Strategic Plan for Conservation in Benton County

2015

In cooperation with the following:

Benton County Landowners and Residents

Current and Retired Faculty of Oregon State University

Oregon Watershed Councils

Natural Resources Conservation Service

greenbelt land trust

Benton Soil and Water Conservation District

U.S. Fish and Wildlife Service

Cascade Pacific Resource Conservation + Development
Strategic Plan for Conservation in Benton County

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All photos without credits are from:
http://www.sos.state.or.us/archives/county/cpscenic.html
The 2015 Local Workgroup was held at the Tangent Service Center on Wednesday January 25th. As was done in 2014 this Local Workgroup was a joint Benton/Linn meeting. Both Benton and Linn Counties have similar landscapes and resource concerns. Many representatives of partner organizations cover both Benton and Linn Counties. The Benton and Linn District Conservationists felt that they would have a higher turnout to both meetings by partners if the meetings were combined. There was an excellent turnout at the Tangent field office for the 2015 meeting.

At this meeting NRCS confirmed with partners that the current strategies should continue to be priorities moving into the future. These strategies include: Oak Habitat Restoration, Groundwater Management Area and Soils quality on farms that produce food for local markets. There was very little discussion on expanding to other strategies.

At this meeting, the state up funding for the Environmental Quality Incentives Program was discussed. Due to low funding it was recommended and agreed that partners should look for additional funding to improve and restore oak habitat through the Regional Conservation Partnership Program (RCPP). It was also agreed that the Conservation Stewardship Program would provide incentives to farmers within the Groundwater Management Area to improve Irrigation Water Management and Nutrient Management. Implementing these practices will greatly reduce nitrate infiltration into the shallow aquifer along the Willamette River. The group also agreed that addressing soil quality on local market farms would further conservation in Benton County. Many operators of these small market farms are beginning or historically underserved clients. The need for Conservation Technical Assistance is greatest among this segment of the farming community.

The Benton SWCD is calling a meeting together of partners to draft a proposal for the RCPP program. There is significant interest, and a very diverse partnership coming together to collaborate on this issue.

Outreach will increase for the Conservation Stewardship Program to increase participation in the Groundwater Management Area. The 2015 signup has increased to 6 applications and is anticipated to increase in 2016.
Section I. Introduction

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

1.2 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 Benton County and the State of Oregon.

1.3 Purpose
The purposes of this plan are to improve and conserve the natural resources we depend upon. This plan is specifically intended to increase the participation of various professionals and stakeholders in a collaborative process designed to see resources from a holistic view in order to properly analyze problems and solutions at a landscape level. The landscape in question is Benton County, including the Alsea and Upper Willamette Watersheds. We intent to target specific resource issues within the county and address them with specific actions which will constitute our action plan.

1.4 Participants
Those involved in this plan include natural resource professionals; Natural Resource Conservation Service, Benton County Soil and Water Conservation Service, Oregon Department of Fish and Wildlife, United States Fish and Wildlife Service, Greenbelt Land Trust, Oregon State University faculty and extension staff, Farm Service Agency, Cascade Pacific RC&D, employees of Benton County, Luckiamute Watershed Council, Marys River Watershed Council, Oregon Department of Forestry, and various residents and landowners of the county.

1.5 Time Frame
Beginning in January 2015, this plan will be evaluated annually and amended as needed. It is intended to serve Benton County in conservation for 5 years, until January 2021.
Section II. Natural Resource Inventory

2.1 Natural Resources
To begin the plan for Benton 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.

2.2 Human Resources
Benton County has a unique and diverse population base primarily due to the presence of Oregon State University in Corvallis, Oregon. This institution also provides a resource for research and support in the conservation of Benton County’s natural resources. According to the US Census Bureau the population of Benton County in 2009 was estimated at 82,605, a 5.7% increase from year 2000. With 676.46 square miles this results in 122.1 persons per square mile. When compared, Benton County is above the average persons per square mile in the United States which is 86.8 and of Oregon which is 39.9.

Number of Farms
According to the 2007 Farm Census, Benton County had 907 separate farming operations working 114,558 acres of the 432,934.4 acres of the County, which is 26.4% of the County and 3.6% less than 2002 numbers. The average size of farms in the County was 126 acres, a 12% decrease from 2002.

Farm Income and Crop
In 2007 Benton County sold agricultural products for a total of $74,565,000 and received $342,000 in government payments.
Farm Income and Crop cont.
The following are the top crops grown in Benton County by either acres, head of livestock, or value sold in 2007. Field and grass seed crops ranked 6th and Cut Christmas trees ranked 8th against Counties throughout the United States.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Acres</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field and grass seed crops</td>
<td>39,946</td>
<td>7,843</td>
</tr>
<tr>
<td>Forage</td>
<td>7,605</td>
<td>n/a</td>
</tr>
<tr>
<td>Cut Christmas trees</td>
<td>6,997</td>
<td>4,733</td>
</tr>
<tr>
<td>Vegetables harvested for sale</td>
<td>5,902</td>
<td>3,707</td>
</tr>
<tr>
<td>Wheat for grain</td>
<td>3,615</td>
<td>2,450</td>
</tr>
</tbody>
</table>

Figure 2.23 represents the crops below.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Annual Revenue (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other crops and hay</td>
<td>$26.8</td>
</tr>
<tr>
<td>Vegetables, melons, etc</td>
<td>$13.0</td>
</tr>
<tr>
<td>Cut Christmas trees</td>
<td>$11.3</td>
</tr>
<tr>
<td>Milk and other dairy</td>
<td>$6.8</td>
</tr>
<tr>
<td>Fruits, tree nuts, and berries</td>
<td>$5.3</td>
</tr>
<tr>
<td>Grains, oilseeds, etc</td>
<td>$3.3</td>
</tr>
<tr>
<td>Nursery, greenhouse, etc</td>
<td>$3.0</td>
</tr>
<tr>
<td>Cattle and calves</td>
<td>$2.1</td>
</tr>
<tr>
<td>Other animals</td>
<td>$0.9</td>
</tr>
<tr>
<td>Horses, ponies, etc</td>
<td>$0.8</td>
</tr>
<tr>
<td>Sheep, goats</td>
<td>$0.4</td>
</tr>
</tbody>
</table>

Figure 2.23: The distribution of crop value in Benton County by percent of annual revenue.
Ownership and Land Use
Benton County is characterized by several urban areas including Corvallis, Philomath, North Albany, and Monroe. The majority of the landscape is mountainous woodland and forestland, however a significant amount of farmland is located near the Willamette River which represents the eastern border of the County. (figure 2.24)

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

<table>
<thead>
<tr>
<th>Cover</th>
<th>Percent</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestland</td>
<td>55.6%</td>
<td>240,712</td>
</tr>
<tr>
<td>Farmland</td>
<td>23.4%</td>
<td>101,307</td>
</tr>
<tr>
<td>Urban</td>
<td>10.6%</td>
<td>43,891</td>
</tr>
<tr>
<td>Shrub</td>
<td>6.3%</td>
<td>27,275</td>
</tr>
<tr>
<td>Wetlands</td>
<td>3.7%</td>
<td>16,019</td>
</tr>
</tbody>
</table>
Ownership and Land Use cont.
The majority of farmland in Benton County is considered prime farmland or has the potential to become prime farmland. The County as a whole, however, is dominated by forestland. (Figure 2.35)

The following are values of forestland and timber harvest in Benton County.

<table>
<thead>
<tr>
<th>Forestland Owner</th>
<th>Acres</th>
<th>2008 Owner</th>
<th>Acres</th>
<th>Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Private</td>
<td>159,000</td>
<td>50.1%</td>
<td>87.7%</td>
<td></td>
</tr>
<tr>
<td>BLM</td>
<td>66,000</td>
<td>20.8%</td>
<td>0.9%</td>
<td></td>
</tr>
<tr>
<td>Small Private</td>
<td>46,000</td>
<td>14.5%</td>
<td>5.9%</td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>28,000</td>
<td>8.8%</td>
<td>5.3%</td>
<td></td>
</tr>
<tr>
<td>National Forest</td>
<td>18,000</td>
<td>5.7%</td>
<td>0.06%</td>
<td></td>
</tr>
<tr>
<td>Tribal</td>
<td>0</td>
<td>0.0%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>317,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Ownership and Land Use cont.

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

<table>
<thead>
<tr>
<th>Owner</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>75%</td>
</tr>
<tr>
<td>Federal</td>
<td>19.4%</td>
</tr>
<tr>
<td>State</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private (NI)</td>
<td>227,205</td>
</tr>
<tr>
<td>Private (industrial)</td>
<td>98,649</td>
</tr>
<tr>
<td>BLM</td>
<td>58,180</td>
</tr>
<tr>
<td>State</td>
<td>24,238</td>
</tr>
<tr>
<td>USFS</td>
<td>17,789</td>
</tr>
<tr>
<td>Misc</td>
<td>8,139</td>
</tr>
</tbody>
</table>

Figure 2.26
Ownership in Benton County
Section II. Natural Resource Inventory

2.3 Soils Resources
The soils of Benton County are as follows.
Topography and Terrain
Eastern parts of the County are characterized by floodplain and hydric conditions while northern and western parts are mountainous with occasional valleys and river channels. Elevations in the County range from Mary’s Peak, the highest point, at 4,097 feet in elevation, to Kiger Cutoff, the lowest recorded point, at 194 feet in elevation.

Land Capability Class
The Land Capability Class (LCC) system is designed to show the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. Capability classes are designated by the numbers 1 through 8. The classes are defined as follows (figure 2.33):

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.
Figure 2.34  LC Subclass Map of Benton County

Land Capability Subclass
- Erosion
- Soil limitation within the rooting zone
- Excess water
- Climate condition

Figure 2.33  LCC Map of Benton County

Land Capability Class
- Capability Class - I
- Capability Class - V
- Capability Class - II
- Capability Class - VI
- Capability Class - III
- Capability Class - VII
- Capability Class - IV
- Capability Class - VIII
Land Capability Class (cont.)
In the capability system, soils are generally grouped at three levels-capability class, subclass, and unit. Only class and subclass are included in this data. Subclasses are defined as the following (figure 2.34):

- **Erosion**: "e" shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained.

- **Excess water**: "w" shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage).

- **Soil Limitation**: "s" shows that the soil is limited mainly because it is shallow, droughty, or stony.

- **Climate**: "c" used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

**Hydric Soils**
There are a significant amount of hydric soils along the 99W Highway corridor. This also happens to be where a majority of agricultural production is also found. Approximately 181,360 acres of Benton County soils are hydric or partially hydric which is about 41.9% of it surface area.
Common Resource Area (CRA)
CRA regions are characterized by their geographic location, climate conditions, and vegetative body. The following are CRA’s of Benton County.

1.1 This unit is comprised of mountains that are basalt and are outside of the "fogbelt." The temperature regime is mesic or frigid with small areas that are cryic, and the moisture regime is udic. The vegetation is dominantly Douglas fir and western hemlock.

1.6 This unit is comprised of mountains that are sedimentary rock and are outside of the "fogbelt." The temperature regime is mesic, and the moisture regime is udic. Sitka spruce is typically absent. The dominant vegetation is Douglas fir and western hemlock. This unit includes narrow inland flood plains and terraces.

2.2 This unit is comprised of the flood plain of the Willamette River and its major tributaries. It includes historic riparian areas and areas of intensive row crops. The temperature regime is mesic, and the moisture regime is xeric.

2.3 This unit is comprised of the terraces in the Willamette Valley. The soils are well drained to poorly drained. Land use is variable. The temperature regime is mesic, and the moisture regime is xeric. There are numerous ponded seasonal wetlands.

2.4 This unit is comprised of the foothills of the Willamette Valley. The soils are underlain by basalt and sedimentary bedrock and are typically red and clayey. The vegetation is Douglas-fir and Oregon white oak. The temperature regime is mesic, and the moisture regime is xeric. The unit does not support western hemlock, which is characteristic of the adjacent units in the Coast and Cascade MLRA’s.
Section II. Natural Resource Inventory

2.4 Water Resources

As with other Counties, water is an important resource in Benton County. Annual precipitation values for the County range from 180 inches to 40 inches and change rapidly in the County over short distances. Major rivers of the area, including Mary's River, Alsea River, Oliver Creek, Soap Creek, and Greasy Creek, carry precipitation from West County to either East County and the Willamette River, or westward into Lincoln County.

Watersheds and Streams

Wetland Reserve Program (WRP) easements are found in the County, with 760 acres of WRP and of those, 95 acres are permanently placed, the others are on 30 year easement agreements. The Greenbelt Landtrust has secured 199 acres of conservation land and 203 acres of easement. In all, 1,162 acres of the county are currently out of production with the purpose of resource conservation, which equates to 0.27% of the county. The new Agricultural Conservation Easement Program will be utilized in place of WRP. The Wetland Restoration Easements will continue to be focused in the Muddy Creek Watershed of Benton County.

Figure 2.41 Precipitation of Benton County
Groundwater
The Southern Willamette Groundwater Management Area, which includes Linn, Benton, and Lane counties, is a designated area of high water quality sensitivity and is the focus of conservation efforts.

“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 level above 10 ppm not uncommon.”

http://gwma.oregonstate.edu/background
Irrigation
The Greenberry Irrigation District is a major provider of irrigation water to Benton County. The jurisdiction of the district is south of Mary’s River, just south of Corvallis, until Eureka road, and west of the Willamette River while east of Bellfountian Road. This area is shown in blue in the figure to the right.

In Benton County there are 9 CAFO operations: 5 small, 2 medium, 1 large and 1 State CAFO. These are shown as purple dots in the figure to the right.

In Benton 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.

Figure 2.43
Greenberry Irrigation District and CAFO
In Benton County
County Water Quality
Figure 2.44 shows 303d streams (shown in red) and areas of vulnerable groundwater (in green) in Benton County. These areas are of concern for domestic and agricultural use, as well as aquatic wildlife. All major urban development in Benton County is within these concern areas.

