

Strategic Plan for Conservation in Linn County

March 2016



In cooperation with the following:



Linn Soil and Water
Conservation District



Current and Retired Faculty of



Oregon Watershed
Councils



Linn County
Landowners and
Residents



Strategic Plan for Conservation in Linn County

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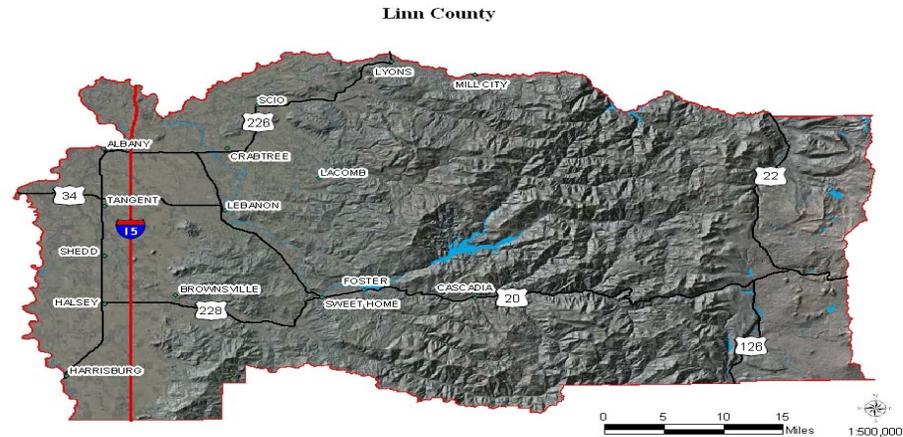
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Linn County Courthouse
 Albany, Oregon

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 Linn Soil and Water Conservation District—Kevin Seifert

Section I. Updates

1.1 2015/2016 Updates

NRCS and partners had a busy year in conservation. Linn County saw a record signup of the Conservation Stewardship Program and are still implementing several Conservation Implementation Strategies (CIS). These strategies are the Linn Watershed Enhancement, Oak Habitat Restoration, and Soil Health for Local Foods. All of these strategies have been successful. The Oak Habitat Restoration CIS had a go at the Regional Conservation Partnership Program (RCPP) with much partner support. However, State funding was very competitive in 2015 and it was not funded.

NRCS saw a large reduction in financial assistance through the Environmental Quality Incentives Program (EQIP). In Linn County, this means that only approximately 30% of funds are available in compared to 5 years ago. This will have an effect on current implementation strategies.

The Upper Willamette Basin meet earlier this year to discuss the future for new wetland through the Wetland Reserve Easement program. Due to the types of priority wetlands (Wet Prairie), NRCS will need a high level of partner/producer support to enroll new lands.



1.2 In the Hopper

- Looking at creating a new CIS for healthy forests ecosystems.
- Looking for partners to submit an RCPP for Oak Restoration in 2017

1.3 Local Workgroup Meeting Minutes

The Local Workgroup Meeting was held on December 15, 2015 as a Linn/Benton LWG.

2017 Local Work Group

This year's local work group was a joint work group for Benton and Linn Counties. There is continued support for oak habitat restoration. There is significant interest in improving irrigation efficiency on new hazelnut orchards. Both the Linn SWCD and Benton SWCD strongly support an implementation strategy that shadows their local ODA focus area. Forestry continues to be a local concern. In 2018 the Local Food Strategy will not be utilized. It is anticipated that the Oak Strategy will become an RCPP. A forest strategy will be adopted in both Benton and Linn Counties. An irrigation efficiency strategy will be adopted for 2018.

Strategic Plan for Conservation in Linn County

Forestland

Breakout Group Concern Summary:

- Invasive species control
- Oak Habitat Degradation
- Douglas fir planted on inappropriate sites
- Fire, Fuels, and forest resilience to fire
- Forest conversion to other land use
- Partnerships and collaboration
- Forest resilience to climate change
- Conifer encroachment
- Lack of riparian cover
- Tribal cultural site habitat quality
- Youth programs utilization

Categorized NRCS Resource Concern Summary:

Vegetative

- Structure and composition: Oak Habitat Degradation, Invasive species control, Douglas fir planted on inappropriate sites, Fire, Fuels, and forest resilience to fire, Forest resilience to climate change, Conifer encroachment, Lack of riparian cover
- Productivity and health: Oak Habitat Degradation, Douglas fir planted on inappropriate sites, Conifer encroachment
- Wildfire, biomass, and fuels: Oak Habitat Degradation, Douglas fir planted on inappropriate sites, Fire, Fuels, and forest resilience to fire, Conifer encroachment
- Excess plant pest pressure: Invasive species control

Wildlife

- Habitat degradation: Oak Habitat Degradation, Invasive species control, Douglas fir planted on inappropriate sites, Conifer encroachment, Lack of riparian cover

Water Quality

- Elevated water temperature: Lack of riparian cover

Human

- Public health and safety: Fire, Fuels, and forest resilience to fire
- Land use: Forest conversion to other land use, Douglas fir planted on inappropriate sites, Conifer encroachment, Lack of riparian cover
- Other social concerns: Partnerships and collaboration, Tribal cultural site habitat quality, Youth programs utilization

Opportunities to focus efforts to proposed concerns:

- Invasive species control: Integrate herbaceous weed control and brush management into forest land use strategies. Edges and associated openings could be included to support associated habitats and minimize the invasion into a treated forest.

- Oak Habitat Degradation: Continue efforts that promote oak habitat restoration, seek strategy that allows for progress to continue beyond oak strategy that expires in 2017, seek and continue effective partnerships
- Douglas fir planted on inappropriate sites: Consider a strategy or component of a strategy that removes degraded plantings and restores the site with appropriate species that encourages habitat quality, ecosystem function, fuels reduction or gained fire resilience.
- Fire, Fuels, and forest resilience to fire: Consider a strategy or component of a strategy that gains desired resilience with appropriate structure and composition, reduces fuels and potential for catastrophic events, reduces potential burn severity and extent. Strategic fuel breaks could be considered in inherent or high risk scenarios.
- Forest conversion to other land use: Strategies that improve forest health and quality may add value to areas considered for land use change, Seek opportunities to apply the Healthy Forest Reserve Program (currently unavailable in Benton/ Linn)
- Partnerships and collaboration: Expand and continue collaboration with various agencies and organizations with similar goals in planning and implementation of conservation. Include collaboration, roles, and opportunities for partners in strategies.
- Forest resilience to climate change: It is critical that resilience be considered when planning forestry strategies. Selecting for species well suited to warmer and drier conditions is an important consideration when planting or controlling competition.
- Conifer encroachment: Consider a strategy or component of a strategy that that encourages habitat quality, ecosystem function, fuels reduction or gained fire resilience. Promote upland prairie, oak savannah, oak woodland, and other early successional habitat.
- Lack of riparian cover: Continue gaining riparian function through CREP. Consider enhancing riparian projects with other strategies that promote water quality, habitat, etc.
- Tribal cultural site habitat quality: Engage Tribes in strategy development and encourage partnerships that uphold their traditional values.
- Youth programs utilization: Support youth group labor programs where appropriate

Strategic Plan for Conservation in Linn County

Wildlife Habitat

Breakout Group Concern Summary:

- Native Prairie Restoration
- Oak Habitat Degradation
- Floodplain/Riparian Habitats

Priority Habitats:

Oak Woodland

- Benefits Neotropical Songbirds
- Benefits Pollinators (such as endangered Fender's Blue Butterfly and endangered Taylor's Checkerspot)
- Provides habitat for cavity nesting birds (such as Acorn Woodpecker, Slender Billed Nuthatch)
- Reduces wildfire risk and adds resiliency to landscape
- Where grazed, working lands easements such as ALE could be a mechanism for protection.
- Potential Focus Areas: Coburg Hills, Indian Head Butte

Oak Savannah/Native Prairies

- Focus on restoration of native prairies
- Benefits Pollinators (such as endangered Fender's Blue Butterfly and endangered Taylor's Checkerspot)
- Invasive species of concern are: Shinning geranium, Milk thistle, Italian thistle
- Habitat for grassland birds (such as Western Meadowlark, Western Bluebirds)
- Where grazed, working lands easements such as ALE could be a mechanism for protection.
- Landowners would benefit from Technical Assistance on how to use grazing as a tool to maintain the open nature of these habitats.

Riparian Gallery Forest

- Invasive species are the largest concern in these riparian habitats, partners (such as the Benton SWCD) have been focusing on controlling invasives along the Willamette River.
- These habitats are important for absorbing flood water and minimizing impacts of high flows on major river systems.
- Should focus on protection and restoration of high quality flooded forests. Could use easement programs to encourage protection. The Greenbelt Land Trust is already focusing efforts to acquire gallery forest habitats.
- High value should be placed on backwater areas. These habitats are very important as rearing habitat for fish

Riparian Habitat

- Programs other than CREP should be utilized to restore riparian habitat due to the restrictions associated with the CREP Program.

- Important for providing wood for instream fish habitat. Potential focus areas (ODFW) Mountain View Creek, Brush Creek, Mary's River, Soap Creek, Upper Mary's River, Cortney Creek, Little Muddy Creek, Muddy Creek

Categorized NRCS Resource Concern Summary:

Vegetative

- Structure and composition: Oak Habitat Degradation, Invasive species control, incorporate grazing, degraded riparian areas
- Excess plant pest pressure: Invasive species control

Wildlife

- Habitat degradation: Oak Habitat Degradation, Invasive species control, floodplain and backwater restoration, lack of riparian cover

Opportunities to focus efforts to proposed concerns:

- Should think about adding other species in addition to Ash in wet areas because the Emerald Ash Bore. Diverse species will add resilience to the landscape.
- Utilize NRCS plans for ODFW tax credit programs. Currently there is no staff to write wildlife habitat plans for tax credit programs. Could potentially use NRCS Conservation Plans for ODFW Wildlife Habitat Plans.

Strategic Plan for Conservation in Linn County

Cropland/Pastureland

Breakout Group Concern Summary:

- Future water availability/irrigation efficiency
- Pest management
- Innovative technology on farms
- Pollinators/beneficial insects
- Buffer zones
- Soil health
- Manures-over application

Categorized NRCS Resource Concern Summary:

Vegetative

- Productivity and health: Pest management strategies with loss of chemicals, incorporate more cultural practices such as trap crops and beneficial insects to address pests, improve native pollinators on farms, encourage innovative technology on farms, improve irrigation efficiencies, appropriate application of manures, proper composting of organic wastes.

Soil Quality

- Organic matter depletion: Utilize soil health tests on farms, benefits of microbes in manures

Water Quality

- Nutrients in ground water: Proper composting to reducing leaching of nutrients to ground water
- Nutrients/pesticides in surface waters: Alternatives for buffer zones with pesticide regulations, field borders to solve weed issues in ditch and protect water quality

Water Quantity

- Inefficient use of irrigation water: Water availability for the future, inefficient irrigation systems

Opportunities to focus efforts to proposed concerns:

- Future water availability/irrigation efficiency-Look at way of helping water availability in the future. This includes looking at replacing irrigation systems to more efficient systems. More efficient irrigation systems will help leave more water available in streams and groundwater.
- Pest management-With the loss of pesticides there less controls for crop pests. Look at the incorporation of more cultural methods that use trap crops, beneficial insects, and others to solve the issue. An integrated pest management approach.
- Innovative technology on farms-Encourage the adoption of improved farm technologies including GPS guided pesticide and nutrient application systems, yield monitoring, and others to reduce impacts to water quality.

- Pollinators/beneficial insects-Native pollinators, pollinate crops efficiently and there is more of a need to attract those pollinators to farms. Develop more areas beneficial to these pollinators but also beneficial insects. Beneficial insects can help predate on crop pests.
- Buffer zones-Develop innovate ways to work with pesticide regulation and buffer zones. Look at different crop types that don't require high amounts of chemical use within these areas.
- Soil health-Encourage the adoption of producer using soil health tests. Also help farmers to understand the benefits of manures.
- Manures-Work with small farms that often times over apply manures and composts or also store these manures and composts improperly. Over application or lack of proper storage leads to issues of surface and groundwater quality.

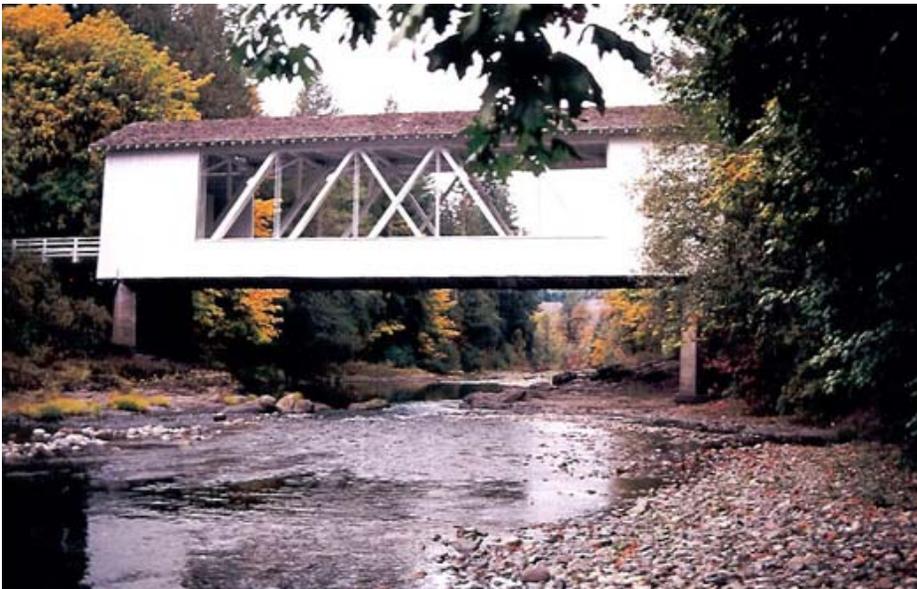
Section II. Introduction

2.1 Vision

The vision of this collaboration is **shared responsibility and commitment to local action** with the intent that **effective land stewardship** in Linn County will be achieved.

