

# **Benton County Riparian and Wetlands Project**

## **Inventory Report Update Completed 5/8/2011**

with support from the  
Benton County Riparian  
and Wetlands Advisory  
Group



Alea River Falls



William L. Finley Wildlife Refuge



Jackson Frazier Wetland

**Inventory Report, Updates and other Project  
Materials Available on the Project Website at:**

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

# TABLE OF CONTENTS

<b>Background .....</b>	<b>6</b>
<i>Overview of Current Stream/Riparian and Wetland Resource Issues.....</i>	<i>7</i>
<b>Developing Distinct Alsea Basin and Willamette Basin Riparian and Wetland Inventory .....</b>	<b>10</b>
<i>Purpose and Overview of Inventory:.....</i>	<i>13</i>
<i>Goal, Objectives, and Guiding Principles .....</i>	<i>13</i>
<b>Goal.....</b>	<b>13</b>
<b>Objectives:.....</b>	<b>13</b>
<b>Guiding Principles.....</b>	<b>14</b>
<i>Benton County Comprehensive Plan (updated 2007) .....</i>	<i>14</i>
<i>Benton County Stormwater Management Program for the Corvallis Urbanized Area (2007).....</i>	<i>14</i>
<i>Benton County Total Maximum Daily Load Implementation Plan (2008).....</i>	<i>15</i>
<b>Inventory Overview .....</b>	<b>15</b>
<b>Figure 4.....</b>	<b>16</b>
<b>Inventory Method Selected for Benton County.....</b>	<b>17</b>
<b>Adopted Inventory and Protection Method.....</b>	<b>17</b>
<b>Inventory Area .....</b>	<b>19</b>
<b>Goal 5: Riparian Safe Harbor Inventory .....</b>	<b>19</b>
<i>Safe Harbor Inventory Methods .....</i>	<i>21</i>
<i>Mapping Data.....</i>	<i>21</i>
<i>Light Detection and Ranging Data (LiDAR) Map Data .....</i>	<i>21</i>
<i>Review of Existing Goal 5 Riparian Inventory Information.....</i>	<i>24</i>
United States Geological Survey .....	24
Oregon Department of Forestry.....	24
Oregon Department of Fish and Wildlife .....	26
Watershed Councils.....	27
Oregon Department of Agriculture (ODA) and Benton Soil and Water Conservation District .....	27
<b>Wetlands Inventory.....</b>	<b>27</b>
Local Wetland Inventories (cities).....	29
Wetland Information compiled from Oregon Wetland Explorer (Oregon State) .....	29
<b>Field Verification .....</b>	<b>29</b>
<b>Riparian Mapping Accuracy Field Assessment.....</b>	<b>30</b>
<b>Goal 5: Riparian Areas, Streams, and Wetland Findings.....</b>	<b>32</b>
<b>Goal 6: Water Quality Inventory.....</b>	<b>32</b>
<i>Overview of Current Water Quality Issues.....</i>	<i>32</i>
<b>Willamette Basin Water Quality .....</b>	<b>33</b>

<i>Water Quality Inventory</i> .....	35
<i>Alsea Basin Water Quality</i> .....	36
<i>Water Quality Mapping Data</i> .....	36
<i>Review of Existing Goal 6 Water Quality Inventory Information</i> .....	36
Oregon Department of Environmental Quality .....	37
<i>Willamette Basin</i> .....	40
<i>Alsea Basin</i> .....	40
<i>Priority Inventory Data for Developing Benton County Riparian Protection Policy within the Alsea Basin and Willamette Basin</i> .....	40
<b>Existing Riparian and Wetland Rules and Regulations</b> .....	<b>41</b>
<b>Community Meetings</b> .....	<b>42</b>
<b>Listening Sessions with Landowners Summary</b> .....	<b>43</b>
<b>Conclusions</b> .....	<b>50</b>
<i>Goal 5: Riparian (Safe Harbor) Resources Conclusions</i> .....	50
<i>Goal 6: Water Quality Conclusions</i> .....	51
<b>Recommendations, Next Steps</b> .....	<b>52</b>
<i>Drafting Policy Options</i> .....	52
<i>Local City Coordination</i> .....	54
<i>Outreach, Incentives, and Partnerships</i> .....	54
Agency to Agency Communication .....	55
<b>Voluntary Incentives Scenarios for Landowners with Riparian and Wetland Resources</b> .....	<b>55</b>
<b>Draft Code--Benton County Stream and Riparian Corridor Protection (SRP)</b> .....	<b>65</b>

## List of Figures

<b>Figure 1</b> Example Riparian Area Functions and Values.....	8
<b>Figure 2</b> Example Wetland Area Functions and Values .....	8
<b>Figure 3</b> Alsea Basin and Willamette Basin within Benton County, Oregon.....	10
<b>Figure 5</b> Approved Riparian/Wetlands Inventory Process .....	18
<b>Figure 6</b> Benton County General Zoning and Stream Length .....	20
<b>Figure 7</b> Current LiDAR Mapping Coverage Area .....	22
<b>Figure 8</b> LIDAR Based Stream Delineation Locations .....	23
<b>Figure 9</b> Streams with Confirmed Fish Presence of Game and Threatened or Endangered Fish Species; Completed by and ODF.....	25
<b>Figure 10</b> Oregon Wetlands Explorer Wetland Location Overview .....	27
<b>Figure 11</b> Greasy Creek Sub-basin Photo Point Example .....	30
<b>Figure 12</b> LIDAR based Stream Delineation for Field Assessment Location.....	31
<b>Figure 13</b> Oregon Rapid Wetland Assessment completed on Private Property north of Jackson-Frazier Wetland (Benton County Park) .....	31

<b>Figure 14</b> Oregon Department of Environmental Quality Effective Shade Diagram.....	34
<b>Figure 15</b> Contaminant removal effectiveness of Riparian Buffers (adapted from Washington Department of Ecology, 2009).....	37
<b>Figure 16</b> Current Benton County Water Quality Limited Streams .....	39
<b>Figure 17</b> Fliers for 2009 and 2010 Community Meeting Dates and Locations .....	42
Figure 18 General buffer functions based on buffer size.....	53
Figure 19 Draft Benton Stream and Riparian Protection Scenarios .....	74

### List of Tables

<b>Table 1</b> Description and Goals of Inventory Updates .....	5
<b>Table 2</b> Summary of Basin Level Characteristics for Major Hydrologic Basins, Benton County for Riparian/Wetland Inventory .....	12
<b>Table 3</b> Listed Fish Species in Benton County Waterways* .....	26
<b>Table 4</b> Benton County Water Quality Impaired Streams .....	38
<b>Table 5</b> Benton County 303d Listed Streams with Listed Water Quality Pollutants.....	38
<b>Table 7</b> Comparison of Priority Riparian Inventory Data for Alsea and Willamette Basin Major Hydrologic Basins, Benton County .....	41

### Acronyms

Arcview	Geographic Information System (GIS) (software)
BiOp	Biological Opinion
CWA	Clean Water Act
DO	Dissolved Oxygen
DSL	Division of State Lands
IMST	Independent Multidisciplinary Science Team
GIS	Geographic Information Systems
NPDES	National Pollution Discharge Elimination System
NRCS:	Natural Resources Conservation Service
ODA	Oregon Department of Agriculture
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
ODLCD	Oregon Department of Land Conservation and Development
OWQI	Oregon Water Quality Index
RWAG	Riparian and Wetland Advisory Group
TMDL	Total Maximum Daily Load
UGB	Urban Growth Boundary

### Acknowledgements

The Riparian and Wetland Advisory Group participants volunteered many hours to developing the project plan, goals, and objectives. The group also helped county staff improve the Draft Inventory as new information was researched, created, and ‘brought to the table’. The Alsea Citizen Advisory Committee and Alsea area residents provided historical knowledge, landowner concerns and ideas throughout the project. Local and regional staff from the Oregon Department of Forestry, Oregon Department of Environmental Quality, Oregon Department of Agriculture, and the Oregon Department of State Lands provided data,

background information, and current riparian/wetland protection program requirements and regulation background to improve the final protection program. Oregon State University graduate Student, Julie Ryden, consistently worked to provide much needed outreach and education support along with key information for updating the inventory.

## Updates to Draft Inventory

The first Draft Benton County Riparian and Wetlands Inventory Report was released for public review on 12/17/10; notice was provided via email, project website, and local newspapers and newsletters. Public comments were provided by county landowners and residents, Riparian and Wetland Advisory Group participants, State/local government, and many others. In addition, Benton County held additional community meetings with approximately one-hundred attendees in the community of Alsea, to share project work to date, and was provided with additional input on improving the draft report. Ongoing “Listening Sessions” led by a Benton County graduate student intern, also provided landowners with additional one-on-one discussions to learn more about the project and provide ideas for improving the inventory and any proposed code.

Based on the range of input received from December 2010 to April 2011, the following updates to the Draft Inventory were completed by project staff:

**Table 1** Description and Goals of Inventory Updates

<b>Description of Inventory Update</b>	<b>Goal</b>
Separate sections for water quality and riparian inventory for each portion of the Alsea and Willamette Basin within Benton County.	Clarify Alsea Basin and Willamette Basin as separate inventory areas in Benton County; providing basis for unique programs for protection within each location of the county
Provide updated water quality data for the Alsea and Willamette Basins including current State water quality mandates for Benton County; provide additional details regarding the timeline of the Mid-Coast Basin (Alsea) Total Maximum Daily Load development and process.	Clarify water quality regulatory requirements and local county goals regarding water quality for the Mid-Coast Basin and Willamette Basin portion of Benton County. Begin process to encourage State and Federal Agencies to work on consensus based assessment and improvement of water quality in the Alsea Basin portion of Benton County.
Update protected/game Fish Species status and habitat.	Clarify and provide additional documentation of current threatened and game fish species within the Alsea Basin and Willamette Basin respectively; Review of research/recommendations for supporting habitat improvement.

Description of Inventory Update	Goals
Scenarios documenting the process Benton County will utilize to determine riparian vegetation protection zones along applicable streams	Twelve countywide community meetings with landowners provided staff with landowner concerns regarding riparian protection; staff used common landowner concerns to develop scenarios demonstrating how Benton County would determine protection requirements in the Alsea Basin and Willamette Basin.
Provide new section on non-regulatory, voluntary, incentives for riparian and wetlands enhancement; include overview of current programs.	Provide new section on existing opportunities for various land uses (farm, forest, rural residential) with various acreage and goals (protection, tax incentives). Create three types of land ownership and uses matched with voluntary programs and resources for improvement and protection while still accomplishing property goals (retaining property value, building a new structure, etc.)
Provide Listening Session findings and ideas for improving the final regulatory and non-regulatory elements of a Benton County the program.	Include summary of input from landowners that participated in listening sessions.

## Background:

This inventory report is a work in progress that will be updated through the remaining stages of the project (see **Recommendations, Next Steps**). A final inventory report will be adopted prior to implementation of any new riparian and wetlands code/requirements. Benton County led development of the Riparian and Wetlands Inventory to inform county residents and other stakeholders in order to accomplish community goals and State requirements for riparian and wetland resources within Benton County. The inventory provides best available information during the project period, on the location and type of riparian and wetland resources. These resources help to improve property features, stabilize slopes, enhance habitat for fish and many other wildlife species, improve water quality, and help protect against flood damage to private and public property (see overview of resource functions and values). Benton County Riparian and Wetlands Advisory Group members and staff will utilize the inventory to:

*The inventory is intended to provide the best available information possible during the project period, on the location and quality of riparian and wetland resources.*

- Assess the current conditions of inventoried resources,
- Forecast the effect of land use regulations,
- Provide education and outreach on the importance of riparian and wetland resources,
- Help connect landowners with available incentives for protecting/enhancing inventoried resources, and
- Develop partnerships to support and improve riparian and wetland resources.

- Develop code to support and improve riparian and wetland resources.

The inventory was completed countywide with focus on the unincorporated areas of Benton County.

*The Inventory was developed from 2009 to November 2010 and updated from December to May 2011 by participation from Benton County Landowners, county staff, Benton Soil and Water Conservation District, City of Adair Village, City of Monroe, Marys River Watershed Council, Alsea Watershed Council, Audubon Society of Corvallis, Oregon Department of Agriculture, Oregon Department of Fish and Wildlife, Oregon Department of Land Conservation and Development, Oregon Department of Forestry, and the Oregon Department of Environmental Quality. Funding was provided through the awarding of a competitive grant from the Wetlands Program Development Program, within US EPA Region 10 to Benton County Community Development Department and in-kind staff and volunteer support. The inventory was requested by county residents during*

Under the Oregon Statewide Planning Program, which was initiated with the enactment of Senate Bill 100 in 1973, state statutes and rules require local jurisdictions to plan for natural resources. Among its many components, Statewide Planning Goal 5 (Historic & Natural Resources) directs cities and counties to inventory, evaluate and protect riparian corridors along fish-bearing streams. Goal 6 (Air, Land and Water Quality), requires that land use plans ensure that water quality will be maintained.

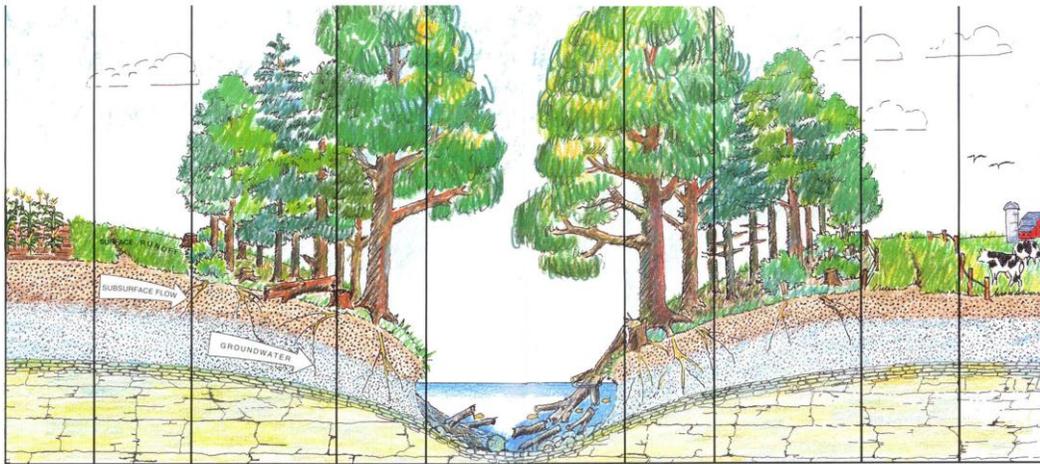
Benton County is also required by the federal Clean Water Act to improve water quality. Since 2007, Benton County has been subject to a National Pollution Discharge Elimination System permit, requiring improvements to stormwater quality (see **Water Quality** section for Benton County stormwater permit requirements). Additionally, the County must implement a Total Maximum Daily Load (TMDL) Implementation Plan to reduce inputs of bacteria, mercury and heat to the Willamette River Basin (see **Water Quality** section for TMDL). A key element of the County's efforts in both of these areas is to conserve and improve riparian and wetland resources meet current water quality requirements and goals. (See **Guiding Principles**)

The Benton County Riparian and Wetlands Advisory Group was called together to provide diverse perspectives and consensus recommendations to Community Development Staff for completion of the inventory (see **Appendix A** for RWAG participants and Adopted Advisory Group Project Role). The inventory includes mapping and evaluation of riparian and wetland resources under State and local Goal 5 and Goal 6 policies (**Appendix D**), and takes into account overlapping jurisdictional rules.

## Overview of Riparian and Wetland Resources

Riparian area plant communities are critical ecological features of terrestrial and aquatic ecosystems (Gregory, et. al, 2002). Most commonly, resource managers and the public consider riparian areas as the structure and function associated with riparian vegetation along rivers and streams. Ecological conditions are considered for spatially explicit bands on both sides of a stream (see **Figure 1** Example Riparian Area).

**Figure 1** Example Riparian Area Functions and Values



**This figure shows the characteristics of riparian areas including:** stream flow, surface runoff, subsurface water flow, groundwater flow, streamside vegetation, in-stream aquatic habitat (large wood, rock, gravel, sediment), and adjacent land uses (farming, forestry, other rural land uses) (adapted from US NRCS).

Due to high amount of precipitation and soil types in Benton County, there are many areas with hydric (moist/wet) soils, throughout the majority of the year. These wetland areas are often located adjacent to and associated with streams and riparian areas. In addition, wetlands can be isolated from nearby streams (see **Figure 2** for example). The vegetation type, hydrology, and soil type are used to determine if the wetland is considered a “significant wetland” under State law (see **Appendix B** for Project Definitions).

**Figure 2** Example Wetland Area Functions and Values



Riparian and wetland areas are important for the many functions and values they provide. These include but are not limited to the following:

- Fish and wildlife habitat;
- Water quality;
- Flood storage;
- Economic benefits;
- Aesthetics.

In 1997, with the support and participation of a wide spectrum of stakeholders from all sectors and regions of the state, the Oregon Legislature and Governor established the Oregon Plan for Salmon and Watersheds (Oregon Plan “Origins”, website). The Oregon Plan for Salmon and Watersheds was developed to restore and protect listed coho and other salmon species and their habitat. Information and issues related to western Oregon riparian areas were synthesized in *Oregon’s Statewide Riparian Restoration and Management Policy* for implementing the Oregon Plan for Salmon and Watersheds, and to guide studies and rulemaking related to riparian areas. An overview of findings includes:<sup>1</sup>

- Riparian areas make up about fifteen percent of the total area of Oregon;
- Trends in riparian condition along the upper mainstem Willamette River have shown a loss of more than half of the historical channel complexity and reduction of more than 85 percent of the total riparian forest since the 1850s;
- Urbanization and residential development impact a much smaller portion of Oregon’s land base—less than ten percent—but reduce riparian functions to a great degree;
- Non-native plants make up more than half of the riparian species along the mainstem Willamette River”.

Benton County streams provide habitat for Endangered Species Act (ESA) listed salmon species, including the Upper Willamette River Coho, Coastal Coho and Steelhead for spawning, feeding, and migration (NOAA, 2010). Many impacts have led to the decline of salmon populations including documented impacts from development encroachment within the riparian area leading to channelization, degraded water quality, loss of in-stream habitat, and other impacts from humans (NOAA, 2008; City of Corvallis Salmon Response Plan, 2004; IMST Technical Report Technical Report 2010-1).

A recent report released by the Oregon Department of State Lands (DSL), which regulates wetlands and waterways in Oregon, described how impacts to wetlands have changed significantly over the last thirty years. Between 1982 and 1994, 67% of the loss was due to upland agricultural land uses. However, between 1994 and 2005, most of the loss (68%) was to urban and rural development (Wetland and Land Use Change in the Willamette Valley, Oregon: 1994 to 2005; Oregon DSL, 2011). The Willamette Valley has lost approximately 57% of its original wetlands area. Approximately 80% of the once abundant riparian, bottomland forest has been converted to agricultural and urban land uses

---

<sup>1</sup>For additional report findings from *Oregon’s Statewide Riparian Restoration and Management Policy* regarding riparian buffer/area functions in western Oregon, see **Appendix C**.

(Oregon Progress Board, 2000). Today, the bottomland wet prairie is the rarest of the native plant communities, reduced by an estimated 99% (Christy, Oregon Wetlands Explorer).

Current local stream and riparian/wetland issues have been well documented by watershed councils located in Benton County. Watershed councils are continually working towards implementation of the State of Oregon Plan for Salmon and Watersheds (OWEB, 2010). Through the completion of comprehensive watershed assessments, councils review the historic and current conditions of riparian corridors, vegetation, fish and wildlife habitat and abundance. In general, the assessments in Benton County document that there have been major modifications to riparian corridors including: native vegetation clearing, dams, road crossings, irrigation diversions, straightening stream channels, diked channels and disconnected channels from floodplains, and draining and other impacts to wetland areas (Luckiamute River, Long Tom River, Marys River, Alsea River watershed assessments). Watershed councils and local, state and federal organizations work towards improving these and other issues across private and public land (see **Voluntary Incentives Scenarios for Landowners with Riparian and Wetland Resources**, Policy section).

## **Developing Distinct Alsea Basin and Willamette Basin Riparian and Wetland Inventory**

The following staff analysis provides an overview of key information for developing a distinct Alsea Basin and Willamette Basin riparian and wetlands inventory. The following analysis was prompted by Alsea landowner public comments and recent water quality information (technical and regulatory) provided by State Department of Environmental Quality (see Oregon Department of Environmental Quality Memo on Status of Total Maximum Daily Load Implementation Schedule for the Alsea Basin in **Appendix J**). The goal for developing distinct basin inventories for the portion of the Alsea and Willamette basins within Benton County is to provide basin specific information for developing Benton County riparian and wetlands protection program.

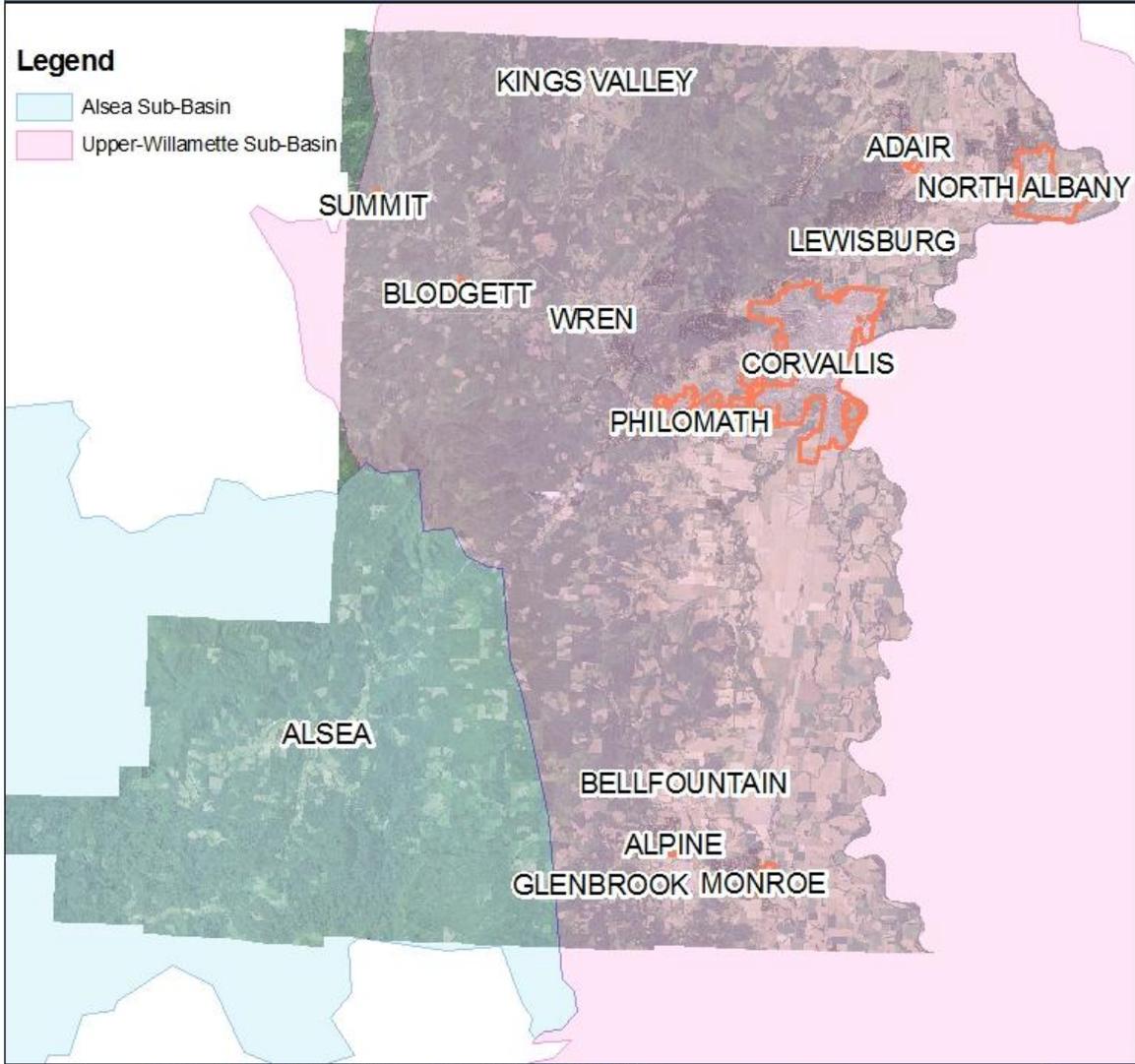
Based on the additional analysis completed, Benton County has updated the inventory sections to provide clarification of Alsea and Willamette Basin inventory information. The updated inventory (updated April 2011) specifies inventory data for each basin in Benton County. This updated inventory provides basin specific data (see **Figure 3**, Alsea Basin and Willamette Basin in Benton County, Oregon) wherever applicable. This information will be utilized to inform development of Basin specific requirements (see **Draft Policy** section) for riparian and wetland resources within unincorporated areas of Benton County.

**Figure 3** Alsea Basin and Willamette Basin within Benton County, Oregon

# Portions of Alsea and Upper Willamette sub-basins within Benton County

## Legend

- Alsea Sub-Basin
- Upper-Willamette Sub-Basin

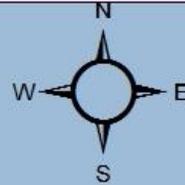


Benton County Community Development  
360 SW Aveny Ave.  
Corvallis, Oregon 97333-1152  
Phone: (541)766-6821  
FAX: (541)766-6891

Created: 4/23/11  
FILE: S:\maps\Riparian

This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.



**Table 2** Summary of Basin Level Characteristics for Major Hydrologic Basins, Benton County for Riparian/Wetland Inventory\* “Total Maximum Daily Load (TMDL)” is a calculation of maximum amount of a pollutant that a waterbody can receive and still meet State

<b>Basin (Benton County)</b>	<b>Riparian Inventory Applicable Stream Miles</b>	<b>Mainstem and Tributary Water Quality Status</b>	<b>Threatened/ Endangered &amp; Game Fish Species</b>	<b>Current Rural Population with riparian property</b>	<b>Projected Rural Population Development Level on riparian properties</b>
Alsea	14.5 miles mainstem Alsea River;  220 miles total	303(d) listed streams for Temperature, Bacteria; no TMDL* adopted	Oregon Coast Coho (federal ESA threatened) Alsea river and tributaries designated critical habitat;  Steelhead trout state listed critical, vulnerable  Several game fish species (bass, cutthroat trout)	Approx. 500 riparian properties; lower number with structures 50-75 ft from stream	Low new development potential/population increase under current development code; redevelopment near streams possible on many properties.
Willamette	555 miles total	Mid-Willamette Basin adopted TMDL* for Temperature, Mercury, and Bacteria	Chinook and Steelhead (Federal ESA threatened); several game fish species  Oregon chub- state listed sensitive, critical; Federal listed endangered  Several game fish species (bass, cutthroat trout)	Approx. 2,000 on riparian property; lower number with structure 50-75 ft from stream	Moderate levels of new development potential/population increase under current development; redevelopment near streams possible on many properties

water quality standards.

## Purpose and Overview of Inventory:

This report summarizes the inventory of riparian areas, streams, and wetlands within Benton County, Oregon. The inventory was prepared by Benton County Community Development and Geographic Information Systems staff team, with guidance, review and input provided by the Benton County Riparian and Wetland Advisory Group (RWAG); (See **Appendix A** for RWAG volunteer list), RWAG included landowners and State Agency staff. The inventory begins with project goals and background, overview of study area characteristics, and inventory methods. Next, the report provides an overview of findings for each resource with a summary of available data sources utilized, and recommendations for meeting project goals. The report takes a watershed approach to describe location, quantity, and quality of riparian and wetland resources. Inventory maps show the location of resources and the distribution of riparian corridors, streams, and wetlands within Benton County based on the inventory process developed by Benton County, the advisory group, and reviewed by county commissioners.

The Benton County Riparian and Wetlands Inventory provide a basis for forming policy decisions regarding the type of program appropriate for riparian and wetland resources. Inventory and policy analysis is ongoing through June 2011, supported by an EPA-Region 10 Wetland Program Development Grant, Benton County, project advisory group volunteers and citizens.

## Goal, Objectives, and Guiding Principles

### Goal

The Riparian and Wetland Advisory Group (RWAG) developed the overarching goal to guide project work over a two year period. The inventory utilizes the best available information for meeting project goal and objectives.

### Objectives:

### Benton County Riparian and Wetlands Project GOAL

Create a plan to support and improve natural function of streams, riparian areas and wetlands within the unincorporated areas of Benton County, to comply with State planning rules and Benton County's Comprehensive Plan.

*The Riparian and Wetlands Inventory will compile and create the best available data to meet the citizen developed comprehensive plan goals for riparian, wetland and other natural resources while informing a Benton County Riparian and Wetlands Plan (policy, education, incentives)*

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

- Prepare and adopt a Statewide Planning Goal 5 inventory for riparian corridors and protection program for ‘fish bearing streams’ and ‘fish bearing water bodies’ in Benton County.
- Compile water quality related inventory data to determine areas for improving water quality under Statewide Planning Goal 6.
- Improve land use, development and transportation projects and other private and public work to protect habitat and negative impacts to wetlands and riparian areas through: policy, outreach, education, and incentives.

## Guiding Principles

### Benton County Comprehensive Plan (updated 2007)

The Comprehensive Plan is the official policy guide for decisions about growth, development, services, and resource management in Benton County outside of incorporated cities. The policies of the Comprehensive Plan serve as the basis for developing and implementing regulations of the Development Code. The Comprehensive Plan is based on the physical, economic and social characteristics of the county; the desires and needs of county citizens, state laws, and programs and policies of other local, state, and federal governmental agencies. Overall, the Plan is intended to provide a framework for consistent and coordinated public and private land use decisions.

The Comprehensive Plan was updated with significant citizen input, culminating in adoption of a new Plan in 2007. The Riparian and Wetland Inventory and Plan was developed with guidance provided by the Goal 5 section of the new Comprehensive Plan, which addresses natural resources, including riparian resources, fish habitat, and wetlands.

*There are many State and Federal water quality and riparian/wetland requirements along with local citizen developed land use goals, which provide the background and need for the Benton County Riparian and Wetlands Project.*

For example, Comprehensive Plan Policy 5.6.1, “Benton County shall undertake the Goal 5 process and adopt a protection program for significant riparian areas within 18 months of adoption of the Plan amendments”. In addition, Goal 6 policies for water resources direct the County to improve and maintain water quality; for example, Policy 6.2.4 “Benton County shall place a high priority on maintaining natural systems and processes as a biological method for maintaining and protecting clean water” (see **Appendix D** for full list of Benton County Comprehensive Plan Goal 5 and Goal 6 applicable policies, and State Policy applicable to the Benton County Riparian and Wetlands Project Inventory).