The primary concern facing Benton County streams is high temperatures in the summer months. Both Dixon Creek and Price Creek are listed for flow modification. The seasonal flows on these creeks have been modified due to high water withdrawals.
Section II. Natural Resource Inventory

2.5 Air and Energy

“On June 29, 2009, the Oregon Legislature adopted Senate Bill 528. This bill will prohibit general open field burning in the Willamette Valley starting in 2010. Special hardship or emergency burning of up to 2,000 acres per year can be authorized by the Environmental Quality Commission (EQC) to address “disease outbreak or insect infestation.” Also under the bill, identified species and steep terrain burning is reduced from a maximum of 25,000 to 15,000 acres per year. Other restrictions on stack burning and propane flaming allow this burning to continue at very low levels until 2013, and then none thereafter. Other provisions in SB 528 double the registration and burn fees, and allow for rules to be developed that would prohibit burning in "critical non-burn areas" where there are power transmission lines or other similar concerns.”

http://www.deq.state.or.us/aq/burning/willamette.htm

The Cascade Pacific RC & D not-for-profit organization has an energy program which includes Benton County. This program works in two ways:

1. Improve energy efficiency,
2. Establish renewable energy resources.

The CPRCD energy program can help landowners set objectives, conduct energy audits, seek alternatives, and apply for grants and incentives.
Air Quality

Air quality in Oregon is measured by EPA ratings which range from “Good” to “Hazardous.” Benton County, shown in Red 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 pollution levels on December 10, 2009 in Oregon, some of the highest during the year, the bottom image shows pollution levels on May 4, 2010 in Oregon, some of the lowest during the year.

- **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 II. Natural Resource Inventory

2.6 Plant and Animal Resources

Benton County is very similar to the rest of the Willamette Valley in that historical vegetative populations are rapidly diminishing due to the persistent development of agricultural and urban lands. Oak Savanna and Wet Prairie habitats in particular are a vital part of biotic communities in the county and are vastly disappearing from their once abundant territories. See the next page (image 2.62) for data concerning these vegetative covers under the title of "Herbaceous Prairie".

From the list of Threatened and Endangered species on page 22, nearly all of these species rely on Oak Savanna and Wet Prairie habitat for their survival.
Strategic Plan for Conservation in Benton County

~33.4%
Of the county is now either farmland or developed, and

~47.0%
Of historic vegetation cover still exists today, 3/4 of which is evergreen forest.

Figure 2.62
Historic Vegetation of Benton County

Historic Vegetation
The following is a comparison between present day (2001) and historic (19th century) land cover acres, and percent loss in Benton County during the past 200 years. (see image 2.24 for 2001 map)

<table>
<thead>
<tr>
<th>Land Cover and Color</th>
<th>Present</th>
<th>Historic</th>
<th>Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evergreen Forest</td>
<td>154,801.3</td>
<td>203,118.2</td>
<td>24%</td>
</tr>
<tr>
<td>Hay/Grass</td>
<td>60,846.5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Mixed Forest</td>
<td>59,636.7</td>
<td>32,252.7</td>
<td></td>
</tr>
<tr>
<td>Developed</td>
<td>42,157.9</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Cultivated Crops</td>
<td>40,934.7</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Shrub/Scrub</td>
<td>27,334.0</td>
<td>230.6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Herbaceous Prairie</th>
<th>Present</th>
<th>Historic</th>
<th>Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woody Wetland</td>
<td>17,865.4</td>
<td>171,056.4</td>
<td>90%</td>
</tr>
<tr>
<td>Deciduous Forest</td>
<td>12,944.7</td>
<td>22,087.8</td>
<td>41%</td>
</tr>
<tr>
<td>Barren Land</td>
<td>8,978.0</td>
<td>1,008.2</td>
<td></td>
</tr>
<tr>
<td>Emergent Wetlands</td>
<td>4,135.0</td>
<td>66.5</td>
<td></td>
</tr>
<tr>
<td>Open Water</td>
<td>1,607.9</td>
<td>735</td>
<td></td>
</tr>
</tbody>
</table>

| Evergreen Forest             | 203,118.2 | 154,801.3 | 24%  |
| Mixed Forest                 | 171,056.4 | 60,846.5  |      |
| Shrub/Scrub                  | 230.6     | 59,636.7  |      |
| Woody Wetland                | 22,087.8  | 59,636.7  |      |
| Deciduous Forest             | 1,008.2   | 42,157.9  |      |
| Barren Land                  | 66.5      | 42,157.9  |      |
| Emergent Wetlands            | 735       | 42,157.9  |      |
| Open Water                   | 735       | 59,636.7  |      |

Figure 2.62
Historic Vegetation of Benton County

~33.4%
Of the county is now either farmland or developed, and

~47.0%
Of historic vegetation cover still exists today, 3/4 of which is evergreen forest.
Threatened and Endangered
The following are T&E species in Benton County.

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

Animals
Streaked Horned Lark  Marbled murrelet
Northern spotted owl  Fender’s blue butterfly

Invasive Non-Native
The following are invasive and non-native species found in Benton County.

Plants
Bull Thistle  Canada Thistle
Diffuse knapweed  False brome
Gorse  Giant knotweed
Himalayan blackberry  Japanese knotweed
Lesser celandine  Meadow knapweed
Purple loosestrife  Scotch broom
Spotted knapweed  St. Johnswort
Tansy ragwort

Animals
Bluegill  Brook trout
Brown bullhead  Brown trout
Bullfrog  Carp
Catfish  Crappie
Eastern fox squirrel  Gray squirrel
snapping turtle  European starling
Fathead minnow  Feral pig
Goldfish  Largemouth bass
Norway rat  Nutria
Red eared slider  Shad
Smallmouth bass  Sunfish
Tench  Virginia opossum
Walleye  Yellow bullhead

For more info on these species see
http://www.fws.gov/oregonfwo/Species/Lists/Documents/County/BENTON%20COUNTY.pdf
3.2 Partner Conservation Efforts
Listed in the following paragraphs are each partner’s current and ongoing work. This section will be updated as needed.

Natural Resource Conversation Service
Current NRCS funding is focused on improving oak woodland habitat.

The primary focus of the Environmental Quality Incentives Program is Oak Habitat Restoration and Soil Health on Local Market Farms.

Funding for conservation practices in the Groundwater Management Area will utilize the Conservation Stewardship Program.

Benton Soil and Water Conservation District
The Benton SWCD is focusing on Soil Health Assessments and outreach about opportunities to improve soil health on farms. They are also establishing a Certified Weed Management Area. This is a diverse partnership that includes Federal, State, and Local Governments, Non-profits and local farmers. They provide native plants through an annual sale for the public and cost-share programs for conservation plans.

Oregon Department of Forestry
The ODF works with the Forest Practices Act to make sure that forest managers are compliant. They work on reforestation projects throughout the county and assist forestland owners with riparian buffers, endangered species, and wildfire protection.
Partner Conservation Efforts cont.

Oregon Department of Agriculture
The ODA is educating the public about specific resource concerns, particularly water quality, especially in the GWMA. They suggest to landowners practices that help improve water quality and are currently working on a survey which will outline specific ways to reduce nitrate levels in the GWMA.

Landowners and Farmers
Landowners of Benton County are the primary stewards of the land. They work to reduce invasive species, improve habitat, implement conservation practices, and try to protect natural resources on their property.

Oregon State University Extension
OSU extension staff are holding classes for small acreage landowners to learn about managing their pastures, soil erosion, manure, etc. They have also secured a DEQ grant to improve well water and septic systems in the GWMA. Some of their programs also reach out to new and beginning farmers. They work to create secondary forest products markets with hopes that proceeds can then go towards conservation development, and ecosystem service markets as way of compensation. The master gardener society of extension works with the public in spreading conservation information to the public. They also fight knotweed through the Luckimute Eradication project.

Farm Service Agency
The FSA is working to improve stream bank condition by developing riparian buffers through the CRP program.

Benton County Natural Areas and Parks
Benton County NAP has developed the Companion Prairie Conservation Strategy to enhance endangered habitat including wet prairie and oak savanna. They are also working towards improving water quality issues in the Jackson-Frazier wetlands northeast of Corvallis.

http://www.oregon.gov/ODA/
http://extension.oregonstate.edu/
http://www.co.benton.or.us/parks/
http://www.fsa.usda.gov/
Partner Conservation Efforts cont.
United States Fish and Wildlife Service
The USFWS are partners for the Fish and Wildlife Program and are working to remove invasive species around listed endangered species while helping improve seral stage plant communities that support T&E species including Fender’s Blue Butterfly.

Benton County
County employees work on the EPA Region 10 Riparian Project to support and improve natural areas and wetland function. They are also working on creating and updating an inventory on an improved stream layer data for mapping. They focus on larger water quality issues.

Oregon Department of Fish and Wildlife
The Oregon Conservation Strategy from ODFW provides comprehensive information on the efforts of ODFW and its partners to address natural resource issues in Oregon. It’s foreword states: “The Conservation Strategy is an effort to use the best available science to create a broad vision and conceptual framework for long-term conservation of Oregon’s native fish and wildlife, as well as various invertebrates and native plants...The strategy provides guidance on the types of actions most likely to benefit these species and habitats, and describes a variety of non-regulatory programs that can help landowners and land managers with implementation.”

http://www.dfw.state.or.us/conservationstrategy/
http://www.fws.gov/
Partner Conservation Efforts cont.

Conservation Opportunity Areas are areas identified in the Oregon Department of Fish and Wildlife’s, Conservation Strategy. Conservation Opportunity areas are landscapes where broad fish and wildlife conservation goals could best be met.

Watershed Restoration

The Oregon Watershed Restoration Inventory (OWRI) has recorded over 294,000 (56 miles) feet of river and stream improvements and over 342,000 (65 miles) feet of road improvements, intended to improve fish habitat. As shown on figure 3.22 there are 483 separate projects in the county ranging from in stream to upland restoration.
Section III. Natural Resource Analysis

3.3 Summary of Resource Condition

Benton County is a relatively small county compared to others in Oregon and the Western United States. Compared to its size there are numerous people living here creating resource overuse problems. Over half of the county is forested, about a quarter is farmed, and a quarter is either urban or other. There are several water resources in the county which are of great concern including the groundwater supply and GWMA region, Willamette River, and others. Water quality and quantity are some of the most important issues; non-point pollution is widespread.

Native and historic habitat and species to the county are also a high priority. Oak savanna and wet prairie ecosystems are unique to this region of the world, along with the species that inhabit them.

These unique habitat types are home for many different wildlife and vegetative species which are currently considered endangered and threatened. The loss of this habitat is accompanied by the establishment of many invasive species.

Unfortunately, these unique habitats also end up being some of the most prime and high quality farmland. On many occasions these areas must be tiled and drained in order for conventional crops to be grown there, due to the consistent hydric conditions. Rivers and streams, especially the Willamette, have been channelized and inhibited from performing their natural functions which involve their extensive flood-plains. This causes frequent flooding and overflows of the river banks. Even though there is an abundance of water, the timing of this abundance causes seasonal shortages.

The combined characteristics of dense population and water use with seasonal shortages and flows creates streams and rivers that become dangerously low during summer months, and places increased pressure on aquatic T&E species.

There is a considerable amount of support in the protection and conservation of natural resources in the county. The presence of federal, state, and private conservation organizations and agencies is very apparent. The general public is also supportive of conservation, as they have shown through the abundance of protected natural areas and parks within the county. The Finley Wildlife Refuge, nearly 5,700 acres, and surrounding nature preserves in particular is a significant achievement.
Section III. Natural Resource Analysis

3.4 Resource Concerns Description

Every year, the local resource concerns are evaluated at the Local Workgroup Meeting. The following concerns are current and identified by Benton partners and residents.

Soil Concerns

Inefficient tillage practices
Small acreage issues
Producers lack understanding of soil quality

Current tillage practices in the County allow unnecessary soil erosion to occur. 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.

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 and urban development. The species which rely on this habitat are at great risk of becoming T/E species while those which are have great difficulties in recovery because of the loss of habitat. Wildlife in particular are often harassed by domestic animals as their habitat diminishes.

Water Concerns

Flood plain fragmentation
Inefficient irrigation systems
Wallowette river flow misregulation
Inconsistent stream bank protection
Insufficient water available for irrigation
Soap Creek fish passage/warm water issues
Thornton Lake water quality
Groundwater issues

Historic flood plain territories are fragmented due to farmland and urban development. Many irrigation systems are inefficient and allow excessive evaporation. Also, many landowners over-irrigate. The available amount of water for domestic use, especially irrigation, has steadily been decreasing. Soap Creek has specific fish passage issues and, due to low water levels, has increased water temperature. Thornton Lake suffers from non-point pollution, as well as groundwater throughout the county.

Forest Concerns

Overstocked forests
Invasive species in forestland
Forest Roads

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.

Social Concerns

Affordability of conservation
Need for renewable energy
TMDL regulation failures
Challenges to increase carbon sequestration
Farmers/Ranchers need to tell their story
Educating the public about these issues

It is a concern that many residents of Benton County are motivated to do conservation, but lack proper funding. Renewable energy, particularly wind and solar, are currently unexplored options, mostly due to lack of funding as well. There have been several TMDL failures which resulted in the development of a GWMA which includes Benton County. Proper tillage practices can increase carbon in the soil. Farmers and ranchers know the land best and are trusted by the public, but they don’t have good ways of telling their story. Education especially in the schools is an important step of this process.

Land Use Concerns

Lack of ditch management
Lack of riparian buffers
Land use changes and planning in the future
Unmanaged grazing

There is a lack of buffers and properly managed ditches in the county. Pastureland is often over-grazed. The urban growth boundary and the loss of farmland are concerns for the future.
Section IV. Natural Resource Problems and Desired Future Outcomes

4.1 Holistic View of Problems

The top resource concerns identified by the Strategic Local Planning committee are:

- Lack of Riparian Buffers
- Inefficient Irrigation
- Habitat Fragmentation
- Loss of Rare and Unique Habitats

The lack of riparian buffers is not in itself a resource concern. It is however, a symptom of current and past management strategies and contributes to the degradation of other resource concerns. The major concerns relating to lack of riparian buffers are wildlife habitat and corridors as well as water quality. Most Benton County Streams are listed on the DEQ 303d list for temperature. Riparian buffers would increase shade on the streams and therefore reduce water temperatures. Riparian buffers also contribute to improved water quality by intercepting overland run-off and capturing soil and other contaminants carried by overland flow. Riparian buffers provide wildlife habitat. The buffers themselves provide habitat for a number of wildlife species and act as corridors through agricultural lands to link quality wildlife habitats. All of these concerns are so inter-related that the working group wanted to generalize these concerns and address them by increasing riparian buffers.

Likewise, irrigation efficiency is tied to water quantity, quality, energy and management time. By improving irrigation efficiency water consumption will be reduced, but deep percolation of nutrients will also be reduced. By installing a system that will irrigate an entire field without having to move hose reels or pipe will reduce the amount of time a manager needs to spend irrigating their fields. Energy will be saved and air quality improved by going to a system that is electric rather than running equipment that relies on diesel fuel for energy. Again the local work group wanted to lump these concerns together and address this issue under the umbrella of irrigation efficiency.