2.2 Mission

The mission of this cooperative plan is **to build alliances** among stakeholders and resource professionals and **strategically utilize limited resources** to **effectively solve natural resource problems** in Linn County and the State of Oregon.



Short Bridge crossing the South Fork of the Santiam River, Linn County



http://www.chuckhawks.com/linn_county_bridges.htm Photography by Jerri Graff

2.3 Purpose

To enhance our ability to solve high priority Natural Resource concerns in a focused and strategic manner. By clearly identifying where we are going, what we need to do to get there and when we have reached are goal, we can more effectively leverage and strategically deliver our conservation assistance.

2.4 Time Frame

Beginning in January 2013, this plan will be evaluated annually and amended as needed and is intended to serve Linn County.

Section III. Natural Resource Inventory

3.1 Natural Resources

To begin the plan for Linn County a breakdown of current and past conditions of the County’s resources must be assessed. To simplify the assessment process, we will analyze five major subcategories of resources in the County, they are as follows.

- ◆ Human Resources
- ◆ Soil Resources
- ◆ Water Resources
- ◆ Air and Energy Resources
- ◆ Plant and Animal Resources

An approach on these items will include many diagrams, maps, and graphs with descriptions and interpretations of the information in an attempt to give light to possible resource concerns. Any possible trends or patterns will be identified by their significance to the development of resource concerns or their ability to either create or solve a resource concern.

3.2 Human Resources

Linn County has 14 incorporated cities and a total population of 116,672 people. The general population is not ethnically diverse with less than 10% of the population representing races other than white. The largest of these groups is the Hispanic or Latino origin group, which was 8.0% of the population according to the 2011 census. There was a 13% increase in population between



2000 and 2009, which was close to the state average. In 2009, nearly 15.9% of the population was reported to be living below the poverty level.

The County is situated in the upper half of the Willamette Valley, with good infrastructure, good market access and good connection to transportation systems. Touted as the grass seed capital of the world, the economy is diversified among agriculture, forestry, manufacturing and mining sectors.

Number of Farms

According to the 2007 census of agriculture there are 2,325 farms in Linn County, a decrease of 1% (21 farms) since 2002. Linn County has 376,483 acres of farmland with an average farm size of 162 acres. The market value of the products sold from these farms increased 40% between 2002 and 2007, reaching \$213,178,000 with the average farm selling \$91,690 of product.

There are 40 organic farms in Linn County (totaling 2,609 acres) making up 2.8% of Oregon’s organic acreage (92,405) and 0.7% of Linn Counties farmed acreage(376,843). Linn County has a total of 2,290 square miles, covering 2.3% of Oregon’s 98,386 square miles.

Farm Income and Crop

In 2007 Linn County sold agricultural products for a total of \$162,758,000 and received \$721,000 in government payments.

Figure 3.21 below shows the size and number of farms by acre in Linn county.

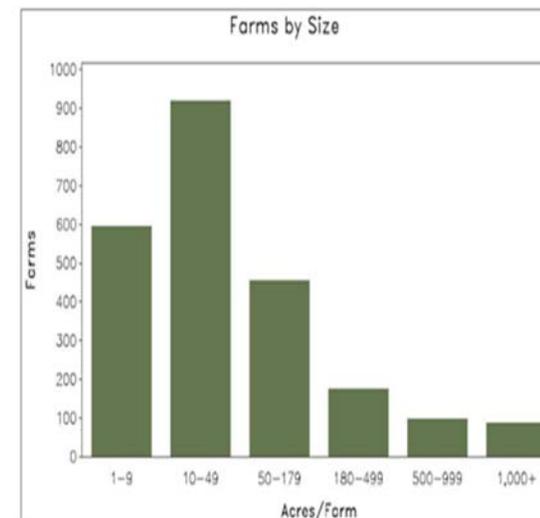


Figure 3.21

Farm Income and Crop cont.

According to the 2007 Census of Agriculture Linn County is the number one producer of grass seed in the country. The county ranks 1st in the state for inventory of sheep and lambs and 2nd in the state for bees, mink, and chickens. Linn County ranks 6th in the state and 15th in the country for cut Christmas trees.

The tables below represent the distribution of land among livestock and field crops in Linn County.

<u>Crop</u>	<u>Acres</u>
Field and grass seed crops	169,269
Forage	24,340
Vegetables harvested for sale	5,561
Wheat for grain	4,234
Cut Christmas trees	3,239

<u>Livestock</u>	<u>Number</u>
Chickens	780,714
Sheep and Lambs	53,174
Mink and their pelts	36,535
Cattle and Calves	32,045
Colonies of bees	7,493

Figure 3.22 to the right shows the percentage of land in Linn County based on usage.

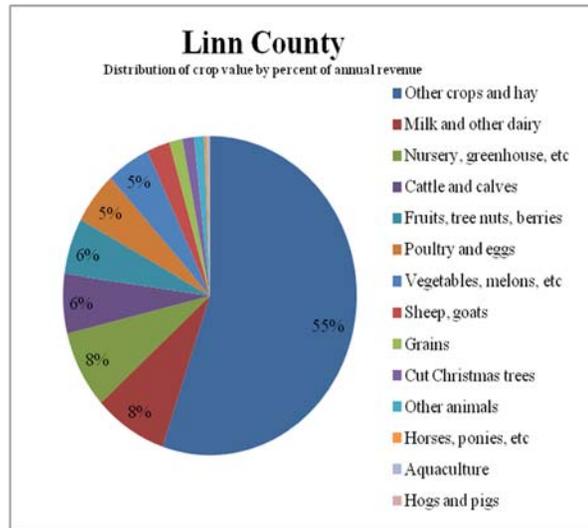


Figure 3.22 The distribution of crop value in Linn County by percent of annual revenue

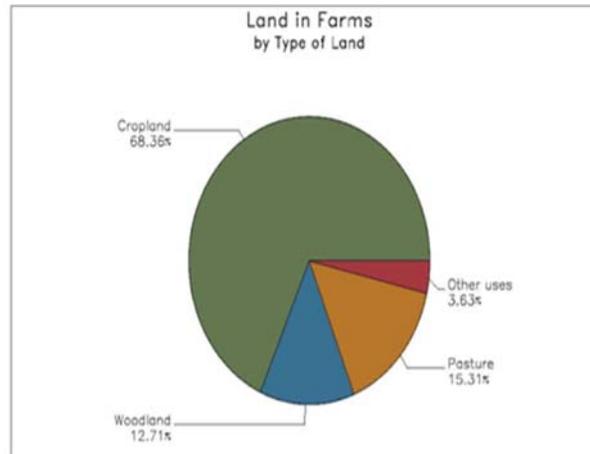


Figure 3.23 Land In Farms

Figure 3.23 represents the crops below.

<u>Crop</u>	<u>Annual Revenue (in millions)</u>
Other crops and hay	117.7
Milk and other dairy	17.2
Nursery, greenhouse, etc	16.8
Cattle and calves	12.8
Fruits, tree nuts, berries	12.1
Poultry and eggs	11.3
Vegetables, melons, etc	10.3
Sheep, goats	5.4
Grains	3.1
Cut Christmas trees	2.7
Other animals	2.4
Horses, ponies, etc	0.7
Aquaculture	0.5

Linn County is Number 1 in the state in sheep and lamb production.



<http://getawaytips.azcentral.com/lamb-wool-festival-scio-oregon-2394.html>

By Zora Hughes, Demand Media

Ownership and Land Use

Linn County is characterized by a large urban area in the northwest part of Linn County which includes Albany, Milersburg, and Tangent. The other major city in Linn County is Lebanon. The majority of the landscape is mountainous woodland and forestland, however about a third of the county is farmland/pastureland located near the Willamette Valley floor which represents the western border of the County. (figure 3.24)

Land cover by percentage and acres of County (2001) are as follows.

Cover	Acres	Per-
cent		
Forestland	837,749	56.7
Hay/Pasture	254,848	17.3
Shrub	164,462	11.1
Cultivated	91,121	6.2
Developed	42,442	2.9
Wetlands	17,532	1.2

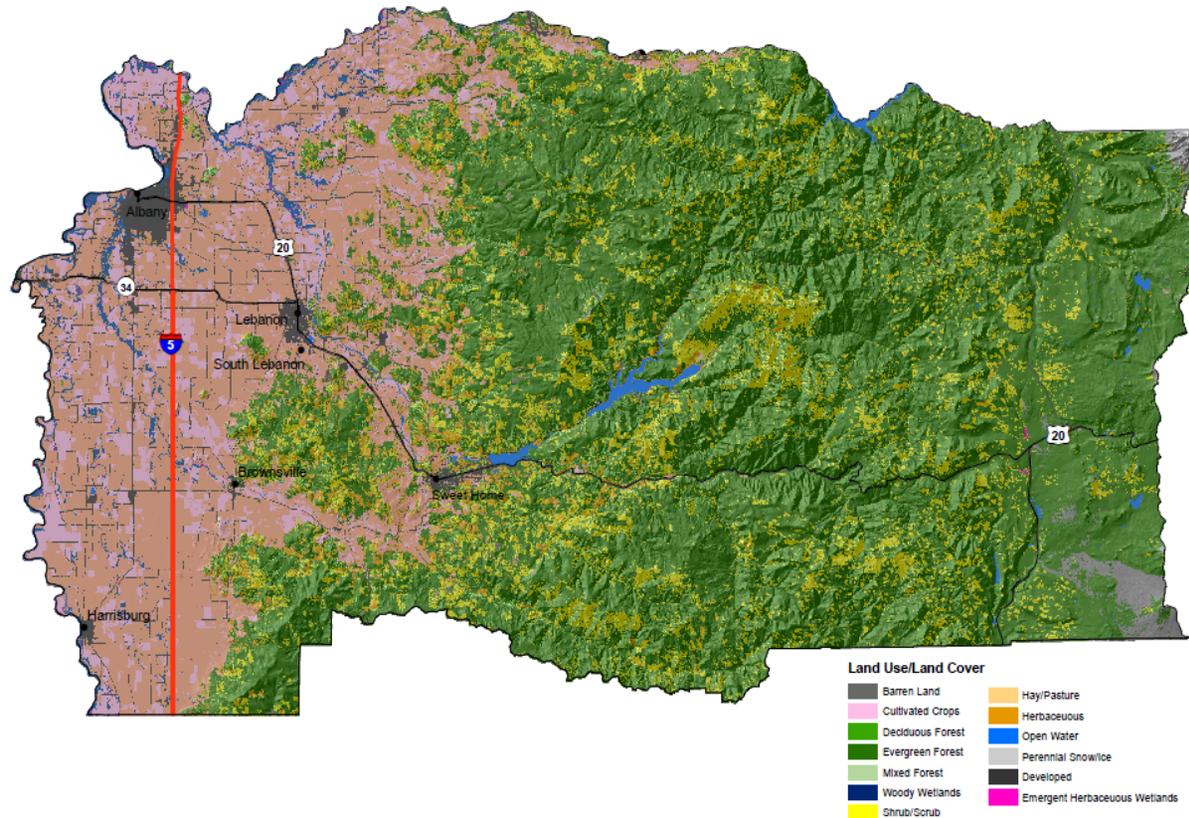


Figure 3.24 Linn County Land Use and Cover

Ownership and Land Use continued

<u>Linn County</u>	<u>State of Oregon</u>
2,209 sq. miles	98,386 sq. miles
(2.3% of the State)	

2,609 organic ac.	92,405 organic ac.
(2.8%% of the State)	

Ownership of County lands are represented by the following percentages and values.