### Benton County Stormwater Management Program for the Corvallis Urbanized Area (2007)

Beginning in 1990, the US Environmental Protection Agency (EPA) required large municipalities to obtain National Pollutant Discharge Elimination System (NPDES)

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

permits for their municipal separate storm sewer systems (MS4). An MS4 is a system of conveyances, including roads, ditches, gutters, catch basins, and storm drains that are owned or operated by a public body. In December of 1999, the EPA adopted rules to implement “Phase II” of the stormwater program. Phase II expanded the stormwater permitting program to include smaller communities located in US census defined urban areas. The Corvallis Urbanized Area includes the urban fringe surrounding the cities of Corvallis, Philomath, and Adair Village. Stormwater program implementation goals adopted by Benton County include *“develop and adopt Development Code standards for protection of wetlands and riparian areas to maintain the natural filtration and retention capacity of the ecosystem.”*

### **Benton County Water Quality Total Maximum Daily Load Implementation Plan (2008)**

The Willamette River and numerous tributaries do not currently meet several water quality standards that assure beneficial uses of the rivers. In addition the Alsea Basin has several water quality limited streams (see **Water Quality**). When these water quality standards are not met, the federal Clean Water Act (CWA) requires that Total Maximum Daily Loads (TMDLs) be established to determine how much pollution can be added to the river without exceeding the standards. The adopted Benton County TMDL Implementation Plan outlines that the County will implement *“better preservation of riparian corridors along waterways will enable better filtering of bacteria and other pollutants before they reach the stream for all water quality impaired streams. Increasing dry-season streamflows will reduce the concentration of pollutants. Managing and developing strategies from a watershed perspective will enable better understanding of problems and better ability to formulate solutions.”* The Water Quality Inventory section builds on the ongoing TMDL Implementation plan and Stormwater Implementation Plan efforts within the portions of the Alsea Basin and Willamette basins in Benton County (see **Water Quality** section).

### **Inventory Overview**

Benton County staff completed the following tasks as directed by local and State policies with review and input by the project Advisory Group members, County residents, and other State and Local stakeholders:

1. **Collection of Data** from applicable academic, State, Federal and local scientific research and existing/ongoing inventory methods;
2. **Field Observations** of stream locations, riparian areas, and wetlands;
3. **Mapping** of data relevant to Goal 5 (riparian, wetlands) and Goal 6 (water quality) to meet the goals of the project;
4. **Facilitation of Public Involvement** through the formation of the Riparian and Wetlands Advisory Group, news releases, public meetings, public mailings, website, creation and updates, public review of draft documents, and acknowledgement of the final plan by the Benton County Board of Commissioners;

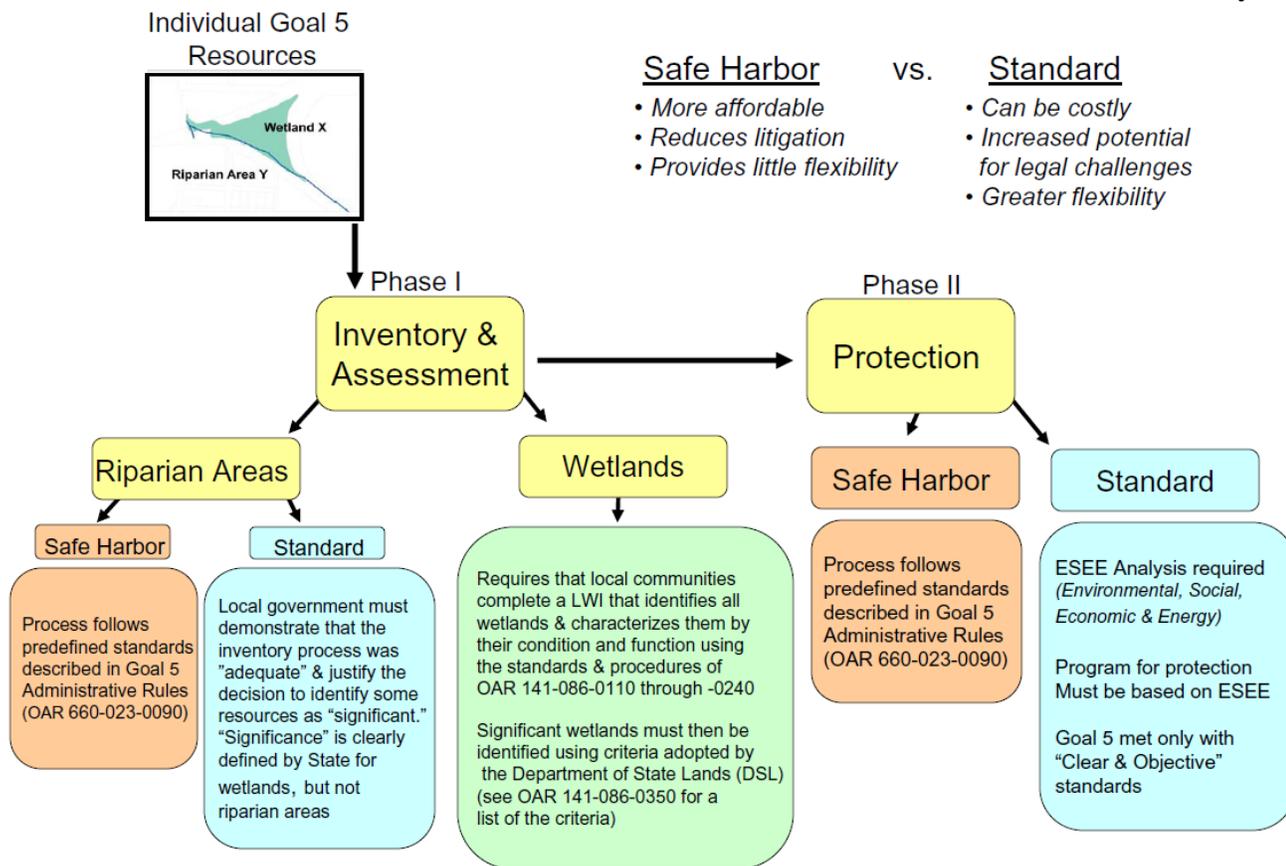
5. Analysis and Drafting of the Inventory Report to integrate the results of the planning process provide ample review and integration of committee and public input.

*The inventory will adhere to the requirements under Statewide Planning Goal 5 (Riparian, Wetland Resources) and Goal 6 (Water Quality) to meet project goals.*

The Inventory Report will include a series of countywide public meetings and other outreach, with support from the Riparian and Wetlands Advisory Group. The final plan, and associated requirements, will be prepared by June 30, 2011, for the public review and adoption process with the Benton County Board of Commissioners (see **Figure 4**).

Goal 5: General Overview of Process Alternative

**Figure 4** Riparian and Wetland Inventory Overview \*



## State of Oregon Riparian and Wetland Inventory Policy Options

An overview of the variety of inventory approaches under Statewide Planning Goal 5 is presented in **Figure 4**. This inventory guidance was utilized by staff and participants at advisory group meetings, along with input from community meeting participants during 2009 to determine an inventory approach. This included a compilation of definitions for riparian and wetland resources as described in State, Federal and local rules (see **Appendix C** for applicable project definitions under State statute).

Oregon Statewide Planning Goal 5 mandates that local governments “*adopt programs that will protect natural resources and conserve scenic, historic, and open space resources for present and future generations.*” Goal 5 requires local governments to maintain current inventories and evaluations of resources, and develop land use ordinances with clear and objective standards to protect the subset of wetland and riparian resources deemed to be significant. Goal 6 seeks to maintain and improve the quality of the air, water and land resources. Unlike Goal 5, Goal 6 does not have Administrative Rules to set standards for meeting the goal. Instead, it relies entirely on other state and federal regulations for direction on improving water quality.

### Inventory Method Selected for Benton County

Participants in the Benton County Riparian and Wetlands Advisory Group (**Appendix A**), in coordination with the Benton County Riparian and Wetlands Project staff met monthly (ongoing monthly meetings will occur until June 2011). The result was an understanding of the inventory and protection options available to meet project goals and objectives. Project staff also coordinated with the State of Oregon Department of Land Conservation and Development, Oregon Department of Forestry, Oregon Department of State Lands, Oregon Department of Agriculture, and Oregon Department of Environmental Quality, with these agencies providing in-person ideas and support.

During February 2010 the Advisory Group and project staff with public input, finalized an inventory and protection option and process (see **Figure 5** below). The proposed inventory approach was reviewed during a Benton County Board of Commissioners public meeting, where all Commissioners recommended the “completion of the Riparian and Wetlands Project inventory option and set deliverables, for long term County support and improvement of riparian and wetland areas in Benton County”.

### Adopted Inventory and Protection Method

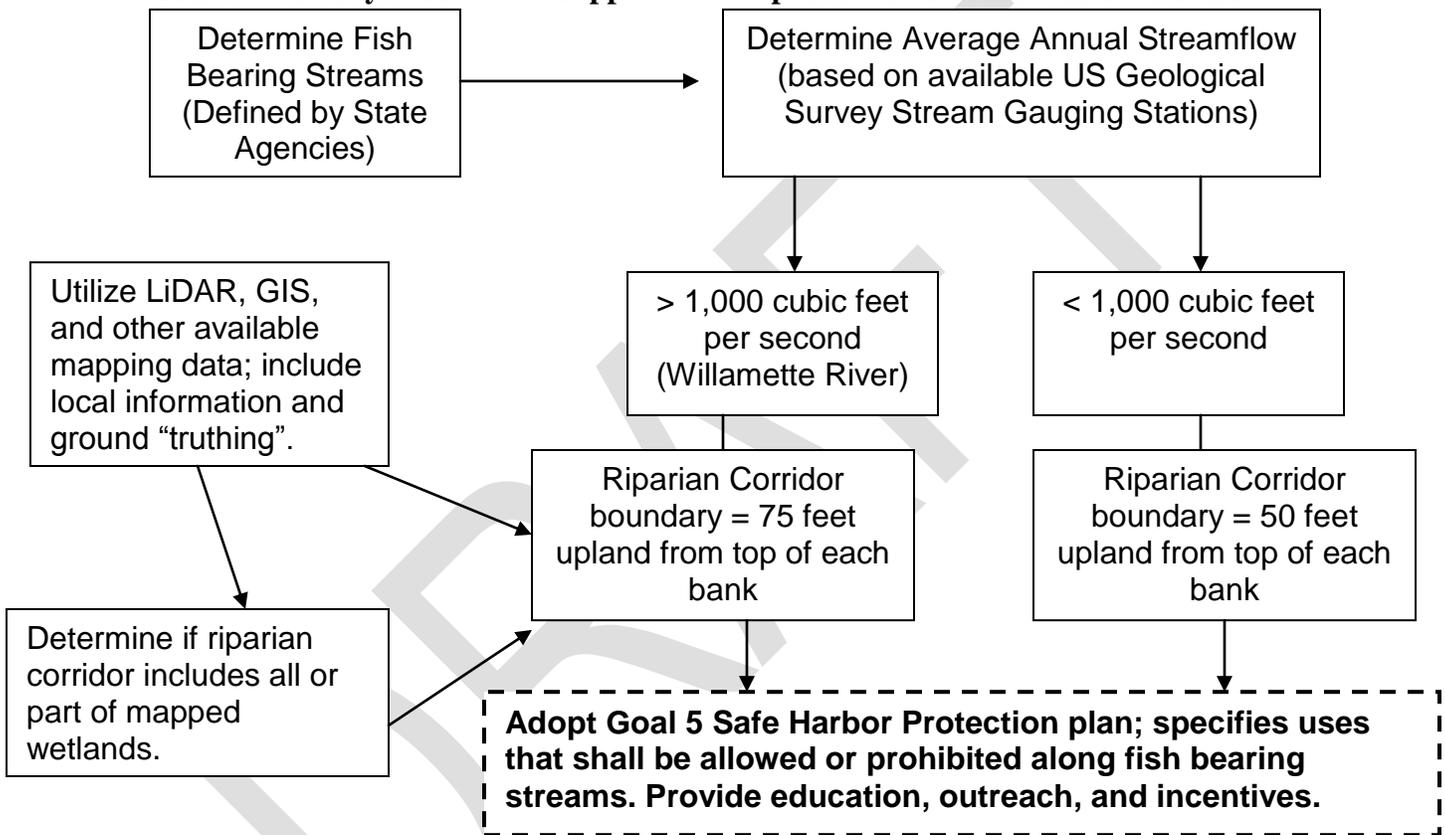
After several months of Advisory Group review, a series of community meetings, and many conversations with applicable State Agency staff, the Riparian and Wetland Advisory Group (RWAG) adopted the following for Benton County Riparian and Wetlands Inventory approach and Plan creation and implementation:

**Figure 5**

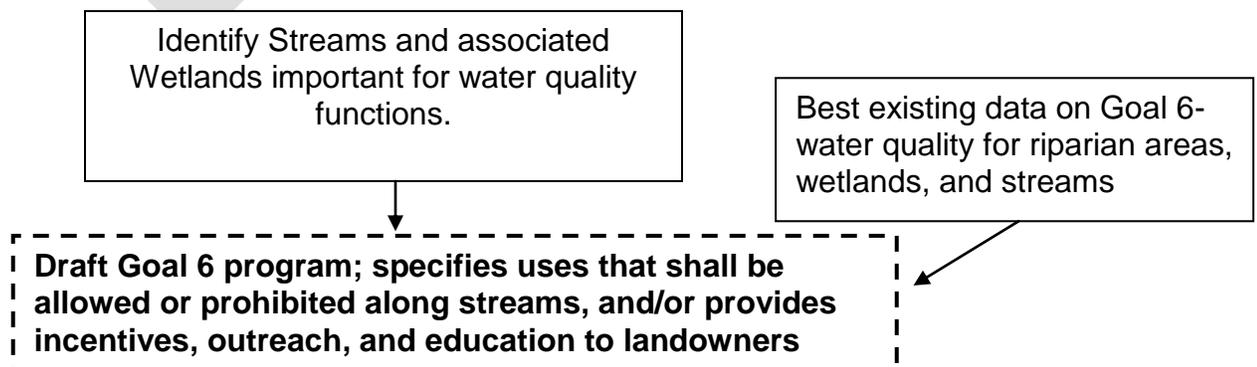
**Approved Riparian/Wetlands Inventory Process  
Supporting and Improving Natural Functions,  
Meeting State and Local Goals**

**Objective:** Complete a ‘Safe Harbor Inventory’ and form a Goal 6 (Water Quality) inventory to inform the development of a Benton County Riparian and Wetland Plan.

**Goal 5 Inventory: Focused to Support and Improve Fish and associated Habitats**



**Goal 6 Inventory: Flexible to Support and Improve Riparian/Wetlands Functions**



## Inventory Area

The inventory study area is Benton County, Oregon. Benton County encompasses several cities, large areas of agricultural and forest lands, and rural residential areas (see **Figure 6**). In 2007, the US population census for Benton County totaled 85,300. Approximately 80% of the total population was located within the five incorporated cities: Corvallis, North Albany, Philomath, Adair Village, and Monroe. Remaining residents are dispersed throughout the unincorporated areas of the county. Inventory work focuses on rural/unincorporated land of Benton County, outside the Urban Growth Boundaries (UGBs) of incorporated cities. Abundant riparian and wetland resources are spread throughout Benton County, with annual precipitation countywide averaging 43 inches per year.

There are eight principal streams in Benton County including the mainstem Willamette River, within Benton County and several hundred tributary streams. The majority of rivers and tributaries flow into the mainstem Willamette River, however the streams west of the summit of the Coast Range flow westward toward the ocean with the majority of these comprising the Alsea River watershed. All of the major waterways in the county are known to provide habitat for listed (sensitive, threatened or endangered under State and Federal law) and/or game fish species and fisheries. The Alsea watershed provides important salmon habitat and is a popular fishery. Tributaries to major streams with listed fish species are vital for maintaining fish populations.

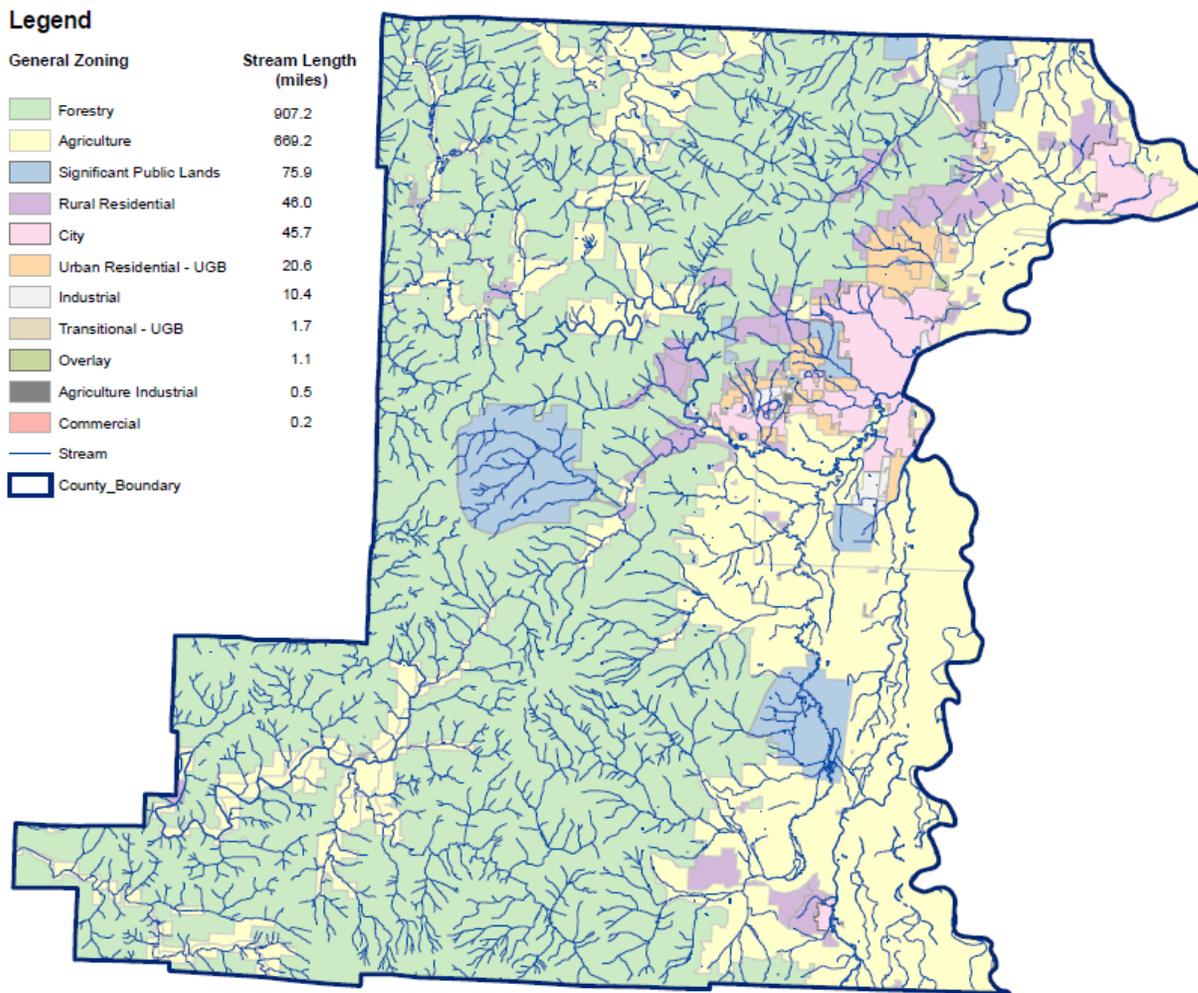
## Goal 5: Riparian Safe Harbor Inventory

Under the safe harbor inventory requirements in State statute (see Oregon Administrative Rules 0623-000 through 0623-0250), significant riparian corridors are those areas including and adjacent to 'fish-bearing lakes' and 'fish bearing streams'. The area of significance under the Safe Harbor inventory is determined by using a standard mapping distance from all fish-bearing lakes and streams. Inventory information used to make this determination should include, but are not limited to:

- a) Oregon Department of Forestry stream classification maps;
- b) United States Geological Service 7.5 minute quadrangle maps;
- c) National Wetlands Inventory Maps;
- d) Oregon Department of Fish and Wildlife maps indicating fish habitat;
- e) Federal Emergency Management Agency flood maps; and
- f) Aerial photographs.

Figure 6

# Benton County General Zoning and Stream Length



Benton County Public Works  
360 SW Avery Ave.  
Corvallis, Oregon 97333-1192  
Phone: (541)766-6821  
FAX: (541)766-6891

REVISED: February 23, 2010  
FILE: S:\maps\PROJECTS\Riparian\GZoneStr.mxd

This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

0 2.5 5 Miles



## Safe Harbor Inventory Methods

Two methods were developed to prepare the Benton County Riparian and Wetlands Project inventory:

1.) A compilation and review of existing information as required under Statewide Planning Goal 5 affiliated Oregon Administrative Rules, and presentation to the Riparian and Wetlands Advisory Group (RWAG), Benton County residents and Benton County project staff. The compiled information includes:

- Oregon Department of Forestry stream classification maps;
- United States Geological Service 7.5 minute quadrangle maps and available stream gauge data;
- Bureau of Land Management stream maps;
- Benton County stream delineation maps;
- National Wetlands Inventory maps ;
- Oregon Wetland Explorer wetlands maps;
- EPA Region 10 wetland geodatabase (2010);
- Oregon Department of Fish and Wildlife maps indicating fish habitat;
- Federal Emergency Management Agency flood maps; and
- Aerial photographs.

2.) Delineation of stream and riparian area locations using Light Detection and Ranging (LiDAR) remote-sensing, high resolution mapping data.

3.) Select field verification of mapping data as project staff and advisory group deemed necessary to meet project goals.

## Mapping Data

There was a wide range of available Geographic Information Systems (GIS) data available for the project (see overview below). Project staff was required under State statutes and planning rules to compile and review specific types of mapping data, such as stream classification maps from the Oregon Department of Forestry. Benton County staff utilized best existing data (e.g. highest resolution, most current, most accurate) whenever possible, to improve the mapping data available. For an overview of GIS mapping metadata, including references of mapping data, refer to **Appendix E**.

## Light Detection and Ranging Data (LiDAR) Map Data

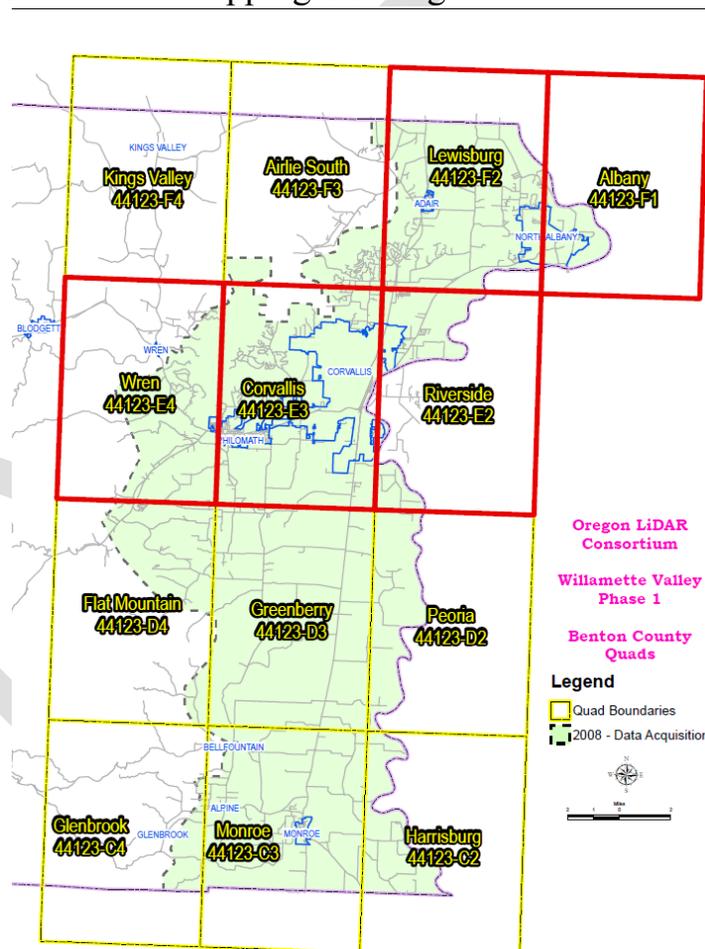
"Light Detection and Ranging" is an optical remote sensing technology that measures properties of scattered light to find range and/or other information of a distant target. The prevalent method to determine distance to an object or surface is to use laser pulses. Benton County was a partner in the Oregon LiDAR Consortium and utilized LiDAR data for the Riparian and Wetlands project.

**The high resolution LiDAR mapping allowed GIS project staff to:**

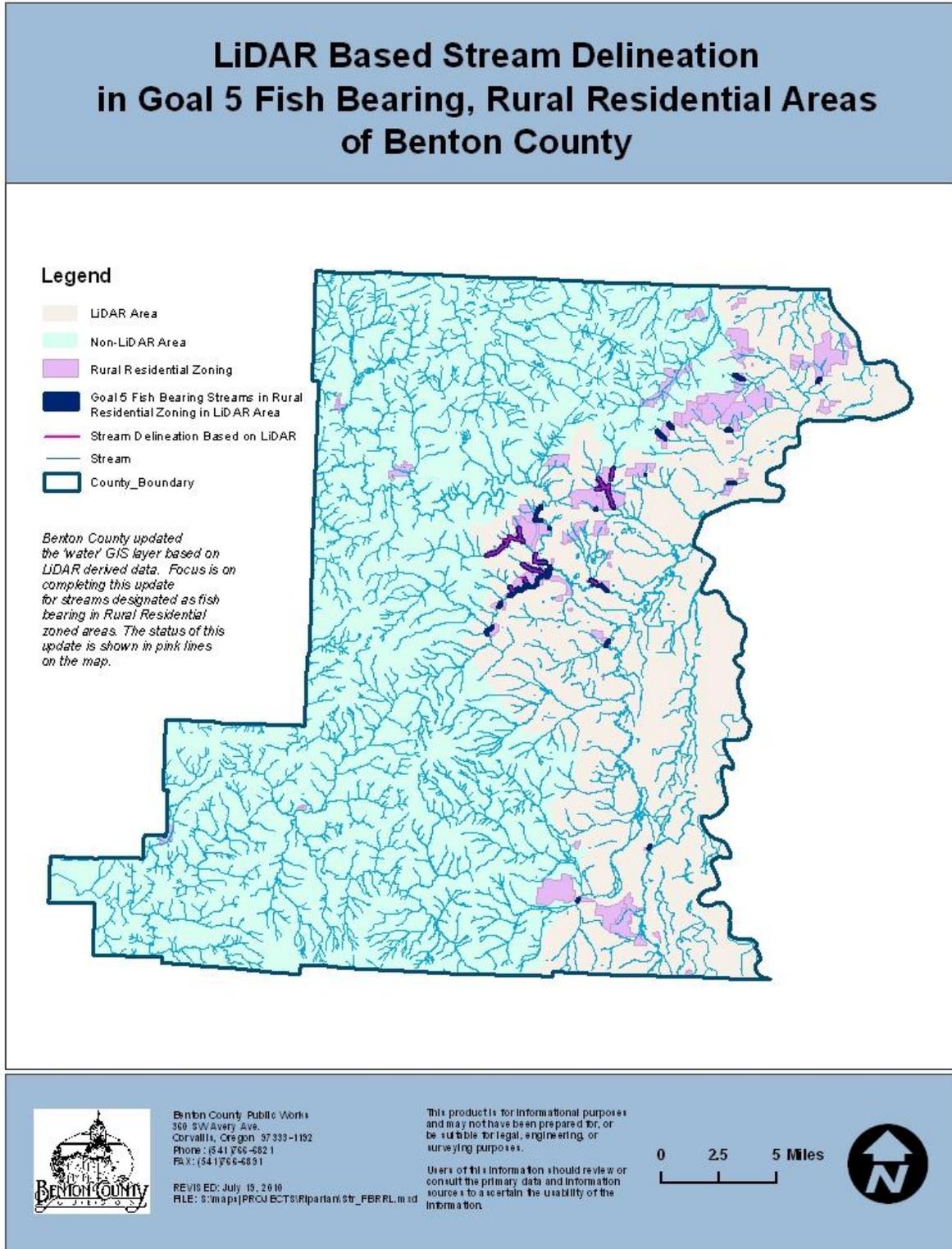
1. Develop 1 meter squared digital elevation models and 1 foot contours within current LiDAR coverage area (**Figure 7**),
2. Prioritize and update stream channel locations within areas documented as “fish bearing streams” with “fish presence” documented by Oregon Department of Forestry (**Figure 8**), and
3. Provide outreach and education and other technical assistance to local residents and organizations on the landscape features of properties located within the current coverage area (see **Riparian and Wetland Landowner Incentives**).

The LiDAR mapping allowed staff to create highly detailed delineations of stream channels. For an overview of the LiDAR mapping approach to improve stream location accuracy utilized for the Benton County Riparian and Wetlands Project ( see **Appendix F**).

**Figure 7** Current LiDAR Mapping Coverage Area



**Figure 8** LIDAR Based Stream Delineation Locations



## Review of Existing Goal 5 Riparian Inventory Information

Following the steps that project partners approved in the Riparian/Wetland Inventory Process (see **Figure 5**), project staff conducted a review of existing documents, maps, and other materials to identify riparian corridors, fish bearing streams, and other resources as required under the Statewide Planning Goal 5 “safe harbor” inventory requirements as described in the Oregon Administrative Rules (OAR 660-023-0090). This information was utilized to produce maps and information to meet Goal 5 inventory requirements.

### United States Geological Survey

United States Geological Survey (USGS) 7.5 minute quadrangle maps, were utilized to determine locations of streams countywide (Benton County GIS department digitized). Benton County staff also worked to digitize stream locations based on USGS maps. In addition, available USGS stream gauge data was downloaded from the USGS Surface-Water Annual Statistics National Water Information System to determine average annual streamflow over the period of USGS gauge records (**Appendix G**). The Willamette River is the only stream within Benton County that has average annual streamflow greater than 1,000 cubic feet per second (CFS) over the available USGS stream gauge record, resulting in increased riparian/wetland corridor (see **Draft Stream and Riparian Overlay Zone**).