Due to development, current and past management, invasive weeds and the lack of fire have severely reduced several key habitat types. These same pressures have caused remaining habitat to be isolated and not connected in a way that allows wildlife movement. Since Rare and Unique Habitats and Habitat Fragmentation are caused by many of the same issues, these were combined when discussing desired future outcomes.
Section IV. Natural Resource Problems and Desired Future Outcomes

4.2 Lack of Riparian Buffers
Many streams and rivers lacking riparian buffers were identified by the planning committee. These streams include: Marys River, Luckiamute River, Beaver Creek, Muddy Creek, Sequoia Creek and Newton Creek. Both Beaver Creek and the Luckiamute River are part of the model watershed program. These watersheds are both the focus of intensive restoration efforts. Both the Marys River Watershed Council and the Luckiamute Watershed Council have identified a number of projects in the model watersheds. The major concern that would be addressed on these rivers and streams are high temperatures for anadromous salmonids and coastal cutthroats.

The Willamette River was also identified as lacking riparian buffers. The City of Corvallis has an interest in lowering the temperature in the Willamette River below their waste treatment plant outlet. During low flow times of the year, the water discharged from the waste treatment raises the temperature of the Willamette River. One of their mitigation strategies is to improve riparian shading on tributaries to the Willamette. Since the Willamette is so large, it is not practical to have a tree canopy over the river. The major benefits to riparian buffers along the Willamette are to filter overland runoff and provide wildlife habitat and corridors. These previously listed watersheds all fall within the Willamette Synthesis areas and are already being focused on by many partners. Two watersheds were identified that have not received the attention of the synthesis areas. These watersheds are the Alsea Watershed and the Long Tom watershed in Benton County. The Long Tom Watershed Council has focused on the Lane County portion of the watershed, but there has not been as much effort on the Benton side of the watershed. The Alsea Watershed Council is now becoming active. There has not been a focus in the Alsea Watershed for restoration. The Alsea River is an important river for salmon and steelhead spawning. The local planning committee recommended outreach efforts in these watersheds to increase restoration efforts.

The Strategic Planning Committee thought that efforts should first be focused in the top of the watershed and work its way downstream. They also thought that the first priority should go toward existing robust efforts. They felt that once some outreach is done in the Long Tom and Alsea watersheds that the focus could shift to these watersheds.

The Planning Committee would like NRCS to first work with the Benton SWCD and local watershed councils to identify existing projects where the Conservation Reserve Enhancement Program (CREP) would provide partner match for projects where grant funding is being sought. Both the Marys River Watershed Council and the Luckiamute Watershed Council have model watersheds. CREP will be focused in the Beaver Creek Model Watershed and the Luckiamute River Model Watershed. Outreach efforts will be focused in the Alsea Watershed and the Long Tom Watershed to increase the awareness of funding opportunities for riparian buffer restoration.

Desired Future Condition: To have functioning riparian buffers that filter runoff, and shades the stream to reduce water temperature. These buffers would act as corridors for wildlife to move through agricultural lands.

Goal: Work with the local SWCD and watershed councils to develop 10 CREP contracts on parcels that are either being restored, or links existing habitat efforts.
Section IV. Natural Resource Problems and Desired Future Outcomes

4.3 Forest Health
During the 2014 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, the 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 Benton 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 fish passage and backing up of water that can 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 forest land.

NRCS also plans to utilize the Conservation Stewardship Program to implement some or all of the above resource concerns.

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 IV. Natural Resource Problems and Desired Future Outcomes

Urbanization- Since the Willamette Valley supports 90% of Oregon’s population, loss of farmland is a significant concern. The Agricultural Land Easements could provide easements that provide long term protection of cropland. The primary focus should be in and around the urban portions of Benton County.

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 loss 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.

The Wetland Restoration Easement Program will be utilized as WRP was in the Muddy Creek Watershed of Benton County.
Strategic Plan for Conservation in Benton County

Section IV. Natural Resource Problems and Desired Future Outcomes

4.3 Inefficient Irrigation Systems

Improving irrigation efficiency will not only save water, but it will also save energy and the land manager’s time. Much of the irrigation in Benton County is being done with wheel lines, hand lines, travelling big guns and old, inefficient pivot systems. Much of the mainline irrigation pipe is leaky above ground pipe that needs to be moved between irrigation applications. Many of these systems are moved from field to field. This takes a lot of time on the part of the land manager.

The manager is required to move, set up, operate and then tear down and move to the next field needing irrigation. It is hard to irrigate all of the fields in a timely manner. Often, fields are irrigated before it is necessary, just because they need to get through all the fields. Some fields are also watered too late. They are both hurting production and increasing infiltration in over irrigated fields. The majority of the irrigated land is in the Valley bottom along the Willamette River. This area is also in the Ground Water Management Area (GWMA). As previously stated, the reason for the GWMA is high nitrates in the ground water. The Planning Committee felt that the GWMA was a good area to focus on improving irrigation efficiency.

The Benton SWCD, the Oregon Department of Agriculture (ODA) and the Oregon Department of Environmental Quality (DEQ) have focused efforts in this area to reduce nitrates in the ground water by addressing nutrient applications and improving irrigation efficiency. NRCS is utilizing the Conservation Stewardship Program to address Inefficient Irrigation Systems.

**Desired Future Condition:** Irrigation systems will be used efficiently, in a way that won’t increase nitrate infiltration into groundwater.

**Goal:** The goal is to reduce the amount of nitrate leaching into groundwater.


Section IV. Natural Resource Problems and Desired Future Outcomes

4.4 Habitat Fragmentation, and Loss
Many habitat types are declining in Benton County. This is due to conversion to other land uses, the lack of fire has caused encroachment of woody species into open habitats, and invasive species have reduced the amount of native plant communities. The planning committee identified several declining habitat types. These include: Oak Savannah and Oak Woodlands, Wet Prairie, Riparian Areas, Ash Swales and Floodplains.

The planning committee recommended focusing on prairie and oak habitats where efforts are under way to improve habitat for the Threatened Fender’s Blue Butterfly. According to the USFWS the only way to delist this species is to link existing remnant butterfly populations.

They are currently trying to link the Wren population with the Lupine Meadows population. The group would like to see grazing used as a tool in enhancing these habitats. All of the declining habitats are disturbance dependant. Due to the lack of fire, this leaves mechanical methods. Extensive mowing and haying is not always practical. Better results can be achieved through proper grazing management. A proper disturbance regime will also help manage invasive weeds, which is also contributing to decline of rare habitats.

**Desired Future Condition:** That habitat stepping stones could link the Cardwell Hills and Wren Fender’s Blue Butterfly populations. Grazing lands could provide some of these stepping stones. If the pastures are rotationally grazed and inter-seeded with nectar plants, the butterflies would be more capable of dispersing.

**Goal:** To improve habitat and connectivity by thinning overstocked oak habitat and seeding understory species that will provide nectar resources.
Section IV. Natural Resource Problems and Desired Future Outcomes

4.5 Loss of Rare and Unique Habitat

The Oregon Department of Fish and Wildlife has identified the land north of Corvallis and Philomath as a Conservation Opportunity Area (COA). This area was also identified as a priority area by The Nature Conservancy due to the existing efforts to promote oak woodlands. It has been identified as a priority area, because of remnant oak habitats as well as land under conservation easements. The Oregon Department of Forestry did some analysis on where species exist that utilize oak habitats. The resulting maps and prioritization complements the COAs and Synthesis areas.

Landowners in this part of the county have shown an interest in addressing forestry concerns. There has been an increased number of landowners applying for Farm Bill Programs from this part of the county. This part of the county has many 40 acre and smaller parcels. These landowners typically have full time jobs off the property. They are requesting help for general forestry plans and oak habitat enhancements.

**Desired Future Condition:** That a network of oak woodlands and savannahs would link together to provide corridors connecting existing habitat restoration efforts.

**Goal:** That restoration would occur on 200 acres of oak woodland and savannahs. This would compliment the current restoration efforts by helping create the historic mosaic pattern of conifer forest, oak woodlands and savannahs.

These images were taken from the Benton County website: http://www.co.benton.or.us/parks/pcs/habitat.php
Section V. Conservation Implementation Strategies

The implementation strategies will address: Habitat Fragmentation and Loss of Rare and Unique Habitat
The lack of riparian buffers will continue to be addressed in coordination with the Benton Soil and Water Conservation District utilizing the Conservation Reserve Enhancement Program.

Irrigation efficiency and high nitrates within the Ground Water Management Area are being addressed through Conservation Stewardship Program Enhancement Activities.

Oak woodlands will be enhanced by removing competing fir and thinning thick stands of oak. These areas may be grazed in order to maintain the open understory associated with historic oak woodland habitat.

Soil Quality on farms producing food for local markets are a priority in Benton County. Many of these farms are operated by beginning farmers and other historically underserved clients. These operations are in particular need for Conservation Technical Assistance.
Oak Habitat Implementation Strategy: Linn, Lane, and Benton Counties

**Problem Statement**

Oak woodlands and savannas in the Willamette Valley have been radically diminished by urban growth, clearing for agricultural purposes, and vegetative changes due to the lack of historic fires. 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 750 acres within targeted areas by 2017.

**Background**

According to the Oregon Department of Fish and Wildlife’s 2006 Conservation Strategy, only seven percent of historic oak woodlands and four percent of oak savanna currently exist in the Willamette Valley. (See Map 1.) This devastation has occurred due to a variety of factors including urban growth, clearing for agricultural purposes, competition with faster growing trees invasive species, and the lack of fire. The Willamette Valley is the most populated region of Oregon, with the vast majority of the land being owned privately. This creates a unique challenge to developing a unified effort toward the preservation and extension of oak habitats.

Oak woodlands in the Willamette Valley are characterized by a diverse population of tree species that is dominated by the presence of oaks: most specifically, Oregon White Oak. The understory is relatively open and allows enough sunlight to accommodate a variety grasses, forbs and shrubs. These woodlands are populated by diverse wildlife, some of which are currently on Oregon’s Sensitive Species list, such as the Western Gray Squirrel, Acorn Woodpecker, and neotropical songbirds. A list of species that utilize oak woodland and savannah habitat has been provided by Nancy Taylor, ODFW. This list can be seen in Attachment A.

Oak savannas, often referred to as upland prairie, are dominated by grasses and forbs, and scattered with large, well-developed white oaks. These trees play a critical role in providing shelter for birds and small animals to nest and rear their young. Much of the historic savanna has been replaced by agricultural crops, leaving any native remnants so isolated and confined that the plants and wildlife species are unable to thrive. Some species, including the endangered Fender’s Blue Butterfly and its host plant, Kincaid’s Lupine (threatened) are precariously near extinction due to habitat loss. The Oregon State Bird, the Western Meadowlark is also in peril.

In 2010, the Benton County Local Work Group identified Rare and Declining Habitat as a priority resource concern along with Habit Connectivity. Oak Habitat was chosen as a priority habitat due to current partner efforts and landowner interest. NRCS developed the focus area with the help of Jim Cathcart at ODF. Jim worked with the Oregon Biodiversity Information Center to develop a list of species that utilize Oak Habitat. Each species was weighted based on how common they are on the landscape. The rare plants and animals were given additional value over the common species. Then utilizing an ODF Database they are using to update their Forest Assessment. They were able to rank 12 digit HUCs based on the relative abundance of identified priority species.
Oak habitat restoration is specifically listed as an issue of concern in the Lane County Strategic Plan. Lane County also has significant interest from landowners and partners to restore oak habitat. The Linn County Strategic Plan is still under development, but the WHIP funding for 2009 and 2010 has gone to Linn County for the highest priority oak habitat restoration in the Upper Willamette Basin.

The depletion of oak woodlands and savannas has continued for too long. It is crucial that focused conservation efforts be increased to reverse this trend. Various agencies and organizations have recognized the need for oak habitat restoration, and are actively working to preserve this important habitat. NRCS has worked cooperatively with these agencies to assist private landowners within project areas to enhance or expand woodlands and upland prairies. Progress has been made in the reclamation of historic oak populations, but has yet to reach a sustainable level.

This implementation strategy will focus on the identified priority areas shown in Map 2 within Linn, Lane and Benton Counties. The Priority Areas are much larger than the potential treatment area. Oak woodlands and savannas existed in a mosaic across the landscape. Approximately 1% of the total area was historically oak woodland or savannah according to historic vegetation maps. The goal is to treat 750 acres of oak woodland habitat in Benton, Linn and Lane Counties by the end of the implementation strategy in 2017. This would make significant progress toward providing necessary habitat for species that depend on this habitat type.

Objectives

In order to restore and expand oak woodlands and savannas, invasive weed species must be suppressed and trees that compete with oaks must be controlled. These tasks will be the focus of implementation plan, with the ultimate intention of revitalizing current oak populations and creating corridors to unite oak habitats that have previously been isolated. This will not only prevent the disappearance of Oregon White Oaks from their historic range, but will improve the prospect of survival for many species that thrive in oak habitats.

Local soil & water conservation districts (SWCD), Watershed Councils, ODFW, ODF and the US Fish and Wildlife (USFW) have all recognized the need for oak habitat restoration. ODFW has identified “conservation opportunity areas” in which restoration would most viable. These Conservation Opportunity areas fall within the priority habitats identified by ODF.

The success of restoration and expansion initiatives can be measured by the number of acres in which oak woodlands and savannas have been improved. NRCS can monitor its own contributions by tracking the acres that are contracted for oak habitat. It will be crucial that NRCS coordinate with partners to document total progress within the targeted conservation opportunity areas.

Alternatives
Three alternatives have been considered in determining the best course of action in regard to oak habitat restoration:

- No action
- Restoration of existing oak populations only
- Restoration combined with re-establishment of oaks in historically populated areas

**No Action**

Oak habitat will continue to decline without a concerted effort to protect it. Other trees and invasive understory species will crowd oaks out, diminishing the diversity of forested areas in the Willamette Valley. Upland prairies will be overtaken by invasive species; as legacy oaks die naturally or are removed, saplings will be choked by thick vegetation and will not reach maturity. The futures of oak habitat and the species that dwell within will be bleak without any intervention.

**Restoration of oak populations (no grazing)**

Oak woodlands and savannas are both disturbance dependent climax plant communities. Due to the steep slopes on much of the oak woodland habitat, mowing is not practical. Likewise, burning is not practical due to high density of rural residential property that commonly is oak habitat.

**Restoration combined with prescribed grazing**

This scenario provides the most advantages of the three alternatives that have been discussed. Not only will it provide for the longevity of existing oak habitat through restoration, but will also expand current oak habitat to create connective corridors amongst isolated woodlands and upland prairies. Diversity of ecosystems in the Willamette Valley will be protected by the propagation of the white oaks that are the foundation of two key habitats in this region. Species that are fading due to restricted habitat will be rejuvenated by their ability to access more territory and co-mingle with others of their kind. Adding grazing to the restoration will provide a disturbance regime that will help control invasive species.