<u>Owner</u>	<u>Percent</u>
Private	60.5%
Federal	37.5%
State	2.0%

Owner	Acres	Percent
Private Non-Industrial	512,087.1	34.7
USFS	465,323.9	31.5
Private Industrial	380,779.5	25.8
BLM	88,847.9	6.0
State	26,406.8	1.9
Misc	2137.8	0.1
Total	1,475,583.0	

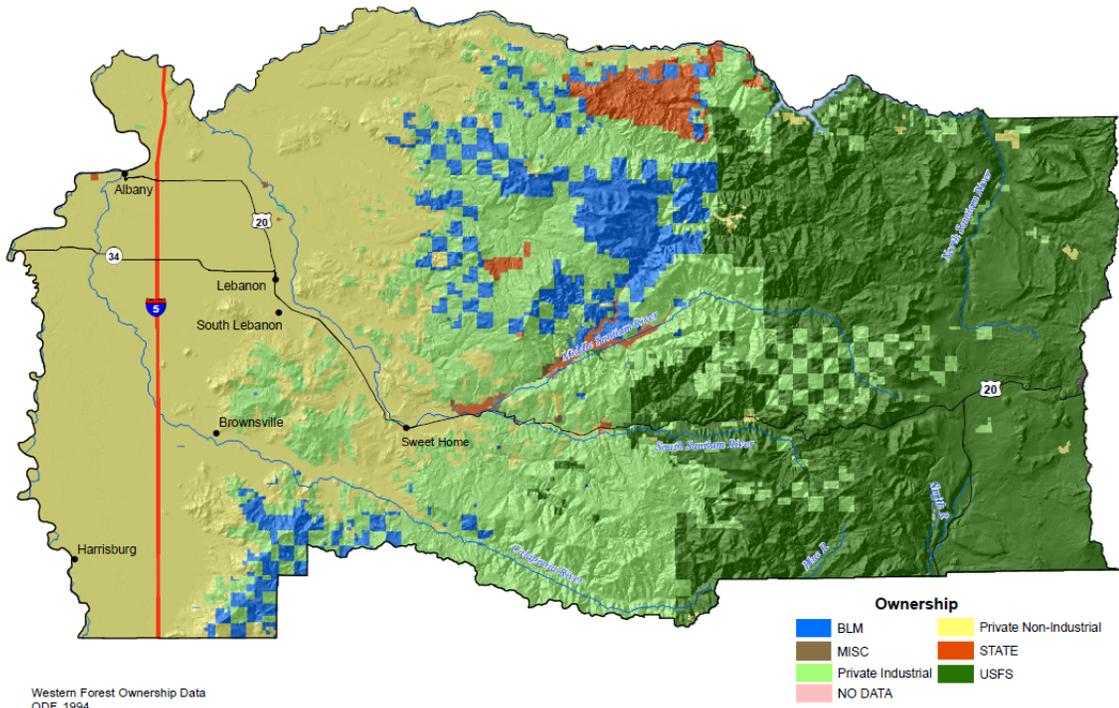


Figure 3.25 Ownership in Linn County

Section III. Natural Resource Inventory

3.3 Soils Resources

Geomorphic Features

The geomorphic features of the Willamette Valley in Linn County are shown in Figure 2.31. For a greater description of the surface, please see the Geology and Soils, Willamette Valley Special Report 265 of 1968.

Looney Unit

The terrain of this unity is very steep and subjected to erosion. The soil depth is shallow and has dark brown to reddish soils like Price, Ritter, MacDunn, Witzel, and Chehulpum. It is well drained and best suited for forestland or Christmas tree production.

Eola Surface

Weathered surface not affected by the Missoula floods. This surface is generally located in the hills northeast of Scio. These are well drained, sloping soils that are very deep. Typical soils are Jory, Bellpine, Nekia, and Gelderman. Typical resource concerns is water availability and addition of soil amendments.

Dolph Surface

This surface occurs well above the main valley floor, but not affected by the floods. They are brown to yellowish soils such as Willakenzie, Dupee, Salkum, Steiwer, and Goodin. These soils are well drained to somewhat poorly drained with moderate structure and commonly grow crops such as hay, pasture, orchards/vineyards, and Christmas trees. Resource con-

High/Low Brateng Surface

Above the valley floor, this surface was only slightly affected by the Missoula Floods. These soils are moderately well drained to somewhat poorly drained consisting of Hazelair and Wellsdale (High) and Helvetia, Linslaw, and Santiam (Low). These soils can have season water tables and grow wheat, grass seed, hay, and other seed crops.

Senecal Surface

On the main valley floor consisting of soils such as Willamette and Woodburn. These soils are well drained to moderately well drained and can grow crops such as grains, orchards, hay, fruits, nursery stock, Christmas trees, and other seed crops. This surface has few limitations.

Calapoovia Surface

One of the main surfaces on the valley floor. This surface has a dense clay layer and is mostly made up of Dayton, Concord, and Amity soils. These soils are very deep, but are very poorly drained to somewhat poorly drained due to the clay layers. Most crops grown on this surface is grass seed.

Lukiamute Surface

On floodplain and small drainage ways that contain local alluvium derived from erosion of soils higher in the landscape. These are fine textured silty and clayey deposits such as Abiqua, McAlpin, and Waldo. These soils are well drained to poorly drained and can grow crops such as orchards, cereals, and others. This surface is subjected to flooding events.

Winkle Surface

This is the old abandoned floodplain in the Willamette Valley. It is typified by bar and channel topography, but some has been land leveled. It has accumulation of different parent material such as organic material from lakebeds (Labish), flood sediments (Malabon, Coburg, Conser,

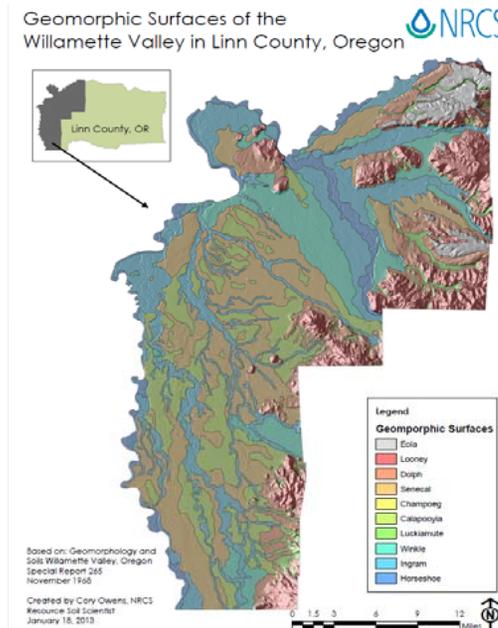


Figure 3.31 Geomorphic Surfaces of Linn County

Geomorphic Information provided by Matthew Fillmore and Cory Owens.

Geomorphic Features Continued...

Awbrig), outwash sands and gravels from the Cascades (Salem, Clackamas, Courtney), and pumice and ash from previous volcanic eruptions is typically beneath the Winkle Surface. Soils are deep and well drained to poorly drained. Depending on the soils it can grow crops such as grains, grass seed, row crops, and irrigated crops.

Ingram Surface

This is the higher of the two current flood plains in the Willamette Valley. This surface is some of the best agriculture soils growing a high variety of irrigated row and specialty crops. Typical soils are Newberg, Cloquato, and Chehalis. The soils have few limitations but is subjected to flooding, erosion, and groundwater quality.

Horseshoe Surface

Lower of the two current floodplains. This surface has soils such as Camas, Pilchuck, and riverwash. They are typically very deep and well to somewhat excessively drained. Because of this, they are somewhat marginal to crop production. This surface frequently floods.

Willamette Valley Soils and Wetlands

Linn County from east to west includes portions of the Cascade Mountains and the south Willamette Valley. Soils formed in the valley have a rich and unique geologic history. During the last Ice Age (18,000 to 12,000 years ago) and in multiple previous Ice Ages episodic cataclysmic glacial flood waters originating in Missoula, Montana careened across what are now the channeled scablands of eastern Washington through the present day Columbia River Gorge and back filled the Willamette Valley south to Eugene with around 300 feet of water. Every 40 to 140 years these temporary glacial lakes brought with them massive sediment loads that became the modern day geomorphic surfaces and soils that we see in the county today.

Several geomorphic surfaces have been recognized in the Willamette Valley from the current active floodplain up into the foothills, which are at an elevation above the influence of the glacial flood waters. Of particular interest are the Senecal and Calapooyia geomorphic surfaces that make up large expanses of the valley floor in Linn County. The Senecal surface is the first higher terrace surface stepping out of the floodplain. It is formed by minor incision and integration of drainages with the next higher surface, Calapooyia. These two surfaces occur as a mosaic across the valley floor and together include the agriculturally significant Willamette, Woodburn, Holcomb, and Dayton soils formed in the finest of the Pleistocene glacial flood sediments. These soils range from well to poorly drained respectively with the better drained soils occurring

adjacent to streams where natural levees are created by overbank flow.

In the Willamette Valley the Calapooyia surface is best expressed in Linn County, particularly along the eastern side of the Calapooyia River, from which it takes its name. Relief is minimal along this surface with slopes in a northwesterly direction occurring at a rate of five feet per mile. As can be expected drainage ways on this surface are poorly organized and drainage of surface water is extremely slow. The extensive Dayton and Holcomb soils that occur here both have dense silty clay or clay horizons. The minimal relief, poorly organized drainage ways, and heavy clay layers together set the stage for the Senecal and Calapooyia surfaces being home to the most extensive areas of wetlands in the Willamette Valley.

Heavy soils and a nearly flat surface together with ample cool season precipitation create perched water tables, which form the wet prairies and vernal pools common in Linn County. Historically these areas were typified by plant communities that included Roemers fescue and tufted hair grass. Additionally, the historic Willamette River floodplain was unrestrained, which allowed extensive braided channels and riparian gallery forests. These forests often contain mosaics of depressional wetland typified by plant communities that included ash, alder, maple, and oak.

Intact wetlands provide several key functions and values for ecosystems and society including protection and improvement of water quality, flood water storage and delay, groundwater recharge, habitat for migratory birds and

Willamette Valley Soils and Wetlands Continued...

other wildlife, and recreational and aesthetic qualities such as hunting, fishing, photography, and bird watching.

In Linn County natural resource concerns associated with wetlands are tied to these key functions and values. Aquifer overdraft is associated with groundwater recharge. Water quality issues spanning temperature, nutrient and pesticide load, plus metals, and pathogens are a concern with both wetland groundwater and surface waters. The wet prairies and vernal pools across the broad expanses of Linn County are home to some of the remaining populations of threatened and endangered plants and are connected to critical endangered fish habitat. Wildlife relies on wetland areas for food, cover, shelter, and space.

Historically, all types of wetlands were abundant in Linn County. This is represented by 156,300 acres of hydric soil; 16% of the county. Many of those wetlands have been drained for agriculture and development. Despite the pressures from an ever increasing population base, some remnant prairies remain. These prairies have been grazed which allowed the native plant community to remain. Remnant habitats provide great opportunities for restoration efforts to save the best of what's left. Some of these remnant prairie pockets are on the rocky soils SE of Scio.

Topography and Terrain

The west side of Linn County from the Willamette River is flat as you move east; you are met with the foothills of the Cascade Range. This gives the county a diverse topography which has diversified soils and structure. The elevation ranges on the valley floor is 100-200 feet and the range of elevation in Linn County is the Cascade Range of 400-6000 feet.

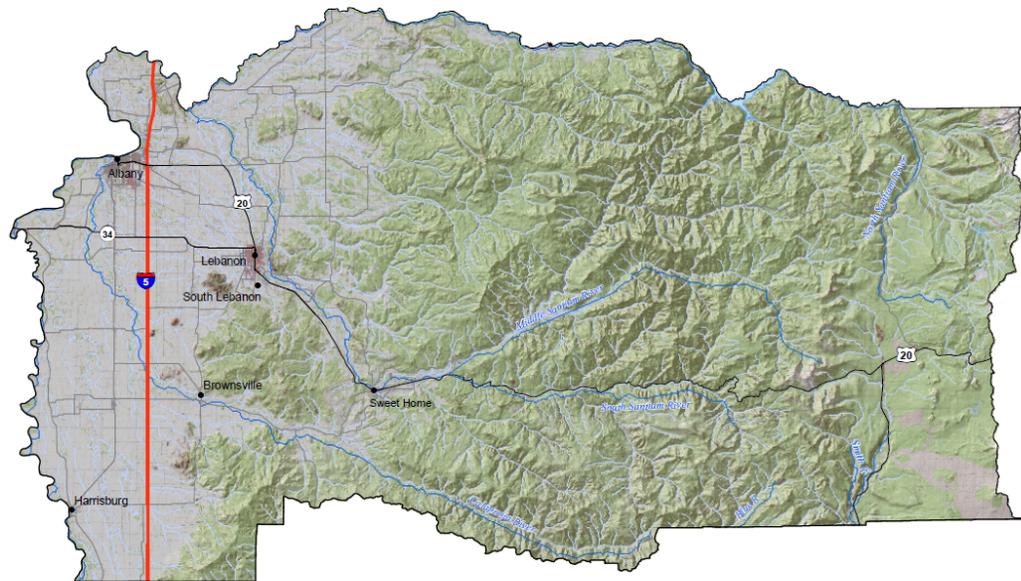


Figure 3.32 Terrain Map of Linn County

Land Capability Class (LCC)

Land capability classification is a system of grouping soils primarily on the basis of their capability to produce common cultivated crops and pasture plants without deteriorating over a long period of time. An abstract is given below are for the eight designated capability classes. For a complete definition of each class, refer to the Soil Survey.

Classes 1 through 2 demonstrate the ability to be croppd and farmed, with some having moderate limitations. These lands are found most in agriculture production of crops.

Classes 3 through 8 demonstrate restrictive and severe limitations of the soil and its properties. These lands are generally found to be forested areas and used for timber harvest.

See Figure 3.33 for the LCC map.

