle Willamette and North Santiam TMDLs in September 2006. When a TMDL for a pollutant to a waterbody is approved, DEQ will remove that specific listing from the federal Clean Water Act Section 303(d) list of impaired waterways needing a TMDL. Still, DEQ considers the waterbody impaired until water quality standards are achieved.

The State and Federal governments have joined to offer landowners/operators a voluntary program of financial and material incentives to improve streamside areas. This voluntary program is called the Conservation Reserve Enhancement Program (CREP). CREP can serve to help a landowner/operator to keep streams cool, improve streambank stability (and protect property and property values), and filter out sediment and attached farm chemicals and bacteria. Additional information about CREP is provided in Appendix A. Appendix B provides local contacts for landowners/operators interested in the program.

Required Elements of Area Plans

Area Plans must describe a program to achieve the water quality goals and standards necessary to protect designated beneficial uses related to water quality, as required by state and federal law (Oregon Administrative Rule (OAR) 603-090-0030(1)). At a minimum, an Area Plan must:

- Describe the geographical area and physical setting of the Management Area.
- List water quality issues of concern.
- List impaired beneficial uses.
- State that the goal of the Area Plan is to prevent and control water pollution from agricultural activities and soil erosion and to achieve applicable water quality standards.
- Include water quality objectives.
- Describe pollution prevention and control measures deemed necessary by the Oregon Department of Agriculture (ODA) to achieve the goal.
- Include an implementation schedule for measures needed to meet applicable dates established by law.
- Include guidelines for public participation.
- Describe a strategy for ensuring that the necessary measures are implemented.

Plan Content

Chapter 1: Agricultural Water Quality Management Program Purpose and Background. The purpose is to have consistent and accurate information about the Agricultural Water Quality Management Program.

Chapter 2: Local Background. Provides the local geographic, water quality, and agricultural context for the Management Area. Describes the water quality issues, regulations (Area Rules), and available or beneficial practices to address water quality issues.

Chapter 3: Local Goals, Objectives, and Implementation Strategies. Chapter 3 presents goal(s), measurable objectives and timelines, and strategies to achieve the goal(s) and objectives.

Chapter 4: Local Implementation, Monitoring, and Adaptive Management. ODA and the Local Advisory Committee (LAC) will work with partners to summarize land condition and water quality status. Trends are summarized to assess progress toward the goals and objectives in Chapter 3.

Chapter 1: Agricultural Water Quality Management Program Purpose and Background

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

As part of Oregon's Agricultural Water Quality Management Program (Ag Water Quality Program), this Area Plan guides landowners and partners such as Soil and Water Conservation Districts (SWCDs) in addressing local agricultural water quality issues. The purpose of this Area Plan is to identify strategies to prevent and control water pollution from agricultural activities and soil erosion (ORS 568.909(2)) on agricultural and rural lands for the area within the boundaries of the Management Area (OAR 603-090-0000(3)) and to achieve and maintain water quality standards (ORS 561.191(2)). This Area Plan has been developed and revised by ODA, the LAC, with support and input from the SWCD and the Oregon Department of Environmental Quality (DEQ). Throughout the development and revision processes, the public was invited to participate. This included public comment at meetings and public hearings during the Area Plan approval process. This Area Plan is implemented using a combination of outreach and education, conservation and management activities, compliance, monitoring, evaluation, and adaptive management.

The provisions of this Area Plan do not establish legal requirements or prohibitions (ORS 568.912(1)). Each Area Plan is accompanied by OAR regulations that describe local agricultural water quality regulatory requirements. ODA will exercise its regulatory authority for the prevention and control of water pollution from agricultural activities under the Ag Water Quality Program's general regulations (OARs 603-090-0000 to 603-090-0120) and under the regulations for this Management Area (OARs 603-095-1900). The Ag Water Quality Program's general OARs guide the Ag Water Quality Program, and the OARs for the Management Area are the regulations that landowners must follow.

This Area Plan and its associated regulations apply to all agricultural activities on non-federal and non-Tribal Trust land within the Management Area, including:

- Large commercial farms and ranches.
- Small rural properties grazing a few animals or raising crops.
- Agricultural lands that lay idle or on which management has been deferred.
- Agricultural activities in urban areas.
- Agricultural activities on land subject to the Forest Practices Act (ORS 527.610).

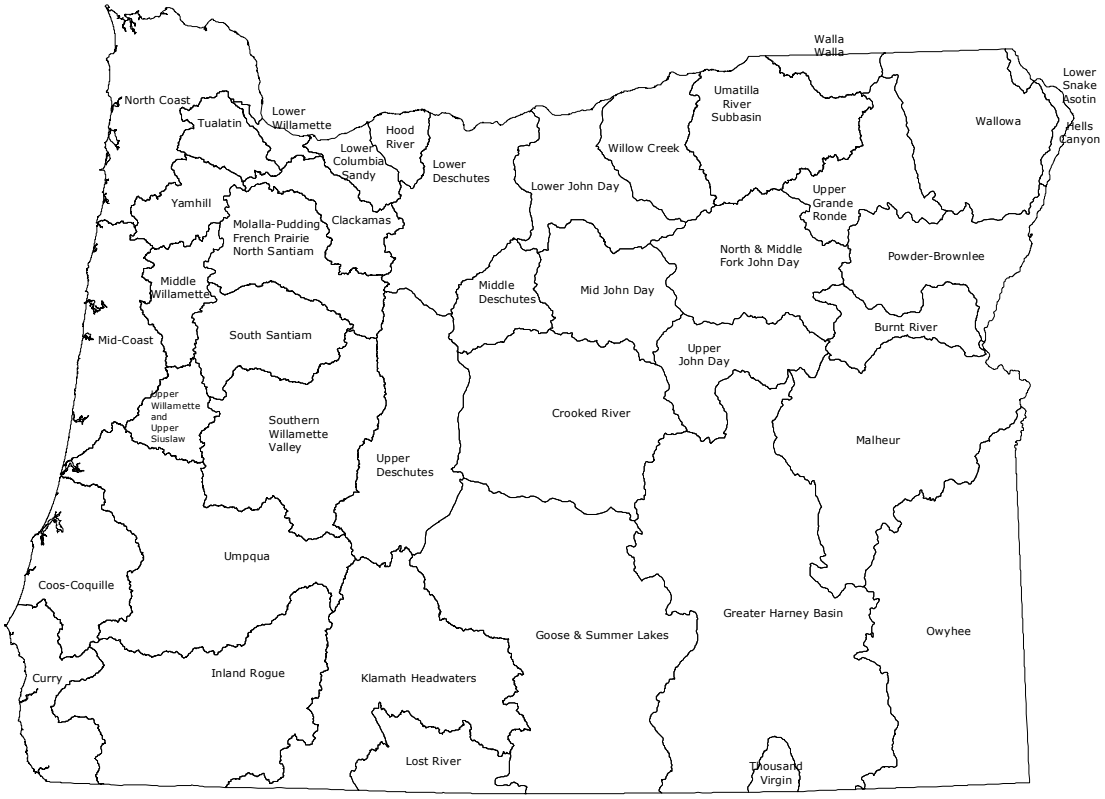
1.2 History of the Ag Water Quality Program

In 1993, the Oregon Legislature passed the Agricultural Water Quality Management Act, directing ODA to develop plans to prevent and control water pollution from agricultural activities and soil erosion, and to achieve water quality standards (ORS 568.900 through ORS 568.933). Senate Bill 502 was passed in 1995 to clarify that ODA regulates agriculture with respect to water quality (ORS 561.191). This Area Plan and its associated regulations were developed and subsequently revised pursuant to these statutes.

Between 1997 and 2004, ODA worked with LACs and SWCDs to develop Area Plans and associated regulations in 38 watershed-based Management Areas across Oregon (Figure 1). Since 2004, ODA, LACs, SWCDs, and other partners have focused on implementation, including:

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

Figure 1: Map of 38 Agricultural Water Quality Management Areas



1.3 Roles and Responsibilities

1.3.1 Oregon Department of Agriculture (ODA)

ODA is the agency responsible for implementing the Ag Water Quality Program (ORS 568.900 to 568.933, ORS 561.191, OAR 603-090, and OAR 603-095). The Ag Water Quality Program is intended to meet the needs and requirements related to agricultural water pollution, including:

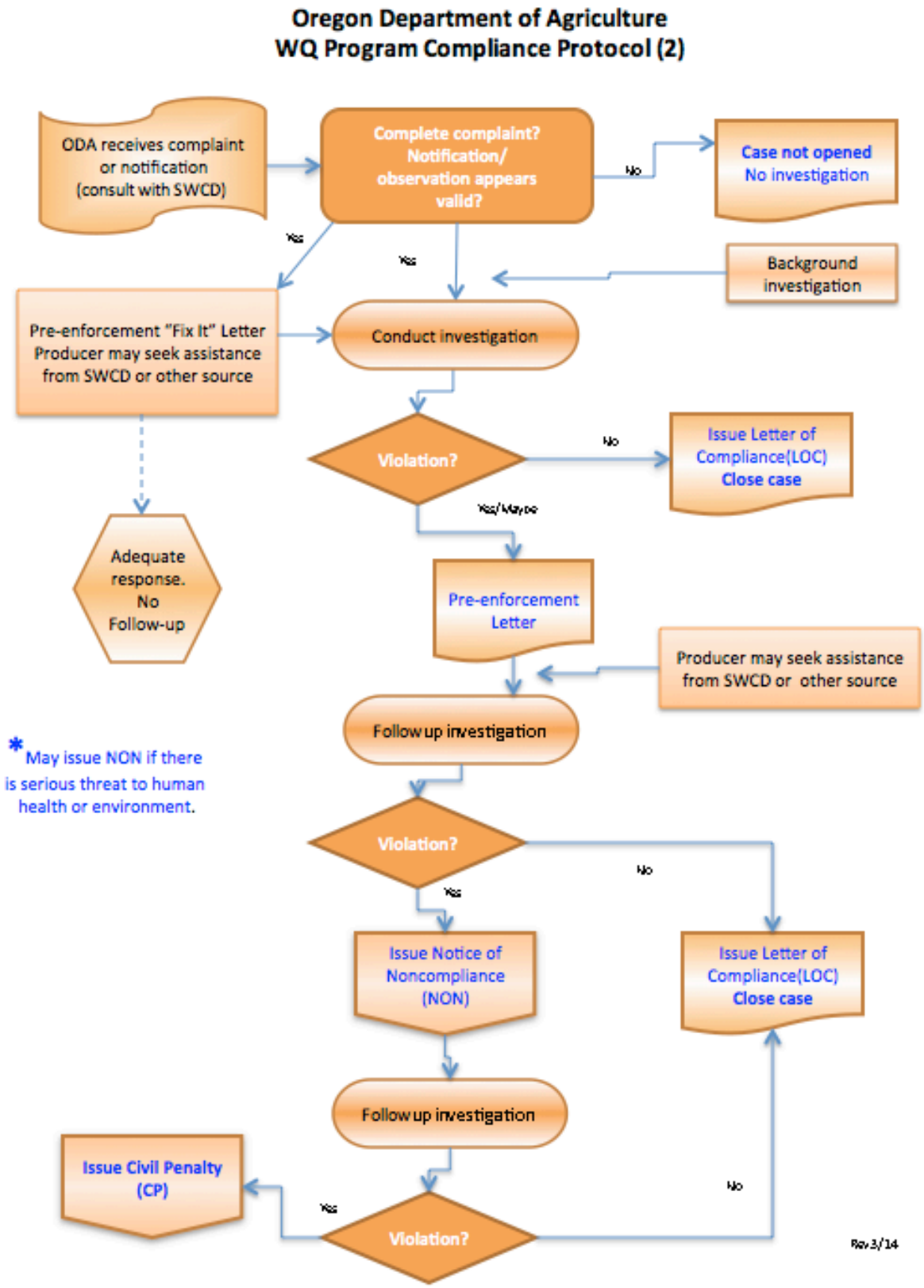
- State water quality standards.
- Load allocations for agricultural nonpoint source pollution assigned under Total Maximum Daily Loads (TMDLs) issued pursuant to the Clean Water Act (CWA), Section 303(d).
- Approved management measures for Coastal Zone Act Reauthorization Amendments (CZARA).
- Agricultural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

ODA has the legal authority to develop and implement Area Plans and associated regulations for the prevention and control of water pollution from agricultural activities and soil erosion, where such plans are required by state or federal law (ORS 568.909 and ORS 568.912). ODA will base Area Plans and regulations on scientific information (ORS 568.909). ODA works in partnership with SWCDs, LACs, DEQ, and other partners to implement, evaluate, and update the Area Plans and associated regulations. ODA has responsibility for any actions related to enforcement or determination of noncompliance with regulations (OAR 603-090-0080 through OAR 603-090-0120). ORS 568.912(1) and ORS 568.912(2) give authority to ODA to adopt regulations that require landowners to perform actions necessary to prevent and control pollution from agricultural activities and soil erosion.

The emphasis of this Area Plan is on voluntary action by landowners or operators to control the factors effecting water quality in the Management Area. The regulations are outlined as a set of minimum standards that must be met on all agricultural or rural lands. Landowners and operators who fail to address these regulations may be subject to enforcement procedures, which are outlined below.

Enforcement Action—ODA will use enforcement mechanisms where appropriate and necessary to gain compliance with water quality regulations. Any enforcement action will be pursued only when reasonable attempts at voluntary solutions have failed. If a violation is documented, ODA may issue a pre-enforcement notification or an Order such as a Notice of Noncompliance. If a Notice of Noncompliance is issued, the landowner or operator will be directed by ODA to remedy the condition through required corrective actions under the provisions of the enforcement procedures outlined in OAR 603-090-060 through OAR 603-090-120. If a landowner does not implement the required corrective actions, civil penalties may be assessed for continued violation of the regulations. See the Compliance Flow Chart for a diagram of the compliance process. If and when other governmental policies, programs, or regulations conflict with this Area Plan or associated regulations, ODA will consult with the agency(ies) and attempt to resolve the conflict in a reasonable manner.

Compliance Flow Chart



1.3.2 Local Management Agency

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

The day-to-day implementation of the Area Plan is accomplished through an intergovernmental agreement between ODA and each SWCD. Each SWCD implements the Area Plan by providing outreach and technical assistance to landowners. SWCDs also work with ODA and the LAC to establish implementation priorities, evaluate progress toward meeting Area Plan goals and objectives, and revise the Area Plan and associated regulations as needed.

1.3.3 Local Advisory Committee (LAC)

For each Management Area, the director of ODA appoints an LAC (OAR 603-090-0020) with up to 12 members, to assist with the development and subsequent biennial reviews of the local Area Plan and regulations. The LAC serves in an advisory role to the director of ODA and to the Board of Agriculture. LACs are composed primarily of landowners in the Management Area and must reflect a balance of affected persons.

The LAC may meet as frequently as necessary to carry out their responsibilities, which include, but are not limited to:

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

1.3.4 Agriculture's Role

Each individual landowner or operator in the Management Area is required to comply with the regulations, which set minimum standards. However, the regulations alone are not enough. To achieve water quality standards, individual landowners also need to attain land conditions that achieve the goals and objectives of the voluntary Area Plan. Each landowner or operator is not individually responsible for achieving water quality standards, agricultural pollution limits, or the goals and objectives of the Area Plan. These are the responsibility of the agricultural community collectively.

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

Area regulations only address impacts that result from agricultural activities. A landowner is responsible for only those conditions caused by activities conducted on land managed by the landowner or occupier. Conditions resulting from unusual weather events or other circumstances not within the reasonable control of the landowner or operator are considered when making compliance decisions. Agricultural landowners may be responsible for some of the above impacts under other legal authorities.
Under the Area Plan and associated regulations, agricultural landowners and operators are not responsible for mitigating or addressing factors that do not result from agricultural activities, such as:

- Hot springs, glacial melt water, extreme or unforeseen weather events, and climate change.
- Septic systems and other sources of human waste.
- Public roadways, culverts, roadside ditches and shoulders.
- Dams, dam removal, hydroelectric plants, and non-agricultural impoundments.
- Housing and other development in agricultural areas.

1.3.5 Public Participation

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

ODA, LACs, and SWCDs conduct biennial reviews of the Area Plans and regulations. Partners, stakeholders, and the general public are invited to participate in the process. Any future revisions to the regulations will include a public comment period and a public hearing.

1.4 Agricultural Water Quality

1.4.1 Point and Nonpoint Sources of Water Pollution

There are two types of water pollution. Point source water pollution emanates from clearly identifiable discharge points or pipes. Significant point sources are required to obtain permits that specify their pollutant limits. Agricultural operations regulated as point sources include permitted Confined Animal Feeding Operations (CAFOs) and pesticide applications in, over and within three feet of water. Many CAFOs are regulated under ODA's CAFO Program. Irrigation water discharges may be at a defined discharge point, but does not currently require a permit.

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

1.4.2 Beneficial Uses and Parameters of Concern

Beneficial uses of clean water include: public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, hydropower, and commercial navigation and transportation. The most sensitive beneficial uses are usually fish and aquatic life, water contact recreation, and public and private domestic water supply. These uses are generally the first to be impaired as a water body is polluted, because they are affected at lower levels of pollution. While there may not be severe impacts on water quality from a single source or sector, the combined effects from all sources contribute to the impairment of beneficial uses in the Management Area. Beneficial uses that have the potential to be impacted in this Management Area are summarized in Chapter 2.

Many water bodies throughout Oregon do not meet state water quality standards. These water bodies may or may not have established water quality management plans documenting needed reductions. The most common water quality concerns related to agricultural activities are temperature, bacteria, biological criteria, sediment and turbidity, phosphorous, algae, pH, dissolved oxygen, harmful algal blooms, nitrates,

pesticides, and mercury (See Appendix C). These parameters vary by Management Area and are summarized in Chapter 2.

1.4.3 Impaired Water Bodies and Total Maximum Daily Loads (TMDLs)

Every two years, the DEQ is required by the federal Clean Water Act (CWA) to assess water quality in Oregon. CWA Section 303(d) requires DEQ to identify a list of waters that do not meet water quality standards. The resulting list is commonly referred to as the 303(d) list. DEQ, in accordance with the CWA, is required to establish TMDLs for pollutants on the 303(d) list.

A TMDL includes an assessment of water quality data and current conditions and describes a plan to restore polluted waterways to conditions that meet water quality standards. TMDLs specify the daily amount of pollution that a water body can receive and still meet water quality standards. Through the TMDL, point sources are assigned pollution limits as "waste load allocations" in permits, while nonpoint sources (agriculture, forestry, and urban) are assigned pollution limits as "load allocations." TMDLs are legal orders issued by the DEQ, so parties assigned waste or load allocations are legally required to meet them. The agricultural sector is responsible for meeting the pollution limit (load allocation) assigned to agriculture specifically, or to nonpoint sources in general, as applicable.

TMDLs generally apply to an entire basin or subbasin, and not just to an individual water body on the 303(d) list. Once a TMDL is developed for a basin, the basin's impaired water bodies are removed from the 303(d) list, but they remain on the list of impaired water bodies. When data show that water quality standards have been achieved, water bodies will be identified on the list of water bodies that are attaining water quality standards.

As part of the TMDL process, DEQ identifies the Designated Management Agency or parties responsible for submitting TMDL implementation plans. TMDLs designate that the local Area Plan is the implementation plan for the agricultural component of the TMDLs that apply to this Management Area. Biennial reviews and revisions to the Area Plan and regulations must address agricultural or nonpoint source load allocations from TMDLs.

The list of impaired water bodies (303(d) list), the TMDLs, and the agricultural load allocations for the TMDLs that apply to this Management Area are summarized in Chapter 2.

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

Senate Bill 502 was passed in 1995, authorizing ODA as the state agency responsible for regulation of farming activities for the purpose of protecting water quality. A Department of Justice opinion dated July 10, 1996, states that "...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 into all of the Area Plans and associated regulations in the state. A Department of Justice opinion, dated September 12, 2000, clarifies that ORS 468B.025 applies to point and nonpoint source pollution.

ORS 468B.025 states that:

"(1) ...no person shall:

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

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

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

The aspects of ORS 468B.050 that apply to the Ag Water Quality Program, state that:

"(1) Except as provided in ORS 468B.053 or 468B.215, without holding a permit from the Director of the Department of Environmental Quality or the State Department of Agriculture, which permit shall specify applicable effluent limitations, a person may not:

(a) Discharge any wastes into the waters of the state from any industrial or commercial establishment or activity or any disposal system."

Definitions (ORS 468B.005)

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

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

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

1.4.5 Streamside Vegetation and Agricultural Water Quality

Across Oregon, the Ag Water Quality Program emphasizes streamside vegetation protection and enhancement to prevent and control agricultural water pollution. Streamside vegetation provides three primary water quality functions: shade for cooler stream temperatures, streambank stability, and filtration of pollutants. Other water quality functions include: water storage for cooler and later season flows, sediment trapping that builds streambanks and floodplains, narrowing and deepening of channels, and biological uptake of sediment, organic material, nutrients, and pesticides.

Additional reasons for the Ag Water Quality Program's emphasis on streamside vegetation include:

- Streamside vegetation improves water quality related to multiple pollutants, including: temperature (heat), sediment, bacteria, nutrients, toxics, and pesticides.
- Streamside vegetation provides fish and wildlife habitat.
- Landowners can improve streamside vegetation in ways that are compatible with their operation.
- Streamside vegetation condition can be monitored readily to track the status and trends of agriculture's progress in addressing water quality concerns.

The Ag Water Quality Program uses the concept of "site-capable vegetation" to describe the vegetation that agricultural streams can provide to protect water quality. Site-capable vegetation is the vegetation that can be expected to grow at a particular site, given natural site factors (e.g., elevation, soils, climate, hydrology, wildlife, fire, floods) and historical and current human influences (e.g., channelization, roads, invasive species, modified flows, past land management). Site-capable vegetation can be determined for a specific site based on: current streamside vegetation at the site, streamside vegetation at nearby reference sites with similar natural characteristics, NRCS soil surveys, and local or regional scientific research.

The goal for Oregon's agricultural landowners is to provide the water quality functions (e.g., shade, streambank stability, and filtration of pollutants) produced by site-capable vegetation along all streams flowing through agricultural lands. The agricultural water quality regulations for each Management Area require that agricultural activities provide water quality functions consistent with what the site would provide with site-capable vegetation.

1.5 Other Water Quality Programs

1.5.1 Confined Animal Feeding Operation (CAFO)

ODA is the lead state agency for the CAFO Program. The CAFO Program was developed to ensure that operators and producers do not contaminate ground or surface water with animal manure. Since the early 1980s, CAFOs have been registered to a general Water Pollution Control Facility permit designed to protect water quality, while allowing the operators and producers to remain economically viable. A properly maintained CAFO does not pollute ground or surface water. To assure continued protection of ground and surface water, ODA was directed by the 2001 Oregon State Legislature to convert the CAFO Program from a Water Pollution Control Facility permit program to a federal National Pollutant Discharge Elimination System (NPDES) program. ODA and DEQ jointly issued a NPDES CAFO Permit in 2003 and 2009. The 2009 permit will expire in May 2014, and it is expected that a new permit will be issued at that time. The NPDES CAFO Permit is compliant with all Clean Water Act requirements for CAFOs; it does allow discharge in certain circumstances as long as the discharge does not violate Water Quality Standards.

Oregon NPDES CAFO Permits require the registrant to operate according to a site-specific, ODA approved, Animal Waste Management Plan that is incorporated into the NPDES CAFO Permit by reference. CAFO NPDES Permits protect both surface and ground water resources.

1.5.2 Drinking Water Source Protection

Oregon implements its drinking water protection program through a partnership between DEQ and the Oregon Health Authority. The program provides individuals and communities with information on how to protect the quality of Oregon's drinking water. DEQ and the Oregon Health Authority encourage community-based protection and preventive management strategies to ensure that all public drinking water resources are kept safe from future contamination. For more information see: http://www.deq.state.or.us/wq/dwp/dwp.htm. Agricultural activities are required to meet those water quality standards that contribute the safe drinking water.

1.5.3 Groundwater Management Areas (GWMAs)

Groundwater Management Areas are designated by DEQ when groundwater in an area has elevated contaminant concentrations resulting, at least in part, from nonpoint sources. Once the GWMA is declared, a local groundwater management committee comprised of affected and interested parties is formed. The committee then works with and advises the state agencies that are required to develop an action plan that will reduce groundwater contamination in the area.

Oregon has designated three GWMAs because of elevated nitrate concentrations in groundwater. These include the Lower Umatilla Basin GWMA, the Northern Malheur County GWMA, and the Southern Willamette Valley GWMA. Each GWMA has a voluntary Action Plan to reduce nitrate concentrations in groundwater. If after a scheduled evaluation point DEQ determines that the voluntary approach is not effective, then mandatory requirements may become necessary.

1.5.5 Pesticide Management and Stewardship

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

In 2007, the interagency Water Quality Pesticide Management Team (WQPMT) was formed to expand efforts to improve water quality in Oregon related to pesticide use. The WQPMT includes representation from ODA, Oregon Department of Forestry, DEQ, and the Oregon Health Authority. The WQPMT facilitates and coordinates activities such as monitoring, analysis and interpretation of data, effective response measures, and management solutions. The WQPMT relies on monitoring data from the Pesticides Stewardship Partnership (PSP) Program and other monitoring programs to assess the possible impact of pesticides on Oregon's water quality. Pesticide detections can be addressed through multiple programs and partners, including the PSP Program described above.

Through the PSP Program, state agencies and local partners work together to monitor pesticides in streams and to improve water quality (http://www.deq.state.or.us/wq/pesticide/pesticide.htm). DEQ, ODA, and Oregon State University Extension Service work with landowners, SWCDs, watershed councils, and other local partners to voluntarily reduce pesticide levels while improving water quality and crop management. There has been noteworthy progress since 2000 in reducing pesticide concentrations and detections.

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

1.5.6 The Oregon Plan for Salmon and Watersheds

In 1997, Oregonians began implementing the Oregon Plan for Salmon and Watersheds referred to as the Oregon Plan (http://www.oregon-plan.org). The Oregon Plan seeks to restore native fish populations, improve watershed health, and support communities throughout Oregon. The Oregon Plan has a strong

focus on salmon, because they have such great cultural, economic, and recreational importance to Oregonians, and because they are important indicators of watershed health. ODA's commitment to the Oregon Plan is to develop and implement Area Plans and associated regulations throughout Oregon.

1.6 Partner Agencies and Organizations

1.6.1 Oregon Department of Environmental Quality (DEQ)

The U.S. EPA has delegated authority to DEQ under the CWA authority for protection of water quality in Oregon. In turn, DEQ is the lead state agency with overall authority to regulate for water quality in Oregon. DEQ coordinates with other state agencies, including ODA and Oregon Department of Forestry, to meet the needs of the CWA. DEQ sets water quality standards and develops TMDLs for impaired waterbodies. In addition, DEQ develops and coordinates programs to address water quality including National Pollution Discharge Elimination Permits (for point sources), 319 program, Source Water Protection, 401 Water Quality Certification, and GWMAs. DEQ also coordinates with ODA to help ensure successful implementation of Area Plans as part of its 319 program.

DEQ designated ODA as the Designated Management Agency for water pollution control activities on agricultural and rural lands in the state of Oregon to coordinate meeting agricultural TMDL load allocations. A Memorandum of Agreement (MOA) between DEQ and the ODA recognizes that ODA is the agency responsible for implementing the Ag Water Quality Program established under ORS 568.900 to ORS 568.933, ORS 561.191, and OAR Chapter 603, Divisions 90 and 95. The MOA between ODA and DEQ was updated in 2012 and describes how the agencies will work together to meet agricultural water quality requirements.