### Oregon Department of Forestry

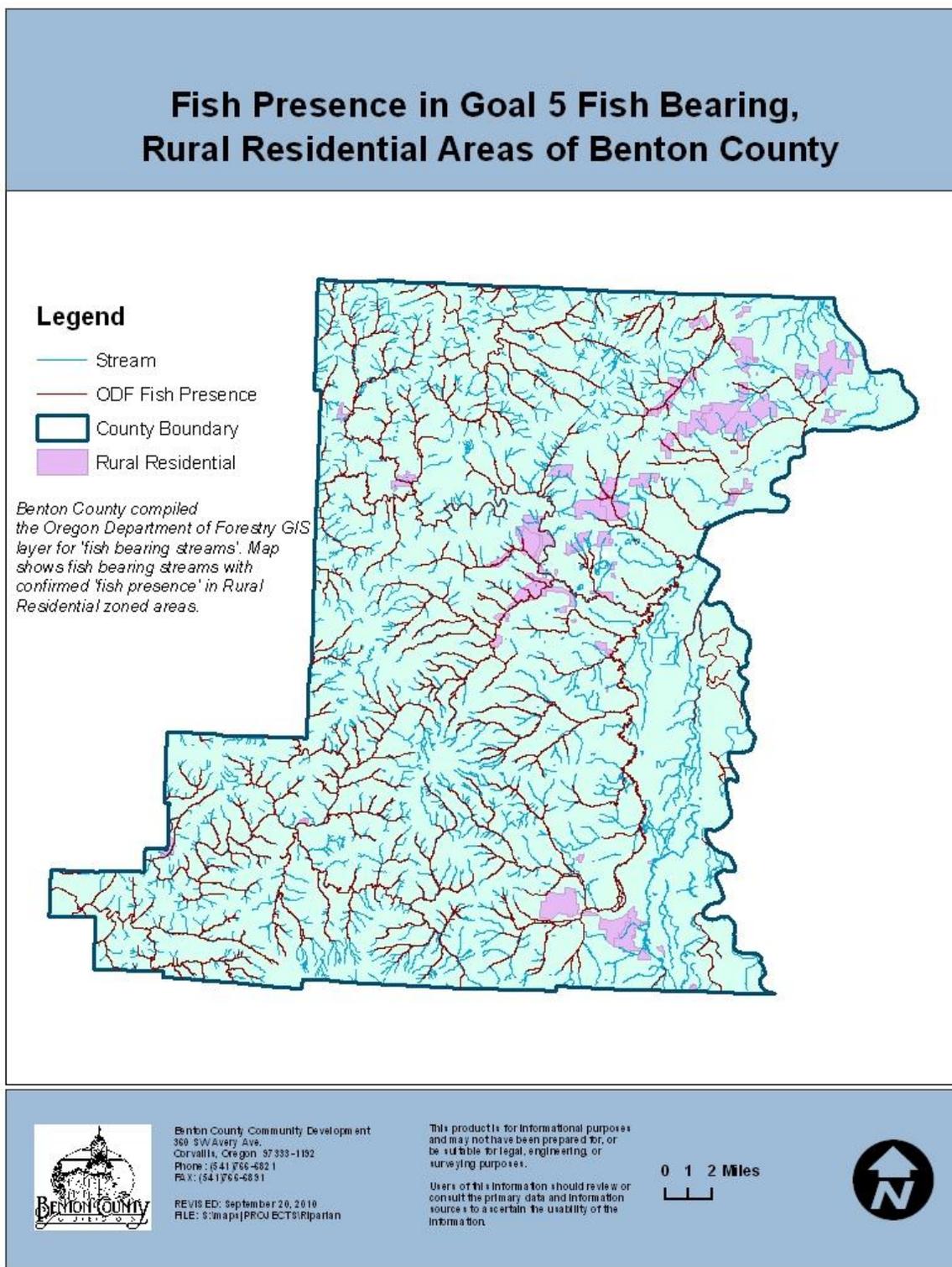
The Oregon Department of Forestry (ODF) implements the Oregon Forest Practices Rules, which classifies streams based on:

- Average streamflow (small, medium, and large);
- Presence/absence of fish, and
- Location of domestic water rights (e.g. surface drinking water sources).

ODF actively conducts field surveys and maps “Fish Presence” (see **Figure 9**) as required under the Oregon Forest Practice Rules for threatened and game fish species. In addition ODF GIS mapping staff has compiled modeled fish habitat data (also referred to as “RC 3 data”). In general the data is an artificial stream network created from US Geological Survey (USGS) 10 meter Digital Elevation Model (DEM) to determine stream gradient. The data can be used by ODF district staff for determining fish presence on previously “Unknown” streams if no other allowable method is available for use (pers. comms. Ryan Millar, ODF GIS Coordinator, 7/26/10). Benton County Advisory Group focused on utilizing ‘confirmed fish presence’ ODF map data to determine ‘fish bearing’ water bodies during the inventory (see **Figure 9**).

Depending on the riparian and wetland features located on the property, various rules and regulations apply when a timber harvest is proposed on public and private lands (see **Existing Riparian, Wetland Regulations, and Appendix H**).

**Figure 9** Streams with Confirmed Fish Presence of Game and Threatened or Endangered Fish Species; Completed by and ODF



[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

#### Oregon Department of Fish and Wildlife

There are known populations of protected, State and Federal listed fish species throughout the streams and wetlands of Benton County (see **Table 3**). Oregon Department of Fish and Wildlife (ODFW) works with other government agencies and non-profits to provide data and fish habitat survey support, to determine fish presence likelihood within forestland (ODFW Physical Habitat Survey Manual, Draft July 2010). Verification of fish presence data is also conducted with ODFW in partnership with ODF.

Communications and technical assistance from ODFW fish biologist Karen Hans confirmed the documented presence of cutthroat, other native and nonnative fish species, and associated fish habitat in Benton County streams, wetlands, lakes and ponds that are perennial and seasonal (pers. comms. with Hans at monthly Advisory Group meetings). In addition, many native/nonnative and Federal or State listed and non-listed fish species within Benton County (see below) have been documented by ODFW across various land uses and zoning (e.g. agriculture, forest, residential and other zoning and land uses within Benton County).

**Table 3** Listed Fish Species in Benton County Waterways\*

Waterway	Listed Species	State Listing	Federal Listing	Distinct Population Segment (DPS)
Willamette R.	Oregon chub	Sensitive, critical	Endangered	N/A
	Chinook salmon	N/A	Threatened	Upper Willamette R.
	Steelhead trout	Sensitive, critical	Threatened	Upper Willamette R.
Long Tom R.	Chinook salmon	N/A	Threatened	Upper Willamette R.
Luckiamute R.	Steelhead trout	Sensitive, critical	Threatened	Upper Willamette R.
Marys R.	Oregon chub	Sensitive, critical	Endangered	N/A
	Chinook salmon	N/A	Threatened	Upper Willamette R.
	Steelhead trout	Sensitive, critical	Threatened	Upper Willamette R.
Rock Cr.	Steelhead trout	Sensitive, critical	Threatened	Upper Willamette R.
Muddy Cr.	Oregon chub	Sensitive, critical	Endangered	N/A
Alsea R.	Coho salmon	N/A	Threatened	Oregon Coast
	Steelhead trout	Critical, vulnerable	N/A	

\* Oregon Department of Fish and Wildlife, 2008

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

### Watershed Councils

Project staff reviewed the Mid-Coast (Alesia), Marys River, Luckiamute River, and Long Tom River respective Watershed Assessments (various published dates, see **References**). These provide a comprehensive review of federal, state, and local natural resource reports and data. For example, these watershed assessments review the historic and current conditions of riparian corridors, vegetation, fish and wildlife habitat and abundance. In general, the assessments document findings that there have been major modifications to riparian corridors including: native vegetation clearing, dams, road crossings, irrigation diversions, straightening stream channels, diked channels and disconnected channels from floodplains, and draining of adjacent wetland areas. Timber harvesting, farming, and building adjacent or within the floodplain and riparian corridor is cited as negatively impacting the function of riparian corridors, and wetland resources.

*Inventory work found that there is currently many organizations such as local non-profits and State agencies, that have detailed information and programs in place, that document impacts to the riparian/wetland resources and water quality—while also working to improve function and quality.*

### Oregon Department of Agriculture (ODA) and Benton Soil and Water Conservation District

ODA completed a Middle Willamette and Mid Coast Agricultural Water Quality Management Area plans covering Benton County. The plans were developed by a Local Advisory Committee of farmers, ODA staff, and local Soil and Water Conservation Districts. The State adopted plan provides guidance for addressing water quality issues in areas with agricultural practices—regardless of zoning. The purpose of the plan is to identify strategies to enhance water quality and minimize water pollution from agricultural lands. The plan supports meeting state rules that require riparian corridor vegetation and banks to be maintained along with goals and implementation strategies to encourage conservation and improve water quality with optional management practices that landowners may implement to improve water quality (see **Appendix I** for Mid-Willamette and Mid-Coast Agriculture Water Quality Management Plan Overview). This includes the requirement that “*Riparian vegetation along perennial streams must provide the water quality functions of shade, streambank stability, and filtration of pollutants. A diverse structure and species mix should provide these functions*”.

## **Wetlands Inventory**

Due to the time-intensive State requirements to determine “significant” wetlands by individual evaluation of each wetland to complete a Local Wetlands Inventory and develop protection measures accordingly, project staff and Advisory Group focused on compiling best available data on existing wetlands locations; from the most current wetlands geodatabases from US EPA Region 10/Oregon State Explorer. In addition, the inventory identified areas where riparian wetlands (wetlands adjacent to/within the riparian area) have been documented or are likely located (see **Findings, Wetlands**).

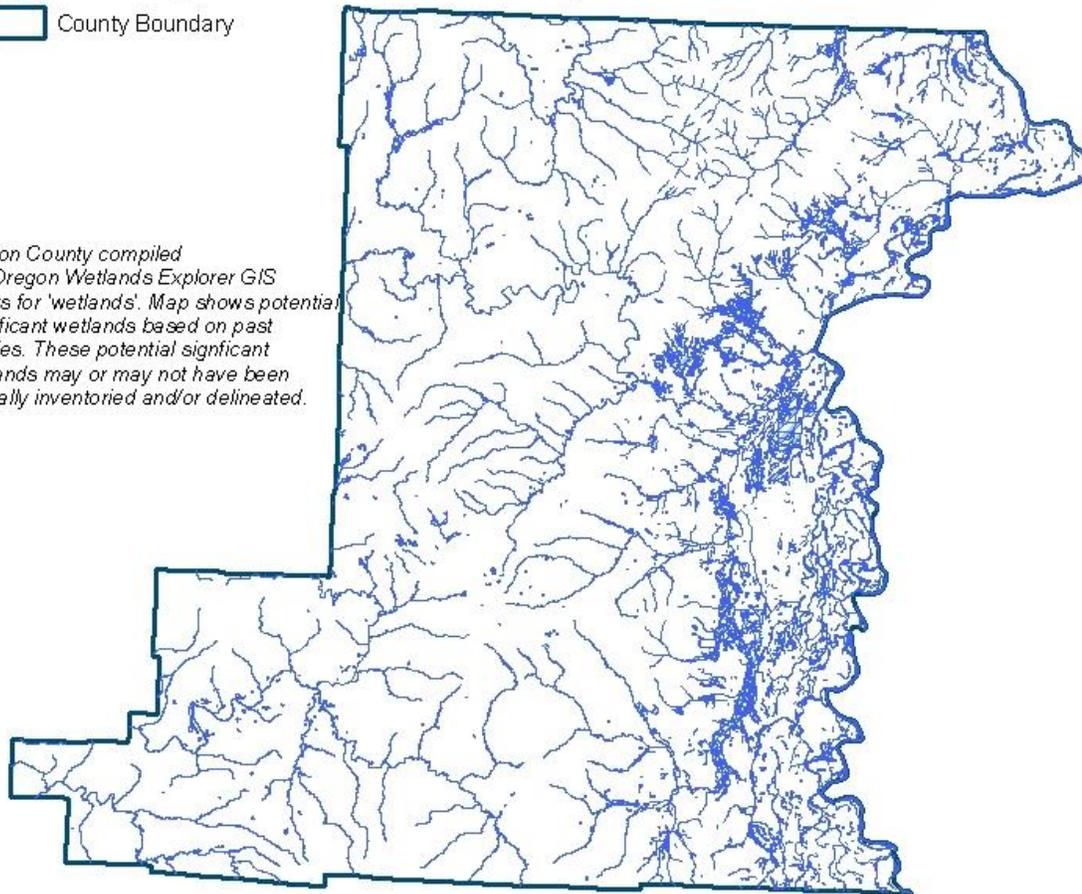
**Figure 10** Oregon Wetlands Explorer Wetland Location Overview

## Potential Significant Wetlands within Benton County

### Legend

-  Potential Significant Wetlands within Benton County
-  County Boundary

*Benton County compiled the Oregon Wetlands Explorer GIS layers for 'wetlands'. Map shows potential significant wetlands based on past studies. These potential significant wetlands may or may not have been formally inventoried and/or delineated.*



Benton County Community Development  
300 SW Avery Ave.  
Corvallis, Oregon 97333-1192  
Phone: (541) 766-6821  
FAX: (541) 766-6831

REVISED: September 20, 2010  
FILE: 0:\maps\PROJECTS\Riparian

This product is for informational purposes  
and may not have been prepared for, or  
be suitable for legal, engineering, or  
surveying purposes.

Users of this information should review or  
consult the primary data and information  
sources to ascertain the usability of the  
information.

0.51 Miles



[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

### Local Wetland Inventories (cities)

The City of Corvallis and City of Philomath have completed Local Wetland Inventories (LWI). The City of Monroe and City of Adair Village are participating in LWIs conducted by Lane Council of Governments and wetland consultants from March-April 2010. An LWI requires mapping of all wetlands at least 0.5 acres or larger at an accuracy of approximately 25 feet on a parcel-based map. Actual map accuracy varies, and areas that cannot be field verified will be less accurate (The LWI is not a substitute for a detailed delineation of wetland boundaries). The LWI maps and report provide information about the inventory area and the individual wetlands, including:

- Total acreage of wetlands in the inventory area
- Acreage of each wetland type in the inventory area (e.g., 18 acres of forested wetland)
- Location, approximate size, and classification (type) of each wetland mapped
- A description of each mapped wetland
- A functions and condition assessment of all mapped wetlands
- All tax lots containing wetlands

During the project period, the City of Monroe and City of Adair will be completing Local Wetland Inventories within their respective Urban Growth Boundaries (UGBs) and in some areas where expansion of the UGB is likely. The data created during the Monroe and Adair wetlands inventory will be reviewed, along with communication/collaboration with project leads to develop beneficial rules, incentives, outreach and education within UGBs and city limits as required under state land use laws (see **Recommendations**).

### Wetland Information compiled from Oregon Wetland Explorer (Oregon State) US EPA Region 10

The reviewed geodatabases are for planning and research purposes only. It is an estimation of the occurrence and extent of wetlands in Oregon, and does not necessarily map all wetlands or represent wetlands that are subject to Federal or State jurisdiction. Benton County has compiled the eleven Federal, State, local, and non-profit Oregon Wetland Explorer data files (see **Figure 10**); the information is useful for assessing and displaying general and location specific wetland indicators for future review. Not all the compiled wetlands data have been field verified.

### **Field Verification**

Ground-truthing occurred in areas selected by project staff with review by the Benton County Riparian and Wetlands Advisory Group. Selection of ground-truth locations was based on:

- Determination of wetland and riparian and stream location map accuracy,
- Priority areas for riparian and wetland planning and protection based on locations chosen by Benton County staff and Riparian and Wetlands Advisory Group;
- Compare ground truth data with mapping to determine accuracy and future work.

Field work occurred during the wet-season of March-April 2010 and 2011. Some field work utilized the Oregon Wetland Rapid Assessment Protocol methodology where feasible during the project

## Riparian Mapping Accuracy Field Assessment

The Benton County Riparian and Wetlands Advisory Group selected locations to complete field assessments to determine accuracy of mapping locations of streams and wetlands. The following locations were selected based on where:

- Photo points could be established within the public right of way along county roads (**Figure 11**);
- Benton County is a designated management authority (under current Willamette Basin Water Quality Implementation Plan);
- Compiled mapping data including LIDAR and Fish Bearing streams data could be compared to review for on the ground accuracy.

Examples from assessments are provided below. The value of utilizing LIDAR data for current stream locations is also shown in **Figure 12**.

**Figure 11** Greasy Creek Sub-basin Photo Point Example



**Photo Point Description:**

Looking Downstream –standing on Aurora road right of way.

**Primary Map Data Source:**  
County Hydro Line, LIDAR

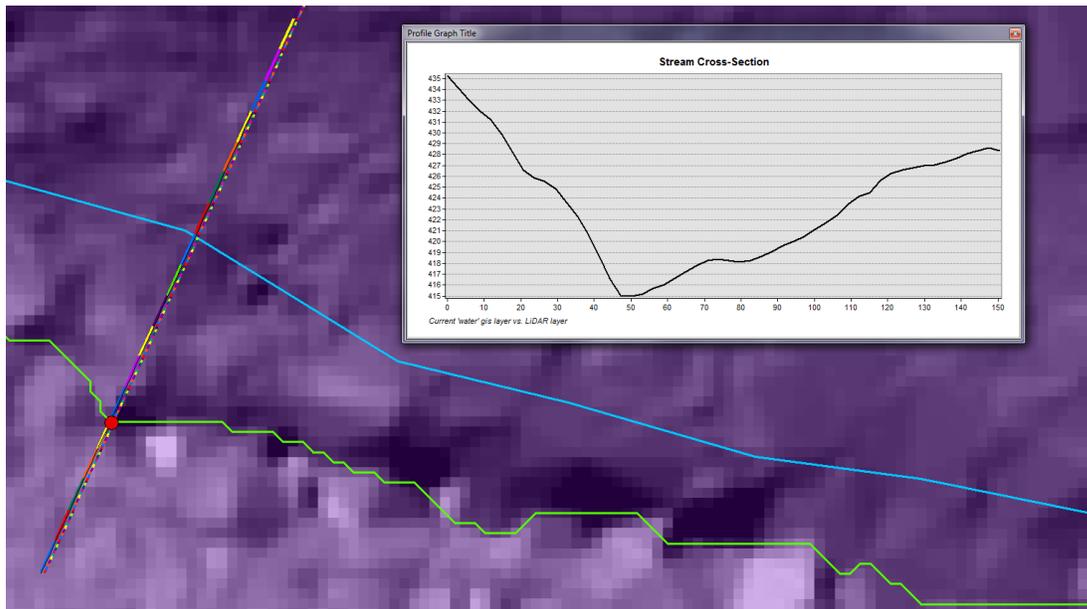
**Assessment:**

LIDAR mapping data provided accurate location of small, seasonal stream

**Figure 12** LIDAR based Stream Delineation for Field Assessment Location  
Profile drawn across 'old' and 'new' stream lines for Quality Assurance check

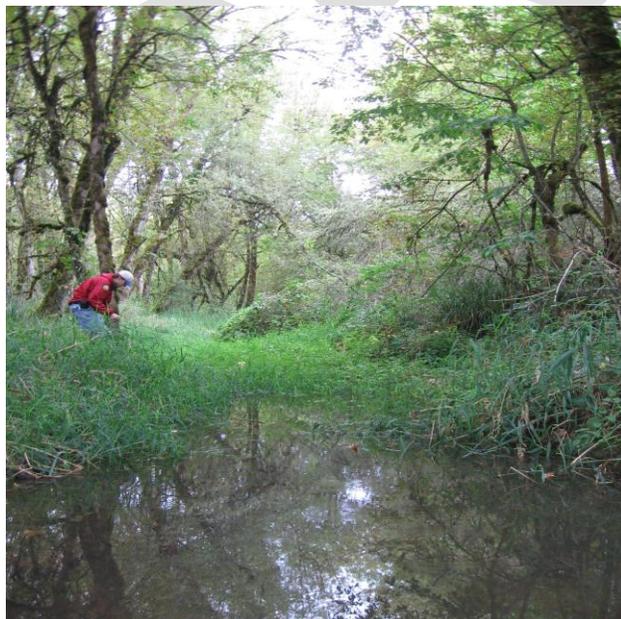
**Blue Line ~ stream from County 'water' GIS layer ~ 'old'**

**Green line ~ stream derived using ArcHydro program and LIDAR data ~ 'new'**



\* At this location the new ArcHydro TM derived stream utilizing LIDAR data is *more* accurate than the currently used Benton County 'water' stream layer by 60 ft.

**Figure 13** Oregon Rapid Wetland Assessment completed on Private Property north of Jackson-Frazier Wetland (Benton County Park)



**Photo Point Description:**

Seasonal Stream running adjacent to wetland assessment boundary, north of Benton County Jackson-Frazier Wetland.

**Assessment:**

Oregon Wetland Rapid Assessment Protocol determination completed on property.

**Goal 5: Riparian Areas, Streams, and Wetland Findings**

- Based on available stream maps there are an estimated 50 stream miles within areas currently zoned Rural Residential, 670 stream miles in general Agriculture, 907 stream miles in general Forestry.
- Available stream gauge data in Benton County show that the average annual streamflows for most streams is less than 1,000 CFS average annual streamflow. The Willamette River is the only stream greater than 1,000 CFS average annual streamflow according to the Albany USGS stream gauge.
- Currently most perennial streams in Benton County have confirmed fish presence and are fish bearing streams as defined by State Department of Forestry.
- Stream channels delineated using LIDAR data (where available) are more accurate and LIDAR data provides enhanced understanding of a given properties drainage features to improve stormwater management and water quality.
- Compiled wetlands maps are accurate in providing an improved understanding of potential significant wetland locations (based on rapid wetland assessments), however no formal delineations of boundaries could be completed during the project period to confirm “significant wetland” under Oregon DSL requirements.

**Goal 6: Water Quality Inventory****Overview of Current Water Quality Issues**

The Clean Water Act (CWA) was enacted in 1972, and is a “statute that employs a variety of regulatory and non-regulatory tools to sharply reduce direct pollutant

*The Water Quality Inventory section takes a “watershed approach” to identify and begin understanding the relationships between the documented causes and sources of water quality impacts in Benton County; building on adopted Benton County water quality plans required by under Federal and State water quality laws.*

discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff” (US EPA). Evolution of CWA programs over the last decade has also included something of a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. The project takes this watershed approach, to understand how to best support and improve water quality.

The water quality inventory work is based on the Benton County Water

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

Quality Implementation Plan and Benton County Storm Water Management Plan (adopted in 2007) water quality pollutant findings, approved implementation goals.

As noted in Oregon's Statewide Riparian Management and Restoration Policy document water quality section, the report observed that "...instances of good or excellent water quality occur most often in the forested uplands of Oregon. Both forest practice rules on public and private forest lands and lack of development help explain this result. On the other hand, instances of poor or very poor water quality occur most often in the non-forested lowlands where intensive land uses have occurred" (p. 19-20, Statewide Riparian Management and Restoration Policy).

Development and use of rural land can lead to removal of riparian vegetation that can buffer impacts from runoff of pesticides, paint, wood treatment chemicals, fertilizer and other chemicals during rainstorms (Oregon Nonpoint Source Pollution Plan, 2000). An additional water quality issue within several Benton County streams is water quality impairments for temperature during specific times of the year for priority aquatic species such as salmon and other fish and aquatic species (Benton County TMDL, 2007). A major factor of stream temperature impairment is lack of vegetation providing stream shading (NRC 2002; Benton County TMDL, 2007; Moore, 1997; Beschta, 1997). Stream temperature can also be reduced by increased stream flow, stream bank stabilization (leading to narrower stream channels), and other factors (Moore and Miner, 1997; Beschta et al., 1987; and Sinokrot and Stefan, 1993). The location of shading between the headwaters and confluence of the river is also an important influence on stream temperature (Beschta et al., 1987). Once stream temperature is elevated, heat is not dissipated easily even if the water flows through a shaded reach (Beschta et al., 1987).

### **Willamette Basin Water Quality**

There are specific water quality problems that the Riparian and Wetlands Project is intended to help address; one of the foremost is the water-quality status of the mainstem Willamette River, and the water quality impacts from Willamette River tributary streams. Oregon DEQ has mandated that Benton County and all other "designated management agencies" (DMAs) in the Willamette Basin take steps to:

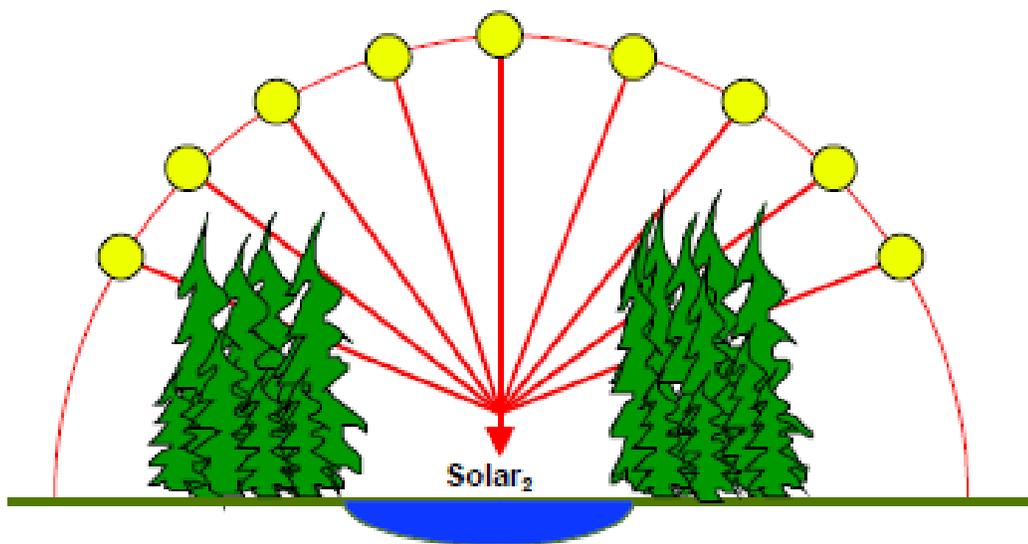
- Reduce bacteria loading (Benton County TMDL Implementation Plan, 2008,
- Reduce erosion and sedimentation; eroded soil entering waterways is the leading cause of mercury pollution and areas lacking vegetated riparian areas are unable to stabilize streambank soils and filter sediment-laden runoff before it reaches streams in Benton County (Benton County TMDL Implementation Plan, 2008),
- Reduce temperature inputs to the watershed (Benton County TMDL Implementation Plan, 2008). As most of the streams in Benton County drain into the Willamette, Benton County is required to improve water quality and work towards improving and maintaining the riparian buffer between land development/land use activities and the waterways (Benton County Stormwater Management Plan, 2007, Benton County TMDL Implementation Plan, 2008).

As shown in **Figure 14**, the Oregon DEQ Effective Shade Diagram, Oregon DEQ utilizes the “effective shade” model to determine the amount of solar radiation load that would affect stream temperatures, and improvements in stream temperature if ‘site potential’<sup>2</sup> riparian vegetation is protected along that can occur along perennial streams that flow into the Willamette River resulting in elevated temperatures (see **Appendix H** for additional details on ‘surrogate measures’ related to effective shade’).

**Figure 14** Oregon Department of Environmental Quality Effective Shade Diagram

---

**Solar<sub>1</sub>** – Potential daily direct beam solar radiation load adjusted for julian day, solar altitude, solar azimuth and site elevation.



$$\text{Effective Shade} = \frac{(\text{Solar}_1 - \text{Solar}_2)}{\text{Solar}_1}$$

Where,

**Solar<sub>1</sub>**: Potential Daily Direct Beam Solar Radiation Load

**Solar<sub>2</sub>**: Daily Direct Beam Solar Radiation Load Received at the Stream Surface

---

<sup>2</sup> Site potential vegetation is defined as the vegetation types with specific characteristics (height, density) that would historically have been present in a particular site.

## Water Quality Inventory Process

### Start with Local Knowledge, Ideas, and Issues

Project staff heard from residents on what they believe is the major concerns in the watershed, and began to identify possible causes and sources of these concerns. Anecdotal evidence, such as “There aren’t any fish in the stream anymore because the temperature is too warm and there is too much dirt going into the stream since they removed all the trees along the streambank”. There was a range of ideas and issues of how to best complete an inventory and structure a plan (see Appendix )

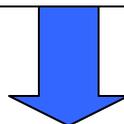
Early in the project, countywide community meetings were held in 2009 and 2010 with rural residents.



### Best Available Research and Reports

Compiled peer-reviewed research and reports from the Pacific Northwest (western Oregon and Washington), appropriate for meeting project goals. In addition, State and Federal water quality assessment and improvement manuals were utilized, whenever possible, to provide continuity with water quality related plans and program work including storm water management and total maximum daily loads.

Best Available Data was compiled to the most relevant information to meet project goals by staff, and the volunteer Advisory Group.



### The Public Process

Inventory findings along with recommendations for plans (policy, outreach and education, landowner support, partnerships) were presented to communities through a second round of community meetings during the Fall of 2010. Input at community meetings and other events (County Fair, door-to-door ‘listening sessions’), will be presented to the Advisory Group.

A second round of meetings and other outreach to local residents will occur, to inform the Advisory Group development of any policy, outreach and education.

## Alsea Basin Water Quality

The Alsea Basin has several streams that are 303d listed streams, where water quality issues have been documented by ODEQ. These include water quality impairments of:

- **Dissolved Oxygen (DO):** Adequate dissolved oxygen is necessary for good water quality. Oxygen is a necessary element to all forms of life. Natural stream purification processes require adequate oxygen levels in order to provide for aerobic life forms. As dissolved oxygen levels in water drop below 5.0 mg/l, aquatic life is put under stress. The lower the concentration, the greater the stress. Oxygen levels that remain below 1-2 mg/l for a few hours can result in large fish kills.
- **Temperature:** Protected fish species including salmon require cooler water temperatures for migration, spawning and core cold water habitat under Oregon State law. Temperatures that exceed these criteria during the assessment period (when temperature monitoring occurs)

According to the ODEQ, Oregon Water Quality Index Report (OWQI), water quality in the Alsea sub-basin for water years 1986-1995 water quality is “On the average, water quality is good in the fall, winter, and spring, and improves to excellent in the summer” (ODEQ Water Quality Index: <http://www.deq.state.or.us/lab/wqm/wqimain.htm>).

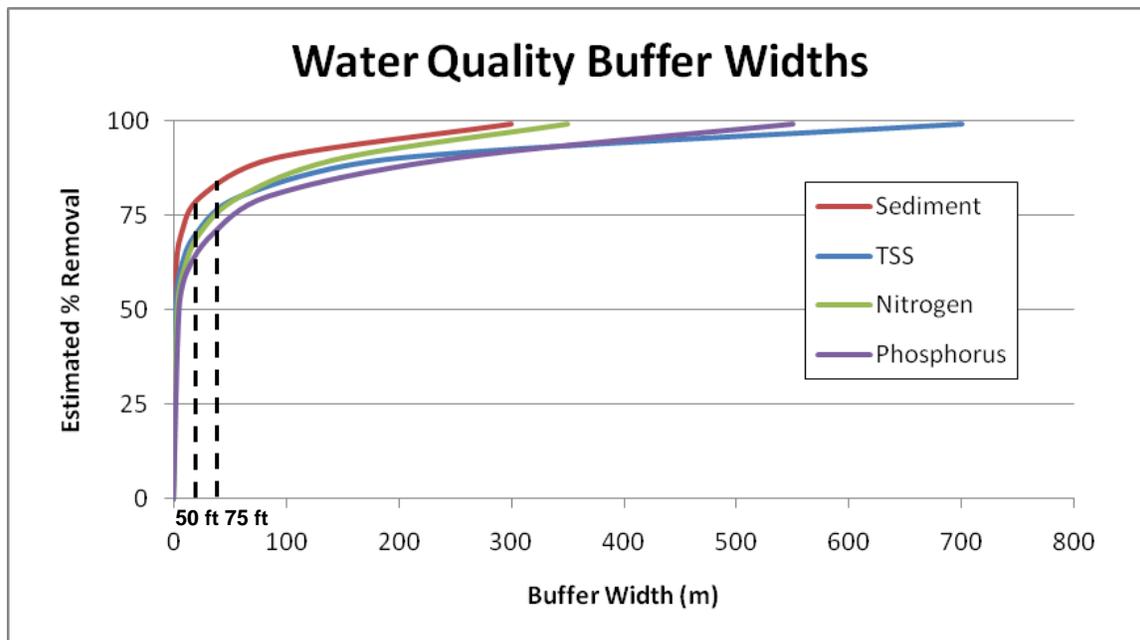
## Water Quality Mapping Data

For an overview of GIS water quality related mapping metadata, including references of mapping data, refer to **Appendix E**.