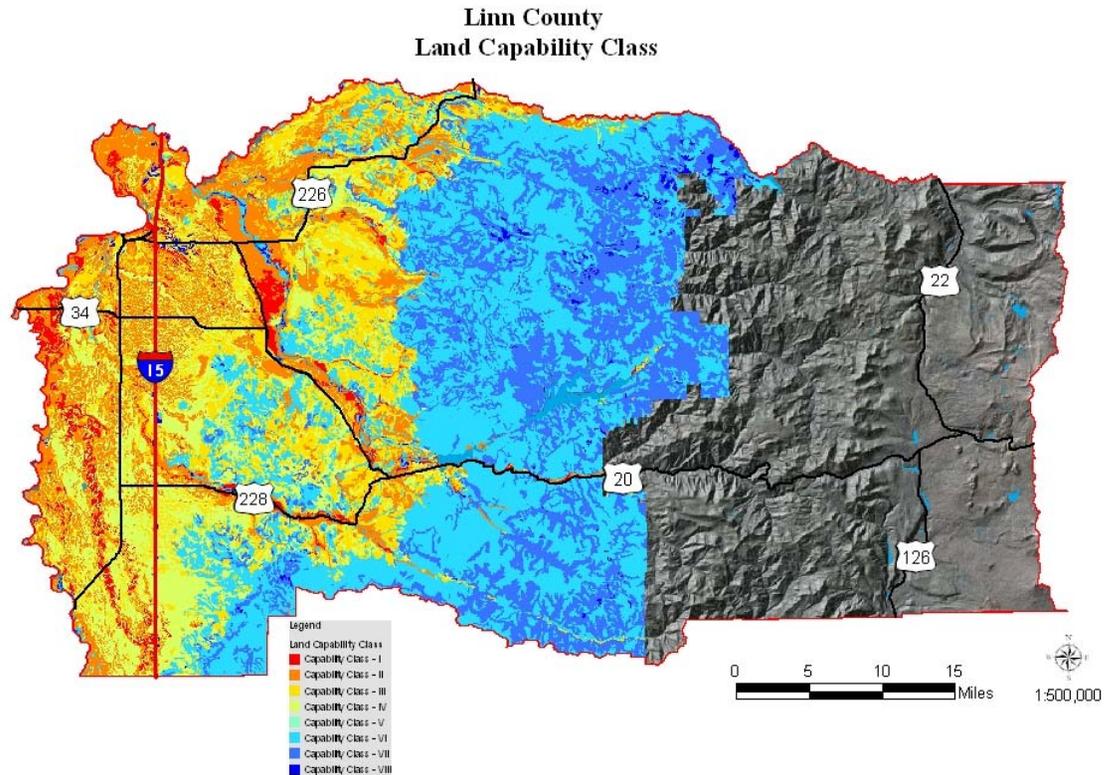


Figure 3.33 Land Capability Class of Linn County

Prime Farmland Soils:

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time. Users of the lists of prime farmland map units should recognize that soil properties are only one of several criteria that are necessary. Much of the valley floor in Linn County is prime farmland.

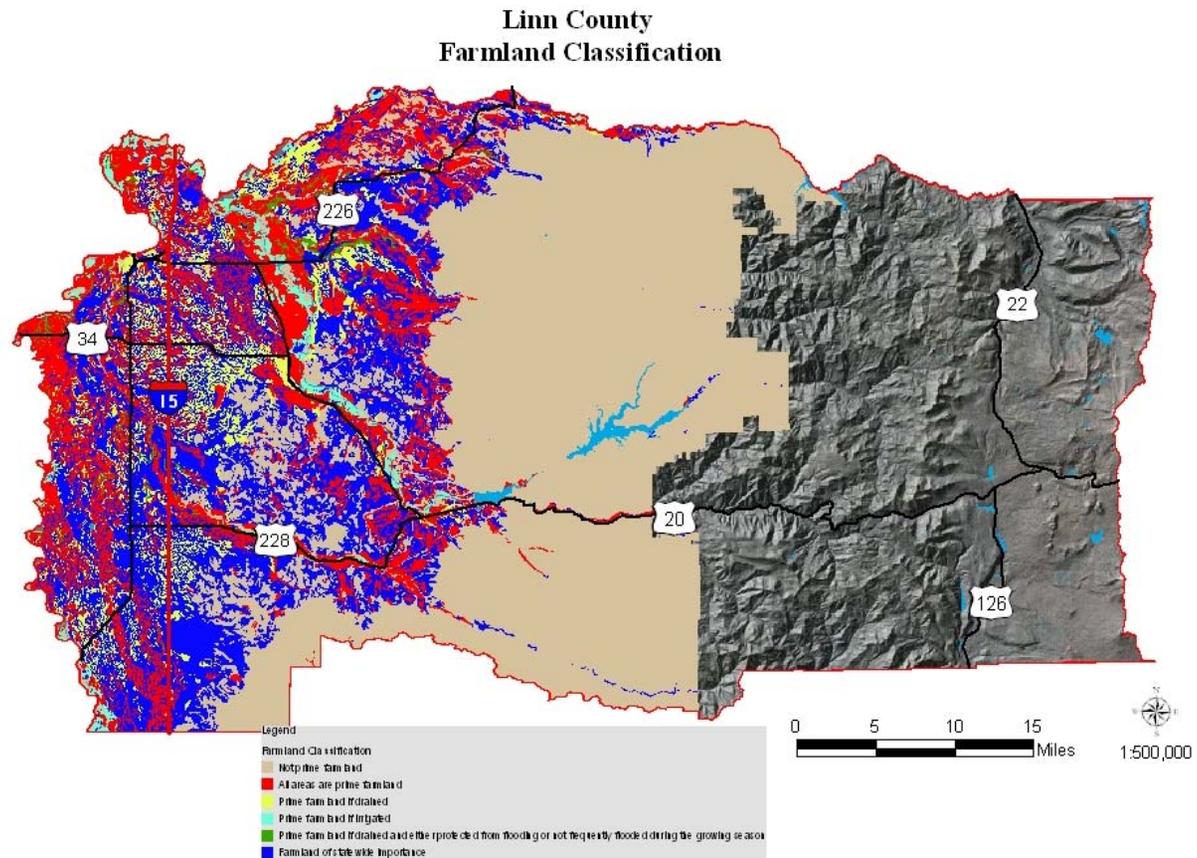
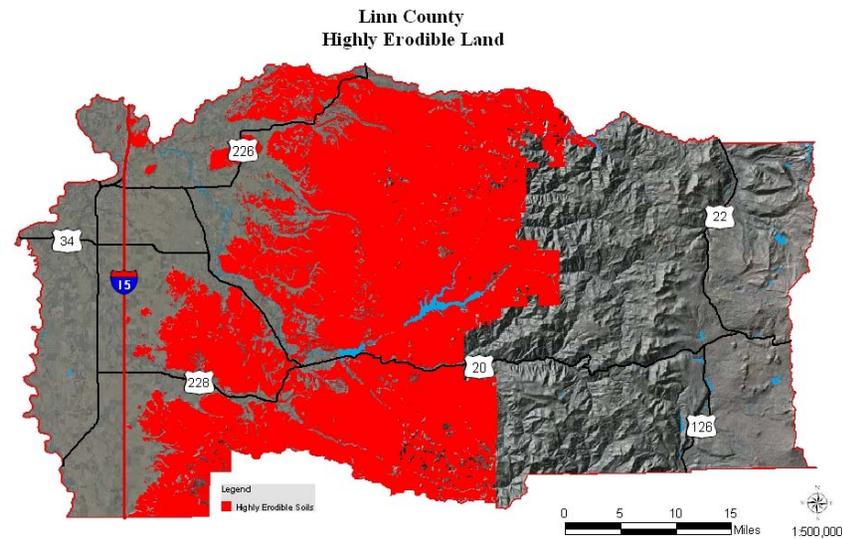
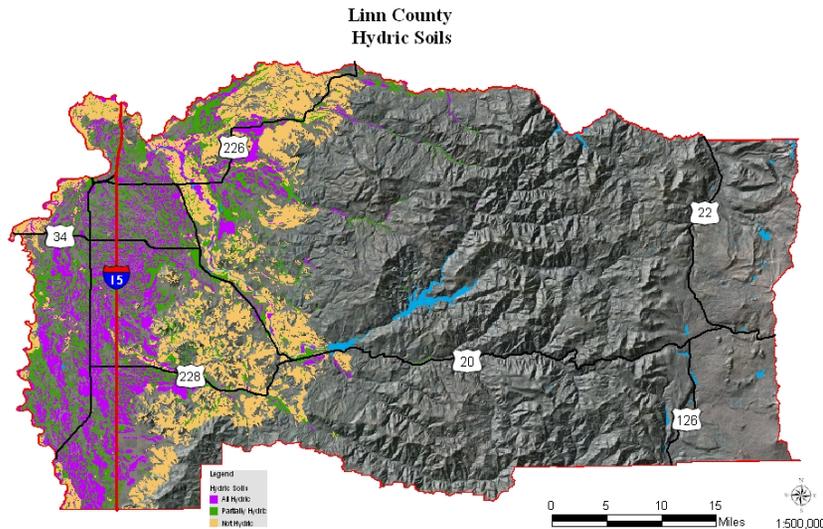


Figure 3.34 Prime Farmland of Linn County

Hydric Soils:

A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions of the upper part. Hydric soils are indications of wetlands. Soils are classified as hydric, partially hydric, or not hydric.

Much of the Willamette Valley floor is hydric or partially hydric. Because of this, much of the agricultural land has been drained for production of crops. Land that has been cleared/draind before 1985 is consider prior converted. Land eligibility for USDA programs is based off the Conservation Compliance parts of the Food Security Act of 1985. Certified Wetland Determinations are made by a Resource Soil Scientist and are made upon request or by violation by a producer.



Highly Erodible Land (HEL):

Highly erodible land is defined by the Sodbuster, Conservation Reserve, and Conservation Compliance parts of the Food Security Act of 1985 and the Food, Agriculture, Conservation, and Trade Act of 1990. Determinations for highly erodible land are based on an erodibility index as defined in the National Food Security Act Manual.

Determinations for Highly Erodible Land are obtained by taking the rainfall and runoff factor, the susceptibility of the soil to water erosion and the combined effects of slope length and steepness and dividing their product (the potential erodibility) by the soils loss tolerance value. Most HEL land in Linn County is found at the foothills of the Cascade Range.

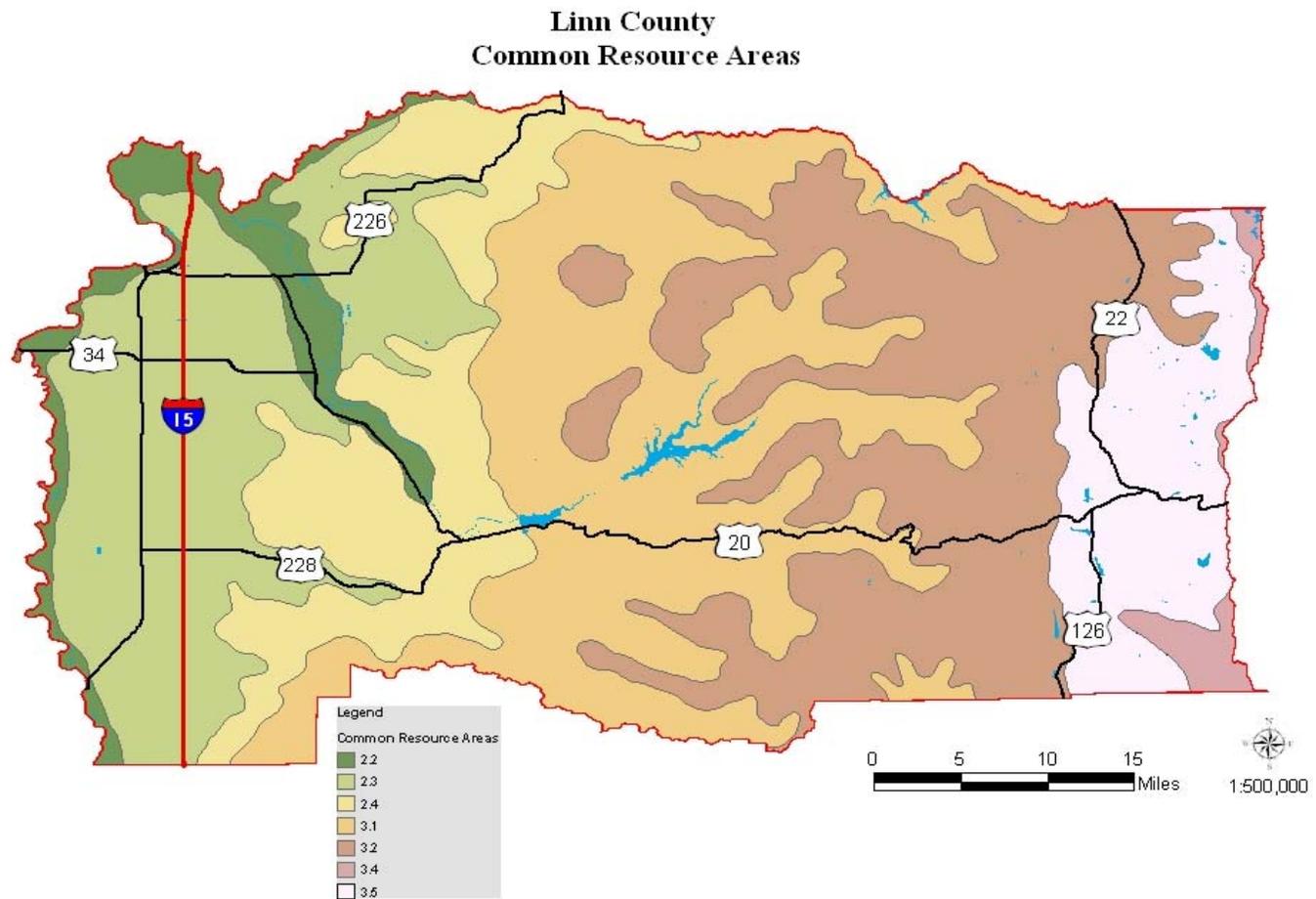
Figures 3.35
Hydric and HEL Soils of Linn County

Common Resource Area (CRA)

CRA regions are characterized by their geographic location, climate conditions, and vegetative body. The following are CRA's of Linn County.