The MOA includes the following commitments:

- ODA will develop and implement a monitoring strategy, as resources allow, in consultation with DEQ.
- ODA will evaluate Area Plans and regulation effectiveness in collaboration with DEQ.
    - ODA will determine the percentage of lands achieving compliance with Management Area regulations.
    - ODA will determine whether the target percentages of lands meeting the desired land conditions, as outlined in the goals and objectives of the Area Plans, are being achieved.
- ODA and DEQ will review and evaluate existing information with the objective of determining:
    - Whether additional data are needed to conduct an adequate evaluation.
    - Whether existing strategies have been effective in achieving the goals and objectives of the Area Plan.
    - Whether the rate of progress is adequate to achieve the goals of the Area Plan.

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

1.6.2 Other Partners

ODA and SWCDs work in close partnership with local, state, and federal agencies and organizations, including: DEQ (as indicated above), the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) and Farm Service Agency, watershed councils, Oregon State University Extension Service, livestock and commodity organizations, conservation organizations, and local businesses. As resources allow, SWCDs and local partners provide technical, financial, and

educational assistance to individual landowners for the design, installation, and maintenance of effective management strategies to prevent and control agricultural water pollution.

1.7 Measuring Progress

Agricultural landowners and operators have implemented effective conservation projects and management activities throughout Oregon to improve water quality for many years. However, it has been challenging for ODA, SWCDs, and LACs to measure this progress. ODA is working with SWCDs, LACs, and our partners to develop and implement objectives and strategies that will produce measurable outcomes for agricultural water quality.

1.7.1 Measurable Objectives

Measurable objectives allow the Ag Water Quality Program to better evaluate progress toward meeting water quality standards and load allocations where TMDLs have been completed. Many of these measurable objectives relate to land condition and are mainly implemented through focused work in small geographic areas (section 1.7.3). The measurable objectives for this Area Plan are in Chapter 3, and progress toward achieving the objectives is summarized in Chapter 4.

At a minimum, the measurable objectives of the Ag Water Quality Program and this Area Plan are to:

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

1.7.2 Land Condition and Water Quality

Land conditions can serve as useful surrogates (indicators) for water quality parameters. For example, streamside vegetation is generally used as a surrogate for water temperature, because shade blocks solar radiation from warming the stream. In addition, sediment can be used as a surrogate for pesticides and nutrients, because many pesticides and nutrients adhere to sediment particles.

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

- Landowners can see land conditions and have direct control over them.
- It can be difficult to separate agriculture's influence on water quality from other land uses.
- It requires extensive monitoring of water quality at an intensive temporal scale to evaluate progress; it is expensive and may fail to demonstrate short-term improvements.
- Improved land conditions can be documented immediately, but there may be a significant lag time or a need for more extensive implementation before water quality improves.
- Agricultural improvements in water pollution are primarily through improvements in land and management conditions.

Water quality monitoring data may help ODA and partners to measure progress or identify problem areas in implementing the Area Plan; although, as described above, it may be less likely to evaluate the short-term effects of changing land conditions on water quality parameters such as temperature, bacteria, nutrients, sediment, and pesticides.

1.7.3 Focused Implementation in Small Geographic Areas

Focus Areas

A Focus Area is a small watershed with significant water quality or land condition concerns that are associated with agriculture. ODA's intent in selecting Focus Areas is to deliver systematic, concentrated

outreach and technical assistance in small geographic areas ("Focus Areas") through the SWCDs. A key component of this approach is measuring conditions before and after implementation to document the progress made with available resources. The focused implementation approach is consistent with other agencies' and organizations' efforts to work proactively in small geographic areas, and is supported by a large body of scientific research (e.g., Council for Agricultural Science and Technology, 2012).

Systematic implementation in Focus Areas can provide the following advantages:

- Measuring progress is easier in a small watershed than across an entire Management Area.
- Water quality improvement may be faster since small watersheds generally respond more rapidly.
- A proactive approach can address the most significant water quality concerns.
- Partners can coordinate and align technical and financial resources.
- Partners can coordinate and identify the appropriate source specific conservation practices and demonstrate the effectiveness of these conservation practices.
- A higher density of projects allows neighbors to learn from neighbors.
- A higher density of prioritized projects leads to greater connectivity of projects.
- Limited resources are used more effectively and efficiently.
- Work in one Focus Area, followed by other Focus Areas, will eventually cover the entire Management Area.

SWCDs choose a Focus Area in cooperation with ODA and other partners. In some cases, a Focus Area is selected because of efforts already underway or landowner relationships already established. The scale of the Focus Area matches the SWCD's capacity to deliver concentrated outreach and technical assistance, and to complete (or initiate) projects over a biennium. The current Focus Area for this Management Area is described in Chapter 3.

Working within a Focus Area is not intended to prevent implementation within the remainder of the Management Area. The remainder of the Management Area will continue to be addressed through general outreach and technical assistance.

Strategic Implementation Areas

Strategic Implementation Areas are small watersheds selected by ODA, in cooperation with partners, and after review of water quality and other available information. ODA leads the assessment of current conditions and the landowner outreach. Strategic Implementation Areas and Focus Areas are both tools to concentrate efforts in small geographic areas to achieve water quality standards. As with Focus Areas, SWCDs and partners work with landowners to improve conditions that may impact water quality. However, Strategic Implementation Areas also have a compliance evaluation and assurance process that allows ODA to proactively gain compliance with Ag water quality regulations.

1.8 Implementation, Monitoring, Evaluation, and Adaptive Management

Implementation of the Area Plan and associated regulations will be assessed by evaluating the status and trends in agricultural land conditions. Measurable objectives will be assessed across the entire Management Area and within the Focus Area. ODA conducts land condition and water quality monitoring at the statewide level and will analyze this and other agencies' and organizations' local monitoring data. The results and findings will be summarized in Chapter 4 for each biennial review. ODA, DEQ, SWCDs, and LACs will examine these results during the biennial review and will revise the goal(s), objectives, and strategies in Chapter 3, as needed.

1.8.1 Statewide Aerial Photo Monitoring of Streamside Vegetation

Starting in 2003, ODA began evaluating streamside vegetation conditions using aerial photos acquired specifically for this purpose. ODA focuses on land condition monitoring efforts on streamside areas because these areas have such a broad influence over water quality. Stream segments representing 10 to 15 percent of the agricultural lands in each Management Area were randomly selected for monitoring. ODA examines streamside vegetation at specific points in 90-foot bands along the stream from the aerial photos and assigns each sample stream segment a score based on ground cover. The score can range from 70 (all trees) to 0 (all bare ground). The same stream segments are re-photographed and re-scored every five years to evaluate changes in streamside vegetation conditions over time. Because site capable vegetation varies across the state, there is no one correct riparian index score. The main point is to measure positive or negative change. The results are summarized in Chapter 4 of the Area Plan.

1.8.2 Agricultural Ambient Water Quality Monitoring Assessment

ODA currently evaluates water quality data from monitoring sites in DEQ's water quality database that reflects agricultural influence on water quality. These data are also published in the DEQ water quality database and evaluated at the statewide level to determine trends in water quality at agricultural sites statewide. Results from monitoring sites in the Management Area, along with local water quality monitoring data, are described in Chapter 4.

1.8.3 Biennial Reviews and Adaptive Management

The Area Plan and associated regulations undergo biennial reviews by ODA and the LAC. As part of each biennial review, ODA, DEQ, SWCDs, and the LAC discuss and evaluate the progress on implementation of the Area Plan and associated regulations. This evaluation includes enforcement actions, landscape and water quality monitoring, and outreach efforts over the past biennium across the Management Area and for the Focus Area. In addition, progress toward achieving agricultural load allocations may be documented (if a TMDL has been established). As a result of the biennial review, the LAC submits a report to the Board of Agriculture and the director of ODA. This report describes progress and impediments to implementation, and recommendations for modifications to the Area Plan or associated regulations necessary to achieve the purpose of the Area Plan. The results of this evaluation will be used to update the goal(s), measurable objectives, and strategies in Chapter 3.

Chapter 2: Local Background

2.1 Local Roles and Responsibilities

2.1.1 Local Advisory Committee (LAC)

This Area Plan was developed with the assistance of a LAC. The LAC was formed in 2000 to assist with the development of the Area Plan and regulations and with subsequent biennial reviews. Current members are:

Name	Location	Description
Daniel Goffin, Chair	Aumsville/ Mill Creek	Farmer, Livestock
Jim Myron, Vice-Chair	Canby/ Molalla	Environmental Interests
Bob Dettwyler	Silverton/ Pudding	Grass seed, wheat, bush beans, beef
Matt Knudsen	Marion County	County Government
Alan Kraemer	Mt. Angel/ Pudding	Ornamental nursery stock
Jerome Rosa	Gervais/ Pudding	Dairy
Joan Zuber	Molalla	Local Management Agency

2.1.2 Local Management Agency

The implementation of this Area Plan is accomplished through an Intergovernmental Agreement between ODA and the Marion, Clackamas, and Linn SWCDs. This Intergovernmental Agreement defines the SWCD(s) as the Local Management Agencies for implementation of the Area Plan. The SWCD(s) was/were also involved in development of the Area Plan and associated regulations.

2.2 Area Plan and Regulations: Development and History

In January of 2002, the Area Plan and regulations were approved by the director of ODA. Since approval, the LAC met in 2004, 2006, 2008, and 2010 to review the Area Plan and regulations. The review process included assessment of the progress of Area Plan implementation toward achievement of plan goals and objectives.

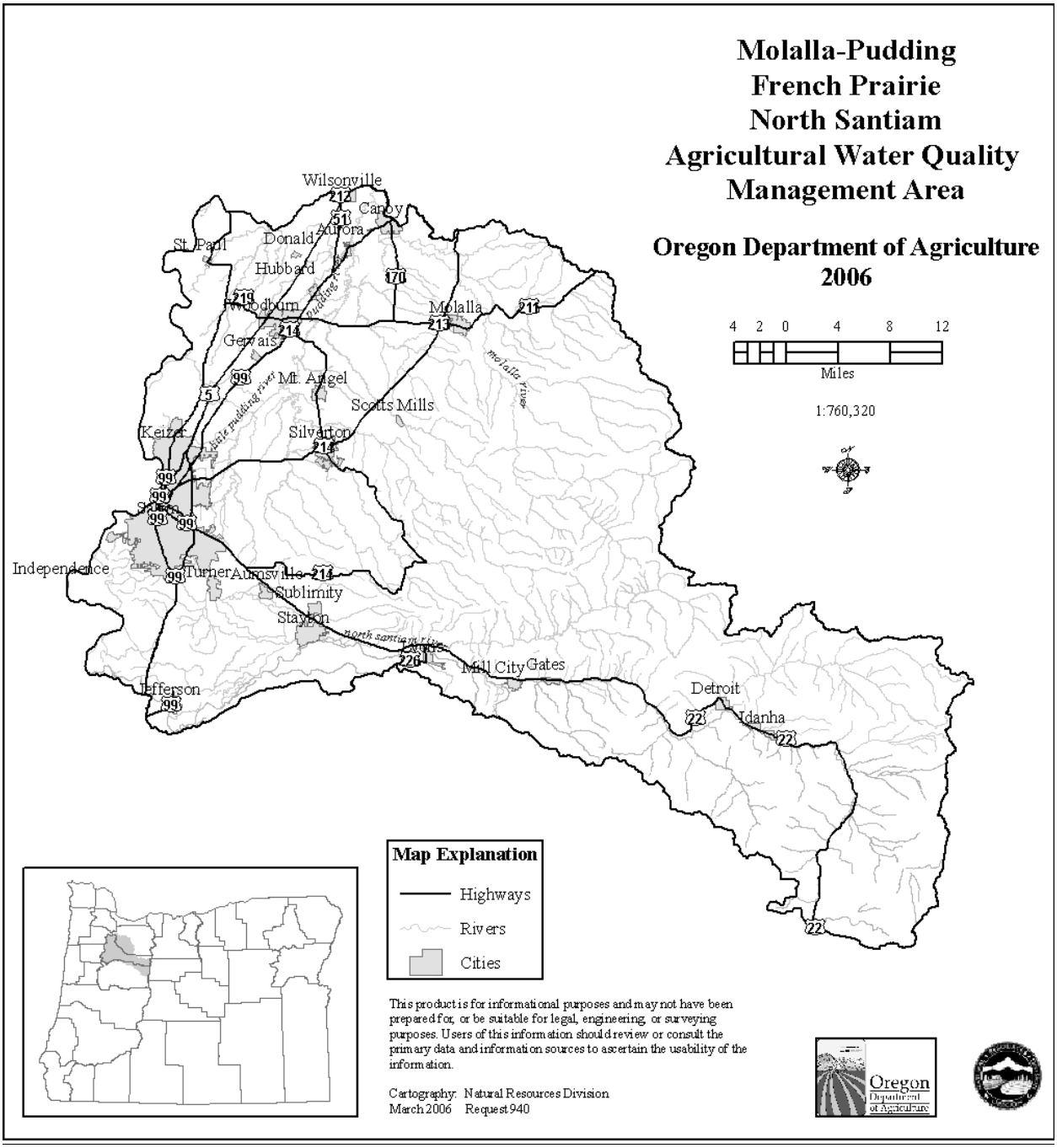
2.3 Geographical and Physical Setting

2.3.1 Geographic and Programmatic Scope

The Molalla/Pudding/French Prairie/North Santiam Subbasins include the drainage areas of the Molalla, Pudding, North Santiam, and Santiam rivers. In the area known as French Prairie, all the creeks and drainages between the towns of St. Paul and Donald that flow directly into the Willamette River are also part of this management area. The Willamette River is the western boundary. The physical boundaries of the Molalla/Pudding/French Prairie/North Santiam Subbasins are indicated on the map in Section 2.3.2. Operational boundaries for the land base under the purview of these rules include all lands within the Molalla/Pudding/French Prairie/North Santiam Subbasins in agricultural use, agricultural and rural lands which are lying idle or on which management has been deferred, and forested lands with agricultural activities, with the exception of public lands managed by federal agencies and activities which are subject to the Forest Practices Act.

2.3.2 Map of the Management Area

Figure 1: Map of the Molalla-Pudding-French Prairie-North Santiam Agricultural Water Quality Management Area



2.3.3 History: Farming In Marion County: A Glimpse At Now And Then[1]

Introduction

In this section, the LAC describes the rich history of agriculture in this area and how agriculture is an important endeavor, providing a vital economic stimulus to the area (Table 1). However, it is a difficult and chancy enterprise, with an increasingly older farm population taking great financial risks forever decreasing returns (Table 2). Yet this area's farmers continue to persevere, following tradition while experimenting with new farming methods in the hope that things will get better. Within this context, farmers are facing new water quality demands.

Table 1: Agricultural Commodity Sales ($) Marion County, 2009*

Commodity	Sales ($)
Crops Spec. Prod.	220,088,000
Grass & Legume Seeds	81,473,000
Not Disclosed	63,895,000
Dairy Products	71,148,000
Small Fruits	49,572,000
Eggs & Produce	47,836,000
Field Crops	9,575,000
Hays & Forage	12,822,000
Tree Fruits & Nuts	15,178,000
Cattle & Calves	14,468,000
Misc. Animals	15,961,000
Grains	19,752,000
TOTAL	**$493,025,000**

*Compiled from Oregon County and State Agricultural Estimates: Oregon State University Extension Service, Special Report 790-09, February 2012 (http://oain.oregonstate.edu/SignIn.asp).

The Oregon County and State Agricultural Estimates: Oregon State University Extension Service, Special Report 790-09 provides data regarding agricultural commodity sales which can be found at http://oain.oregonstate.edu/SignIn.asp. Demographics for Marion County can be found at http://www.city-data.com/county/Marion_County-OR.html.

Table 2: Bits and Pieces

Population of Marion Co.: 2012: 319,985 (87% urban, 13% rural); it was 284,834 in 2000
Average size of farms: 106 acres
Average value of agricultural products sold per farm: $134,457
Average value of crops sold per acre for harvested cropland: $1,708.44
The value of nursery, greenhouse, floriculture, and sod as a percentage of the total market value of agricultural products sold: 43.91%
The value of livestock, poultry, and their products as a percentage of the total market value of agricultural products sold: 15.42%
Average total farm production expenses per farm: $114,750
Harvested cropland as a percentage of land in farms: 62.52%
Irrigated harvested cropland as a percentage of land in farms: 44.75%

[1] This subsection was written by Barbara Lucas when she served as a Local Advisory Committee member. Please see Acknowledgements and Bibliography section for information sources.

Average market value of all machinery and equipment per farm: $87,306
The percentage of farms operated by a family or individual: 84.89%
Average age of principal farm operators: 54 years
Average number of cattle and calves per 100 acres of all land in farms: 11.34
Milk cows as a percentage of all cattle and calves: 37.50%
Corn for grain: 51 harvested acres
All wheat for grain: 9,573 harvested acres
Vegetables: 31,410 harvested acres
Land in orchards: 9,907 acres
http://www.city-data.com/county/Marion_County-OR.html, as of 2012

The Land

The destination of early settlers in the Oregon Country was the land east of the Willamette River and south to present-day Salem in Marion County. This prairie land was fringed with wide forests, bordering rivers and streams but the prairies themselves had few trees and little brush due to periodic burning by the indigenous people. Dr. John McLoughlin and one of his Hudson Bay Company employees pronounced this prairie land the Northwest's most desirable region for Euro-American settlement. According to an early day traveler, Rev. Samuel Parker, the soil was alluvial river bottom; rich, easy to cultivate, sufficiently dry for cultivation, yet well watered by small streams and springs. French Prairie is the largest of these prairies.

At the south end of French Prairie, north of Salem and east of Keizer, are the Lake Labish bottomlands, a one-time swamp left over from an old bed of the Willamette River. It is about 10 miles long and one-half mile at its widest, 1,270 acres of peat created by decayed vegetation. The peat is four feet to eight feet deep. Surrounding the swamp were woodlands of fir, pine, and oak, but the swamp itself contained willow, ash, vine maple, cattails, skunk cabbage, cottonwoods, and many beaver dams. Because of its swampiness, no one filed a donation land claim, and the state of Oregon later sold the property for $1 an acre.

Anecdotes. *Early stagecoaches avoided the swamp, bypassing the lake about a half-mile northwest of the Chemawa Indian School…. A Marion County engineer reportedly shoved a 2" x 6" sixteen feet into the peat with his bare hands and never touched bottom…. According to one resident, Lake Labish soil is even more fertile than French Prairie.*

The highlands southwest of Silver Creek Falls Park is a stretch of land described by historian Mark Schmid as a fairyland of majestic timber, white water and wild flowers, a primeval forest with Indian trails and mountain streams abounding in fish. These highlands and the lowlands around neighboring Mill Creek provide the setting for farms and the small towns of Turner, Aumsville, Sublimity, and Stayton. Besides providing many of the Christmas trees sold here and abroad, this area is the home of the famed Kentucky Wonder Santiam Green Bean, and the home of the world's largest grass seed farm. A particularly productive tract, north of the North Santiam River, is a 13-mile flatland between Parrish Gap and Stayton.

Other land is farmed along the Willamette, the Pudding, and the lower North Santiam - very fertile land, which in winter and spring is under water. Come back in the summer and you see crops growing and cattle grazing. The situation is different up the North Santiam. As you climb higher and the gorge narrows, the main agricultural activity along the river is pastureland.

The People

The Kalapuya Indians were the earliest known inhabitants of the prairies. They fished salmon at Willamette Falls, and trout and eel throughout the upper tributaries, hunted waterfowl and game, and gathered nuts, berries, camas bulbs, tarweed seeds (wild oats), basketry materials and various herbs. Each fall they burned the prairies to harvest tarweed, renew fertility, and eliminate brush while maintaining widely spaced Oregon white oak trees. There was an Indian trail from the Willamette Falls to Silverton, Sublimity, across the Santiam River, and on to the Klamath basin, with another Indian trail through the North Santiam gorge across the Cascades into the Deschutes valley.

The first recorded European visitors to French Prairie were trappers from the Pacific Fur Company in 1812. Then, in 1829, a retired Hudson Bay Company French-Canadian trapper settled on French Prairie near what is now St. Paul. Eventually, about 75 former trappers, with the Company's financial assistance, located in the area. Many of the French Canadians settled here to start new lives with their Indian families and they were followed by Methodist missionaries looking for converts. Beginning in the 1840's, the Eden-seekers began arriving by wagon train, or by ship from across the Isthmus of Panama, or around the tip of South America. Among later immigrants were families not only from eastern states but also from Ireland, Germany, Switzerland, and Austria. Many of their descendants are still farming here.

Anecdotes. *In 1879, a missionary from Minnesota came to Sublimity and convinced his previous flock to follow him.... One immigrant, armed with California gold, came to French Prairie amassed 10,000 acres, divided it among his 11 children, and returned to the East.... An entire family, including aunts and uncles, arrived in Oregon in two rail cars, one car with family and furniture, and another car with cattle and equipment.... A now-retired farm wife came west with her family before World War II, 14 people in two model Ts, "just like the Grapes of Wrath" she says.*

Crops

The first settlers were subsistence farmers, raising what was needed to support a family: gardens, fruit trees, cows, pigs, and chickens. "Old white winter wheat" was the mainstay cash crop and was the medium of exchange until the 1850s: $1 = 1 bushel of wheat. The yield was fifteen to twenty bushels an acre. Besides wheat, early Hudson Bay records show that trading items of beaver skins, buckskins, salt salmon, shingles, and saw logs. By 1843, trade included cattle, horses, sheep, swine, oats, potatoes, bacon, and sides of beef. At that time, the market was the Sandwich Islands, China, and the Russian settlements in Alaska. As improved transportation brought markets closer to Willamette Valley farmers, the list of crops expanded to include beef cattle, hops, berries, chickens, and turkeys and by the end of the century, many farmers were growing apples, prunes, cherries, peaches, and nuts as well.

The rush for gold in California and southern Oregon had a great effect on the Willamette Valley. Two-thirds of the men left to search for gold, together with some women. Farms and mills were run by old men, boys, and women. Some gold seekers never returned to the Valley, some returned with nothing. Others brought back gold, which they invested in more land or became storeowners. There was a great demand for flour and lumber in the gold fields, not only in California, but also in Jacksonville, eastern Oregon, and Idaho. Prices soared. To take advantage of the heightened demand, to get more land into production, forested land was cleared, using Chinese labor and horses. Horses were used not only to pull stumps, but also to propel threshing machines, plow, take logs to mills, and crops to market.

Moving Crops to Market

Wagons in the early days were either up to their hubs in mud or dust. The settlers' connection with the civilized world was the Willamette River, which they used for transportation of passengers and crops. They tried to locate within a day's round trip of the river.

The River. The first settlers located along the Willamette from Oregon City south to Salem. There were about 100 landings on the river. Farmers brought their grain to these river landings, stacked it under trees to protect it from weather and theft, then waited for canoes, flatboats, or keel boats to take their grain down to Oregon City.

Regular steamboat service began in 1851, calling landings at Butteville, Champoeg, Fairfield, Wheatland, and Lincoln. Warehouses were built where grain and other perishables could be stored. Cattle and swine were kept in pens near the river. The two-month period following harvest was the busy time at the landings, teams and wagons waiting their turns to unload. Steamboats moved wheat downriver during the high water season, and by spring, most warehouses had been emptied.

The river was a mixed blessing. Many times floods carried away livestock, landings, docks, warehouses, shops, hotels, and stores. The 1861 flood, the biggest in memory, is just one of the many which afflicted Willamette Valley residents. Repeated floods in 1843, 1849, 1853, 1860, 1861, 1888, 1890, and 1894 convinced early day settlers that it was wise to build and farm at a safe distance from the river.

Rails. The railroad, supplanting the steamboat, changed the future for many communities along the river. No longer was it necessary for a farmer to live within a day's round trip to the river. No longer was it necessary to wait for high water so boats could navigate. The landings along the river disappeared. The railroad became the artery of trade. In 1869, a north-south railroad from Portland via Aurora-Woodburn to Waconda was established. An east-west railroad from Ray's Landing (across the Willamette from Dayton), through St. Paul and Woodburn to Silverton never materialized. With the advent of the railroad, wheat production and cattle grazing moved across the mountains to central Oregon but the railroad brought markets and processors closer to Willamette Valley farmers.

Roads. The paved road finally got the farmer out of the mud. In 1919, acting as agent for the state of Oregon, Marion County paved the first 7.39 miles of road. This active partnership lasted until the Depression, and by 1932, there were 94 market roads in Marion County, 187 miles paved and 264 miles graded. Today, Marion County has 990 miles of rural county roads, 780 miles of which are paved, and 210 miles graveled. But water still causes road problems in bottomlands. A Marion County report lists four pages of roads where water accumulates during heavy rains.

Anecdote. *One old-timer claims that the early market road was paved on the side where the heavily laden wagon went to market, but graveled on the side where the wagon returned home empty.*

The number of warehouses on today's farms is increasing. These warehouses provide a place where produce can either be stored or containerized for eventual transfer by truck to a rail yard or port. A question, which needs to be addressed, is the adequacy of local roads being used by trucks. The County reports that 71 percent of its roads don't meet pavement width standards, and 81 percent don't meet shoulder width standards.

Unfortunately, Marion County does not have funds to correct all the deficiencies in its rural road system. Its 1998 study lists major repairs and replacements needed for seven bridges and possible weight limitations if these improvements cannot be made. The study also cites the growth in Marion, Polk, and

Yamhill counties as a reason for looking at the need for another bridge across the Willamette, perhaps linked with a study for a second interchange at Woodburn.

Back to the River. Marion County still operates two ferries across the Willamette, serving rural areas. The Wheatland Ferry, at the end of Matheny Road about five miles north of Keizer, operates daily (except Christmas and Thanksgiving). Annual ridership is 125,000 vehicles. The Buena Vista Ferry, operating between an area south of Independence to Buena Vista Road on the other side of the river, carries only 6,000 vehicles a year. Operation of both ferries depends on weather conditions, river levels, and maintenance requirements. The shutdown of the Wheatland Ferry is an inconvenience for many because the ferry is the only way to cross the Willamette between Newberg and Salem.

Increasing Production. Because of the Willamette Valley's long growing season, local farmers can pick and choose among 200 potential crops. Whereas wheat, oats, barley, flax, and grass can survive without irrigation, other crops need well-drained soil and water during the summer months.

Drainage. While benefiting from the long growing season, Marion County farmers are plagued with wet springs. Drainage is a means to provide a 4' depth for optimal plant root development. It also allows the farmer to get out to his fields earlier in the spring and to raise a greater variety of crops.

According to local memory, installing drainage tile in the Willamette Valley began about 1892. In those days, clay was fired into foot-long red drainage tiles; the tiles were laid in trenches, butted up against each other, and pointed to some low spot. The problem with these tiles was soil that entered the cracks blocking the flow of water. A new kind of tiling is now being used: high-density polyethylene flexible tubing, which can be attached to additional tubing with plastic couplets. Cost is about $1,000 to $1,500 an acre to install the tubing.