NEPA concerns will need to be evaluated on a site by site basis. Cultural Resource reviews will be done for each site. Due to the number of invasive species that have come to dominate these sites and where they are located on the landscape, it is expected that none of the projects will be in conflict with NEPA concerns.

**Solution**

The proposed solution is for NRCS to cooperate to the greatest extent possible in efforts to preserve and extend oak woodlands and savannas in Linn, Benton, and Lane Counties. These habitats have been identified as being critically diminished and the need for restoration efforts has been copiously documented by NRCS and its partners. The coordination of efforts amongst NRCS and partners, outreach to private landowners in targeted areas, and assistance in restoration projects will be the primary undertakings of this implementation plan.
Once a parcel of land has been identified as a project area, NRCS can provide technical assistance and funding to meet the requirements of that particular property. The majority of existing oak habitat will require forest stand improvement practices (code 666) and conservation cover practices (code 327). If grazing will be utilized then Fence (382), Livestock Pipeline (516), Heavy Use Area (561) and Watering Facility (614) will also be necessary. It is estimated that project costs will be approximately $1500 to $2,000 restoration efforts on their own.

Only parcels with remnant oak habitat will be eligible for restoration cost share.

**Partnerships**

The restoration of oak habitat will require a concerted effort by NRCS and its partners. It will be crucial to develop an organized plan of implementation to ensure the most continuous coverage of the conservation opportunity areas. Through local workgroups and partner meetings, district conservationists from Linn, Benton, and Lane Counties will be able to maintain a network of communication to ensure that NRCS resources are being used effectively toward the strategy goal. In addition to coordination amongst agencies and organizations, efforts to restore oak habitat will be dependent upon information being disseminated to all local landowners within focus areas; it will be critical for them to understand the current plight of oak woodlands and savannas, what they can do to alleviate the situation, and how NRCS and partner agencies can assist them with conservation efforts. Current partners include Soil and Water Conservation Districts, Watershed Councils, US Fish and Wildlife Service and the Oregon Department of Fish and Wildlife.

The Watershed Councils and Soil and Water Conservation Districts are assisting with landowner outreach. The Mary’s River Watershed Council, the Long Tom Watershed Council, North Santiam Watershed Council, South Santiam Watershed Council and Calapooia Watershed Council have specifically targeted Oak Habitat Restoration as a priority for their organizations. The Benton Soil and Water Conservation District is assisting in working with a rural residential neighborhood in North Benton County to coordinate a large scale restoration project with multiple landowners. They are also writing grants for funding oak restoration projects. This will help landowners with the match necessary to restore oak habitat. The Linn SWCD will assist in outreach. The US Fish and Wildlife Service and the Oregon Department of Fish and Wildlife are assisting through Technical Assistance. The USFWS and ODFW often provide equipment and operators to assist in implementing restoration activities.

**Implementation**

There is currently significant interest in enhancing oak habitat. There are experienced planners and contractors ready to implement this strategy, and a lot of interest from the public in enhancing oak habitat restoration. NRCS and partners are meeting with landowners and identifying potential projects. The NRCS State Office is providing assistance to formalize the
outreach plan. This is necessary so that the projects are implemented fairly and equitably across basin demographics.

This implementation will be completed within the next 5 years. It is estimated that the planned improvements will cost $400,000 per year. NRCS and partners will need to continue to meet with interested landowners. This type of habitat is high priority for many partners and all of the necessary technical assistance is available. It is estimated that NRCS will spend approximately 500 hours and partners will provide approximately 100 hours on this project.

Projects are prioritized so that property within the Partner identified Priority Watersheds will rank highest. Then within the opportunity areas, landowners with existing oak enhancement plans and legacy oaks will be top priority.

Local district conservationists will coordinate the restoration efforts within their home counties.

**Progress Evaluation and Monitoring**

Projects will be monitored through established status review procedures. Acres of oak habitat enhancement will be monitored through ProTracts, the Performance Results System and Toolkit. Response to treatments over time will be monitored through partners, such as the Greenbelt Land Trust, who are implementing oak habitat restoration. Partners will be integral in monitoring long term success of restoration projects. The focus areas of this implementation plan were specifically targeted to take advantage of monitoring efforts already occurring in the designated Conservation Opportunity Areas by the USFWS, ODFW and The Nature Conservancy. All of these monitoring efforts combined will provide comprehensive data on the overall progress of Oak Habitat restoration in the basin.

"The U.S. Department of Agriculture (USDA) prohibits discrimination in all of its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, political beliefs, genetic information, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD)."
Map 1

Historic Oak Habitat

Current Oak Habitat

Map 2

Oak Priority Area

Agency: NRCS
Assisted By: T. Snyder

Benton, Lane and Linn Counties

Legend
- BLL_Counties
- Oak Priority Area
List of priority wildlife species associated with oak habitats in Linn, Lane, and Benton Counties

**Birds** (adapted from Altman and Stephens, 2012 and Vesley and Rosenberg 2010)
- Western bluebird
- Chipping sparrow
- Lazuli Bunting
- White breasted nuthatch
- Acorn Woodpecker
- Ash throated flycatcher
- Western wood peewee
- Purple finch
- Purple martin
- Bewick’s Wren
- Black headed grosbeak
- House wren
- Spotted towhee
- Lesser goldfinch
- Bullock’s oriole
- Yellow warbler
- Black throated gray warbler
- Nashville warbler
- Western tanager
- Cassin’s Vireo
- Hutton’s Vireo
- Black capped chickadee
- Bushtit
- Downy woodpecker
- Band tailed pigeons

**Mammals** (BPJ NT and DV)
- Western gray squirrel
- California vole

**Reptiles** (adapted from Vesley and Rosenberg 2010)
- Western Rattlesnake
- Common garter snake
- Northwestern garter snake
- Western territorial garter snake
- Gopher snake
- Sharptail snake
- Ringneck Snake
- Racer
Goal

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 (180-VI-NPPH Part 600.75 Exhibit 6).

Background

The 2007 Ag Census states that, small farms account for 91 percent of all U.S. farms and more than half of the land in farming. Operators of farms with a value of sales between $100,000 and $249,999 were more likely to be full time farmers in contrast to operators who worked off farm that reported sales of less than $10,000. Although farms with sales between $100,000 and $249,999 decreased by 7 percent between 2002 and 2007; these operators were reported to be younger than average. Farms with sales less than $10,000 increased while farms with sales of more than $10,000 decreased. More than half of farms that produced less than $10,000 in sales were beef cattle or “other crop” farms. This category includes hay farms and farms where no single crop comprised more than 50 percent of sales. The increase of small farms with sales less than $10,000 shows an increase in producers that work off farm to supplement their income. Small Farmers are now younger than average and typically work off farm.

This growing trend of small farms in the U.S. is certainly not new for Oregon’s Willamette Valley, which shoulders much of the produce that is synonymous with the Northwest. Environmental awareness, ethics, city life, and love for the great outdoors has fostered a social norm to adopt a demand of local products such as fresh produce, homemade brew, local farmers, and a great obsession with small scale farms. The majority, 57 percent, of direct to consumer sales is from small farms. Benton, Lane, Lincoln, and Linn counties have 91% - 100% farms with sales less than $250,000.

According to the 2007 AgCensus there are 114,337 acres of small farms that were operated by 2674 local market agricultural producers for Benton, Lane, Lincoln, and Linn Counties.
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<tr>
<th>County</th>
<th>Local Market Farms</th>
<th>Acres</th>
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<tr>
<td>Benton</td>
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<td>9,866</td>
</tr>
<tr>
<td>Lane</td>
<td>1,342</td>
<td>59,181</td>
</tr>
<tr>
<td>Lincoln</td>
<td>117</td>
<td>8,887</td>
</tr>
<tr>
<td>Linn</td>
<td>868</td>
<td>36,403</td>
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</table>

These producers in Benton, Lane, Lincoln, and Linn Counties produce agricultural products including fresh produce and meat for direct markets such as produce stands, local restaurants, community-supported agriculture (CSA), farmers markets, and you-pick crop production. Having limited acres to farm, there remains a feasibility dilemma to dedicate acres to soil health and long term agricultural outcomes. Intensive production systems are certainly normal for small farms. These systems are detrimental to soil health and associated resource concerns. Soil health principals describe a suite of practices may be used to reduce soil quality degradation and improve organic matter levels to increase the resilience of our soils for production systems. These soil health practices are compatible or can be readily adopted by most local market producers.

**Problem**

The problem persists in the limited knowledge of the interaction of production systems to organic matter depletion and the way organic matter is critical for improved soil health and sustainability. Many of these agricultural producers utilize aggressive tillage to compensate for not using pesticides, over apply nutrients, and don’t fully grasp the limitations of their land. Our experience has shown that most farmers make a good faith effort to be good stewards of their land. However, because limited knowledge of soil health, many practices are simply cultural norms of the farming community and not correctly adopted or understood.

**Objectives**

The objective of this CIS would be to provide producers on farms that produce agricultural products to local markets in Benton, Lane, Lincoln, and Linn Counties (see attachment 6). There will be a suite of practices to encourage the incorporation of practices such as: cover crops, crop rotation, proper grazing management, agricultural buffers, reduce weed infestation, increase biodiversity, and soil quality testing (see attachment 5 - OR340-2014-2, 3.1). Incorporating a 2-3 year perennial cover into a crop rotation or improving pasture diversity and introducing the concept of improving soil microbiology may be a somewhat new approach for landowners, but one that has the potential to be very beneficial to agricultural lands and applicable to local markets. Long term sustainable agriculture is in the best interest of producers and consumers in achieving our mission, “helping people, help the land”.

Working with partners, appropriate low cost soil quality testing methods available to these producers would include the Solvita CO2 Burst Test (see attachment 1), Soil Quality Assessment (see attachment 2), Willamette Valley Soil Quality Card (see attachment 3), and potentially the Soil Heath Rapid Assessment Tool (SHRAT). The SHRAT is currently being developed by the NRCS Kellogg Laboratory in Lincoln, Nebraska and Oregon NRCS is planning on piloting the tool in 2015. All of these tools will assist in collecting baseline data for the farm and also show the progress of implementing soil health practices on the farm.
Alternatives

1) **No action**
If nothing is done on these farms soil quality degradation, specifically organic matter depletion will continue and lead to additional resource concerns such as water quality.

2) **Adoption of limited practices on cropland**
Landowners would adopt a few practices to increase soil organic matter on cropland, but would not address additional resource concerns on pastureland. The potential for these sites could remain low if producers continue intensively cropping and not implementing a full soil health management system. Without having a good understanding of the interaction of soil health principals, their soil limitations, and soil capabilities; cultural adoptions of continuous cropping or practices that deplete soil organic matter would lead to a decrease in microbial activity and overall poor soil health.

3) **Incentivize the adoption of practices that are beneficial for the long term**
This alternative would be to install a soil health management system to reduce soil quality degradation and increase organic matter on cropland and pastureland. Real results will come through adopting a suite of practices such as cover cropping, grazing management, and crop rotation. This alternative would increase plant diversity, encourage year round living roots in the soil, reduce soil disturbance, and maintain cover.

Proposed Solution and Actions
The farms that we are focusing on are highly diverse and often have cropland and pastureland that utilizes farm bi-products as part of their on-farm nutrient cycling (See attachment 5 OR340-2014-2, 3.i). Alternative three will be selected to fully address improving soil organic matter in systems that utilize farm bi-products as part of their nutrient cycling.

The first step of the process will be to conduct some baseline inventory of microbial activity. Baseline inventories will be compared to reference sites after practices are adopted by participants. The assumption right now is that there will be some key soil health attributes that will be in a poorer condition on intensively cropped land and overgrazed pastures. The selection of alternative (#3 above) will result in the implementation of a soil health management system that will reduce soil quality degradation and improve organic matter on both cropland and pastureland.

It is estimated that the total cost would be $750K over five years, $150K per year, $15K per project, and NRCS technical assistance (TA) full-time equivalent would be $200K for the life of this CIS.

The solution will be a suite of practices that increase soil organic matter to reduce soil degradation. Increasing soil organic matter has far reaching effects and serves to improve the plant community, will reduce the establishment and growth of invasive plants, improve carbon sequestration, improve wildlife habitat by incorporating more palatable species, increase infiltration rates by increasing organic matter in the soil profile, and improve overall plant productivity.

Practices will include:
1. Cover Crop (340)
2. Fence (382)
3. Nutrient Management (590)
4. Prescribed Grazing (528)
5. Conservation Cover (327)
6. Conservation Crop Rotation (328)
7. Irrigation Water Management (449)
8. Water Facility (614), Livestock Pipeline (516)
9. Micro-irrigation (441), Irrigation Pipeline (430)
10. Composting Facility (317)/Waste Storage Facility(313)
   - Roofs and Covers (367)
   - Roof Runoff Structure (558)
   - Underground Outlet (620)
11. Comprehensive Nutrient Management Plan (102)
12. Forage and Biomass Planting (512)
13. Hedgerow (422)
14. Seasonal High Tunnel for Crops (798)

**NEPA Concerns**

NEPA concerns will need to be evaluated on a site by site basis. Cultural Resource reviews will be done for each site. Due to the historical and continued disturbance on cropland in this strategy area, it is expected that none of the projects will be in conflict with NEPA concerns.

**Partnerships and other Funding Sources**

We have engaged multiple partners for the development and funding of this CIS. See the table below of partners and assistance provided.