The CRA's 2.2 to 2.4 are comprised of Willamette Valley floodplain, terraces, and foothills. This area comprises most of the agricultural practices in the County. The CRA's 3.2- 3.5 are comprised of lower to high elevations of the Cascade Range. This area houses the majority of timber production for the County.

For complete definitions of the CRA's, please refer to the Soil Series.



CRA Map of Linn County

Section III. Natural Resource Inventory

3.4 Water Resources

As with other Counties, water is an important resource in Linn County. Linn County’s annual precipitation rates range from 40 inches in the Willamette Valley to 120 inches in the foothills of the Cascades.

Precipitation in Linn County in the valley region generally comes as rain. Heading east towards the Cascade Mountains, precipitation increases. The foot hills of the Cascade’s receive more snowfall than the Willamette Valley floor and increase through the summit.

The Willamette Valley has a mesic climate which means there is a wet and dry season. Most of the precipitation is accumulated from October through April. May through September is generally fairly dry.

Water from precipitation drains through the many different watersheds and end up in the Willamette River (far western edge of the county). There are typically high water events/flooding in streams shortly

after the first fall rains and in the spring during snow melt and saturated soils. Most streams flood every couple years.

There are two main reservoirs in Linn County; Foster and Green Peter Reservoir. These reservoirs supply water for irrigation, municipal, recreation and flood control. Detroit Reservoir on the edge of Marion and Linn Counties also provide water and flood control.

The winter months are cool and range between 30 and 50 degrees Fahrenheit and summer months range from 50 to 90 degrees Fahrenheit. While there are still temperature extremes in all seasons, the Willamette Valley has a moderate climate.

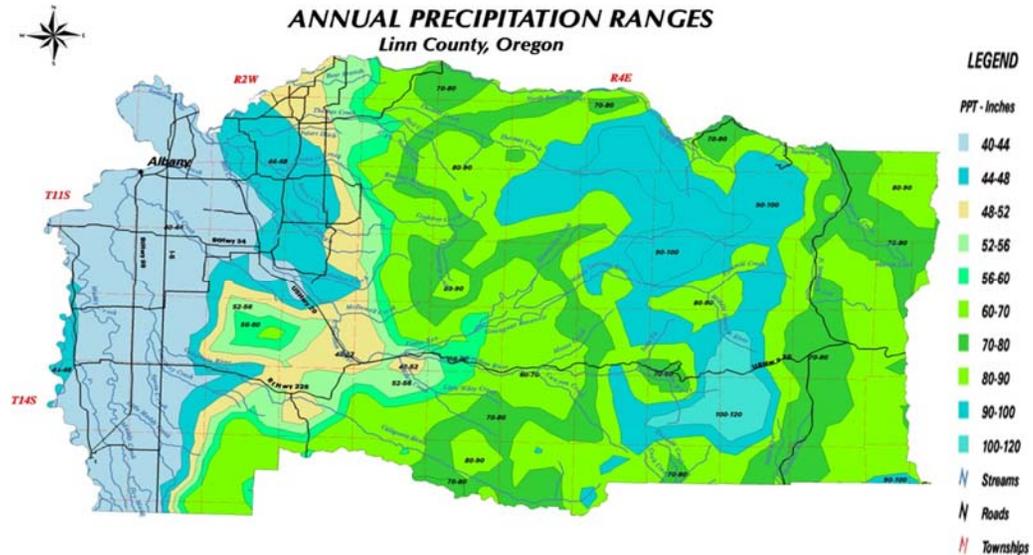


Figure 3.41 Precipitation of Linn County

Section III. Natural Resource Inventory

3.4 Water Resources

Watersheds and Streams

Linn County spans over four sub-basins of the Willamette River; the South Santiam, the North Santiam, the McKenzie, and the Upper Willamette. The North, Middle, and South Santiam Rivers and the Calapooia River run westward through the county to the Willamette River which constitutes the western boundary of the county. There are 17 watersheds included in the four sub-basins in Linn County. See the map labeled Linn County Watersheds.



Waterloo Falls: Oregon Historical County Records Guide

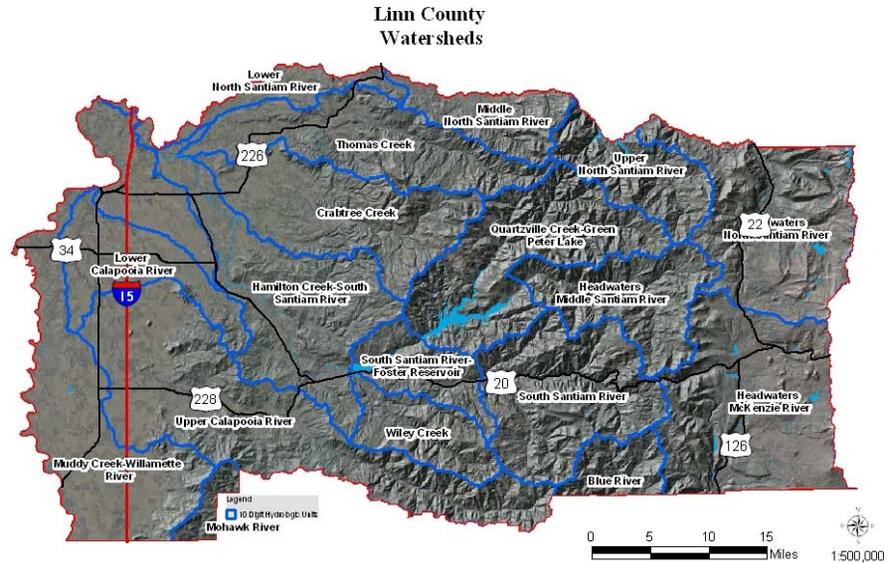
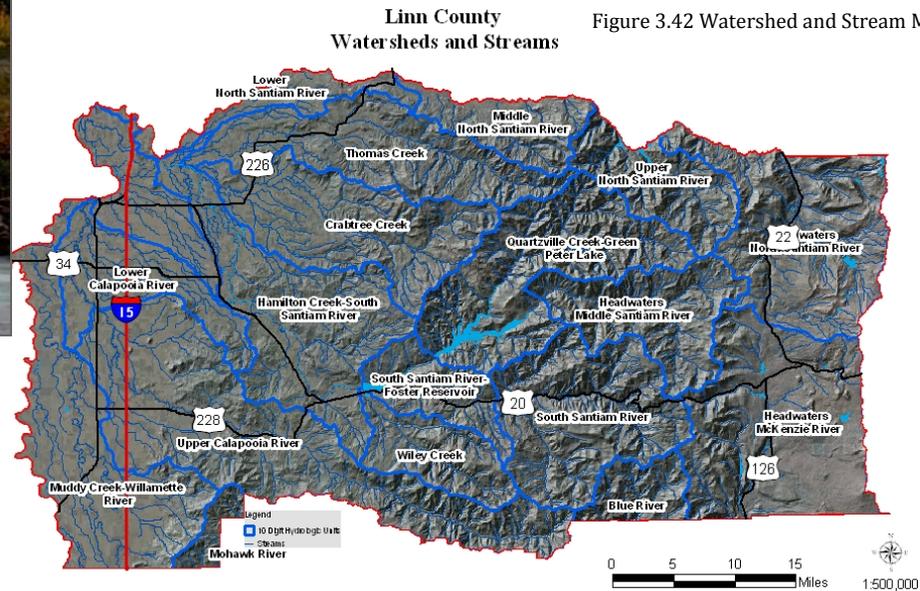


Figure 3.42 Watershed and Stream Maps



Irrigation

A majority of water use is through surface irrigation or shallow (surface influence water) wells. There are some deeper wells used for irrigation.

As stated by the Water Resource Department in Linn County, and Oregon, “landowners with water flowing past, through, or under their property do not automatically have the right to use that water without a permit from the Department.” As stated by the Oregon Water Resources Department. All persons and entities that desire to use water from any source must obtain a permit from the Department before they begin.

Most of the irrigation in the county is in the northwestern part of the county. These areas also coincide with the major tributaries: North and South Santiam, Thomas Creek, Crabtree Creek, and the Willamette River. Approximately 40,000 acres are irrigated annually between May and October.

With irrigation there is a wide variety of crops capable of being produced. In Linn County, producers grow crops such as mint, corn, beans, berries, nuts, nursery crops, vegetable seed, grass seed, pasture, and much more.

Irrigation systems vary across the area, but the predominate irrigation system is through big guns or traveler systems. These

systems irrigate at an efficiency of approximately 60%. While it is inefficient, it is able to irrigate odd shaped fields and crops that are tall. Over the past ten years, many producers have been converting these inefficient system to linears. Linears can irrigate at an efficiency of 85%, thus saving water and energy.

Micro-irrigation such as drip or micro spray can irrigate at an efficiency of 90%. Recently micro-irrigation has been replacing solid set systems and big guns in berries and orchards. Over the last three years the acres of hazelnuts have drastically increased in Linn County. With the increase, producers have changed from these inefficient systems to

drip, thus saving water and energy.

Other irrigation systems used in Linn County include solid sets, hand lines, wheel lines, and pod irrigation.

There are currently several irrigation districts set up in Linn County. These are the Lacombe, Scio, and Jordan Irrigation District. The Lacombe and Scio Irrigation District utilize unlined ditches to convey water to users, while the Jordan Irrigation District pumps water and delivers water to fields pressurized. Between all the districts, thousands of acres are irrigated each year.

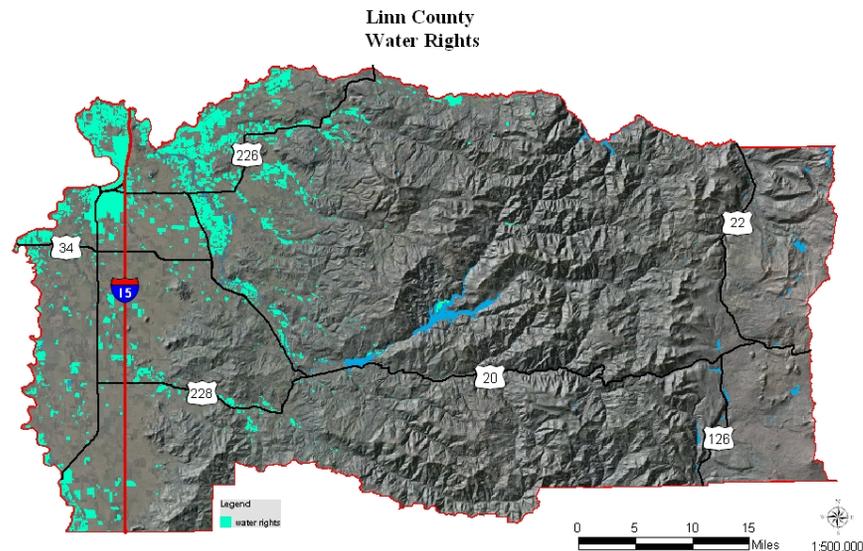


Figure 3.43 Water Rights in Linn County

Groundwater

The Southern Willamette Groundwater Management Area was established in 2004 to address high water quality sensitivity within parts of the Southern Willamette Valley which includes areas of Linn, Benton, and Lane counties.

“According to the law, DEQ must declare a Groundwater Management Area (GWMA) if it is confirmed that the groundwater contains nitrate at 7 ppm (parts per million) as a result of non-point source pollution. Once a Groundwater Management Area has been announced, DEQ must establish a local GWMA committee made up of affected citizens and other interested parties. The committee advises state agencies who are required to develop and implement an action plan that will reduce groundwater contamination in the area. Nitrate is a common contaminant of shallow groundwater in areas with well-drained soils. It comes from fertilizers, septic systems, and animal manure. The US EPA has set 10 ppm (parts per million) as the maximum allowable level of nitrate in water delivered by public drinking water systems. There are no requirements for individual private wells. Nitrate concentrations above the accepted background level of 2 ppm have been recorded in the Southern Willamette Valley since the 1930s, with levels above 10 ppm not being uncommon.”

