# NRCS's Long Range Strategic Approach to Conservation
# Columbia County, Oregon

**December 2010**

## SECTION I: INTRODUCTION

### Vision

The vision of this long range strategic approach in Oregon is shared responsibility and commitment to local action to generate effective land stewardship.

## Mission

NRCS's mission is to build alliances and strategically invest technical assistance, financial assistance and time to effectively solve natural resource problems in Oregon.

## Purpose

Columbia County's long range strategy will provide a baseline of the county's natural resources including the history of natural resource uses, where we've started and how we've addressed natural resources in the past. Furthermore, it is the intent of the strategic plan to indicate what our future approach will be based on the current and predicted natural resource needs in the county and the resource priorities of the public.

Many superb efforts have been made in the recent past to both identify and to resolve natural resource concerns in Columbia County. Partnership efforts have been used effectively to identify problems on a watershed scale with tools such as watershed assessments, watershed studies, recovery plans, and strategic plans. In many cases each federal, state or local agency or group has developed these tools for the purpose of directing their funding and technical assistance for a specific scope.

This strategic plan will be comprehensive for private land conservation, including all natural resources.

## Participants

The following long range strategic plan for Columbia County, Oregon was completed by the Natural Resources Conservation Service. Input into the plan and the natural resource priorities was provided by the Columbia Soil and Water Conservation District, Lower Columbia River Watershed Council, Scappoose Bay Watershed Council, Upper Nehalem Watershed Council, Columbia County OSU Extension, Oregon Department of Forestry, Lower Columbia Estuary Partnership, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife, Columbia County Land Services, and other members of the Local Work Group.

## Timeframe

The following strategic plan will extend from 2010 until 2018.

| Columbia County, Oregon | |
|---|---|
|  <br>Location in the state of Oregon<br>  <br>Oregon's location in the U.S. | |
| **Seat** | St. Helens |
| **Area**<br>**- Total**<br>**- Land**<br>**- Water** | <br>688 sq mi (1,782 km²)<br>657 sq mi (1,702 km²)<br>32 sq mi (83 km²), 4.59% |
| **Population**<br>**- (2000)**<br>**- Density** | <br>43,560<br>67/sq mi (26/km²) |
| **Founded** | 16 January 1854 |
| **Website** | www.co.columbia.or.us |

Columbia County, Oregon is a scenic county. From mature Douglas fir forests with fern and shrub understory, to the level floodplains of the Columbia River with farmland and landscape nurseries, the diversity becomes obvious. Interior river valleys such as the Nehalem, lined with large bigleaf maple and red alder, are known for their scenic appeal as well as the salmon and steelhead habitat they provide. The floodplain tidal sloughs and wetlands of the Columbia River provide fish and wildlife habitat and act as a major flyway for many varieties of migratory waterfowl. Rolling pasturelands of the coastal mountain foothills, bordered by coniferous forests, with grazing livestock are picturesque.

First impressions might be to ask, so what are the resource problems in a forested county with no obvious, standout issues? A closer review will uncover some of the primary resource concerns, some dating back to early settlement of the area, that haven't been easily solved in more than 100 years.

## General Information about the County

Columbia County is located in the northwest corner of the state of Oregon. Separated from the state of Washington by the Columbia River on the north and east, it adjoins Clatsop County, Oregon on the west

and Washington and Multnomah Counties on the south. The southern border of the county is 30 minutes from Portland, the largest metropolitan area in Oregon, while the western border is only 30 minutes from the Pacific coast (8).

Columbia County has a total land mass of 420,301 acres (657 sq. miles) with an additional 32 sq. miles of water, primarily the Columbia River. It has over 62 miles of Columbia River shoreline, the most in the state (7). The elevations range from sea level in the Columbia River floodplain to 2240 feet at Buck Mountain in the interior Coastal Mountain Range. The annual precipitation ranges from approximately 40 inches near the city of Scappoose to more than 100 inches in the western portion of the Coastal Mountain Range (12). The climate is mild with an average temperature of 39 degrees in January and 68 degrees in July (7).

Columbia County is divided into two major watersheds, split by the Coastal Mountain Range. They include the Lower Columbia River Watershed (which also includes a portion of the Lower Willamette River Watershed) and the Upper Nehalem River Watershed. Approximately 2/3 of the county drains to the Columbia River and the remaining 1/3 to the Nehalem River that eventually discharges into the Pacific Ocean to the west.

Established on January 16, 1854 as a break-off portion of the northeast part of Washington County, it is named for the Columbia River that makes up its northern and eastern borders. The Columbia River inherited its name from the sailing vessel that Captain Robert Gray sailed into its waters in 1792, a river originally known by the Native Americans as Ouragan (Oregon). The county seat is located in St. Helens.

The primary industries include wood and paper products from local timber production, trade, construction and horticulture. Other industries of importance include gravel mining, sports fishing and hunting, transportation, agriculture and natural gas (7, 8).

**Interesting Facts about the towns**

**St. Helens** – Nathaniel Wyeth, a trader, opened a trading post in 1834 calling it Wyeth's Rock. In 1847, Captain H.M. Knighton laid out the town calling it "Little Stump Town", intending it to be an early competitor to the newly established Portland. He named it after his native town St. Helens, England and the neighboring mountain. (13)

**Scappoose** – an Indian word meaning "gravel plain" (13). The Scappoose area was a meeting place for Chinook tribes who held annual pow wows there. The town later offered occupations for brick layers, loggers, blacksmiths, dairy farmers and shingle millers. It became a city in July of 1921. Captain Dominus sailed his ship, the Owyhee, into Scappoose Bay in 1829 (19). The Scappoose area is believed to be the first cultivated land in Oregon (20).

**Vernonia** – Ozias Cherrington, one of the town founders, named it after his daughter Vernonia in 1876 (13). It was first homesteaded by Clark Parker in 1874. In the 1920's, Vernonia was the site of the Oregon-American sawmill billed at the time as the largest in the world. It closed in the 1950's after all of the old-growth timber was gone (21).

**Clatskanie** – Old Indian place name for a spot in the Nehalem Valley, settlers named the river and town after that term and the native people the Tlatskanai (13). Clatskanie was originally called Bryantville after one of the town founders, E.G. Bryant.

**Rainier** – Named after Mount Rainier which takes its name from Peter Rainier, a Rear Admiral in the Royal Navy. The town was settled in 1851 (13). Rainier was originally known as Eminence. In 1976 it became known as the home for Trojan Nuclear Power Plant, the only commercial nuclear plant in Oregon. Trojan was decommissioned in 1992 (22).

## Columbia County History

Little is recorded about the history of Columbia County. Before white man explored and settled, two Native American tribes inhabited the area. They include the Chinookan (branches included the Cathlamets in the lower reaches of the Columbia River and the Multnomahs near present day Sauvie Island) and the Athapascan speaking (branch included the Tlatskanai tribe, now known as the Clatskanie) that inhabited the area around present day Clatskanie and the interior regions along the Nehalem River. Both tribes utilized the river systems for transportation. Their main subsistence was salmon, roots and berries. Although the Chinook tribes were more peace loving people, the Tlatskanai were considered a war like tribe. Early Hudson Bay trappers did not dare to traverse their lands in fewer than 60 armed men (3). Both Native American tribes lived in communal type homes along the river. Coffin Rock, near the mouth of the Cowlitz River was a sacred burial ground. Both of these native peoples were decimated by small pox in the early 1800's (2). Mooney estimated 1600 Clatskanie in 1780. By 1851 they were reduced to 8. The census of 1910 returned only 3 remaining people associated with the Clatskanie (1). Today the tribe is considered extinct.

Resources of high importance to Native Americans of the area included; forest products such as Western red cedar, used for basket making, dwelling materials, items of apparel, ceremonial uses and canoe building. A native wetland plant called "wapato" was harvested from shallow wetlands. Its tuber was processed into cakes and grilled. Local mammals such as elk, deer and sea lion provided important winter apparel. Salmon and other fish were an essential part of their protein diet and were considered a sacred part of the society.

A common practice of the Native American tribes throughout the west was to occasionally burn areas of trees and brush to encourage grass growth for deer and elk grazing (9).

The Lewis and Clark expedition of 1805-6 explored the region and camped along the county's shoreline. In the years to follow frontier men began to extend further west.

In 1810, Captain Nathan Windship established the first European settlement in Columbia County, across from what is now Oak Point, Washington. Because of the unfriendliness of the Tlakskanai and local flooding, Windship was forced to abandon this location and moved further downriver (3). Interestingly, this area is still considerably prone to flash flooding as was evidenced by recent 1948, 1996 and the 2007 flood events, considered natural disasters of national attention.

## Fur Trade

Fur trade was the first natural resource of Oregon to be utilized by white men. As late as 1860, a traveler on the Deschutes reported that streams thronged with beaver. Although fur trade brought the first European travelers to the area, the major driving force to European settlement was timber and fisheries.

## Timber Harvest

The soils and climate of the region produce some of the world's most productive Douglas fir, Western hemlock and Western red cedar forest cover types. Although present day Columbia County is the 3rd smallest in the state, it is ranked the 5th highest in total timber harvest (11). By the 1880's extensive clearing of streams and riparian vegetation was completed to allow log drives from interior forestland. By 1914, 70% of the Lower Columbia had been harvested and by the early 1950's, all of Columbia County's old growth forest had been logged. Tide Creek was the first stream within the county to be used for log drives (17). Streams were cleared of debris, temporary dams were installed and newly harvested logs were piled up behind them. During high winter runoff, the dams were blasted and the logs flushed downstream, along with everything else. This practice decimated riparian and in-stream habitats and directly impacted salmon populations. By 1914 this practice was discontinued. In 1919-20 the Nehalem Divide Railroad Tunnel was constructed in the Chapman area. A total of 1712 feet long, it was the only tunnel to cross the divide of the Oregon Coastal Mountain Range. This railroad line allowed the harvest and transport of the rich old growth timber in the interior Nehalem River portion of the county to the Multnomah Channel along the Columbia River (10).

## Fisheries

In the 1830's European's began to exploit the abundant salmon fishery. In 1867, the first cannery was established along the Columbia River at Eagle Cliff, Washington, across from present day Clatskanie, Oregon. By 1883, cannery numbers reached their peak at 55 on or near the Columbia River. Chinook salmon were the primary catch until the late 1800's when other species began to be utilized. Undesirable species such as Chum salmon were removed to provide less competition for the desirable fish species such as Chinook and Coho. These species were then overharvested and their habitats removed. The Oregon Fish Commission, now Oregon Department of Fish and Wildlife, conducted stream cleaning starting in 1949 through the 50's to open up habitat for salmonids. They believed the lack of fish access was a limiting factor. This practice was later proven to have negative impacts to fish habitat and watershed health.

## Agriculture

By the 1894, Columbia County had 12,000 acres of land under cultivation. Most of the interior land converted to farmland was previously in forest. These areas were burned, stumps removed and converted to pasture and small farms. Farmland was cleared at a rate of about 900 acres per year in the late 1800's. At its peak in the 1990's, 661 farms covered 72,000 acres (ODF, 1995). Most of the farming activities however were concentrated in the inland valleys and floodplains of the Columbia River. In

1908 the first diking of floodplains was conducted. In 1922 the Scappoose Drainage District was formed. Several other drainage/diking districts followed along the Columbia River floodplain. Many small dairies, beef, sheep and variety farms were common until poor commodity prices and local agricultural markets disappeared in the 1940's and 50's. Small creameries and other local agriculture markets closed their doors as transportation infrastructure was put in place. In the 1930s, 40s and 50s, Columbia County was one of the largest peppermint producing counties in the state, with an estimated 15,000 acres in production. This changed as prices dropped and rust diseases infected the area (33). In late May of 1948, the devastating flood, known as the Vanport flood (named for the Vanport community at Portland, Oregon) broke several of the dikes along the Columbia River, destroying and setting agriculture backwards for years (34). Other common crops included vegetables such as cabbage and cucumbers to supply Seinfeld's pickle industry in Scappoose, pole beans, bentgrass for seed and flax (33). During the 1950's through the 1980's, Columbia County had more than 5000 acres near St. Helens in strawberry production. As labor laws changed, the lack of inexpensive mass labor for the short strawberry season made these operations nonviable. Many school children in the area recall being transported by school buses to the strawberry fields for a few weeks each spring to earn spending money and all the strawberries they could eat.