<table>
<thead>
<tr>
<th>Partner Name</th>
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<th>Financial Assistance</th>
<th>Description</th>
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<tr>
<td>Benton SWCD</td>
<td>$5,000</td>
<td>$10,000</td>
<td>Soil Assessment, Outreach</td>
</tr>
<tr>
<td>Upper Willamette SWCD</td>
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<td>$40,000</td>
<td>Small Grants, Outreach</td>
</tr>
<tr>
<td>Lincoln SWCD</td>
<td>$1,000</td>
<td>$40,000</td>
<td>Small Grants, Outreach</td>
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<tr>
<td>Linn SWCD</td>
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<td>Review of Water Right</td>
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<td>OSU Extension</td>
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<td>Farm Planning Assistance, Outreach</td>
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<td>Oregon State University</td>
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<td>$2,500</td>
<td>Handling Samples, Lab Space</td>
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<td>Cascade Pacific RC&amp;D</td>
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<td>Outreach</td>
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<td>Plant Material Center</td>
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<td>Cover Crop Presentation, Hedgerow</td>
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<tr>
<td>Oregon NRCS State Office</td>
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<td>Soil Assessment, Outreach</td>
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<td><strong>Total</strong></td>
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**Implementation**

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<td>2018</td>
<td>10 - 15</td>
</tr>
<tr>
<td>2019</td>
<td>7 - 10</td>
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</table>

Work with producers to implement soil health practices for projects in Linn, Lane, Lincoln, and Benton Counties. The initial steps of implementing this CIS will be to gather baseline data through appropriate soil quality testing methods on cropland before soil health practices are adopted; to educate landowners about new and emerging soil health principles, to work with landowners to implement these soil health practices, and then measure the outcomes of these adoptions. Soil samples will be taken by landowners, submitted to the local NRCS offices, and will then be mailed to the Portland State Office, Att: Ron Raney. In order to measure outcomes, soil samples will undergo
Solvita Burst test in the lab as the primary soil quality testing method and be supported by the Willamette Valley Soil Quality Card to collect the baseline biological activity levels. This test measures Carbon dioxide (CO₂), which is an indicator of biological activity levels in the soil. Greater biological activity translates to a more robust soil food web and greater organic matter in the soil which is determined by measuring the amount of CO₂ in the soil. At the end of the implementation period another Willamette Valley Soil Quality Card and Solvita Burst Test will be conducted to compare to baseline data. In addition to the Solvita Burst Test and Willamette Valley Soil Quality Card, a Soil Quality Assessment will be encouraged for producers to increase their knowledge of their soil capabilities and limitations. One of our partners, Benton Soil Water and Conservation District (SWCD), offers this assessment at a greatly reduced cost in partnership with Oregon State University. Producers will be educated through conservation technical assistance (CTA) provided by NRCS and partners.

Education and outreach will be completed for the length of the strategy. Education will be provided by OSU extension and SWCD’s. Outreach will be conducted by NRCS and the partners listed above through workshops, events, producer meetings, flyers, one-on-one, and peer to peer contact.

Each project will be ranked based the opportunity for improving soil organic matter content. See attached funding pool request screening and ranking criteria.

As stated above, NRCS will remain the primary agency leading this effort. Therefore, FO staff will work directly with the landowners on the projects, providing oversight and on the ground monitoring of implementation.

**Outreach**

By utilizing the Oregon Farm Direct website [www.mydirectoregonfarm.org](http://www.mydirectoregonfarm.org), a directory of farmers markets, roadside stands, and farm stands (see attachment 7), this directory for Benton, Lane, Lincoln, and Linn Counties has the potential to target outreach to many limited farmers/ranchers, veteran farmers, beginning farmers/ranchers, disability farmers, and non-traditional farmers/ranchers.

**Progress Evaluation and Monitoring**

Success of individual projects will be measured by the baseline microbial activity and Willamette Valley Soil Quality Card score before and after comparison. Projects will be contracted in Protracts and progress will be tracked through certification of practices in Toolkit/Protracts/PRS.

The CIS outcomes will be measured by comparing the soil organic matter depletion on agricultural fields before a conservation practice is applied and after it has been adopted. We are targeting a 5% increase in soil biological activity. Were a lack of soil activity indicates the soil health has not improved, an increase in the amount of soil microbial activity indicates a positive correlation to soil health. The Field Office staff will work with Ron Raney, Soil Data Quality Specialist to process soil samples for the Solvita Burst Test.

NRCS will work with producers to help make discussions based on the baseline data from soil test and the Willamette Valley Soil Quality Card. These results will be compiled and shared with the local working group meetings which include producers and participants in the strategy. These results will be compiled and shared with the local working group meeting that producers and partners will be participants of. Each project will be evaluated by the different local working groups and landowners will remain anonymous. Testing progress will report to these local work groups who will review and help to modify when appropriate. Monitoring will be done by NRCS and participants.

<table>
<thead>
<tr>
<th>Author:</th>
<th>Wallace Jennings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewers:</td>
<td>Nathan Adelman, Tom Burnham, Thomas Snyder, Kate Danks, Erin Kurtz, Emily Fife</td>
</tr>
<tr>
<td>Technical Reviewers:</td>
<td>Cory Owens, Jim Regan-Vienop, Ron Rainey, Chris Reidy, Denise Troxell</td>
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</table>
Solvita CO2-Burst Test

The Solvita® soil test, utilizing the CO2-Burst method, is a convenient, standard way of quantifying the microbiological community of a given soil sample at a given point in time. The Solvita® CO2-burst method uses a standard quantity of soil and measures its respiration under uniform soil moisture and standard laboratory conditions. The amount of CO2 respired by the soil microbes in 24 hours reflects the microbiological activity of the sample, and because the standardizing conditions, allows the activity to be compared to other soils, or compared to soils from a single site through time. Table 1 in the Solvita® Soil Manual describes how the Solvita® Color Number correlates with respired CO2, potential N-mineralization, the soil condition, and soil microbial biomass C (Solvita®, 2013). High numbers are correlated with high biological activity, while low numbers are correlated with low activity.

C mineralization

The CO2-burst method directly measures the amount of CO2 released by soil microbes following the release of nutrients that occurs after sieving, drying, and rewetting. Soil respiration can reflect two key properties of the soil sample:

1) The size or activity of the microbial community. A larger microbial community is more likely to respire a greater amount of CO2. A small, but highly active microbial community, may also have high rates of CO2 evolved.

2) The amount readily-available soil C. Often, readily available food sources or nutrients are the limiting factor in microbial growth and activity. A small community of microorganisms can grow and respire CO2 if there is a plentiful supply of easily degradable soil C.

These two properties are closely related to one another. However, they reflect different characteristics of the soil environment. Therefore, knowing either the size of the microbial community in a soil sample, or knowing the total amount of soil organic C, and coupling these measures with the CO2 burst can help identify which of these two factors your respiration measurement reflects. In numerous studies, CO2 burst respiration has been strongly correlated with the total size of the soil microbial population.

What it reveals

The soil microbial community can be considered a part of the total soil C pool. Because they are alive, they are considered “active C pool”—they convert other soil C into CO2, and they degrade organic residues and carry out other important chemical transformations such as mineralizing N from organic residues. However, the amount of C contained in the microbial biomass is usually only <1 to 4% of the total soil C pool (Brookes 2001). Because it is a small and active part of the soil C pool, it changes more quickly in response to environmental changes than do the total C or N pools. For this reason, understanding and monitoring changes to the soil microbial community can help assess the effects of environmental or land use changes, and detect detrimental impacts early on. A healthily sized microbial population can help release N from soil organic matter at a rate that minimizes the need for fertilizer application.

Shortcomings

Since the test is measured over 24 hours, it reflects only the active, fast-cycling C pool. It does not necessarily reflect basal or long-term rates of soil respiration. Slow growing or slow-acting microbes’ activity will not be reflected as strongly in the measurement. It is also important to be aware that the process of preparing soils for measurement (drying, sieving, and re-wetting) can alter the soil microbial community. It has been shown that sieved, dried, and rewetted soils tend to release more CO2 than soils that have not been dried and rewetted, due to a flush of released nutrients (Fierer and Schimel, 2003). This flush of nutrients has also been shown to result in changes to the bacterial community in the soil sample that does not reflect the undisturbed bacterial community (Thomson et al. 2010). These changes indicate that CO2-burst results may not reflect actual organic matter mineralization dynamics in the field.
N mineralization

A component of soil organic matter is N. As organic matter is mineralized by the microbial community, a portion of that N is released in plant available forms. A large or active microbial community will mineralize a greater fraction of this N, potentially reducing the need for additional fertilizer application. Thus, the amount of N released is positively correlated with the amount of mineralized CO$_2$. However, the efficiency with which microbes mineralize N decreases as CO$_2$ mineralization increases. In other words, high CO$_2$ will mean more N is released, but that N is also mineralized less efficiently.

Many other factors will affect N release from your soil. Both soil properties and climate indicators can affect the amount of N mineralized. Soil sand and clay percentages, the amount of soil organic C and N, the C:N ratio of the soil, soil pH, and mean annual temperature and precipitation all impact the amount of mineralized N. It has been suggested that both soil physical and chemical properties as well as climatic factors be taken into consideration when trying to predict N mineralization (Dessureault-Rompré et al., 2010). Different land management practices can also affect the pool size of available N.

Conclusions

High CO$_2$-burst respiration indicates a large, active pool of soil C. This large, active pool is often associated with a large soil microbial population. Thus, variations in CO$_2$-burst respiration related to differences in the microbial community and the soil organic C pools, which can in turn reflect the impacts of environmental factors of land management. While many factors affect C and N mineralization rates in the field, a large soil microbial community is correlated with releasing greater amounts of N, reducing the need for additional fertilizer application. The relative amount of N released can be estimated from the amount of mineralized C, but will vary depending on soil physical and chemical factors, climate, and land management.

It is important to remember that because soil microbes are living things, their numbers, activity, and species composition may vary through time due to factors such as season, time of day, soil moisture, ambient temperature, tillage, and many other factors. Even the process of drying soils for measurement has shown to affect microbial community composition. Amounts of C and N mineralized in laboratory tests may not represent accurate field mineralization rates. Tracking these changes in moisture, temperature, and management practices over time will help account for variation in your CO$_2$-burst reading, as well as mineralized C and N.

Resources


Solvita® 2013. Soil CO$_2$ Respiration Test Solvita® Official Guide. Woods End Laboratories Inc. PO Box 297, Mt Vernon ME 04352 USA

Soil Quality Assessment
Refer to SGP Sample Collection and Handling Guide. See S100.

 Fill in completed form and soil sample to:
OSU Central Analytical Lab, 3079 Ag Life Science Bldg., Corvallis, OR 97331-7306
For more information: email cmatts@hortsci.oregonstate.edu; call 541-737-7208

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Please complete 10-year management table on other side.

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<th>FIELD MANAGEMENT AND CROP HISTORY: use codes at bottom of page to fill in table.</th>
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| Crop |
| Soil disturbance |
| Amendments |
| ELU Blueberries |
| BDS Bed shaper |
| BPM Black plastic mulch |
| BRS Braratoes, crucifers |
| CHP Chisel plow |
| CML Compost - leaf |
| CMB Christmas trees |
| DSL Drop line spreader |
| CML Compost - manure |
| -50% Cover crop, 1-25% legumes |
| HQ Hand hoe |
| CMV Compost - woody |
| >50% Cover crop, >25% legumes |
| HSP Hand spade |
| CMO Compost - on-site |
| 1.5-50% legumes |
| HSR Harrow |
| CMO Compost - municipal |
| 0 < 1.5% legumes |
| MSCP Mincro sprayer |
| MTC Mulch |
# Willamette Valley

## Soil Quality Card

The soil quality assessment card was developed by farmers in collaboration with the Natural Resources Conservation Service (NRCS), local soil and water conservation districts, and Oregon State University (OSU). It is a locally adapted field tool for farmers, educators, and agricultural support professionals such as soil conservationists, extension agents, or agriculture industry personnel.

Regular use will allow you to assess current soil quality conditions, record changes in soil quality, and compare fields and management practices. The card is most effective when filled out by the same person over time. It provides you with a qualitative assessment of the soil. Evaluation scores do not represent absolute measures or values. Use the card in more than one spot in your field to obtain a more representative assessment.

The Willamette Valley Soil Quality Card Guide was developed as a companion to this card. It includes detailed information about each indicator listed on the card. The guide also contains techniques for making further judgment about each factor.

The Willamette Valley Soil Quality Card (EM-1711, 8.5x11, 22g) and the Willamette Valley Soil Quality Card Guide (EM-1710) are available from your local OSU Extension Service, NRCS, or Soil and Water Conservation District office, or from Extension & Station Communications, Oregon State University, 432 Kerr Administration, Corvallis, OR 97331-2219 (phone: 541-737-2513). Please call for current prices.

### Suggested Assessment Calendar

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Before planting</th>
<th>Spring</th>
<th>Active crop growth</th>
<th>Summer</th>
<th>Fall</th>
<th>Late fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Soil structure and tilth</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>2. Compacted layers</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>3. Waterlogged</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>4. Soil organic matter</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>5. Soil fertility</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>6. Plant residues</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>7. Soil moisture</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>8. Water infiltration</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

Management, crop, and climatic factors determine the optimum time of soil quality assessment. The assessment times in this card are appropriate for the Willamette Valley of western Oregon.

### How to use the card

1. **Date, location, crop, year of planting**, and soil moisture level in the field. Select 1-5 representation spots in the field.
2. Use a shovel or a wire flag to probe the soil. Note each indicator on a scale from 1 to 10. Refer to the rating guide to determine the score for each indicator.
3. Record your observations. Review and evaluate your scoring.
4. On the basic page, revise your current management practices. Record ideas for changes in management that you will implement as a result of your assessment.

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### Willamette Valley Soil Quality Card

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Rating</th>
<th>Observations</th>
<th>Prepared</th>
<th>Year of planting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does the soil have good structure and tilth?</td>
<td>5</td>
<td>Clayey, peaty, mucky, or sticky</td>
<td>1</td>
<td>2023</td>
</tr>
<tr>
<td>2. Is the soil free of compacted layers?</td>
<td>3</td>
<td>Hardpan, finished</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3. Is the soil wetted easily?</td>
<td>4</td>
<td>Moist</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4. Is the soil full of living organisms?</td>
<td>6</td>
<td>Little or no observable soil life</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5. Are earthworms abundant in the soil?</td>
<td>2</td>
<td>No earthworms</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6. Is plant residues present and decomposing?</td>
<td>7</td>
<td>No residue or not decomposing for long periods</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7. Do roots extend beyond healthy and vigorous?</td>
<td>9</td>
<td>Healthy, vigorous, and uniformly growing plants</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>8. Do plant roots appear healthy and vigorous?</td>
<td>10</td>
<td>Healthy, vigorously, and uniformly growing plants</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9. Does water infiltrate quickly?</td>
<td>1</td>
<td>Water covers surface for long periods after rain</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10. Is water available for plant growth?</td>
<td>2</td>
<td>Moisture</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
## Soil Quality Assessment

### Cover Crop

**Cropland Farmer 1:**

1. The applicant has had a contract terminated due to non-compliance within the last 5 years, or the applicant has an existing contract out of compliance.
   - **Screening Priority:** Low Priority
   - **Answer (Circle Answer):** Yes No

2. The applicant has an existing contract that has been modified 3 or more times to reschedule practices and/or to extend the contract length.
   - **Screening Priority:** Low Priority
   - **Answer (Circle Answer):** Yes No

3. The applicant has cropland or pasture land that sells agricultural products via local markets.
   - **Screening Priority:** Medium Priority
   - **Answer (Circle Answer):** Yes No

4. The applicant agrees to install a soil building practice on the farm with an EQIP project and sells agricultural products within 15 miles of local markets.
   - **Screening Priority:** High Priority
   - **Answer (Circle Answer):** Yes No

5. Application is for a Conservation Activity Plan and sells agricultural products within 15 miles of local markets.
   - **Screening Priority:** High Priority
   - **Answer (Circle Answer):** Yes No

### Ranking Questions

1. Is this project a CAP? Do not answer any other questions.
   - **Ranking Points:** 450

2. Will the participant install a soil building practices? (answer 2 OR 3)
   - **Ranking Points:** 100

3. Will the participant install 2 or more soil building practices? (answer 2 OR 3)
   - **Ranking Points:** 250

4. Will the participant incorporate a diverse perennial mix including grasses and two or more flowering plants into the non-cropland?
   - **Ranking Points:** 50

5. Will the participant incorporate a season long cover crop into the crop rotation?
   - **Ranking Points:** 50

6. Will the participant install conservation crop rotation on the farm?
   - **Ranking Points:** 50

7. Will the participant complete a soil quality assessment on the farm within the first year?
   - **Ranking Points:** 50

Soil building practices are activities that improve the soil organic matter such as: cover crop, forage, no-till, conservation cover, conservation crop rotation, nutrient management, and prescribed grazing.