<http://gwma.oregonstate.edu/background>

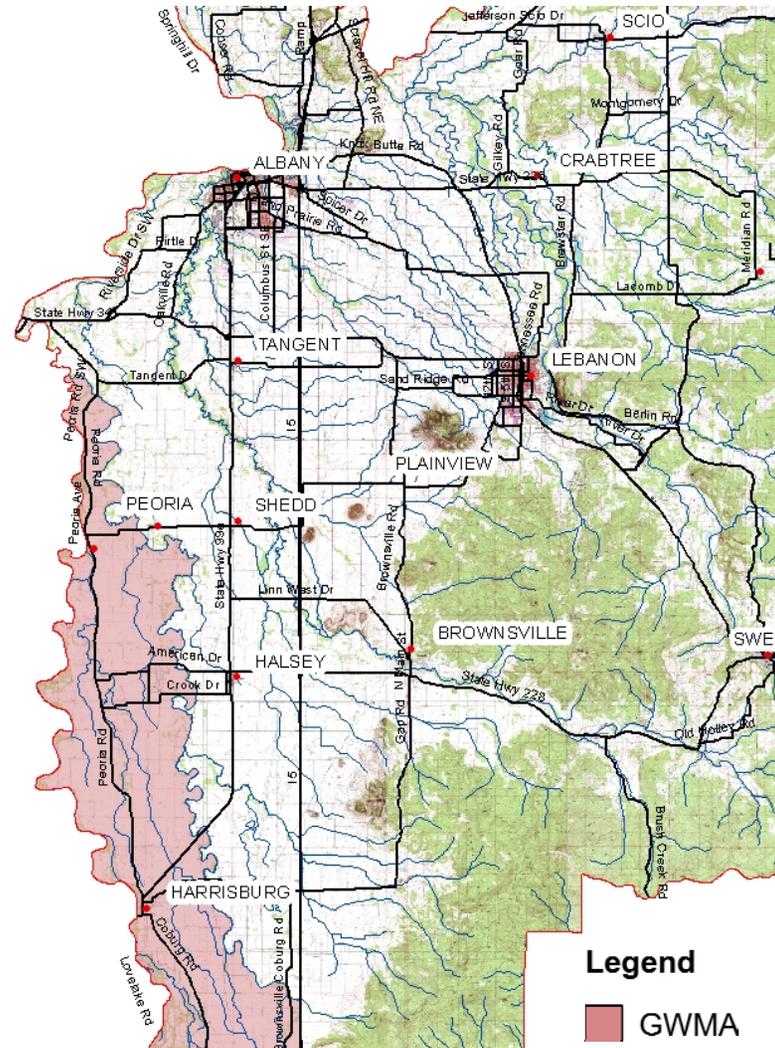


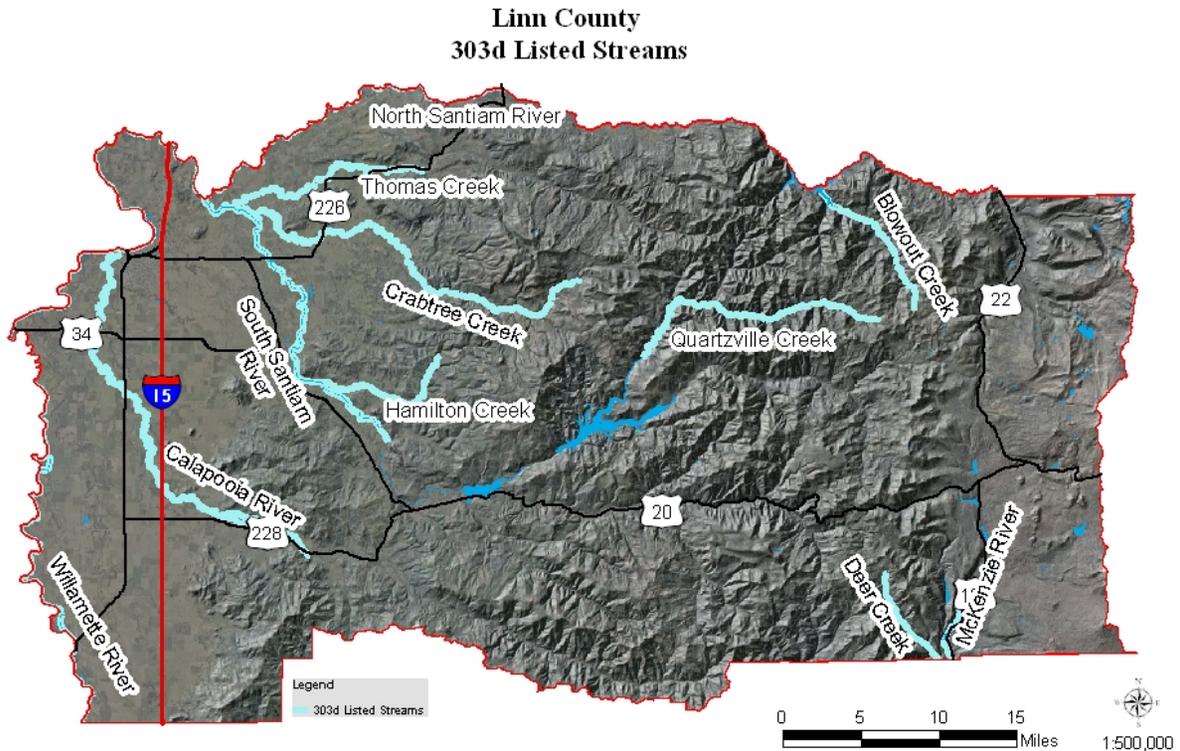
Figure 3.44 Groundwater Management Area (GWMA) including Linn County

County Water Quality

Linn County 303d listed streams are mainly affected by temperature, sediment, bacterial conditions, and toxicity. Rivers that have TMDL's include the: Willamette River, North & South Santiam River, Thomas Creek, Calapooia River, Crabtree Creek, Quartzville Creek, Deer Creek, McKenzie River, and Hamilton Creek. Most of these rivers are surrounded by agricultural lands that have buffers that can be from zero to 100 feet, however most are of minimal buffer width.

The South Santiam Agricultural Water Quality Management Area/Plan is addressing the 303d listed streams, as well as the Linn SWCD. The Linn SWCD works with ODA to create and establish practices aiming to address sediment, riparian area, and nutrients/manure. The South Santiam, North Santiam, and Calapooia Watershed Councils are focusing on restoring riparian area plantings.

The South Santiam Agricultural Water Quality Management Area/Plan works in the areas pertaining to 303d listed streams and their buffers. The main concerns are riparian buffers as well as agricultural practices along the stream areas.



Water quality criteria	Streams not meeting criteria/listed 303(d)
Bacteria	Calapooia River (mile 0-42.8)
Temperature	Beaver Creek, Cedar Creek, Crabtree Creek, Hamilton Creek, McDowell Creek, Middle Santiam River, Moose Creek, Neal creek, Quartzville Creek, Scott Creek, South Santiam River, Sucker Slough, Thomas Creek, Wiley Creek, Little Muddy Creek, North Fork Calapooia River, Calapooia River.
Dissolved Oxygen	Calapooia River

Section III. Natural Resource Inventory

3.5 Air and Energy

Throughout Linn County energy is used to power farm equipment. In the Northern part of Linn County, much of the energy consumption is through irrigation. These include electric pumps and inefficient irrigation systems.

There are several dairy operations that utilize energy for pumps and lighting throughout year. The farms that mainly use confined areas for their dairy will consume larger amounts of energy for lighting, as well as equipment for cleaning the area. Pumps are used multiple times a day resulting in a large consumption of energy.

Greenhouses consume energy through heating and irrigation. Heating systems for greenhouses allow them to create climate control areas that can produce their products. Irrigation systems can include overhead sprinkler systems as well as small hose lines to distribute water.

Grass seed growers are a large part of Linn County. Farm equipment consumes a large sum of energy from farm equipment. This equipment tends to be diesel powered. Over the past five years, there has been a conversion to no-till methods throughout the county for energy savings.

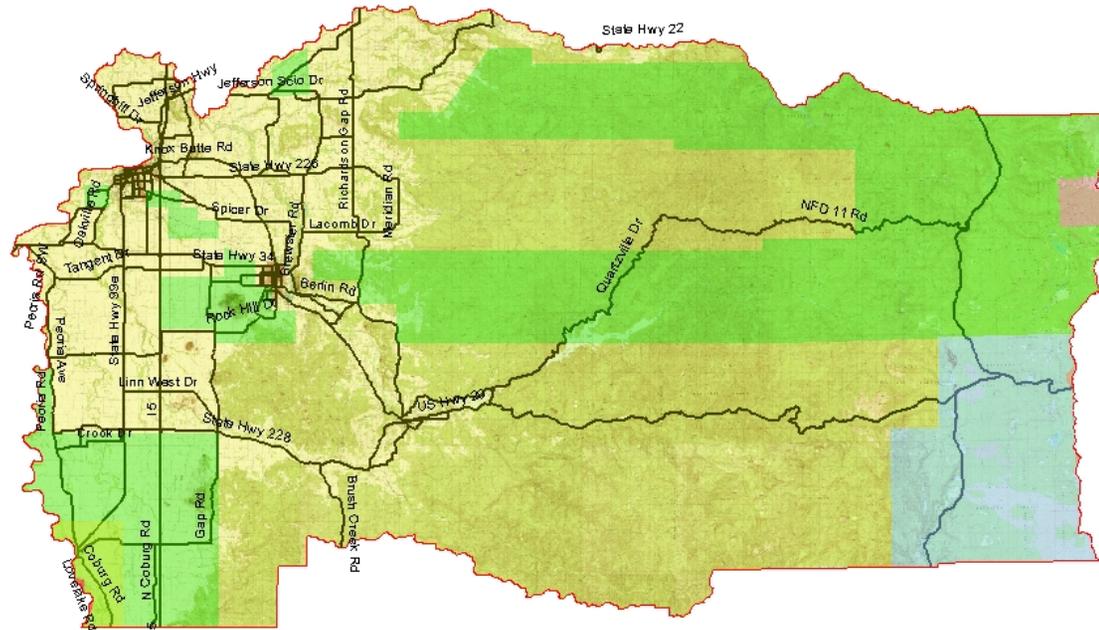
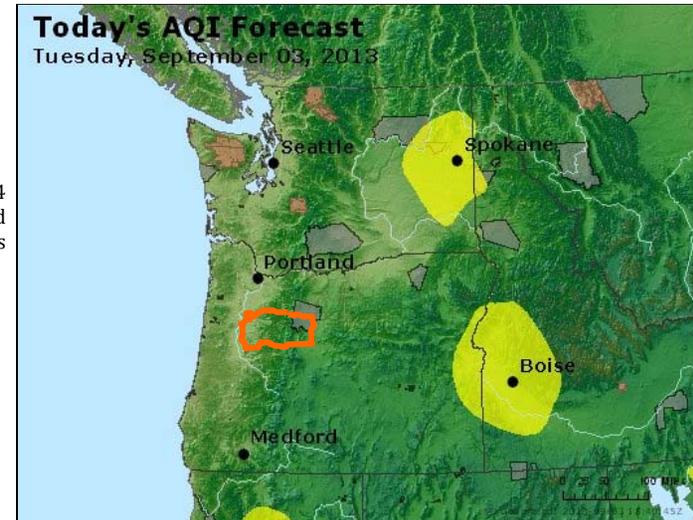


Figure 3.51
Power and Utility Area Map for Linn County

Air Quality

Air quality in Oregon is measured by EPA ratings which range from “Good” to “Hazardous.” Linn County, shown in Orange on the images to the right, has an average of “Good” to “Unhealthy for Sensitive Groups” air quality throughout the year. The top image shows the AQI pollution levels forecast on September 3, 2013 in Oregon. The bottom image shows the actual pollution levels on September 3, 2013 .

Figure 3.53-4
Air Quality Index and
Pollution in Oregon Maps



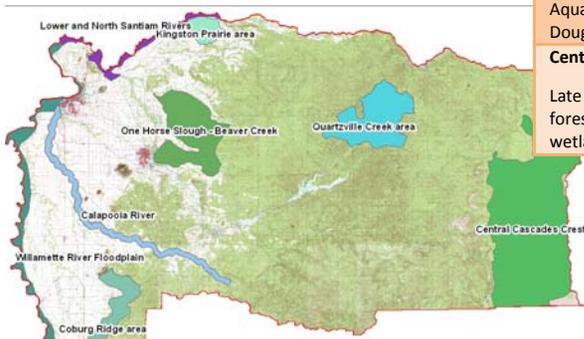
- Good** Air quality is considered satisfactory, and air pollution poses little or no risk.
- Moderate** Air quality is acceptable; for some, pollutants may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
- USG** Members of sensitive groups may experience health effects. The general public is not likely to be affected.
- Unhealthy** Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
- Very Unhealthy** Health alert: everyone may experience more serious health effects .
- Hazardous** Health warnings of emergency conditions. The entire population is more likely to be affected.

For more information on EPA and Air Quality see
<http://www.airnow.gov/>

Section III. Natural Resource Inventory

3.6 Plant and Animal Resources

Wildlife Conservation Opportunity Areas
 See the map by the Oregon Department of Fish and Wildlife for the diverse Conservation Opportunity Areas (COA) (Figure 3.61). The areas in Linn County include the Willamette River Floodplain, the Coburg Ridge, the Calapooia River, One Horse Slough, Beaver Creek, Lower and North Santiam Rivers, Kingston Prairie, Quartzville Creek, and Central Cascades Crest.