The first conservation district formed in Columbia County was the Clatskanie Soil and Water Conservation District in December of 1946. Of interest, the main objectives of the early SWCD are still relevant today. These objectives were to help all of the landowners…..conserve, improve and develop their soil and water resources and to work together to correct soil erosion, drainage, flood control, watershed protection and other resources of the area. The Scappoose Soil Conservation District followed in April of 1947. Columbia SWCD was later formed by the merger of the Clatskanie and the Scappoose-Rainier Conservation District in August of 1966. It includes all land in Columbia County except for 10,342 acres of Sauvie Island which is served by the West Multnomah SWCD.

**June, 1948 Vanport, Oregon Flood**

# SECTION II: NATURAL RESOURCES INVENTORY

## Resource Concerns: Human

### Landuse/Land Cover

Of the 426,000 acres in Columbia County, 77% is forested and used primarily for timber production. A secondary purpose of high importance is the fish and wildlife habitat these forestlands provide.

Of the forestland, approximately 19% is private non-industrial with operations ranging from 2 to 1700 acres. 52% of the county is considered industrial forestland. Only 6% of Columbia County is public lands (State and Federal) and most of this is also forestland.

The remaining 23% of Columbia County contains all other landuses including; urban/residential, industrial, pasture, cropland/hayland and wildlife lands.

In addition, 32 square miles (20,480 acres) of Columbia County is water, primarily the Columbia River and its freshwater estuaries.

Of the 57,758 acres reported as agricultural land in the 2007 Census of Agriculture, 37% (17,092 acres) is considered harvested cropland, 41.1% (28,730 acres) is woodland (these acres represent lands planted to wood lots that may also be captured as part of nonindustrial forestland) and 14.8% (8548 acres) are considered pasture. Only 2535 acres are reported as land under irrigation.

There are 5 towns that have significant populations including St. Helens, Scappoose, Clatskanie, Rainier and Vernonia. Other small communities are spread throughout the county including: Mist, Birkenfeld, Warren, Deer Island, Columbia City, Quincy, Alston, Prescott and others.

### Ownership

As mentioned above approximately 94 % of Columbia County is considered private owned. This is unique for a county that is heavily forested. Only 6% is publically owned (State and Federal lands). Federal lands include 10,829 acres of forestland owned by Bureau of Land Management (BLM) and 10,129 acres of wildlife lands owned by US Fish and Wildlife Service.

### Number, Types and Size of Farms

According to the 2007 Census of Agriculture, there were 805 farms in Columbia County, down 8% from the 878 farms in 2002. The land recorded in farms is 57,758 acres, down 7% from the 62,398 acres in 2002.

Farm size is also an important factor. The average farm size is 72 acres but the median sized farm is only 23 acres. 587 farms (73%) are less than 50 acres in size. Only 15 farms (1%) are more than 500 acres in size and most of these are timber operations. Also relevant is the income derived from farming. 60% of

the properties considered farms have farm sales of less than $2500. Only 6% (49 farms) have farm sales exceeding $25,000 (4).

Small organic farms are becoming more prevalent as well with operating methods out of agriculture's main-stream. Columbia County has at least one organic dairy, one organic beef operations and several organic vegetable, hay, chicken and other livestock operations.

**Actual farms vs. rural living residents**

The number of farms that USDA may consider actual farms versus rural living residents may not be reflected well by the farm numbers represented by the Agricultural Census. Many rural residents may have small gardens, a woodlot, a few grazing animals or small orchards but they produce very limited agricultural income. Only 310 farms consider farming their primary occupation. This number may also be overstated because of the number of retirees living in a rural setting with no other current occupation.

## Commodities

Agricultural commodities are diverse in Columbia County; however, farming is a minor occupation. Many of the farms, numbers and acreages are small. Below is an abbreviated list of commodities produced in the county.

- Christmas Trees – 46 farms, 721 acres
- Nursery/Greenhouse – Means Nursery near Scappoose is one of the largest in the nation.
- Orchards 35 farms, 50 acres
- Vegetables – 15 farms, 12 acres
- Hay/Haylage/Silage – 354 farms, 10188 acres producing 24,467 tons/dry matter
- Cattle 405 farms, 10679 animals, sales of 3,055,000 from 327 farms selling 5524 animals
- Dairy products – 8 farms with 194 cows
- Horses – 1575 horses (most considered pets/recreation).
- Sheep – 56 farms, 1000 sheep
- Berries – blackberries, blueberries, boysenberries, raspberries, strawberries
- Fruits and Nuts – apricots, sweet cherries, tart cherries, grapes, kiwi, peaches, pears, plums and prunes, apples, hazelnuts, walnuts
- Vegetables – Asparagus, snap beans, cabbage, carrots, garlic, lettuce, onions, peas, pumpkins, squash, sweet corn, tomatoes, potatoes.
- Crops – Corn, wheat, oats, peppermint, spearmint, grass seed
- Short rotation woody crops – hybrid poplar (2$^{nd}$ in the state), red alder

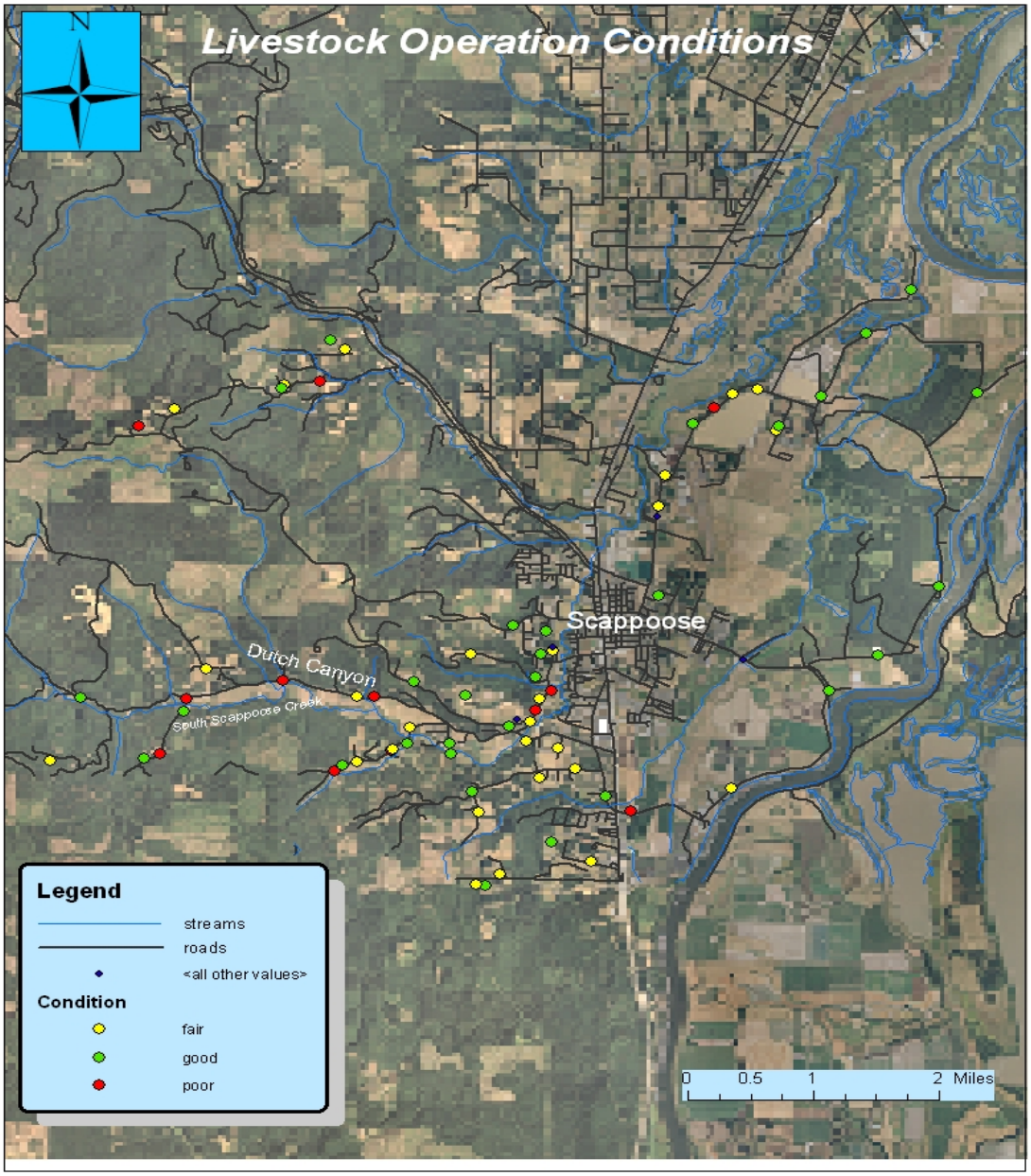
## Confined Animal Feeding Operations

Currently, Columbia County has 4 permitted Confined Animal Feeding Operations with Oregon Department of Agriculture. All 4 are considered in compliance with ODA's CAFO regulations. NRCS has provided technical assistance to each of these, providing assistance with a comprehensive nutrient management plan (CNMP).

Many other small to medium sized non-permitted livestock operations exist in the county.

In 2007 NRCS and the Columbia SWCD conducted a livestock inventory in a small portion of the county, the Scappoose area. The inventory was intended to show the concentration of small livestock operations and their condition. Below are some basic findings of the inventory.

- 74 Total Operations Evaluated – 37 Horse, 30 Beef, 2 Llama, 2 Goat, 3 unknown or not present
- Conditions evaluated based on visual condition of pasture vegetation, also considering condition of the confinement area.
- 52% Evaluated as POOR to FAIR
- 54% Of Horse operations evaluated as POOR to FAIR
- 50% of Cattle operations were POOR to FAIR




**Locations and Condition of Livestock Operations in the Scappoose Area**

## The People of Columbia County – Social and Economic Conditions

According to the US Census Bureau, the estimated population of Columbia County in 2009 was 49,592.

Columbia County has the third highest median household income in Oregon at $57,568. Only Clackamas County at $65,862 and Washington County at $65,576 are higher.

The mean travel time to work is 29.3 minutes. More than ½ of the counties workforce commutes out of the county to work, many to nearby Portland. Most residents, including rural operators, do not rely solely on their property for income.

The 2008 estimated poverty rate was the 4th lowest in Oregon at 11.3% but the unemployment rate as of May 2010 was 12.0%.

**Demographics**

The US Census Bureau reports that nearly 95% of Columbia County is populated by white persons. Black persons represent 0.6%, Native American and Alaskan Native persons represent 1.4%, Asian decent represent 1.0% and the remaining 2% report two or more races. Hispanic or Latino origins represent about 4%.

The principle age of agricultural decision makers is 57.7 years old.

There are 191 agricultural operations, or about 23% of the operations county wide, where the principle operator is female. This is one of the highest percentages in Oregon.

**Natural Resources Attitudes**

Rural Columbia County residents are independent thinking and typically don't ask for government assistance easily. Only 29 farms have acknowledged receiving government payments totaling $181,000. This statistic in no way indicates a lack of concern for the natural resources of the county. Most county operators are quite progressive regarding natural resources. Healthy soils, clean water and abundant fish and wildlife are of high value. Rural residents place high importance on their anonymity but are willing to work behind the scenes to accomplish important resource objectives. Most operators are interested in a conservation plan for their land however they also place a high value on privacy. With all that said, Columbia County rural residents still have a spirit of community and cooperation with neighbors and others for accomplishing a common interest.

In the last 2 decades, with the increase in rural county population fueled by primarily metropolitan residents, an increase in environmental and preservation attitudes have surfaced. Once small rural farming and timber communities such as Scappoose and Vernonia have become a hybrid mix of traditional farmers/ranchers and forest rural owners with more nontraditional ex-urban residents. Influences of the later have changed some of the rural dynamics and approaches to resource management in recent years.