## Review of Existing Goal 6 Water Quality Inventory Information

The County is approximately 677 square miles with more than 8,000 households served by septic systems outside the city limits. Many of these properties are located along rivers and streams where riparian buffers (if present) provide water quality benefits (see **Figure 12**). Total Maximum Daily Loads have been established to help reduce pollution in the water to comply with water quality standards. In this way, designated beneficial uses such as aquatic life, drinking water supplies, and water related recreation will be protected. When implemented successfully, the TMDL will result in a cleaner and healthier Willamette River for current and future generations. Information on how riparian and wetland resources can improve water quality was compiled to inform code development.

**Figure 15** Contaminant removal effectiveness of Riparian Buffers (adapted from Washington Department of Ecology, 2009)



The above graph was modified to show the estimated percent removal of pollutants including sediments, total suspended solids (TSS), and nutrients such as nitrogen and phosphorus that result from 50 foot (ft.) and 75 ft. riparian buffers (Safe Harbor Protection, see **Policy** section). The graph also highlights the incremental improvements in buffer widths greater than Safe Harbor Protection methods.

#### Oregon Department of Environmental Quality

The Oregon Department of Environmental Quality (ODEQ) Impaired Water Quality Report 2005/2006 was reviewed to determine the status of water quality in Benton County (see **Table 4** summarizes water quality standards that were exceeded for monitored streams in the Willamette Basin, and **Table 5** summarizes water quality standards that were exceeded for monitored streams in the Alsea Basin ). Specific water quality pollutants (parameters) are described by river mile. In addition, the season and when water quality impairments were documented by ODEQ are shown. The water quality pollutants of temperature, bacteria, and mercury are of highest concern in the Mid-Willamette Basin Water Quality Plan. Oregon Department of Environmental Quality temperature standards are exceeded on all perennial streams monitored within Benton County.

**Table 4** Benton County Water Quality Impaired Streams

**Willamette Basin**

Waterbody Name	Listed River Mile	Parameter	Season	TMDL Written
Long Tom River	0 to 24.2	Fecal Coliform	Winter/Spring/Fall	Yes
Long Tom River	0 to 24.2	Temperature	Summer	Yes
Long Tom River	0 to 24.2	E. Coli.	Fall/Winter/Spring	Yes
Long Tom River	0 to 57.3	Manganese	Year round	No
Long Tom River	0 to 57.3	Iron	Year round	No
Marys River	0 to 13.9	Fecal Coliform	Winter/Spring/Fall	Yes
Marys River	0 to 13.9	Temperature	Summer	Yes
Marys River	0 to 13.9	Dissolved Oxygen	January to May	No
Marys River	0 to 41	Manganese	Year round	No
Marys River	0 to 41	Iron	Year round	No
Muddy Creek	0 to 33	Temperature	Summer	Yes
Soap Creek	0 to 16.8	Dissolved Oxygen	October - May	No
Soap Creek	0 to 16.8	Temperature	Year round	Yes
Willamette River Mainstem	110.5 to 149	Fecal Coliform	Winter/Spring/Fall	Yes
Willamette River Mainstem	110.5 to 158.6	Temperature	Summer	Yes
Willamette River Mainstem	110.5 to 158.6	Mercury	All Year	Yes
Luckiamute River	0 to 60.1	Temperature	Year round	No

\* **Source:** Oregon Department of Environmental Quality, Willamette Basin Total Maximum Daily Loads (TMDLs)

**Alsea Basin**

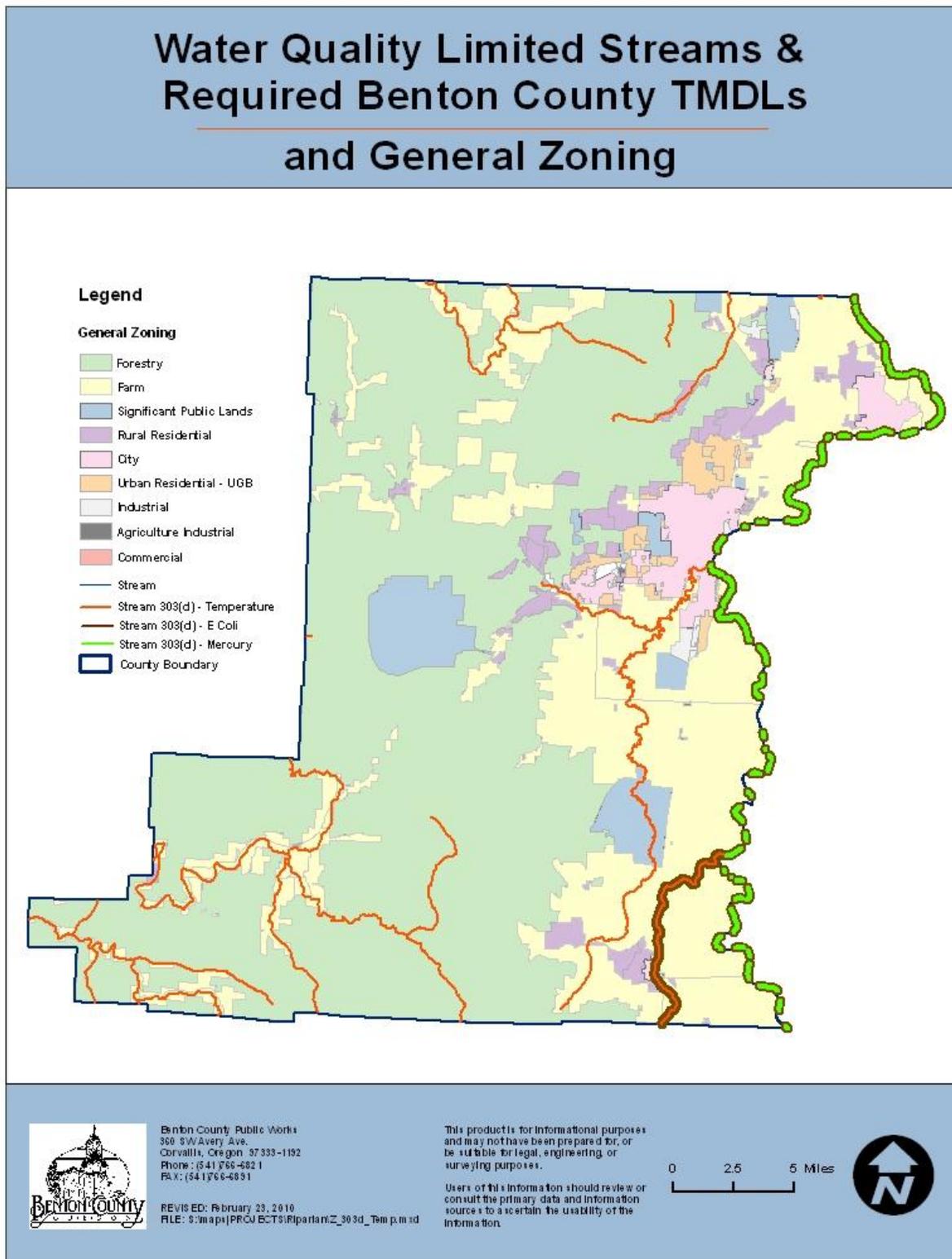
**Table 5** Benton County 303d Listed Streams with Listed Water Quality Pollutants

Waterbody Name	Listed River Mile	Parameter	Season	TMDL Written
Alsea River	15.7 to 27	Dissolved Oxygen	September to June	No
Alsea River	15.2 to 47	Temperature	Summer	No

\* Several other tributary streams to the main-stem Alsea River are water quality limited; to review additional data, see **Appendix H**

It is important to note that mercury is a pollutant on the mainstem Willamette River. Human actions cause erosion and contribute to the problematic levels of mercury, which is a naturally-occurring element in many Oregon soils, volcanic rocks and in geothermal water sources. Benton County tributaries to the Willamette River transport sediment that contains small amounts of mercury.

Figure 16 Current Benton County Water Quality Limited Streams



## Goal 6 Water Quality Inventory Findings

### Willamette Basin

The mainstem Willamette River is “water quality limited” for key water quality parameters of mercury, temperature, and bacteria. All perennial stream locations were mapped in Benton County, including improvements to the locational accuracy of several tributaries to the Willamette River. These perennial streams contribute to the main stem Willamette River water quality, and are subject to the Upper Willamette Subbasin, Temperature TMDL requirements (see **Appendix H** for Regulatory Riparian Protections required for the Willamette Basin TMDL).

### Alsea Basin

The Alsea Basin has several water quality limited (i.e. 303(d) Listed) streams for temperature and the mainstem Alsea River for dissolved oxygen (see **Appendix I**). There is currently no formal guidance or State plan (such as a TMDL Implementation Plan) that has been adopted requiring Benton County and other entities to limit temperature or bacteria inputs to streams in the Alsea Basin. There is currently no State adopted TMDL Implementation Plan for temperature impaired streams within the Alsea Basin.

## Priority Inventory Data for Developing Benton County Riparian Protection Policy within the Alsea Basin and Willamette Basin

Based on the findings of the Goal 5 and Goal 6 inventory work, additional analysis was completed to document priority inventory data for directing development of Goal 5 (Riparian and Wetland Resources) and Goal 6 (Water Quality) related riparian protection policy for each major Basin in the county (see **Table 7**).

**Alsea Basin:** Due to the ongoing State, Federal and Local work to assess water quality and develop a Total Maximum Daily Load for water quality parameters (see **Appendix J** for Mid-Coast Basin TMDL Update ), it appears premature to implement riparian and wetland protection policies for water quality purposes. Once goals and priorities have been established through an Alsea Basin TMDL, development of protection measures can follow accordingly. By contrast, the riparian protection provisions of Goal 5 for fish-bearing streams are (a) applicable statewide, and (b) addressed to a broad array of stream and riparian functions (fish habitat, wildlife habitat, water quality, flood mitigation, etc.). Therefore, it is recommended that the focus for riparian protection in the Alsea Basin be fish bearing streams under Goal 5 (see **Recommendations**). There are a higher percentage of landowners with total tax lots in the Alsea Basin that contain fish-bearing streams (33.5%) compared to the Willamette Basin.

**Willamette Basin:** Under the Willamette TMDL, the pollutant load allocation for temperature is “background solar radiation” based on “system potential vegetation (Willamette Basin, TMDL, 2006). This load allocation applies to all perennial tributaries of the Willamette Basin. In order for Benton County to meet the currently adopted Water

Quality Implementation Plan requirements and Goal 5 significant riparian protection goals; fish bearing and all other non-fish bearing, perennial streams will be included in riparian protection program. Analysis in **Table 7** shows that the additional estimated streams miles for protecting riparian vegetation/corridors for all perennial streams and fish bearing streams would increase the number of applicable tax lots by 0.8% or an estimated ninety (90) stream miles.

**Table 7** Comparison of Priority Riparian Inventory Data for Alsea and Willamette Basin Major Hydrologic Basins, Benton County

Priority Inventory Data	Alsea Basin	Willamette Basin		
	Stream Type	Stream Type		
	Fish-bearing <sup>4</sup>	Fish-bearing	All Perennial <sup>3</sup>	Fish-bearing or Perennial
Stream Miles <sup>1</sup>	220	555	889	959
Number of Riparian Lots <sup>2</sup>	1037	2246	3107	3179
Percentage of total lots in basin that are riparian	33.5%	20.3%	28%	28.7%
Number of Riparian lots with buildings w/in 75' of the stream	46	244	334	334
Percentage of total lots in basin that have buildings w/in 75' of stream	4.4%	2.2%	3.0%	3.0%

1. Stream miles determined by number of streams in both incorporated and unincorporated Benton County; US Geological Survey, Benton County, and BLM map sources.
2. Riparian lots are based on lots that have applicable streams (e.g. fish bearing), in only the unincorporated areas of Benton County.
3. Perennial streams are streams that have been documented as having stream flow throughout the entire year.
4. Fish Bearing Streams are streams in Benton County with verified fish presence (Oregon Department of Forestry).

## Existing Riparian and Wetland Rules and Regulations

There are many overlapping Federal, State, and Local government plans and policies pertaining to riparian and wetland resources. Overlapping riparian and wetland maps, inventories, outreach, and planning efforts are currently taking place within Benton County. There are six (6) well established government programs associated with riparian corridors, wetlands, and associated natural resources in Oregon (see **Appendix K**). Within Benton County these various local and State Rules apply to protecting streams

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

and wetlands, with various jurisdictions having authority over land use. Benton County will utilize current policy and build on information from these to avoid duplication.

## Community Meetings

During 2009 and 2010 countywide community meetings were held throughout Benton County. 2009 community meetings provided a general overview of the need for the project, goals and timelines. Meeting attendees provided input for staff consideration prior to inventory work beginning. Project mailing list subscribers were emailed a notice of the meeting, with flyers and local news media articles and other media provided.

**Figure 17** Fliers for 2009 and 2010 Community Meeting Dates and Locations

**RIPARIAN AND WETLAND MEETINGS!**

**COUNTYWIDE NOVEMBER 2009**

**BENTON COUNTY**  
OREGON

**Riparian & Wetlands Project**

<p><b>Philomath Area Community Meeting</b> Date: November 10, 2009 Time: 7:00-8:30 PM Location: Benton County Historical Museum Upstairs, Philomath</p>	<p><b>Lewisburg/ Adair Area Community Meeting</b> Date: November 12, 2009 Time: 7:00-8:30 PM Location: Mountain View School Library</p>
<p><b>Alsea Area Community Meeting</b> Date: November 16, 2009 Time: 7:00-8:30 PM Location: Community Center Library Meeting Room</p>	<p><b>Monroe/Alpine/Bellfountain Area Community Meeting</b> Date: November 17, 2009 Time: 7:00-8:30 PM Location: Monroe High School Library</p>
<p><b>Wren/Kings Valley/Blodgett Area Community Meeting</b> Date: November 18 Time: 7:00-8:30 PM Location: Wren Community Center</p>	<p><b>Adair Village/North Albany</b> Date: November 19, 2009 Time: 7:00-8:30 PM Location: Adair City Hall</p>

**CONTACT:**  
Adam Stebbins,  
(541) 766-6085  
Adam.stebbins@co.benton.or.us

During October and November 2010, a second round of community meetings was held countywide. Direct mailings were sent to property owners within the Benton County GIS database within 100 feet of streams within the five miles of the areas of Alsea, Monroe/Alpine/Bellfountain, Philomath, Lewisburg, and Wren/Kings Valley/Blodgett. In addition, flyers were sent to local libraries and articles were provided by the Benton County Public Information Officer to local news media. All meetings included an overview of inventory work to date, provided by project leads. In addition various policy scenarios and discussion for outreach/education and incentives occurred at all meetings (see **Appendix L** for community meeting slides/policy scenarios). At the request of the

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

Alsea Citizens Advisory Committee chair, an additional public meeting was held on March 1<sup>st</sup> 2011.

Comments captured at community meetings and other correspondence including the one-on-one “listening sessions” (see **Listening Sessions** section below) document a wide range of input including but not limited to: inventory findings and methodology, the type and location of potential policy, education and enforcement needs and many other areas. Public input was reviewed by staff and Advisory Group volunteers to determine an effective plan for protecting and improving riparian and wetland resources in Benton County. Benton County Staff utilized this community input to update the inventory and proposed riparian and wetland protection policy.

### **Listening Sessions with Landowners Summary**

The Riparian and Wetland Project Listening Sessions (see **Appendix M** for Listening Sessions Outreach Flyer) consisted of the participation of 25 individuals in 17 listening sessions conducted in February and March of 2011. Each session lasted approximately 30-60 minutes and was casually structured. This was participants’ opportunities to express any thoughts, concerns, suggestions, or ask any clarifying questions they may have regarding the project. The majority of participants are property owners in rural areas (most participants were from the Alsea area), that have streamside parcels.

This report encompasses the major points, thoughts and concerns of participants. Not every comment is recorded in this summary report; however, every effort has been made to include the points that each participant wanted conveyed to County Staff as they take the project forward. Summaries of responses are organized into the following four categories:

1. **Process**- comments related to the overall process of the project
2. **Technical comments**- comments related to the scientific nature of the issue and the County’s approach to addressing these issues
3. **Policy**- comments regarding potential development code updates as they relate to riparian and wetland areas
4. **Other**- Points of importance that did not neatly fit into a previous category but were important, recurring statements throughout the listening sessions

#### **Process**

In general, participants felt the County could have done a better job in structuring this project from the beginning, including better notification and involvement of property owners. The following are comments and suggestions made regarding the overall process of the project, including community involvement and notification:

- The process needs better notification overall. E-mail notification is not sufficient for all landowners in Alsea and the County should make sure mailers go to everyone that is potentially affected.

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

- There are already too many rules and regulations. The County should not be spending time or money on these efforts and should leave private property owners alone.
- When the County does projects like this a pile of money needs to be dedicated to education and notification. People want to show up to a meeting and be able to have their questions answered accurately.
- Collaborative efforts need to be collaborative between more than just 'elite' or scientifically savvy individuals. While the community has been invited to advisory group meetings, some feel the concern has been with water and water quality, but the professionals have failed to look at this from the landowners perspective. They feel as if they must constantly share at these meetings.
- Some feel the public has been turned off to the process because there has been no level of detail. The people want to see a timeline and details outlined for the project.
- A level of trust needs to be restored between the County and landowners. The County should work with landowners much like the Watershed Councils do instead of passing new rules.
- There is no cost-benefit analysis for this project. A cost-benefit analysis needs to be done before the County gets into the details of a project like this.
- The community needs to have access to the data used in the study (TMDL data, for example). Turns people off to participate in a study with no data that is readily available to the public.
- Any program for Alsea should include Lincoln as well because they are connected by the river. To achieve this, it should be a joint effort with DEQ and other surrounding jurisdictions.
- People feel that the County has sought their opinions in the past and that they have been ignored. It is hard for some to believe anything they provide as input will be considered

### **Technical comments**

#### Lack of data

- Many people believe the Alsea River and associated streams are in comparatively great condition and do not need additional rules to improve water quality. They've been unimpressed by the lack of data stating what, if anything, is wrong with the water quality of the area. Several said they have looked for reports stating the status of water quality in the Alsea and could not find anything

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

available to the general public. In the end they believe it's an issue of 'if it's not broken, don't fix it.'

#### Shortcomings in the inventory report

Those that had read the inventory report felt that it could use some improvements. In particular, it needs more clarity of scientific language for the general public, more scientific data supporting the County's findings, more clarity as to the County's goals and objectives through this project, and a clear statement as to who will be affected and how they will be impacted.

- Several participants pointed out what they felt were inaccuracies in the report with regards to stream identification and delineation
- There is not enough data to back the inventory report. Were there field checks done? Field checks should be necessary to validate any data that is on the computer.
- There has been lots of talk of riparian impact. Need to see the supporting evidence
- Would be nice to have a zoomable map and a list of affected properties
- Measuring the top of the bank doesn't make sense for streams that have significant elevation changes near the stream banks.
- Clarification is needed for the following points:
  - Which waterways these rules would apply? Clearly state which bodies of water would and would not be subject to these rules
  - What is considered the 'top of the bank' for these regulations?
  - The distinction between land use jurisdiction of residential vs farming vs logging.
  - What properties are included in this project?
  - What other state and federal rules can landowners expect to run into?
  - If there is a fire or a structure needs to be remodeled, there is a fear that these rules will restrict the ability to rebuild a house. Need to make sure that house can be fixed, updated or replaced in case of a fire.
  - Would this apply to any wetland, pond or stream that happens to be on the property? What about intermittent streams or culverts?

#### Water Quality

- There are no dams on the Alsea so water quality is not an issue
- Water quality is very important and the County should take measures now to make sure water quality is maintained for the future

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

- There is not enough or accurate enough data regarding water quality and stream temperature along the Alsea to warrant additional rules at this point.
- Salmon are important in the Alsea for habitat and recreational value. Steps need to be taken to ensure water quality remains adequate for salmon and other fish species
- Is this intended to be restoration for the floodplain? The floodplain is bigger than 50 feet and would not benefit from such a small area.

#### Vegetation and Riparian Areas

- Noxious weed control is an issue along streamsides. Any regulations should support and encourage the removal of noxious weeds and invasives.
- The top of bank already includes a number of trees and is fairly close to the water. It does not seem necessary to expand this even further when there are so many trees within the top of bank area
- A lot of things have been happening with the land in riparian areas. A number of activities are currently going on including roads, orchards, lawn. If these activities are already in place and the riparian area appears healthy, why would be necessary to stop them?
- Ideas that there be some rule that you can't use pesticides or herbicides within riparian areas to prevent water pollution
- Wild animals use the streams and rivers, and need access. Openings in riparian vegetation need to be maintained in order to allow these animals access to the stream.

#### Erosion

- Banks are fragile with sandy soils and it's beneficial to plant trees to stabilize the bank
- There are not very many steep slopes along the Alsea so erosion is not a big concern for the people who live here
- Some people take care of the streamside but others bulldoze all of the vegetation down
- There are a number of people that are worried about erosion, so protecting the riparian area is one way to help stop and prevent erosion

#### Unique Alsea community characteristics

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

- Many properties in Alsea have houses that were built within 50 feet of the stream because that is what was desirable at the time the homes were built. Given this fact, many people question what good a riparian buffer would do in protecting natural integrity when so many residences and buildings are already within the riparian zone.
- Considering all stream miles countywide, those in Alsea constitute ½ of 1% of river miles, so why doesn't the County spend their time more effectively by looking at other areas?

*The Alsea basin is not the same as the Willamette*

People point out the fact that the Alsea watershed is not the Willamette, does not face the same issues, and therefore should not be subject to the same rules as the Willamette Valley. Water quality issues are different, and given the narrower nature of the valley, there are a lot more streams that dissect and border properties, creating a bigger riparian impact for property owners.

- Land use patterns make Alsea unique and therefore should not be subjected to the same land use rules as other parts of the County
- The project is encompassing different basins and policy can't be geared to multiple basins on a one size fits all approach. Trying to apply the same rules and regulations to the Alsea as the Willamette and doesn't work well
- Zoning and land use are so locked up out in Alsea that there will be little development if any occurring. Because this is the case, new rules affecting future land use in Alsea will have little overall effect
- More data is needed before you can determine what needs to be done. Start with the Willamette- what are the problems and evidence for those problems? The County should be focusing their efforts here first because the Willamette basin has more problems
- Several people have concerns with the project down the road. These appear to be blanket rules, but people and their property are affected differently. It does not appear that the County has taken all of these scenarios into consideration

**Policy**

The following are comments regarding policy options and direction. In general, participants were wary of additional policies that may be restrictive, and would much rather see the County take a voluntary and incentives-based approach to this program. They also felt the end goal of achieving better habitat and water quality could not be achieved if logging and agricultural practices were not subjected to similar rules.

*Land Stewardship*

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

- People want to do well on their property. They will respond more favorably to more incentives and fewer rules.
- Many activities in riparian areas are for the benefit of the land, such as removing blackberries, so why should landowners have to get permission from the County before engaging in such activities?
- People live in Alsea because it is a lifetime investment. Want to be able to build a retirement on their property and pass it on to their family. They have no intention of doing anything harmful to the land because they want it to be there for the next generation.
- Riparian area on some properties is lowlands where grass is growing. There are no trees and the grass is kept mowed. There are concerns that if the grass can't be kept down to prevent a fire hazard, then there are potential liability issues.

#### Allowable activities-

- There is a mistrust in the statement of practices and uses being 'grandfathered in'. Some community members feel they have been wronged over the past several decades through different interpretation of policy. They have been told one use is ok and grandfathered in, but then have been told by another person later on that it is not ok.
- Both those opposed and in agreement with the project agreed that there are some activities should be allowed in any proposal developed by the County. These activities included:
  - Access paths to the streamside
  - Trimming vegetation
  - Removal of limbs and trees when they pose safety issues, and not being forced to remove any vegetation that is non-native.
  - Support and encourage the removal of noxious weeds and invasives
  - Allow the continuation of recreational activities
  - Any existing structures are ok
  - Rebuilding or remodeling is ok
  - Existing landscaping and gardening is ok
  - Any other existing uses are to be grandfathered in

#### Equity of policies

- Why is the County targeting private property owners? Agriculture and forestry have a bigger effect on water quality. Logging areas need buffers as well, and logging should be a bigger concern because it has a bigger impact.
- Some areas need more protection than others. Rules shouldn't apply to those areas that are less impaired.

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

- Buffers as currently proposed in the inventory report could have a huge impact on some lots. One example: a stream runs through the middle of a 1 acre lot. With a 50 foot buffer on 1 acre, the buffer will encompass 77% of the available land.

*Focus on non-regulatory and voluntary incentives-*

- Participants were not opposed to protecting water quality and streamside integrity, but would rather that the County provide incentives for landowners and create outreach and educational materials informing property owners of the best ways to maintain their property.
- It would be helpful to have a short list of what people can do to help. Something like a half sheet of paper with key points on one side and contact information on the other side with the intent that it could be laminated (or printed on heavy paper) and handed out at meetings for people to put on their fridge
- People like trees planted. Property owners should give the County to come on to their property and plant trees that would be funded by taxpayer dollars.
- Helpful information for property owners includes:
  - How to remove non-natives
  - How do you make it as good as you can? What works best?
  - How do you deal with poplars?
  - What's the best way to deal with blackberries?
  - Where can you find information on what plants are native?
  - Where can you buy native plants?
  - What's the best way to manage livestock near streams?

*Disagreement with the method of enforcement*

- The majority of listening session participants did not agree with the County's proposed method of enforcement through 'ratting out your neighbor'. They felt that if the County did not have an appropriate means of enforcement then it lead to the question of 'if the County can't enforce it, why are they doing this project?'

**Other Points of Importance**

*Fear of eminent domain*

- Property owners are afraid that by requiring any type of riparian setback or buffer the County would be taking away their right to that portion of the property. Most have gone as far to say that they believe this would essentially be eminent domain of a piece of their property.
- Concerns that a riparian buffer is just the first step. Eventually the County will want to continue to move in and take the land.

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

- If the County goes through with this project there are a number of people that expect some sort of lawsuit will be filed on the basis of eminent domain.

#### Impact on property values

- Most participants that own waterside property strongly believed that any new layer of regulation on their property would adversely affect property values. Some believed this was due to the fact that a portion of their property would be rendered 'unusable'. Others thought that should they decide to sell the property, any potential buyer would be turned away by the fact that the property was subject to another layer of regulations.
- If the County feels that this area is important enough to restrict owners from utilizing it, then the County should be required to reimburse landowners for the portion of their property they feel is rendered unusable

## Conclusions

### Goal 5: Riparian (Safe Harbor) Resources Conclusions

The Safe Harbor inventory provides the locations of riparian and wetland resources to meet State and local requirements. The inventory supported meeting project goals by providing locations for supporting and improving riparian areas, streams and wetlands. The best available data was used to complete the inventory, including:

- Improved stream locations of fish bearing streams and wetlands from high resolution mapping and State/Local mapping data sources (see **Findings**),
- Priority locations for riparian and wetland protection and improvement where fish bearing streams are located and or water bodies with connectivity to fish bearing streams,
- Highest quality inventory data on current stream location was produced utilizing high resolution LIDAR mapping for rural residential zoned land.
- Supporting materials such as current program rules, technical resources, and funding for agricultural and forestry activities were compiled to provide education and incentives for improving riparian and wetland resources (see **Voluntary Riparian and Wetland Enhancement Support**).

The Safe Harbor inventory focuses on fish bearing streams and fish bearing water bodies, within watersheds across Benton County. During the Safe Harbor Inventory, research and data demonstrated that:

- Rural residential zoned land account for approximately 4% of stream miles for fish bearing streams,

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

- There are many known and unknown intermittent/seasonal streams within Benton County that are important for maintaining fish bearing streams, but are not currently considered “fish bearing” (see **Findings**),
- Fish bearing streams and water bodies are dynamic systems that will change over time— any rules for protection of the functions of the resources should provide flexibility to landowners;
- Based on reviewed research and recommended buffers for maintaining riparian and wetland functions, Benton County can improve the protection of Goal 5 resources through an update of land use requirements, that will not result in ‘taking’ of private property (see **Draft Code** section).

## Goal 6: Water Quality Conclusions

The riparian and wetlands inventory has documented water quality impairments in Benton County water bodies. Substantial scientific research demonstrates that intact riparian and wetland areas improve water quality by filtering out pollutants, stabilizing streambanks, shading, and other functions and values. Watershed assessments and other studies have identified substantial riparian and wetland impairment in Benton County watersheds.

- Benton County is required by state and federal law to improve water quality conditions in the Willamette Basin for specific TMDL parameters.
- Benton County is not currently required to develop and implement riparian protection for improving water quality (temperature, dissolved oxygen) within the Alsea Basin.
- The most common water quality impairment is temperature in streams exceeding optimum levels for spawning and rearing of protected salmonid species.
- Riparian areas along perennial streams are most important for mitigating temperature impacts, because intermittent streams are unlikely to be flowing during the periods of peak temperatures.
- Riparian areas along all streams reaches, including headwaters, are important for minimizing bacterial and sediment inputs to streams.

The water quality literature review shows removal effectiveness as a function of buffer widths. In general, an increase in water resources buffers generally increases effectiveness to filter water quality pollutants. For example, a proposed Safe Harbor Inventory buffer of 50 linear feet would likely have 75% of the benefits for improving water quality for common water quality pollutants (see **Figure 12** shading/temperature mitigation for buffers of different widths with limited increases in water quality benefits with greater buffers). Compiled research shows that water quality contaminant loading can increase over time (depending on the site conditions and type of contaminant), thereby reducing the overall effectiveness of a buffer. This variability reinforces the need to develop flexible riparian buffer widths based on given site conditions.

## Recommendations, Next Steps

### Drafting Policy Options

Based on the reviewed scientific information documenting the connection between land use and water quality, riparian and wetland resources, Benton County project staff recommend developing distinct riparian and wetland protection policy for the portion of the Alsea Basin and Willamette Basin within Benton County. Goal 5 safe harbor setback distance to Goal 5 resources would apply across Benton County. Goal 6 water quality setback distances for perennial streams would only apply in the Willamette Basin to meet current water quality requirements under the Benton County TMDL Implementation Plan and Willamette Basin TMDL.

#### **To meet Benton County Comprehensive Plan goals and statewide planning goals the Riparian and Wetlands Program should include:**

- A. Regulatory protections for “fish-bearing” streams and lakes pursuant to the “Safe Harbor” provisions of Statewide Planning Goal 5, for land use activities over which Benton County has regulatory jurisdiction;
- B. For the Willamette Basin, regulatory protections for streams and riparian wetlands pursuant to Goal 6 (Water Quality), for land use activities over which Benton County has regulatory jurisdiction.<sup>2</sup> These regulations should be developed to:
  - Protect headwater stream channels from erosion and pollutant input;
  - Preserve vegetation and soil integrity in buffer areas along non-fish-bearing streams;
  - Augment, if necessary, the riparian protections established along fish-bearing streams pursuant to the Goal 5 Safe Harbor (see above);
  - Preserve wetland vegetation, soils and hydrology for wetlands that are proximal to streams or lakes.