Conservation opportunity areas & features	Strategies	Key species
WILLAMETTE VALLEY Ecoregion		
Lower and North Santiam Rivers Aquatic, floodplain forests, riparian, wetlands and wet prairie	Maintain in-channel watershed function and riparian habitat	Riparian Birds, Oregon Chub, Winter Steelhead
Kingston Prairie area Grasslands, oak savanna, oak woodlands, riparian, wetlands and wet prairie	Wet meadow conservation and restoration	Western Meadowlark, Bradshaw's Lomatium, Oregon Larkspur, White-Topped Aster, Willamette Daisy
Calapooia River Aquatic, riparian	Maintain riparian habitat and function, protect winter shore-bird habitat	Riparian Birds, Winter Steelhead
One Horse Slough – Beaver Creek Aquatic grasslands and oak savanna, oak woodlands, riparian, wetlands	Control non-natives, maintain oak habitats, maintain water flows and frog habitat	Foothill Yellow-Legged Frog, Northern Red-Legged Frog, Chipping Sparrow, Slender Billed Nuthatch, Willow Flycatcher
Willamette River Floodplain Aquatic, bottomland hardwoods, riparian	Habitat complexity, maintain riparian habitat and function, control weeds, restore wetlands, and floodplain interactions	Foothill Yellow-Legged Frog, Northern Red-Legged Frog, Riparian Birds, Coho Salmon, Fall Chinook Salmon, Oregon Chub, Winter Steelhead, Northwestern Pond Turtle
Coburg Ridge Grasslands, oak savanna, oak woodlands, riparian, wetlands and wet prairie	Maintain riparian habitat and ecological function	Acorn Woodpecker, Vesper Sparrow, Western Bluebird, Western Meadowlark, Fender's Blue Butterfly
WEST CASCADES Ecoregion		
Quartzville Creek area Aquatic, late successional Douglas fir	Maintain or enhance in-channel watershed function, hydrology	Cascade Torrent Salamander, Larch Mountain Salamander, Oregon Slender Salamander, Harlequin Duck
Central Cascades Crest Late successional Douglas Fir forests, montane grasslands, wetlands and wet meadows	Wet meadow conservation or restoration	Cascade Torrent Salamander, Cascades Frog, Oregon Slender Salamander, Oregon Spotted Frog, Black Swift, Bufflehead, Northern Goshawk, Sandhill Crane, American Marten, Fisher

Figure 3.61
 ODFW Conservation Opportunity Areas in Linn County

Threatened and Endangered Species

Linn County currently has nine species on the threatened and endangered species list. This includes four animals: the Northern spotted owl, the Oregon chub, Bull trout, Chinook Salmon (Willamette River ESU), Steelhead (Upper Willamette ESU) and Fender’s blue butterfly, and five plant species: Golden paintbrush, Willamette daisy, Bradshaw’s desert parsley, Kincaid’s lupine, Howellia, and Nelson’s checker-mallow.

Plants

- Golden paintbrush
- Water howellia
- Bradshaw’s desert parsley
- Nelson’s checker-mallow
- Willamette daisy
- Kincaid’s lupine

Animals

- Oregon chub
- Northern spotted owl
- Fender’s blue butterfly
- Chinook Salmon
- Bull Trout
- Steelhead

Some Species of Concern

- White-footed vole
- Camas pocket gopher
- W. burrowing owl
- Acorn woodpecker
- Purple martin
- Coast cutthroat trout
- Shaggy horkelia
- Silver-haired bat
- Northern goshawk
- Black tern
- Mountain quail
- Pacific lamprey
- Cascades Frog
- Whitetop Aster

For more info on these species see <http://www.fws.gov/oregonfwo/Species/Lists/Documents/County/LINN%20COUNTY.pdf>

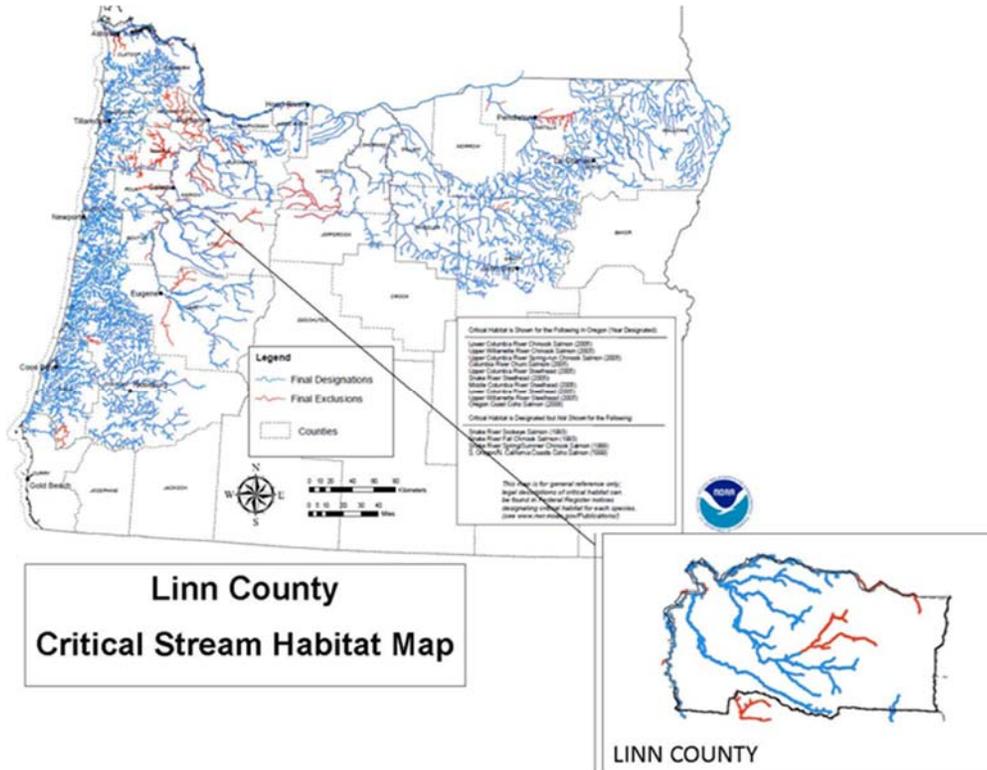


Figure 3.45 Critical Stream Habitat in Linn County



Figure 3.62

Nelson’s checker-mallow

http://www.oregon.gov/ODA/PLANT/CONSERVATION/pages/profile_sine.aspx

Invasive Species

Invasive species pose a risk to production, habitats and species. Many riparian areas have been taken over by plants such as English ivy, reed canary grass, Armenian blackberry, and others.

With the invasion of these plants riparian areas are not able to produce the native plants adapted to the site because of competition.

Because of this many riparian habitats are degraded and lack diversity essential for fish and terrestrial species.

Documented Invasive plants <i>From ODFW Strategy Habitats</i>		Potentially invasive non-native plants
Armenian blackberry	Portuguese broom	African waterweed
Butterfly bush	Purple loosestrife	Awl-leaf arrowhead
Curly leaf pondweed	Purple starthistle	Brass buttons
Elodea	Reed canary grass	Camelthorn
English ivy	Rush skeleton weed	Coltsfoot
Eurasian milfoil	Scotch broom	European water chestnut
False brome	Shining crane’s bill	Giant salvinia
Fragrant water lily	Spotted knapweed	Hydrilla
Garlic mustard	Tall oat grass	Marsh dewflower
Giant hogweed	Tansy ragwort	Pondwater starwort
Herb Robert	Traveler’s joy	Puncture vine
Knotweeds	Watercress	Purple nutsedge
Kudzu	Yellow flag iris	Uruguay seedbox
Meadow knapweed	Yellow starthistle	Water mint
Mouse ear hawkweed		
Parrots feather		

Section IV. Natural Resource Analysis

4.1 IDEA Data

Since year 2009, 46 Linn County farmers have been aided by NRCS funding programs. Since 2009, the following practices have been applied in Linn County.

Also in Linn County, NRCS has restored nine wetlands through the Wetland Reserve Programs easements to total approximately 1500 acres. The main habitat serviced has been wet prairies.

Practice Name	Unit	Applied Amount	Practice Name	Unit	Applied Amount
Comprehensive Nutrient Management Plan		3	Irrigation Water Management	ac	3754.1
Agricultural Energy Management Plan, Headquarters	no	1	Access Control	ac	553.6
Waste Storage Facility	no	5.00	Tree/Shrub Site Preparation	ac	564.7
Brush Management	ac	609.00	Forage and Biomass Planting	ac	110.6
Herbaceous Weed Control	ac	344.9	Livestock Pipeline	ft	7445
Conservation Cover	ac	188.4	Prescribed Grazing	ac	1201.7
Conservation Crop Rotation	ac	1,971.10	Roof Runoff Structure	no	4
Residue and Tillage Management, No-Till	ac	104.6	Heavy Use Area Protection	ac	41.4
Prescribed Burning	ac	60	Streambank and Shoreline	ft	1,800.00
Cover Crop	ac	71.8	Nutrient Management	ac	5474.7
Critical Area Planting	ac	4	Integrated Pest Management	ac	2,685.40
Residue and Tillage Management, Reduced Till	ac	2800.9	Tree/Shrub Establishment	ac	154.5
Windbreak/Shelterbelt Establishment	ft	470	Watering Facility	no	24
Fence	ft	118,616.00	Underground Outlet	ft	879.5
Woody Residue Treatment	ac	12.8	Waste Separation Facility	no	1
Riparian Forest Buffer	ac	388.4	Waste Transfer	no	2
Filter Strip	ac	0.6	Upland Wildlife Habitat	ac	1520.8
Grassed Waterway	ac	0.5	Wetland Restoration	ac	626.4
Hedgerow Planting	ft	1235	Wetland Enhancement	ac	311.1
Irrigation Pipeline	ft	40,248.00	Forest Stand Improvement	ac	303.4
Irrigation System, Microirrigation	ac	156.6	Seasonal High Tunnel System for Crops	sq ft	6,548.00
Sprinkler System	ac	921.2			



Section IV. Natural Resource Analysis

4.2 Partner Conservation Efforts

Linn SWCD is working to reduce ditch erosion in production grass fields and is addressing drainage issues due to increasing rainfall averages and urban growth.

Cascade Pacific is working to improve water quality, fish and wildlife habitats, and sustainable agriculture and forestry, and working with the Northwest Oregon Invasive Weed Management Partnership.

ODFW is focused on wildlife diversity, wildlife habitat, and land resource programs.

The NW Power and Conservation Council (Willamette Subbasin) has an overall objective to increase fish and wildlife population trajectories.

South Santiam is concerned with soil and stream bank erosion, diminishing water quality and aquatic habitat, invasive weeds, inadequate grazing management and insufficient irrigation water management.

Watershed Councils

North Santiam is concerned with soil and stream bank erosion, deteriorating soil condition, diminishing water and air quality, loss of fish and wildlife habitat, and poor management of non-industrial forestland.

McKenzie’s main resource concerns are water quality and invasive weeds on forestland and pastureland.

Calapooia is focused on improving the upstream passage of fish and protecting and restoring riparian areas for improved fish and amphibian habitat.

More information on current conservation projects within Linn County can be found at <http://or.conservationregistry.org/>.



Conservation Partners	Project partner	Technical assistance	Project funding	Outreach, tech. transfer	Resource interest areas
Federal Agencies, Tribes					
Farm Service Agency	×		×	×	All resources
USDA Forest Service	×	×	×		Forest, fuels
US Fish & Wildlife Service	×	×	×		Wildlife
State Agencies & Organizations					
Department of Agriculture	×		×		Water quality
Department of Energy		×	×		Energy
Department of Environmental Quality	×	×	×		Water, Air
Department of Fish & Wildlife	×	×	×	×	Wildlife
Department of Forestry	×	×	×	×	Forest, fuels
Water Resources Department	×				Water quantity
OSU Extension Service	×	×		×	Human resources
Local Agencies & Organizations					
Linn Soil & Water Conservation District	×	×	×	×	All resources
The Nature Conservancy	×		×		Plant, wildlife
Watershed Councils: North Santiam, South Santiam, Calapooia	×	×	×	×	Water quality, wildlife
Cascade Pacific RC&D Council	×	×	×	×	Energy

Section IV. Natural Resource Analysis

4.3 Summary of Resource Condition

Linn County is a diverse county comprising of forest, pasture, cropland, wildlife lands, and urban lands. Over half of the county is forested, about a third is farmed, and less than quarter is either urban or other lands.

With such a diverse range of landuses across the county, comes a wide range of resource issues and conditions. As a whole, the resource condition of Linn County is pretty good compared to mid and early 1900's. There has been much change in the management of lands; moving toward sustainable management. While there has been a lot of change, resource issues still exist along the landscape due to past and some current activities.

The priority resource concerns that exist in Linn County is:

- Water Quality/Quantity
- Soil Health
- Forest Health
- Habitat (wetlands, prairies, oak savannahs, oak woodlands)

4.4 Resource Concerns Description

During the Local Workgroup Meeting held in January 2014 with producer and the partners mentioned previously, resource concerns were outlined and discussed. The topics and subjects discussed are as follows.

Water Quality/Quantity Concerns

- Inefficient irrigation systems
- Lack of riparian areas
- Nutrient/sediment contributions to streams

Historic flood plain territories are fragmented due to farmland and urban development. Many irrigation systems are inefficient and allow excessive evaporation. Riparian areas were rated based off of DEQ listing, fish presence, buffers, and associated land use. Streams were then placed into tree categories and rated as high, medium, and low priority for restoration. Many of the streams within the Santiam River Watershed are listed as medium to high priority with a need of reduction of nutrients and sediment to the stream as well as buffers.