**Partnerships**

A very important human resource asset in the county has to include the partnerships between rural landowners, groups, local, county, state and federal agencies.

NRCS has built functional partnerships with many of the aforementioned including:

- **Landowners**
- **Grass Roots Groups** – Friends of Fox Creek, Friends of Dibblee Point, etc.
- **County and City Governments** – Columbia County Commissioners, Columbia County Roads Department, Columbia Land Development Services, City of Clatskanie, City of Vernonia, Mist/Birkenfeld Rural Fire Department, etc.
- **Watershed Councils** – Scappoose Bay Watershed Council, Upper Nehalem Watershed Council, Lower Columbia River Watershed Council
- **Columbia Soil and Water Conservation District**
- **State Government** - Oregon Department of Forestry, Oregon Department of Fish and Wildlife, ODOT
- **Federal Government** – Farm Service Agency, BLM, Northwest Oregon RC&D, Rural Development, U.S. Fish and Wildlife Service
- **Flood Control Districts** – 13 total in Columbia County

## Forest/Woodland Owners

As previously mentioned under the land use section, 19% of the county is considered private nonindustrial forestland with operations ranging in size from 2 acres to nearly 2000 acres. Of the acres reported as agricultural lands, 41.1% are considered woodland (4).

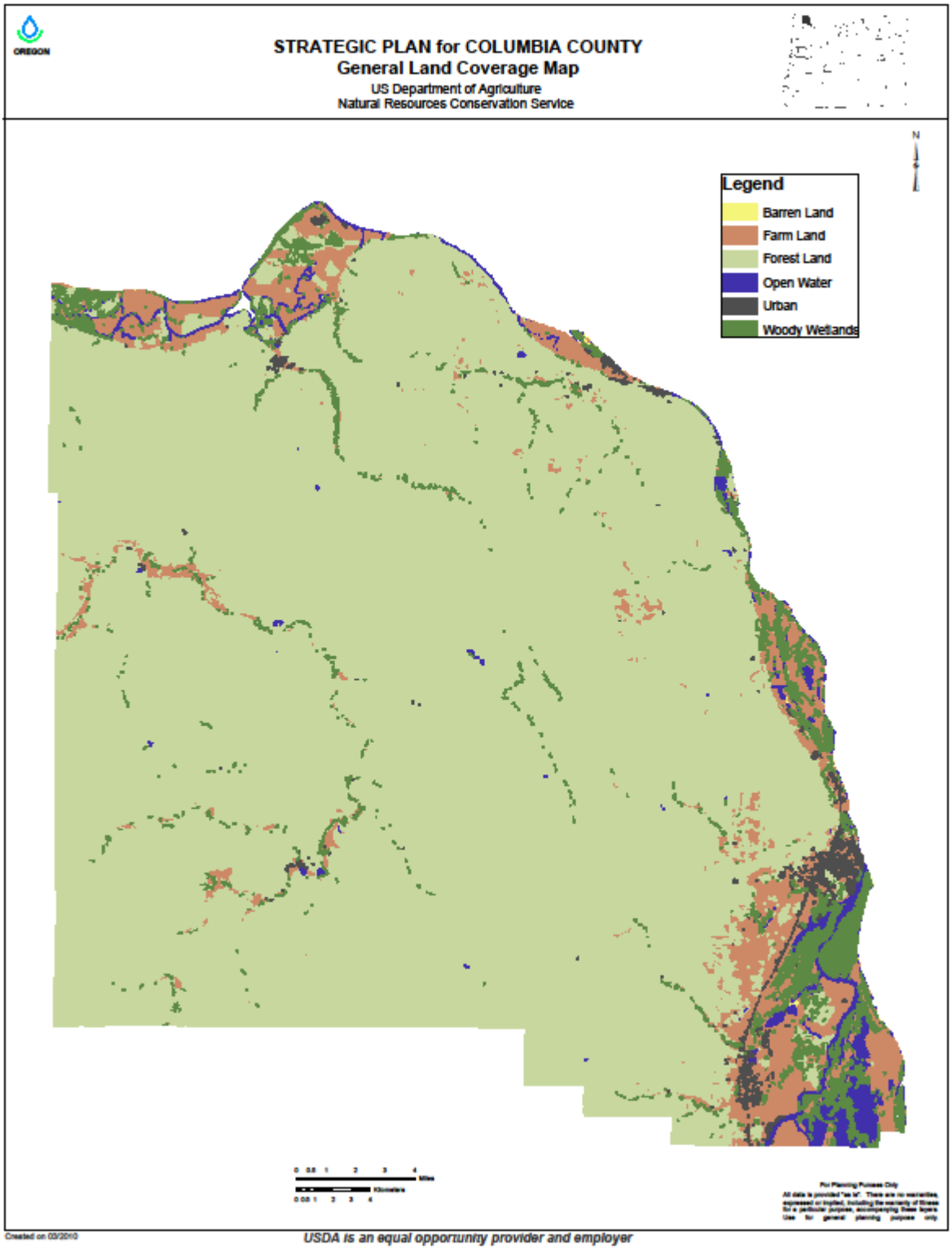
It is estimated that only a dozen of the forest operators have a sizable enough operation to consider it a business (23). Timber harvesting operations are on such a long rotation (40 to 80 years) that they need to be quite large to maintain a sustainable rotation and be economically viable (24). Most operations are rural residents with forest acreage that serve for privacy, rural living, occasional timber income, wildlife and aesthetic values.

Other forest products and purposes in the recent future have allowed some smaller operations to realize some income from their lands. With the interest in mushroom, truffles, berries, recreational uses and nontraditional forest products such as ornamental plants, these smaller forest operations have began creating alternative markets derived from their property.

The table below shows Columbia County assessment information for forestland owners as of 2008. As described above, it indicates that nearly one-half of the forest ownerships in the county are small 5 to 10 acre parcels (23).

## Forest Ownership in Columbia County (2008)

| Size of Forest Acreage by Operation | Number of Owners | Total Number of Acres | Percentage of Owners |
|---|---|---|---|
| 500+ | 16 | 29417 | 0.5% |
| 100 to 500 | 127 | 23677 | 4.2% |
| 50 to 99 | 246 | 17372 | 8.1% |
| 20 to 49 | 619 | 18770 | 20.4% |
| 10 to 19 | 709 | 9954 | 23.4% |
| 5 to under 10 | 1313 | 8621 | 43.3% |
| **total** | **3,030** | **107,811** | |
| | | | |
| In Forest Deferral | 2018 | | 70.5% |
| Not in Forest Deferral | 843 | | 29.5% |