Flood Control. Local drainage is not enough to protect against floods. Some major twentieth century floods along the Willamette occurred in 1923, 1927, 1945, 1955, in 1964, and 1996. These last two floods were 100-year events, caused by heavy rainfall that saturated the ground, by low temperatures that froze the ground, by heavy wet snowfall and by sudden melt off of the snow pack. These floods brought logs, brush, trees and structures down the rivers. Topsoil was eroded, livestock drowned, riverbanks destroyed, orchards and specialty crop fields were washed out or silted under. The damage caused by these last two floods was great, but it was reduced by the flood control projects built by the U. S. Army Corps of Engineers since 1940 on the Willamette, the McKenzie, the Long Tom, and the Santiam rivers. Detroit Dam and its regulating dam Big Cliff are the projects that provide flood control downstream along the North Santiam River.

Anecdotes. *My neighbor lost 700 acres to the '64 flood. Corrective measures since then have cost me 120 acres.... These heavy rains the last three or four years remind me of what we had 25 years ago. My stream was always over its banks then, and we even ice skated down there in the winter....*

Irrigation. Although the Willamette Valley receives 40" to 60" of rain a year, most of it falls at the wrong time for crops. To get the maximum return for his efforts and investment, the farmer needs to raise diverse crops, and to do that he needs 6" to 10" of water during the three summer months when almost no rain falls. Irrigation became commonplace after World War II. Marion County farmers use several irrigation methods: lines which must be moved by hand, lines which are moved on wheels, big guns which spray water and fertilizer, and the micro, or drip, system. Cost for the drip system is $800 to $1,000 an acre. About 70,000 acres in Marion County are irrigated, with an additional 15,000 acres irrigated sometimes.

Irrigators in the French Prairie and Lake Labish areas use water from wells or the rivers. Farmers in the North Santiam area can contract for irrigation water from Detroit reservoir. Three irrigation districts have been organized to take advantage of this stored water through water rights permits issued by the State Water Resources Department. These districts include: Sidney, Kingston, and the Santiam Water Control. The most extensive irrigation project, the Santiam Water Control District, serves the thirteen miles of fertile land west of Stayton where 17,000 acres are irrigated from March to October.

Irrigation water in Detroit Reservoir is available through the Bureau of Reclamation. There are 281,630 acre-feet of water that can be used for conservation storage, including irrigation, during the period from March to October. However, the Bureau has not entered into any permanent contracts since March of 1999, waiting for a Biological Opinion.

Fertility. Chemicals have wrought the biggest change in agriculture. In the old days, before World War II, farmers maintained soil fertility by rotating crops. A four-year rotation was clover or alfalfa and manure the first two years, wheat the third year, with corn or a row crop the fourth year. This rotation guaranteed a certain level of fertility and weed control and, with a cover crop, controlled soil erosion. Since the advent of chemicals, crop rotation has given way to chemical fertilizers, herbicides, and pesticides. New hybrids and chemical fertilizers have vastly increased production. Chemical herbicides have eliminated the need for hand weeding. However, chemical runoff to streams may reduce water quality and can be harmful to aquatic life.

Correcting Mistakes. Trying to increase production has brought problems; riverbanks have been eroded by cultivation and cattle grazing; soil erodes during winter storms for lack of cover crops. Draining hastens storm runoff creating bigger floods downstream, and irrigation competes with other uses for water. The run-off of nitrogen-rich fertilizers creates oxygen-robbing conditions in streams. Herbicides and pesticides do not always kill only their targets.

Some Marion County farmers are changing their practices to correct these problems and together with federal, state and county governments are drawing up voluntary management plans to reduce erosion and pollution in creeks and rivers.

Harvest Headache. Labor has always been a problem for the farmer. When wheat was the major crop, the harvest had to be completed within 20 days. Family and neighbors, and sometimes, local Indians, or even Chinese immigrants, supplied the manpower. Before long, the horse provided help and later on came mechanization, but there has always been the need for willing hands.

Local farmers who remember the last fifty and sixty years recall how neighbors would help each other with the harvests. Then, as farms grew bigger and families grew smaller, the number of neighbors diminished, and farmers began to recruit platoons of mothers and children from the cities. These volunteers would be picked up by a bus in the morning, and delivered back in the evening. When this source of labor ended, farmers recruited homeless men either from Salem or Portland, bused them back and forth, providing lunch and liquid refreshment. Another limited source of farm labor were Russian and Vietnamese immigrants.

There was another labor source - migrant families who returned year after year to the same farms, bringing relatives and even friends. Some migrants followed a crop, moving from California, to Oregon, to Washington, and Montana before returning home to Oklahoma, Texas, and Arkansas. Others came to the Valley for the May to October harvest season and then they returned home.

An increasingly important source of labor is contractors. Working with several farmers whose harvest times differ, the contractor can arrange that laborers from Mexico and Central America are available when they are needed and where they are needed.

Encroachment Pressures. Urban encroachment on farmland is a worry for Marion County farmers as people flee from Portland and Salem to find a better life and cheaper housing in small towns. Two towns advertise that there are several new subdivisions in the rolling hills and farmland of their charming communities. Before long these subdivision dwellers will complain about the dust, noise, and odors emanating from the farm next door, and the farmer will notice the faster runoff from the new subdivision.

Another urban encroachment is the commercial development at interchanges along the I-5 corridor, at Wilsonville, Donald, Brooks, and especially at Woodburn where land which was farmed just ten years ago is now covered with gas stations, fast food outlets, motels, car dealerships, two regional distribution centers, and a huge factory outlet shopping mall.

The encroachment on farmland from urbanization can be tracked in population increases over the past 46 years as shown on Table 3.

Encroachment by a Big Neighbor. The city of Keizer, non-existent until 1982, was involved in a dispute with neighboring Lake Labish Irrigation District over 1996 flood damages to a city park next to Labish Ditch. The city said the problem was the way the Parkersville Dike was operated. The District claimed it was operating legally to protect its members' onion fields. The city ultimately dismissed its case against the District.

This case brings back memories of dynamiting and armed opposition in 1905 when Lake Labish property owners wanted to farm their swampland and property owners in the Parkersville area wanted to protect their mill. The matter went to court. Eventually the mill owners were bought out but it was not until 1914 that the lake bottom was under cultivation.

Big City Water Needs. The city of Salem, with a water right dating back to 1856, gets its municipal water supply from the North Santiam River. The intake for Salem's water supply is located at Geren Island near Stayton. Prolonged high turbidity water in the North Santiam River below Detroit Reservoir following the floods of 1996 and 1997 destroyed one of Salem's slow sand filters and forced Salem to improve its filtration system. Salem needs clean water for its 155,000 residents and its food processors and opposes activities in the North Santiam canyon which might adversely affects its drinking water source. Upriver towns in the canyon want jobs to replace those lost when timber harvest was reduced. Occasionally, Salem's interests run counter to those of canyon residents and property owners.

In the future, farmers above Stayton may find their activities further regulated by the Three Basin Rule, Safe Drinking Water Act, and other water quality laws that prohibit direct discharges of wastewater and potential runoff of specific pesticides and fertilizers into the North Santiam above major drinking water intakes. This would also be true of agriculture activities above the municipal water intakes of the cities of Canby and Molalla on the Molalla River. The Molalla River is not covered by the Three Basin Rule.

Small Town Water Needs. Several cities have wells in Marion County exclusive farm use areas: Monmouth, Independence, Mt. Angel, and Jefferson. Newberg has five or six wells. After its application for another well permit was turned down several years ago by Marion County, Newberg, together with the League of Oregon Cities, convinced the Oregon Legislature to ease rules for siting utilities in exclusive farm use zones.

Another concern for farmers and water quality: If cities continue to drill wells for drinking water in county exclusive farm use zones, the County or state Health Department may be forced to establish rules or enforce existing rules for well head protection which may limit the use of some pesticides or fertilizers within the wellhead protection zone.

Conversion of Farm Land to Other Uses. Farmers are concerned about the conversion of farmland for residential, commercial, and industrial use, for roads and for cell phone towers. Increasingly they're troubled about the use of farmland for the disposal of treated wastewater by cities. For example, in Marion County, Woodburn is using poplars on farmland to help clean up its wastewater; Silverton is using the Oregon Gardens, formerly a farm, as a wastewater disposal site; and Salem has embarked on a wastewater study, which might eventually result in creating a wetland on farmland. Though these activities convert farmland, the reduction in waste to the rivers can benefit farmers. Four state agencies are discussing rules to define farm use and possibly restrict utilities to less valuable farmland.

Present Day Economics and a New Generation. Marion County's 1998 commodity sales, representing 87 different crops, were the biggest in history, but the makeup of sales is changing. Bad weather has taken its toll on fruit crops. Growers are taking out peach and cherry orchards. Walnut orchards are dying out and hazelnuts are suffering from blight. Berry fields are disappearing because labor costs are so high. There are no vines in some hop fields. The reorganization of processing firms has dried up the market for bush beans and sweet corn, for broccoli and cauliflower, for berries. Dairy herds are half of what they were 25 years ago and there is little demand for mint.

Anecdote. *That place up the road had the biggest dairy around here, 500 acres. Now it's all grass. A ninety-year old lady still lives up there, in a house hidden by all the shrubbery that's grown up, but the barns are all tumbling down.*

Farmers complain that they have lost parity; the prices of things they must buy have risen while the prices they receive for their crops have actually decreased. Wheat costs $4.00 a bushel to raise but sells for less than $3.00. It costs more to pick a crop than it can be sold for. Farmers in 1998 earned only 2.83 percent on their investment in land and equipment. They can earn more than that in a bank or on the stock market without the worry of weather and the hassle of government reports.

But there are winners in Marion County agriculture nowadays: ornamental nursery and greenhouse crops and grass seed. Together with Christmas trees, these are the moneymakers. The market for grass seed is created by the need to seed and reseed golf courses and home lawns. The market for ornamentals is created by the need to landscape the explosive growth in residential, commercial, and industrial developments. A contributing factor is the continued bad weather in other parts of the country.

Today's average farmer is 54. At that age, he isn't planning to expand, or buy more land or new equipment - he is making plans for retirement. If he has children, he will leave his land to them. If there are no children, he will sell. But who will buy? The original settlers in Oregon got 640 acres for nothing (per married couple). In 1878, land near Woodburn sold for $25-$50 an acre. Today land with a water source and drainage can sell for $7500 or more an acre. The likely prospects to buy this land are not young people but large corporations or land developers.

With the high cost of land and equipment, people can't get into farming now without help from their families, and even then they may have to work at jobs off the farm until their farms produce enough to pay principal, interest, and expenses. The most vexing problem is repaying loans to the bank every year. A farmer must choose very carefully which crop he is going to raise. There's little room for error anymore. The margin is too slim. A farmer may be able to survive one bad year, but not several in a row.

Despite unpredictable weather, diminished financial returns, labor problems, and governmental regulations, young people in Marion County are still choosing to follow in their parents' and grandparents' and even great-grandparents' footsteps and be farmers. They gamble every spring that they will choose the right crop. Some are opting to specialize, to find a niche for themselves, perhaps raising specialty items for foreign markets, or raising food and even flowers strictly for a direct-to-customer market. Whatever the adversity, they enjoy having their lives in tune with the seasons, experimenting with crops, and gambling that this year will be better than last.

Anecdote. *This house was built 100 years ago. We added on. This is a family farm. My sons and daughter live here. So do my daughter-in-law and my grandchildren. I'm 56 years old. My boy is 30. He's taking over. We're acting like we have 20 years more....*

2.3.4 Location, Water Resources, Land Use, Land Ownership, Agriculture

The Molalla River, Pudding River, Santiam River, North Santiam River, Mill Creek, and French Prairie Area subbasins are in the northwest quadrant of the state of Oregon, 70 miles west of the Pacific Ocean. All of these watersheds are tributaries of the Willamette River. The Willamette River runs from south to north between the Coast Range and the Cascade Range of Oregon. All of these subbasins drain from the Cascade Range west to the Willamette River. The watersheds have developed geographically and geologically from tectonic plate movement, basalt flows from east of the Cascades, and silt deposited by the Missoula Floods at the end of the last ice age.

Oregon sits in an area known informally as the Pacific Rim of Fire, which is the name given to the region of volcanic activity around the Pacific Ocean. In the case of Western Oregon, the Juan De Fuca Plate is moving under (subducting) the North American Plate. Among many things, this process has scraped off the sea floor to produce foothills. Fossils from sea creatures are found in the basin above Scotts Mills at 300-foot elevation. The process of subduction produced the volcanic activity that created the Western Cascade Range and High Cascades. The volcanic activity of the Western Cascade Range has produced the headwaters of the Molalla at approximately 5,000 feet and the headwaters of tributary streams of the Pudding River at 4,000 feet, flowing to an elevation of 60 feet. The High Cascades are east of the Western Cascade Range and younger in geologic time. The High Cascades are the headwaters of the North Santiam River with Mt. Jefferson being the highest point in the watershed at 10,495 feet.

The crops grown from the land are varied but consistent throughout the planning area. The soil types vary throughout the area as the geology changes. The region has unique characteristics that over time shaped the geography and meteorology. These characteristics are the reason why the watersheds of these streams encompass one of the highest producing agricultural areas in the United States of America.

Much of the agricultural area in the Molalla River, Pudding River, and French Prairie Area subbasins is a fault-block basin that filled with sand and gravel washed in several thousand years ago. The subbasins were covered to an elevation of about 400 feet by water-laden sediment during the last Ice Age from the Missoula Flood. The sediment created the present soils of today. Granitic rocks, known as glacial erratic rocks, are found throughout the valley that were brought in with chunks of ice during the Missoula Flood. During the construction of a pond near Mount Angel, an erratic rock was found in the glacial-lacustrine sediment seven feet below the ground surface.

The North Santiam River, Santiam River, and Mill Creek subbasins have unique geologic characteristics that relate to agriculture production and water quality. As previously mentioned, the Missoula Floods that occurred over the thousands of years as each Ice Age warmed provides the Northern Willamette Valley with many of the soils farmed today. During this same time, Alpine Glaciers occurred in the Cascade Mountains. A 1939 report by Department of Geology and Mineral Industries identifies three glaciers:

Mill City, Detroit, and Tunnel Creek. All three glaciers were in relatively the same areas over different periods of time. The significance is the gravelly soils that make up most of the farming area from Stayton to Jefferson. The gravel and alluvium reflect the glacier erosion and outwash deposition. Farmers say that corn will ripen two weeks earlier on gravel soils due to the heat that is built up during the day and released at night, providing for warmer night time temperatures. Many of these soils are well drained with low water holding capacity. This requires more frequent irrigation and longer irrigation. These main geologic features have provided agriculture with soil to produce crops. In addition, ground water is supplied from wells in the sand and gravel sediment or fractured volcanic rock created millions of years ago, and from mountains that collect snow and rain in the winter, providing summer runoff for irrigation and groundwater recharge of the aquifers.

The mountains of Molalla and Pudding subbasins are considered part of the Cascade Range. This area ridge is 25 miles west of the Cascade Range crest. The watersheds are bordered on the north and east by the Clackamas River subbasin and on the south by the North Santiam River subbasin. These watersheds are bordered on the east by the Cascade Range crest. During the year, the mountains of the Molalla and Pudding subbasins historically go through periods of snow accumulation followed by warm rain and rapid snowmelt. The runoff causes flooding over agricultural lands, causing erosion of croplands, pastures, and streambanks. In February of 1996, the runoff caused flooding that affected homes, roads, and power lines.

The meteorology of the region is unique to only a few areas of the world, with a Mediterranean, modified marine climate. The area has wet winters and dry summers. This is the reason agriculture areas here can receive up to 80 inches of rainfall but still require irrigation to sustain some crops in the summer. The heavy winter rains saturate soils, causing erosion that contributes to water quality problems. The lack of precipitation in the summer, along with no high elevation mountains for snow accumulation, creates extremely low stream flows this time of year. This makes the area vulnerable to water quality problems in late summer, such as low dissolved oxygen.

The Molalla, Pudding, and French Prairie area make up subbasins of the Willamette Basin, which is a basin within the Columbia River Region. The Molalla, Pudding, and French Prairie area subbasins drain approximately 900 square miles. The Pudding River is 62 miles long and originates in the low elevation Waldo Hills located east of Salem. The Molalla River is 49 miles long and originates on the west slope of the Cascade Range. The Pudding River flows in to the Molalla River 0.75 miles upstream from the point the Molalla River flows into the Willamette River.

LAND USE

The Molalla-Pudding-French Prairie-North Santiam agricultural water quality management area is the eastern half of the North Willamette River Valley. Settlers came to this area for the rich farmland and mild climate. Today the major land use is still agriculture. However, many farms of yesterday have given way to land division and homes in the country.

The land has been divided into farm parcels of 1 to 200 acres. In Marion County, there are 25,425 parcels in the exclusive farm use zone. There are 3,518 parcels in special agriculture zone, and 8,429 parcels in acreage residential zone. Over 30 percent of the parcels outside of the cities are not exclusive farm use, although many of these parcels do produce farm products. The USDA Natural Resource Conservation Service has estimated the average acreage field size to be 17 acres.

Land use changes in the management area are based on elevation and the characteristics for vegetation growth. Milk Creek, tributary to the Molalla River, is in the north end of the plan area. The stream begins at 1,700 feet elevation flowing to 500 feet of elevation by the time it reaches the City of Colton.

This watershed is mostly forest and pastures, Christmas tree parcels, and timber parcels managed by commercial timber companies. With many farmed parcels ranging from 2 to 100 acres, there are few full time farmers here, many of whom work as far away as Portland.

Most of this area's agriculture is contained along the narrow Molalla subbasin. This area has a full range of agriculture use. The parcels are mixed with clusters of 1 to 5 acres and large tracks of over 100 acres. The area does have full time farmers. At 500 feet in elevation near Dikey Prairie, agriculture gives way to forestlands and timber operations.

The largest subbasin in this plan area is the Pudding River. The broad plain of the Pudding River subbasin is high production agriculture, with a mix of full time and hobby farmers. Small landowners and hobby farmers commute to various cities for work including Salem and Portland. The area extends from Donald and Aurora on the northwest to Macleay on the south and Silver Falls State Park on the east.

The Silverton Hills area of the Pudding River subbasin has extensive Christmas tree and grass seed farms. They include both full time and part time farmers. Mixed in are row crops, nursery production, and occasional vineyards and pastures. Many of the canyons in the area are too steep to farm and used for livestock production and timber.

The valley floor of the Pudding River subbasin produces over 200 different agricultural crops that utilize small and large parcels. They constitute scattered areas of 1 to 10 acre tracts where landowners have landscaping but not agriculture production. Whether or not a farmer can make a living on a small land holding depends on their crop - some nurseries and livestock operations operate on less than 10 acres.

The North Santiam River, Santiam River, and Mill Creek are similar to the Pudding River subbasin. The upper watershed, still below the timber production area, is mainly grass seed and Christmas trees. The lower watershed consists of row crops and a variety of other agricultural production. Thousands of acres are irrigated from the North Santiam River by diversion ditches of the Santiam Water Control District. Downstream, the Sidney Irrigation Cooperative diversion ditch provides irrigation water from the North Santiam near the village of Marion to the Willamette River.

Of all the streams in this management area only Mill Creek, which flows through Salem and Silver Creek, which flows through Silverton, flow through any city. The Willamette River also flows through Salem, but this Plan focuses on the tributaries to the Willamette River, not the Willamette itself.

The French Prairie area consists of predominately full time farming operations. Named for the French settlers, this was the first area within the management area to be put into agricultural production. The area is prime agricultural soil, producing a variety of agriculture products. The area extends from Donald on the east to the Willamette River on the west, the Willamette River on the north and Salem on the south. The area includes the Claggett Creek watershed. The number and expanse of the large agricultural tracts dominate the area. The number of small parcels does not exceed the large parcels except in an area north of Keizer.

BIOLOGICAL RESOURCES

The streams, wetlands, and riparian zones within the management area contain a wide range of biological values. The riparian zones vary significantly. Streams range from very slow moving to very fast moving. Riparian zones extend from a few yards to thousands of feet wide. Most riparian areas and wetlands have been manipulated to some extent. The area includes a broad spectrum of species and for that reason it is difficult to develop an all-encompassing description of the area. There is a core group of species that are

found with equal abundance throughout the area, complemented by those species whose presence is variable depending upon the specific location within the plan area.

Riparian zones within the management area contain a variety of plant species. Numerous rushes, pondweeds, and sedges inhabit the waterways and marshy areas. Ferns such as northern maidenhair, sword fern, and bracken fern are common in shaded areas. Horsetails are abundant along stream banks in the area. Timothy grass, meadow foxtail, spike bentgrass, and tufted hairgrass are just a few species of grass found in the riparian zone. Reed canary grass is a non-native, invasive species that is found throughout, especially in wet lower elevations. Providing a spectrum of color in the spring is a number of native wildflowers, which include iris, camas, asters, buttercups, and larkspur. Rare species include golden Indian paintbrush, which is federally listed as threatened. Some trees and shrubs of the riparian zones include red alder, several species of willow, and Oregon ash. Found in higher altitude locations is the Pacific rhododendron. Other shrubs that are commonly found are salal, ocean spray creambush, Indian plum, and Oregon grape. Introduced species that have thrived in the area are Scotch broom and the Himalayan blackberry.

Tree species include Douglas fir, grand fir, Western red cedar, Ponderosa pine, and Western hemlock, which are encountered throughout the area, especially in the upper reaches of the Molalla and North Santiam rivers and their tributaries. Pacific yew is also found in parts of the watershed area. Deciduous species include big-leaf maple, vine maple, black hawthorne, black cottonwood, and dogwood. Throughout the planning area is Oregon white oak, which is found mostly in groves of varying sizes. These groves contain a unique grouping of species that depend upon the oaks for survival. A common shrub associated with the drier oak zones in the area is Pacific poison oak. California hazel can be found on moist Oregon white oak sites. Contained in the riparian zones of this area are numerous species of amphibians and reptiles. Pacific tree frogs, rough-skinned newts, and introduced bullfrogs are common amphibians of the area. Some reptiles found in the area include the common garter snake, the western fence lizard, and the painted turtle. The Oregon spotted frog is a species found in the area, and is currently a candidate on the federal endangered species list. Species whose existence in the area is of concern are the tailed frog, western pond turtle, the red-legged frog, the yellow-legged frog, and the Cascades frog.

A broad-range of bird species inhabit the management area. Those species encountered in and around water include increasing numbers of Canadian geese, of which the Aleutian subspecies is federally listed as endangered. A variety of ducks are also found, such as the common mallard, wood duck, pintail, and the green-winged teal. Blue herons are a common site in the watershed and the smaller green-backed heron is also present. Upland game birds that are found in the planning area include the ring-necked pheasant and California quail. Turkey vultures, American kestrels, and barn owls are a few of the birds of prey commonly found in the area. Red-tailed hawks can be seen perched on telephone poles or soaring above open fields. The bald eagle has been sighted in areas contained within the plan. The northern spotted owl is a species of occurrence that is listed as threatened by the federal government. A colorful mix of other birds can also be found throughout the watershed. Lewis' woodpecker and the pileated woodpecker can be found in wooded areas particularly among the Oregon white oak groves. Sparrows are common, particularly the English sparrow and the white-crowned sparrow. Starlings, originally from Europe, are found in abundance and considered a nuisance by many fruit growers and livestock owners. Redwing blackbirds frequent the area as well. Violet-green swallows are seasonal visitors arriving in the early spring and staying through the summer. Other species of interest are the Rufous hummingbird, the western bluebird, the Pacific nighthawk, and the western belted kingfisher. Species of songbird that are of concern are the olive-sided flycatcher and the little willow flycatcher.

The species and number of fish found in the streams and rivers of the management area depend greatly on the characteristics of the stream in question. Those species found in the slow-moving Little Pudding

River differs from those found in the faster, colder Abiqua Creek and, of those species found in both types of streams, the abundance or availability differs greatly. The Oregon chub is a fish species that, at one time, was common to waters of the area but is now listed as endangered on the federal list. Several populations of steelhead (*Oncorhynchus mykiss*) and Chinook salmon (*Oncorhynchus tshawytscha*) inhabit rivers within the area and are listed as threatened. The populations include upper Willamette steelhead, lower Columbia steelhead, lower Columbia Chinook salmon, and upper Willamette Chinook salmon. Coastal cutthroat trout (*Oncorhyncus clarki*) is a candidate for the endangered species list and lower Columbia Coho salmon (*Oncorhynchus kisutch*) has been listed as a threatened species. A species of concern found in the area is the Pacific lamprey. In faster, colder waters the rainbow trout is found. Other common natives are speckled dace, redside shiner, and assorted sculpins. Non-native residents include largemouth bass, carp, bullhead catfish, bluegill, and crappie. Bull trout historically inhabited the North Santiam River but are now possibly extinct in that particular river (ODF, 2000).

A large assortment of mammals is present in the management area. The smaller mammals consist of a number of bats, which include the big brown bat and the silver-haired bat. Several species of squirrel are found, such as the California ground squirrel and the western grey squirrel as well as chipmunks. Various voles, shrews, and mice inhabit the area. These include, among others, the deer mouse, the bushy-tailed woodrat, and the Pacific shrew. Burrowing in the soil of the area are gophers and moles, which include the common mole and the western pocket gopher. Other native small mammals closely connected to the riparian zone include the mountain beaver, beaver, river otters, raccoon, striped skunks, mink, and nutria. Additional mammals of interest are red fox, gray fox, coyote, porcupine, and bobcat. Small mammals present in the area and listed as species of concern are the Pacific big-eared bat, the California wolverine, the Pacific fisher, the long-eared myotis (bat), the fringed myotis, the long-legged myotis, and the Yuma myotis. Several large mammals occur within the bounds of the area. The black bear is found in the forested, less-populated parts of the area. Encountering humans with increasing frequency is the cougar. Blacktail deer are very common throughout the area and Roosevelt elk are found in selective areas at higher elevations.

DEMOGRAPHICS

The total population of Marion County was 305,265 as of 2006. This is a 49 percent increase from a 1980 total population of 204,692. The Hispanic community plays a very important role in area agriculture, in part by satisfying the large demand for farm labor. People of Hispanic origin live throughout the county but have concentrated in towns like Woodburn and Gervais that have high agricultural employment opportunities.

Table 3 provides the cities and towns of the management area along with their population history. Population changes over time can be found at http://bluebook.state.or.us/local/cities/sy/index.htm. Salem, the largest city in the area, is also the state capital. The population of all these towns has increased significantly in the past 40 years, illustrating the general trend of urbanization taking place across the entire management area.

These towns contribute greatly to agriculture in the management area. They serve as collection points for crops and distribution centers for fertilizers, chemicals, and other agriculture supplies. There are a number of small, unincorporated communities within the management area. Many of these communities are strongly dependent upon local agriculture. Pratum, for example, is home to a farmers' cooperative that serves an area east of Salem. A small sawmill operates in the community of Yoder and serves local customers.

The town of Woodburn, and the area surrounding it, contains a significant population of Orthodox Russians. A large percentage of these people are farmers, raising many different crops, particularly berries.

Table 3: Population Changes for Marion and Clackamas counties, 1960-2011.