### Examples:

<table>
<thead>
<tr>
<th>Pasture Farmer 1:</th>
<th>Pasture Farmer 2:</th>
<th>Pasture Farmer 3:</th>
<th>Pasture Farmer 4:</th>
<th>Cropland/Pasture Farmer 1:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescribed Grazing</td>
<td>Prescribed Grazing</td>
<td>Prescribed Grazing</td>
<td>Prescribed Grazing,</td>
<td>Prescribed Grazing</td>
</tr>
<tr>
<td>Fence</td>
<td>Nutrient Management</td>
<td>Nutrient Management</td>
<td>Nutrient Management,</td>
<td>Fence</td>
</tr>
<tr>
<td>Water facility/Pipeline</td>
<td>Fence</td>
<td>Fence</td>
<td>Fence</td>
<td>Fence</td>
</tr>
<tr>
<td>Soil Quality Assessment</td>
<td>Water facility/Pipeline</td>
<td>Water facility/Pipeline</td>
<td>Water facility/Pipeline</td>
<td>Water facility/Pipeline</td>
</tr>
<tr>
<td></td>
<td>Forage/biomass planting</td>
<td>Forage/biomass planting</td>
<td>Forage/biomass planting</td>
<td>Forage/biomass planting</td>
</tr>
<tr>
<td></td>
<td>(with diverse mix)</td>
<td>(with diverse mix)</td>
<td>(with diverse mix)</td>
<td>(with diverse mix)</td>
</tr>
<tr>
<td></td>
<td>Soil Quality Assessment</td>
<td>Soil Quality Assessment</td>
<td>Soil Quality Assessment</td>
<td>Soil Quality Assessment</td>
</tr>
</tbody>
</table>

**Points:** 150

### Cropland Farmer 1:

<table>
<thead>
<tr>
<th>Pasture Farmer 1:</th>
<th>Pasture Farmer 2:</th>
<th>Pasture Farmer 3:</th>
<th>Pasture Farmer 4:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover Crop</td>
<td>Cover Crop</td>
<td>Cover Crop</td>
<td>Cover Crop</td>
</tr>
<tr>
<td>Soil Quality Assessment</td>
<td>Nutrient Management</td>
<td>Nutrient Management</td>
<td>Nutrient Management</td>
</tr>
<tr>
<td></td>
<td>Soil Quality Assessment</td>
<td>Conservation Crop Rotation- (2 years Perennial Rotation)</td>
<td>Conservation Crop Rotation- (2 years Perennial Rotation)</td>
</tr>
</tbody>
</table>

**Points:** 150

### Cropland Farmer 2:

<table>
<thead>
<tr>
<th>Pasture Farmer 1:</th>
<th>Pasture Farmer 2:</th>
<th>Pasture Farmer 3:</th>
<th>Pasture Farmer 4:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover Crop</td>
<td>Cover Crop</td>
<td>Cover Crop</td>
<td>Cover Crop</td>
</tr>
<tr>
<td>Soil Quality Assessment</td>
<td>Nutrient Management</td>
<td>Nutrient Management</td>
<td>Nutrient Management</td>
</tr>
<tr>
<td></td>
<td>Soil Quality Assessment</td>
<td>Conservation Crop Rotation- (2 years Perennial Rotation)</td>
<td>Conservation Crop Rotation- (2 years Perennial Rotation)</td>
</tr>
</tbody>
</table>

**Points:** 150

### Cropland Farmer 3:

<table>
<thead>
<tr>
<th>Pasture Farmer 1:</th>
<th>Pasture Farmer 2:</th>
<th>Pasture Farmer 3:</th>
<th>Pasture Farmer 4:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover Crop</td>
<td>Cover Crop</td>
<td>Cover Crop</td>
<td>Cover Crop</td>
</tr>
<tr>
<td>Soil Quality Assessment</td>
<td>Nutrient Management</td>
<td>Nutrient Management</td>
<td>Nutrient Management</td>
</tr>
<tr>
<td></td>
<td>Soil Quality Assessment</td>
<td>Conservation Crop Rotation- (2 years Perennial Rotation)</td>
<td>Conservation Crop Rotation- (2 years Perennial Rotation)</td>
</tr>
</tbody>
</table>

**Points:** 150

### Cropland Farmer 4:

<table>
<thead>
<tr>
<th>Pasture Farmer 1:</th>
<th>Pasture Farmer 2:</th>
<th>Pasture Farmer 3:</th>
<th>Pasture Farmer 4:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover Crop</td>
<td>Cover Crop</td>
<td>Cover Crop</td>
<td>Cover Crop</td>
</tr>
<tr>
<td>Soil Quality Assessment</td>
<td>Nutrient Management</td>
<td>Nutrient Management</td>
<td>Nutrient Management</td>
</tr>
<tr>
<td></td>
<td>Soil Quality Assessment</td>
<td>Conservation Crop Rotation- (2 years Perennial Rotation)</td>
<td>Conservation Crop Rotation- (2 years Perennial Rotation)</td>
</tr>
</tbody>
</table>

**Points:** 150

### Cropland Farmer 5:

<table>
<thead>
<tr>
<th>Pasture Farmer 1:</th>
<th>Pasture Farmer 2:</th>
<th>Pasture Farmer 3:</th>
<th>Pasture Farmer 4:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover Crop</td>
<td>Cover Crop</td>
<td>Cover Crop</td>
<td>Cover Crop</td>
</tr>
<tr>
<td>Soil Quality Assessment</td>
<td>Nutrient Management</td>
<td>Nutrient Management</td>
<td>Nutrient Management</td>
</tr>
<tr>
<td></td>
<td>Soil Quality Assessment</td>
<td>Conservation Crop Rotation- (2 years Perennial Rotation)</td>
<td>Conservation Crop Rotation- (2 years Perennial Rotation)</td>
</tr>
</tbody>
</table>

**Points:** 150

### Cropland Farmer 6:

<table>
<thead>
<tr>
<th>Pasture Farmer 1:</th>
<th>Pasture Farmer 2:</th>
<th>Pasture Farmer 3:</th>
<th>Pasture Farmer 4:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover Crop</td>
<td>Cover Crop</td>
<td>Cover Crop</td>
<td>Cover Crop</td>
</tr>
<tr>
<td>Soil Quality Assessment</td>
<td>Nutrient Management</td>
<td>Nutrient Management</td>
<td>Nutrient Management</td>
</tr>
<tr>
<td></td>
<td>Soil Quality Assessment</td>
<td>Conservation Crop Rotation- (2 years Perennial Rotation)</td>
<td>Conservation Crop Rotation- (2 years Perennial Rotation)</td>
</tr>
</tbody>
</table>

**Points:** 150
Date: January 14, 2014

OREGON BULLETIN NO. OR 340-2014-2

SUBJECT: SPA – Conservation Implementation Strategy (CIS) Planning

PURPOSE: To provide guidance on CIS planning for Soil Health Management Systems and Noxious/Invasive weeds.

EXPIRATION DATE: September 31, 2014

ACTION REQUIRED: Incorporate guidance materials into planning for all CIS related to Soil Health or Noxious/Invasive weeds.

Two resource issues that are important in Oregon are 1) addressing Noxious/Invasive plants and 2) incorporating Soil Health Management Systems into our work. The Leadership Team has developed guidance to incorporate these resource issues into our CIS planning and implementation.

The following guidance is broken up into two sections. The first is guidance on Noxious/Invasive plants and the second focuses on Soil Health. Along with this guidance there are good examples of CIS that address these resource issues. They are all located on the SAC SharePoint - go to the folder and most recent fiscal year to find the latest documents.

**Guidance for CIS addressing ‘Noxious/Invasives’ (Degraded Plant Condition - Excessive Pest Pressure)**

Conservation Implementation Strategies (CIS’s) with the Primary Resource Concern as “Degraded Plant Condition – Excessive Plant Pest Pressure”

- The specific species targeted must be listed in the CIS.
- All the species must be on ODA’s Noxious Weed A or B list.
- The CIS should explain how and why the target species was identified as a priority.
  - ODA maintains a T list, which consists of A and B listed species which have been identified as ODA target species for prevention and control.
  - If species identified in the CIS are not on the T list, then they need to be identified as a priority under another local process (such as the County Noxious Weed List or by the local Cooperative Weed Management Area CWMA).
- An adequate inventory must already exist or must be identified as a specific, early action item within the CIS. An adequate inventory is one that maps the extent and level of invasion over a defined geographic area.
- An Operations and Maintenance (O&M) plan must be included that demonstrates how the species will be effectively controlled into the future over the focus area. This should include:
An explanation of how the proposed treatment will achieve an adequate level of control. The plan should consider treatment method(s), number and timing of treatments, etc.

An explanation of what rehabilitation will take place to restore a healthy plant community. This may include seeding desirable vegetation, natural recovery, grazing rest or deferment, prescribed grazing, etc.

If there are sub-areas within the priority area that will not be treated (such as public lands), include an explanation of what measures will be taken to prevent reinestation of treated areas. The plan should consider road closures, cleaning stations, quarantine areas, scouting and treatment along boundaries and roads, etc.

An explanation of on-going management and maintenance for treated areas should be included. The plan should consider monitoring, spot treatments, grazing management, etc.

CIS’s addressing plant species which may be considered invasive, but which are not listed on the ODA Noxious Weed List may not use “Degraded Plant Condition – Excessive Plant Pest Pressure” as the primary resource concern. In addition, no CIS may use “Degraded Plant Condition – Undesirable Plant Productivity and Health” as the primary resource concern.

○ Consider using one of the following Primary Resource Concerns:
  - Degraded Plant Condition – Inadequate structure and composition
  - Inadequate Habitat for Fish and Wildlife – Habitat degradation
  - Soil Erosion – Sheet, rill and wind erosion
  - Water Quality Degradation – Excessive sediment in surface waters

**Guidance for Integrating Soil Health Management Systems into CIS’s**

The Soil Health Steering Committee and the Leadership Team have created an overall vision in order to advance Oregon to the forefront of the national soil health movement. Over the next few years we hope to better understand the various soil health management system options here in Oregon. We will need to tailor these systems so we can help effectively solve resource concerns across our diverse cropping systems and land uses.

The Soil Health Steering Committee has been gathering ideas and feedback by talking with field offices across the state on all aspects of soil health and specifically asking how we can integrate soil health management systems into the Strategic Approach to Conservation process. The most crucial piece for many DC’s and field offices is to identify (and help fund) a few innovative cropland growers or pasture managers willing to implement higher degrees of conservation tillage or use soil-building cover crops as part of a system. For other DC’s, the biggest issue is to understand how soil health management system concepts can be applied on range and forest land. The challenge for all DC’s is how to do this within our SAC process.

Fortunately, some offices have already creatively and strategically incorporated soil health management systems into their county long range plans and CIS’s. Though some are just now beginning to take applications, we have already begun to learn from these planning efforts and have examples to share in this guidance.


1) For existing CIS’s

   a. Use the renewal process to determine if incorporating a soil health management systems approach will help achieve the CIS goals. DC’s should work with Basin Team Leaders to evaluate if any of these changes affect the scope of the CIS enough to require a higher level leadership team review.

   i. One option is to add soil health management system practices such as cover crops or reduced tillage as a funded practice to more fully address the priority resource concerns. For example, this could directly address resource concerns such as Water Quality – Sediment in Surface Water or Water Quality – Nutrients in Groundwater.
ii. Another option is to consider adding a related resource concern and associated practices to a CIS. For example, Soil Quality – Organic Matter Degradation and cover crops could be added to a CIS that now has Water Quality – Sediments as a resource concern.

2) For new CIS’s

a. Directly incorporate soil health management system practices into a new CIS as either primary or secondary concerns.

b. There are examples of CIS’s that have used a soil health management system approach and practices to address:

   i. Soil Quality – Organic Matter Depletion
      1. Grant County Soil Heath on Abandoned Dry Land Crop fields
      2. Mid-Columbia Soil Health Management Systems

   ii. Water Quality – Sediment in Surface Water
      1. Blackjack Butte Water Quality Improvement
      2. Brandy/Pudding River NWQI

   iii. Air Quality – Greenhouse Gas Reduction
      1. Tualatin Basin Greenhouse Gas Reduction

3) Additional clarification

   i. Small geographic focus areas need not be the only method of targeting limited funds and strategically addressing resource concerns. For example, a specific crop type or land use may be a valid approach for targeting the CIS.

   ii. CIS’s do not have a specific limit on the number of practices as long as there is adequate justification of the need to fund each of them. The Portfolio Database can be expanded to go beyond 20 practices. Justification for going beyond 20 practices is required to assist the Oregon SAC in meeting its commitment to avoid practice creep.

   iii. In the Portfolio Database there is a check box for ‘Soil Health’. In addition to incorporating the approach into the CIS discussion, check this box to help identify this as a Soil Health CIS.

   iv. Under the Organic/Transition to Organic Initiative we have funded many soil health management system practices, such as Conservation Crop Rotation, Cover Crops and Mulching. Continue to incorporate these innovative systems into the Organic and Transition to Organic conservation plans and contracts.

   v. New basin-wide or multi-county soil health CIS’s may be desirable but should be targeted towards a crop type, rotation or management system, soil series, or other similar focused situation in which realistic outcomes can be demonstrated in 1, 2 3 or, at most 5 years with appropriate funding.

   vi. We recognize that an important aspect of the soil health movement is social change and that targeted education and outreach efforts (that is, marketing through demonstrations, field days, and relationship building) is vital to the success of the soil health movement in your area as well as the success of any CIS with soil health integrated with it. The Soil Health Steering Committee is committed to providing assistance, as appropriate, with these types of activities.

   vii. To monitor and evaluate the progress of soil health related practices tangible, measurable and visibly beneficially outcomes may include, but are not limited to:

      1. Changes in soil organic matter
      2. Changes in tillage practices
      3. Soil health visual assessment (e.g., Willamette Valley Soil Quality Card)
      4. The soil conditioning index
      5. Soil food web analysis
      6. Changes in crop rotation

Soil health management systems can be used to address many resource concerns. If incorporating these systems will support reaching the outcomes identified in your county long range plan then it makes sense to
invest in them. As with all our CIS’s it is important to recognize funding is limited and locally prioritizing efforts will remain an important part of managing your investment portfolio.