OREGON
STRATEGIC PLAN for COLUMBIA COUNTY
General Land Coverage Map
US Department of Agriculture
Natural Resources Conservation Service
N
Legend
Barren Land
Farm Land
Forest Land
Open Water
Urban
Woody Wetlands
Miles
Kilometers
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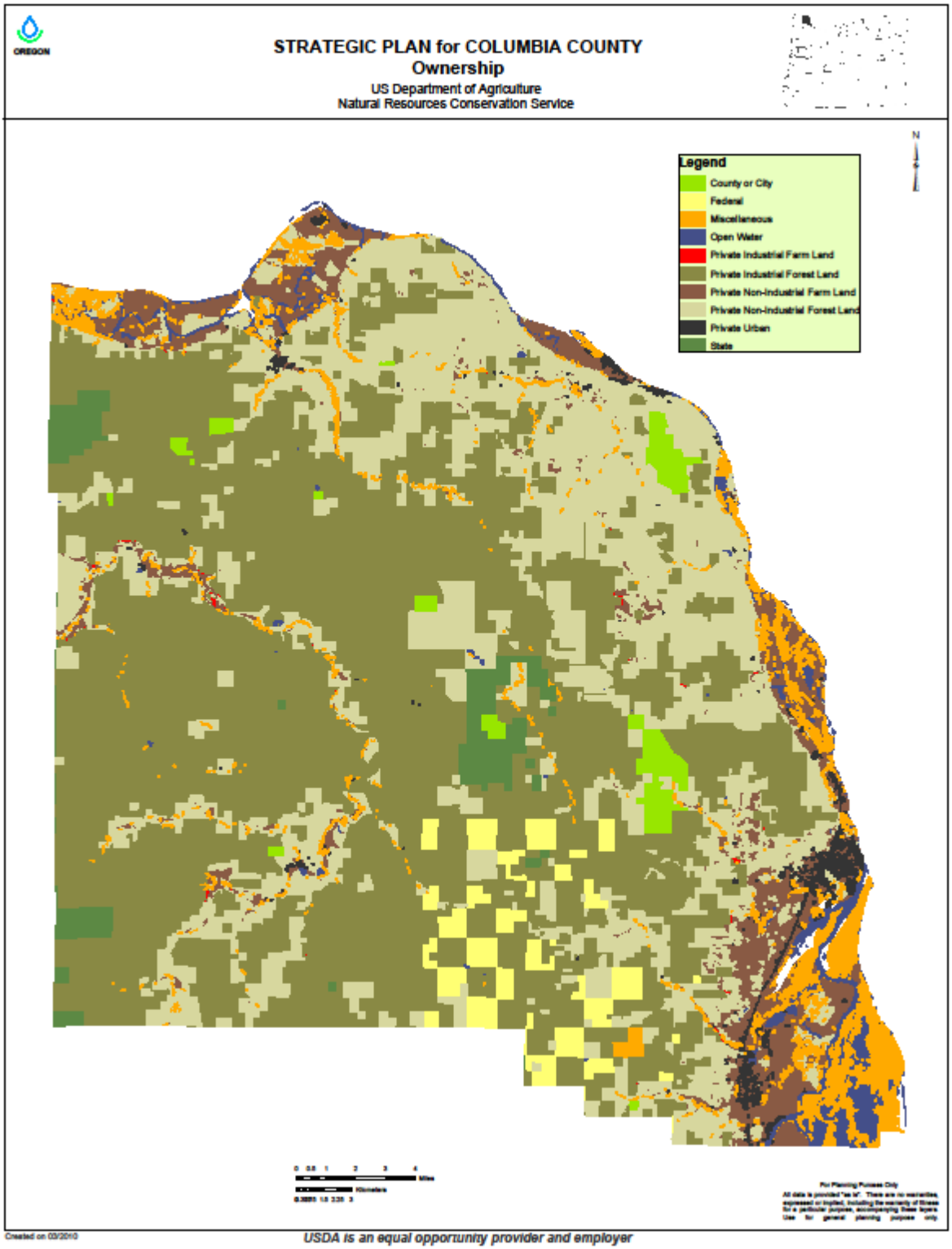
OREGON
STRATEGIC PLAN for COLUMBIA COUNTY
Ownership
US Department of Agriculture
Natural Resources Conservation Service
Legend
County or City
Federal
Miscellaneous
Open Water
Private Industrial Farm Land
Private Industrial Forest Land
Private Non-Industrial Farm Land
Private Non-Industrial Forest Land
Private Urban
State
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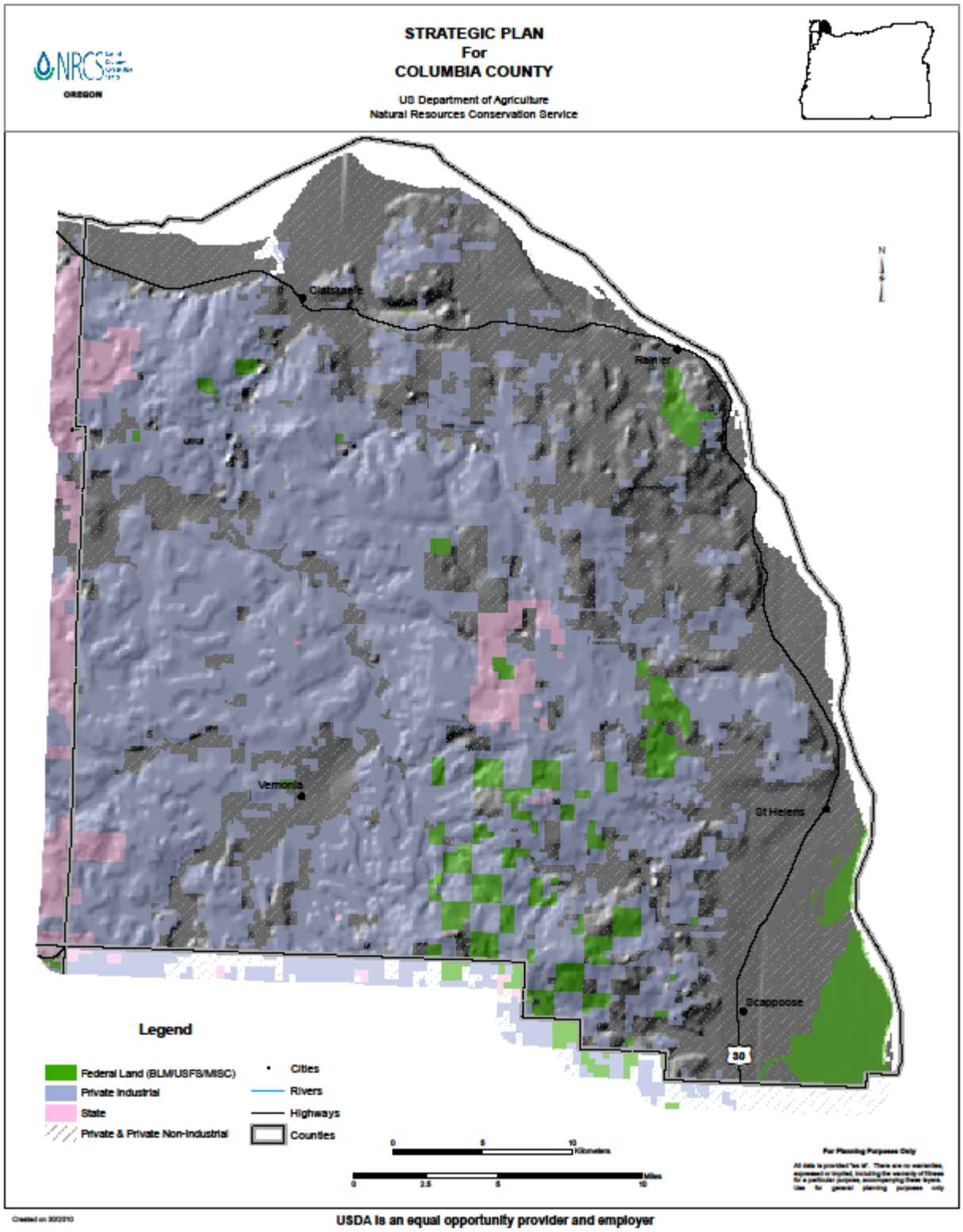
NRCS
OREGON
STRATEGIC PLAN
For
COLUMBIA COUNTY
US Department of Agriculture
Natural Resources Conservation Service
Clatskanie
Rainier
Vernonia
St Helens
Scappoose
30
N
Legend
Federal Land (BLM/USFS/MISC)
Private Industrial
State
Private & Private Non-Industrial
Cities
Rivers
Highways
Counties
0 5 10 Kilometers
0 2.5 5 10 Miles
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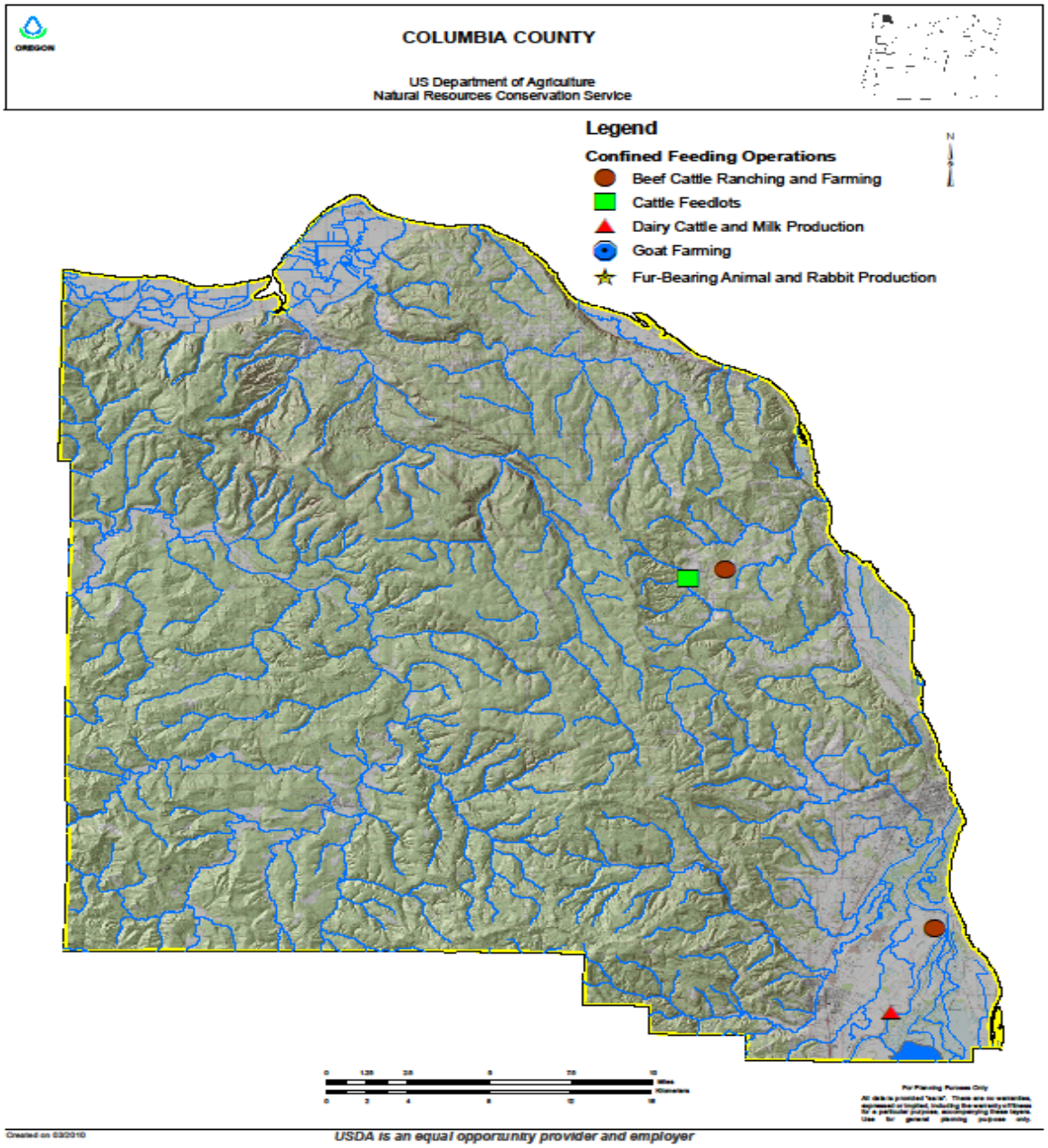
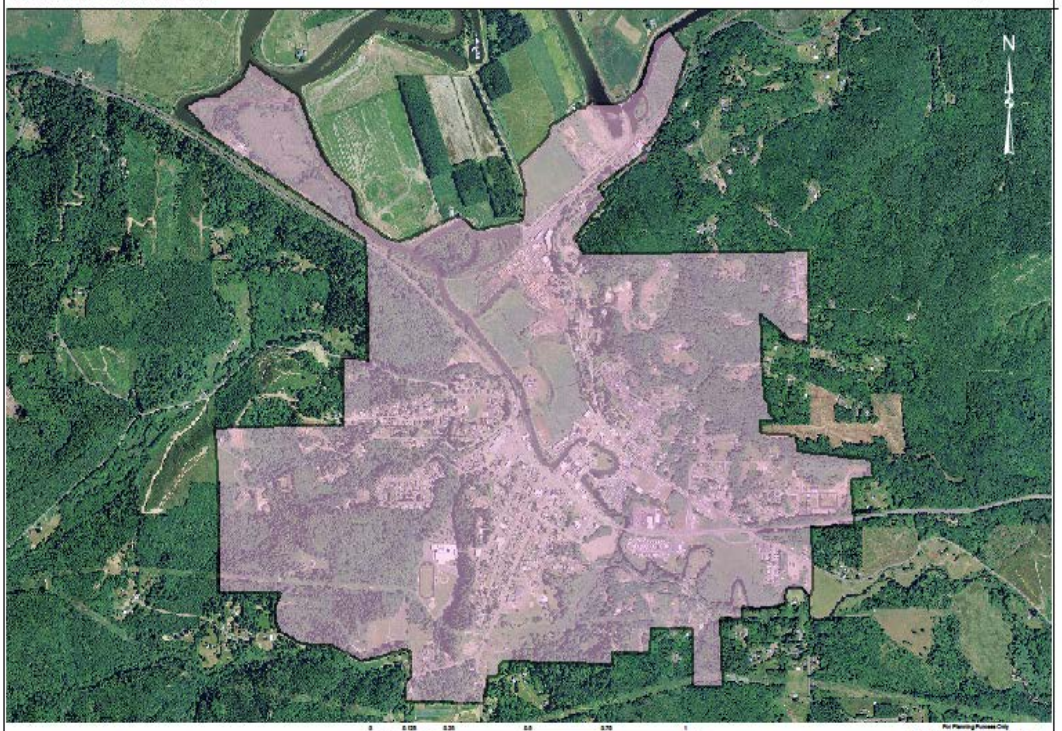
| Sum of acres_1 | Column Labels | | | | | | |
|---|---|---|---|---|---|---|---|
| Row Labels | Bureau of Land Management | Local Government | Oregon Department of Forestry | Oregon Department of State Lands | Private | United States Fish and Wildlife Service | Grand Total |
| Barren Land | 22 | 20 | 53 | | 12,445 | 753 | 13,293 |
| Cultivated Crops | | | | | 3,771 | 899 | 4,670 |
| Deciduous Forest | 53 | 119 | 39 | | 18,287 | 2 | 18,500 |
| Developed, High Intensity | | | | | 656 | 11 | 667 |
| Developed, Low Intensity | 0 | 0 | 8 | | 5,782 | 46 | 5,836 |
| Developed, Medium Intensity | | | | | 1,640 | 5 | 1,645 |
| Developed, Open Space | 171 | 69 | 309 | 1 | 23,614 | 35 | 24,199 |
| Emergent Herbaceuous Wetlands | 1 | 0 | 6 | | 8,179 | 1,513 | 9,700 |
| Evergreen Forest | 8,065 | 856 | 4,343 | 47 | 121,376 | | 134,687 |
| Hay/Pasture | | | | | 16,181 | 470 | 16,651 |
| Herbaceuous | 56 | 210 | 165 | | 35,406 | 1,445 | 37,282 |
| Mixed Forest | 1,979 | 826 | 674 | 32 | 70,921 | | 74,431 |
| Open Water | 3 | | | | 894 | 2,319 | 3,216 |
| Shrub/Scrub | 473 | 315 | 720 | 2 | 66,558 | 12 | 68,079 |
| Woody Wetlands | 4 | 2 | 32 | | 7,296 | 2,619 | 9,953 |
| **Grand Total** | **10,829** | **2,417** | **6,348** | **82** | **393,005** | **10,129** | **422,810** |




| Row Labels | Values Sum of PermitAnim | Sum of TotAnimal | Count of MailStreet |
|---|---|---|---|
| Beef Cattle Ranching and Farming | 1050 | 923 | 2 |
| Cattle Feedlots | 80 | 39 | 1 |
| Dairy Cattle and Milk Production | 300 | 318 | 1 |
| **Grand Total** | **1430** | **1280** | **4** |