City	2011 Pop.	1960 Pop.	% Change
Salem	155,710	49,142	217
Keizer	36,715	0	N/A
Woodburn	24,090	3,120	672
Canby	15,830	2,168	630
Silverton	9,265	3,081	201
Stayton	7,660	2,108	263
Molalla	8,110	1,501	440
Mt. Angel	3,285	1,428	130
Aumsville	3,680	3,000	23
Sublimity	2,680	490	447
Jefferson	3,135	716	338
Mill City	1,865	1,289	45
Gervais	2,520	438	476
Turner	1,860	770	142
Lyons (Linn Co.)	1,160	463	150
Donald	980	201	388
Aurora	920	274	236
Gates	475	189	151
Detroit	205	206	-0.5
Idanha	135	295	-54
St. Paul	420	254	65
Scotts Mills	360	155	132

http://bluebook.state.or.us/local/cities/sy/index.htm

Water Quantity

Marion County covers an area approximately 1,194 square miles and is bordered on the south by the North Santiam and Santiam rivers, on the west and north by the Willamette River and much of the east by the Pudding River and Butte Creek. Detroit and Big Cliff reservoirs, located on the North Santiam River, about 55 miles east of Salem, are part of the US Army Corps of Engineers Willamette Basin Project, and are operated for flood control, irrigation, navigation, and hydropower production purposes. A portion of the Little North Santiam River is included within the State Scenic Waterway System.

The county has been divided into four drainage areas. In all drainage areas, unregulated stream flows are inadequate to meet the total current needs during the low-flow season. In some cases, unregulated stream flows are not adequate to meet requirements of existing consumptive water rights. In all cases, unregulated stream flows are inadequate to meet instream requirements.

There are three Groundwater Limited Areas established by the Oregon Water Resources Department in Marion County that extend over 158 square miles: Mt. Angel, Stayton-Sublimity, and South Salem Hills. Also within in the management area there is the Gladtidings Groundwater Limited Area in Clackamas County, along with the Kingston Ground Water Limited Area in Linn County (Figure 2). These areas are

identified in Oregon Administrative Rules, Department of Water Resources, Chapter 690, Division 502, Willamette Basin Program. The designation includes limitation of future groundwater use in these areas to uses related to meeting individual family needs.

Clackamas County has two major watersheds within this management area, Rock Creek and the Molalla River. Rock Creek is a tributary of the Pudding River. Rock Creek has limited flow to no flow depending on stream reach during summer months. The headwaters are in the foothills south of Molalla. The watershed is entirely agricultural and rural residential. The headwaters of Molalla River are located 5,000 feet in the National Forest. The largest part of this watershed consists of public and private forest. There are no major reservoirs in Molalla River watershed. The low flows in the summer have reached as little as 20 cubic feet per second at the Canby gage and the August flow is normally below 100 cubic feet per second. These low flows contribute to the water quality limited factors.

Present Water Use

Supplies to urban areas from surface water, while supplying over half the present population of Marion County but only three municipalities, generally are secure because of the seniority of rights that most cities hold. For example, Salem diverts from the North Santiam under priorities dating from 1856, 1866, and 1923. The city of Silverton has one of the most senior rights of Abiqua Creek and a reservoir on Silver Creek. Eleven cities in Marion County rely on groundwater for their supplies. Mt. Angel and Sublimity, both located within Groundwater Limited Areas, have reached the production capability of their wells. Most industrial use that is not supplied from municipal systems acquires their water supplies from groundwater. Nearly all the rural residential population in the county, amounting to nearly 73,000 persons, and all the rural schools rely on groundwater to meet their needs.

Over 49,500 acres are irrigated from surface water sources in Marion County. Lands in the Santiam Water Control District and the Sidney Irrigation Cooperative both have reliable supplies from the North Santiam River, as the rights they operate under have priorities that predate establishment of minimum flows for fish and other aquatic life, and in some cases predate the 1909 water code. The combined acreage of these two districts totals about 23,500 acres, nearly one half the county total. Water is diverted from the Willamette River for irrigation of about 6,900 acres. About half of these lands have water rights that predate the instream rights and minimum flows. Nearly 15,000 acres have irrigation rights from streams in the Pudding Drainage Area. Many rights predate instream water rights set for aquatic life, however stream flow amounts during the irrigation season are such that less than 20 percent of these lands have full-season supplies and significant acreage obtain supplemental supplies from groundwater. About 78,250 acres rely on groundwater sources for full-season irrigation supplies in Marion County. Along the North Santiam, Santiam, and Willamette rivers, a relatively small acreage relies on water purchased from US Army Corps of Engineers storage, although Sidney Irrigation Cooperative is adding about 2,500 acres to its service area supplied by water purchased from Detroit Reservoir.

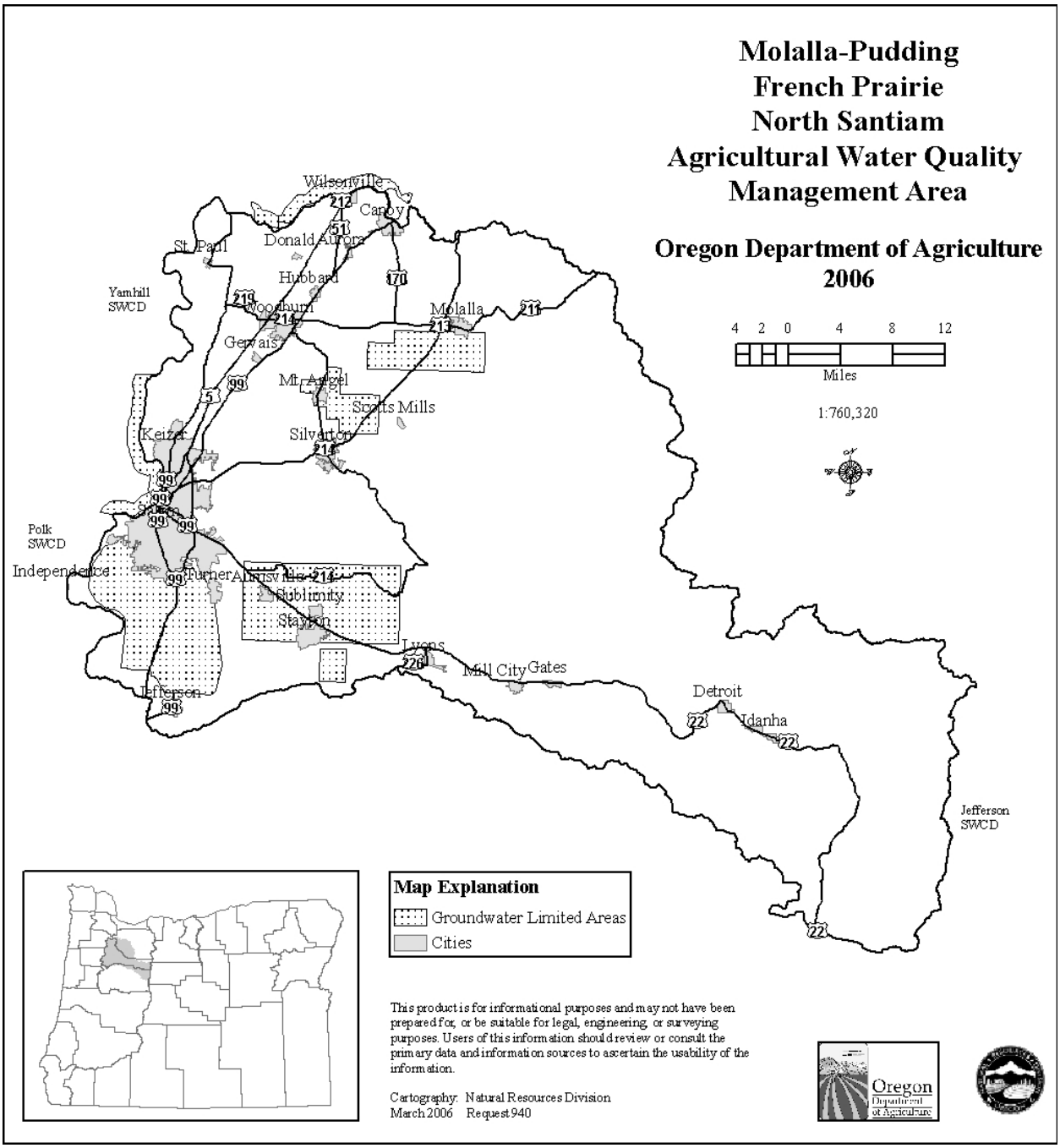
Average recreation use at Detroit Reservoir is the largest over the entire Willamette Basin Project. Other than the Detroit Reservoir with a full-pool surface of 3,500 acres, and Silverton Reservoir with a surface area at full pool of 65 acres, there are no slack-water recreation sites in Marion County. Kayaking, canoeing, and drift boating are popular seasonal recreation uses of the North Santiam, Little North Santiam, Santiam, and Willamette rivers.

Instream rights for aquatic life exist for many streams in Marion County. In the North Santiam, Santiam, and Willamette, minimum flows are established for a portion of “natural flows” and a portion of reservoir releases. The level of releases present in these streams tends to “mask” shortages occurring from the lack of “natural flows.” Flow amounts present in the Willamette at Salem meet “target” amounts during all

but the driest years. Tributaries of the Pudding River and the Pudding itself have inadequate flows to satisfy instream rights for much of the late summer and early fall every year.

The Molalla River provides water for the city of Molalla and the city of Canby. Water is also used for irrigation of agricultural lands adjacent to the River. In the past, industrial use was related to timber and lumber manufacturing. Today, a major use of the Molalla River is recreation. This includes bank and drift boat fishing, canoeing, kayaking, rafting, and swimming. There are three public parks on the River, and during warm summer days, residents go to the parks to swim. There are many private swimming and recreation areas including a golf course and religious retreat.

Figure 2: Oregon Water Resources Department Map of Groundwater Limited Areas in Molalla-Pudding/ French Prairie/North Santiam AgWQM Area



2.4 Agricultural Water Quality in the Management Area

2.4.1 Local Issues of Concern

The Willamette, North Santiam, Molalla, and Pudding rivers and several tributaries have been classified as "water quality limited" by DEQ. Temperature and bacteria counts commonly exceed state criteria in

both the mainstem of the Middle Willamette River as well as in some tributaries. Dissolved oxygen may fall below state criteria in the Santiam River during fall, winter, and spring. Data collection also revealed legacy pesticides, no longer in use in the United States, in the Pudding River, Little Pudding River and Zollner Creek water columns. Nitrate concentrations in Zollner Creek frequently exceed the human health standard, which, itself, is orders of magnitude greater than typical aquatic concentrations. Fish tissue collected from the mainstem middle Willamette River contained toxics, including legacy pesticides and mercury. Nearly all streams where water quality is tested exhibit unacceptable high water temperatures during summer and early fall. A Groundwater Quality Limited Area has been established by the DEQ in the Mission Bottom area. Elsewhere and over most of the county, excessive hardness and iron levels are the most common groundwater quality problems.

The U.S. Geological Survey and DEQ measured Pudding River water quality during 1994 and 1995. These studies highlighted some important concerns about water quality within the watershed. Nitrate content in the stream greatly increased after the first storm event of the year. Levels of potassium and organic nitrogen peaked after the first storm as well. The Pudding River is a naturally turbid stream due to its flat gradient and to the soil types found in the area. The level of total phosphorous (TP) closely corresponded to the amount of total suspended solids. Suspended solids are generally low throughout the summer months while levels of TP vary. Water quality criteria values for the Willamette River Basin, set by DEQ in 1994, such as fecal coliforms (max#/100ml=400), were routinely violated during storm events in the Pudding River and its tributaries.

Zollner Creek, which is a tributary to the Pudding River, is a high-intensity agricultural watershed. The monitoring done by U.S. Geological Survey and DEQ showed water quality in Zollner Creek to be very poor. Erosion is high, nutrient transport is increased, fecal contamination is elevated, and ion chemistry is altered. The Marion SWCD Board of Director's identified Zollner Creek in 2009 as a priority area to focus conservation efforts to improve water quality.

The Pudding River Pesticide Stewardship Partnership (PSP)

The Marion SWCD partners with DEQ, ODA, OSU Extension Service, agricultural businesses and other partners to address potential pesticide issues in local streams. The PSP study area includes agricultural streams of the Pudding basin near Mt. Angel such as Zollner Creek, which has been the focus of many research articles since the early 1990's when a number of different pesticides were documented exceeding levels set for aquatic life. Due to changing agricultural practices, some of the chemicals found in the older studies are no longer used, but may be found in stream sediments, while newly introduced chemicals may begin appearing in water samples. Even low concentrations of pesticides in local streams can pose serious threats to aquatic life and to migrating salmon. The partnership utilizes a voluntary approach and enlists the aid and expertise of local growers and businesses interested in improving water quality in local streams without having new regulations imposed. Objectives include determining risks posed by current use organophosphate insecticides and triazine herbicides in the study area of the Pudding River basin by monitoring water samples, associating land uses with detected pesticides and application timing, measuring flow in local streams and identifying and promoting best management practices to reduce high risk pesticide detections.

2.4.2 303(d) List of Impaired Water Bodies

TMDLs are limits on pollution intended to bring rivers, lakes and streams into compliance with water quality standards designed to protect human health, aquatic life, and other beneficial uses of water. The development of TMDLs is required by the federal Clean Water Act of 1972 and the Oregon DEQ is the state agency authorized by federal and state law and regulation to develop these pollution limits.

Section 303(d) of the federal Clean Water Act requires states to periodically list waterbodies that do not meet water quality standards ("303(d) list"). The 2004-2006 303(d) list identified 28 stream segments in the Molalla-Pudding Subbasin as water quality limited and needing TMDLs (Appendix C). (DEQ, 2008. Molalla-Pudding Subbasin TMDL & WQMP, p. 1). Several stream reaches of the mainstem Willamette River and within the Middle Willamette and North Santiam Subbasins were listed as impaired on the 1998 303(d) list as well. The DEQ 303(d) list can be found at http://www.oregon.gov/deq/WQ/Pages/Assessment/2012report.aspx.

2.4.3 Basin TMDLs and Agricultural Load Allocations

In 2006, DEQ completed bacteria, temperature and mercury TMDLs for the mainstem Willamette Basin and tributaries, a bacterial and temperature TMDL for the Middle Willamette River tributaries, and a temperature TMDL for the North Santiam Subbasin. Since the adoption of the Area Plan and Rules, DEQ has also developed a TMDL for temperature, bacteria, pesticides (DDT, dieldrin, chlordane), nitrate, and metals for the Molalla-Pudding Subbasin. TMDLs apply to all or portions of the Molalla-Pudding subbasin.

According to the Molalla-Pudding TMDL report, fourteen stream reaches are listed as impaired by high stream temperature, which affects rearing and spawning habitat for salmonids. Two of those reaches are listed individually for spawning and non-spawning seasons. The temperature TMDL addresses all of these listings basinwide. There are seven stream reaches listed as impaired by bacteria contamination in the subbasin (including two reaches impaired both in summer and fall/winter/spring). Bacteria listings are based on standards for water-contact recreation. The TMDLs for bacteria address all bacteria listings on the 2002 and 2004-2006 303(d) lists and apply basinwide. There is one listing in Zollner Creek for nitrate. The nitrate TMDL addresses that listing and applies to Zollner Creek and all its tributaries year-round. There are three stream reaches impaired by pesticides no longer in use: the Pudding River (DDT and dieldrin) and Zollner Creek (DDT, chlordane and dieldrin) and Little Pudding River (DDT). The TMDL addresses six impairments on these stream reaches and applies to the Pudding River, Little Pudding River and Zollner Creek and their tributaries.

Table: Load Allocations

Subbasin	Parameter Reductions
Clackamas **Middle Willamette** **Molalla-** **Pudding**	**Mercury:** 27% Willamette Basinwide - All Subbasins **Temperature:** Attainment and preservation of effective shade levels on smaller tributaries associated with system potential vegetation will eliminate most anthropogenic nonpoint source heat loads. Surrogate measure is percent effective shade targets and a heat load equivalent of 0.05 ºC of the Human Use Allowance. Other important measures— preserving and restoring cool water refuges where salmonids rear and migrate to when the river warms up in the summer; restore instream flow quantity.
Middle Willamette	**Bacteria:** 88% summer 75% fall-winter-spring Middle Willamette Specific Tributaries 81% Mill Creek Turner Road 79% Pringle Creek at Pringle Park/Church Street 89% Clark Creek at Mouth Bush Park

Molalla-Pudding	**Bacteria:** Agricultural land use, unless otherwise specified: 87% (summer), 92% (winter) 70-92% Pudding R., Zollner Cr., Silver Cr., W. Fk. Little Pudding, Molalla R. (October 1 – May 31) 75 – 86% Pudding R., Zollner Cr., Silver Cr. (June 1 – September 30)
Pudding	**Iron:** 3-6 mg/l total suspended target to meet 19% to 96% based on stream flow Pudding River and Zollner Creek Watersheds. **Legacy Pesticides:** Surrogate Load Allocation Total Suspended Solids (96 hr average) Pudding River: 15 mg/L Zollner Creek: 15 mg/L Little Pudding River: 7 mg/L -90% Dieldrin Pudding River and Tributaries 95% Dieldrin Zollner Creek DDT congeners Little Pudding River: 95 – 99% Pudding River and tributaries: 61 – 97% Zollner Creek: 71 – 99% **Nitrate:** 48% Reduction Zollner Creek and tributaries

2.4.4 Beneficial Uses and Parameters of Concern

Water quality refers to the general health of the water in a particular stream and to its ability to sustain the beneficial uses of that stream. The beneficial uses of streams include water supply, aquatic life, recreation, and aesthetics, among others. These uses have varying levels of sensitivity and are affected by different factors. Aquatic life is the most vulnerable use that is listed, therefore it is the most heavily monitored and most improvements and recovery efforts are focused around this use.

2.4.5 Sources of Impairment

The sources of water pollution can be divided into two general categories: point sources and non-point sources. Point sources of pollution within this management area consist mainly of municipal wastewater discharge and Confined Animal Feeding Operations (CAFOs). Also of significance is a food processing plant. These point sources are required to obtain a permit from DEQ in order to discharge waste.

Point source water pollution can be easy to identify, and is often associated with a factory discharge or local sewage treatment overflow pipe. Non-point source pollution can be difficult to pinpoint to a single source. Non-point pollution can consist of the many vehicles on our roadways that leak oil and gas, whereas the surface drainpipe that drains this oil and gas into the local waterway may be considered a point source of water pollution. Lack of shade along agricultural, rural, and urban streams may contribute to non-point pollution. However, a single 500-acre cultivated field leaching excess nitrogen could be considered a point source of water pollution. Non-point source pollution is normally considered the result

of various activities throughout a watershed. Non-point sources of pollution can include:

- Eroding agricultural and forest lands;
- Eroding stream banks and roadsides;
- Erosion from developing urban areas;
- Lack of riparian shade producing vegetation;
- Reduced water quality;
- Contaminated runoff from livestock and other agricultural operations;
- Contaminated runoff from established urban areas; and
- Septic systems.

The pollutants from these sources are carried to the surface water or groundwater through the action of rainfall, irrigation runoff, and seepage. While there may not be severe impacts on water quality from a single non-point source or activity, the combined effects from all sources contribute, along with impacts from other land uses and activities, to the impairment of the beneficial uses of the water in the area.

Most of the management area is considered moderate to high intensity agriculture land. Agricultural factors that affect water quality include:

- Crop type,
- Fertilization practices,
- Hydrologic modifications,
- Riparian alternation.

Hydrologic modifications include farm ponds, ditches, and drain tile. Ponds can have a positive effect on water quality by collecting and retaining sediment and phosphorous and providing conditions favoring increased uptake of nitrogen and de-nitrification under anaerobic conditions.

Higher in the management area there is a greater percentage of forested streams and decreasing agricultural and urban use. The water entering the watershed at these upper levels is therefore of better quality and contributes very little to the degradation of downstream reaches.

2.5 Prevention and Control Measures

The emphasis of this Area Plan is on voluntary action by landowners and operators to control the factors affecting water quality in the Molalla River, Pudding River, North Santiam River, Mill Creek, and French Prairie Subbasins. Prevention and control measures provide guidance to help landowners and operators reduce water pollution from all agricultural and rural lands. These form the basis for the OARs developed for this management area. Landowners or operators who fail to address the applicable OARs either with or without an individual voluntary conservation plan may be subject to enforcement procedures based upon the administrative rules. Enforcement procedures are outlined in Section 1.3.1.

2.5.1 Nutrients and Manure Management

Nutrients are important for crop and pasture production. It is a goal of this measure to minimize discharge of agricultural nutrients into waters of the state. Appropriate timing and rates of nutrient application use can save operators money through efficient utilization of nutrients, minimizing leaching from the plant root zone and losses from surface runoff and tile drainage. Reducing leaching and surface runoff will also reduce ground water and surface water pollution from agricultural activities.

Examples of Management Practices

Nutrient management, waste utilization to agronomic levels, and nutrient/manure application equipment calibration and maintenance.

Landowners/operators can get information about nutrient management and crop nutrient needs from consultants, USDA NRCS local field office, local SWCD, and/or the OSU Extension Service.

The Oregon Administrative Rule

OAR 603-095-1940

(7) Nutrients. Effective upon rule adoption.

(a) Landowners or operators shall use and apply crop nutrients in a manner that prevents transport into the waters of the state.

TMDL parameters may be affected by this measure:

- Bacteria
- Nitrate

Waste: Livestock and Other

The goal of this measure is to ensure that potentially concentrated nutrients and pathogens associated with higher livestock density areas are not readily transported to waters of the state. It is encouraged that livestock waste and/or storage feeds be collected, safely spread on land, treated, or stored until it can be safely disposed. Runoff and leaching of pollutants into the waters of the state from livestock lots, pasture areas, corrals, paddocks, barnyards, arenas, and other livestock areas should be minimized so that water quality standards are not violated.

Producers should be aware that in addition to this Prevention and Control Measure, other laws regulate the management of animal waste. Many livestock operations are required to have a CAFO permit. Also, ORS 468B.025 prohibits activity that causes pollution of any waters of the state, or places or causes to be placed any wastes in a location where such wastes are likely to escape or be carried into waters of the state by any means.

Examples of Management Practices

Waste storage structure, waste utilization, nutrient management, irrigation management, water diversion, underground outlets, roof gutters, prescribed grazing, filter strips, riparian buffers, fencing, off stream watering, and stream crossing.

Landowners/operators can get information on livestock resource management from consultants, agriculture engineers, USDA NRCS local field office, local SWCD, OSU Extension Service, and/or the the ODA – Natural Resources Division.

The Oregon Administrative Rule

OAR 603-095-1940

(6) Waste: Livestock and Other. Effective upon rule adoption.

(a) No person subject to these rules shall violate any provision of ORS 468B.025 or ORS 468B.050.

(b) Landowners and operators shall prevent the runoff or leaching of contaminated water from feed and manure storage piles into waters of the state, including but not limited to groundwater.

TMDL parameters may be affected by this measure:

- Bacteria
- Nitrate

2.5.2 Riparian/Streamside Management Area (RMA)

The goal of this measure is to encourage landowners/operators to manage their riparian areas to establish and maintain riparian vegetation such as grasses, sedges, shrubs, and trees appropriate to the site. In the normal course of time, this vegetation is expected to provide shade and protect streamside stability during high stream flows at or below those that occur during or following a 25-year, 24-hour storm event (i.e. a four percent chance of occurrence).

A functional RMA also provides adequate vegetation to trap sediment, prevent flood debris from depositing on fields, and protect pasture and cropland from bank erosion. Protecting vegetation along smaller streams helps reduce solar radiation reaching the water and provides wildlife habitat.

In general, a functional RMA provides:

- Shade to reduce solar radiation with the objective of minimizing heating of the water.
- Filtering of sediment, organic material, nutrients, and pesticides in surface runoff.
- Streambank stability.
- Large wood and other naturally occurring vegetative contributions to the stream.

In areas where riparian vegetation has been degraded, landowners and operators are encouraged to use either passive or active management to restore vegetation and to thereby restore riparian function. Passive management could include adjustments in grazing systems, altering cropping regimes, or other adjustments to management. Active management includes planting site appropriate plant species or other restoration techniques.

When considering active management, it is recommended that native plant species be used to provide a variety of riparian functions. Non-native species in the riparian management area, however, may also provide important functions including shade, streambank stabilization, and wildlife cover.

Regardless of the approach taken, management and water quality goals should be clearly outlined. For further information about riparian areas, please refer to Appendix D.

Examples of Management Practices

Forest buffer, stream crossing, filter strip, riparian buffer, and exclusion zone, or limited use area.

Landowners/operators may use CREP to restore riparian areas. CREP provides materials and labor cost-share as well as rental payments in exchange for a commitment to protect the riparian area. See Appendix A for more information.

Landowners/operators can get information about riparian areas from consultants, USDA NRCS local field office, local SWCD, the OSU Extension Service, and/or the ODA - Natural Resources Program Areas.

TMDL parameters may be affected by this measure:

- Temperature,
- Bacteria,
- Mercury from soil erosion and runoff,
- Bacteria from soil erosion and runoff,
- Nitrate,
- Current use pesticides,
- Legacy pesticides (surrogate total suspended solids.

The Oregon Administrative Rule

OAR 603-095-1940

(8) Riparian Management Area. Effective upon rule adoption.

(a) A Riparian Management Area (RMA) that allows for the natural or managed development of riparian vegetation and riparian function over time shall be provided along all streams. This shall include the natural or managed establishment and maintenance of riparian vegetation, such as grasses, sedges, shrubs, and trees, appropriate to site capability, and that in the normal course of time will provide shade and protect streambank stability from flows at or below those expected to occur during or following a 25-year, 24 hour storm event.

(b) Sufficient RMA width will be site specific, and may vary by, for example, soil type, size of stream, and agricultural use.

2.5.3 Soil Erosion Prevention and Control

The goal of this Prevention and Control Measure (PCM) is to control soil erosion and minimize eroded soil access to waterways. Erosion occurs when soil particles detach and move due to the impacts of wind and water on soil without vegetative cover. Eroded soil particles can carry contaminants along with them. These particles, either with or without attached contaminants, can move to waterways and create water quality problems. Soil erosion reduces the long-term productivity of farmland.

Example of Management Practices

Annual and permanent cover crops, crop residue management, subsurface drainage, sedimentation basins, filter strips, cross slope farming, and riparian buffers.

Visual on-site indicators for erosion to surface water include sheet and rill erosion that combines to a concentrated flow that runs into a waterway or road ditch, or any waters of the state. Other visual indicators include sediment deposition from overland flow in channels that are carrying or connected to waters of the state. Field measurements may include depth of sheet and rill erosion on the field and by inspection of exposed roots from soil erosion. See Appendix E for on-site visual indicators of erosion.

Landowners/operators may get additional information about erosion and soil management from the USDA NRCS local field office, local SWCD, and/or the OSU Extension Service.

The Oregon Administrative Rule

OAR 603-095-1940

(4) Erosion Prevention and Sediment Control. Effective upon rule adoption.

(a) Soil erosion rate shall not exceed five tons per acre per year between October 1 and September 30 if the resulting sediment has access to and enters the waters of the state. The erosion rate will be determined using standard scientific methods.

TMDL parameters may be affected by this measure:

- Mecury from soil erosion and runoff,
- Bacteria from soil erosion and runoff,
- Current use pesticides,
- Legacy pesticides (surrogate total suspended solids.

2.5.4 Upland Management, Irrigation Management, Livestock Management

Role of Upland Vegetation to Prevent and Control Pollution

Upland areas are the rangelands, forests, and croplands located upslope from streamside areas. Upland areas extend to the ridge-tops of watersheds. With a protective cover of crops and crop residue, grass (herbs), shrubs, or trees, these areas will capture, store, and safely release precipitation, thereby reducing the potential of excessive soil erosion or delivery of soil or pollutants to the receiving stream or other body of water.