Soil Health Concerns

- Slugs, voles, and other pests
- Heavy amount of tillage
- Excess/Lack of nutrients
- Absent of cover crop mixes
- Soil erosion due to compaction

Current tillage practices in the County allow unnecessary soil erosion to occur. Lack of control of slugs, voles, and other pest make it hard to implement no-till. Small farms do not deal with soil erosion, manure management, and invasive species issues properly. Many producers/farmers do not understand soil nutrient quality and either under or over fertilize and conduct damaging tillage practices.

Forest Health Concerns

- Overstocked forests
- Invasive species in forestland
- Lack of diversity

Forests in the county are overstocked, possibly due to lack of proper regulation from the Oregon Forest Practices Act. These forests are more prone to disease, pest, and fire disturbance. Particular invasive species have established in forests around the county and are steadily spreading. Many sites are a monoculture of Douglas fir and lack diversity for wildlife species and diversity of roots to improve soil health.

Habitat Concerns

- Habitat fragmentation
- Loss of rare/unique habitat
- Effects of domestic animals on native species
- Potential for future T/E species
- Endangered species recovery issues

Habitat, especially historic wet prairie and oak savanna, has decreased at a dramatic rate and that which is left has been fragmented due to rural/urban development and spread of invasive species. Wildlife in particular are often harassed by domestic animals as their habitat diminishes.

Section V. Natural Resource Problems and Desired Future Outcomes

5.1 Water Quality/Quantity

In 2012 and 2013, NRCS with the Linn Soil and Water Conservation District rated streams in Linn County based off of DEQ 303d list rating, fish presence, buffers, and adjacent land uses. From this inventory, streams were rated by high, medium, or low priority for need of restoration. Many of the streams within Linn County are listed as medium or high. The main focus of this inventory was completed in the northern part of the county.

Many streams and rivers lacking riparian buffers were identified through this inventory and were discussed with partners. These streams include: Thomas Creek, Crabtree Creek, Hamilton Creek, South Santiam, North Santiam, and Bear Branch Creek. This is of concern as many of these streams are utilized by threatened and endangered anadromous salmonids.

Much of the land adjacent to the streams are used for irrigated/dryland agriculture (including pastures) and can contribute to increased sediment and nutrients to streams as well as stream temperature increases due to lack of shading and water withdraws for irrigation.

Projects that can reduce sediment and nutrient contributions to streams would include working with cropland and pasture landuses. By implementing practices that improve pasture condition, water infiltration can be increased, soil erosion reduced, and loss of nutrients

through runoff can be eliminated. By incorporating nutrient management, cover crops, and conservation crop rotation to cropland, soil erosion can be reduced and nutrients and sediments that enter streams can be decreased. Also by implementing practices that impact irrigation such as systems and irrigation water management, water can be applied more efficiently and without waste. By applying less water, more water can be retained in the streams and be beneficial to fish.

Even with structural and management practices on the farm, having effective buffers on waterways is just as important. Depending on the stream; some may require just grass buffers to filter nutrient and sediments as water is intermittent and not around while ambient temperatures are warmer. However other streams that are perennial, riparian tree buffers may be required to filter and shade streams.

The width of the stream dictates the width of the buffer.

By working with farms along these stream reaches, habitat for threatened and endangered fish can be improved.



Linear in Mint Field, Linn County

Desired Future Condition: Streams rated as high and medium priority are addressed to move it to a medium or low priority. By doing this, habitat for threatened and endangered fish is greatly improved.

Goal: Enhance threatened and endangered species habitat through the adoption and/or increased level of conservation practices on agricultural land in the Thomas Creek, Crabtree Creek, Hamilton Creek, South Santiam, North Santiam, and Willamette sub-watersheds.

Future Goal: Enhance threatened and endangered species habitat as first goal, but expanded to streams in other watersheds in Linn County

Section V. Natural Resource Problems and Desired Future Outcomes

5.2 Soil Health

The four key factors of soil health are: maintain cover, diversity of roots, minimize disturbance, and living cover throughout the year. Knowing this, there are many areas that soil health can be improved in Linn County.

The issues that have been noticed affecting soil health are:

- ◆ Lack of diverse cover crops during the winter on vegetable crops
- ◆ Intensive tillage on all types of crops-plows on field crops and rototillers on small farms
- ◆ Lack of knowledge of soil microbes and relation of soil nutrients
- ◆ Lack of information on pest controls in reduced tillage situations including slugs and voles.
- ◆ Increase levels of nitrate levels in aquifers .

By improving the soil health on cropland, many other resource concerns can be improved such as water infiltration/runoff, plant condition, water quality, and more. However to improve soil health in Linn County, much needs to be done.

There needs to be more education/outreach about the benefits of cover crops. Cover crops can reduce erosion, feed soil microbes, and provide nutrients to production crops. While Linn County has much of the land covered through the entire year, there is many farms that are capable of producing vegetables crops where the soil is not covered all of the year. By targeting

these operations (typically around water sources/irrigation), soil health can be greatly improved.

Research needs to be completed in order to address the concerns with the amount of soil disturbance on farms. Typically farms plow fields in August to prepare for planting and to destroy populations of slugs and voles. There are only primarily two control methods of these two pests: baits and tillage. If there were more effective control methods, more land could potentially be no-tilled which in return would help with water infiltration/runoff, water quality, and improved the soil biology.

Knowledge in soil biology would be beneficial to farmers. Most farmers apply nutrients without understanding soil tests, crop demands, and requirements of microorganisms. By understanding some soil health tests, soil tests, and nutrients, land could become healthier and reduce chances of nutrients ending up in surface and ground waters.

Nitrates in the ground water have a direct correlation to soil health. If cropland had cover throughout the winter that scavenges nitrate and/or that fixes nitrogen, less would enter the ground water. Also if nutrients were applied that meets OSU recommendations, less nitrates have the potential to enter ground water.



Desired Future Condition: Soil is covered during all parts of the year, information is gained about pests so that reduced tillage can be implemented, and more focus on soil biology.

Goal: Enhance the soil health on small farms that produce for direct markets by increasing cover crops, nutrient management, and reducing tillage.

Also encourage the use of cover crops, intense levels of nutrient management, and irrigation water management on fields within the Ground Water Management Area (20,000 acres).

Future Goal: Improve knowledge about pest (slugs and voles) so that 50% of the acreage in Linn County is under some type of conservation tillage or no tillage.

Section V. Natural Resource Problems and Desired Future Outcomes

5.3 Forest Health

During the 2015/2016 Local Workgroup Session, time was spent discussing forestry resource concerns. The top resource concerns are:

- ◆ Forest biodiversity
- ◆ Culvert replacement for fish passage and erosion control
- ◆ Legacy roads
- ◆ Wildfire prevention
- ◆ Pest and disease

The group was interested in forest biodiversity as it has many benefits. By improving the biological (plant) diversity on forest land, in return there are:

- ◆ Greater diversity of roots in the soil which improve soil microbial activity and can beneficially affect water infiltration and soil erosion.
- ◆ Diversity of plants can also make the forest more resilient to pests and disease as the forest is no longer a monoculture. With less disease and pest pressure, there is also less dead timber which reduces fire risk.
- ◆ Through the process of improving diversity, forests are thinned to appropriate stocking rates to reduce the spread of fire hazard.

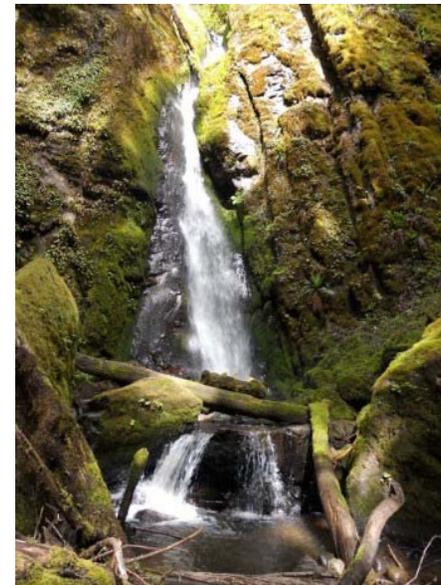
Legacy roads and culvert replacement is a wide spread problem in Linn County. Many roads are highly prone to erosion and lead to water quality issues. Also on the legacy roads, culverts are commonly undersized resulting in issues with

cause land slides and erosion.

While NRCS is not conducting any activities with forest health currently, there are many opportunities for the future. Many of NRCS partners including US Forest Service and Oregon Department of Forestry (ODF) are focusing on lands to improve the water quality. There are Non-Industrial Private Forest adjacent to state and federal lands that can also benefit from what the above partners are doing.

There is also opportunities to work with ODF to help target areas that need treatment of the previously mentioned resource concerns. NRCS has been working with ODF to conduct inventories on forestland.

NRCS also plans to utilize the Healthy Forest Reserve Program (if funding is available) to implement some or all of the above resource concerns.



Soda Falls, Linn County

Desired Future Condition: Forest lands have a strong biodiversity which maintains a low pest/disease cycle, erosion is minimized, and forests are at a low risk of wildfire.

Goal: Work with partners to identify areas where biodiversity could be implemented.

Future Goal: Enhance forestlands by thinning and then planting diverse shrub and tree species.

Section V. Natural Resource Problems and Desired Future Outcomes

5.4 Habitat

During the 2014 Local Workgroup Session producers and partners identified two main areas of focus with habitat and the loss of:

- ◆ Wetland Prairies
- ◆ Oregon White Oak Habitats

Since the Willamette Valley was settled in the 1800’s, the Valley has seen a lost of these key habitats due to settlement, industry, and agriculture/forestry. These areas were targeted as they were close to streams/rivers and they were easy to covert as they didn’t have many trees on them. Today, less than one percent of the land in the Willamette Valley is devoted to wetland prairies and less than three percent to oak habitats.

Many plant and animal species utilize these habitats and due to the decline, many of these species are federally and state listed as being threatened, endangered, or species of concern.

In the Oregon Conservation Strategy (in Linn County), list several areas as Conservation Opportunity Areas for wetland prairies and Oregon White Oak.

Bradshaw’s Lomatium (*Lomatium bradshawii*) is a federally listed plant that utilizes wetland prairie habitats. In Linn County, there are some populations that are hanging on is some pastures or previously

grazed areas. Many of these areas are now becoming overwhelmed by English Hawthorn and there is a risk of loosing Bradshaw’s Lomatium. By targeting these areas , there is a potential for de-listing this species.

Many oak savannahs and woodlands are currently over stocked due to lack of management or for a goal of forestry. Many of these sites need to be thinned to open areas for greater grass and forb diversity and to increase lateral growth on the oak.

It is important to act now on these habitats, so species that use these are not lost forever.

The wetland prairie resource concern has been addressed through the Wetlands Reserve

Program, and the Wetland Reserve Easement will be utilized to address the recovery of Bradshaw’s Lomatium.

Desired Future Condition: Bradshaw’s Lomatium is de-listed and there are healthy oak habitat areas.

Goal: Convert existing pastures that are not good for agriculture production into wetland prairie to aid in the recover of Bradshaw’s Lomatium. Increase known populations that contribute to recovery.

Increase the percentage of Oregon White Oak habitats by one percent in the Willamette Valley.



Upland Prairie

Wet Prairie

Oak Woodlands

These images were taken from the Benton County website: <http://www.co.benton.or.us/parks/pcs/habitat.php>

Strategic Plan for Conservation in Linn County

Section VI. Conservation Implementation Strategies

Linn County Water shed Enhancement

The purpose of the Linn County Watershed Enhancement project is to provide landowners with the opportunity to significantly improve temperature and sediment loads in surrounding rivers and streams through conservation measures to improve habitat for threatened, endangered, and sensitive aquatic species.

The goal of this project is to:

Enhance threatened and endangered species habitat through the adoption and/or increased level of conservation practices on agricultural land in the Thomas Creek, Crabtree Creek, Hamilton Creek, South Santiam, North Santiam, and Willamette sub-watersheds.

The desired outcomes of this implementation plan are defined by two objectives:

Maintain cool water temperatures in rivers and streams to increase habitat for fish and aquatic species by improving shade and reducing water withdrawals. An increase of water in streams will lower the capacity for heating.

Decrease sediment loads and bacteria counts to sustainable levels and habitable for aquatic species by implementing erosion techniques and nutrient management.

Oak Habitat Implementation Strategy:

Oak woodlands and savannas in the Willamette Valley have been radically diminished by urban growth, clearing for agricultural purposes, and vegetative changes due to cessation of the use of fire to control undergrowth. The need to restore oak populations and preserve existing stands has been recognized by Natural Resources Conservation Service (NRCS) and its partners for quite some time.

The goal of this strategic plan is to increase the extent and vigor of oak habitat in Linn, Lane, and Benton Counties through plantings and habitat restoration of 1000 acres within targeted areas by 2017.

Soil Health for Local Markets:

The goal of this Conservation Initiative Strategy (CIS) will be to improve soil health on farms that produce agricultural products for local markets. This will focus on the resource concern of soil quality degradation, specifically organic matter depletion