# URBAN GROWTH BOUNDARY - CLATSKANIE
# COLUMBIA COUNTY, OREGON

US Department of Agriculture
Natural Resources Conservation Service

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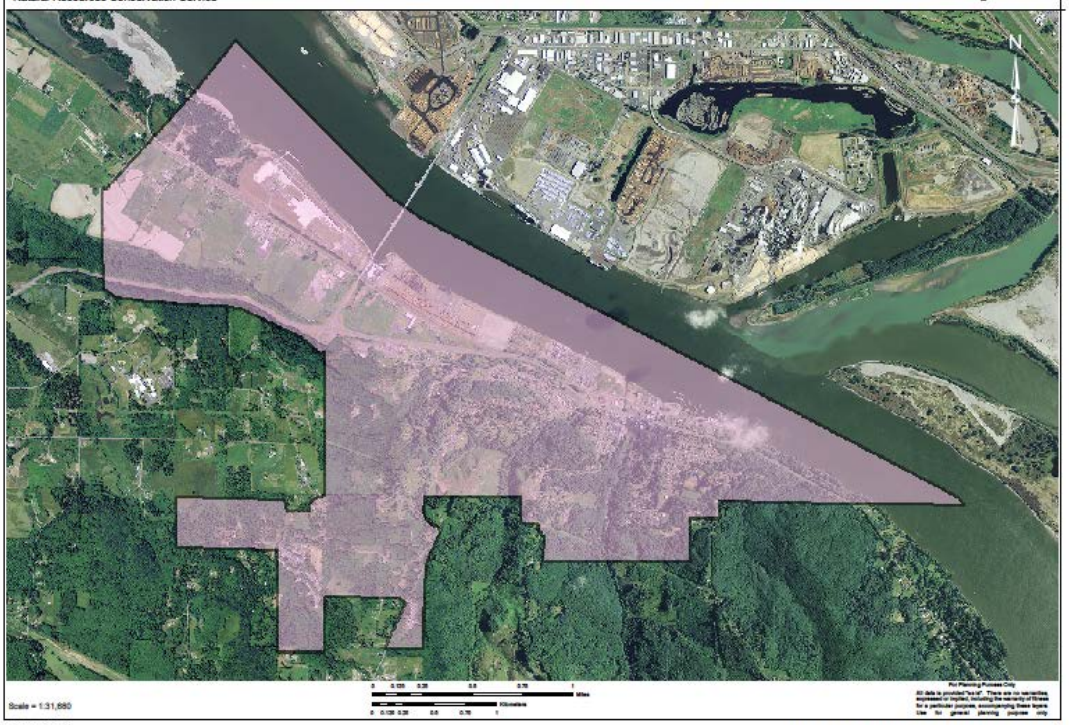
# URBAN GROWTH BOUNDARY - RAINIER
# COLUMBIA COUNTY, OREGON

US Department of Agriculture
Natural Resources Conservation Service

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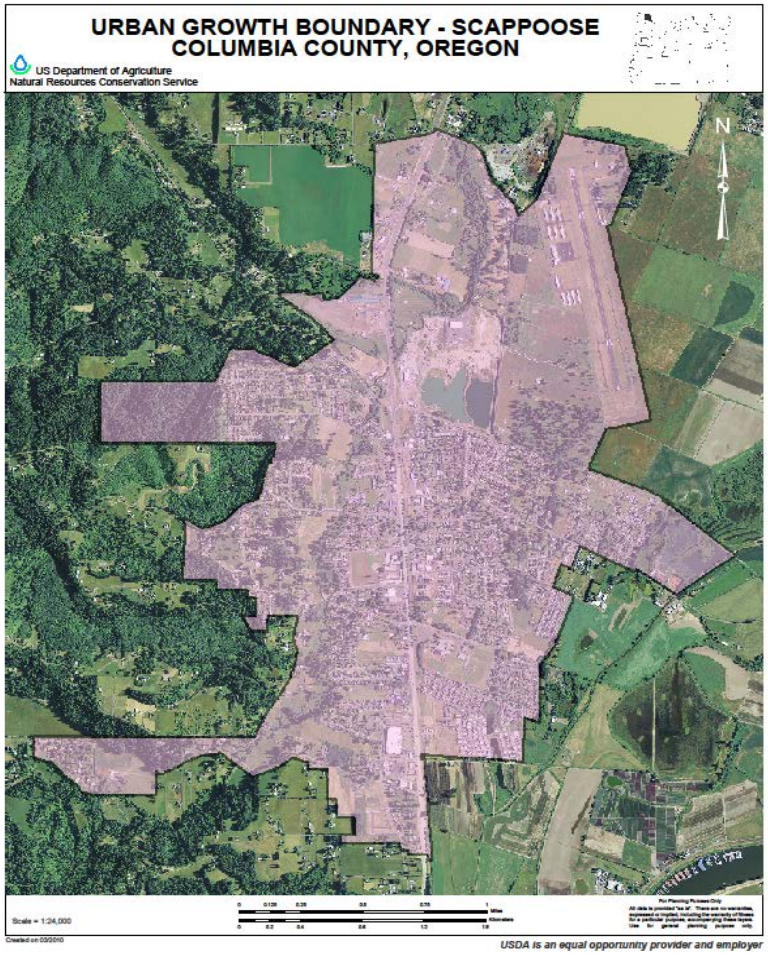
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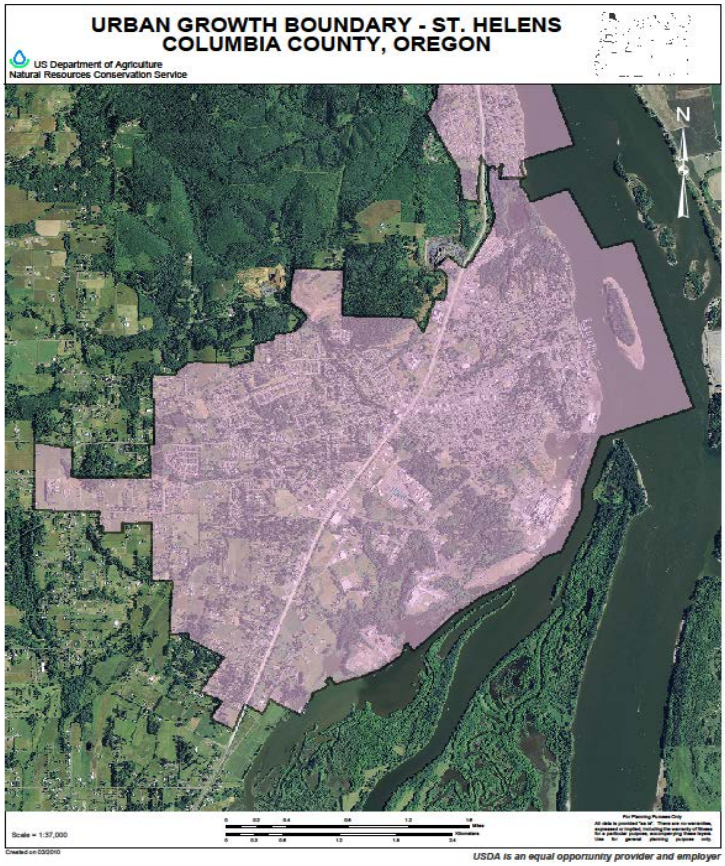
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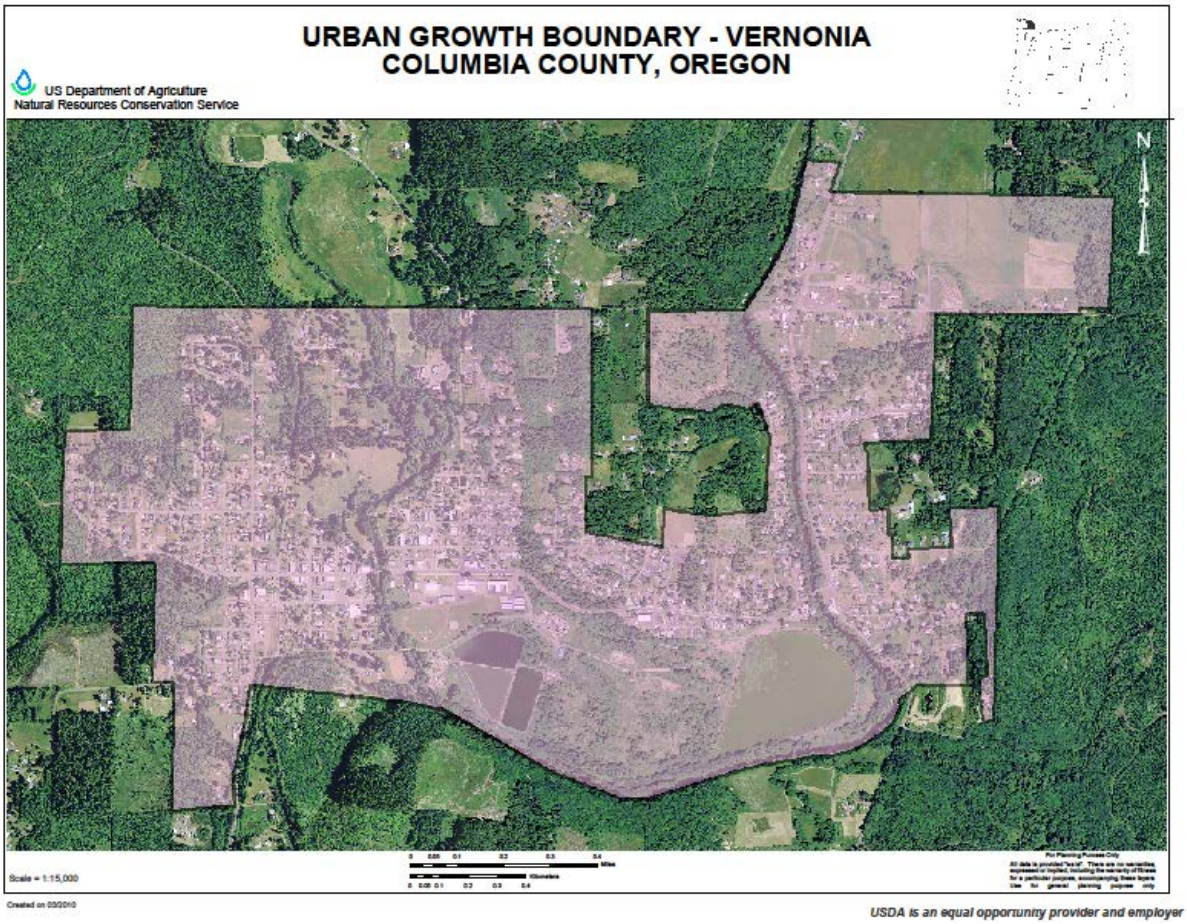



# Resource Concern: Soil

## Topography

The topography of Columbia County varies significantly, ranging from nearly level, broad floodplains along the Columbia River to steep mountains with more than 70% slopes in portions of the Coastal Range Mountains. Geologically, these formations occurred from marine, volcanic, flood and landslide influences. Marine sedimentary deposits, volcanic deposits and alluvial deposits created the soils of the county.

The Columbia River is tidal throughout the county with tides at St. Helens as high as 2.5 feet.

## Soil Classifications

The soils of Columbia County uncover much about the geological formation of the county. There are 3 major soil taxonomy classes found throughout the county and several other minor classifications.

**Inceptisols** – These soils are common throughout Columbia County. About 50% of the county soils are inceptisols making up more than 55% of the acreage. Inceptisols are geologically young soils derived from sedimentary and igneous rock. Most inceptisols in the county are forest soils. They have weakly

developed horizons because they are immature. Inceptisols can be prone to soil erosion, especially on steep sites. They can also compound water quality problems, both surface and groundwater. As an example, Goble silt loams (11.5 % of county), have a clay pan that can create seepage problems. When used as pasture, many of these sites are very wet and runoff, instead of moving through the soil, is carried near the surface, picking up nutrients and chemicals on the field. Sifton, another inceptisol, is underlain with gravel. If heavy rates of nutrients or pesticides are applied, Sifton soils, found in floodplains, can contribute to groundwater pollution. Due to the weak structure of many forest inceptisols on steep topography, these units are prone to landslides and severe streambank erosion.

**Entisols** – These soils are common in the floodplains of the county. Enitsols are commonly formed by streams or rivers depositing alluvium. They are usually very young. Because of this, entisols are void of or have weakly formed horizons. Entisols are important in Columbia County because they make up a big percentage of the soils in cropland (floodplains). About 6% of the county's soils are entisols. They can be very prone to water erosion because of their very weak structure. They can also be prone to water quality problems, both surface and groundwater. Many are very poorly drained (silt loams), others are excessively drained (sands). They typically have high water tables and seasonal ponding is common. Deep soils made up of entisols can have serious streambank and scour erosion problems if not permanently vegetated.