Based on current State rules and Benton County water quality implementation plans (see **Water Quality** section), this inventory has focused on the primary “water quality impairments” identified by Oregon DEQ for the Willamette Basin: temperature, bacteria, and mercury. To improve water quality, riparian and wetland buffer protections should be established by Benton County. To maximize the buffer’s effectiveness to remove contaminants, the following actions are recommended in order of priority:

- Retain, restore, or enhance vegetation, particularly native vegetation;
- Manage drainage to ensure that water is moving evenly through the buffer to maximize retention time and infiltration, rather than flowing through pipes, culverts, rills, or other conveyance mechanisms. Avoid routing drainage to adjacent streams that may transect marine riparian areas;

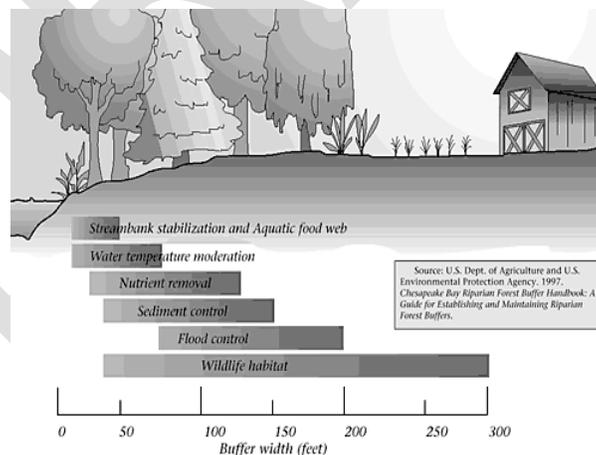
[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

- Avoid the use of pollutants (petroleum, toxics, pesticides, etc) in or near riparian areas;
- Avoid construction of impervious surfaces and septic tank drain fields in riparian areas.

Focus will be on researching buffer effectiveness for water quality and riparian and wetland resource enhancement by completing the following actions:

- C. Benton County participation in the Alsea Basin TMDL development process, with a subsequent update of this inventory document and the appropriate riparian and wetland protection mechanisms to help meet the goals and priorities established through the TMDL.
- D. Voluntary incentives for landowners: County staff will compile references to the several existing incentive opportunities, and be able to inform interested parties in opportunities. The County should also work with other organizations to promote voluntary improvement of riparian and wetland areas and water quality.
- E. Partnerships with local non-profits, agencies, and other local governments and organizations that can provide support for improving and protecting riparian and wetland resources. Such partnerships should be formalized, where possible.
  - Additional community outreach with the goal of gaining ideas and input from the public on the completed inventory and draft policy, ideas for education and incentives.

**Figure 18** General buffer functions based on buffer size



The Benton County Riparian and Wetlands Project staff has developed draft policy for review by the stakeholder advisory group, landowners, and any others interested (see **Draft Riparian and Wetlands Protection Code**). Review and input on the draft policy to develop proposed final policy and outreach, and education materials will be completed by the following:

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

- Benton County Riparian and Wetlands Advisory Group;
- General public through community meetings, printed copies available at Benton County Community Development and libraries, email, and other correspondence;
- Local realtors, brokers, and other private organizations through outreach/direct meetings;

## Local City Coordination

County staff will need to review City of Adair Village and City of Monroe Local Wetland Inventories; once made available to update existing County wetland maps—focused on areas outside of city limits. City of Monroe and City of Adair Village are currently working to complete Local Wetland Inventories, in partnership with the Lane Council of Governments. Within the urban fringes (the areas outside city limits but inside city Urban Growth Boundaries), the cities have primary responsibility for comprehensive planning (such as Goal 5 inventories) and the County has responsibility for the land use code. Benton County should collaborate with the cities to ensure (a) agreement with inventory and the "program" developed under Goal 5 to protect significant resources, and (b) that the cities agree with the land use code that Benton County would apply to the significant resources. Compatibility or complementarity between the riparian/wetland code adopted inside city limits and the code that Benton County applies county-wide would simplify implementation.

In addition, Benton County should continue to participate in the Total Maximum Daily Load Stakeholder Group meetings and work efforts, led by the City of Corvallis. It is a goal to partner, where feasible, to support shared water quality objectives. Benton County Riparian and Wetland Project staff and the Benton County Riparian and Wetlands Advisory Group will continue to support the formation of a Benton County partnership that works to support shared goals with the City of Corvallis Temperature TMDL project ([http://www.ci.corvallis.or.us/index.php?option=com\\_content&task=view&id=3878&Itemid=4429](http://www.ci.corvallis.or.us/index.php?option=com_content&task=view&id=3878&Itemid=4429)) through possible work that could include:

- Jointly developing incentive programs for private landowners in the rural and urban areas of Benton County to enhance riparian and wetland vegetation;
- Collaboration on riparian and wetland enhancement outreach and education to private and public landowners;
- Utilization and adaptation of Benton County Riparian and Wetlands Inventory data, partnerships, and community outreach.

## Outreach, Incentives, and Partnerships

The balance between incentives based programs currently available or that are available in the future will be encouraged to ensure protection of riparian areas and water quality. The following outreach, education and incentives work will be implemented in addition to any land use/code changes.

[www.co.benton.or.us/cd/riparian](http://www.co.benton.or.us/cd/riparian)

### **Agency to Agency Communication**

Partnerships with state agencies listed in areas, where county lacks regulatory authority regarding riparian and wetland resources (agriculture or forestry practices) can be improved through the improved coordination and communication with applicable agencies on a parcel by parcel, landowner by landowner needs basis and enhancement funding.

### **Voluntary Incentives Scenarios for Landowners with Riparian and Wetland Resources**

Several landowners shared their interest in gaining more details on technical and funding resources for enhancing riparian areas, wetlands, and water quality on their property. To provide Benton County landowners with additional with support for determining the best options, three general scenarios have been developed (see Landowner Incentive Scenarios). The following provides three types of general lands found in Benton County and likely associated activities (farm, forest, and other private lands), matched with voluntary programs and resources for improvement and protection while still accomplishing common property goals (retaining property value, building a new structure, etc.). The entire current list of contact information and details for funding sources listed for each scenario and land type can be found in **Appendix N**.

### Landowner Voluntary Enhancement Scenario 1—Agriculture Lands



The following activities, goals and resources are based on a review of most current resources (technical and funding) that would be best suited for landowners that are carrying out agricultural practices as defined as “farm use” in locations and zoning types across Benton County. Farm use is defined in Benton County Development Code Chapter 51.020 (12) and covers a wide range of agricultural related uses. There are several technical resources and funding resources most applicable to agricultural land activities.

#### AGRICULTURE LANDS

Activity	Goal	Technical Resources	Funding Sources
Weed and Pest Management	<b>Wildlife</b> <ul style="list-style-type: none"> <li>Improve wildlife quality and quantity</li> </ul> <b>Habitat</b>	<b>OSU Extension Service Publications</b> <ul style="list-style-type: none"> <li><i>Pacific Northwest Weed Management Handbook</i></li> <li><i>Managing Himalayan Blackberry in Western Oregon Riparian Areas</i></li> </ul>	<b>USDA – FSA</b> <ul style="list-style-type: none"> <li>Conservation Reserve Enhancement Program</li> <li>Conservation Reserve</li> </ul>

	<ul style="list-style-type: none"> <li>• Improve abundance and quality of habitat</li> </ul> <p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>• Improve proper functioning condition of riparian buffers</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Pacific Northwest's Least Wanted List: Invasive Weed Identification and Management</i></li> <li>• <i>Scotch Broom: Biology and Management in the Pacific Northwest</i></li> </ul> <p><b>Oregon NRCS Publications</b></p> <ul style="list-style-type: none"> <li>• <i>Tips for Small Acreages in Oregon Fact Sheets</i> (online or in office) <a href="http://www.or.nrcs.usda.gov/news/factsheets.html">http://www.or.nrcs.usda.gov/news/factsheets.html</a></li> <li>• STEPS for Healthy and Sustainable Rural Living on Small Acreages in Oregon - <a href="http://www.or.nrcs.usda.gov/technical/STEPS.html">http://www.or.nrcs.usda.gov/technical/STEPS.html</a></li> </ul>	<p>Program</p> <p><b>USDA – NRCS</b></p> <ul style="list-style-type: none"> <li>• Wetland Reserve Program</li> <li>• Wildlife Habitat Incentives Program</li> </ul> <p><b>USFWS</b></p> <ul style="list-style-type: none"> <li>• Partners for Fish and Wildlife Program</li> </ul> <p><b>ODFW</b></p>
<p>Prescribed Grazing</p> <p>(Examples: Rotation methods, Fencing, Increased watering facilities)</p>	<p><b>Wildlife</b></p> <ul style="list-style-type: none"> <li>• Improve wildlife quality and quantity</li> </ul> <p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>• Improve proper functioning condition of riparian buffers</li> <li>• Erosion control</li> </ul> <p><b>Habitat</b></p> <ul style="list-style-type: none"> <li>• Improve abundance and quality of habitat</li> </ul>	<p><b>Oregon NRCS Publications</b></p> <ul style="list-style-type: none"> <li>• <i>Tips for Small Acreages in Oregon Fact Sheets</i> (online or in office) <a href="http://www.or.nrcs.usda.gov/news/factsheets.html">http://www.or.nrcs.usda.gov/news/factsheets.html</a></li> <li>• STEPS for Healthy and Sustainable Rural Living on Small Acreages in Oregon - <a href="http://www.or.nrcs.usda.gov/technical/STEPS.html">http://www.or.nrcs.usda.gov/technical/STEPS.html</a></li> </ul> <p><b>US Fish and Wildlife Service</b></p> <ul style="list-style-type: none"> <li>• Managing invasive plants: Management Methods – Prescribed Grazing: <a href="http://www.fws.gov/invasives/staffTrainingModule/methods/grazing/review.html#part2">http://www.fws.gov/invasives/staffTrainingModule/methods/grazing/review.html#part2</a></li> </ul>	<ul style="list-style-type: none"> <li>• Access &amp; Habitat Program</li> <li>• Riparian Tax Incentive Program</li> <li>• Western Oregon Stream Restoration Program</li> <li>• Small Grant Program</li> </ul> <p><b>Soil &amp; Water Conservation Districts</b></p> <ul style="list-style-type: none"> <li>• Conservation Incentive Program</li> <li>• OWEB Small Grant Program</li> </ul>
<p>Enhancing Riparian Buffers</p>	<p><b>Wildlife</b></p> <ul style="list-style-type: none"> <li>• Improve wildlife quality and quantity</li> </ul> <p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>• Improve proper functioning condition of riparian buffers</li> </ul>	<p><b>OSU Extension Service Publications</b></p> <ul style="list-style-type: none"> <li>• <i>Stream*A*Syst</i> – A tool for gauging stream quality on your property</li> <li>• <i>Tree Buffers Along Streams on Western Oregon Farmland</i></li> <li>• <i>Selecting Native Plant Materials for Restoration Projects</i></li> </ul> <p><b>Miscellaneous</b></p> <ul style="list-style-type: none"> <li>• Campbell, Bruce. <i>Restoring Rare Native Habitats In The</i></li> </ul>	<p><b>Oregon State Weed Board Grant Program</b></p>

	<ul style="list-style-type: none"> <li>Erosion control (decrease in sediment and nutrient loads from runoff)</li> </ul>	<p><i>Willamette Valley:</i>  <a href="http://www.ser.org/sernw/pdf/DefOWild_willamette_hab_restore_manual.pdf">http://www.ser.org/sernw/pdf/DefOWild_willamette_hab_restore_manual.pdf</a></p> <ul style="list-style-type: none"> <li>Linn SWCD. <i>Guide For Using Willamette Valley Native Plants Along Your Stream:</i>  <a href="http://linnswcd.oacd.org/NativePlantGuide05.pdf">http://linnswcd.oacd.org/NativePlantGuide05.pdf</a></li> </ul>
Fertilization	<p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>Erosion control (decrease in sediment and nutrient loads from runoff)</li> </ul>	<p><b>OSU Extension Service Publications</b></p> <ul style="list-style-type: none"> <li><i>Nutrient Management-</i>  <a href="http://smallfarms.oregonstate.edu/soils/nutrient.php">http://smallfarms.oregonstate.edu/soils/nutrient.php</a></li> </ul> <p><b>NRCS</b></p> <ul style="list-style-type: none"> <li>Nutrient &amp; Pest Management Resources: Resources Regarding Nutrient Management -  <a href="http://www.nrcs.usda.gov/technical/nutrient.html">http://www.nrcs.usda.gov/technical/nutrient.html</a></li> <li>STEPS for Healthy and Sustainable Rural Living on Small Acreages in Oregon -  <a href="http://www.or.nrcs.usda.gov/technical/STEPS.html">http://www.or.nrcs.usda.gov/technical/STEPS.html</a></li> </ul>
Maintaining Water Quality	<p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>Erosion control (decrease in sediment and nutrient loads from runoff)</li> </ul>	<p><b>NRCS</b></p> <ul style="list-style-type: none"> <li>STEPS for Healthy and Sustainable Rural Living on Small Acreages in Oregon -  <a href="http://www.or.nrcs.usda.gov/technical/STEPS.html">http://www.or.nrcs.usda.gov/technical/STEPS.html</a></li> </ul>

## Landowner Voluntary Enhancement Scenario 2—Forest Lands

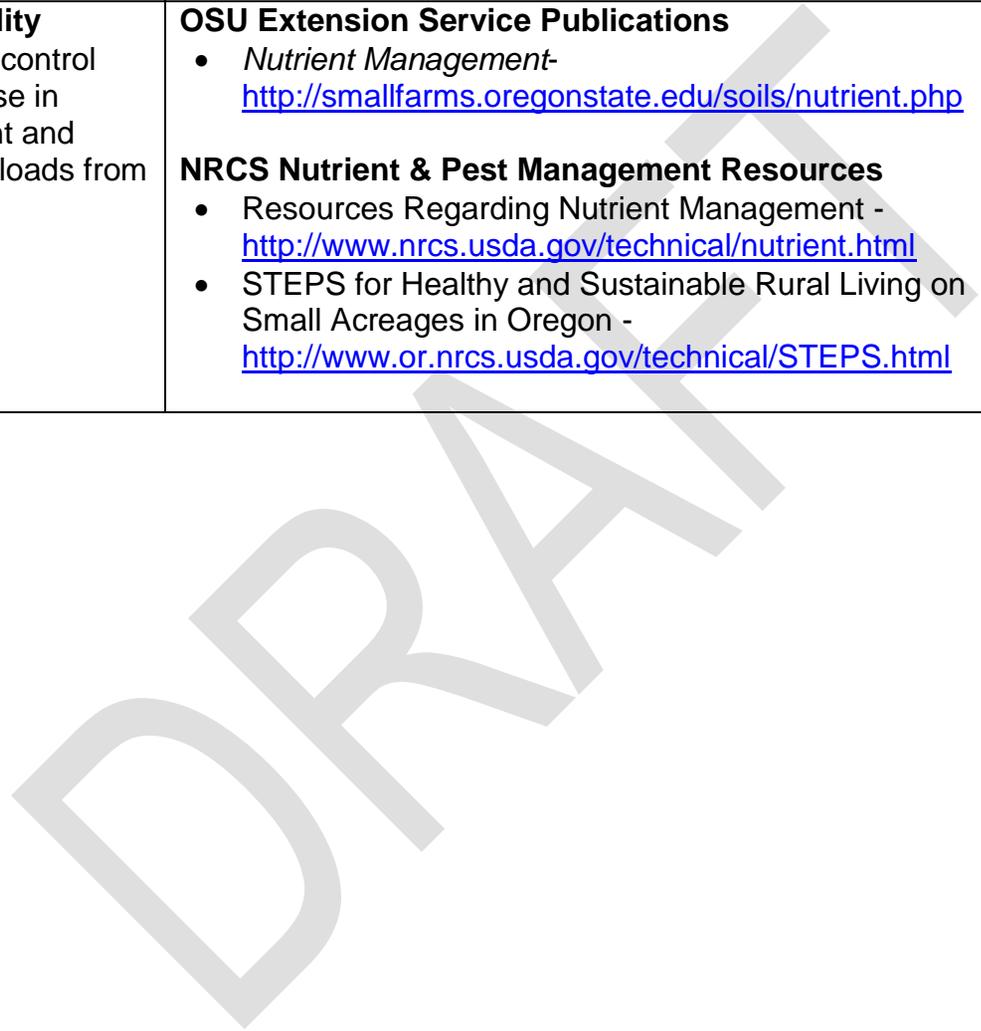


The following activities, goals and resources are based on a review of most current resources (technical and funding) that would be best suited for landowners that are carrying out forestry practices as defined as “forest use” in locations and zoning types across Benton County. Forest use is defined in Benton County Development Code Chapter 51.020 (21) (a-g) and covers a wide range of forest uses including production of trees and processing of forest products, open space, buffers from noise, watershed and wildlife and fisheries protection. There are several technical resources and funding resources described below that are applicable to landowners with lands managed for forest uses.

FOREST LANDS			
Activity	Goal	Technical Resources	Funding Sources
Weed and Pest Management	<b>Wildlife</b> <ul style="list-style-type: none"> <li>Improve wildlife quality and quantity</li> </ul>	<b>OSU Extension Service Publications</b> <ul style="list-style-type: none"> <li><i>Pacific Northwest Weed Management Handbook</i></li> <li><i>Invasive Weeds in Forestland</i> (online)</li> <li><i>Managing Himalayan Blackberry in Western Oregon</i></li> </ul>	<b>USFWS</b> <ul style="list-style-type: none"> <li>Partners for Fish and Wildlife Program</li> </ul>

	<p><b>Habitat</b></p> <ul style="list-style-type: none"> <li>• Improve abundance and quality of habitat</li> </ul> <p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>• Improve proper functioning condition of riparian buffers</li> </ul>	<p><i>Riparian Areas</i></p> <ul style="list-style-type: none"> <li>• <i>Pacific Northwest's Least Wanted List: Invasive Weed Identification and Management</i></li> </ul> <p><b>Oregon NRCS Publications</b></p> <ul style="list-style-type: none"> <li>• <i>Tips for Small Acreages in Oregon Fact Sheets</i> (online or in office) <a href="http://www.or.nrcs.usda.gov/news/factsheets.html">http://www.or.nrcs.usda.gov/news/factsheets.html</a></li> <li>• STEPS for Healthy and Sustainable Rural Living on Small Acreages in Oregon - <a href="http://www.or.nrcs.usda.gov/technical/STEPS.html">http://www.or.nrcs.usda.gov/technical/STEPS.html</a></li> </ul>	<p><b>ODFW</b></p> <ul style="list-style-type: none"> <li>• Access &amp; Habitat Program</li> <li>• Riparian Tax Incentive Program</li> <li>• Western Oregon Stream Restoration Program</li> <li>• Small Grant Program</li> </ul> <p><b>Soil &amp; Water Conservation Districts</b></p> <ul style="list-style-type: none"> <li>• Conservation Incentive Program</li> <li>• OWEB Small Grant Program</li> </ul> <p><b>Oregon State Weed Board Grant Program</b></p>
<p>Tree Harvesting</p>	<p><b>Habitat</b></p> <ul style="list-style-type: none"> <li>• Maintain habitat quality and quantity during and after tree harvesting</li> </ul>	<p><b>Forest Service</b></p> <ul style="list-style-type: none"> <li>• Forestry Practices Within Riparian Zones: <a href="http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/RIPARIAN/RIPAR5.HTM">http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/RIPARIAN/RIPAR5.HTM</a></li> </ul>	
<p>Enhancing Riparian Buffers</p>	<p><b>Wildlife</b></p> <ul style="list-style-type: none"> <li>• Improve wildlife quality and quantity</li> </ul> <p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>• Improve proper functioning condition of riparian buffers</li> <li>• Erosion control (decrease in sediment and nutrient loads from runoff)</li> </ul>	<p><b>OSU Extension Service Publications</b></p> <ul style="list-style-type: none"> <li>• <i>Stream*A*Syst</i> – A tool for gauging stream quality on your property</li> <li>• <i>Selecting Native Plant Materials for Restoration Projects</i></li> </ul> <p><b>Oregon NRCS Publications</b></p> <ul style="list-style-type: none"> <li>• <i>Tips for Small Acreages in Oregon Fact Sheets</i> (online or in office) <a href="http://www.or.nrcs.usda.gov/news/factsheets.html">http://www.or.nrcs.usda.gov/news/factsheets.html</a></li> </ul> <p><b>Miscellaneous</b></p> <ul style="list-style-type: none"> <li>• Campbell, Bruce. <i>Restoring Rare Native Habitats In The Willamette Valley</i>: <a href="http://www.ser.org/sernw/pdf/DefOWild_willamette_hab_restore_manual.pdf">http://www.ser.org/sernw/pdf/DefOWild_willamette_hab_restore_manual.pdf</a></li> <li>• Linn SWCD. <i>Guide For Using Willamette Valley</i></li> </ul>	

		<p><i>Native Plants Along Your Stream:</i>  <a href="http://linnswcd.oacd.org/NativePlantGuide05.pdf">http://linnswcd.oacd.org/NativePlantGuide05.pdf</a></p>	
Fertilization	<p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>Erosion control (decrease in sediment and nutrient loads from runoff)</li> </ul>	<p><b>OSU Extension Service Publications</b></p> <ul style="list-style-type: none"> <li><i>Nutrient Management-</i>  <a href="http://smallfarms.oregonstate.edu/soils/nutrient.php">http://smallfarms.oregonstate.edu/soils/nutrient.php</a></li> </ul> <p><b>NRCS Nutrient &amp; Pest Management Resources</b></p> <ul style="list-style-type: none"> <li>Resources Regarding Nutrient Management -  <a href="http://www.nrcs.usda.gov/technical/nutrient.html">http://www.nrcs.usda.gov/technical/nutrient.html</a></li> <li>STEPS for Healthy and Sustainable Rural Living on Small Acreages in Oregon -  <a href="http://www.or.nrcs.usda.gov/technical/STEPS.html">http://www.or.nrcs.usda.gov/technical/STEPS.html</a></li> </ul>	



### Landowner Voluntary Enhancement Scenario 3—Other Private Rural Lands



The following activities, goals and resources are based on a review of most current resources (technical and funding) that would be best suited for landowners that have smaller acreage rural lands that may likely have smaller forest and farm uses described in scenarios 1 and 2. The table below provides an overview of what smaller rural landowners should

#### OTHER PRIVATE RURAL LANDS

Activity	Goal	Technical Resources	Funding Sources
Weed and Pest Management	<p><b>Wildlife</b></p> <ul style="list-style-type: none"> <li>Improve wildlife quality and quantity</li> </ul> <p><b>Habitat</b></p>	<p><b>OSU Extension Service Publications</b></p> <ul style="list-style-type: none"> <li><i>Pacific Northwest Weed Management Handbook</i></li> <li><i>Managing Himalayan Blackberry in Western Oregon Riparian Areas</i></li> </ul>	<p><b>USFWS</b></p> <ul style="list-style-type: none"> <li>Partners for Fish and Wildlife Program</li> </ul> <p><b>ODFW</b></p>

	<ul style="list-style-type: none"> <li>• Improve abundance and quality of habitat</li> </ul> <p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>• Improve proper functioning condition of riparian buffers</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Pacific Northwest's Least Wanted List: Invasive Weed Identification and Management</i></li> </ul> <p><b>Oregon NRCS Publications</b></p> <ul style="list-style-type: none"> <li>• <i>Tips for Small Acreages in Oregon Fact Sheets</i> (online or in office) <a href="http://www.or.nrcs.usda.gov/news/factsheets.html">http://www.or.nrcs.usda.gov/news/factsheets.html</a></li> <li>• STEPS for Healthy and Sustainable Rural Living on Small Acreages in Oregon - <a href="http://www.or.nrcs.usda.gov/technical/STEPS.html">http://www.or.nrcs.usda.gov/technical/STEPS.html</a></li> </ul>	<ul style="list-style-type: none"> <li>• Western Oregon Stream Restoration Program</li> <li>• Small Grant Program</li> </ul> <p><b>Soil &amp; Water Conservation Districts</b></p> <ul style="list-style-type: none"> <li>• Conservation Incentive Program</li> <li>• OWEB Small Grant Program</li> </ul> <p><b>Oregon State Weed Board Grant Program</b></p>
Riparian Buffers	<p><b>Wildlife</b></p> <ul style="list-style-type: none"> <li>• Improve wildlife quality and quantity</li> </ul> <p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>• Improve proper functioning condition of riparian buffers</li> </ul>	<p><b>OSU Extension Service Publications</b></p> <ul style="list-style-type: none"> <li>• <i>Stream*A*Syst</i> – A tool for gauging stream quality on your property</li> <li>• <i>Selecting Native Plant Materials for Restoration Projects</i></li> </ul> <p><b>Oregon NRCS Publications</b></p> <ul style="list-style-type: none"> <li>• <i>Tips for Small Acreages in Oregon Fact Sheets</i> (online or in office) <a href="http://www.or.nrcs.usda.gov/news/factsheets.html">http://www.or.nrcs.usda.gov/news/factsheets.html</a></li> </ul> <p><b>Miscellaneous</b></p> <ul style="list-style-type: none"> <li>• Campbell, Bruce. <i>Restoring Rare Native Habitats In The Willamette Valley:</i> <a href="http://www.ser.org/sernw/pdf/DefOWild_willamette_hab_restore_manual.pdf">http://www.ser.org/sernw/pdf/DefOWild_willamette_hab_restore_manual.pdf</a></li> <li>• Linn SWCD. <i>Guide For Using Willamette Valley Native Plants Along Your Stream:</i> <a href="http://linnswcd.oacd.org/NativePlantGuide05.pdf">http://linnswcd.oacd.org/NativePlantGuide05.pdf</a></li> </ul>	
Maintaining Water Quality	<p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>• Improve proper functioning condition of riparian buffers</li> </ul>	<p><b>OSU Extension Service Publications</b></p> <ul style="list-style-type: none"> <li>• <i>Stream*A*Syst</i> – A tool for gauging stream quality on your property</li> <li>• STEPS for Healthy and Sustainable Rural Living on Small Acreages in Oregon - <a href="http://www.or.nrcs.usda.gov/technical/STEPS.html">http://www.or.nrcs.usda.gov/technical/STEPS.html</a></li> </ul>	

--	--	--	--

This Page Left Intentionally Blank

DRAFT

## **Draft Code--Benton County Stream and Riparian Corridor Protection (SRP) Overlay Zone\***

\* The following DRAFT Policy will be reviewed and edited by the Benton County Riparian and Wetlands Advisory Group project staff, with input received from landowners and other interested parties (i.e. State agency representatives). A final draft will be prepared, followed by public hearings, and final adoption and implementation by Benton County. Please review the **Stream and Riparian Protection Scenarios** section

### **(1) Definitions**

**Avulsion:** NOTE: definition and applicability under review by county staff.

**Fish and Wildlife Habitat:** An area where fish and wildlife depend in order to meet their requirements for food, water, shelter and reproduction.

**Fish Bearing Lakes:** When a fish bearing stream has seasonal connectivity with a natural or human constructed water body

**Fish Bearing Streams:** a stream inhabited at any time of the year by anadromous or game fish species, or fish that are listed as threatened or endangered species under the federal or state Endangered Species Act.

**Impaired Water Body:** Any waterbody of the United States that does not attain water quality standards due to an individual pollutant, multiple pollutants, pollution, or an unknown cause of impairment.

**Lake:** A naturally occurring still-water body. A water area off of a main channel (e.g. a backwater or slough) is considered a stream and not a lake if there is a likely hydrologic connection with the stream during an average year of precipitation.

**Ordinary High Water Line (OHWL):** Means the line on the bank or shore to which the high water ordinarily rises annually in season (ORS 274.005). This excludes exceptionally high water levels caused by large flood events (e.g. 100 year events). OHWL is indicated in the field by the following physical characteristics:

- (a) Clear, natural line impressed on the shore;
- (b) Change in vegetation (riparian (e.g. willows) to upland (e.g. oak, fir) dominated);
- (c) Textural change of depositional sediment or changes in the character of the soil (e.g. from sand, sand and cobble, cobble and gravel to upland soils);
- (d) Elevation below which no fine debris (needles, leaves, cones, seeds) occurs;
- (e) Presence of litter and debris, water-stained leaves, water lines on tree trunks; and/or
- (f) Other appropriate means that consider the characteristics of the surrounding areas.

**Pond:** A human created (e.g. through impoundment or diversion) still-water body with outfall to a stream during some portion of the year with average precipitation. Isolated Ponds (i.e. ponds that do not meet this definition) are not subject to the requirements of this section.

**Riparian Area:** the area of transition from an aquatic ecosystem to a terrestrial ecosystem.

**Riparian Corridor:** the area within a boundary established along both sides of a waterway, including the riparian area and any associated wetlands.

**Riparian Vegetation:** native ground cover, shrubs, trees, and other vegetation predominately influenced by their association with water.

**Stream:** A channel such as a river or creek that carries flowing surface water, including perennial streams and intermittent streams with defined channels, and excluding man-made irrigation and drainage channels.

**Stream-Associated Wetland:** A mapped wetland documented on current wetland mapping resources utilized by Benton County, with a portion of the mapped area of the wetland located within the riparian corridor.

**Water Area:** Area between the banks of a lake, pond, river, perennial or fish-bearing intermittent stream, excluding man-made farm ponds

**Water Quality Limited:** Any stream segment where it is known that water quality does not meet applicable water quality standards.

**Wetland:** Area inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soils.

**(2) Purpose:**

The primary purposes of the SRP overlay zone are to protect the riparian and stream-associated wetland resources of the waterways of Benton County, while preserving the ability of property owners to utilize their lands. Components of the common waterway resources that this code is written to protect, in particular, include: protect and enhance water quality; reduce property damage during floods and storms; protect native plant species; maintain and enhance fish and wildlife habitats; and conserve scenic and recreational values of riparian areas; and to support and improve other diverse natural functions of streams, and associated riparian areas and wetlands.

Note that the provisions of this chapter are not intended to prevent pedestrian access to waterbodies and typical low-impact activities such as fishing.