The Leadership Team, Soil Health Steering Committee (which includes your Basin Soil Health leads) and Technical Team are available to assist in integrating soil health management systems into the CIS planning process. Please contact us as soon as possible for assistance in developing or revising CIS’s for FY15 and beyond.

Please contact the State Office technical and planning staff for assistance in developing and updating CIS’s.

/signed/

RONALD ALVARADO
State Conservationist cc via

website:

https://nrcs.sc.egov.usda.gov/west/or/bulletins/default.aspx
The goal of this Conservation Implementation 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 (180-VI-NPFF Part 600.75 Exhibit 6). The focus area will be within 1.5 miles of Local Markets. NRCS is focusing on small farms which are highly diversified and produce for Local Markets.
<table>
<thead>
<tr>
<th>County</th>
<th>City</th>
<th>Name</th>
<th>Address</th>
<th>Dates/Hours of Operation</th>
<th>Contact name/ Telephone #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benton</td>
<td>Albany</td>
<td>Midway Farms</td>
<td>6980 NW Hwy 20</td>
<td>March 01 – Sept.30 Fri &amp; Sat: 10AM - 6PM Sun: 10AM - 5PM</td>
<td>Cynthia Kapple 541-740-6141</td>
</tr>
<tr>
<td>Benton</td>
<td>Corvallis</td>
<td>Beene Farm</td>
<td>2755 SE 3rd</td>
<td>June 04 – Oct. 29 Tuesday &amp; Friday 4pm – 7pm</td>
<td>Luke Beene 541-761-9448</td>
</tr>
<tr>
<td>Benton</td>
<td>Corvallis</td>
<td>Blueberry Meadows</td>
<td>3860 NE Hwy 20</td>
<td>July 01 – Aug. 31 Monday – Sunday: 8AM - 7pm</td>
<td>Lynn Thompson 541-753-2614</td>
</tr>
<tr>
<td>Benton</td>
<td>Corvallis</td>
<td>Saturday Farmers Market</td>
<td>1st &amp; Jackson</td>
<td>April 19 – Nov. 22 Saturday 9AM – 1PM</td>
<td>Rebecca Landis 541-740-1542</td>
</tr>
<tr>
<td>Benton</td>
<td>Corvallis</td>
<td>Wednesday Farmers Market</td>
<td>1st &amp; Jackson</td>
<td>April 19 – Nov. 22 Wednesday 9AM – 1PM</td>
<td>Rebecca Landis 541-740-1542</td>
</tr>
<tr>
<td>Benton</td>
<td>Corvallis</td>
<td>David Family Farm Inc.</td>
<td>4380 NW Hwy 20</td>
<td>May 01 – Dec. 22 Monday – Sunday 9AM- 6PM</td>
<td>Russell Davis 541-752-0697</td>
</tr>
<tr>
<td>Benton</td>
<td>Corvallis</td>
<td>Red Hat Melon/Melon Shack</td>
<td>Hwy 20 at Garden Ave.</td>
<td>Aug. 01 – Oct.31 Mon. – Fr. 11AM – 7PM Saturday 10AM – 6PM Sunday 11AM – 6PM</td>
<td>Mike Hessel 541-207-6010</td>
</tr>
<tr>
<td>Benton</td>
<td>Corvallis</td>
<td>Sunbow Farm</td>
<td>6910 5W Plymouth Dr.</td>
<td>Jan. 01 – Dec. 31 Monday – Friday 9AM – 5PM</td>
<td>Harry MacCormack 541-929-5782</td>
</tr>
<tr>
<td>Benton</td>
<td>Corvallis</td>
<td>Territorial Road Orchard</td>
<td>5570 5W 3rd St</td>
<td>Aug. 08 – 28 Friday 5:30PM – 8PM Sunday 1PM – 6PM</td>
<td>Larry Landis 541-224-4447</td>
</tr>
<tr>
<td>Benton</td>
<td>Corvallis</td>
<td>Tweedt’s Willamatteadale Farms Inc</td>
<td>2015 NE Seavy Ave</td>
<td>June 01 – Oct. 31 Mon. – Sat. 8:30AM – 7PM</td>
<td>Homer Tweedt 541-757-7814</td>
</tr>
<tr>
<td>Benton</td>
<td>Corvallis</td>
<td>Wilt Farm - Sunset Valley Organics</td>
<td>31567 Hwy 99 W</td>
<td>June 15 – Sept. 01 Monday – Sunday 9AM – 6PM</td>
<td>Diane Wilt 541-752-0460</td>
</tr>
<tr>
<td>Benton</td>
<td>Monroe</td>
<td>My Pharm</td>
<td>Call for hours/availability 541-424-2233</td>
<td>Jan. 01 – December 31 Saturday 9AM – 1PM</td>
<td>Julia Sunkler 541-424-2233</td>
</tr>
<tr>
<td>Benton</td>
<td>Philomath</td>
<td>Gathering Together Farm</td>
<td>25159 Grange Hall Rd.</td>
<td>Feb. 28 – Nov. 16 Tuesday – Friday 9AM – 6PM Saturday 9AM – 5PM</td>
<td>John Eveland 541-929-4270</td>
</tr>
<tr>
<td>Benton</td>
<td>Philomath</td>
<td>Shep’s M-T-Fine</td>
<td>521-A N 19th St</td>
<td>Sept. 15 – Nov. 03 Saturday 9AM – 1PM</td>
<td>Shepard Smith 541-231-3225</td>
</tr>
<tr>
<td>Lane</td>
<td>Cottage Grove</td>
<td>Friday Growers Market</td>
<td>90 S. 10th Street</td>
<td>Jan. 01 – Dec. 31 Friday 1PM - 7PM</td>
<td>Scott Burgwin 541-337-7684</td>
</tr>
<tr>
<td>Lane</td>
<td>Cottage Grove</td>
<td>Monday Growers Market</td>
<td>90 S. 10th Street</td>
<td>Jan. 01 – Dec. 31 Monday 11AM – 6PM</td>
<td>Scott Burgwin 541-337-7684</td>
</tr>
<tr>
<td>Lane</td>
<td>Cottage Grove</td>
<td>Saturday Growers Market</td>
<td>90 S. 10th Street</td>
<td>Friday 1PM - 7PM Saturday 11AM – 6PM</td>
<td>Scott Burgwin 541-337-7684</td>
</tr>
<tr>
<td>Lane</td>
<td>Cottage Grove</td>
<td>Wednesday Growers Market</td>
<td>90 S. 10th Street</td>
<td>Jan. 01 – Dec. 31 Wednesday 11AM – 6PM</td>
<td>Scott Burgwin 541-337-7684</td>
</tr>
<tr>
<td>Lane</td>
<td>Cottage Grove</td>
<td>Eden Valley Farm</td>
<td>77698 Mosby Creek Rd.</td>
<td>June 01 – Aug. 31 Mon. - Sat. 9AM - 5PM</td>
<td>Laura Berdeen 541-942-2216</td>
</tr>
<tr>
<td>Lane</td>
<td>Cottage Grove</td>
<td>Hoelburg Winzle Farm</td>
<td>12th &amp; E Main St</td>
<td>Jan. 01 - Dec. 31 Saturday 9AM - 6PM</td>
<td>Scott Burgwin 541-337-7684</td>
</tr>
<tr>
<td>Lane</td>
<td>Cottage Grove</td>
<td>Patton’s Country Gardens</td>
<td>80432 Delight Valley School Rd.</td>
<td>July 01 - Oct. 31 Tues. – Sat. 10AM - 5PM Sunday 12PM - 5PM</td>
<td>Donna Patton 541-942-7672</td>
</tr>
<tr>
<td>Lane</td>
<td>Cottage Grove</td>
<td>Shady Oaks</td>
<td>77380 Hwy 99 S</td>
<td>April 01 – Oct. 31 Mon. - Sat. 10AM - 5:30PM Sunday 12PM - 5:30PM</td>
<td>Cindy Lentz 541-942-5004</td>
</tr>
<tr>
<td>Lane</td>
<td>Cottage Grove</td>
<td>Sweet Things by Arlene</td>
<td>77561 Hwy 99 South</td>
<td>April 25 – Oct. 15 Fri. &amp; Sat. 12PM - 6PM</td>
<td>Arlene Taddei 541-767-0993</td>
</tr>
<tr>
<td>Lane</td>
<td>Creswell</td>
<td>CK Farm</td>
<td>64 West Oregon Ave</td>
<td>May 06 – Oct. 28 Tuesday 4PM - 6PM</td>
<td>Craig Leonard 541-914-9675</td>
</tr>
<tr>
<td>Lane</td>
<td>Creswell</td>
<td>Creswell Blueberries</td>
<td>34030 Orchard Ave</td>
<td>July 14 - Oct. 01 Mon. – Sun. 8AM - 6PM</td>
<td>Nancy Kizer 541-895-8907</td>
</tr>
<tr>
<td>Lane</td>
<td>Creswell</td>
<td>Hansen’s Coast Fork Farms</td>
<td>82735 Sears Rd</td>
<td>June 16 - Sept. 30</td>
<td>Don Hansen</td>
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Lane Creswell  Ramblin Ewe Farms/ Ziniker Orchard  33912 Ziniker Ln  Mon.– Sat. 9AM - 5PM  541-895-3082
Lane Eugene  Coburg Hillview Farm  91662 N Coburg Rd  Tues. – Sun. 10AM - 6PM  26  Vaughn Bispham  541-895-5180
Lane Eugene  Johnson Vegetable Farms  89733 Armitage Rd  Mon. – Sat. 10AM - 6PM  28  Walt Johnson  541-343-9594
Lane Eugene  Lane Community College Learning Garden  Produce Stand  4000 E 20th Ave.  April 01 – Oct. 01 Tues. & Wed. 10 AM -2PM  29  Julie Sheen  541-463-5899
Lane Eugene  Lane County Saturday Farmers’ Market  8th & Oak St  Mon. – Sat. 9AM - 3PM  30  Carrie Swarts  541-431-4923
Lane Eugene  Lane County Thursday Farmers’ Market  295 E 5th St  Thursday 2PM - 6PM  31  Carrie Swarts  541-431-4923
Lane Eugene  Lane County Tuesday Farmers' Market  8th & Oak St  Tuesday 10AM - 3PM  32  Carrie Swarts  541-431-4923
Lane Eugene  Me & Moore  34137 Seavey Loop  Mon. – Sat. 9AM - 6PM  33  Mary Moore  541-741-4790
Lane Eugene  R Harvest Farms  3835 W. 11th Ave  Mon. – Sat. 10AM - 6PM  34  Rhonda Harwood-Schafer  541-343-8523
Lane Eugene  Rachel Marcotte  86013 Loraine Hwy  Saturday 10AM - 2PM  35  Rachel Marcotte  206-841-8799
Lane Eugene  Royal Blueberries  28718 Royal Ave  Mon. – Sat. 9AM - 5PM  36  Norma Grier  541-689-1836
Lane Eugene  Winter Green Farm  Emmaus Lutheran Church  July 15 - Aug. 20 Wednesday 2PM - 6PM  37  Jack Gray  541-743-3366
Lane Eugene  Apodaca’s Farm & Nursery  1751 12th St.  April 01 - Nov. 01 Mon. – Sat. 10AM - 6PM  39  Diana Apodaca  541-337-7323
Lane Eugene  Greenfields Farm  310 Hwy 101  May 24 - Oct. 25 Saturday 10AM - 2PM  40  Maria Yager  541-902-8815
Lane Eugene  Peerless Produce LLC  2630 Hwy 101 (lot of mini pet mart)  July 15 - Oct. 30 Tues. 9AM - 3PM  41  James Lee  541-643-6789
Lane Eugene  Quail Ridge Farm  Quail Ridge Farm Boardwalk @ Old Town  July 06 -Oct. 31 Fri. – Sun. 8AM – 7PM  42  Doug Lewis  925-628-3699
Lane Eugene  Bush’s Fern View Farms LLC  90536 Territorial Rd  Mon. – Sat. 9AM - 6PM  43  Dwayne Bush  541-935-6362
Lane Eugene  Hentze Farm  30045 Hentze Ln  Mon.- Sun. 9AM – 6PM  44  Gordon Hentze  541-998-8944
Lane Eugene  Lone Pine Farms LTD  91909 River Rd  April 23 - Oct. 31 Mon. – Sun. 9AM - 7PM  45  Denise Garner  541-688-4389
Lane Eugene  Thistedown Farm  91455 River Rd  April 15 - Nov. 02 Mon. – Sat. 9AM - 6PM  46  Pamela Henderson  541-689-2019
Lane Eugene  Leaburg  McKenzie River Farms  44382 McKenzie Hwy  Jan. 01 – Dec. 31 Mon. – Sun. 9AM – 6PM  47  Jack Richardson  541-896-3928
Lane Eugene  Leaburg  The Blueberry Patch Farm  89849 Greenwood Dr  July 05 - Sept. 01 Mon. - Sat. 9AM-6PM Sunday 9AM - 2PM  48  Dave Cole  541-896-3746
Lane Eugene  Noti  Apodaca’s Farm & Nursery  Call for hours and availability April 01 - Nov. 01  49  Diana Apodaca 541-337-7323
Lane Springfield  Joe Cantrell Farm  35263 Brabham Rd  Mon. – Sat. 8AM - 6PM  50  Joe Cantrell  541-747-8920
Lane Springfield  Apodaca  Apodaca’s Farm & Nursery  6898 Main St  April 01 - Nov. 01 Tues. – Sat. 10AM - 6PM  51  Diana Apodaca 541-337-7323
Lane Springfield  Food For Lane County Youth Farm  Riverbend Produce Stand  3311 River Bend Drive  June 05 - Oct. 30 Thursday 2PM - 6PM  52  Jen Anonia  541-343-2822
Lane Springfield  Food For Lane County Youth Farm  Produce Stand 705 Flamingo Ave  June 07 - Oct. 30 Saturday 10AM - 2PM  53  Jen Anonia  541-343-2822
Lane Springfield  Herrick Farms  88088 Millican Rd  May 01 - Dec. 20 Mon. – Sun. 9AM - 6PM  54  Paula Herrick  541-741-1046
Lane Springfield  Marketplace@Sprout!  212 Main St  May 02 - April 24 Wednesday 12PM - 4PM Friday 3PM - 7PM  55  Kevin Hillman  541-345-7106
Lane Springfield  Transition Garden Project - Springfield Public School  212 Main St  May 02 - April 24 Wednesday 12PM - 4PM  55  Kevin Hillman  541-345-7106
<table>
<thead>
<tr>
<th>Lane</th>
<th>Veneta</th>
<th>Saturn Farm</th>
<th>The Village Table 24983 Dunham Ave</th>
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<td>Lane</td>
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<td>May 07 - Sept. 27</td>
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<td>Rain Forest Mushroom Co</td>
<td>Hwy 101, Lincoln City Cultural Cntr.</td>
<td>11021 SE Hwy 20</td>
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<td>Lincoln City</td>
<td>Anna's Falls</td>
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<td>Barking Dog Farms</td>
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<td>Farmer John’s Strawberry Patch</td>
<td>Old Strawberry Farm</td>
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<td>Willamina</td>
<td>Schindler Farms</td>
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<td>Lincoln</td>
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<td>Seeds of Oregon – Kauffman Farms</td>
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<td>Albany Helping Hands Garden</td>
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<td>Bose Family Farm LLC</td>
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<td>Lebanon</td>
<td>Berkey’s Blueberries</td>
<td>32589 Berlin Rd</td>
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<td>Cherry Acres - McAllister’s</td>
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<td>Fry Road Produce</td>
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<td>Springbank Farm</td>
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<td>Lebanon</td>
<td>Sunflower Hill Farm</td>
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<td>Linn</td>
<td>Lebanon</td>
<td>The Mushroomery</td>
<td>Call for more information</td>
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<td>Linn</td>
<td>Scio</td>
<td>Queener Fruit Farm</td>
<td>40385 Queener Dr</td>
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</table>
| Linn  | Shedd         | Peoria Garlic Farm     | 29751 Peoria Rd  | Mon. – Sat. 10AM - 5:30PM | 85 | 503-769-8965 | May 15 – Nov.24  
|       |               |                        |                  | Mon - Fri. 11AM - 6PM  
|       |               |                        |                  | Wed. & Sat. 4PM - 7:30PM | 86 | Bill Phillips  
|       | Sweet Home    | Earl’s Eggs & Produce  | 40681 Hwy 228    | Aug. 01 - Oct. 31  
|       |               |                        |                  | Mon. – Sun. 7AM - 7PM | 87 | Earl Kelso 541-367-7309 | 
| Linn  | Sweet Home    | Sweet Home Farmers     | 28580 Pleasant Valley Rd | June 07 - Sept. 27  
|       |               | Market                 |                  | Saturday 10AM - 2PM | 88 | Janice Neilson  
|       |               |                        |                  |                     |   | 541-401-2678 |
Upper Willamette
Ground Water Management Area
Conservation Implementation Strategy