Healthy upland areas provide several important ecological functions, including:

- Capture, storage, and moderate release of precipitation reflective of natural conditions.
- Plant health and diversity that support cover and forage for wildlife and livestock.
- Filtration of sediment.
- Filtration of polluted runoff.
- Plant growth that increases root mass, utilizes nutrients, and stabilizes soil to prevent erosion.

Chemigated Irrigation Water

The goal of this measure is to encourage the application of crop nutrient applications through irrigation systems at a time and in a manner that does not adversely impact the waters of the state. Fertilizers should be applied in accordance with nutrient budgets developed for each crop, incorporating current yield estimates, water analysis, soil tests, tissue tests, and/or other appropriate tests and information. All pesticides should be used in accordance with the label.

Examples of Management Practices

Waste storage structure, pond, pond sealing or lining, irrigation water management, nutrient management, pest management, filter strips, and riparian buffers.

For most commercial crops, information is available at OSU Extension Service, USDA NRCS Field Office, and/or the local SWCD.

The Oregon Administrative Rule

OAR 603-095-1940

(2) Chemigated Irrigation Water. Effective upon rule adoption.

(a) Landowners or operators shall use the application of chemicals in combination with irrigation water in a manner that does not adversely impact waters of the state.

TMDL parameters may be affected by this measure:

- Current use pesticides

Surface Drainage and Irrigation Ditches

Ditches provide important drainage and irrigation functions for agricultural lands. It is the goal of this measure to minimize impacts on fish and water quality from agricultural ditches while preserving landowner/operator ability to effectively construct, maintain, and use their ditches. The environmental benefits of proper drainage and irrigation ditch operation include a reduction in pollutants conveyed to the waters of the state.

For ditches to function over time, maintenance will be required. Excavation may be required to return a ditch to its original design function. Ditch bank vegetation may be damaged during maintenance. Care should be taken to minimize this damage and provide for re-vegetation. Ditch vegetation should be maintained in a manner that does not restrict water flow or prohibit ditch maintenance. Special Districts for drainage, irrigation, and/or water control may require specifically designed vegetation to meet the maintenance needs.

Landowners/operators are encouraged to refer to Oregon Department of Fish and Wildlife (ODFW) fish screening laws to determine requirements and cost share availability.

When required, either a joint permit from the U.S. Army Corps of Engineers and the Department of State Lands (DSL), or a General Authorization permit from DSL, must be obtained to clean or dig new ditches.

Examples of Management Practices

Streambank stabilization, critical area planting, filter strips, riparian buffers, grassed waterway, and lined waterway or outlet.

Information about surface drainage and irrigation ditches is available at the USDA NRCS local field office, local SWCD, and/or OSU Extension Service.

The Oregon Administrative Rule

OAR 603-095-1940

(3) Surface Drainage and Irrigation Ditches. Effective upon rule adoption.

(a) Construction, maintenance, and use of surface drainage field ditches or surface irrigation field ditches shall cause no pollutant delivery to waters of the state from soil erosion induced by excessive channel slope, unstable channel cross section, or placement of disposed spoils.

TMDL parameters may be affected by this measure:

- Temperature (surrogate shade),
- Mecury from soil erosion and runoff,
- Bacteria from soil erosion and runoff,
- Current use pesticides,
- Legacy pesticides (surrogate total suspended solids).

Irrigation

Appropriate irrigation and water use benefits the environment by reducing irrigation water run-off and leaching, and total pollutant discharge from an irrigation system. Landowners/operators benefit from appropriate irrigation and water use by maximizing water use efficiency and minimizing waste.

The efficacy of irrigation water application is generally enhanced by assuring the quantity and timing of application is based on the needs of the crop, as determined by soil moisture levels, crop water use budgets, or other monitoring tools.

Every farm or ranch has its own characteristics, its own soil conditions, climate, topography, and crops to consider when designing an irrigation system.

Examples of Management Practices

Irrigation water management, nutrient management, pest management, filter strips, riparian buffers, and equipment calibration and timely maintenance.

Landowners/operators can get information about crop needs, soil moisture levels, crop water use budgets, irrigation, and monitoring tools from consultants, local irrigation sales, USDA NRCS local field office, local SWCD, and/or the OSU Extension Service.

The Oregon Administrative Rule

OAR 603-095-1940

(5) Irrigation. Effective upon rule adoption.

(a) Irrigation systems shall be designed and operated to minimize runoff of potential pollutants. Irrigation scheduling shall be appropriate to each site and consideration shall be given to water use efficiency, off-target minimization, soil conditions, crop, climate, and topography.

TMDL parameters may be affected by this measure:

- Temperature,
- Mercury from soil erosion and runoff,
- Bacterial from soil erosion and runoff,
- Current use pesticides,
- Legacy pesticides (surrogate total suspended solids).

Pesticides

The goal of this measure is to encourage the appropriate management of pesticides, while maintaining their availability for beneficial uses while reducing the risk of surface or groundwater contamination.

Pesticide handling and application practices should be adopted that prevent off-target application and that limit off-site transport.

Current state law requires that landowners/operators follow labeling instructions for transport, storage, mixing, and application of pesticides.

Examples of Management Practices

- Use of integrated pest management strategies,
- Equipment calibration and maintenance,
- Use of anti-backflow devices.

Landowners/operators are encouraged to store, mix, and handle pesticides correctly. One way to accomplish this is by providing secure containment facilities including a leak proof pad with curbing for mixing and loading. An alternative is to load and mix pesticides at the application site carefully, avoiding spillage.

Several routines for disposal of empty containers are suggested:

(1) Triple rinsing of liquid pesticide containers, then puncturing the containers and disposing in an approved manner;
(2) Emptying dry chemical bags, then bundling and storing them until they can be disposed of in an approved manner.

Landowners/operators can get information about pesticide use from consultants, the USDA NRCS local field office, the local SWCD, the OSU Extension Service, and the ODA - Pesticides Division.

Landowners/operators shall use pesticides in accordance with the label as required under ORS Chapter 634, as administered and enforced by the ODA Pesticides Division.

TMDL parameters may be affected by this measure:

- Current use pesticides

<u>Road and Staging Areas</u>

The goal of this measure is to minimize water pollution from agriculture activities from the use and maintenance of farmstead, farm roads, and related areas. Farm roads, staging areas, barn lots, stream crossings, bridge abutments, and right of ways should be managed to reduce the impact of runoff from agriculture activities into waterways. This includes activities, similar to agricultural activities, including: nutrient management, pest management, well head protection, erosion control, grass seeding of rights of way, rock placement in ditches, stream crossings, bridges, sediment basins, proper culvert placement, sizing, and management, and weed control. Similarly, agricultural lands shall be managed to reduce the impacts of runoff onto public rights of way.

Examples of Management Practices

Critical area vegetation, heavy use protection, water bars on dirt or gravel roads, appropriate culvert placement-construction-design, appropriate road construction grade-crown, bio-swales for runoff, all measures that apply to crops apply to roads, staging areas, and farmsteads.

Landowners/operators can get information about farm roads and associated areas from consultants, USDA NRCS local field office, local SWCD, and/or the OSU Extension Service.

The Oregon Administrative Rule

OAR 603-095-1940

(9) Roads and Staging Areas. Effective upon rule adoption.

(a) Roadways, staging areas, and heavy use areas shall be constructed and maintained to prevent sediment or runoff contaminants from adversely affecting waters of the state.

(A) Exemptions: Public roads and roads subject to the Oregon Forest Practices Act.

TMDL parameters may be affected by this measure:

- Mercury from soil erosion and runoff,
- Bacteria from soil erosion and runoff,
- Legacy pesticides (surrogate total suspended solids.

Chapter 3: Goals, Objectives, and Strategies

Mission

The mission of the Plan is to promote agricultural management practices that protect and improve water quality in the Molalla River, Pudding River, North Santiam River, Santiam River, Mill Creek and French Prairie Area subbasins while maintaining agricultural viability.

The primary strategies to reduce water pollution from agricultural and rural lands lie in the reduction of pollutants in runoff, and the reduction of erosion through educational programs, land treatment, implementation of agricultural management practices, and installation of structural or nonstructural (agronomic) measures. These strategies are carried out at the local level by the Marion SWCD in cooperation with landowners, operators, other agencies, volunteer organizations, and others.

3.1 Goal

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

I. Reduce, minimize, prevent and control water pollution from agricultural activities and soil erosion to achieve applicable water quality standards.
   a) Control pollution as close to its source as possible.
   b) Minimize erosion and sediment delivery from agricultural and rural lands.
   c) Reduce pesticide and nutrient discharge from agricultural and rural lands.
   d) Control irrigation and run-off and tail water discharges to waters of the state.
   e) Eliminate direct livestock waste discharges to waters of the state, and ensure proper animal waste storage, utilization, or disposal.
   f) Limit livestock access to streams, wetlands, and riparian areas.
   g) Promote the restoration, enhancement, and protection of wetland, riparian, and wildlife habitat.

II. Create a high level of awareness and understanding of conservation issues among the agricultural community and rural residents through education and technical assistance.
   a) Conduct education programs to promote public awareness of water quality issues and their solutions.
      i) Develop and promote demonstration projects that showcase successful conservation practices and systems.
      ii) Produce and distribute LMA newsletter that includes water quality issues and educational materials, workshops, tours, and demonstrations.
      iii) Provide educational materials and presentations to schools and youth oriented groups.
      iv) Create and maintain a list of experienced agricultural operators willing to share their agricultural management practices with other interested people by speaking, leading tours, and providing tour sites.
   b) Develop an ongoing media program to inform agricultural operators and the public of conservation issues and events.
      i) Submit news articles and public service announcements to area newspapers, radio stations, and newsletters.
      ii) Invite media to conservation tours and workshops.
      iii) Build partnerships with agribusiness to promote conservation.
      iv) Share education materials with agribusiness field representatives.
   c) Identify, develop, and distribute agricultural management practices that protect and improve water quality.

i) Promote the development of Voluntary Water Quality Farm Plans (Voluntary Plans) and Voluntary Plan amendments.
ii) Assist any person conducting agricultural management or land disturbing activities to develop a Voluntary Plan.
iii) Obtain practical information from agricultural producers.

III. Monitor and evaluate the plan to assist in periodic review of effectiveness.
a) Work with all relevant agencies to measure plan effectiveness in meeting goals and report results.
i) Inventory and assess watershed conditions and sources of pollution in this plan area.
ii) Establish a plan of monitoring streams and surface water areas for current water quality conditions and determine needs.
iii) Use present water quality condition of the plan area as a baseline.
iv) Partner or participate with local schools, watershed councils, and other agencies to develop a monitoring program.
b) Include documentation data in the annual and long-range work plans of the LMA.
i) Document the number of Voluntary Plans written, producers implementing agricultural management practices, and total acres planted which protect water quality.
ii) Document the number of attendees of conservation workshops and tours.
iii) Document the number of agribusiness partnerships produced and the successes of this partnership.
iv) Identify the occurrence of prohibited conditions of the plan area by type and geographic area.
v) Document the number of complaints referred to LMA.
vi) Review the plan every two years.

IV. Secure adequate funding for administration and implementation of the plan.
a) Obtain funding for implementation of agricultural management practices, conservation planning assistance, conservation education, and water quality monitoring.
i) Promote the USDA incentive-based cost share programs to assist producers with conservation implementation, for example:
- Conservation Reserve Enhancement Program
- Conservation Reserve Program
- Environmental Quality Incentive Program
- Wetland Reserve Program
- Wildlife Habitat Incentives Program
- Farmland Protection Program
- Conservation Farm Program
- Forestry Incentives Program
- Stewardship Incentive Program
- Regional Conservation Partnership Program

b) Pursue the feasibility of Pollution Tax Abatement Program relative to water quality.
c) Work with the Oregon Association of Conservation Districts and others to establish stable funding from the Oregon Legislature to fully implement this Plan.
d) Submit grant proposals to the USDA, US EPA, Oregon DEQ, ODA, and other funding sources.
e) Form partnerships with the agribusiness sector for additional funding.

3.2 Measurable Objectives

Achieving the TMDL water quality targets will take many years. In order to measure progress, ODA, in consultation with the LAC, DEQ, and SWCDs, will identify interim measurable objectives for agriculture to strive for over designated time periods and at a scale suitable for measuring progress. The measurable objectives will be identified in the 2016 Area Plan and progress toward those objectives will be reported in subsequent biennial reports prepared for the Board of Agriculture. ODA will determine the tasks in the scopes of work in consultation with the SWCDs and may also consult with DEQ staff to review the

adequacy of that scope to make significant progress toward meeting the pollutant reduction targets set in the TMDLs.

Molalla-Pudding measurable objectives will be developed using the S.M.A.R.T. principles.

- Specific
- Measurable
- Achievable
- Relevant
- Time-bound

The Molalla-Pudding TMDL currently provides the following objectives for agricultural lands:

- For the entire Molalla-Pudding/North Santiam/French Prairie Area, the target for mercury loading reduction for all sources, including agricultural land, is 27 percent.
- The water quality targets from the Molalla-Pudding TMDL for agricultural land use are:
    - Reduce bacteria loading by approximately 90% year around on Pudding River trubutaries, at least 80% on the Pudding River, and 80% during winter months (October – May) on the lower Molalla River and tributaries.
    - Increase site appropriate shading in riparian areas to at least 70% on average on tributaries and 50% on average on mainstem streams (Pudding and lower Molalla rivers).
    - Reduce legacy pesticide loading by at least 60% in the Pudding River, Zollner Creek, and the Little Pudding River.
    - Reduce nitrate loading at median stream flow in Zollner Creek to approximately 100 kilograms/day.
- The water quality targets from the Middle Willamette TMDL applicable to agricultural land use in the French Prairie and Santiam portions of the Area Plan are:
    - In French Prairie and Santiam areas, reduce bacteria loading by approximately 95% in summer months (June – September) and 61% in winter months.
    - In Mill Creek, reduce bacteria loading by approximately 83% in winter months, 89% in summer months.
    - In Bashaw Creek, reduce bacteria loading by approximately 68% year around.
    - Increase site appropriate shading in riparian areas to at least 55% on average on tributaries, and at least 20% on average on the mainstem Santiam River.
- The water quality targets from the North Santiam TMDL for agricultural land use are:
    - Increase site appropriate riparian shading to at least 65% on average on tributaries and at least 25% on average on the mainstem N. Santiam River.
    - Reduce bacteria loading by at least approximately 66%.

3.2.1 Milestones (Targets) and Timelines

Milestones and timelines will be developed in cooperation with ODA, the LAC and the SWCDs at a future meeting.

3.2.2 Focus Area

The current Focus Area for this Management Area is the Silver Creek Focus Area. An Action Plan for the current biennium has been developed and approved by ODA outlining the key components of the process (Appendix F):

- Conduct a pre-assessment of current land conditions.
- Identify areas of concern.
- Conduct education and outreach to landowners.
- Offer technical assistance to landowners and financial assistance, if needed.

- Conduct a post-assessment after project implementation.
- Report progress to ODA and the LAC.

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

3.3 Strategies for Area Plan Implementation

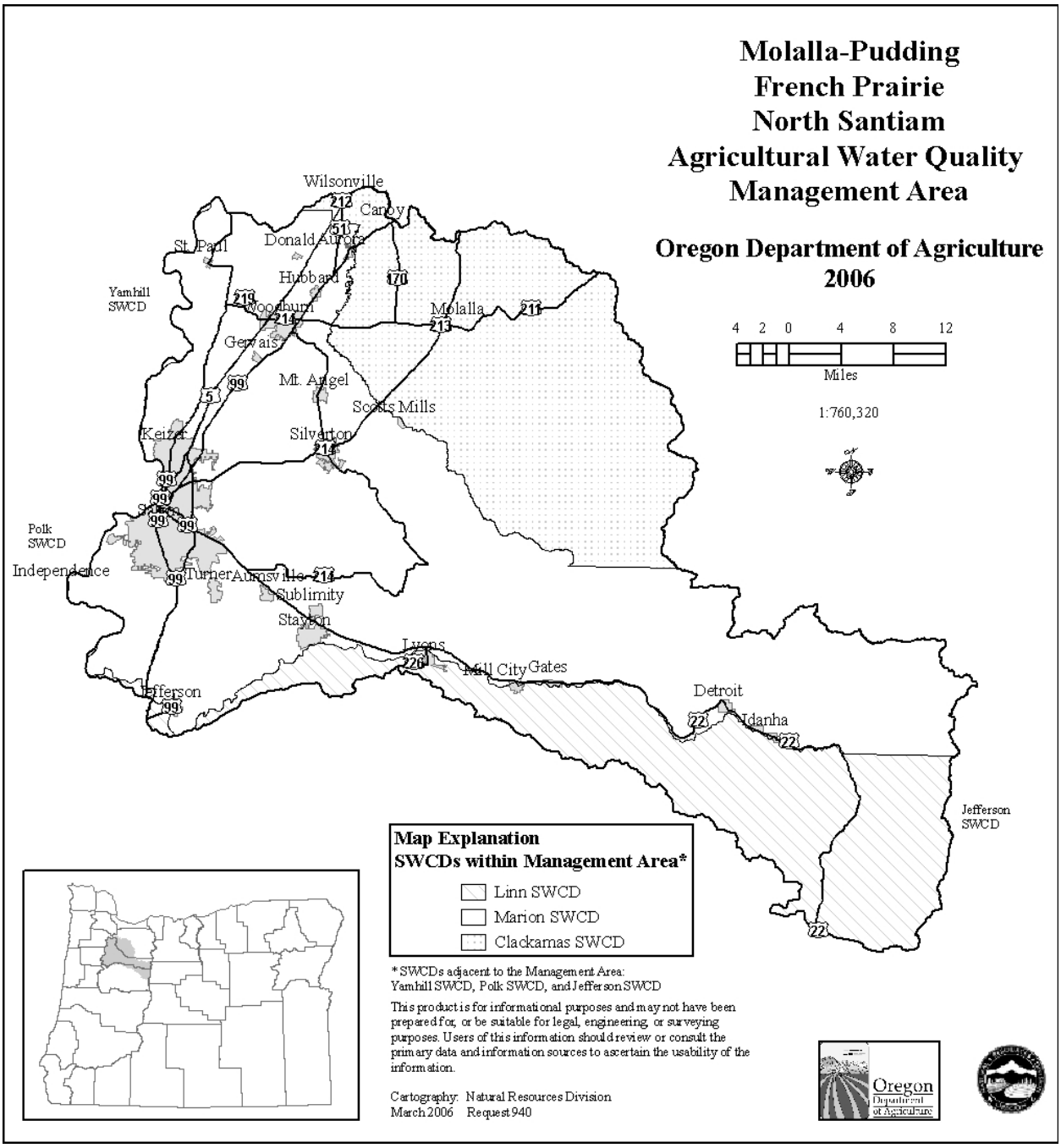
The Marion SWCD, as the primary LMA designated by the ODA for this Plan area, oversees administration and implementation of this Plan. The day-to-day implementation of this Plan will be accomplished through a Memoranda of Agreement between the Marion SWCD and the ODA. Implementation priorities will be included in the annual work plans developed by the Marion, Linn, and Clackamas SWCDs with input and approval from the ODA.

The primary strategies to reduce water pollution from agricultural and rural lands lie in the reduction of pollutants in runoff, and the reduction of erosion through educational programs, land treatment, implementation of agricultural management practices, and installation of structural or nonstructural (agronomic) measures. These strategies are carried out at the local level by the Marion SWCD, Linn SWCD and Clackamas SWCD in cooperation with landowners, operators, other agencies, volunteer organizations, and others.

The SWCDs work to achieve the Plan's water quality goals and objectives through the volunteer efforts of landowners/operators. If voluntary compliance cannot be achieved, the ODA will use appropriate enforcement actions.

The implementation strategy of the Plan for controlling water pollution on agricultural and rural lands relies on existing and expanded efforts. For the purposes of this Area Plan, these efforts will include education, voluntary water quality farm plans/conservation planning, funding, and Area Plan evaluation and modification.

Figure 3: Soil and Water Conservation District Coverage in the Plan Area



3.3.1 Education and Outreach

The LMA coordinates the Plan education efforts. To do this, the LMA forms partnerships with state and local governments and organizations such as watershed councils, OSU, USDA NRCS, Oregon Farm Bureau Federation, and others. The focus of the education effort will be on meeting water quality standards utilizing Voluntary Water Quality Farm Plans or Conservation Planning, that include the following:

- Conservation Planning on rural lands;
- Conservation Plan implementation;
- Water Quality monitoring to determine conditions and improvement requirements;
- Wetlands and upland habitat restoration and enhancement for wildlife;
- Small acreage management;
- Grants and/or cost-share to help implement new agricultural practices; and
- Riparian area maintenance and re-establishment.

The LMA will create a high level of awareness and understanding of water quality issues among the agricultural communities and rural residents through education and technical assistance.

The Education Program I works through all means of information dissemination to communicate with the wide diversity of people in the Plan area. The target audience is the rural landowners and operators. Residents within the urban growth boundary are a part of the target audience to show rural efforts toward improved water quality and efforts to meet water quality standards. The Program I provides information to create a high level of awareness of water quality issues.

The LMA has demonstration projects to promote a high level of awareness with the public on water quality issues and solutions. These projects address a wide area of agriculture enterprises. Individual solutions that address common problems on agriculture enterprises are the focus. The LMA provides workshops, tours, and other presentations throughout the year to communicate to the rural residents on water quality issues. This Program I includes educational materials and presentations to schools and youth oriented groups. The LMA works with all parties to assist in this education effort. A survey of rural residents may be done each year to determine the education needs to be addressed in the annual work plan. The LMA works to identify those operators willing to share their knowledge in water quality issues, practices and other experiences. These individuals can be used as speakers at tours, presentations, and workshops and can provide tour sites for demonstrations.

The LMA distributes a newsletter to interested residents of the Plan Area that provides information on water quality issues. The newsletter describes activities in the Plan Area to provide information on water quality issues. The newsletter includes a calendar of events that are taking place relating to water quality issues, watershed council activities, Willamette River restoration and any other area related to water quality issues and environmental impacts.

The LMA uses all media sources available to educate basin residents on water quality issues. The media is informed of all events such as tours, presentations, or demonstrations taking place.

3.3.2 Conservation Planning and Conservation Activities

Effective water quality management depends on activities and structural measures that are the most effective, practical means of controlling and preventing pollution from agricultural activities. Appropriate management activities for individual farms may vary with the specific cropping, topographical, environmental, and economic conditions at a given site. Due to these variables, it is difficult to recommend any specific, uniform set of management activities in this document to improve agricultural water quality.

Management activities and land management changes are most effective when selected and installed as parts of a comprehensive resource management plan based on natural resource inventories and assessment of management activities.

A detailed list of specific measures that can be used to address agricultural pollution are contained in other documents such as the NRCS Field Office Technical Guide, available for reference at the local NRCS office. Landowners and operators have flexibility in choosing management approaches to address water quality issues on their lands.

Voluntary conservation plans describe the management systems and schedule of conservation activities that the landowner will use to conserve soil, water, and related plant and animal resources on all or part of a farm unit. Landowners, operators, consultants, or technicians available through a SWCD or the NRCS may develop voluntary conservation plans. A conservation plan can be used to outline specific measures necessary to address the "Prevention and Control Measures" outlined in this Area Plan.

Conservation activities should:

- Identify priorities for management activities, including reasonable timelines.
- Control pollution as close to the source as possible.
- Improve irrigation water use and conveyance efficiency to reduce the potential of polluted return flows.
- Show reduction in potential sources of pollution through scientifically valid monitoring and periodic surveys of stream reaches and associated lands.
- Be flexible to adjust management based on feedback, or monitoring and changing environmental and economic conditions.

For a list of agencies and organizations to contact for more information about resource management, please refer to Appendix B. Educational and Technical Services for Natural Resource and Farm Management. Additional information about voluntary conservation plans please refer to Appendix H: Instructions and Guidelines for a Voluntary Conservation Plan.

3.3.3 Funding

Sometimes the cost of conservation measures do not fit well with a producer's operating budget. Local, state, and federal technical and financial resources are available to improve the cost-effectiveness of protecting and improving water quality. It is not the intent of the Area Plan to impose a financial hardship on any individual. If there are potential water quality threats on their land, it is the responsibility of the landowner or operator to request technical and/or financial assistance and to develop a reasonable time frame for addressing potential water quality problems.

The designated LMA seeks funding to implement this agricultural water quality management Area Plan. Funding is necessary in four main areas:

- Education – to fund education programs such as workshops, tours, outreach at stores and development of published materials. Goal II of the Plan.
- Inventory, monitoring, and assessment of the watersheds in the Plan Area. Develop baseline water quality in the Plan Area and monitor trends. Goal III of the Plan.
- Technical Assistance – to hire staff to work with landowners/operators in conservation planning process and conservation plans. Also, to review conservation plans submitted to the LMA approval. Goal IV of the Plan.
- Cost share assistance for landowners/operators to implement agriculture management practices.

For this Area Plan, stable funding is required to provide staff for the items listed above. Stable funding provides the matching dollars needed to obtain needed grant money to implement this Area Plan. The Marion SWCD, expected to serve as a primary LMA for this management area, now has stable funding, with a tax base approved in November 2000.

The 1993 AgWQM Act allows the ODA, in consultation with the State Board of Agriculture, to collect a fee for state Area Plan implementation. Currently, ODA has no plans to collect this fee.

Funding will also be sought from ODA, US Department of Agriculture, US Environmental Protection Agency (EPA), Oregon DEQ, the Oregon Watershed Enhancement Board (OWEB), and other agencies and organizations.

For sources of financial assistance, see Appendix A: Public Funding Sources for Landowner Assistance.

3.3.4 Monitoring and Evaluation

The LMA coordinates the monitoring and evaluation efforts of the Area Plan, working with any interested party. The focus will be on surface water quality trends and LMA documentation of implementation efforts.

The LMA works with other organizations to inventory and assess present point and non-point source pollution in the watershed. The inventory and assessment is a high priority.

The LMA and ODA coordinate with partners such as the US EPA, DEQ, OSU, and the OWEB to prioritize watersheds and streams for monitoring. This is crucial for development of a plan for monitoring streams for current water quality conditions and to determine trends of water quality conditions in main and tributary streams of this agricultural water quality plan area. The existing conditions monitored become the baseline for determining trends.

To perform the tasks of inventory, assessment and monitoring the LMA partners with as many groups or agencies as possible. This includes schools, watershed councils, cities, ODA, DEQ, USDA NRCS, and other agencies.

The LMA and ODA document plan implementation, which includes this work in the annual and long-range work plan. The LMA reports the results in the Annual Report, at the Annual Meeting and to the ODA per existing Memorandum of Agreement(s).

The following items and areas are tracked and documentation compiled:

- Voluntary plans written,
- Producers implementing agriculture management practices,
- Total acres planned,
- Number of workshops and tours,
- Number of attendees at workshops and tours,
- Number of agribusiness partners,
- Number of prohibited conditions in this Management area by type and geographic area,
- Number of complaints.

The ODA and LAC review this Area Plan every two years, with help from the LMA. The review will cover all aspects, which include water quality trends and implementation tracking.

The progress and success of implementation efforts are assessed through determination of necessary changes in land management systems, measurement of water quality improvement over time, and evaluation of educational techniques and technical and financial tools.