**Alfisols** – Alfisols are some of the most productive soils in the county. They are formed primarily under deciduous forest cover in humid temperate regions. As clays are leached out of the top soil horizons, the remaining humus layer can become very productive. The only class I soil in Columbia County, Latourell silt loam, is an alfisol. Most alfisols in the county are in cropland or pasture production. Their main limitation is due to low pH and nutrient limitations. Approximately 13.5% of Columbia County soils are alfisols.

**Other important and unique soils in Columbia County:**

**Ultisol** – Formed in humid tropical climates, these forest soils are usually low in organic matter, due to rapid decomposition and highly weathered. They are very acidic as nutrients leach out of the soil profile and are replaced by iron and aluminum oxides. A telltale sign of ultisols in the county is their bright orange to red horizon from iron oxides. About 20% of Columbia County soils are ultisols and almost all are in forest production.

**Mollisols** – A highly productive soil formed on grass prairie makes up about 3% of the counties soils. The Sauvie soil series is the most common mollisol found in the county. Most of these are in cropland.

**Histosols** – Histosols are organic soils commonly known as peat or muck soils. They are very unique because of their high organic content. Some histosols in Columbia County have organic matter greater than 50%. Histosols are formed under cool climates with heavy vegetation. The major resource limitations associated with histisols are their extremely low pH levels, their potential for subsidence as they decompose, their high water tables and ponding and their ability to catch on fire. Approximately 1% of the soils in the county are histosols. They are found in the Columbia River floodplain in the

Clatskanie area and are in cropland, pasture or wildlife habitat. Maintaining water table levels is crucial to deter subsidence.


**Dark histosols (organic soils) (foreground) with entisols (background) near Clatskanie, Oregon**

## Highly Erodible Soils

Many of the county's soils are considered highly erodible. Most erodibility is due to steep soils that are prone to water erosion. Wind erosion is not a factor in most cases. Some soils are quite shallow as well and have very low soil loss tolerances.

The great majority of the soils considered highly erodible in Columbia County are under permanent cover, forestland or pasture land. Therefore, the 1985 Food Security Act, highly erodible land determinations (HEL) for bringing land into production have not been a significant workload. Land under cultivation is typically floodplain or low terrace benches that are not highly erodible.

## Hydric Soils

Many of Columbia County's soils are considered hydric, or at least have hydric inclusions within them. The majority of the hydric soils are found in floodplains, where ponding, flooding and high water tables are common. In the early 1900's the US Army Corps of Engineers began installing dikes and drainage systems in the Columbia River floodplain. At that time most floodplain lands were converted to agricultural uses with subsurface tile and surface field ditches. Large pumping stations were installed to discharge the excess surface and groundwater from the specific drainage district into the Columbia River system. In the last two decades, as farm markets have disappeared, many of these drainage systems

have fallen into disrepair and field drainage ditches and subsurface tile have began to deteriorate. Although these soils have been categorized as “protected” (behind flood control dikes with drainage system in place), some sites are regaining their wetland characteristics due to lack of maintenance, at least on a seasonal basis.

## Prime Soils and Soils of Statewide or Unique Importance

Columbia County has several prime farmland soils of significance. It also has several soils of statewide importance. Several soils are also considered prime if protected from flooding or when drained as described in the hydric soils section above. Also listed is one soil of unique importance, the only organic soil in the county, known as Crims silt loam.

In 1990, NRCS (SCS) conducted a land evaluation of agricultural soils for Columbia County through the LESA process. This document rated farmland soils based on their productivity for pasture forage. It also considered cost associated with drainage, nutrients and irrigation as well as the lifespan of individual practices. This information was used to rank county soils numerically from best to worst (25).

Prime farmland soils are in danger of conversion to non-agricultural uses in the county. As communities and industrial uses continue to expand, some of the larger remaining tracts of prime farmland soils are steadily being lost. For example, in 2010, the Port of St. Helens acquired more than 700 acres of farmland north of Clatskanie that may eventually be converted to industrial purposes. Another recent example, the City of Scappoose has requested approval from Columbia County to extend their urban growth boundary by more than 400 acres. Most of those acres are prime farmland soils.

## Forest Soils

As previously mentioned, 77% of Columbia County is forestland. Therefore, forest soils represent a very significant resource worthy of consideration. Columbia counties forestlands are some of the most productive Douglas fir sites in the world. 50 year Douglas fir site indexes of 120 to 140 are common.

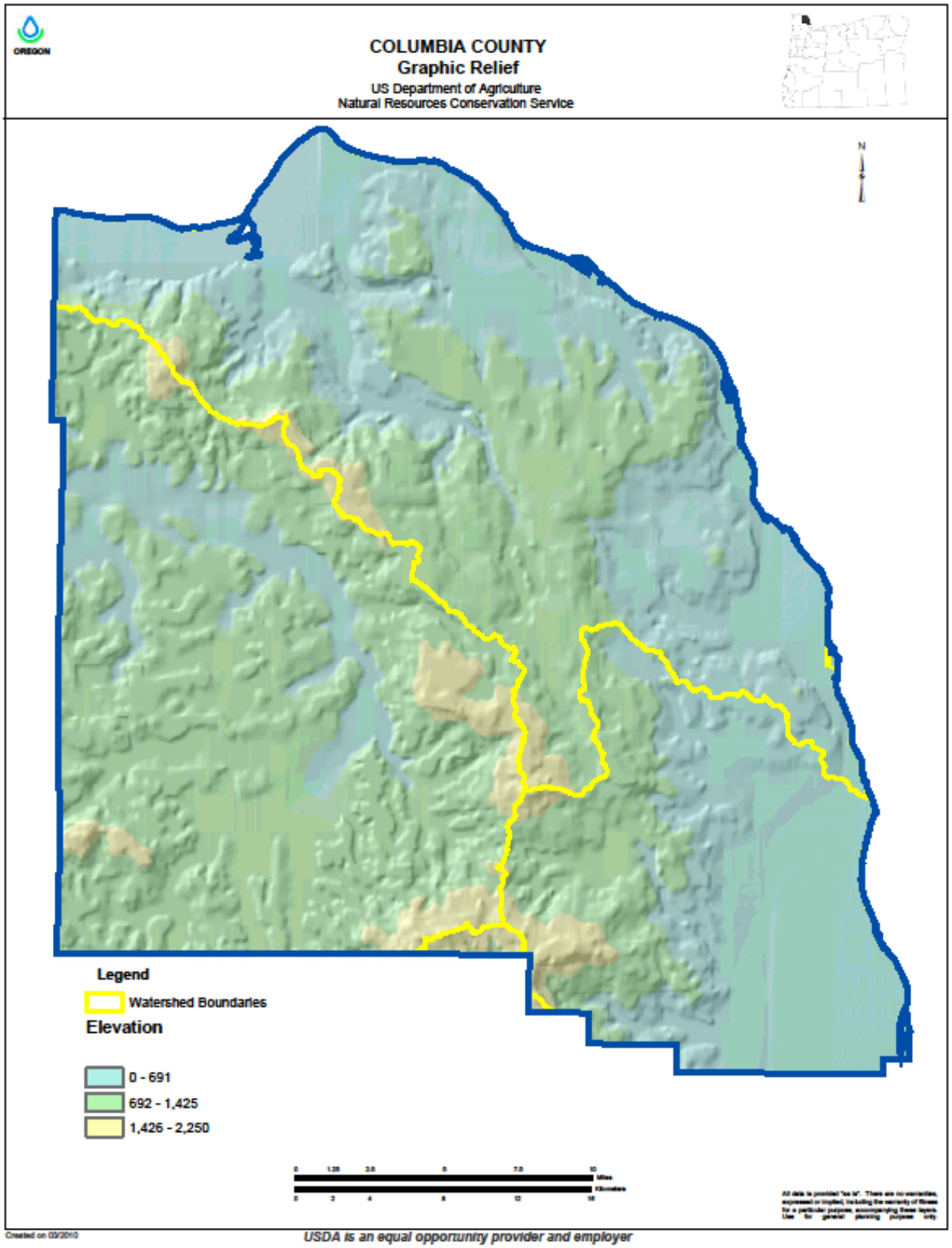
In 1989, NRCS (SCS) conducted a land evaluation of forest soils for Columbia County through the Land Evaluation and Site Assessment (LESA) process. A committee of local soil and forest experts ranked forest soils numerically based on their productivity (26).

## Mined Land

One of the larger industries of Columbia County includes gravel and hard rock mining. Deep alluvial gravel deposits in the Columbia River floodplain from Scappoose to Deer Island are highly sot for their high quality and abundant gravel deposits. The majority of this material is exported out of the county for development in metropolitan areas. Hard basalt rock mines are also found in the western portion of the county.

Mining reclamation policies are weak in Columbia County. Restoration is very limited. These large pit mines, when exhausted of quality gravel, are left as a permanent scar on the landscape.

**Open pit gravel mine near Scappoose**

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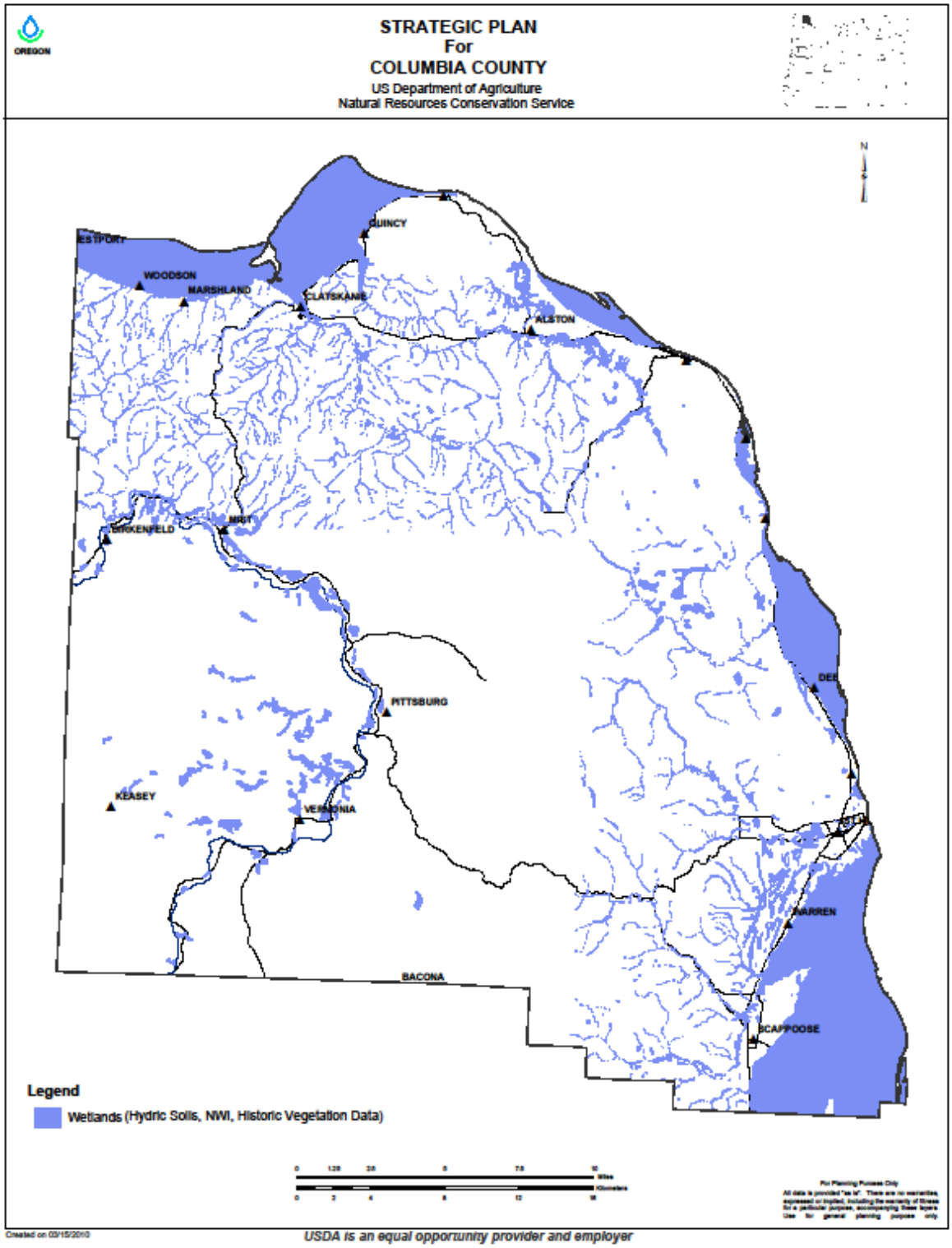