**(3) Uses Exempt from this Code.** The following uses, structures and activities are exempt from this Code, as specified below:

- (a) **Nonconforming or “grandfathered” uses.** Legally established structures or land uses existing as of [effective date of the ordinance] within the SRP Overlay shall be

allowed to continue and to be maintained at their current extent, and may be replaced, pursuant to the provisions of BCC 55.305 through 55.340. Expansions of such structures may be allowed through one of the following:

- (A) Up to a 10% increase from the footprint of the structure as it legally existed on [effective date of this ordinance];
- (B) Additions that do not increase the surface area of land designated as SRP Overlay (for example a second story, or expansion of a structure situated on the edge of the SRP Overlay such that the expansion occurs outside of the SRP Overlay).
- (C) As allowed through other provisions of this chapter.
- (b) Legally established **modifications to natural vegetation and topography** (including, for example, landscaping, gardens) existing as of [effective date of this ordinance] within the SRP Overlay shall be allowed to remain and to be maintained at their current extent.
- (c) **Minor trimming** of native riparian vegetation that does not imperil the life of the plant or substantially reduce its ability to perform riparian functions relating to runoff filtration, streambank stabilization, or stream shading, shall be allowed.
- (d) Accepted **farm practices**, not including construction of buildings;
- (e) Removal of a **hazardous tree**;
- (f) **Removal of non-native or invasive vegetation**, provided that such areas remain vegetated in other existing vegetation. Property owners are encouraged to replace removed vegetation with native species. Replanting of disturbed areas shall not allow invasive vegetation.

#### (4) “Desired Condition” of Riparian Corridors:

**NOTE** this section is under development with the goal of developing general guidelines for conditions of riparian corridors and providing education and incentives to landowners.

- (a) Definition
- (b) Incentives, Encouragement and Assistance to Property Owners to Achieve Desired Condition
  - (A) Reduced application fees
  - (B) Flexibility in standards
  - (C) Encourage use of existing tax incentives
  - (D) Assist with connecting property owners to federal and state grants, incentives, etc.

#### (5) Requirements within City Urban Growth Boundaries

- (a) Riparian and wetland setbacks and related regulations for properties located in the Corvallis Urban Fringe shall be subject to the provisions of Chapter 88 Natural Features and Hazards and shall not be subject to this chapter.
- (b) Monroe City limits and UGB (policy in development as of 5/2/11)
- (c) Adair City limits and UGB (policy in development as of 5/2/11)
- (d) Philomath City limits and UGB: Current city code and wetlands map.

**(6) Establishment of the SRP Overlay Boundary.**

- (a) The riparian protection overlay consists of the following component areas: the area within the channel banks, and the protective overlay zone adjacent to the stream channel banks on both sides of the stream.
- (b) The Riparian Protection Overlay shall apply to all streams and adjacent land areas as they exist on the landscape. The current Benton County SRP Overlay Map identifies the approximate location of streams; however, if an actual location is not consistent with the location shown on the map, the actual location shall be used for determining the location and extent of the SRP Overlay.
- (c) Identification of Ordinary High Water Line:
  - (A) Clear, natural line impressed on the shore;
  - (B) Change in vegetation (riparian (e.g. willows) to upland (e.g. oak, fir) dominated);
  - (C) Textural change of depositional sediment or changes in the character of the soil (e.g. from sand, sand and cobble, cobble and gravel to upland soils);
  - (D) Elevation below which no fine debris (needles, leaves, cones, seeds) occurs;
  - (E) Presence of litter and debris, water-stained leaves, water lines on tree trunks; and/or
  - (F) Other appropriate means that consider the characteristics of the surrounding areas.

**(7) The components of the riparian protection overlay:**

- (a) **Stream Channel.** The area within the channel limits of a perennial or intermittent water feature from the ordinary high water line of one bank to top of the opposite bank ordinary high water line.
- (b) **Riparian Corridor.** The riparian area measured horizontally, inland, from the ordinary high water line shall be as follows:
  - (A) West of the summit of the Coast Range (Alsea and other coastal basins):
    - (i) For all fish-bearing streams and other fish-bearing water-bodies: 50 feet;
    - (ii) For all other streams: 25 feet for ground-disturbing activities and structures only; see Section 9(a)(C).
  - (B) East of the summt of the Coast Range (Willamette Basin):

- (i) For the Willamette River, including sloughs and side channels: 75 feet;
- (ii) For all fish-bearing streams and other fish-bearing water-bodies not included in (i): 50 feet;
- (iii) For all other perennial streams in the Willamette Basin: 50 feet;
- (iv) For all other streams: 25 feet for ground-disturbing activities and structures only; see Section 9(a)(C).

(c) **Stream-Associated Wetlands** When a wetland extends beyond the edge of the SRP Overlay required by other provisions in this section, Benton County shall:

- (A) Complete a land use notification form and gain determination from Oregon Department of State Lands (DSL) if the proposed activity impacts jurisdictional wetlands and waterways of the State.
- (B) Inform property owner or applicant of mapped wetlands that Oregon DSL determines as jurisdictional wetlands and waterways of the State (see above) and provide landowners with information and available resources for assessing wetland resources, best management practices (i.e. structure placement on property to avoid hydric soils), and other information on importance of wetland functions.

**NOTE:** Wetland Buffer protections for jurisdictional wetlands and waterways are being reviewed by the Riparian and Wetlands Advisory Group.

- (d) **Steep Slopes.** The entire area of a slope greater than or equal to 25% when any part of the slope is contained within the distances defined in subsection (b).
- (e) **Fish Bearing Lakes.** When a fish bearing stream has seasonal, fish-passable connectivity with a natural or human constructed water body, the water body will be considered a fish bearing stream and be given equal protection (SRP overlay width) as the associated fish bearing stream.

**(8) Map Refinement/Correction Procedure.**

- (a) **Map Refinement.** “Map refinements” are adjustments made through professional analyses to refine the actual boundaries of the SRP overlay zone. Refinements may be effected administratively, with no land use process required, through the applicant or property owner demonstrating the refinement standards below have been met. Refinements may or may not be shown on the current Benton County SRP Overlay map, depending on scale and other factors, but at a minimum shall be attached to the Community Development Department records for the property.
- (b) **Map Correction.** “Map Corrections” are to rectify errors to the mapping of SRP Overlay boundaries where it is found that the map depiction does not reflect the Inventory, as described for each resource type below. These map corrections shall be

made by the Planning Official and do not require Zone Changes or Comprehensive Plan Map Amendments. Periodically, for informational purposes, the Planning Official shall forward accumulated map corrections to the Benton County Board of Commissioners and Planning Commission.

- (c) Once a water of the state has been classified according to Section 7, Benton County shall not change the classification without written notice to the landowners immediately adjoining the portion(s) of water to be reclassified. Notice to landowners shall include the reason for the change of classification and applicable rules.

**(9) Options for Property Owner Management of the Riparian Corridor.** A property owner may choose to manage the land in the SRP Overlay under any one of the options in subsections (a) through (d).

**(a) Option A: Clear and objectives standards.**

**(A) Removal of Vegetation:** The removal of vegetation from the SRP Overlay is prohibited, except for the following uses after Planning Official approval:

- (i) Replacement of vegetation with native riparian species as is necessary for restoration activities;
- (ii) “Harvest-related” commercial timber cutting activities authorized by the Oregon Department of Forestry and subject to the Oregon Forest Practices Rules.
  - (1) If the property owner proposes a forestland conversion, “Waiver to Reforestation”, or “Plan for Alternative Practice” following a forestry operation, land within the riparian overlay shall be considered not incompatible with tree propagation and therefore should be replanted pursuant to the Forest Practices Rules unless the planned and implemented use is a use listed in this subsection.
- (iii) On slopes greater than 25% that are included in the riparian overlay due solely to 7(d) vegetation removal may be authorized by a site-specific geotechnical report certifying that proposed activities will not increase sediment delivery to the water body and associated wetlands.
- (iv) Stream restoration and enhancement programs approved by the Oregon Department of Fish and Wildlife as improving riparian function, and wetland restoration and enhancement programs approved by Oregon Department of State Lands or the Oregon Department of Fish and Wildlife.
- (v) Development of water-related or water-dependent uses that are allowed in the underlying zone, provided they are designed and constructed to minimize impact on existing riparian vegetation.
- (vi) The minimum vegetation removal necessary to establish and maintain a fire fuel-break safety zone surrounding a structure, as defined in BCC 88.010(2). Benton County encourages property owners to consult with the Oregon Department of Fish and Wildlife on ways to minimize the impact of this vegetation removal and to mitigate the impacts that do occur.

(vii) Vegetation removal in conjunction with a development activity allowed under Section (B), below.

**(B) Building, Paving, and Ground-Disturbing Activities:** Within the SRP Overlay, the placement of structures or impervious surfaces, including grading, excavation, placement of fill, and other ground-disturbing activities, are prohibited except as stated below. Exceptions to the SRP Overlay restrictions may be made for the following uses, provided they are designed and constructed to minimize adverse impacts to the riparian area:

- (i) Replacement of existing structures with structures located on the original building footprint or up to a maximum deviation of 10% from the original footprint. Vertical additions to these structures are allowed if they do not disturb additional riparian or wetland surface area. Structures abandoned for a period of one year or longer are not eligible for replacement.
- (ii) The following types of infrastructure, provided they are oriented perpendicular to the riparian corridor or otherwise designed to cause negligible impact to proper riparian or wetland function, and provided any necessary stream crossings meet Oregon Department of Fish and Wildlife fish passage standards and accommodate the 50-year flood event flow:
  - (1) Construction and maintenance of streets, roads, public utilities, and bicycle and pedestrian ways that are included in the Benton County Transportation System Plan, or in other adopted County infrastructure/utility plans. If a street or road is allowed by Benton County to be constructed within the SRP Overlay, the road shall be designed and constructed as narrowly as necessary to meet safety standards.
  - (2) Construction of streets, roads, and pedestrian ways necessary in order to maintain an acceptable functional classification of roadways adjacent to the property, if no feasible alternative is available outside of the SRP Overlay. If a street or road is allowed by Benton County to be constructed within the SRP Overlay, the road shall be designed and constructed as narrowly as necessary to meet safety standards.
  - (3) Driveways necessary to provide access to an approved building site, provided the disturbed riparian surface area is minimized.
  - (4) Pedestrian trail, which is an unpaved path, four feet or less in width, designed for and used primarily by pedestrians.
- (iii) Routine maintenance or replacement of existing public facilities that adhere to Best Management Practices for riparian vegetation in Benton County ;
- (iv) On slopes greater than 25% that are included in the riparian overlay due solely to 7 (d) building, paving or grading activities may be authorized by a site-specific geotechnical report certifying that proposed activities will not increase sediment delivery to the water body and associated wetlands.

- (v) Development of water-related and water-dependent uses allowed by the underlying zone, and where no other viable locations exist, and that have minimal impact on riparian and wetland surface area;
  - (vi) Erosion control or flood control measures that have been approved by the Oregon Department of State Lands (DSL) and/or the U.S. Army Corps of Engineers, and that utilize bio-engineering methods. Streambank hardening (installation of hard-surfaced erosion- or flood-protection structures such as rip-rap) is prohibited except where necessary to address an imminent hazard to a structure built prior to October 6, 2005. Where allowed, hard-surface measures shall be designed by a Professional Engineer licensed by the State of Oregon, and shall at a minimum, require backfilling with soil and planting with native vegetation;
- (C) **25-Foot-Buffer Streams.** Within the SRP Overlay on streams identified in Section (7)(b)(D), building, paving and grading activities shall comply with the provisions of subsection (B) of this section, but the vegetation removal provisions of subsection (A) of this section shall not apply.

**NOTE:** Options B, C and D are currently incomplete and are being reviewed by the Riparian and Wetlands Advisory Group.

**(b) Option B: Maintain and enhance.**

- (A) The applicant shall submit:
  - (i) Documentation of the existing conditions of the SRP Overlay area on the property to establish a baseline of conditions. Note that vegetation removal or ground disturbance within the riparian corridor for purposes of establishing a lower baseline is a violation of this code.
  - (ii) A plan for maintaining and enhancing conditions. The plan may include areas of vegetation removal and development activities within the SRP Overlay area provided the management plan demonstrates a net positive effect to ecosystem function will result from the management activities.
- (B) Approval of the plan will result in a binding agreement between the property owner and Benton County. Failure of the property owner to implement and maintain the plan as approved may result in enforcement action.

**(c) Option C: Meet “Desired Condition”**

- (A) The applicant shall submit a plan for management of riparian area that:
  - (i) may include areas of vegetation removal and development activities within the SRP Overlay area; and
  - (ii) demonstrates that the resulting riparian area will meet the “Desired Condition” defined in Section 4.

**(d) Option D: Variable buffer widths**

(A) The applicant shall submit a detailed site plan showing existing land use and land cover, and proposing a modification to the buffer widths required by Section 7. Under this option:

- (i) A minimum buffer width of at least 50% of the standard requirement shall be maintained at all points.
- (ii) The width of the required buffer may vary, as long as the total area (square feet) subject to the buffer is at least 100% of the amount that would be protected under Option A.

(B) In areas of reduced buffer width, the property owner shall ensure that stormwater runoff is dispersed so as not to concentrate flow in a way that delivers pollutants to the water body.

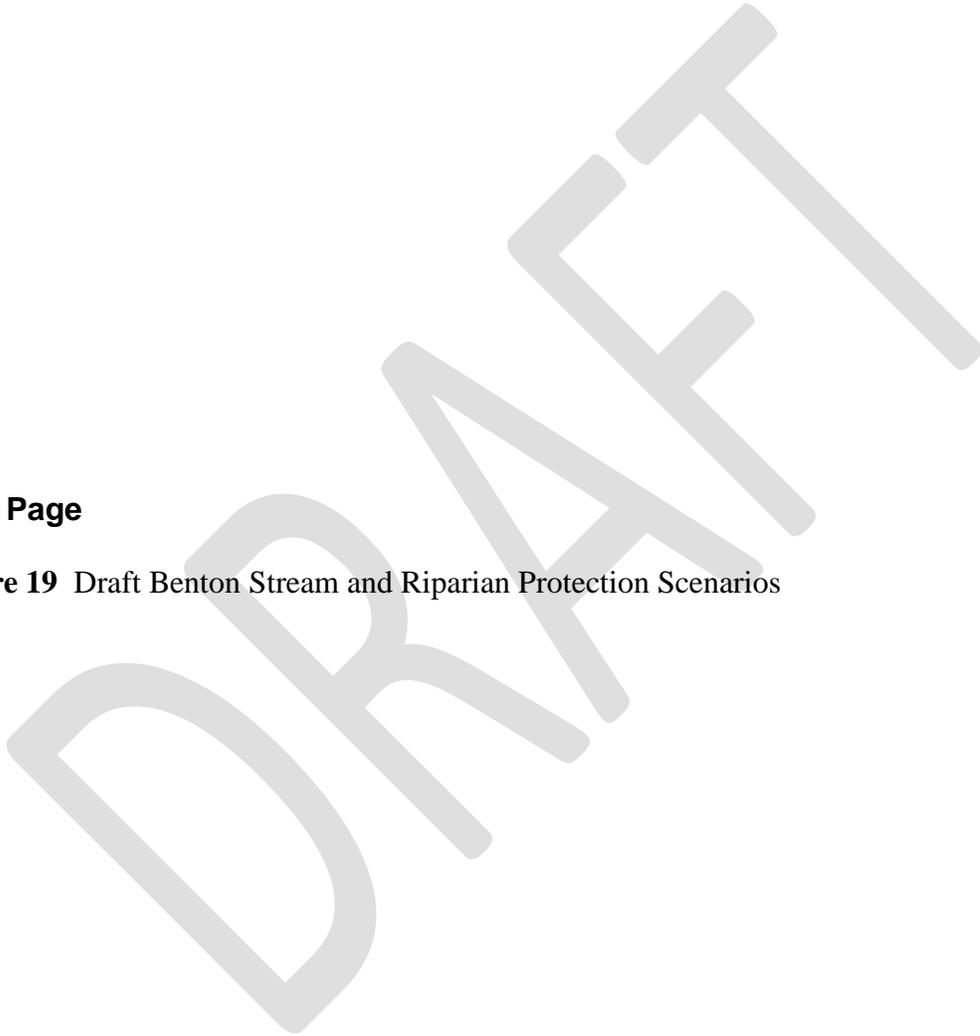
**(10) Land Divisions and Property Line Adjustments.** Subdivisions, partitions, and property line adjustments must be designed so that the resulting lots or parcels can be developed in conformance with SRP Overlay.

**(11) Hardship Variances.** A property owner who, due to the provisions of the SRP Overlay, is unable to utilize land in a manner that would be reasonably expected given site conditions, the underlying zoning, and other relevant factors, may apply for a variance pursuant to the provisions of BCC Chapter 53.

**See Next Page for Scenarios for Implementation of Draft Code**

**Next Page**

**Figure 19** Draft Benton Stream and Riparian Protection Scenarios

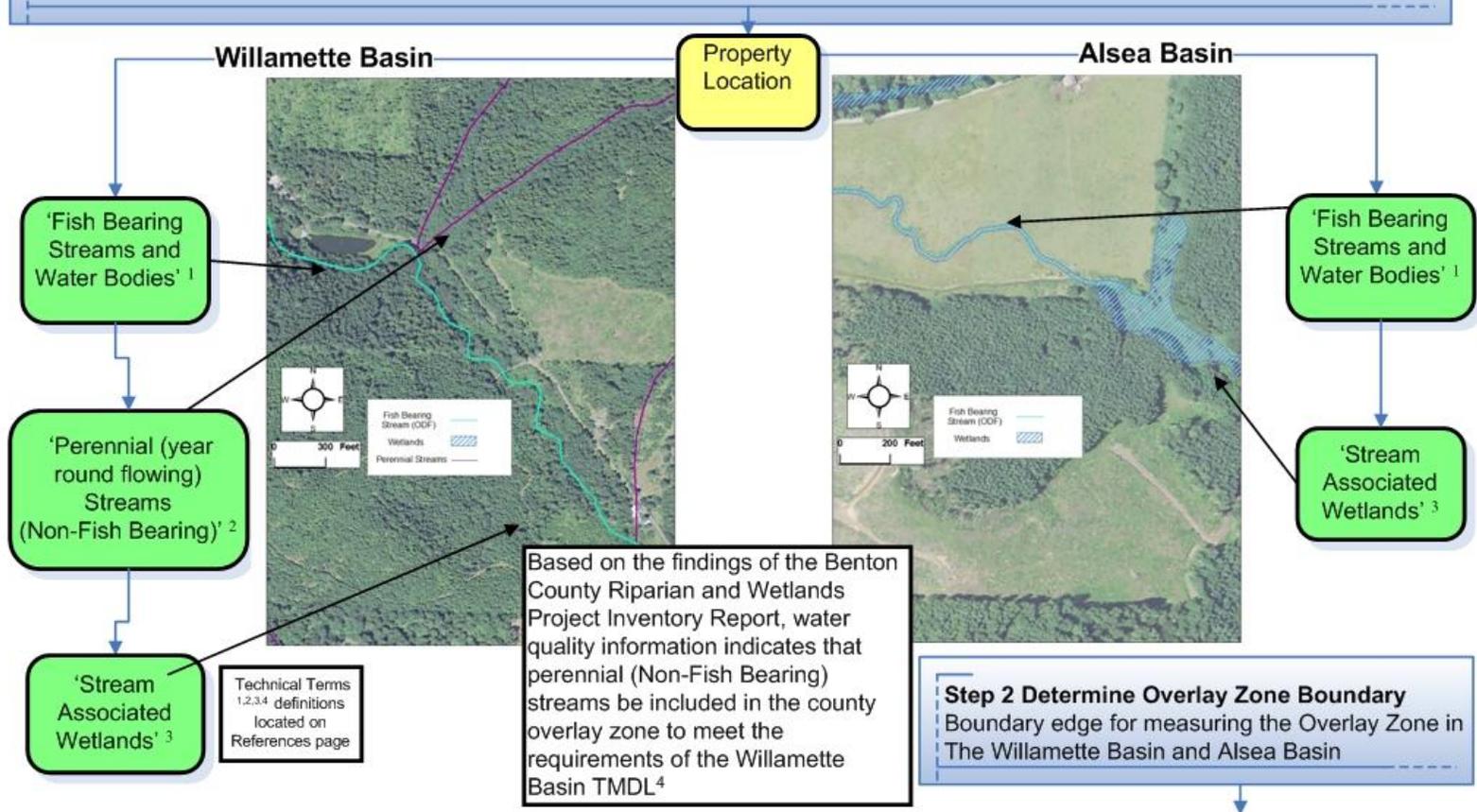


# Benton County Stream and Riparian Protection Scenarios

The following are common scenarios for protection of stream and riparian resources. The following scenarios outline how Benton County Stream and Riparian Protection (SRP) Overlay Zone code amendments would be applied. The scenarios were developed from Local Landowner input at twelve (12) community meetings, and monthly meetings of the Riparian and Wetlands Advisory Group.

## Step 1 Delineation of the Stream and Riparian Protection Overlay Zone

The Overlay Zone boundaries will be established differently for properties with applicable riparian/wetland resources



# Benton County Stream and Riparian Protection Scenarios

Continued (pg 2 of 7 )

## Step 2 Determining the Overlay Zone Boundary in the Willamette Basin

The following scenarios apply to the portion of the Willamette Basin in Benton County

'Fish Bearing Streams and Water Bodies'

**Riparian Corridor:** The riparian area measured horizontally, inland, from the ordinary high water line are as follows

- (A) For the **Willamette River**, including sloughs and side channels: 75 feet;
- (B) For **all other fish-bearing streams and other fish-bearing water-bodies**: 50 feet;

See page 4 for description of how the ordinary high water line will be determined by Benton County.

'Perennial (year round flowing) Streams (Non-Fish Bearing)'

**Riparian Corridor:** The riparian area measured horizontally, inland, from the ordinary high water line are as follows

For all other **perennial streams** in the Willamette Basin: 50 feet

'Stream Associated Wetlands'

**Stream-Associated Wetland:** When a mapped wetland extends beyond the edge of the SRP riparian corridor Overlay zone

### DRAFT OPTIONS

25 foot buffer from mapped wetland edge if Oregon Dept of State Lands indicates that the proposed actions can impact jurisdictional wetlands and waters.

25 foot buffer for National Wetlands Index mapped wetlands

Other?

## Step 2 continued Determining the Overlay Zone Boundary in the Alesea Basin

The following scenarios apply to the portion of the Willamette Basin in Benton County

## Benton County Stream and Riparian Protection Scenarios

Continued (pg 3 of 7 )

### Step 2 Determining the Overlay Zone Boundary in the Alsea Basin

The following scenarios apply to the portion of the Alsea Basin in Benton County

'Fish Bearing  
Streams and  
Water Bodies'

**Riparian Corridor:** The riparian area measured horizontally, inland, from the ordinary high water line are as follows

- (A) For the **Willamette River**, including sloughs and side channels: 75 feet;
- (B) For **all other fish-bearing streams and other fish-bearing water-bodies**: 50 feet;

See page 4 for description of how the ordinary high water line will be determined by Benton County.

'Stream  
Associated  
Wetlands'

**Stream-Associated Wetland:** When a mapped wetland extends beyond the edge of the SRP riparian corridor  
Overlay zone

#### DRAFT OPTIONS

25 foot buffer from mapped wetland edge if Oregon Dept of State Lands indicates that the proposed actions can impact jurisdictional wetlands and waters.

25 foot buffer for National Wetlands Index mapped wetlands

Other?

### Step 3 Determining the Ordinary High Water Line in the Alsea Basin and Willamette Basin

The following scenarios apply to the portion of the Alsea Basin and Willamette Basin in Benton County

# Benton County Stream and Riparian Protection Scenarios

Continued (pg 4 of 7)

Licensed Civil Engineer or Surveyor

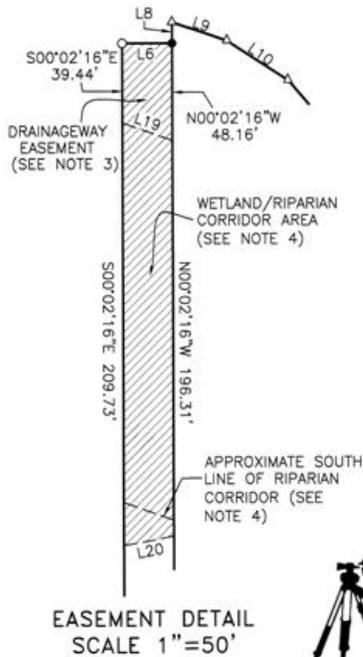
Site Assessment

**Step 3 Determination of Ordinary High Water Line<sup>5</sup>**  
 The ordinary high water line (as defined in DIVISION 141-085 Oregon Administrative Rules for waters of Oregon including wetlands)

Site Assessment

County Planning Official/ Staff using available mapping, photos and other site evaluation techniques

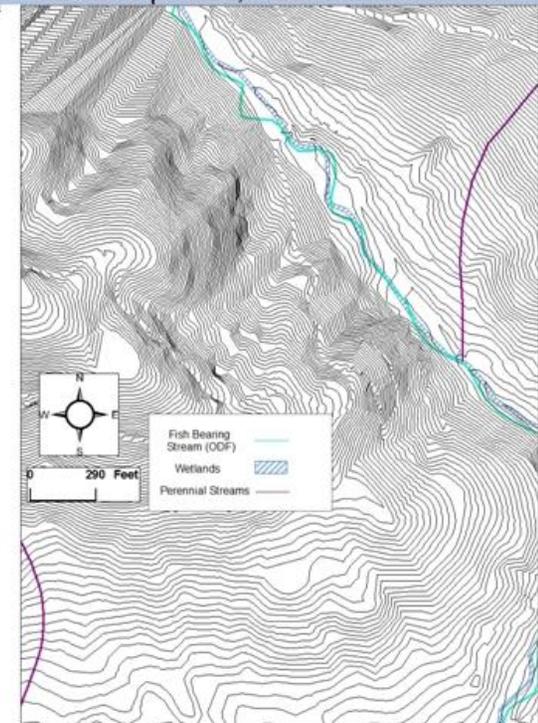
Example of licensed survey to determine Ordinary High Water Line



Photos and on-site visits

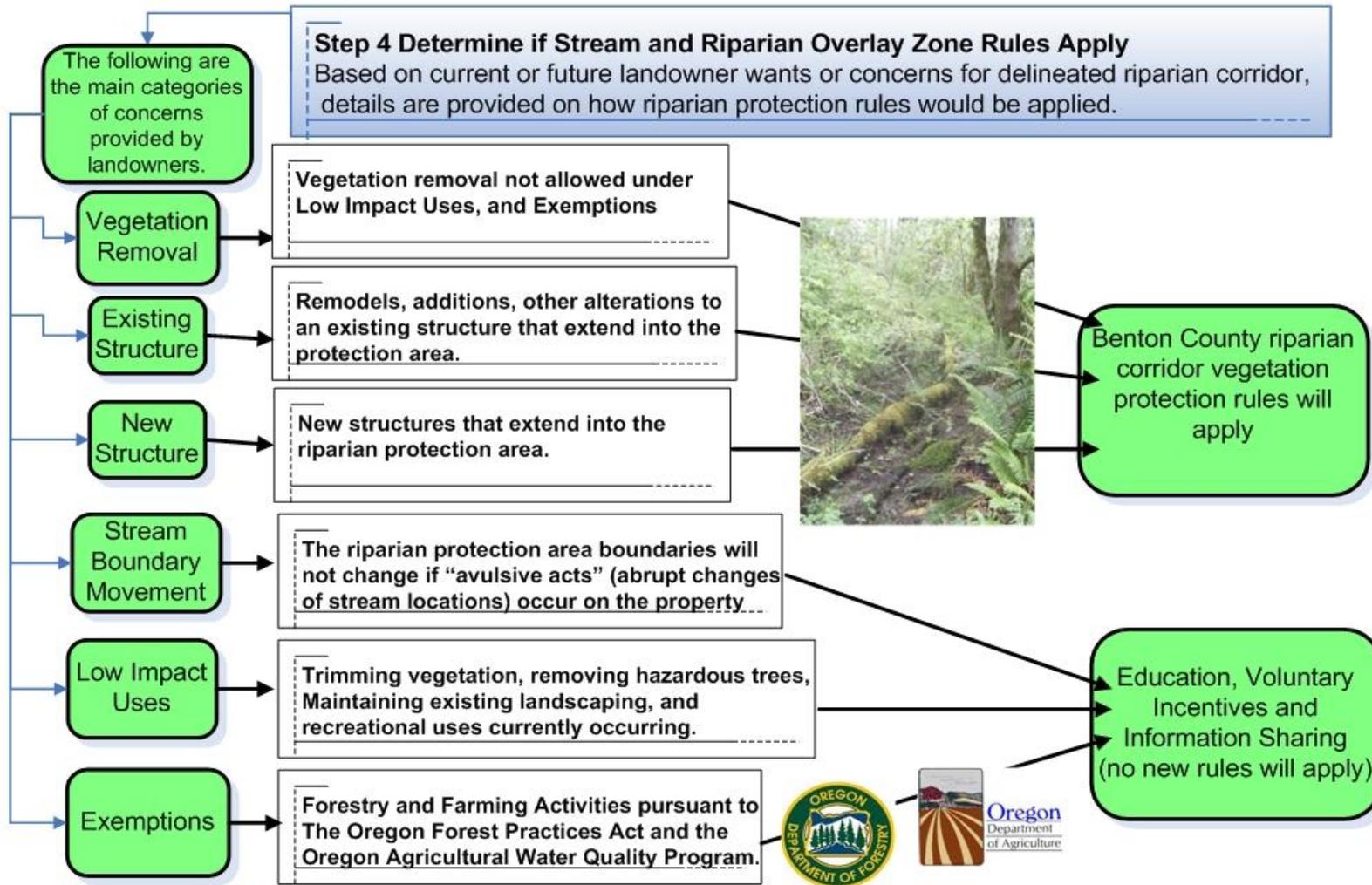


Examples of available County contour data available for determining top of bank  
 With site photos, visits where needed



# Benton County Stream and Riparian Protection Scenarios

Continued (pg 5 of 7)



# Benton County Stream and Riparian Protection Scenarios

Continued (pg 6 of 7 )

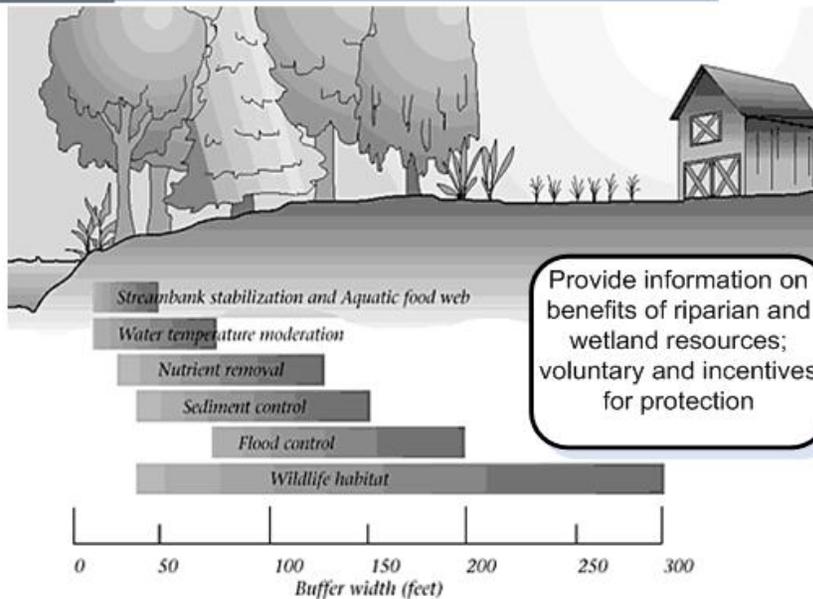
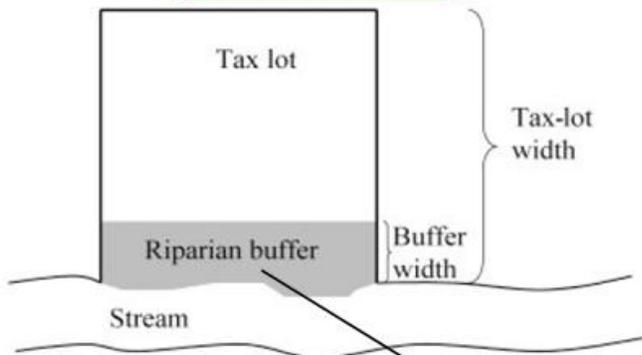
## Step 5 Process for Reviewing and Implementing Stream and Riparian Overlay Zone Rule Requirements

Details on how riparian protection rules are applied to properties.