The Plan was adopted in 2002 and every two years the ODA, with the cooperation and assistance of the LMA and the LAC, and in consultation with DEQ, assesses the progress of Plan implementation toward achievement of Plan goals and objectives. These assessments include:

1. An accounting of the numbers and acreage of operations with approved voluntary conservation plans which address the prevention and control measures;
2. Documentation of violations of the prevention and control measures and subsequent corrections;
3. An evaluation of available current water quality monitoring data and sources of pollution in the Molalla-Pudding-French Prairie-North Santiam Subbasins management area;
4. A review of projects, demonstrations, and tours used to showcase successful management practices and systems;
5. An evaluation of outreach and education programs designed to provide public awareness and understanding of water quality issues; and
6. An evaluation of the effectiveness of technical and financial sources available to the agricultural community.

In 2002, Marion County, the Pudding River Watershed Council and the Marion SWCD began a Water Quality Monitoring program in the Pudding River watershed to establish known baseline water quality conditions. The Pudding basin is one of the most intensely farmed agricultural subbasins in the Willamette Valley. This program provided a means for residents to learn about their watershed, volunteers to collect data and stakeholders to have tools for future decision-making and restoration efforts. This information folded into the Water Quality chapter of the Pudding River Watershed Assessment that was completed in 2006. Because the information was collected, graded and submitted to the DEQ's LASAR database (http://deq12.deq.state.or.us/lasar2), it also was used in the 2008 TMDL allocations in the Molalla/Pudding basin by DEQ.

In 2008, staff began a rigorous water quantity/flow program to measure five stations in the Molalla Pudding for stage height and temperature. This included the installation of automated gages, but took significant staff field time to set up, establish rating curves, monitor and maintain. After 2010, monitoring of most of the previous baseline site locations for several parameters was discontinued due to staff time limitations. Marion SWCD was involved in collecting Pesticide Stewardship Program samples in partnership with DEQ and OSU Extension Service during 2010 and 2011.

In 2014, Marion SWCD entered a contract with USGS to continue to run our automated flow stations in an effort to make the data more publicly assessable and to meet stringent USGS data quality guidelines. For a description of monitoring and evaluation activities, see Chapter 4.

Chapter 4: Implementation, Monitoring, and Adaptive Management

4.1 Implementation and Accomplishments

Many conservation activities and implementation monitoring tracks have been implemented to benefit water quality. The SWCD and NRCS track activities that have been implemented through quarterly reports to ODA and through a NRCS database, respectively. Projects that have received funding from the OWEB are tracked in OWEB's restoration database. In addition, partner agencies can submit reports of projects and activities in the Management Area that improve water quality. A summary of Area Plan goals and the progress of Area Plan implementation are provided in Appendix L.

4.2 Water Quality Monitoring—Status and Trends

Data provided by Eric Andersen, the Regional Monitoring Coordinator for the South Santiam, North Santiam, and Calapooia Watershed Councils, included multiple sites that represent an agricultural influence on water quality. These included three sites on Marion Creek, two on Bear Branch, and one on Stout Creek. This data was reported for the period November 2012 through August 2014. Monitoring progress reports can be found at http://www.sswc.org/what-we-do/monitoring.

Elevated E. coli counts were seen in all three Marion Creek sampling sites, though mostly in the tributary sampled. These high concentrations were episodic, occurring in June through September 2013; January, May, and August 2014. *E. coli* counts during these times ranged over 2,400. Counts were highest at the tributary on June and August, 2013. They were highest at Marion Road and Pletzer Road in January and May 2014.

High *E. coli* counts were also reported in Bear Branch and Stout Creek. Results from the Bear Branch sites were similar to the ones for Marion Creek in time and magnitude, but the Stout Creek high values were only reported in September 2013.

Marion Creek also had numerous high nitrate concentrations. Though the drinking water standard for nitrate is 10 mg/l, ODA generally views concentrations of 0.80 mg/l as indicating a problem in summer months, and 3 mg/l as being a non-issue in winter months. Based on these values, essentially all the monitoring events had excessive nitrate concentrations. The highest concentrations were seen in the Pletzer Road site in March and April 2014 (both near 8 mg/l). High concentrations of nitrate were also reported in Bear Branch, but only in September and October 2013. It should be noted that high nutrient concentrations in those months were most likely the result of unseasonably intense storm events.

Total phosphorus (TP) concentrations exceeded policy concentrations during three sampling events in Marion Creek, but only once in Bear Branch and not at all in Stout. In December 2012 and September 2013, all three monitoring sites on Marion Creek met or exceeded 0.08 mg/l TP. In January 2014, only the Marion Road and Pletzer Road sites exceeded this value. In September 2013, the Shelburn Road site on Bear branch had TP over 0.08 mg/l but the Huntly Road site did not.

The Marion Creek monitoring sites had few instances of elevated total suspended sediment (TSS). The Marion Road site had two samples exceeding 15 mg/l, and the Pletzer Road site had one. None of the samples from Bear Branch and Stout Creek reached 15 mg/l.

Pesticide monitoring has occurred in the Molalla-Pudding basin since 2005 as part of the Pudding River Watershed Pesticide Stewardship Partnership (PSP) project, a collaborative effort between DEQ, ODA,

Marion SWCD, OSU Extension and Integrated Plant Protection center and local agriculture chemical suppliers. Pesticide monitoring continues in the management area and an update will be provided for the 2016 biennial review. Appendix K provides water quality monitoring results for the 2010-2012 timeframe.

4.3 Progress Toward Measurable Objectives

Measurable objectives will be developed at a future meeting. Progress toward meeting measurable objectives will be discussed during the 2016 biennial review and reported here.

4.4 Aerial Photo Monitoring of Streamside Vegetation

Currently, ODA is focusing land condition monitoring efforts on riparian areas because of the influence on water quality. Riparian land conditions are evaluated every five years by analyzing aerial photographs of about five percent of the riparian agricultural land within the Management Area. The ODA staff examine riparian ground cover at specific points in 90-foot bands along the stream from the aerial photos and assign each sample stream reach a score based on ground cover. The score can theoretically range from 70 (all trees) to 0 (all bare ground). Staff compare that score with the score when photos are taken again in five years to track changes in riparian conditions over time. Because site conditions vary across the state, there is no one correct riparian index score.

Aerial photographs for the Molalla/Pudding were last taken in June of 2014. However, it's not likely that these photos will be analyzed until the early spring of 2015. The last set of aerial photos analyzed was from 2009. Results of the 2009 monitoring showed little change in riparian condition along eleven of the 13 streams assessed when compared to the 2004 aerial photos. McKinney Creek's Riparian Index Score (RIS) increased during that period by 8%, mostly due to a decrease in bare agricultural land. The RIS for West Fork Champoeg Creek decreased by 5% due to a loss of trees and an increase in grass/ag cover. Patterson Creek also had significant decreases in bare agricultural land, but not enough to increase its RIS significantly.

4.5 Biennial Reviews and Adaptive Management

During the 2014 LAC meeting, the following needs for improvement were identified:

- A number of vacancies exist on the LAC. Many prior members have served for many years and have provided an excellent foundation. There is a need to bring new members to the committee who represent the agricultural types throughout the management area.
- Measurable objectives are needed to inform and communicate about plan success.
- A communication plan should be considered that would engage LAC members to communicate about the area plan with their constituencies. The communication plan might include support from ODA to write articles in the Capital Press to communicate what the agricultural community is doing to improve water quality and should consider a broader marketing campaign.

Acknowledgements

For Farming in Marion County: A Glimpse at Then and Now

The author of this section, Barbara Lucas, wishes to thank the pioneers' descendants and other farming devotees who helped her catch a glimpse of farming in Marion County: Dave Adams, Barbara Bauman, Bob Dettwyler, Lois Egan, Myron and Jane Harper, Fred Kaser, Alan Kraemer, Edgar Lucht, Judy McClaughry, Mark McKay, Rob Miller, Harold Morgan, Don Nusom, Jr., Don Nuson, Sr., Swede Pavlicek, Ken Perkey, Hazel Smith, Betty Stuchlik, Ron Vandecouvring, and Butch Van Veldhuizen. Her thanks also go to:

Paul Eckley, city of Salem
Gail Gingrich, Marion County Extension Service
Jim Johnson, Oregon Department of Agriculture
Dan Keeley, Marion County Public Works
Rob Kissler, city of Keizer
Ed Magner, Portland District, U. S. Army Corps of Engineers
Larry Parsons, Bureau of Reclamation
Bruce Pokarney, Oregon Department of Agriculture
Richard Schmid, Mid-Willamette Valley Council of Governments
Tina Schweikert, city of Salem
Larry Trosi, Santiam Water Control District
Sterling Anderson, Marion County Planning Department

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Appendices

Appendix A: Public Funding Sources for Landowner Assistance

What is the Conservation Reserve Enhancement Program?

The CREP was created in 1998 through a unique partnership between the USDA and the state of Oregon. Its purpose is to establish riparian vegetation on agricultural land along streams, protecting water quality and restoring fish and wildlife habitat.

Agricultural landowners can enroll eligible riparian lands into a 10 to 15 year CREP contract and receive an annual conservation payment for the 10 to 15 year contract period, reimbursement for 75 percent of the costs of riparian restoration practices, and other financial incentives.

What is the Oregon CREP?
The Oregon CREP is a State and Federal partnership developed to assist in the restoration of freshwater streams along agricultural lands. Riparian habitat along salmon and trout streams throughout the State will be restored under this program. CREP is implemented in partnership with landowners, by the NRCS, FSA, ODF, and local SWCDs.

What are the goals of the Oregon CREP?
Oregon and the USDA have jointly developed several goals for the program. They include:

- Provide riparian buffers to restore stream conditions for salmonid habitat requirements,
- Reduce sediment and nutrient pollution from agricultural lands adjacent to streams,
- Ensure vegetation establishment adequate to stabilize stream banks under non-flood conditions,
- Ensure vegetation establishment adequate to reduce water temperature to natural ambient conditions,
- Ensure acreage enrolled for riparian buffer practice is restored to properly functioning riparian conditions,
- Provide a mechanism for landowners to meet water quality requirements.

What are some of the environmental benefits of the Oregon CREP?

- Establishment of forested riparian buffers will help restructure streams and increase the availability of insects and other salmon and trout food,
- Trees along streams will reduce the rate of solar water heating which is the most important water quality limiting factor in salmonid streams,
- Establishment of wetlands will provide important rearing habitat for trout and salmon,
- Riparian buffers will reduce non-point source pollution and improve stream water quality.

Who is eligible for the Oregon CREP? When can I signup?
You can enroll in CREP at any time. In addition to offering acreage along agricultural lands, the applicant must satisfy the basic eligibility criteria for CRP. Land must be cropland that has been cropped two out of the last five years that is physically and legally capable of being cropped. Marginal pasture is also eligible to be enrolled provided it is suitable for use as a riparian buffer planted to trees. Land for which there is an existing CRP contract or an approved offer with a contract pending is not eligible for CREP until that contract expires.

What land is eligible for CREP?
Local agency employees will work with landowners in determining if the land is eligible.

What types of land are eligible?

- Cropland planted to annual or certain perennial crops
- Marginal pasture
- Cropped wetlands

What must I do with land enrolled in the program?

Three conservation practices are included in the program: riparian forest buffers, wetland restoration, and filter strips. Most CREP land will be planted to riparian buffers, consisting primarily of native trees and shrubs. Landowners will receive annual rental payments from the USDA.

How will I know what to plant in the riparian zones?

Technical assistance is available to all CREP producers at no charge. You will have access to staff members from several agencies including the FSA, NRCS, ODF, Cooperative Extension Service, and U.S. and ODFW. Agency staff will develop a Conservation Plan specifically tailored to your site. (There may be a minimal measurement service charge for determining field sizes.)

How wide are the riparian habitats? Is the riparian habitat width flexible?

The width is site specific and flexible. It is based on landscape features such as soil type, vegetation, stream type, and site history. The width can range from 35 to 180 feet AVERAGE. The widths specified in the riparian forest buffer standard are averages, over the length of the enrolled acreage. Landowners may move the RIPARIAN boundary toward or away from the stream at different locations to meet management objectives as long as the overall average width meets the contract specifications.

Must I enroll all eligible land?

No. The program is voluntary and the decision on how much land is enrolled is up to the landowner. The length of riparian area to enroll, and whether to enroll land on both sides of the stream, is the landowner's choice.

Can I hay, harvest, or graze my CREP land?

Haying, harvesting, and grazing would not be permitted during the CREP contract period unless the Secretary of Agriculture permits it for emergency purposes.

What are the payments under CREP?

There are seven types of payments that participants in the Oregon CREP may receive: annual soil rental payments, annual practice incentives, annual maintenance payments, cost-share assistance in the installation of the conservation practices, and a one-time cumulative impact incentive.

Annual payments:

- Soil rental: Land enrolled will earn an annual payment based on the county's dryland soil rental rates for specific soils on agriculture land. The rate for a producer's land will be based on an average of the three predominant soil types. Additionally, for the first time, producers may be eligible for a rental payment based on the rental value of irrigated land if the water used to irrigate that land is left in the stream and landowners get an “instream lease” from Oregon Water Resources Department.
- Practice incentives: Annual incentive payments above the basic annual per acre rental rate will be made based on the conservation practice installed. Incentive rates will be 25 percent for filter strips, 50 percent for riparian buffers, and 50 percent for wetland restoration.
- Maintenance: Participants will receive $5 to $10 per acre for annual maintenance based upon the conservation practice installed.

Installation compensation:

- Cost-Share: Landowners will receive 50 percent cost sharing from USDA, plus 25 percent cost sharing from Oregon State to establish trees, shrubs, and other components necessary for CREP practices. This 75 percent cost-sharing potentially limits a participating landowner's out-of-pocket expenses in establishing the habitat.

Cumulative Impact Bonus:

- Landowners can earn a one-time bonus incentive of four times their average annual soil rental rate if they enroll at least 50 percent of a five-mile stretch of stream. Neighbors along a stream can join together to be eligible for this bonus.

Signup Incentive Payments:

- Signup Incentive Payment **(Not applicable to CP-23 Wetland Restoration)**
  $10 per acre per each full year of contract
  Example: ($10 X 15 years X 1 acre = $150)
  This is a one-time payment and became available June 21, 2000.

Practice Incentive Payment:

- Practice Incentive Payment (PIP)
  (Not applicable to CP-23 Wetland Restoration)
  40 percent of eligible costs.
  Example: (Total eligible cost of putting in practice per acre is $800 X .40 = $320) If cost of installation is zero, Practice Incentive Payment is zero.
  This is a one-time payment and became available June 21, 2000.

What types of items can I receive cost sharing assistance on?
Cost sharing is available for riparian plantings, fencing and providing livestock water through the habitat (such as with nose pumps). There are not-to-exceed cost share amount guidelines in place.

What will happen to the land in 10-15 years when the contract expires?

- CREP lands *might* be eligible for re-enrollment, if the program is extended, but you may enroll CREP lands into a permanent easement in the original contract.
- The CREP buffer may be retained and good stewardship of your land may be continued.
- Portions of the CREP buffer may be commercially harvested (following proper Forest Practices Act requirements).
- Portions of the CREP buffer may be converted back into agricultural use (following proper regulations such as the Endangered Species Act and Agricultural Water Quality Management Act).

Permission to Access Property - When an applicant enters into a CREP contract, does that give permission for any agency to enter their property? If not, other than NRCS and FSA, who else can enter the property without the owner's authorization?
No, by signing a contract this does not give the right for any agency to enter the property. Participating agencies would be the Oregon Department Forestry, to develop the Tree Plan, or a SWCD employee who helps the producer develop the Conservation Plan of Operation, and/or the Oregon Water Resources Department to perfect the Water Right Lease if a producer is applying for the irrigated rental rate. In no case, should an employee be on the property without calling first and setting up an appointment and/or stopping by the headquarters to facilitate the visit to the producer's property.

Other than the NRCS-038 form that is used for receiving authorized access when a "Yes" is entered on the AD-1026, is there any other provision that automatically allows others to access the property?
NO

How does the CREP gel with the Agricultural Water Quality Management Act **process in regard to purposes, legal protection, etc.?**
Agricultural Water Quality Management Act establishes a process for agriculture to address watershed conservation efforts and identify the condition, problems, priorities, and solutions to maintain or enhance the watershed conditions. CREP is one of the programs available for a producer to enhance the stream corridor on his property.

How can I get more information and sign up?
Check out the website at www.or.usda.gov/edso/or/or.htm, or contact your local SWCD, USDA NRCS office, or Farm Service Agency office. The contact information is located in Appendix B.

Appendix B: Educational and Technical Services for Natural Resource and Farm Management

Soil and Water Conservation Districts (SWCDs)
Prepares management plans and helps implement them by coordinating with other technical experts in natural resources. Helps landowners obtain financial assistance for conservation projects.

Clackamas County:	503-655-3144
Marion County:	503-399-9927
Linn County:	541-926-2483

USDA – Natural Resources Conservation Service (NRCS)
Provides information on soil types, soils mapping, and interpretation. Administers and provides assistance in developing plans for Conservation Reserve Program (CRP), Environmental Quality Incentive Plan (EQIP), Wetland Reserve Program (WRP), and other cost share programs. Makes technical determinations on wetlands and highly erodible land.

Clackamas County:	503-655-3144
Marion County:	503-391-5741
Linn County:	541-967-5925

Oregon State University Extension Service
Offers educational programs, seminars, classes, tours, and publications to guide landowners in managing their resources.

Clackamas County:	503-655-8631
Marion County:	503-588-5301
Linn County:	541-967-3871

Oregon Department of Agriculture (ODA)
Oversees the Agricultural Water Quality Management program, issues permits and helps producers comply with confined animal feeding water management programs, provides support to Soil and Water Conservation Districts.
Natural Resources Division (Salem): 503-986-4700

Department of Environmental Quality (DEQ)
Responsible for protecting and enhancing 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, sets total maximum daily load (TMDL) allocations. Provides technical assistance and grants to assist with non-point source pollution issues (319 grant program).
Portland: 800-452-4011

USDA – Farm Service Agency (FSA)
Maintains agricultural program records and administers various cost share programs. Their offices also provide up-to-date aerial photography of farm and forestland.

Clackamas County:	503-655-3144
Marion County:	503-399-5741
Linn County:	541-967-5925

Department of State Lands (DSL)
Administers state removal/fill law and provides technical assistance.
Salem: 503-378-3805

Oregon Water Resources Department (WRD)
Provides technical and educational assistance and water rights permits and information.
Salem: 503-986-0900

Molalla-Pudding-French Prairie-North Santiam Subbasins Agricultural Water Quality Management Act

Local Advisory Committee (LAC)
Voluntary committee composed of twelve agricultural producers in the plan area. Charged with developing the agricultural water quality management Area Plan in accordance with Senate Bill 1010.
Marion SWCD Technical Manager: 503-399-5741 ext. 130
ODA Natural Resources Division: 503-986-4700

Oregon Department of Fish and Wildlife (ODFW)
Works with landowners to balance protection of fish and wildlife with economic, social, and recreational needs. Advises on habitat protection. Offers technical and educational assistance for habitat and restoration projects. Provides plan review for special property tax assessment for wildlife habitat projects.
North Willamette Watershed District: 971-673-6000

Oregon Department of Forestry (ODF)
Technical assistance with State and Federal cost sharing, Oregon property tax programs, Forest Resource Trust, forestry practices, and forest management plans.
Salem: 503-945-7200

Appendix C: Waterbodies with Approved TMDL and Waterbodies on 2010, 303(d) List

Table 4: The 2004-2006 "303(d) List" of violated Water Quality Parameters in the Molalla-Pudding-French Prairie-North Santiam AgWQM Area.

Water Body	Listed River Mile	Parameter	Season – Criteria	Assessment Year	Action
Beaver Creek	0 to 6.8	Temperature	Year Around (Non-spawning) – Core cold water habitat: 16.0 ºC.	2004	TMDL Completed
Butte Creek	11.9 to 35.6	Temperature	Year Around (Non-spawning) – Core cold water habitat: 16.0 ºC.	2004	TMDL Completed
Drift Creek	0 to 9.5	Temperature	Year Around (Non-spawning) – Salmon and trout rearing and migration: 18.0 ºC.	2004	TMDL Completed
Little Pudding River	0 to 18.3	DDT	Year Around	Previously Unlisted	TMDL Completed
Molalla River	0 to 25	Fecal Coliform	Fall/Winter/Spring	1998	Delisted 2004, but still showing impairment TMDL Completed
Molalla River	19.7 to 44.7	Temperature	August 15 – June 15 – Salmon and steelhead spawning: 13.0 ºC.	2004	TMDL Completed
Molalla River	18.2 to 48.3	Temperature	Year Around (Non-spawning) – Core cold water habitat: 16.0 ºC.	2004	TMDL Completed
Molalla River	0 to 25	Temperature	Summer	1998	Delisted 2004, but still showing impairment TMDL Completed
Pine Creek	0 to 7.2	Temperature	Year Around (Non-spawning) – Core cold water habitat: 16.0 ºC.	2004	TMDL Completed
Pudding River	0 to 35.4	DDT	Year Around	1998	TMDL Completed
Pudding River	0 to 35.4	Dieldrin	Year Around	Previously Unlisted	TMDL Completed
Pudding River	0 to 35.4	*E. Coli*	Fall/Winter/Spring	2004	TMDL Completed
Pudding River	0 to 35.4	Fecal Coliform	Summer	1998	Delisted 2004, but still showing impairment TMDL Completed

Pudding River	0 to 35.4	Iron	Year Around	2004	TMDL Completed
Pudding River	0 to 35.4	Manganese	Year Around	2004	Recommended for Delisting
Pudding River	0 to 61.8	Temperature	Year Around (Non-spawning) Salmon and trout rearing and migration: 18.0 ºC.	2004	TMDL Completed
Silver Creek	0 to 5.9	Fecal Coliform	Summer	1998	TMDL Completed
Silver Creek	0 to 5.9	Temperature	Summer -- Rearing: 17.8 ºC.	1998	TMDL Completed
South Fork Silver Creek	0 to 7	Temperature	Year Around (Non-spawning) - Salmon and trout rearing and migration: 18.0 ºC.	2004	TMDL Completed
Table Rock Fork Molalla River	0 to 8.3	Temperature	August 15 - June 15 -- Salmon and steelhead spawning: 13.0 ºC.	2004	TMDL Completed
Table Rock Fork Molalla River	0 to 12	Temperature	Year Around (Non-spawning) -- Core cold water habitat: 16.0 ºC.	2004	TMDL Completed
Teasel Creek	0 to 6.3	Temperature	Year Around (Non-spawning) -- Salmon and trout rearing and migration: 18.0 ºC.	2004	TMDL Completed
West Fork Little Pudding River	0 to 5.1	Dissolved Oxygen	January 1 - May 15	2004	Not addressed
West Fork Little Pudding River	0 to 5.1	E. Coli	Fall/Winter/Spring	2004	TMDL Completed
Zollner Creek	0 to 7.8	Arsenic	Year Around	2004	Recommended for Delisting
Zollner Creek	0 to 7.8	Chlordane	Year Around	2002	TMDL Completed
Zollner Creek	0 to 7.8	Dieldrin	Year Around	2002	TMDL Completed
Zollner Creek	0 to 7.8	DDT	Year Around	Previously Unlisted	TMDL Completed
Zollner Creek	0 to 7.8	Fecal Coliform	Fall/Winter/Spring	1998	TMDL Completed
Zollner Creek	0 to 7.8	Fecal Coliform	Summer	1998	TMDL Completed
Zollner Creek	0 to 7.8	Iron	Year Around	1998	TMDL Completed
Zollner Creek	0 to 7.8	Manganese	Year Around	1998	Recommended for Delisting
Zollner Creek	0 to 7.8	Nitrates	Year Around	2002	TMDL Completed

Zollner Creek	0 to 7.8	Temperature	Summer -- Rearing: 17.8 ºC.	1998	TMDL Completed
Willamette River Mainstem	24.8 to 54.8	Fecal Coliform	Fall/Winter/Spring	1998	TMDL Completed
Willamette River Mainstem	0 to 186.4	Mercury	Year Round	1998	TMDL Completed
Willamette River Mainstem	0 to 186.4	Temperature	Summer	1998	TMDL Completed
Santiam River	0 to 12	Temperature	Summer	1998	TMDL Completed
North Santiam River	0 to 10	Temperature	Year Around	1998	TMDL Completed
North Santiam River	10 to 26.5	Temperature	Year Around	1998	TMDL Completed
Bear Branch	0 to 9.8	Temperature	Summer	1998	TMDL Completed
Blowout Creek	0 to 11.9	Temperature	Summer	1998	TMDL Completed
Boulder Creek	0 to 2.4	Temperature	Summer	1998	TMDL Completed
Chehulpum Creek	0 to 7.1	Temperature	Summer	1998	TMDL Completed
Elkhorn Creek	0 to 7.4	Temperature	Summer	1998	TMDL Completed
Little North Santiam River	0 to 25.1	Temperature	Summer	1998	TMDL Completed
Marion Creek	0 to 6.2	Temperature	Summer	1998	TMDL Completed
Stout Creek	0 to 8.9	Temperature	Summer	1998	TMDL Completed
Unnamed tributary to Marion Creek	0 to 2.8	Temperature	Summer	1998	TMDL Completed
Bashaw Creek	0 to 4.8	Fecal Coliform	Year Around	1998	TMDL Completed
Clark Creek	0 to 1.9	E. Coli	Year Around	1998	TMDL Completed
Mill Creek	0 to 25.7	Fecal Coliform	Year Around	1998	TMDL Completed
Patterson Creek	0 to 7.2	Temperature	Summer	1998	TMDL Completed
Pringle Creek	0 to 6.2	E. Coli	Year Around	1998	TMDL Completed
Pringle Creek	0 to 6.2	Temperature	Summer	1998	TMDL Completed
Sinker Creek	0 to 3.8	Temperature	Year Around	2004	TMDL Completed

Appendix D: Description of Healthy Riparian Management

Healthy riparian areas exist where vegetation, landform, large wood, and other physical components and processes are adequate to:

- Protect water quality,
- Filter sediment and other pollutants and capture bedload materials,
- Develop root masses and large wood accumulations that develop channel form and habitat,
- Develop diverse ponding and channel characteristics to provide the habitat and water depth, duration and temperature necessary for fish and wildlife production and other uses,
- Support biodiversity.

Where a floodplain exists, riparian areas also provide additional benefits associated with floodplain functions, including:

- Aiding development of floodplain structural diversity,
- Dissipating stream energy associated with high waterflows, thereby reducing erosion,
- Enhancing ground water recharge and streamflows.

The Riparian Management Area is a vegetated area created by active establishment or natural regeneration. It meets or is in the process of building the main riparian or stream area functions according to the conditions of the landscape as described above. The Riparian Management Area Prevention and Control Measure applies to perennial and intermittent streams.

The riparian area serves many functions. Specific functions related to water quality issues are shade (temperature), surface runoff, subsurface runoff, and stream bank stability. These functions will address water quality issues on the federal Clean Water Act 303 (d) list (also referred to as the Water Quality Limited list for those streams that have violations of one or more water quality standards) for streams in the plan area.

The riparian functions are partially achieved by vegetation on the stream bank and to an area extending out from "top of stream bank." The width of the vegetation will be site specific to the stream and to the location on the landscape. Streams located with upland sloping to the stream will require wider vegetation for filtering than valley streams with natural levees that provide slope away from the stream. Valley streams may require wider vegetation for subsurface filtering than upland streams. Stream bank stability will vary with stream slope, which is directly related to stream velocity.

The type of vegetation will vary with the identified function or functions. Type of vegetation will match site conditions, such as soils, hydrology and stream size. To achieve shade on a large stream, trees will be required. On small streams shrubs can achieve the same shade function. Well-drained soils will support fir trees while wet soils may require ash or willow trees.