Goal Statement: In 2004 portions of the Southern Willamette Valley was declared a Ground Water Management Area (GWMA) by the Department of Environmental Quality (DEQ). The goal of this implementation strategy is to reduce nitrate infiltration, from agricultural land, in the Southern Willamette Valley GWMA.
Overview/ Background Information

In 2004 the DEQ declared the Southern Willamette Valley GWMA. Recent studies have determined that many wells in the Southern Willamette Valley (SWV) have nitrate levels higher than 7ppm. This high level of nitrate in the ground water triggers extensive testing, by DEQ, to determine the extent of the problem. DEQ established a local committee made up of affected citizens and other interested parties and has implements extensive testing to determine the extend of the problem as required by law. A network of sampling wells have been installed along the Willamette River to measure ground water nitrate levels during different times of the year.

The sampling results show that nitrate levels frequently fluctuate seasonally, depending on rainfall levels. Typically, spring sampling, following the winter rains shows higher levels of nitrate. However, at some locations, the start of irrigation is correlated with higher nitrate levels. There are many potential sources of nitrate in the SWV. Potential point and non-point sources of nitrate pollution in the Southern Willamette Valley are found across land use sectors in the region and include:

- Fertilizers
- Animal waste
- Septic systems
- Wastewater

The Willamette Valley is one of Oregon’s fastest growing regions and depends heavily on groundwater for private wells, public drinking water, irrigation, industrial operations, and other beneficial uses. The GWMA is comprised of approximately 230 square miles of land within the SWV. The GWMA boundary begins on the
northern edge of the Eugene/Springfield metropolitan area, the second largest city in the state of Oregon, and extends 50 miles north, just beyond the city of Corvallis. The GWMA encompasses the 100-year Willamette River floodplain and a number of tributaries that flow into the Willamette River. The area includes portions of Lane, Linn, and Benton counties, including the cities of Harrisburg, Junction City, Coburg, Monroe, and a small portion of Corvallis.

There are approximately 21,200 residents in the GWMA, 80 percent of which rely solely on groundwater for their drinking water supply. Approximately 12,500 residents live in urban areas and get their drinking water from public water systems, many of which use groundwater sources. There are also several small public water system wells that serve GWMA residents living outside of municipal areas. Virtually all of the estimated 8,700 residents living within the GWMA, who are not served by a public water system, use groundwater from household wells. The Lane County portion of the GWMA is the most heavily populated with half of all GWMA residents and nearly 60 percent of all rural residents. In-home water treatment systems can be very costly. In addition to removing nitrate, treatment systems may also remove many beneficial minerals that people need. Nitrate in the groundwater causes health risks, but so does filtered water. Beyond assisting the agricultural community, this strategy will benefit the entire rural population within the GWMA.

Non-point sources of nitrate can come from fertilizers used by homeowners, commercial and industrial businesses, farmers, and city and county parks. The actual use of a fertilizer is not necessarily a practice that will contribute nitrate to the groundwater. Rather, it is the amount, timing, frequency and type of fertilizer, as well as the timing of irrigation and precipitation relative to the application of fertilizers that can cause nitrate to be flushed beyond the root zone.

While all of these sources contribute to high groundwater nitrate levels in the GWMA, fertilizer use is the largest most widespread potential source of nitrate. This would lead one to believe that fertilizer on agricultural land is a significant contributor to nitrate concerns.

Right now there is some exciting action taking place in the GWMA. The Benton Soil and Water Conservation District (SWCD), Linn SWCD, Upper Willamette SWCD, Oregon Department of Agriculture (ODA), DEQ, Environmental Protection Agency (EPA) and the Natural Resources Conservation Service (NRCS) are working together to implement vadose zone testing that is currently being funded by a Regionally Applied Research Effort (RARE) grant through the Environmental Protection Agency (EPA). The grant has paid to install lysimeters on multiple farms to determine the amount of nitrate infiltration beyond the root zone. The collection of the samples is being paid for by an Oregon Department of Agriculture (ODA) fertilizer grant. The samples are being analyzed by the DEQ lab. This effort is being led by the Benton SWCD. Linn SWCD, Upper Willamette SWCD and NRCS are members of an advisory committee overseeing the implementation of the grant. As part of these grants, outreach has already begun through workshops hosted by the Benton SWCD. The first workshop was held in May of 2013 in partnership with the NRCS Plant Materials Center. It highlighted cover crop trials and soil health. The use of cover crops is one of the practices recommended to reduce nitrate leaching to groundwater. Another workshop was held in March 2014. The focus of this workshop was irrigation water management. Bill Cronin, NRCS irrigation engineer, presented to a group of farmers and field reps for local fertilizer companies about the importance of managing water in a way that does not leach nutrients beyond the root zone.
There is significant interest amongst local farmers to better manage their fertilizer inputs. Almost all of the farm families in the GWMA are drinking from groundwater. Nobody wants to create a situation that is dangerous to them and their loved ones. They are also concerned about ever increasing input costs. Right now there is momentum being generated by a large partnership which includes outreach strategies that will reach the target audience for this implementation strategy.

Goals and Objectives

The goal of this CIS is to build on the current momentum in the GWMA and aid in adoption of management practices that will reduce nitrate leaching. From conversations with early adoptors, there is anecdotal evidence that the cost savings of reduced nutrient applications more than offset the additional cost of sampling and custom nutrient application. USDA Farm Bill Programs would aid in wider adoption of precision farming methods by reducing the perceived risk of changing management strategies.

The desired future condition is that the GWMA status would be rescinded because local producers have addressed high nitrate concerns, preventing further restrictions placed by DEQ.

There are 111,350 acres of agricultural land in the GWMA. Of those acres, a third are probably ineligible due to wetland conversion. If 20% of the total agland was using high level management practices, they would become more widely adopted across all types of operations regardless of eligibility for Farm Bill Programs. Farmers are more credible with other farmers than anybody else. If NRCS can encourage adoption of practices that pay for themselves regardless of cost share it is anticipated that this suite of practices will become widely adopted. The primary objective of this CIS is to address nutrient management and irrigation water management efficiencies on 20% of the total area (about 20,000 acres).

Alternatives

The GWMA Committee was formed in 2004. Their actions have been focused toward education and outreach activities. They partner with OSU Extension to set up booths at local events to evaluate water samples that people bring in. There has also been quarterly GWMA meetings since that time. Other than outreach and education, quarterly meetings, development of an action plan, the installation of monitoring wells and ongoing DEQ monitoring, no significant actions have taken place on agricultural land. No entities have tried to offer agricultural producers incentives to change how they manage their nutrients.

NRCS has looked at alternatives that include addressing livestock operations in the GWMA, irrigation systems and no action. Livestock is a potential source of nitrate. There are not many livestock operations in the GWMA because land values are so high. The dairies in the GWMA use limited pasture and primarily import feed. The manure is land applied both onsite and on neighboring fields. There are a few large dairies in the GWMA, but it is not a significant part of the landuse. Livestock operations are certainly a contributor, but are not the primary source of nitrate.

It would be good to be able to address irrigation systems. A lot of the irrigation is being done with large travelling guns. Producers are watering at less than optimal times because of limited equipment. By the time they get to the end of their irrigation schedule, they are already behind. Improving irrigation systems would reduce nitrate infiltration, but without additional funding sources, such as the Regional Conservation
Partners Program, it is not practical to focus on systems with the limited program dollars currently being allocated.

Other than education, outreach, and monitoring, no action is essentially what is occurring now. No granting or cost share organization, other than NRCS, has funds to give farmers as an incentive to change their practices. The current trend of nitrate levels is in a gradual downward direction. Without further efforts, reducing nitrate in the GWMA has been and will continue to be a slow process.

There are some exciting changes in how some farmers are managing their nutrients. A handful of farmers in the GWMA are using precision application methods, which identify portions of the fields that produce low yields due to soil restrictions. Fertilizer applications are focused on land that has the potential to uptake the applied nutrients. Gravelly areas in the fields are skipped because these areas are also direct conduits to ground water. Growers are just now beginning to look at soil moisture monitoring. Better understanding soil moisture at different levels in the root zone will help producers better understand when to irrigate so that nutrients are not being leached through the root zone.

### Proposed Solution and Actions

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<tr>
<th>Proposed EQIP Practices</th>
<th>Additional practices with RCPP</th>
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<td>Conservation Crop Rotation (328)</td>
<td>Irrigation Conveyance Pipeline (430)</td>
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<td>Cover Crops (342)</td>
<td>Irrigation System Sprinkler (442)</td>
</tr>
<tr>
<td>Nutrient Management (590)</td>
<td>Irrigation System Micro (447)</td>
</tr>
<tr>
<td>Irrigation Water Management (449)</td>
<td></td>
</tr>
</tbody>
</table>

Due to current funding sources the chosen alternative is to focus on improving management in order to reduce nitrate infiltration. CStP Enhancement Activities that address Conservation Crop Rotation(328), Cover Crops(342), high level Nutrient Management(590) and high level Irrigation Water Management(449). Addressing irrigation systems would significantly aid in reducing nitrate infiltration.

Outreach will be conducted by partners. Benton SWCD is hosting a series of workshops in the GWMA. They have already held two workshops to assist with outreach. An outreach strategy is currently being developed by EPA, DEQ and Lane Council of Government (LCOG). Outreach will also be conducted by the fertilizer companies selling their custom fertilizer application services.

### Partnerships and other Funding Sources

There is currently a robust partnership in place. The diverse nature of this partnership shows a high level commitment from agencies and the agricultural community to solve this problem. NRCS has been working with the GWMA Action Committee for a number of years. Recent grants such as the RARE and ODA Fertilizer Grant are creating some exciting momentum. They are currently determining the effects of precision ag techniques on nitrate infiltration. The cooperating producers are early adopters and model farmers. The current efforts with model famers is a key component to the outreach portion of this implementation strategy.
## Upper Willamette GWMA Implementation Strategy

<table>
<thead>
<tr>
<th>Partner</th>
<th>Role</th>
<th>Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEQ</td>
<td>Collecting and analyzing water samples from lysimeter study</td>
<td>$28,000</td>
</tr>
<tr>
<td></td>
<td>Ongoing GWMA well sampling. ($16,000)</td>
<td>$80,000</td>
</tr>
<tr>
<td>EPA</td>
<td>Installing lysimeters and studying water isotopes</td>
<td>$210,000</td>
</tr>
<tr>
<td>Benton SWCD</td>
<td>Fertilizer Grant, Education and Outreach Events Outreach ($1,000/yr)</td>
<td>$51,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$5,000</td>
</tr>
<tr>
<td>Linn SWCD</td>
<td>Outreach ($1,000/yr)</td>
<td>$5,000</td>
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<tr>
<td>Upper Willamette SWCD</td>
<td>Outreach, Sending in soil samples ($1,000/yr)</td>
<td>$5,000</td>
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<tr>
<td>ODA</td>
<td>Measuring nitrate below rootzone</td>
<td>$4,400</td>
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<tr>
<td>NRCS</td>
<td>Management Practice Incentive Payments ($200,000/yr)</td>
<td>$1,000,000</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>$1,388,400</td>
</tr>
</tbody>
</table>

### Monitoring

DEQ has been and will continue to take four samples a year from 40 established test wells within the GWMA. This long term monitoring will measure long term trends in groundwater quality.