### County Review and Requirements

**\*Note that Benton County Building Setbacks currently require 25 to 50 ft. setbacks from streams**

Known or Proposed Alterations to Riparian Vegetation within Riparian Corridor that are not exempt



Provide information on benefits of riparian and wetland resources; voluntary and incentives for protection

**Minimize Vegetation Removal/Riparian Overlay Zone Disturbance;  
Require replanting if area is disturbed;  
Provide for Variance Process if requested  
by landowner (see Draft Stream and Riparian Overlay Zone)**

## Benton County Stream and Riparian Protection Scenarios References

Continued (pg 7 of 7)



- 1. Fish Bearing Lakes:** When a fish bearing stream has seasonal connectivity with a natural or human constructed water body.
- 2. Fish Bearing Streams:** a stream inhabited at any time of the year by anadromous or game fish species, or fish that are listed as threatened or endangered species under the federal or state Endangered Species Act.
- 3. Stream-Associated Wetland:** A mapped wetland documented on current wetland mapping resources utilized by Benton County, with a portion of the mapped area of the wetland located within the riparian corridor.
- 4. TMDL (Total Maximum Daily Load):** is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards.
- 5. Ordinary High Water Line:** Means the line on the bank or shore to which the high water ordinarily rises annually in season (ORS 274.005). This excludes exceptionally high water levels caused by large flood events (e.g. 100 year events). OHWL is indicated in the field by the following physical characteristics:
  - (a) Clear, natural line impressed on the shore;
  - (b) Change in vegetation (riparian (e.g. willows) to upland (e.g. oak, fir) dominated);
  - (c) Textural change of depositional sediment or changes in the character of the soil (e.g. from sand, sand and cobble, cobble and gravel to upland soils);
  - (d) Elevation below which no fine debris (needles, leaves, cones, seeds) occurs;
  - (e) Presence of litter and debris, water-stained leaves, water lines on tree trunks; and/or
  - (f) Other appropriate means that consider the characteristics of the surrounding areas.

## Appendices

**Appendix A** Benton County Riparian and Wetlands Advisory Group (RWAG) participants note that monthly RWAG meeting attendees include the general public and other representatives.

<b>Organization</b>	<b>Applicable Persons</b>	<b>Background/Area of Expertise</b>
Landowners with stream and wetlands	County resident volunteers	Input on process and development, local knowledge
Benton County	Planning Commission member(s)	Volunteers with county and state land use planning and review experience
Benton County Natural Areas & Parks	Director, with staff serving as alternatives	Management and protection of riparian and wetlands resources in County Parks. Assessment of potential conservation areas
Benton County Public Works	Staff and managers as assigned	Road and roadside maintenance along riparian/wetland areas; culvert restoration program
Watershed Councils	Marys River Watershed Council ( various staff, volunteers)	Watershed monitoring and restoration projects; provides up to date riparian and wetland information and opportunities for partnerships
Cities	Staff from interested cities; likely planning and development staff	Direct work with Adair, Philomath, and Monroe. Adair and Monroe will be undergoing local wetland inventories during the project period
Audubon Society	John Gaylord, Member	Represents Corvallis Audubon Society; provide project information and ideas, such as work on the <a href="#">Hesthavn Nature Center</a>
US Environmental Protection Agency, Office of Water	Rich Sumner	Wetland and riparian project work management and research
Oregon Dept. of Fish & Wildlife	Karen Hans, fish biologist;	Fish use areas, habitat buffers to improve riparian areas

Benton Soil & Water Conservation District	Donna Schmitz	Diverse experience in streamside fencing and restoration projects across Benton County
Oregon State University	Dr. Paul Adamus (ex. officio), professor and wetland professional	Delineating, monitoring and managing wetlands; author of several books; expert in Oregon/Benton County type wetlands
Dept. of Land Conservation and Development	Amanda Putnam, Natural Resources Specialist (ex officio)	Provides guidance on State Land Use Planning Rules and Statutes; Inter-agency coordination support to understand jurisdictional authority and overlap
Dept. of State Lands Technical Staff	Janet Morlan (ex officio) State Lands Wetlands Division	Wetland specialist

**Available Advisory Group members meet monthly or as necessary to provide input to County Staff to:**

- Finalize scope and objectives of project
- Inform the assessment and detailed mapping of current riparian/wetland conditions (GIS, LiDAR, and other data)
- Determine program elements including land use code through an “options analysis” process to meet comprehensive plan goals
- Determine the scope and goals of ground truthing field assessments
- Identify information gaps of importance for future work to enhance the county riparian/wetlands program
- Inform and review county policy and program details for riparian/wetland planning and protection adoption by Board of Commissioners

<http://www.co.benton.or.us/cd/riparian/advisory.php>

## **Appendix B** Project Related Definitions

### Existing Riparian and Wetland Rules and Regulations; adapted from State Guidance Document on Managing Riparian Resources

The following definitions will be used to develop a Riparian and Wetlands Project inventory. Definitions are part of the Oregon Statewide Planning Goal 5 Administrative Rule (OAR 660-023-0000); with additional definitions compiled to address Goal 6 water

quality related inventory and planning. Administrative Rule Goal 6 (Air, Water and Land Quality) does not contain State Revised Statute definitions.

<b>Term</b>	<b>Goal 5 Administrative Rule (OAR 660-023-0000)</b>	<b>Goal 6 related Definitions (sources cited)</b>
Fish and Wildlife Habitat	An area where fish and wildlife depend in order to meet their requirements for food, water, shelter and reproduction.	
Impaired Water Body		Any waterbody of the United States that does not attain water quality standards due to an individual pollutant, multiple pollutants, pollution, or an unknown cause of impairment. Where a waterbody receives a discharge from one or more point sources, impaired means that the waterbody does not have or maintain a balanced indigenous population of shellfish, fish, and wildlife (US EPA, ODEQ).
Lake		A naturally occurring still-water body. A water area off of a main channel (e.g. a backwater or slough) is considered a stream and not a lake if there is a likely hydrologic connection with the stream during an average year of precipitation (proposed Benton County definition).
Pond		A human created (e.g. through impoundment or diversion) still-water body with outfall to a stream during some portion of the year with average precipitation. Isolated Ponds (i.e. ponds that do not meet this definition) are not subject to the requirements of this section. <b>NOTE:</b> USGS maps separate 'ponds' 'lakes' and 'sloughs'.
Riparian Corridor	Goal 5 resource that includes the water areas, fish habitat, adjacent riparian areas, and wetlands within the riparian area boundary.	Pertaining to or located on the bank of a body of water, especially a stream (USGS water basics glossary).
Riparian Corridor Boundary	An imaginary line that is a certain distance upland from the top of bank	Delineated area where riparian functions occur (USGS water glossary).
<b>Term</b>	<b>Goal 5 Administrative Rule (OAR 660-023-0000)</b>	<b>Goal 6 related Definitions (sources cited, other notes)</b>
Stream	A channel such as a river or creek that carries flowing surface water, including perennial streams and	A scoured channel expected to contain water flow during some portion of a year with average precipitation (current Benton County planning review definition).

	intermittent streams with defined channels, and excluding man-made irrigation and drainage channels (Goal 5).	
Top of Bank	“bankfull stage”, defined as the two-year recurrence interval flood elevation (Goal 5).	Identifiable break in slope and/or transition from the riparian to upland environment as defined by the ordinary high water line by the State of Oregon (proposed Benton County definition).
Water Area	Area between the banks of a lake, pond, river, perennial or fish-bearing intermittent stream, excluding man-made farm ponds (Goal 5)	
Water Quality Limited		Any [stream] segment where it is known that water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards, even after the application of the technology-based effluent limitations (US EPA, ODEQ).
Wetlands	Area inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soils.	Ecosystems whose soil is saturated for long periods seasonally or continuously, including marshes, swamps, and ephemeral ponds (USGS, National Water-Quality Assessment).

### **Appendix C Oregon’s Statewide Riparian Restoration and Management Policy (2002) Important Riparian Functions**

Important riparian functions are briefly described below; these descriptions are summarized from the Riparian Management Work Group report “Oregon State Programs for Managing Riparian Areas” (Riparian Management Work Group, 2000):

#### **Aquatic shade and water temperatures**

Stream temperature is critical to maintaining viable salmonid populations, as well as other aquatic life. Stream temperature conditions are influenced by shade through vegetation and stream channel morphology.

**Streambank stability and erosion processes**

Well-vegetated riparian areas help maintain the stability of stream banks, reduce bank erosion, and foster the development of complex habitats along channel margins. Riparian plants produce root mass that is distributed throughout the soil column, thereby providing additional resistance to elevated stream velocities. Outside of the channel, healthy stands of riparian vegetation can significantly dampen off-channel floodplain velocities and create backwater conditions. Sediments and nutrients deposited in slack water contribute to water quality and the health and stability of riparian areas.

**Floodplain complexity and riparian vegetation**

Riparian forests can produce large amounts of wood. This wood plays a critical role in aquatic ecosystems by dissipating the force of water and helping to create complex habitats. When high energy streams enter lowlands and valleys, deposition of sediments causes increased interaction between the channel and floodplain, and results in floodplain complexity such as side channels, sloughs, oxbow lakes and spring fed creeks.

**Nutrient and sediment sources**

Riparian vegetation provides a nearly constant input of leaves, wood, insects, spores, and other materials, which represent an important part of the aquatic food chain, and contributes to the overall productivity of aquatic systems. Riparian areas may also be a source of sand and gravel for transport and the creation of instream bars, new riparian areas, and channel complexity downstream.

**Filtration of sediments, organic material, and toxic substances in surface runoff**

All streams, under natural conditions, produce sediment and other inputs at varying levels. Human activities can increase these inputs to a point where they have a negative effect on the health and productivity of the stream. The magnitude of these inputs depends upon local soil types and substrates, topography, vegetation and precipitation. Healthy riparian vegetation can capture and hold these materials, thus keeping them out of the water.

**Wildlife habitat**

When compared to most upland areas, riparian areas provide greater habitat diversity, and often support higher species diversity. In healthy riparian ecosystems, structural complexity and habitat diversity result from diverse plant species, multiple canopy layers, and a range of plant age classes.

**Appendix D Applicable Benton County Comprehensive Plan Goal 5 and Goal 6 Policies, and applicable Statewide Planning Goal Policy**

**5.6.1** Benton County shall undertake the Goal 5 process and adopt a protection program for significant riparian areas.

**5.6.3** Benton County shall require land development and transportation projects to be designed to minimize incursions and other impacts to floodplains, wetlands, and riparian areas. When no reasonable option exists, roads, bridges, and access ways

may be allowed, provided fish passage is assured, channel capacity is maintained, and removal of riparian vegetation is minimized.

**5.6.4** Benton County shall use Best Management Practices in County-owned riparian areas and along public rights of way to protect native vegetation and natural functions.

**5.6.5** Benton County shall provide educational information regarding the importance and protection of riparian areas and water bodies, the existence of county and state regulations concerning these areas, and where feasible shall develop incentives to encourage preservation and/or restoration of these resources.

**5.6.6** Benton County shall encourage landowners to maintain and enhance native vegetation and remove invasive species growing along the banks of surface water areas (streams, creeks, lakes, sloughs, and marshes) with incentives such as the Wildlife Habitat Conservation and Management Program (OAR 635-430).

**5.6.7** Benton County's riparian planning process shall place particular emphasis on identifying and protecting headwater areas from adverse impacts of development.

**5.6.8** Benton County shall work with the Oregon Department of Fish and Wildlife, and other agencies and nonprofit organizations to promote salmon recovery through non-regulatory approaches such as voluntary incentives, encouraging appropriate species management, coordinated planning, habitat protection.

**In addition Goal 6 policies for water resources were created by citizens to improve and maintain water resources:**

**6.2.5** Benton County shall collaborate with others to promote watershed management practices that protect and enhance water quality and quantity.

**6.2.6** Benton County shall require development to be designed or located in a manner that will result in no net degradation of water quantity and quality.

### **Statewide Planning Goal 5 and Goal 6 Inventory Overview**

The following text was adapted from the **Multi City Wetland Riparian Assessment Project**, Lane Council of Governments (2010) and provides the most current background information on the specifics of Oregon Administrative Rule (OAR) requirements, and other existing requirements/guidance applicable to the Benton County Riparian and Wetlands Inventory and Plan.

#### **Goal 5 Riparian (OAR 660-23-0090)**

The Goal 5 rule separates the *identification* of the significant riparian resource, from the process of determining the appropriate *protection* for that identified resource. A jurisdiction may apply the standard or safe harbor option to all phases or may choose to apply the safe harbor approach to one phase and the standard approach to the other phase.

#### **Goal 6 – Air, Water and Land Resources Quality**

Although Goal 6 does not have Oregon Administrative Rules to set standards for meeting the goal, for water quality purposes, Goal 6 has the potential for being the most important land use planning goal. The Goal requires that “all waste and process discharges from future development, when combined with such discharges from existing developments shall not threaten to violate, or violate applicable state or federal environmental quality statutes, rules and standards.” The Goal includes a series of non-mandatory “guidelines” for developing comprehensive plans such as designating sites for controlling pollution, buffering and separating land uses which lead to impacts upon water resources, and considering the planning area’s carrying capacity for water resources.

State definitions for wastewater and pollutants include pollutants carried by stormwater and impacts on habitat that result from stormwater flows. Goal 6 requires jurisdictions to integrate compliance with federal and state water quality regulations with the comprehensive planning process.

Goal 6 can be used as a justification for riparian protection since a link between a healthy riparian area and healthy stream is well established. Although Goal 6 does not require the ESEE process, a similar process will be needed to establish findings that support limiting development in riparian areas. It may also be possible to address wetland and wetland buffer protection under the water quality provisions of Goal 6. It is well established that wetlands serve an important function in preserving the natural hydrology of a watershed. However, a connection must be made between protecting wetland function in a watershed and protecting water quality. Findings to justify protection of wetlands under Goal 6 would need to be established. DSL’s Oregon Freshwater Wetlands Assessment Methodology and the state criteria for determining wetlands significant for water quality (see OAR 146-086-0350) provide guidance for this type of assessment.

## Appendix E GIS Mapping Data Overview

<b>GIS Data</b>	<b>Source(s)</b>
Stream and Wetlands locations	Federal, State, Local government; Oregon State University, Wetlands Explorer
Flow Gauge/Water Quality Monitoring Station(s)	USGS, DEQ
Fish Bearing and other Stream Classification Maps Streams	ODF, ODFW, DEQ Watershed Councils
Listed Riparian/Wetland Species	USFWS, ODFW
High Resolution Satellite Imagery (LiDAR)	Oregon LiDAR Consortium, Benton County GIS Staff
Aerial Photography	National Agriculture Imagery Program (2009), Benton County (2005)

National Wetlands Inventory Maps	USFWS
Floodplain and Floodway Maps	FEMA (currently adopted and proposed flood maps)

#### Overview of mapping data to complete Goal 6 Safe Harbor Inventory

GIS Data	Source(s)
Flow Gauge/Water Quality Monitoring Station(s)	USGS, DEQ
Water Quality Impaired Streams	Oregon DEQ, US EPA
Slope	Benton County, NRCS
Erodibility of Soils	NRCS water erosion potential index (in process, November 20, 2010 ETA)
Wetlands	Oregon Wetlands Explorer
Potential Headwaters locations	based on LIDAR imagery, BLM stream order classifications where available.

### Appendix F Overview of LiDAR Mapping Products evaluated for use in stream delineation (including example map)

Digital elevation models (DEMs) used to generate: Hillshades, 1-ft contours, stream cross-sections, slope, curvature, streamlines, intensity images, and highest hits.

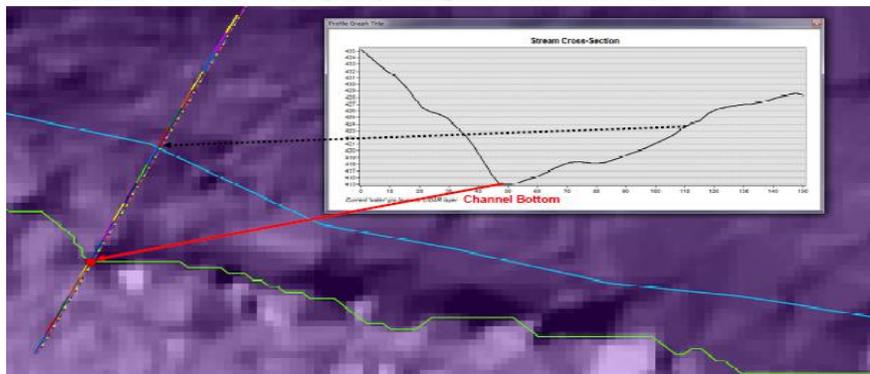
#### Stream/Riparian Cross-Section: Example 1

At this location the new ArchHydro derived stream is *more* accurate than the currently used 'water' stream layer by 60 ft.

Profile drawn across 'old' and 'new' stream lines for Quality Assurance check

Blue Line ~ stream from County 'water' GIS layer ~ 'old'

Green line ~ stream derived using ArchHydro program and LiDAR data ~ 'new'



**Appendix G** Available USGS Stream Flow Gauge Records applicable to Benton County streams; used to determine Average Annual Streamflow

**USGS 14170000 LONG TOM RIVER AT MONROE, OR**

Available data for this site Time-series: Annual statistics

Benton County, Oregon Hydrologic Unit Code 17090003 Latitude 44°18'47", Longitude 123°17'43" NAD27 Drainage area 391 square miles Gage datum 270.57 feet above sea level NGVD29	<b>Output formats</b> <a href="#">HTML table of all data</a> <a href="#">Tab-separated data</a> <a href="#">Reselect output format</a>
---	---

Water Years 1922-2008

**USGS 14190500 LUCKIAMUTE RIVER NEAR SUVER, OR**

Available data for this site Time-series: Annual statistics

Polk County, Oregon Hydrologic Unit Code 17090003 Latitude 44°47'00", Longitude 123°14'00" NAD27 Drainage area 240 square miles Gage datum 171.92 feet above sea level NGVD29	<b>Output formats</b> <a href="#">HTML table of all data</a> <a href="#">Tab-separated data</a> <a href="#">Reselect output format</a>
---	---

Water Years 1906-2008

**USGS 14171000 MARYS RIVER NEAR PHILOMATH, OR**

Available data for this site Time-series: Annual statistics

Benton County, Oregon Hydrologic Unit Code 17090003 Latitude 44°31'35", Longitude 123°20'00" NAD27 Drainage area 159 square miles Gage datum 224.01 feet above sea level NGVD29	<b>Output formats</b> <a href="#">HTML table of all data</a> <a href="#">Tab-separated data</a> <a href="#">Reselect output format</a>
---	---

Water Years 1941-2008

**USGS 14174000 WILLAMETTE RIVER AT ALBANY, OR**

Available data for this site Time-series: Annual statistics

Linn County, Oregon Hydrologic Unit Code 17090003 Latitude 44°38'20", Longitude 123°06'20" NAD27 Drainage area 4,840 square miles Gage datum 167.18 feet above sea level NGVD29	<b>Output formats</b> <a href="#">HTML table of all data</a> <a href="#">Tab-separated data</a> <a href="#">Reselect output format</a>
---	---

Water Years 1894-2008

**Appendix H** Willamette Basin Water Quality Regulations pertaining to Riparian Resources under the Willamette Basin TMDL

## Excerpts from Willamette Basin TMDL: Upper Willamette Subbasin, Temperature

Willamette Basin TMDL: Upper Willamette Subbasin

September 2006

### Load Allocations

#### OAR 340-042-0040(h)

Load Allocations are portions of the loading capacity divided among natural, current anthropogenic, and future anthropogenic nonpoint pollutant sources. Load allocations (i.e. distributions of the loading capacity) are provided in Table 10.9 for Coyote Creek, Calapoia and Luckiamute Rivers.

In this TMDL, load allocations are allowed 0.05°C of the human use allowance (0.3°C). This heat allowance is in addition to the load that streams would receive when they are at system potential and would allow activities that might increase the loading (such as riparian management activities) or for human disturbance that may not easily be addressed (e.g. presence of a road near a stream that would limit shading). The 0.05°C increase in temperature above criteria (1/6th of the HUA) is dedicated to nonpoint sources but is not allocated to individual sources at this time.

The current loading from nonpoint sources is much greater than that which would exist under natural thermal potential. This requires nonpoint sources to reduce thermal inputs to reach natural thermal potential conditions through allocation of a surrogate measure, effective shade. The principal means of achieving this condition is through protection and restoration of riparian vegetation. Additional measures may also be taken to improve summer temperatures. For example, water conservation measures that improve summer stream flows will benefit stream temperatures through an increase in load capacity. Stream restoration efforts that result in narrower stream channel widths will improve the effectiveness of existing vegetation to shade the stream surface.

Nonpoint source allocations were assigned natural background loads and are implemented as shade curves for upland forests and each geomorphic unit. This allocation also applies to tributaries of temperature listed waterbodies. Shade curves illustrate the relationship between each potential vegetation cover type, channel width and the resulting effective shade level.



### Surrogate Measures

#### OAR 340-042-0040(5)(b), 40 CFR 130.2(i)

The Upper Willamette Subbasin Temperature TMDL incorporates measures other than "daily loads" in allocating heat to nonpoint sources. These measures are termed surrogate measures. The applied surrogate measure in this temperature TMDL is percent effective shade expressed as a shade curve. Shade curves have been developed for each geomorphic unit in the Willamette Valley and upland forest area of the Cascade and Coast Ranges in the Willamette Basin. Shade curves determine the nonpoint source load allocation. They were developed using trigonometric equations estimating the shade underneath tree canopies.

## **Appendix I Oregon Department of Agriculture Middle Willamette and Mid-Coast Water Quality Management Plan Overview sheet**

### ***What is the plan?***

In 2002, the Oregon Department of Agriculture (Department) developed the Middle Willamette Agricultural Water Quality Management Area and Rules in accordance with the Agricultural Water Quality Management Act of 1993. The Polk and Benton Soil and Water Conservation Districts (Districts) and a panel of local landowners helped the Department craft the area plan and rules.

The area plan is a tool that provides agricultural water quality partners and landowners information about:

- The geographic area of the plan and its boundaries. (See map)
- Local water quality concerns in the plan area.
- Goals and implementation strategies to encourage conservation and improve water quality.
- Optional management practices that landowners may implement to improve water quality.

The water quality concerns identified for the Middle Willamette management area are:

- Temperature
- Bacteria
- Dissolved oxygen
- pH
- Mercury

The Districts and the landowners involved in writing the Middle Willamette area plan identified a goal of ensuring water quality goals are met while promoting the flexibility and economic viability of agriculture. They proposed to reach this goal through education, resource management, seeking funding sources, and monitoring and evaluating the plan over time.

The area plan does not tell anyone how to farm, ranch, or otherwise utilize their natural resources. Rather it is a resource for landowners to address water quality issues. In it, they can find contacts for technical and financial assistance that will help them meet their business and conservation goals, and attain water quality standards at the same time.

### ***Are there regulations?***

The focus of the Agricultural Water Quality Management Program is on voluntary and cooperative efforts by landowners, the Department, and others to protect water quality.

However, the Agricultural Water Quality Management Act also provides for a regulatory backstop to ensure prevention and control of water pollution from agricultural sources in cases where landowners or operators refuse to correct problem conditions.

Agricultural water quality regulations serve as this backstop while allowing landowners flexibility in how they protect water quality. Local area regulations describe characteristics to be achieved on agricultural lands, rather than practices that must be implemented.

The following is a summary of regulations that apply in the Middle Willamette Area:

- 1. Riparian vegetation along perennial streams must provide the water quality functions of shade, streambank stability, and filtration of pollutants. A diverse structure and species mix should provide these functions.*
- 2. Landowner actions may not cause pollution to any waters of the state or place any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.*

***Do the plan and regulations apply to me?***

The area plan and associated regulations apply to all lands, regardless of size, in current agricultural use and those lying idle or on which management has been deferred. It also applies to agricultural operations within incorporated city boundaries within the designated management area boundary.

Communities within the area include Adair Village, Airlie, Blodgett, Corvallis, Dallas, Eola, Independence, Kings Valley, Monmouth, Monroe, north Albany, Philomath, Rickreall, and west Salem. See map.

More information?

If you would like further information, you can contact the Polk Soil and Water Conservation District at (503) 623-9680 or the Benton Soil and Water Conservation District at (541) 753-7208.

OR

Contact the Oregon Department of Agriculture Natural Resources Division at (503) 986-4700 or visit their website at [www.oregon.gov/oda/nrd/water\\_quality\\_front.shtml](http://www.oregon.gov/oda/nrd/water_quality_front.shtml)

Alsea Basin Water Quality 303 d Listed/Water Quality Limited Stream data

Watershed (USGS 4th Field Name)	USGS 4th Field HUC	Water Body (Stream/Lake)	River Miles	Parameter	Season	Criteria	Beneficial Uses	Status	AssessmentYear	TMDL Written?
ALSEA	17100205	Alsea River	15.7 to 27	Dissolved Oxygen	September 15 - June 15	Spawning: Not less than 11.0 mg/L or 95% of saturation	Salmon and steelhead spawning	Cat 5: Water quality limited, 303(d) list, TMDL needed	2004	No
ALSEA	17100205	Alsea River	15.2 to 47.4	Temperature	Summer	Rearing: 17.8 C	Anadromous fish passage Salmonid fish rearing	303(d)	2002	No
ALSEA	17100205	Bummer Creek	0 to 8.2	Temperature	Year Around (Non-spawning)	Core cold water habitat: 16.0 degrees Celsius 7-day-average maximum	Core cold water habitat	Cat 5: Water quality limited, 303(d) list, TMDL needed	2004	No
ALSEA	17100205	Camp Creek	0 to 2.7	Temperature	Summer	Rearing: 17.8 C	Anadromous fish passage Salmonid fish rearing	303(d)	1998	No
ALSEA	17100205	Little Lobster Creek	0 to 6.6	Temperature	Year Around (Non-spawning)	Core cold water habitat: 16.0 degrees Celsius 7-day-average maximum	Core cold water habitat	Cat 5: Water quality limited, 303(d) list, TMDL needed	2004	No
ALSEA	17100205	Lobster Creek	6.8 to 17.7	Temperature	October 1 - June 15	Salmon and steelhead spawning: 13.0 degrees Celsius 7-day-average maximum	Salmon and steelhead spawning	Cat 5: Water quality limited, 303(d) list, TMDL needed	2004	No
ALSEA	17100205	Lobster Creek	0 to 17.7	Temperature	Year Around (Non-spawning)	Core cold water habitat: 16.0 degrees Celsius 7-day-average maximum	Core cold water habitat	Cat 5: Water quality limited, 303(d) list, TMDL needed	2004	No
ALSEA	17100205	North Fork Alsea River	0 to 2.7	Temperature	September 15 - June 15	Salmon and steelhead spawning: 13.0 degrees Celsius 7-day-average maximum	Salmon and steelhead spawning	Cat 5: Water quality limited, 303(d) list, TMDL needed	2004	No
ALSEA	17100205	North Fork Alsea River	0 to 15	Temperature	Year Around (Non-spawning)	Core cold water habitat: 16.0 degrees Celsius 7-day-average maximum	Core cold water habitat	Cat 5: Water quality limited, 303(d) list, TMDL needed	2004	No
ALSEA	17100205	Peak Creek	0 to 7	Temperature	Year Around (Non-spawning)	Core cold water habitat: 16.0 degrees Celsius 7-day-average maximum	Core cold water habitat	Cat 5: Water quality limited, 303(d) list, TMDL needed	2004	No
ALSEA	17100205	Phillips Creek	0 to 2.1	Temperature	Summer	Rearing: 17.8 C	Anadromous fish passage Salmonid fish rearing	303(d)	1998	No
ALSEA	17100205	South Fork Alsea River	0 to 17.2	Temperature	Year Around (Non-spawning)	Core cold water habitat: 16.0 degrees Celsius 7-day-average maximum	Core cold water habitat	Cat 5: Water quality limited, 303(d) list, TMDL needed	2004	No

**Appendix J** Mid-Coast Basin TMDL Update provided by Oregon Department of Environmental Quality



**January 4, 2011**

Mid-Coast Basin TMDL Technical Advisory Committee

**RE: Mid-Coast Basin TMDL Update**

Dear Mid-Coast TMDL Technical Advisory Committee (TAC) members:

Since transitioning into the Mid-Coast Basin Coordinator position in June 2010, new challenges and opportunities have been a constant feature of the project. We have talked with many stakeholders about specific issues in their geographic areas over the past few months. Because the TAC has not met since April 2009, we are overdue to provide a more comprehensive update to both the TAC members and a broad range of stakeholders. This memo summarizes recent developments and provides background on DEQ's activities, including some of the significant factors affecting our TMDL program and associated project schedules.

- A. **Technical Advisory Committee; Future Activities:** TMDL stakeholder committees are an essential component of DEQ's TMDL program. The future of the Mid-Coast TAC, and your participation as a member, is a high priority for DEQ. The TAC meetings held in 2008-2009 represent a considerable stakeholder investment and we appreciate your participation and support. The TAC meetings were suspended when we concluded that the TAC process exceeded existing DEQ's resource capability. A key staff person also retired during the past year, so we focused on data evaluation and review of TMDL technical approaches. Since the TAC process was documented, your efforts do not represent "lost" time or effort and we intend to build on that foundation. We also recognize that modifications to the TAC process are necessary to adequately address recent legal developments and associated requirements affecting Oregon's TMDL process in the coastal zone management area (see **Legal developments**, below). In particular, addressing new deliverables and the associated milestone dates will require a concerted effort by DEQ.

To respond to these new challenges, DEQ is seeking support for a "facilitation-mediation" process to guide the TAC and other stakeholder involvement activities. Two productive avenues that have been pursued are EPA contract support and involvement with Oregon Solutions (<http://orsolutions.org>). The brief legal update should clarify the need for taking this type of approach, but the bottom line is that a professionally facilitated process will provide a number of benefits to DEQ and the Mid-Coast stakeholders. The TAC will play a key role in shaping the direction of the facilitation-mediation process, if it can be funded. TAC membership and stakeholder involvement may need to be expanded to address specific issues via working groups. For instance, developing TMDL implementation plans for

local governments should benefit from a specific working group and there are excellent precedents in other Basins.