Resource Management Area

The area rules require that the Riparian Management Area be managed or allowed to meet the functions for the site condition. These functions include shade, filtering, and streambank stability, and can include others depending on the landowner/operator needs and goals. To meet the functions, vegetation is a requirement. If agricultural activities are practiced in the Riparian Management Area, the area rules require that the activities allow natural vegetation growth.

Livestock Grazing Example[2]
A stream runs through an agricultural property. The stream's average width is 15-20 feet. It floods over its banks on average once every one to two years.

Management Goals:
Manage the riparian area to improve habitat and water quality for salmon, while continuing to graze livestock in the remaining pastures.

Riparian Assessment:
The riparian area is managed as a mixture of grasses with patches of mature willows and alders. It is capable of supporting a mixture of conifers (such as spruce, grand fir, and western red cedar) and hardwoods (such as alder, Oregon White ash, and big leaf maple). A thin band of willows could grow next to the stream.

Management Change:
The landowners will set aside a 25-foot-wide area next to the stream as a riparian management area. They will plant patches of hardwoods and conifers in this area and a thin band of willows next to the stream. Some tree species and grass species will seed into the area naturally.

Protecting the Investment:
The landowners will install a fence and off-stream watering sources to ensure the trees are not grazed and the stream bank is not disturbed. To prevent brush from overtopping desired trees, they also will remove or trim competing brush until trees are above brush height.

Cropland Example
All of the factors in the Livestock Grazing would apply except fencing would not be required.

Special Considerations:
The application of pesticides and fertilizers must be managed to stay on the field area. Special care is needed applying pesticides to avoid drift into the Riparian Management Area. Fertilizer application should be applied according to soil tests and with split applications to maximize nutrients being tied to the soil and plant roots. Fertilizer applications should be done when expected rainfall will not wash the nutrients into the Riparian Management Area or stream. Pesticide and fertilizer applications near Riparian Management Areas should be done in the winter months only when absolutely necessary.

[2]Adopted from: Godwin, Derek. (1999). *Life on the Edge: Improving Riparian Protection*. EM 8738 Oregon State University Extension Service

Appendix E: Erosion Visual Indicators and Measurement

The goal of the Erosion Prevention and Sediment Control Measure referred to in this plan is to control soil erosion and minimize eroded soil access to waterways. A landowner/operator can determine the amount of potential soil that has access to a waterway using the visual indicators of sheet and rill erosion together with the deposition of the sediment of the eroded soil. The landowner/operator can measure the visual erosion in tons per acre. Sediment deposition from this erosion can also be measured. Subtracting this from the total erosion gives an approximation of how much sediment left the field and potentially entered a nearby waterway.

Sheet Erosion rate can be measured in the field by pedestal measurement or root measurement. Pedestals represent the soil particles protected from raindrops by rock, straw, roots, or other material that can withstand the impact of raindrops. Measure the depth of the pedestal from the top of the pedestal, where erosion did not take place, to the soil level immediately around it where soil was eroded away. Root measurement can be performed by inspecting plants in a field to determine how much of the plant roots had been previously covered with soil. The white portion of the roots represents the area previously covered by soil. Measure the depth of the white area, from the top of the white area to the soil level. In each case, the depth is determined and then multiplied by 43,460 square feet (1 acre) to determine cubic feet of soil eroded. The cubic feet is multiplied by 90 pounds per cubic foot and then divided by 2,000 pounds to provide the erosion rate in tons per acre (Table 1).

Rill Erosion rate can be measured in the field by using 20-foot transects across the field, and measuring the width and depth of each rill within the transect to get a field average cross-section of soil lost by rill erosion. The cross-section is the width and depth of the rills. The width multiplied by the depth multiplied by the length of the rills will give the volume. To avoid conversion of cubic inches to cubic feet, measure the rills in feet and tenths of feet. The volume will be converted to tons per acre as in sheet erosion (Table 1).

Sediment deposition can be measured by the average end area method. This method is difficult to explain here. Generally, it is a scientifically accepted way to measure how much soil has been deposited at the base or low point of some area, such as a farm field. Consult a Civil Engineering reference book or textbook for methodology of computing average end area, or contact a local expert. Subtracting the result from the pedestal, white root, or sheet soil erosion estimates will provide an estimate of how much soil left the field and potentially entered into any nearby waterway.

Anyone wishing assistance in erosion measurement and estimation can contact the local SWCD, NRCS or OSU Extension Service.

Table 1: Soil Erosion Estimation Methods

Example of Pedestal or Root Method to Estimate Sheet Erosion

Average pedestal or white root depth in a field _ 0.50 inches _ 0.04 feet
0.04 ft x 43,460 ft^2 = 1,738.40 ft^3 of soil lost per acre
1,738.40 ft^3 x 90 lbs/ft^3 = 156,456 lbs of soil/acre
156,456 ÷ 2000 lbs/ton _ 78.05 tons of soil lost per acre

For a 10-acre field, this would equal 780.5 tons of eroded soil
For a 100-acre field, this would equal 7,805 tons of eroded soil
(assuming a constant soil erosion rate over the entire field)

Example of Method to Estimate Rill Erosion

Average rill depth _ .75 inches _ 0.06 feet
Average rill width _ .50 inches _ 0.04 feet
Total rill length _ 10,000 feet
0.06 ft x 0.04 ft x 10,000 ft _ 24 ft^3
24 ft^3 x 90 lbs/ft^3 = 2,160 lbs soil/acre
2,160 lbs soil/acre ÷ 2,000 lbs/ton _ 1.08 tons of soil lost per acre

Key:

≈ means "approximately equals"
ft^2 means "square feet"
ft^3 means "cubic feet"
lbs means "pounds"

Appendix F: Silver Creek Focus Area Action Plan

Silver Creek Focus Area Project
Molalla-Pudding-French Prairie-North Santiam Sub-basins
Agricultural Water Quality Management Area
Marion SWCD – *Action Plan for 2013-2015*

Description of Focus Area

Silver Creek Watershed drains 24 square miles of a 15,048 acre sub-watershed of the Pudding River Watershed. Silver Creek's source is located in the western foothills of the Cascades where two tributaries known as the North and South Forks of Silver Creek emerge. The tributaries soon converge into the Silver Creek mainstem and then flow downstream until it empties into the Silverton Reservoir. From there the stream travels through the city of Silverton, winding its way through agricultural bottom lands until its confluence with the Pudding River. Silver Creek Watershed is zoned as 45% farm and timber conservation, 38% exclusive farm use, 11 % urban, 4% rural residential, and 2% park and recreation. The area's main agricultural products are grass seed, legumes, vegetable crops, Christmas trees, and nurseries. The city of Silverton lies in the center and is 4% of the watershed. The focus area concentrates on those reaches of the lower Silver Creek mainstem downstream from the city of Silverton influenced by agricultural landuse and encompasses approximately 3.6 river miles of the lower Silver Creek mainstem including the upland areas comprising approximately 2,408 acres, 133 parcels and 78 landowners.

Basis for Selection of Focus Area

The Marion SWCD Board and staff determined the focus area based on Marion SWCD goals, ODA considerations for the focus area, and these other factors:

- Stream is on DEQ's 303 d listing for impaired waterbodies and has TMDL development
- Is a high use agricultural area of Marion County
- Capacity of the Marion SWCD and allocated timeframe for completion
- Available water quality/ stream discharge data

Water Quality Parameters of Concern

Water quality parameters of concern within Silver Creek:

- Stream temperature for summer rearing 17.8◦C
  - (303d listed 1998: TMDL Completed from 0-5.9 river mile)
- Fecal coliform:
  - (303d listed 1998: TMDL Completed from 0-5.9 river mile)
- Dissolved Oxygen:
  - (303 d listed 2012: Year round from 2-16.2 river mile and from October 15-May 15 from 0.9-16.2 river mile)
- Sediment; excess nutrients and bacteria; pesticide runoff-overall water quality
- Water quantity
- Riparian condition

Concerns were indicated in the:

- Marion SWCD 5-Year Action Plan
- Molalla-Pudding-French Prairie-North Santiam Sub-basins Agricultural Water Quality Management Area Plan (ODA-MSWCD 2010)
- Molalla-Pudding Subbasin TMDL and WQMP report (ODEQ 2008)
- Willamette Basin Rivers and Streams Assessment for An Oregon Plan for Salmon and Watersheds (ODEQ-OWEB 2009)

Description of Assessment Method:
The assessment is very general but seeks to understand the overall condition of the lower Silver Creek sub-watershed and the impacts, both positive and negative, from agricultural landuse on water quality. The project includes five assessment phases:

- GIS analysis using aerial orthophotos to determine streamside vegetation along Silver Creek. (pre-assessment completed; site-pre assessments ongoing; post assessment to be completed in 2014)
- The proper functioning condition of the lower Silver Creek mainstem. (completed)
- Upland terrain review of agricultural activities and their influence on stream function and water quality. (active)
- Voluntary landowner requests to review their agricultural landuse and its influence on water quality and stream function. (active)
- A water quality survey created for the agricultural community to express their views on water quality and water quality management in their watershed. (Completed)

Streamside Vegetation Assessment: The Oregon Department of Agriculture (ODA) recommended to Districts while conducting the focus area project they complete an orthophoto aerial assessment of vegetation found within a 35-foot assessment width from the center of the stream. The District's GIS Specialist will complete both a pre and post assessment by hand digitizing the vegetation along Silver Creek using the proposed vegetation categories supplied by ODA. Once the digitization is completed an analysis of each vegetation category by acreage and percent composition will be reported using the ODA's Stream Vegetation Assessment Template and then submitted to ODA. Furthermore, the delineated vegetation categories will be subject to ground truth for validity from road vantage points and site visits. Polygons will then be updated to reflect any changes based on actual conditions as needed. This process will be repeated in 2015 as a post assessment in order to capture any changes as well as for ODA to track pre and post SVA results.

Proper Functioning Condition Assessment of Silver Creek: Streambank condition and the riparian vegetation assessment of Silver Creek will utilize the strategy and approach of the Proper Functioning Condition (PFC) assessment methodology developed by the Bureau of Land Management, Natural Resources Conservation Service (NRCS), and United States Forest Service for the U.S Department of Agriculture and the Department of Interior (1998/2013). The PFC method is a qualitative method for assessing the condition of riparian areas. The term PFC is used to describe both the assessment process and define the condition of riparian functions.

Upland Terrain Review: The upland terrain review was designed to capture current conditions in the upland portion of the lower Silver Creek sub-watershed and look for water quality improvement opportunities. The focus area was divided into four segments and then was assessed both on an aerial scale and from road viewpoints.

Parcel assessments: Landowners in the focus areas will be contacted through mailings and outreach actions to provide information and opportunities for individuals to voluntarily engage in the focus area project. These efforts will hopefully encourage landowners to request an assessment of their agricultural landuse practices and its influence on water quality and stream function using the area's agricultural water quality management plan as a basis for determination. Once completed, Marion SWCD staff can offer to provide technical support and planning based on the results of the parcel assessment. Results from these assessments will remain private and reported in the final project report as the number of parcels and acreage assessed.

Water quality survey: A questionnaire created by Marion SWCD will be sent to landowners and residents asking for their views on water quality management in their area. Selection of the survey

area will include the focus area as well as those landowners and residents which lie within Marion County's Exclusive Farm Use Zone bounded within the lower Silver Creek sub-watershed.

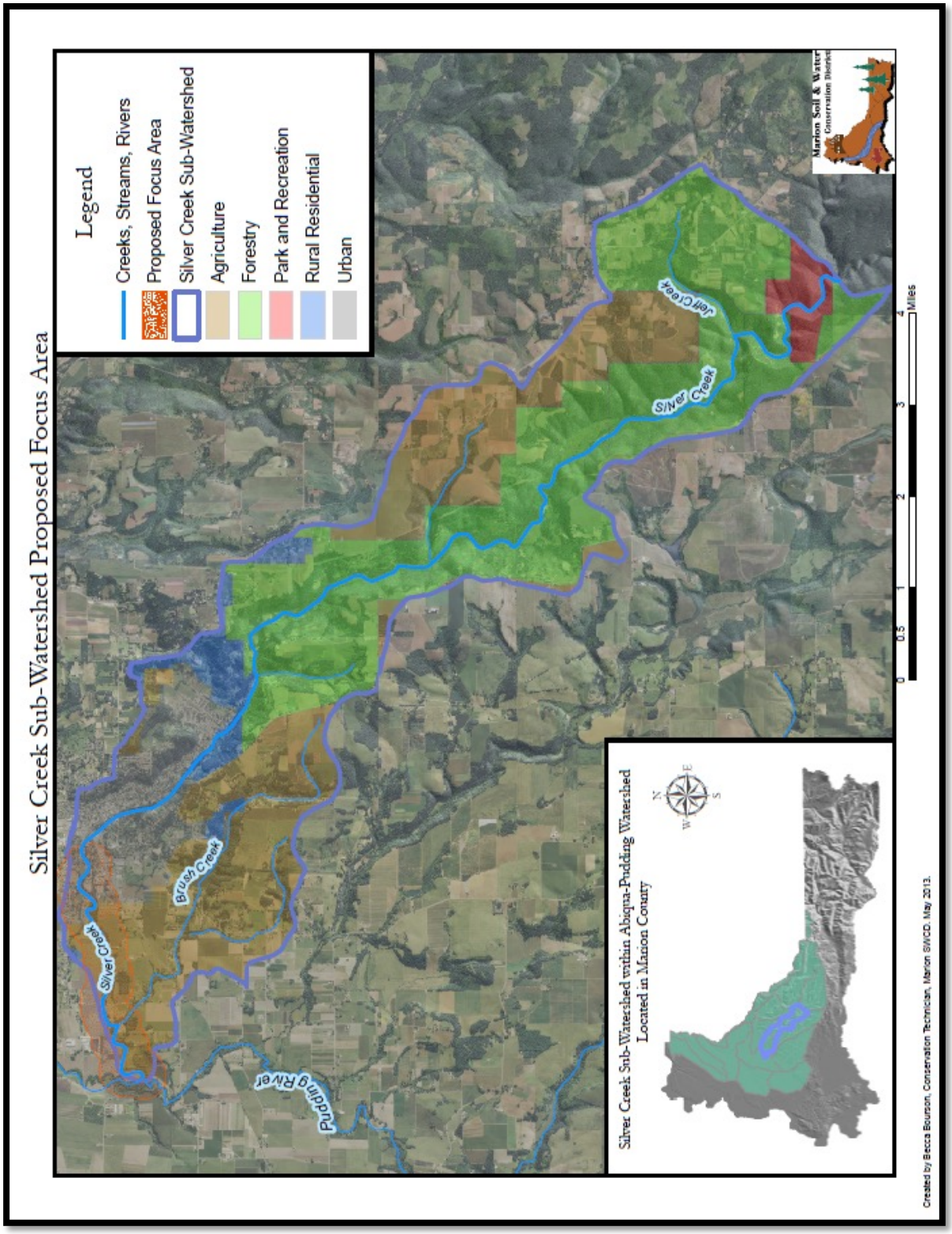
Implementation Timeline

Implementation Timeline	
Timeframe (quarters)	**Activity**
Q1: July 1-September 30 2013	- Develop the Silver Creek Focus Area Action Plan and methodology. - Develop a mailing and outreach strategy for the SCFA agricultural community gain permission to access and notify them of our presence and efforts to come; plan on attending outreach events in the project area. - Prepare/ build capacity for the assessment; assemble a Marion SWCD interdisciplinary team for the SCFA assessment; purchase necessary equipment, supplies and complete relevant trainings. - Prepare and attend webinars for the Social Indicator survey development, implementation, and analysis to be sent to the SCFA in Q3. - Begin the orthophoto aerial assessment and digitize the riparian vegetation along Silver Creek: attend ODA webinars for methodology and result reporting. - Complete PFC condition assessment of Silver Creek. Review of Brush Creek - Enter, store, and begin analysis of data, mapping elements, and photos. - Request landowners in the focus area to allow us to complete a parcel assessment.
Q2: October 1-December 31, 2013	- Complete the ortho aerial assessment and digitizing of Silver Creek vegetation; analyze vegetation categories and add into template. - Finish analyzing the PFC assessment data of Silver Creek, review with team, prepare a draft report. - Complete any parcel assessments as requested by landowners. - Complete an upland terrain review of the project. - Continue to develop and implement outreach and marketing strategies within the project boundary to engage landowners in voluntary actions and parcel assessments needed to improve water quality and riparian condition along stream reaches of their influence. - Complete a list of priorities established by the results of the assessment. - Plan a local area workshop highlighting the focus area project, MSWCD services, SB 1010 and the Ag. WQMP and agricultural practices and activities that improve water quality and riparian function tailored to the area (planning in Q2 and implement in Q3). Identify outside partnerships for collaboration.

Q3: January 1 – March 31, 2014 **Q4: April 1 – June 30, 2014** **Q5: July 1- September 30 2014** **Q6: October 1- December 31, 2014**	- Continue to plan and carry out outreach strategies and events throughout the duration of the project which engage landowners in completing a voluntary parcel assessment and to apply BMPs designed to improve impacts associated with agricultural landuse, with emphasis on those priorities established from the stream and upland terrain assessments. - Hold the Silver Creek Land Management Series Workshop in February 2014. - Prepare the water quality survey and mail to landowners and residents in the lower Silver Creek sub-watershed. Tabulate and report results. - Complete any pre-terrain assessments and pre-SVA ground truth tasks remaining. - Update the Silver Creek Action Plan.
Q7: January 1 – March 31, 2015 **Q8: April 1 – June 30, 2015**	- Complete the post SVA including updates of streamside vegetation polygons from site visits, ground truthing and implemented conservation projects; analyze results, compare to year one; provide results in the ODA SVA template as well as discuss in final SCFA report. - Continue to plan and carry out outreach strategies and events throughout the duration of the project which engage landowners in completing a voluntary parcel assessment and to apply BMPs designed to improve impacts associated with agricultural landuse, with emphasis on those priorities established from the PFC and upland terrain assessments. - Complete a final report for ODA with project results.

Two-Year Implementation Summary:
In addition to the quarterly reporting, a final project report with results, photos, tables, and maps of the activities completed in the 2013-2015 Silver Creek Action Plan will be delivered by June 30, 2015 to ODA. The report will include:

- *Proper Functioning Condition assessment of Silver Creek.*
- *Number of landowners contacted by outreach efforts and attended the workshop.*
- *Number of landowners who completed voluntary parcel assessments.*
- *Number of landowners who engaged in the project's goals and the amount of funding (if any) garnered through the MSWCD grants programs and summation of technical advice implemented on the ground or adapted by landowners.*
- *Water quality survey results of landowners/ growers views on water quality management in their area.*
- *Discussion of key points that led to any project success.*
- *Address failed efforts at landowner engagement and enrollment into the project goals.*


Silver Creek Sub-Watershed Proposed Focus Area
Legend
Creeks, Streams, Rivers
Proposed Focus Area
Silver Creek Sub-Watershed
Agriculture
Forestry
Park and Recreation
Rural Residential
Urban
Silver Creek
Brush Creek
Pudding River
Silver Creek
Jeff Creek
0
0.5
1
2
3
4
Miles
Silver Creek Sub-Watershed within Abiqua-Pudding Watershed
Located in Marion County
N
E
S
W
Created by Becca Bourson, Conservation Technician, Marion SWCD. May 2013.

Appendix G: The Conservation Planning Process

The USDA - NRCS has developed, and the Local Management Agency may choose to use the following nine-step process to develop a voluntary plan.

1. Identify Problems -- Identify resource problems, opportunities, and concerns in the planning area.

2. Determine Objectives -- Identify, agree on, and document the client's objectives.

3. Inventory Resources -- Inventory the natural resources and their condition, and the economic and social considerations. This includes on-site and related off-site conditions.

4. Analyze Resource Data -- Analyze the resource information gathered in planning step 3 to clearly define the natural resource conditions, along with economic and social issues. This includes problems and opportunities.

5. Formulate Alternatives -- Formulate alternatives that will achieve the client's objectives, solve natural resource problems, and take advantage of opportunities to improve or protect resource conditions.

6. Evaluate Alternatives -- Evaluate the alternatives to determine their effects in addressing the client's objectives and the natural resource problems and opportunities. Evaluate the projected effects on social, economic, and ecological concerns. Special attention must be given to those ecological values protected by law or Executive Order.

7. Make Decisions -- The client selects the alternative(s) and works with the planner to schedule conservation system and practice implementation. The planner prepares the necessary documentation.

8. Implement the Plan -- Implement the selected alternative(s). The planner provides encouragement to the client for continued implementation.

9. Evaluate Plan -- Evaluate the effectiveness of the plan as it is implemented and make adjustments as needed.

Appendix H: Instructions and Guidelines for a Voluntary Conservation Plan

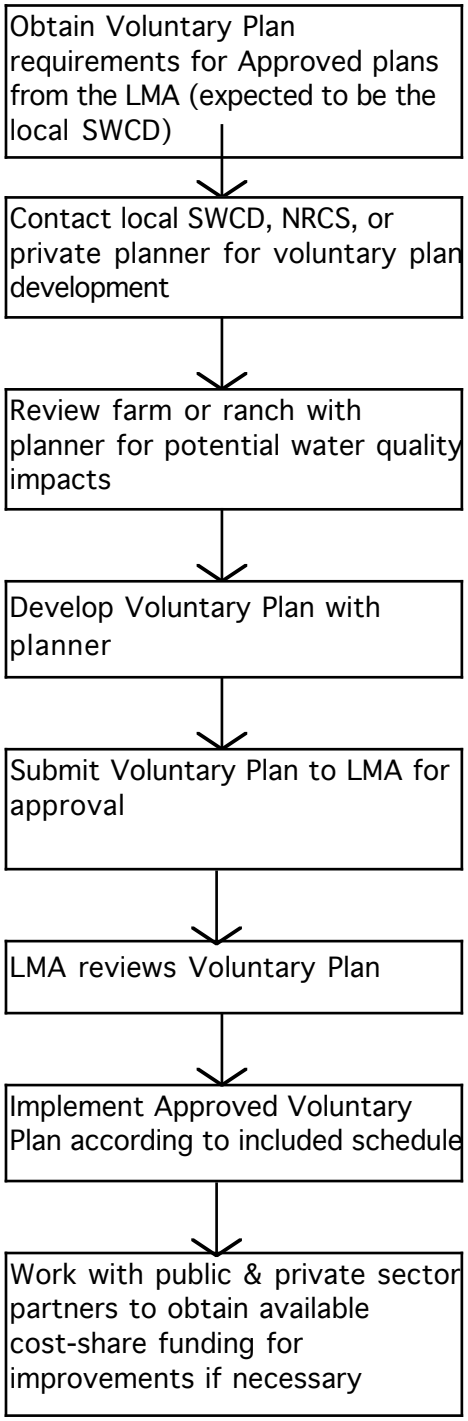
One of the ways to achieve our area water quality management mission is through the development of Voluntary Plans or Conservation Plans for individual farms. A Voluntary Plan or Conservation Plan contains natural resource information and a record of decisions made by the landowner/operator. It contains a schedule of operations and activities that are needed to solve identified natural resource issues on the land. In particular, the Voluntary Plan should describe specific measures needed to address the water quality issues outlined in this area water quality management plan. Voluntary Plan designs have the flexibility for use by large agricultural operations as well as small acreage operations and so called "hobby farms" where a family may be raising a single horse or other livestock animal. Large and small operations can benefit from the educational opportunities that are part of putting a Voluntary Plan together. Voluntary Plans can often help the landowner/operator identify activities and cost share opportunities.

A Voluntary or Conservation Plan is exactly that, voluntary. A landowner is NOT required to have a Voluntary Water Quality Farm Plan or Conservation Plan. The landowner/operator may choose, which management approaches and practices the individual prefers to use. Voluntary Plans may be drawn up not only by the landowner/operator, but also by consultants or by technicians available through the local SWCD or the USDA NRCS.

One method of developing a Voluntary Plan or Conservation Plan is the nine-step planning process developed by the USDA NRCS. It is flexible enough to meet landowner and natural resources needs, and may address federal, state and local requirements. Landowners/operators working with the local SWCD and/or USDA NRCS can implement a Voluntary Plan that would improve operations, and protect water quality. The Voluntary Plan should describe the management system schedule of conservation practices, and operation and maintenance procedures, that the landowner/operator will use to conserve soil, water, air, plants, and animal resources on all or part of the farm unit, and the effect on economic and social conditions. The Voluntary Plan should include all contiguous and noncontiguous land that is part of the landowner's enterprise, including owned and rented land. (See Appendix G: The Conservation Planning Process).

For additional guidance in developing a Voluntary Plan, an example template and plan is available from the Marion SWCD.

Figure 4: Flow Chart for Development and Approval of a Voluntary Water Quality Farm Plan or Conservation Plan



Appendix I: Common Agricultural Water Quality Parameters of Concern

The following parameters are used by DEQ in establishing the 303(d) List and assessing and documenting waterbodies with TMDLs. Note: This is an abbreviated summary and does not contain all parameters or detailed descriptions of the parameters and associated standards. Specific information about these parameters and standards can be found at: http://www.deq.state.or.us/wq/assessment/assessment.htm or by calling (503) 229-6099.

Parameters

Bacteria: *Escherichia coli (E. coli)* is measured in streams to determine the risk of infection and disease to people. Bacteria sources include humans (recreation or failing septic systems), wildlife, and agriculture. On agricultural lands, E. coli generally comes from livestock waste, which is deposited directly into waterways or carried to waterways by livestock via runoff and soil erosion. Runoff and soil erosion from agricultural lands can also carry bacteria from other sources.

Biological Criteria: To assess a stream's ecological health, the community of benthic macro invertebrates is sampled and compared to a reference community (community of organisms expected to be present in a healthy stream). If there is a significant difference, the stream is listed as water quality limited. These organisms are important as the basis of the food chain and are very sensitive to changes in water quality. This designation does not always identify the specific limiting factor (e.g., sediment, nutrients, or temperature).

Dissolved Oxygen: Dissolved oxygen criteria depends on a waterbody's designation as fish spawning habitat. Streams designated as salmon rearing and migration are assumed to have resident trout spawning from January 1 – May 15, and those streams designated core cold water are assumed to have resident trout spawning January 1 – June 15. During non-spawning periods, the dissolved oxygen criteria depends on a stream's designation as providing for cold, cool or warm water aquatic life, each defined in OAR 340 Division 41.

Harmful Algal Blooms: Some species of algae, such as cyanobacteria or blue-green algae, can produce toxins or poisons that can cause serious illness or death in pets, livestock, wildlife, and humans. As a result, they are classified as Harmful Algae Blooms. Several beneficial uses are affected by Harmful Algae Blooms: aesthetics, livestock watering, fishing, water contact recreation, and drinking water supply. The Public Health Department of the Oregon Health Authority is the agency responsible for posting warnings and educating the public about Harmful Algae Blooms. Under this program, a variety of partners share information, coordinate efforts and communicate with the public. Once a waterbody is identified as having a harmful algal bloom, DEQ is responsible for investigating the causes, identifying sources of pollution and writing a pollution reduction plan.

Mercury: Mercury occurs naturally and is used in many products. It enters the environment through human activities and from volcanoes, and can be carried long distances by atmospheric air currents. Mercury passes through the food chain readily, and has significant public health and wildlife impacts from consumption of contaminated fish. Mercury in water comes from erosion of soil that carries naturally occurring mercury (including erosion from agricultural lands and streambanks) and from deposition on land or water from local or global atmospheric sources. Mercury bio-accumulates in fish, and if ingested can cause health problems.