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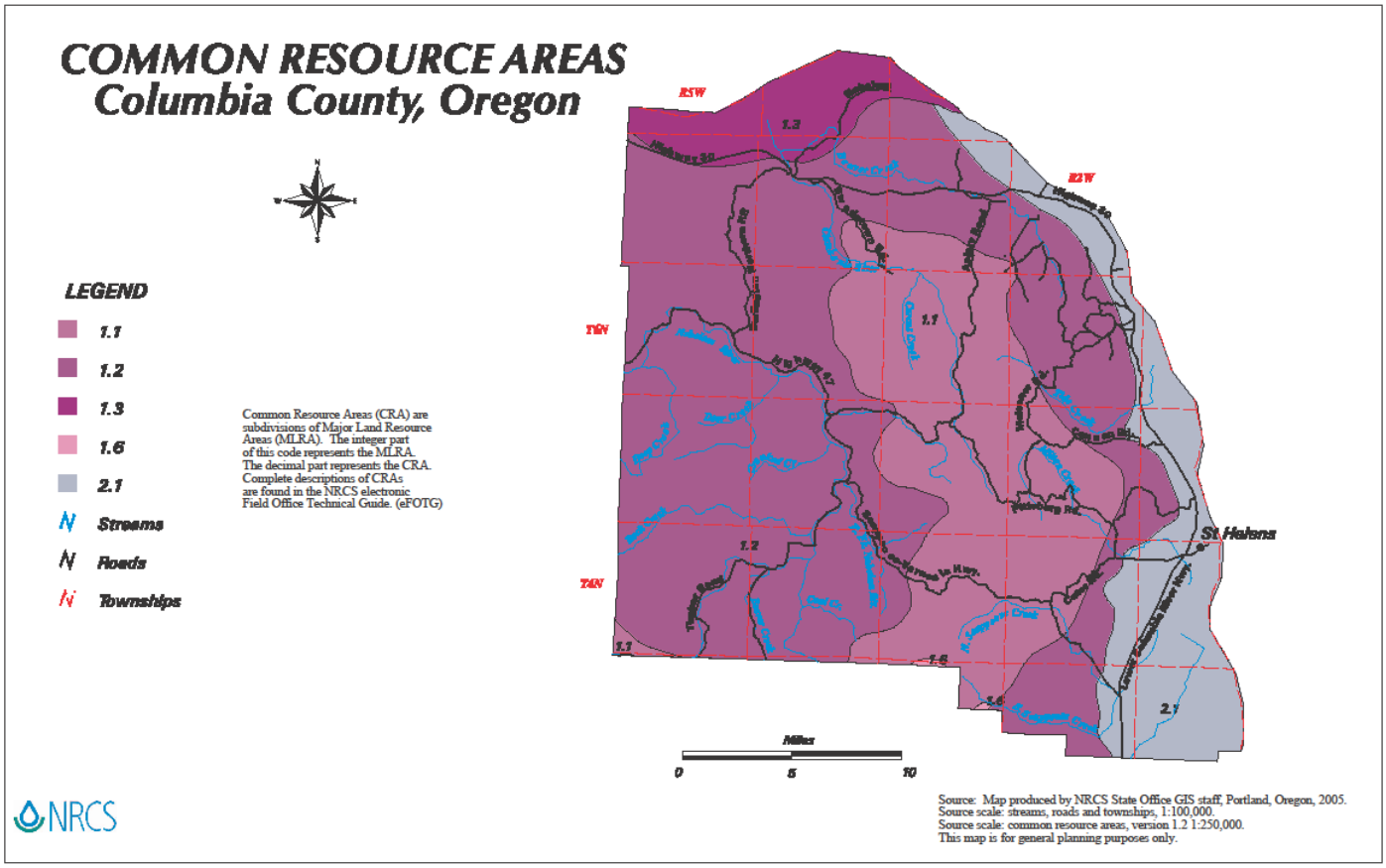



## Resource Concern: Water

Water quality and water quantity are crucial resources to all regions of the world. The vegetation and animal diversity, and the ability to produce agricultural products to maintain a society are directly related to the availability of water at the proper timing.

Salmon and steelhead return to spawn in the interior streams when stream flows are adequate. Migratory waterfowl migrate and/or winter when wetlands have recharged. Beaver create structures when streams are depleted to provide food and shelter, and large forest trees such as Douglas fir adapt to the heavy winter availability and dry summer drought. Life cycles of the county's ecology rely on water.

### Precipitation

The average annual precipitation in Columbia County ranges from approximately 40 inches near Scappoose, Oregon to more than 100 inches in the western portions of the Coastal Mountain Range (12). More than 80% of the precipitation comes from rain falling between October and April. Summers are typically very dry. It is common to receive virtually no rainfall between late June and September.

## Watersheds and Streams

Columbia County is divided into two major watersheds, split by the Coastal Mountain Range. They include the Lower Columbia River Watershed (which also includes a portion of the Lower Willamette River Watershed) and the Upper Nehalem River Watershed. Approximately 2/3 of the county drains to the Columbia River and the remaining 1/3 to the Nehalem River that discharges into the Pacific Ocean to the west. Various large and small tributary creeks discharge into these systems. Most county streams provide historical habitat for salmon species.

## Irrigated Lands, Water Rights, Irrigation Districts, Drainage or Flood Control Districts

Oregon Department of Water Resources maintains a database for all water rights of the state. A search at their website will provide specific information on the water right or the water availability. http://www.wrd.state.or.us/OWRD/MAPS/index.shtml#Other_Water_Right_Maps

Water resources are limited in most rivers of the county. With the exception of the Columbia River and the Willamette River, new water rights have been restricted. Oregon Department of Water Resources reports that the following streams in Columbia County are closed to new surface water withdrawals: The Clatskanie River and tributaries, Scappoose Creek and tributaries, McNulty Creek, Milton Creek, the Nehalem River and Little Creek on Scappoose Bay. Other streams are not closed but have severe limits placed on new water withdrawals, such as Goble Creek. Many of the closed systems are legislatively withdrawn relating to low summer flows that impede fish habitat. Domestic uses may be exempt (36).

Due to the prolonged dry summers, irrigation is an important requirement for many agricultural and nursery operations. The vast majority of agricultural operators in the county do not irrigate. They choose to raise crops that mature early enough to take advantage of spring moisture. Examples include cool season grasses and legumes for hay production. Of the operations irrigating, those in flood control districts rely on sprinkler systems and subsurface irrigation. The typical irrigation season begins in early June through early September. Irrigated crops include grass for silage, corn, peppermint and nursery stock.

In many cases, reducing water is more of an issue than capturing it. Columbia County has 13 flood control districts. These districts, found in the Columbia River floodplain discharge their excess surface and groundwater into the Columbia River system through surface drainage ditches and sloughs to large district pumping stations. In the North Coast Basin floodplains, the water table is often near the surface from late fall through spring. The elevation of water levels maintained can be controversial, depending on the crop or intended purpose. For example, a landowner requiring a high water table to sub-irrigate his/her pasture may be at odds with a producer raising a crop that needs more well drained soil.

## Water Quality Restrictions

TMDL standards set by Oregon Department of Environmental Quality (DEQ) dictate water quality limitations for the waters of Oregon. All three watershed assessments in Columbia County as well as the North Coast Basin Agricultural Water Quality Management Plan indicate similar water quality impairments that will affect aquatic organisms. These include water temperature, dissolved oxygen, bacteria levels, sediment, aquatic weeds, nutrient levels and habitat modifications (27,28,29,30). The most common limitation to all assessments is temperature. Some of these impairments are due to naturally occurring conditions. Others are due to land use and management. As an example, the Nehalem River is known to have elevated temperatures above the TMDL levels. In many cases the temperature is due to the broad, shallow bottom, where the bedrock warms the low flowing water, a naturally occurring phenomenon.

In the North Coast Basin floodplains, floodwaters erode and scour the alluvial topsoil and create channels. Because streambanks in the floodplain are non-cohesive and friable, streambanks naturally erode easily during flooding. Without riparian vegetation, this process can be exacerbated (27). These drainage systems however have been altered for agricultural production and therefore riparian vegetation is impractical due to periodic maintenance requirements.

## Groundwater and Drinking Water

In an area where excessive water is a major management concern, it would seem that groundwater would be a minor issue; however, groundwater availability and quality are becoming serious concerns in most parts of the county.

Recently, Columbia County has formed a technical advisory committee (Water Conservation and Protection Committee) to address water availability issues. A groundwater study is scheduled in the Scappoose area in the next few years that will monitor current wells for quantity and quality. The principles learned will be applied county wide.

Geologic formations of the county dictate the availability of groundwater and potable water. Colloidal marine deposits in the Nehalem River valley restrict ground water availability. Many wells produce very limited flows (1-2 gpm). Other wells expose ancient salt water that is not potable. Many rural residents obtain their domestic water from surface waters (offset wells on the Nehalem River or spring developments). In the basalt formations of the Coastal Range, fractured basalt wells are hit and miss. Some provide good reliable flows, others are poor.

Many rural residents rely on community water systems, where available. This is especially true in the floodplains. Several of these community systems rely on natural springs, but during the dry summer months with little system recharge, these systems are quantity limited. They are also aging and several are in need of major reconstruction. Although water in the floodplains is a matter of a few feet from the surface, the quality for domestic use is inadequate.

Surface water systems that traditionally have provided community water through the creation of small reservoirs restrict fish passage. Some of these are being removed or redesigned.

# Resource Concern: Air and Energy

## Non-attainment and maintenance areas for air quality

There are no non-attainment areas in Columbia County.

The only contributors to air quality problems worth consideration are from industrial outputs. Neighboring Washington State (Longview, WA) has two paper mills. The Wauna paper mill in Clatsop County and the St. Helens paper mill can contribute to air quality problems both odors and visibility. Portland General Electric (PGE) near Clatskanie, US Gypsum at Rainier, the new Cascade Grain ethanol plant near Clatskanie and Beaver Bark composting facility near Scappoose may have minor air quality impacts.

Columbia County has only a few large livestock operations that could impact air quality. These however have been minor concerns. There have been no public complaints or violations recorded.

Because Columbia County is heavily forested, it can play a significant role in reducing greenhouse gases through carbon sequestration. Therefore, maintaining healthy forestland is an important factor for capturing carbon emissions.  16% of small private forestland in the US is in poor health and nearly 4 million acres of private forestland in the west is considered in poor health (37).

## Visibility Standards

There are no visibility issues in the county. Part of the county is in the coastal fog belt, a naturally occurring climatic condition that can create visibility problems for several months each year.

## Utility/Power Company Area of Coverage

Three public utility companies serve Columbia County. They include the Columbia River PUD for the eastern portion of the county (St. Helens, Rainier, Scappoose areas), the Clatskanie PUD for the northwestern portion of the county (Clatskanie area) and the West Oregon Electric Cooperative, Inc. for the southwestern (Vernonia and outlying areas).

Portland General Electric has a power plant north of Clatskanie that generates electricity from natural gas. The Trojan Nuclear Power Plant near Rainier was decommissioned in 1992 and the reactor has been removed. Northwest Natural Gas produces and stores natural gas in the Mist/Birkenfeld area. Ancient marine cavities have been found ideal for storing natural gas in that area.

## Renewable Energy Potential

**Hydropower -** In the last 50 years, small hydropower generators were installed on small creeks in the county. Most of these are no longer operational. Due to threatened and endangered fish concerns and permitting requirements, this type of energy generation is now prohibitive.