The facilitation efforts would provide a structured framework for the TAC-stakeholder process and associated technical issues, enhance meeting productivity and assist DEQ and others with follow-up activities. The mediation aspect, as envisioned, would focus on developing mutually acceptable TMDL implementation plans with Designated Management Agencies (DMAs), working with landowners, help resolve technical, administrative or legal issues and focus on finding solutions to complex issues that create barriers to watershed improvements. These solutions may include using innovative approaches to TMDLs or an alternative such as the Category 4b\* approach.

*\*Category 4b: TMDL is not needed because other pollution control requirements are expected to result in the attainment of an applicable water quality standard (WQS) in a reasonable period of time*

Regardless of the outcome of our efforts to secure additional support for the stakeholder process, we intend to re-engage the TAC in 2011 using available resources. We hope that each of you will consider continuing your participation in the TAC. We plan to send you a formal request to participate as soon as we have a solid picture of the nature and level of support for the facilitated process.

- B. Outreach tools:** We plan to use a website, SharePoint, or similar tool to communicate regularly with Mid-Coast stakeholders and post relevant documents, meeting information, etc. This approach will centralize information, reduce volume and size of emails, and provide a readily accessible clearinghouse of information for all stakeholders. Initially, we will utilize DEQ's Mid-Coast TMDL website to post updated information:  
<http://www.deq.state.or.us/WQ/TMDLs/midcoast.htm#ci>
- C. Legal developments (the condensed version):** In September 2010, a settlement was reached between parties in the Northwest Environmental Advocates (Plaintiffs) - USEPA/NOAA (Defendants) lawsuit involving Oregon's Coastal Nonpoint Pollution Control Program (CNPCP) program. The lawsuit was based on the Coastal Zone Management Act and associated CNPCP requirements. Although this lawsuit had potential major (negative) ramifications for Oregon's Nonpoint Source pollution control program and associated grants, the settlement will produce a number of important outputs and outcomes. One primary outcome is that Oregon committed to preparing "Implementation-ready" TMDLs, starting with preparation of the Mid-Coast TMDL by June 30, 2012. Oregon's actions to address EPA and NOAA Requirements captured in the settlement involve three key management areas affecting water quality and watershed conditions:
- Onsite Sewage Disposal Systems (OSDS)
  - Additional Management Measures For Forestry
  - New Development Management Measures

DEQ is developing guidance to meet or implement these EPA/NOAA requirements and actions to address each of these three areas are in various stages of development. Relevant

documents and updates, including the Settlement Agreement, will be posted on the Mid-coast website: <http://www.deq.state.or.us/WQ/TMDLs/midcoast.htm#ci>

The OSDS review process began in 2009 with formation of an advisory committee. Updates and recommendations are found at: <http://www.deq.state.or.us/wq/onsite/advisory.htm>

We believe that positive outcomes associated with so-called “Implementation-ready” TMDLs will include clearer expectations for DMAs & landowners concerning what actions are required under a TMDL, and that implementation will be based on specific actions (e.g., BMPs) and thus more straightforward to assess than many existing plans. We anticipate extensive discussions with stakeholders on this aspect of the TMDL, and are confident the TAC process will provide valuable direction in shaping implementation goals and activities.

#### D. Brief technical updates:

**Temperature data analysis:** EPA recently provided contractor support for DEQ to conduct an extensive review of existing basin-wide temperature data and assess statistical approaches for evaluating relationships between riparian conditions and water temperature on streams not currently being modeled using Heat Source. The primary objectives of the analysis are to develop a multilinear regression using field data and landscape variables that achieves the following purposes:

- 1) Predicts currently observed stream temperatures in headwater streams (first, second, and third order);
- 2) Tests headwater management scenarios and their impact on stream temperature;
- 3) Produces temperature outputs that can be used as boundary condition inputs for physical based models (i.e., Heat Source) that DEQ is developing on main stem rivers.

The EPA Task Order and reports for this work will be posted here:

<http://www.deq.state.or.us/WQ/TMDLs/midcoast.htm#ci>

**Heat source modeling:** DEQ is continuing modeling activities for the Yaquina and we are focused on calibration using available meteorological data. We found that the met data coverage is not as robust as desired and are looking at the best options to deal with available data. Our target for a calibrated model is winter 2011. GIS work and associated model setup steps are basically complete for the other subbasins. The Confederated Tribes of Siletz Indians are currently working on refining the model for the Siletz subbasin.

**Sedimentation/turbidity:** DEQ recently applied for an EPA TMDL development grant to support collection of LiDAR data, combined with subsequent landslide hazard analysis, for portions of the Siletz subbasin to meet certain commitments under the Settlement Agreement. If funding is received, we will work with the Oregon Department of Geology and Mineral (DOGAMI), Oregon Department of Forestry (ODF) and other stakeholders to implement the project. We will provide an update when we learn whether our application was successful. We plan to bring technical and administrative approaches to sediment and

turbidity issues to the TAC and stakeholders for further evaluation through the facilitated process.

**Other impairments/data analysis:** We are currently evaluating the large amount of bacteria, dissolved oxygen and nutrient data collected by DEQ and various Mid-Coast partners to assess a range of appropriate statistical and modeling approaches for the impaired water bodies. We will provide specific updates on these efforts as we make progress, including more detailed assessment schedules, and identify opportunities for TAC participation.

**Lakes:** We are assessing whether adequate information is available to include two lakes (and associated watersheds) within the scope of the Mid-Coast TMDL. Devils Lake and Siltcoos Lake have experienced harmful algae blooms (HABs) within the past several years that triggered DHS health advisories, thereby affecting beneficial uses of the lakes. The 303(d) listing criteria will include health advisories for the 2010 Assessment/Integrated Report: <http://www.deq.state.or.us/wq/assessment/assessment.htm>

In response to the HABs, DEQ has supported assessment and data management through Section 319 Nonpoint Source grants, and we are providing technical assistance for a drinking water protection project. The work is intended to provide a sound basis for TMDL development, informing health officials, and local decision making. TMDL implementation will address the causes of impairments for these lakes when combined with voluntary actions. We are working with lake stakeholders to determine what level of activity can be supported. These efforts will significantly benefit from input from the TAC, or perhaps a stakeholder subgroup focused on the lakes' unique issues.

- E. **Grants:** DEQ's Nonpoint Source Implementation 319 Grants RFP closed on December 30. We received proposals for the Mid-Coast covering water quality monitoring, sediment reduction project development & drinking water protection, and herbicide reduction through manual weed removal. A review team will evaluate the proposals and we will strive to fully fund the most competitive ones. We are also working with local partners to develop projects for the Siletz subbasin that would qualify for DHS Safe Drinking Water grant funds and that are complementary with multiple objectives, including water quality and salmonid habitat protection and/or restoration.
- F. **DEQ Resources:** Despite several changes in project staff roles and responsibilities over the past 12 months, Bobbi Lindberg, Ryan Michie and I will continue as the core staff for the Mid-Coast TMDL activities. On January 3, 2011, Zach Loboy returned to the position managing DEQ's Western Region TMDL and stormwater programs, a position vacant since the previous manager retired in September 2010. Each of us has been involved in the Mid-Coast TMDL project for at least two years, thus providing continuity, and we are dedicated to working with the TAC and other stakeholders to make meaningful progress. Although the state's budget situation will affect agency resources and provide challenges, meeting our commitments under the settlement agreement is a high priority for DEQ.

Thank you for your continuing interest and patience while we respond to these new challenges and opportunities. I have met and worked with many of you on various projects and look forward to meeting the rest of you. We plan to provide periodic updates via email and begin updating the website in January 2011. Please contact me if you have any questions concerning this project.

Sincerely,

R. David Waltz

TMDL Basin Coordinator  
541-687-7345  
[waltz.david@deq.state.or.us](mailto:waltz.david@deq.state.or.us)

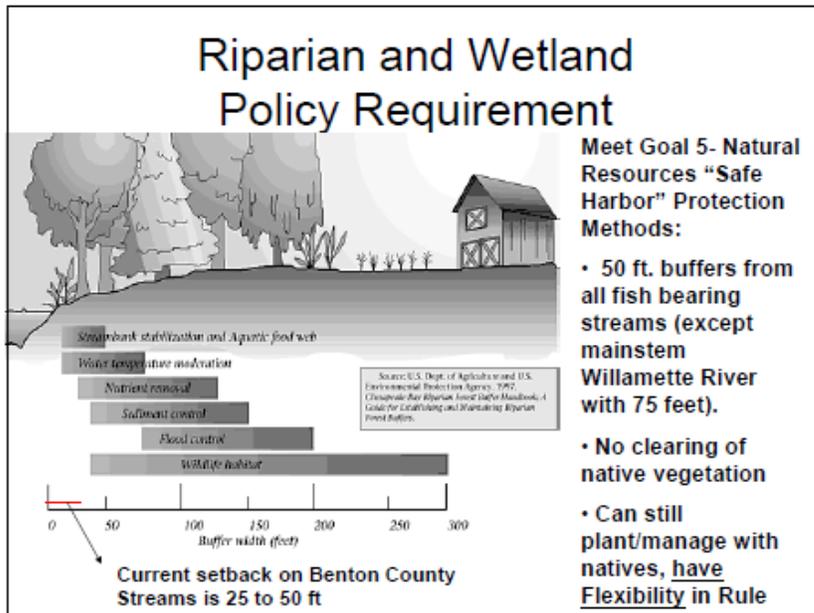
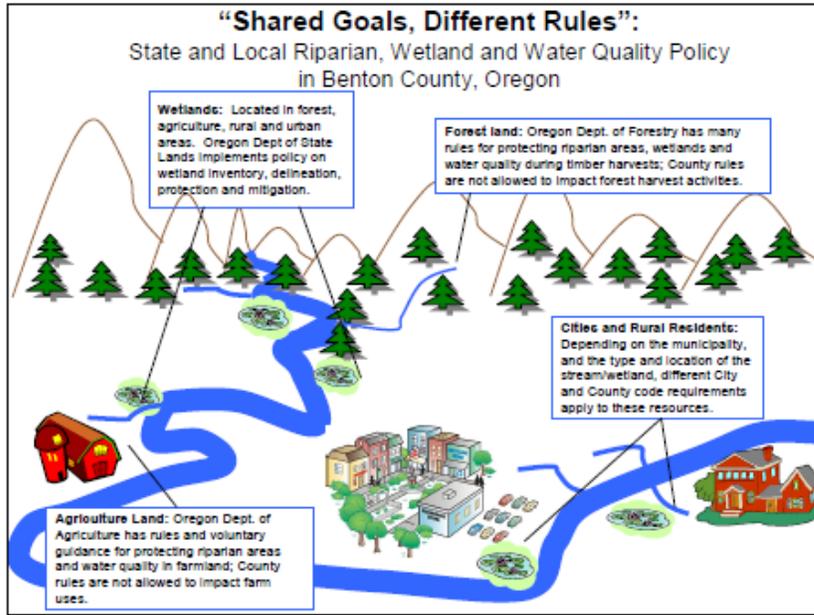
**Appendix K** Existing Riparian and Wetland Rules and Regulations; adapted from State Guidance Document on Managing Riparian Resources

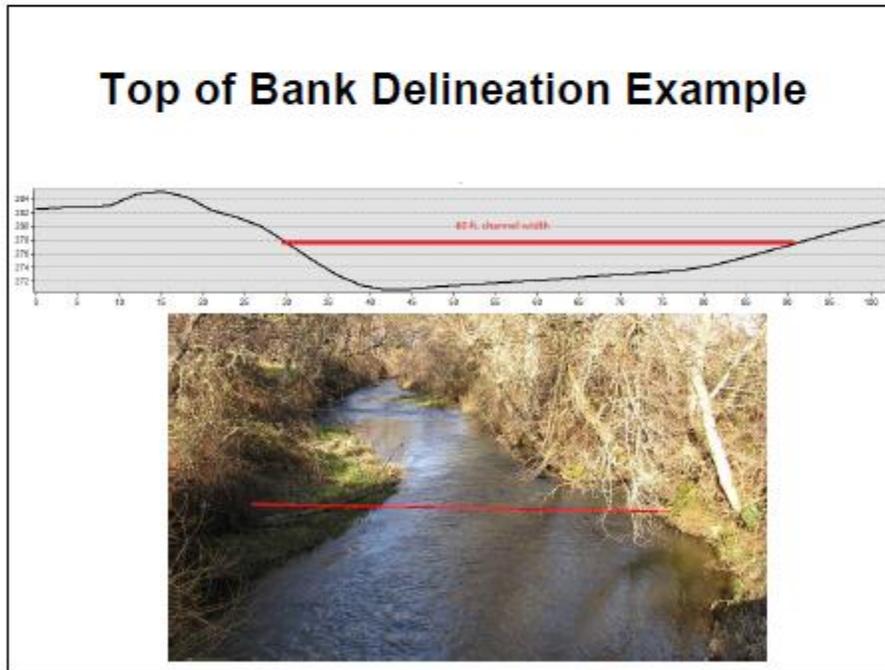
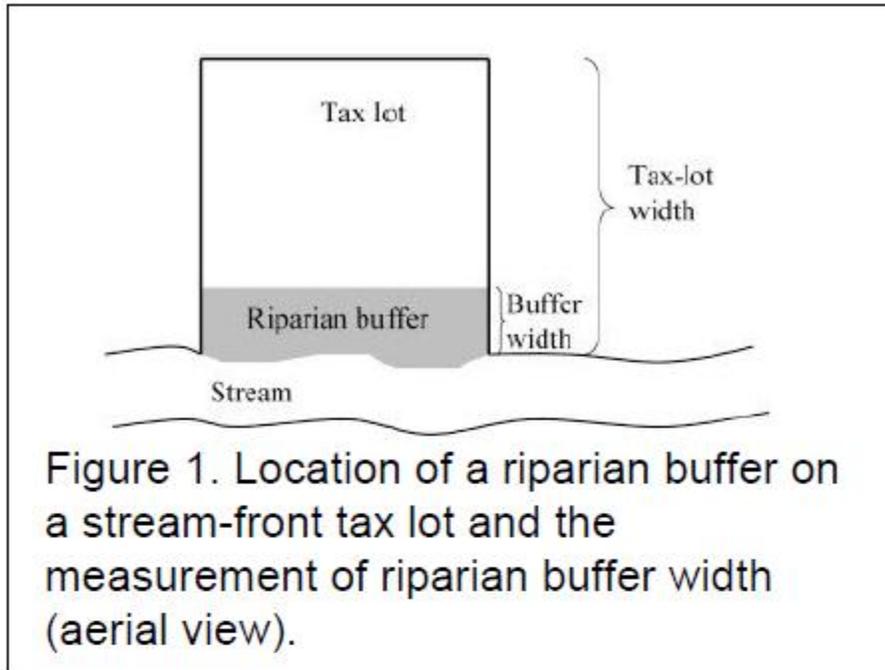
Agency	Applicable Programs	Applicable Projects	Comments
Counties, Cities	Statewide Comprehensive Planning Program	Local Comprehensive Plan Policies for Goal 5 Riparian and Wetlands; Goal 6 Water Quality	Purpose of County planning goals are to establish land use patterns NOT mitigate effect of land use patterns; County will meet comprehensive plan goals to 1.) Inventory and 2.) Establish a program to plan and protect ‘significant’ resources; Local plans are implemented primarily through regulations; Riparian restoration partnerships is a priority.

Oregon Dept. of Agriculture	Agriculture Water Quality Management Program (AgWQM)	Provision for the condition of near stream areas or riparian areas; voluntary driven riparian enhancement; monitoring of 'structural features' such as plant cover, plant community development, streambank stability, or stream channel characteristics can occur.	Area Plan has been developed to address water quality concerns resulting from Ag activities; specific guidelines on how water quality concerns will be addressed; led by ODA, SWCD and local farmers on a voluntary or complaint driven basis.
Oregon Dept. of Forestry	Oregon Forest Practices Act-water protection rules	Resource protection under the Forest Practices Act (FPA) rules for riparian corridors, soil and water quality on defined 'forestland'. This includes erosion control, pesticide and fertilizer application	FPA rules apply to any land used for the growing and harvesting of forest tree species, regardless of how the land is zoned, taxed or how any statutes or local ordinances, rules or regulations are applied; Tree retention varies by stream size and biological criteria and existing beneficial uses.
Oregon Dept. of State Lands	Oregon Wetland Program; Oregon Waterways Program	Wetland delineation review; wetland mitigation	DSL currently reviews delineations prior to development approval by Benton County; DSL uses the National Wetlands Index (circa 1982) Wetlands and deepwater habitats (streams, lakes, estuaries, etc.) are mapped on a USGS quad map base; most are at a scale of 1:24,000. Only those wetlands and other waters that are visible on high altitude aerial photographs are mapped, and most maps date to the mid-1980s.

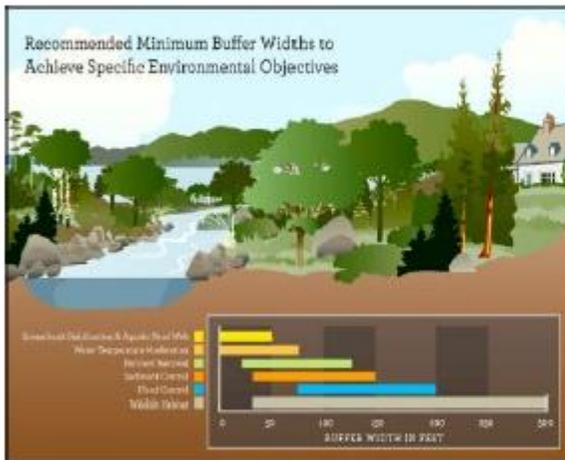
Oregon Dept. of Environmental Quality	Water Quality Standards (TMDL); Stormwater (NPDES)	Coordinated watershed enhancement and protection projects, Education to land managers and landowners,	Currently regulates water quality monitoring and planning, and provides technical and financial assistance to restoration activities which improve riparian vegetation and riparian functions that protect water quality. 'Protecting and restoring riparian vegetation is often the best method for controlling and reducing pollution, and thus for protecting water quality'.
Oregon Dept. of Fish and Wildlife	Voluntary Incentive Programs: Riparian Tax Incentive, Wildlife Habitat Conservation, Restoration and Enhancement, and the Access and Habitat Program	Protection and enhancement of fish and wildlife and their habitats including riparian areas	Smaller private landowners with suitable habitat qualify for many incentive programs and can work with ODFW/County to develop a conservation/restoration plan to improve riparian and wetland areas.

**Appendix L** Policy Scenarios presented to meeting participants during fall 2010 community meetings



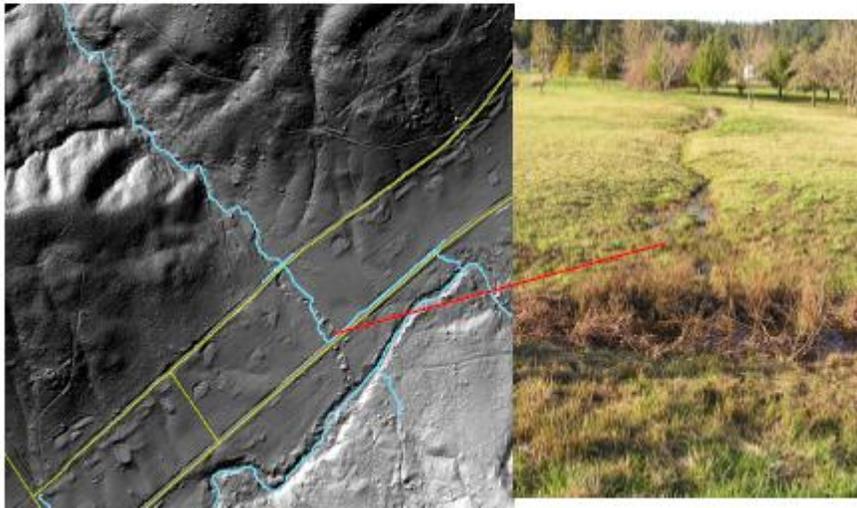


## Scenario A: Wetlands Adjacent to/within Riparian Corridor



1. Protect stream and adjacent wetland/fish bearing water body with a 50 foot buffer
2. Allow for a plan to be developed based on site specifics and landowner needs?

## Intermittent Streams: Providing Information on importance of these smaller channels



## Scenario B: Smaller Streams/Water Quality Protection



1. Protect non-fish bearing stream channels with a 25 ft buffer to support water quality
2. Info on why not to build on smaller stream channels/drainage ways; keep channel functions intact through other means
3. Other ideas?

**Appendix M** Summary of Land Use Impacts on Riparian Function, need for riparian buffers (next page)

Land use	Riparian function impaired							Specific activities associated with land use category	Impact findings on function	Literature cited
	Water Quality	Shade/Microclimate	LWD	Litter fall	Fine sediment control	Wildlife	Hydrology/slope stability			
Development								Clearing and grading/vegetation removal	Riparian areas are more highly altered in developed landscapes than in agricultural and forested landscapes	Booth 1991 ( <i>in</i> Everest and Reeves 2006)
								Construction of homes, buildings, roads/Impervious surfaces	Direct alteration within the riparian area (vegetation removal/reduction, soil compaction, grading) causes changes in loading of nutrients, organic matter and sediments; reduces capacity of riparian area to filter/absorb pollutants; increases sediment loading	Valiela et al 1992; Wahl et al. 1997; Jones et al. 2000; Jordan et al. 2003 ( <i>in</i> Hale et al. 2004)
								Shoreline armoring (docks, bulkheads, etc.)	Creation of impervious surfaces (e.g., parking lots, paved streets, sidewalks, roads), vegetation removal, and soil compaction cause surface water to increase in volume and magnitude. Increased runoff decreases the ability of soils and vegetation to infiltrate and intercept pollutants, increases flooding potential.	Knutson and Naef 1997; Montgomery et al. 2000 ( <i>in</i> Johannessen and MacLennan 2007); Glasoe and Christy 2005; Hashim and Bresler 2005; Ekness and Randhir 2007; Schiff and Benoit 2007
								Landscaping (non-native plants)	Construction of boat landings, docks, and piers creates increased slopes, causing increased and concentrated water flows; construction of domestic, residential and industrial facilities and utilities in and near riparian areas can result in altered topography, removal of vegetation, and rerouting of surface and groundwater flows	Knutson and Naef 1997; NRC 2002; Ekness and Randhir 2007; Schiff and Benoit 2007
	X	X	X	X	X	X	X	Recreational activities (hiking, biking, beachcombing, etc.)	Construction close to the water's edge (bulkheads, docks, etc.) reduce shade as well as species diversity and abundance	Sobocinski et al. 2003; Rice 2006
									Areas with high levels of impervious surface coverage (>50%) correlated with low macrobenthic diversity and abundances	Lerbert et al. 2000
									Vegetation removal causes decreased shade and increased temperatures	Beschta et al. 1987; Macdonald et al. 1994; 1995; Thom et al. 1994; Penttila 1996; Williams and Thom 2001; Bereitschaft 2007
									Removal of vegetation cover also reduces LWD and canopy cover, which serve to dissipate flow energy and control temperature by shading	Booth et al. 2006
									Increases of light levels in the upper intertidal zone results in higher levels of mortality and desiccation of insects, invertebrates, and the eggs of intertidal spawning fish like Pacific sand lance and surf smelt.	Penttila 1996, 2000; Rice 2006
									Low levels of organic litter and LWD have been found on armored beaches	Sobocinski et al. 2003; Dugan and Hubbard 2006; Defeo et al. 2009
								Increased surface runoff of toxins Toxins can affect wildlife through physiological and behavior changes,	Klapproth and Johnson 2000; Krebs and Bums 1977; Krebs and Valiela 1978; Moore et al. 1979	

## Appendix M

## Benton County Riparian and Wetlands Project Listening Sessions

**WE WANT  
TO HEAR  
FROM YOU!**

<http://www.co.benton.or.us/cd/riparian>

Benton County will be conducting listening sessions with interested groups or individuals regarding the Benton County Riparian and Wetlands Project.

These listening sessions will allow participants to:

- Support the review of the Riparian and Wetlands Project Draft Inventory
- Assist Benton County in developing policy and incentives to support and improve riparian and wetland resources
- Provide any thoughts and comments regarding the Riparian and Wetlands Project or riparian and wetland resources in Benton County

For more information or to become involved, please contact:

**Julie Ryden**  
Oregon State University, Graduate Student

Phone: (541) 766-4532  
rydenj@onid.orst.edu



## References

Benton County Watershed Council Reports (available on-line):

[Long Tom Watershed Council Assessment: http://www.longtom.org/assessment2.html](http://www.longtom.org/assessment2.html)

[Luckiamute Watershed Council: http://luckiamute.watershedcouncils.net/projects/projects.html](http://luckiamute.watershedcouncils.net/projects/projects.html)

[Marys River Watershed Council Assessment:](http://www.mrwc.net/Projects/assessment/sdo_mrwp.pdf)

[http://www.mrwc.net/Projects/assessment/sdo\\_mrwp.pdf](http://www.mrwc.net/Projects/assessment/sdo_mrwp.pdf)

[Mid-Coast \(Asea\) Watersheds Council Assessment http://www.midcoastwatershedscouncil.org/](http://www.midcoastwatershedscouncil.org/)

Benton County Phase I: Water Analysis and Demand Forecast 2007-2008. Partial funding provided by Oregon Water Supply and Conservation Initiative.

Benton County Stormwater Management Plan Reviewed and adopted by Benton County Board of Commissioners and Oregon Department of Environmental Quality (2007).

Benton County Total Maximum Daily Load Implementation Plan. Reviewed and adopted by Benton County Board of Commissioners and Oregon Department of Environmental Quality (2007).

Beschta RL. 1997. Riparian shade and stream temperature: an alternative perspective. *Rangelands* 19: 25–28.

Beschta, R. L., R. E. Bilby, G. W. Brown, L. B. Holtby, and T. D. Hofstra. (1987). "Stream Temperature and Aquatic Habitat: Fisheries and Forestry Interactions." In E. O. Salo and T. W. Cundy (eds), *Streamside Management: Forestry and Fishery Interactions*. College of Forest Resources and Institute of Forest Resources, University of Washington, Seattle, WA. Contribution No. 57.

Chagrin River Watershed Partners, Inc. (CRWPI), 2006. *Riparian Setbacks: Technical Information for decision Makers*. January 2006.

[City of Corvallis Salmon Response Plan:](http://www.ci.corvallis.or.us/index.php?option=content&task=view&id=1672&Itemid=1976)

<http://www.ci.corvallis.or.us/index.php?option=content&task=view&id=1672&Itemid=1976>

Cost Estimate to Restore Riparian Forest Buffers and Improve Stream Habitat in the Willamette Basin, Oregon. Ryan Michie, Oregon Department of Environmental Quality Watershed Management Section, March 2010.

[Historical Loss of Wetlands, description by Dr. John Christy, Oregon Wetlands Explorer:](http://oregonexplorer.info/wetlands/HistoricalWetlands/WetlandsHistoricalLoss)

<http://oregonexplorer.info/wetlands/HistoricalWetlands/WetlandsHistoricalLoss>

Journal of Real Estate Finance and Economics, 2001. 22(2-3): p. 273-286.

Koplin, Dana W., Edward Furlong, Michael Meyer, Michael Thurman, Steven Zaugg, Larry Barber, and Herbert Buxton (Koplin, et. al). 2002. *Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams, 1999-2000: A National Reconnaissance*. Environmental Science & Technology. Vol. 36, No. 6.

Mooney, S. and L.M. Eisgruber, *The influence of riparian protection measures on*  
 Moore, J.A., J.R. Miner. Stream Temperatures Some Basic Considerations.  
[National Oceanic and Atmospheric Administration \(NOAA\) northwest Regional Office 2008, Willamette Basin Biological Opinion. http://www.nwr.noaa.gov/Salmon-Hydropower/Willamette-Basin/Willamette-BO.cfm](http://www.nwr.noaa.gov/Salmon-Hydropower/Willamette-Basin/Willamette-BO.cfm)  
[National Oceanic and Atmospheric Administration \(NOAA\) northwest Regional Officehttp://www.nwr.noaa.gov/Salmon-Hydropower/Willamette-Basin/](http://www.nwr.noaa.gov/Salmon-Hydropower/Willamette-Basin/)  
 National Research Council (NRC), 2002. *Riparian Areas: Function and Strategies for Management*. National Academy Press. Washington DC 2002.

Oregon Department of Fish and Wildlife, Physical Habitat Survey Training Manual (DRAFT),  
 Oregon Department of Forestry (ODF), pers. comms. Ryan Millar, ODF GIS Coordinator 7/26/10.

[Oregon Department of State Lands, Local Wetlands Inventory fact sheet: http://www.oregon.gov/DSL/WETLAND/lwi.shtml](http://www.oregon.gov/DSL/WETLAND/lwi.shtml)

Oregon Non-Point Source Control Program Plan (October 2000). Oregon Department of Environmental Quality, Water Quality Division — Watershed Management Section.

[Oregon Plan for Salmon and Watersheds—Origins of the Plan on plan website. http://www.oregon.gov/OPSW/about\\_us.shtml](http://www.oregon.gov/OPSW/about_us.shtml)

Oregon State University Extension Service. EC 1489. 1997.

[Oregon Watershed Enhancement Board \(OWEB\), Oregon Plan for Salmon and Watersheds, Watershed Councils \(2010\). http://www.oregonplan.org/OWEB/WSHEDS/wsheds\\_councils\\_main.shtml](http://www.oregonplan.org/OWEB/WSHEDS/wsheds_councils_main.shtml)  
[Oregon Wetlands Explorer \(geodatabase\): http://oregonexplorer.info/wetlands/](http://oregonexplorer.info/wetlands/)

*Oregon's Statewide Riparian Restoration and Management Policy* (2002) Governor's Natural Resources Office and the Oregon Plan Core Team over the past two years to guide state agency policy and rulemaking as they relate to riparian areas. This policy was developed in response to Executive Order 99-01 and the Independent Multidisciplinary Science Team (IMST) recommendations regarding the need for landscape approaches to watershed management in Oregon.

*Protection of Riparian Functions in the Puget Sound*. Prepared for: Washington Department of Fish and Wildlife (WDFW Agreement 08-1185)  
*residential property values: The case of the Oregon Plan for Salmon and Watersheds*. The Trust for Public Lands (TPL), 2004. *Land Conservation and the Future of America's Drinking Water: Protecting the Source*.

[Urban and Rural-residential Land Uses: Their Role in Watershed Health and the Rehabilitation of Oregon's Wild Salmonids. Technical Report 2010-1. http://www.fsl.orst.edu/imst/reports/urban.html](http://www.fsl.orst.edu/imst/reports/urban.html)  
[US Environmental Protection Agency \(1998\): http://www.epa.gov/owow/NPS/pubs.html](http://www.epa.gov/owow/NPS/pubs.html)  
[Wetland and Land Use Change in the Willamette Valley, Oregon 1994-2005: http://www.oregonstatelands.us/DSL/PERMITS/docs/land\\_use\\_change\\_1994-2005.pdf](http://www.oregonstatelands.us/DSL/PERMITS/docs/land_use_change_1994-2005.pdf)

DRAFT