Nitrate: While nitrate occurs naturally, the use of synthetic and natural fertilizers can increase nitrate in drinking water (ground and surface water). Applied nitrate that is not taken up by plants is readily carried

by runoff to streams or infiltrate to ground water. High nitrate levels in drinking water cause a range of human health problems, particularly with infants, the elderly, and pregnant and nursing women.

Pesticides: Agricultural pesticides of concern include substances in current use and substances no longer in use but persist in the environment. Additional agricultural pesticides without established standards have also been detected. On agricultural lands, sediment from soil erosion can carry these pesticides to water. Current use agricultural pesticide applications, mixing-loading, and disposal activities may also contribute to pesticide detections in surface water. For more information, see at: http://www.deq.state.or.us/wq/standards/toxics.htm

Phosphorous/Algae/pH/Chlorophyll a: Excessive algal growth can contribute to high pH and low dissolved oxygen. Native fish need dissolved oxygen for successful spawning and moderate pH levels to support physiological processes. Excessive algal growth can also lead to reduced water clarity, aesthetic impairment, and restrictions on water contact recreation. Warm water temperatures, sunlight, high levels of phosphorus, and low flows encourage excessive algal growth. Agricultural activities can contribute to all of these conditions.

Sediment and Turbidity: Sediment includes fine silt and organic particles suspended in water, settled particles, and larger gravel and boulders that move at high flows. Turbidity is a measure of the lack of clarity of water. Sediment movement and deposition is a natural process, but high levels of sediment can degrade fish habitat by filling pools, creating a wider and shallower channel, and covering spawning gravels. Suspended sediment or turbidity in the water can physically damage fish and other aquatic life, modify behavior, and increase temperature by absorbing incoming solar radiation. Sediment comes from erosion of streambanks and streambeds, agricultural land, forestland, roads, and developed areas. Sediment particles can transport other pollutants, including bacteria, nutrients, pesticides, and toxic substances.

Temperature: Oregon's native cold-water aquatic communities, including salmonids, are sensitive to water temperature. Several temperature criteria have been established to protect various life stages and fish species. Many conditions contribute to elevated stream temperatures. On agricultural lands, inadequate streamside vegetation, irrigation water withdrawals, warm irrigation water return flows, farm ponds, and land management that leads to widened stream channels contribute to elevated stream temperatures. Elevated stream temperatures also contribute to excessive algal growth, which leads to low dissolved oxygen levels and high pH levels.

Appendix J: Willamette River Basin Water Quality Study

Phase II

Non-Point Source Pollution in the Pudding River Subbasin of the Willamette River

By: E&S Environmental Chemistry, Inc. and Tetra Tech, Inc.
June 27, 1995

Prepared For: Oregon Department of Environmental Quality
Water Quality Division
Portland, Oregon 97204

EXECUTIVE SUMMARY

Nonpoint sources (NPS) of pollution were identified as important contributors to water quality degradation of the Willamette River in Phase I of the Willamette River Basin Water Quality Study, which was completed in 1993. However, there was an acute scarcity of water quality data within the basin, particularly during periods of high discharge, which typically account for the majority of NPS contributions to river systems. This data deficiency precluded rigorous quantification of NPS loads in specific components of the basin, and also prevented Willamette River Study scientists from assigning NPS contributions to the various land uses that are prevalent within the basin. Phase II of the study was designed, in part, to correct this deficiency, and the results of the Phase II activities are described herein.

The NPS screening model that was applied in Phase I indicated that the Pudding River Subbasin contributed some of the greatest loads of total suspended solids (TSS), total phosphorus (TP), and nitrogen (N) on an area-weighted basis in the Willamette River Basin. The Pudding River Subbasin has a high percentage of agricultural land use, and is currently being studied by the U.S. Geological Survey as part of their NAWQA study of the Willamette River Basin. This sub-basin was therefore selected for intensive monitoring and NPS modeling in Phase II.

The principal objectives of the Phase II study were to characterize the effects on water quality of specific land use types and land use intensities within the basin, and to use this information to estimate NPS loads at the watershed and subbasin levels. Four sites within three watersheds were selected for study within the Pudding River system: one intensive agricultural site on Zollner Creek; two low-intensity agricultural sites on Beaver Creek; and a forested site on Silver Creek. A fifth site was located downstream at the Pudding River at Aurora to assess total loadings for the subbasin. Land use, soils, and hydrologic features were characterized at
1:24, 000 scale in the three study watersheds and at a coarser scale (1:100,000) for the subbasin.

The water quality monitoring involved sampling water quality during baseflow and stormflow at five primary sites and over 25 supplemental sites. Each of the primary sites was sampled five times during baseflow and 10 to 14 times during each of five storms during the period from October 1994 to February 1995.

Results from the water quality monitoring showed that there was a strong relationship between water quality and land use activities within the watersheds. Water quality in the forested site was generally excellent, although some elevated loads of TSS were measured, particularly during the first major storm in the fall. The water quality at the two low-intensity agricultural sites on Beaver Creek showed higher

concentrations of TSS, TP, nitrates (NO_3), and major ions than the forested site. However, the predominant crop in the Beaver Creek watershed, grass seed, promotes adequate vegetable cover during high flow periods, resulting in only modest increases in pollutant loads above those measured in the forested watershed. The greatest concentrations and loads of NPS pollutants were generated by the high-intensity agricultural watershed. Concentrations of TSS, TP, NO_3, NH_4, major ions, and coliform bacteria in Zollner Creek were all indicative of highly polluted water. Concentrations of TSS, TP, and total Kjeldahl nitrogen in Zollner increased with increasing runoff and generally reached maximum concentrations just prior to maximum streamflow. Concentrations of NO_3 increased dramatically during the first storm and continued to increase as the stormflow receded, ultimately reaching a maximum of 27 mg/L (as NO_3-N). Nitrate concentrations in Zollner Creek were often well above the drinking water standard (10 mg/L). Nitrate in subsequent storms was diluted by the surface runoff, but increased again during decreasing stream flow. The observed dynamics of NO_3 in Zollner Creek indicated that most of the NO_3 was derived from accumulations in the deep soils (below the rooting zone) and was gradually flushed from the groundwater during hydrologic flows resulting from storm events. Water quality in the Pudding River integrated inputs from the diverse watersheds in the subbasin resulting in runoff of intermediate quality.

The water quality data collected in this study were used to calibrate NPS models based on the modified universal soil loss equation (MUSLE) and spatial characteristics of the watershed (land use, soils, hydrography) using a geographic information system (GIS) framework. The water quality was modeled on a time step equivalent to the duration of a storm, typically about 100 hours. Pollutant loads in most storms were well represented by the model. The greatest calibration problem was associated with the first major storm in October in which measured runoff was far less than predicted runoff and the concentrations of some NPS pollutants were underpredicted. The former was caused by the inability of the model to reflect the extremely high moisture deficit of the soils associated with the dry summer and early fall. The calibration process revealed that the intensity of agricultural practices was more important than general land use categories in assigning pollutant loading coefficients. For example, the pollutant load associated with runoff from grass seed farms appeared to be substantially less than runoff from more intensively cultivated wheat and grain crops. However, grain crops and grass seed fields appear similar on the aerial photographs typically used to characterize land use. The NPS modeling in the agricultural watershed was difficult, in part because of extensive modifications to surface and sub-surface hydrology associated with ditches and tile drains.

The modeling activity was conducted for the entire Pudding River subbasin using more generalized data inputs for land use, soils, and watershed features. The subbasin model results for the Pudding River showed moderate agreement with measured values for individual storms. For all storms combined, however, the model results were in reasonable agreement, with measured values differing by 20%, 14%, and 46% for total suspended solids ,TP, and Nitrate (NO3) respectively.

The monitoring and modeling activities conducted within this study demonstrated that NPS pollution seriously impairs water quality in portions of the Willamette Valley. Among the more intensive agricultural watersheds, water quality problems include high-suspended solids, high nutrients, bacterial contamination, and a complete alteration of the major ion chemistry. Additionally, very high concentrations of NO3 measured in stormflow downstream from intensive agriculture strongly suggest that aquifers in some areas of the valley are receiving excessive loads of NO3 that may lead to groundwater pollution problems.

Appendix K: Molalla-Pudding Monitoring Summary

The questions below and the answers were completed during the 2010 biennial review. These have been retained to provide historical inforamation about monitoring.

1. Are farmers and conservation partners making investments to improve water quality? How many projects have been put in and where, and how much has been invested?

Farmers and conservation partners are clearly making investments to improve water quality. Implementation activities for the past two years reported by the Marion Soil and Water Conservation District (SWCD) in Appendix L, show the levels of investment and the diversity of the projects accomplished.

It is difficult to track the locations of some of the projects accomplished because of privacy constraints on project information. Landscape assessments can capture some of these improvements, even if project data are not readily available. It is likely that projects are distributed throughout the management area in response to landowner-initiated requests for project assistance.

Recommendations:

- Utilize partnerships within the basin, and participate in monitoring data analysis and results meetings for prioritization of projects.
- Advertise success stories and conservation efforts to stakeholders.

2. Are the investments that farmers and conservation partners are making contributing to improvements in water quality and landscape conditions?

While we strongly believe that investments are successfully leading to landscape conditions that contribute to improved water quality, it has been difficult to document these expected improvements. As described in the answer to question 3, water quality appears to be improving in some areas and staying the same in others. It is difficult to determine whether these trends are a result of agricultural water quality projects or not, because the locations of some of the projects implemented are unknown.

The North Santiam Watershed Council has been accepted into the Meyer Memorial Trust Model Watershed Program. The program supports focused restoration work to address limiting factors for salmonids. Within the North Santiam watershed, restoration efforts are focused in Stout Creek, Valentine Creek, and Bear Branch Creek. In 2010, the council gathered baseline data at monitoring sites in these watersheds to characterize conditions before restoration work takes place.

Recommendations:

- Track and report the outcomes of implementation activities within the basin.

3. What are water quality status and trends in agricultural areas?

To answer this question, ODA staff reviewed data in the DEQ Laboratory Analytical Storage and Retrieval (LASAR) database as well as U.S. Geological Survey data.

As of 2012, there were current data (post 2008) on Zollner Creek, the Pudding River, and Silver Creek at Brush Creek Road. Water quality in the Pudding River showed improved dissolved oxygen saturation, and reduced incidents of elevated *E. coli* and turbidity since the 2008 review.

Data for Zollner Creek showed no appreciable change from the 2008 review. A 10-year trend review for Zollner also didn't show significant trends in water quality.

There were limited data on the Silver Creek site, because there were no recent analyses for *E. coli*, nitrate, or phosphorus. Dissolved oxygen and turbidity values at this site were all within acceptable concentrations.

Marion SWCD monitoring data from 2009-2010 found high nitrate and phosphorus levels in Zollner Creek, leading to a "poor" condition rating for those parameters. Zollner Creek was also classified as moderately impaired for dissolved oxygen and turbidity. The SWCD monitoring found poor conditions in Fruitland Creek and the Little Pudding due to phosphorus levels, and conductivity and dissolved oxygen were also considered at impaired levels at monitoring sites in these two watersheds.

Pesticide monitoring has occurred in the Mollala-Pudding basin since 2005 as part of the Pudding River Watershed Pesticide Stewardship Partnership (PSP) project, a collaborative effort between DEQ, ODA, Marion SWCD, OSU Extension and Integrated Plant Protection center and local agriculture chemical suppliers. Since 2007, there has been noteworthy progress in reducing water quality concentrations and detection frequencies of the higher toxicity organophosphate insecticides chlorpyrifos (Lorsban), azinphosmethyl (Guthion) and diazinon. For instance, azinphosmethyl has not been detected since 2007 and chlorpyrifos only twice, once in 2009 and once in 2011. However, both chlorpyrifos detections were over the chronic water quality standard and above the acute water quality standard in 2011 in the Little Pudding River. Chlorpyrifos remains a priority for stewardship and best practice activities in the Pudding watershed. The herbicide diuron (Karmex) remains a statewide and sub-basin priority because of high detection frequencies at all monitoring sites and high concentrations at monitoring sites in Zollner Creek. Diuron was found in 93%, 83%, and 86% of the samples in the Mollala-Pudding in 2009, 2010 and 2011, respectively. In 2011, ten (10) samples of diuron (all in Zollner Creek) were above the lowest EPA aquatic life benchmark for non-vascular plants (algae). In Zollner Creek, the general trend seems to indicate an increase in concentrations of diuron from 2009 to 2011. Three additional herbicides, atrazine, simazine and metolachlor have also been detected at high frequencies throughout the sub-basin. Detection frequencies for atrazine in 2009, 2010 and 2011 have been 83%, 69%, and 89%, respectively. For simazine: 95%, 77%, and 89%. For metolachlor: 70%, 63%, and 83%.

Mixtures of pesticides in water continue to be detected in the sub-basin, especially in Zollner Creek where up to 15 pesticides were detected in individual water samples. Although the state of the science on mixtures of pesticides on aquatic life and human health is unknown, there are legitimate concerns about additive and synergistic impacts of multiple pesticides in the water. Many of the chemicals detected have similar modes of action, which indicates that additive effects could occur. Many improvements in pesticide application practices and technologies apply to all pesticides and, therefore, could result in reductions in a range of chemicals in surface water.

In addition to the PSP monitoring program, Dr. Jeff Jenkins from OSU and a graduate student (Phil Janney) have conducted a study using continuous monitoring techniques to assess pesticide exposure to juvenile salmonids in off-channel habitats during periods of rearing and migration. They have deployed a lipid-free tubing passive sampling device (LFT) at five locations in the Pudding watershed. LFT were deployed continuously in off-channel habitats, including backwaters, channel edge sloughs, and off-channel pools, and sampled at three to four week intervals from June 2010 to October 2011. Time-weighted average concentrations of freely dissolved pesticides have been quantified and results are forthcoming.

The US Geological Survey (USGS) also resumed monthly monitoring on Zollner Creek (Monitor-McKee Road) in the fall of 2011 after a three-year absence. The results for the initial six months of this

monitoring reinforce the PSP monitoring findings, most notably for frequently detected herbicides such as atrazine, simazine and metolachlor (note: diuron is not included in the current USGS monitoring effort). However, the recent USGS monitoring also shows multiple detections of the insecticides chlorpyrifos and ethoprop, which the PSP monitoring has detected very infrequently since 2009. Given that USGS plans to continue their Zollner pesticide monitoring for the forseeable future, these data will continue to be assessed to validate and augment the findings of the PSP monitoring.

Recommendations:

- Continue focusing work within the Zollner Creek watershed.
- Investigate sources of high phosphorus and nitrates in the Zollner Creek watershed.
- Investigate sources of high phosphorus in the Fruitland Creek watershed.

4. What are conditions in streamside areas?

To answer this question, ODA evaluates aerial photos of stream segments in each management area that are selected at random along agricultural lands. Based on the streamside vegetation present at the time of the assessment, each stream segment receives a score. The same stream segments are re-photographed and re-scored every five years to track changes in streamside vegetation conditions. The assessment covers approximately 10 to 15 percent of the riparian areas along agricultural lands in each management area. A total Riparian Index Score (RIS) is calculated for each stream, based on the landscape cover identified. The RIS scores can range from 10 to 70.

By itself, a score does not tell whether streamside vegetation is in good or poor condition, or whether a site is in compliance with the Area Rules. A score provides some idea of the mixture of bare ground, grasses, shrubs, and trees present at a site, but it does not compare the vegetation that is there with the types of vegetation that can be expected given the site capability.

ODA first assessed the Molalla-Pudding in 2004, and repeated the assessment in 2009. In 2009, riparian condition scores ranged from 38.11 in the Kraus Creek segment to 60.26 in the Gribble Creek segment.

Four monitored stream segments – McKinney, Patterson, and Kraus creeks - showed significant improvements in landscape cover. Most of this improvement was due to a decrease in bare agricultural land. West Fork Champoeg Creek had a significant decrease in landscape cover, and this was mostly attributed to increased grazing (i.e. change from grass to grass/agriculture) and some tree loss on the east bank.

Recommendations:
By the next biennial review, ODA will:

- Conduct an assessment to determine the level of compliance with the riparian rule in the management area. This assessment, combined with future assessments, will help track changes that result from projects whose location data are not available due to privacy restrictions.
- Establish site-capable scores for the aerial photo monitored stream segments within the management area to compare with the riparian index scores for each segment. This will be accomplished by identifying and assessing riparian reference sites – places where riparian vegetation shows little or no signs of disturbance.

Additional Work:

In the North Santiam model basins, instream and riparian surveys occurred in 2010, 2011 and 2012 (soon to finish) and will provide before/after data for some project sites. The following model watershed basins, along with two other sites, will be sampled for the upcoming focused water quality work proposed for November 2012 through November 2014: North Santiam Subbasin (HUC 17090005): Valentine Cr, Stout Cr, Bear Branch Cr, and Marion Cr.

Focused water quality monitoring and analysis of results, in areas where agriculture and urban activities are taking place, will facilitate collaborative and prioritized TMDL implementation. The water quality monitoring data is also important for establishing a baseline dataset to measure performance of strategies over time.

Monthly sampling and assessment will cover the following nine parameters that are indicative of the 303(d) listings and TMDLs in these three subbasins: Temperature; Dissolved Oxygen; Specific Conductivity; Turbidity; pH; Total Suspended Solids; Total Phosphorous; Total Nitrogen and *E.coli*. In addition, storm sampling will occur once per year at the sampling locations to detect *E coli*. Up to four times per year, flow measurements will be collected at one of the locations. One-time aquatic macroinvertebrate sampling will be conducted during summer low flow at the sampling locations to assess the biological health of the streams.

Partners include, but are not limited to: the Calapooia and North Santiam Watershed councils, city of Sweet Home, NRCS, ODA, DEQ, and OWEB.

In the fall and early winter of 2006 and following State and Federal mandates, Marion SWCD started establishing a Streamflow Program to collect discharge, stage, and water temperature data on five creeks and rivers in Marion County. Marion SWCD streamflow program was finally established and gathering the necessary baseline data starting in April 2008 to help our county and the Pudding watershed comply with the Federal Clean Water Act (CWA) and the Endangered Species Acts (ESA). Our gauging stations are providing a means for our residents to learn more about their watershed, while providing a valuable service to the state of Oregon Agriculture, Water Resources, and Environmental Quality Departments.

The continuous gathering of streamflow data has provided the SWCD necessary data for making current and future decisions about the potential impacts to our watershed, agriculture, and the restoration efforts needed to mitigate them. The continuous gathering of streamflow data in line with Oregon's first and newly adopted Integrated Water Resources Strategy. Adopted by the Water Resources Commission on August 2, 2012, the strategy provides a blueprint for understanding and meeting Oregon's water quantity, water quality, and ecosystem needs now and into the future.

Appendix L: Summary of Area Plan Goals and Progress of Area Plan Implementation.

Summary of Area Plan Goals and the Progress of Area Plan Implementation July 1, 2012 – June 30, 2014	
Goal	**Progress**
1. Reduce, minimize, and control water pollution from agricultural activities to achieve applicable water quality standards.	**Conservation Planning and WQ Projects Completed:** • Voluntary Conservation Plans Developed: **25** • Landowners Assistance Program (LAP) Awarded Projects: **68** • OWEB Small Grant Projects: **3** • Number of Affected Acres: **678** • Number of Stream Miles Impacted**: 1.2** **Account of Conservation Practices Implemented** • Total Number of CP Implemented: **91** • Most Often Implemented CPs: o Tree Shrub Establishment o Micro-Irrigation o Irrigation water Management o Fence o Brush Management o Access Road
2. Create a high level of awareness and understanding of conservation issues among the agricultural community and rural residents through education and technical assistance	**Technical Assistance:** • Number of Landowners Requesting Assistance: **361** • Number of Site Visits**: 293** **Youth Education Events (Water Quality, Agriculture and Salmon)** • Number of Events:**19** • Number of Youths Attending: **1,413** **Public Workshops, Educational and Outreach Events Held or Partnered by MSWCD:** • Workshops and Training: **2** • Tours: **10** • Outreach Events: **18** • Presentations**: 8** • Number of Informational and Outreach Materials Distributed**: 2,359**
3. Monitor and evaluate the plan to assist in periodic review of effectiveness.	Monitoring of LAP implemented projects for up to 5 years. Monitoring of OWEB Small Grant projects for 4 years. Methods of monitoring consist of evaluating landscape conditions, comparing photo points, and conducting site assessments. Monitoring of other grants/ programs as required.

4. Secure adequate funding for administration and implementation of the plan.	**Total Funding Acquired/ Awarded** • ODA AG WQ SOW Base Program: **$100,000** • LAP, awarded: **$146,773** • OWEB Small Grants, awarded projects: **$30,000**
5. Focus Area Project: Silver Creek, Marion County	The focus area project was initiated by the Oregon Department of Agriculture (ODA) as a way for soil and water conservation districts across the state to develop a project with a focus area approach evaluating the application of conservation management practices on agricultural lands. The project includes five assessment phases evaluating: • The proper functioning condition of the lower Silver Creek mainstem (completed) • Agricultural activities and their impacts on stream function and water quality (completed) • Voluntary landowner requests to review their agricultural landuse and its influence on water quality (active) • Spatial analysis of aerial orthophotos of streamside vegetation along Silver Creek (completed) • A water quality survey created for the agricultural community to express their views on water quality and water quality management in their watershed (completed). Focus Area Summary: *These numbers are not included in above reported numbers.* • Focus Area Landowners Contacted: **222** • Workshops-Trainings/ Tours / Outreach Events/ Presentations: **4** • Number of Event Attendees: **228** • Number of Informational and Outreach Material Distributed: **876** • Landowners Requesting Technical Assistance: **7** • On site evaluations: **18** • WQ Project Implemented: **0** ***Full Silver Creek Focus Area Report Available at*** www.marionswcd.org

Appendix M: Definitions

Active Channel Erosion - Gullies or channels which at the largest dimension have a cross sectional area of at least one square foot and which occur at the same location for two or more consecutive years. (OAR 603-095-0010(1)).

Chemigation – The method of applying nutrients, pesticides, or both in irrigation water. (Natural Association of Wheat Growers Foundation, 1994).

Drainage or Irrigation Ditch – As defined in ORS 196.600 to 196.900 and its associated administrative rules.

Erosion Rate, Sheet and Rill – The annualized amount of soil material lost from a field or parcel of land due to sheet and rill erosion, expressed in tons of soil eroded per acre per year, and calculated according to the Universal Soil Loss Equation or the Revised Universal Soil Loss Equation. (OAR 603-095-0010(13)).

Erosion, Rill – An erosion process in which numerous small channels only several inches deep are formed and which occurs mainly on recently disturbed soils. The small channels formed by rill erosion would be obliterated by normal smoothing or tillage operations. OAR 603-095-0010(14).

Erosion, Sheet – The removal of a fairly uniform layer of soil from the land surface by runoff water. (OAR 603-095-0010(15)).

Farmstead – The farmstead is the cluster of buildings associated with operation of the farm. This may include homes. It does include barns, shops, machinery storage, and other outbuildings. In the case of a dairy it includes all barns, hay and feed storage, livestock housing, and milk parlor. In relation to this Area Plan and water quality the farmstead includes livestock manure handling facilities in pesticide storage and handling areas, well head protection and well location areas, farm vehicle wash down and cleaning areas, and from staging areas used for equipment or commodity handling and loading for shipment.

Fertilizer – Any substance, or any combination or mixture of substances, designed for use principally as a source of plant food, in inducing increased crop yields or plant growth, or producing any physical or chemical change in the soil and shall contain five percent or more of available nitrogen, phosphorus pentoxide (phosphoric acid) or potassium oxide (potash), singly, collectively or in combination, except hays, straws, peat and leaf mold, and unfortified animal manure. (ORS 633.310(5)).

Filter Strip – A strip or area of vegetation for removing sediment, organic matter, and other pollutants from runoff and wastewater. (USDA – Natural Resources Conservation Service, 1997).

Gullies. See Active Channel Erosion.

Hydrology - The science concerned with understanding, describing, and predicting the movement of water on and under the earth's land surface, and the physical, chemical, and biological interactions of water with the earth's terrestrial environment. (Dingman, S. Lawrence. (1984). Fluvial Hydrology. W.H. Freeman and Company)

Intermittent Stream - Means any stream which flows during a portion of every year and which provides spawning, rearing or food-producing areas for food and game fish. (OAR 141-085-0010(20)).

Livestock - The animals described or listed in ORS 596.010 and 596.020 and includes, but is not limited to, horses, mules, jennies, jack-asses, cattle, bison, sheep, dogs, cats, hogs, goats, poultry, domesticated fur-bearing animals, and any other vertebrate in captivity, except fish.

Maintenance - The repair, rehabilitation or reconstruction of a structure pursuant to the provisions of ORS 196.905. (OAR 141-085-0010(22)).

Natural Waterways - As used in ORS 196.800(14), means waterways created naturally by geological and hydrological processes, waterways that would be natural but for human-caused disturbances (e.g. channelized or culverted streams, impounded waters, partially drained wetlands or ponds created in wetlands) and that otherwise meet the definition of waters of the state, and certain artificially created waterways included under the definition of "Other Bodies of Water." (OAR 141-085-0010(27)).

Oregon Forest Practices Act - Provides for economically efficient forest practices that assure the continuous growing and harvesting of forest tree species and the maintenance of forestland for such purposes as the leading use on privately owned land, consistent with sound management of soil, air water, fish and wildlife, as well as scenic resources within visually sensitive corridors, that assures the continuous benefits of those resources for future generations of Oregonians. The Oregon Department of Forestry implements and enforces the Oregon Forest Practices Act. (ORS 527.610 – 527.992).

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

Pesticide - Any substance or mixture of substances intended to be used for defoliating plants or for preventing, destroying, repelling or mitigating all insects, plant fungi, weeds, rodents, predatory animals or any other form of plant or animal life which is, or which the Oregon State Department of Agriculture may declare, to be a pest, which may infest or be detrimental to vegetation, humans, or be present in any environment thereof. (ORS 634.006(8)(h)).

Pollution - Means such alteration of the physical, chemical or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state, which will or tends to render such waters harmful, detrimental, or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses or to livestock, wildlife, fish, or other aquatic life or the habitat thereof. (ORS 468B.005(3))

Riparian Area - At its simplest, it is a zone adjacent to water where the soil is wet around springs, ponds, and streams. The term includes three components:
Aquatic area, which includes the stream, side channels, and depressions in the flood plain away from the stream
Wet terrestrial zone, the area near the stream where vegetation is strongly influenced by water, and either has wet soils or often is flooded
Zone of influence, includes the plants that hang over the stream as well as trees growing farther away that might shade or fall into the stream.

-- (OSU Extension Service, 2000. Watershed Stewardship: A Learning Guide. p. II-5.2.)

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)).

Site Capability - The ability of a site to provide for the development of potential structural and functional properties. Structural properties include, among other things, vegetation and soil characteristics.

Functional properties include processes such as energy and nutrient flow. Capabilities to produce and sustain these properties are not the same for all sites, but are site specific.

Wastes - Sewage, industrial wastes, and all other liquid, gaseous, solid, radioactive or other substances which will or may cause pollution or tend to cause pollution of any waters of the state. (ORS 468B.005(7)).

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

Wetlands - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. (OAR 141-085-0010(40)).