**Solar –** With improvements to technology, there is renewed interest in solar generation for minor uses such as fence chargers and small livestock pumps. The overcast conditions of the county during several months of the year limit large capacity solar generation potential.

**Wind –** Wind generation is impractical for most of Columbia County due to forest cover and wind strength. Some areas along the Columbia River corridor have potential for wind generation due to their persistent wind speeds and consistent prevailing wind direction. There has been some minor interest in turbine generation in these areas. More exploration would be required to investigate the practicality of wind generation on a case-by-case basis.

**Bio-fuels –** Forest products can be used to generate electricity. The timber products markets in the county may have potential for filling that niche. However, providing bio-fuels from logging activities may also reduce organic material recycling and habitat values on forestland.

# Resource Concern: Plants and Animal

## Invasive Species

Since the arrival of European settlers, nonnative species have been introduced, sometimes for a specific purpose, other times by accident.

Columbia County currently has several serious invasive plant and animals and the list continues to grow. Many of the most invasive species have proliferated to the point where landowners and agencies have realized that control is futile. They have become a naturalized part of the ecological systems.

Common examples include:

Reed canarygrass – Thought to have been introduced by early settlers for its high forage production capability, it is now the most common plant found in wetlands and meadows. It replaces native grasses, sedges, rushes and forbs and creates monocultures that make poor wildlife habitat. It is very difficult to restore canarygrass sites because of the weed's climatic versatility and competitive ability.

Himalayan blackberry – It is one of the most common woody invasive plants in the northwest. It will outcompete most native woody species. It is well adapted to full sun and understory on a wide variety of soil types. It can also create a monoculture.

Scotch Broom – Another common woody species that was probably introduced as an ornamental plant. This plant is usually the first species to appear on cut-over timber. The seed survives for many years.

Coypu (Nutria) – This large American rodent was introduced for fur production into the U.S. in the late 1800's. Escape animals quickly spread to many coastal and inland waterways. The mammal burrows into streambanks and dikes to create instability. Nutria also reduce the native channel vegetation along these watercourses.

Some invasive species are actively being targeted for control in Columbia County. They include: Purple loosestrife, Japanese Knotweed, Yellow flag Iris, Tansy ragwort, Garlic mustard, St. Johnswort and others.

## Riparian land use

Riparian zones are crucial for providing shade, nutrient and sediment filters, streambank stability and wildlife habitat. They create corridors between agricultural lands, upland and lowlands which allow wildlife movement. All three Columbia County watershed councils consistently indicate the need for improvements to the riparian condition throughout their respective areas.

The forest practices act of 1994 established rules for managing nonfederal forest lands in Oregon. These regulations set minimal buffer requirements based on the stream size for all streams with anadromous fish (40). In the late 1990's, Oregon Senate Bill SB 10-10 created legislation addressing water quality on agricultural lands. The North Coast Basin Agricultural Water Quality Management Area Plan stresses the importance of maintaining healthy riparian areas.

Historically, agricultural activities in the lowlands and timber production in the upper portions of the watersheds removed almost all riparian protection. After old growth forests were logged the land was typically abandoned. These streams once shaded by Western Red Cedar and Western Hemlock were replaced by earlier successive species such as red alder and bigleaf maple. In the lowlands, black cottonwood, Pacific willow and Oregon ash were removed to allow grazing or cultivation. What riparian vegetation that returned was grasses and shrubs.

Since the forest practices act has been implemented, riparian zones are improving on forestland, however, deciduous trees have replaced the preferred conifer species. Local observations may indicate that the detritus generated by deciduous trees, like red alder, may negatively impact the water quality of some systems, creating higher organics and nutrient loading to streams versus historical values generated from conifer species.

## Wildlife Conservation Opportunity Areas

According to the Oregon Conservation Strategy produced by Oregon Department of Fish and Wildlife, Columbia County contains 3 conservation opportunity areas (32). See the attached map.

**WV-01 – Columbia River Bottomlands** - Found in the Willamette Valley Ecoregion, this area in the floodplains bordering the Columbia River and Multnomah Channel are one of the most important

habitat complexes in the Pacific Flyway for migratory and wintering waterfowl. It contains a mixture of sloughs, lakes, ponds, marshes and deciduous woodlands. The habitats include; Oregon oak woodlands, riparian areas, wetland and wet prairie habitats. Some of the key wildlife species include bald eagle, peregrine falcon, osprey, shorebirds, waterfowl, coho salmon, winter steelhead, northern pond turtle and western painted pond turtle. See page 244 of the Oregon Conservation Strategy.

**CR-02- Columbia-Clatskanie Area** – This area found in the floodplains and dike lands near Clatskanie encompasses part of the Julia Butler Hanson Refuge for the Columbian white-tailed deer. It contains key habitats of freshwater wetlands, Oregon oak woodlands and riparian areas. It is important habitat for the endangered Columbian white-tailed deer, the olive-sided flycatcher, coho salmon and winter steelhead. See page 143 of the Oregon Conservation Strategy.

**CR-03 – Clatskanie River** – This area is important for its aquatic, freshwater wetlands and riparian habitats. Some of the key species include chum salmon, coastal cutthroat trout, coho salmon, fall chinook salmon, winter steelhead and the Columbian white-tailed deer. See page 143 of the Oregon Conservation Strategy.

In addition to opportunity areas identified in ODF&W's Oregon Conservation Strategy, Columbia County contains the following important habitats in various regions throughout the county: wetlands, riparian habitats, oak woodlands, late successional conifer forests and freshwater aquatic habitats (32).

The Lower Columbia River Conservation Recovery Plan for Oregon Populations of Salmon and Steelhead completed by ODF&W, list two of the highest priority streams in the state as the Clatskanie River and Scappoose Creek both located in Columbia County (35).

## Productivity and Forage Quality

Hay and pasture productivity potential is very high in many areas and soil types in the county. The climate is ideal for raising cool season grasses and legumes. Management of most grasslands however is low and undesirable species have invaded many sites. Pasture and hayland productivity in the Nehalem River floodplain has dropped significantly. Bentgrass, sweet vernal and broadleaf weeds; such as daisy and thistle have replaced more palatable and productive forage species. The same is true for pastureland in the Columbia River floodplain where reed canarygrass has overwhelmed most productive species. Productivity on previous forest soils in the Coastal Range foothills is usually much lower than the floodplains and terraced benches. These soils are prone to shorter growing seasons, lower fertility and low pH values. To remain productive, forest soils require shorter grazing periods and higher input rates.

Columbia County's climate is sometimes unfavorable for raising livestock. Although winter temperatures are mild, they are extremely humid and wet. Livestock exposed to the long, wet winters can experience health concerns and weight loss. Without sufficient housing and heavy use area protection, the pastures become overgrazed and barn areas become sources of water pollution. Most grazing specialists recommend seasonal herds versus breeding herds.

## Animals – Fish and Wildlife

As pointed out earlier, the first European settlers arrived with the objective of exploiting the rich fir and salmon resources of the area. In turn, settlers introduced other nonnative fish and wildlife species, many of whom have become naturalized. After nearly 200 years, many of the habitats of the native fish and wildlife species have been significantly impacted or removed while the nonnative species introduced have thrived. Some examples of activities that have altered fish and wildlife habitats include:

Wetlands – The diking, filling and draining of large acreages of floodplains impacted off-channel habitat for fish, resting areas for migratory waterfowl and native amphibian habitat.

Old growth forests – All the old growth forests have been removed.

Floodplain bottom land deciduous forests – Most were cleared and burned for agricultural purposes. Species that relied on these forests for cover and movement, included the now endangered Columbian white-tailed deer.

Riparian Areas – Tree canopy was removed through logging to allow timber harvests and transport. Pasture and agriculture removed most riparian buffers because these areas were considered highly productive.

Perennial/Intermittent Streams – Many streams were dammed, diverted and dewatered for manufacturing, timber harvest, domestic needs and flood control.

## References Cited


1. http://www.accessgenealogy.com/native/oregon/index.htm

2. http://logos.uoregon.edu/explore/oregon/clatskanie.html

3. http://www.clatskanie.com/chamber/history.htm

4. http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Oregon/cp41009.pdf

5. http://www.olmis.org/olmisj/AllRates (unemployment rates in Oregon)

6. http://www.census.gov/cgi-bin/saipe/saipe.cgi (household income in Oregon by County)

7. http://www.co.columbia.or.us (Columbia county facts)

8. http://en.wikipedia.org/wiki/Columbia_County_Oregon (Columbia County facts)

9. Nehalem Valley Historical Society (NVHS) no date provided. A Patchwork History of Nehalem Bay, 181 pp.

10. Portland and Southwestern Railroad Tunnel, "The Nehalem Divide Railroad Tunnel" Susan Worthington – Bureau of Land Management 1976.

11. Forest Resources of Columbia County Handy Facts, Oregon Department of Forestry, 1995

12. Soil Survey of Columbia County, November 1986, USDA-Soil Conservation Service

13. The Encyclopedia of Oregon, 1999, Somerset Publishers Inc., St. Clair Shores, MI 48080 ISBN 0-403-09840-8

14. 1962 Scappoose-Rainier Soil Conservation District Annual Report

15. 1967 Columbia Soils & Water Conservation District Annual Report

16. 1965 Clatskanie Soil and Water Conservation District Program and Objectives

17. Farnell, J.E. 1981 Nehalem, Necanicum, Nestucca Navagability Studies, Division of State Lands, Salem, Oregon, 38pp.

18. http://quickfacts.census.gov/qfd/states/41/41009.html

19. http://www.scappoose.com/history.php

20. http://www.twrps.com/ccor/scap.html

21. http://www.vernonia-or.gov/history/history.asp

22. http://www.cityofrainier.com/history.html

23. Grotta, Amy. OSU Extension Forester Washington/ Columbia County. Personal communication on 7/20/2010.

24. VanNatta, K.C. Forest Owner and President of the Oregon Tree Farm Association. Personal communication on 7/20/2010.

25. USDA-SCS, 1990. Land Evaluation of Agricultural Soils in Columbia County, Oregon

26. USDA-SCS, 1989. Land Evaluation of Forest Soils in Columbia County, Oregon

27. North Coast Basin Agricultural Water Quality Management Plan, September, 2009, Oregon Department of Agriculture
28. Scappoose Bay Watershed Assessment, January 2000, Prepared for Scappoose Bay Watershed Council, 33126 SW Callahan Road, Scappoose, Oregon 97056 by David Evans and Associates Inc., 2828 SW Corbett Avenue, Portland, Oregon 97201
29. Watershed Assessment of the Lower Columbia-Clatskanie Subbasin of Oregon, August 2001, Prepared for the Lower Columbia River Watershed Council by Gary D. Rule as a Master's thesis, Portland State University.
30. Nehalem River Watershed Assessment, December 1999. Prepared by Jill Johnson, Graduate Student, Portland State University for the Upper and Lower Nehalem River Watershed Councils
31. Hillel, Daniel, 2008. Soil in the Environment Crucible of Terrestrial Life. Academic Press, 30 Corporate Drive, suite 400, Burlington, MA 01803.
32. Oregon Department of Fish and Wildlife. February, 2006. The Oregon Conservation Strategy

33. Seely, Michael, Agricultural Owner/Operator. July, 2010. Personal Communication

34. http://www.ohs.org/education/oregonhistory/learning_center/dspResource.cfm?resource_ID=000BC26B-EE5A-1E47-AE5A80B05272FE9F

35. Oregon Department of Fish and Wildlife. April 19, 2010. Lower Columbia River Conservation & Recovery Plan for Oregon Populations of Salmon & Steelhead, Executive Summary. Pg 18-21.

36. Hedin, Darrell. Water Master District 18, Oregon Department of Water Resources. September 9, 2010. Personal Communication.

37. USDA-NRCS, 2006. North Coast Basin Strategic Plan

38. http://www.oregon.gov/ODF/PUBS/docs/Oregon_Forests_Reports/OFR_2007.pdf

39. ODF. Annual Report 2009. http://www.oregon.gov/ODF/STATE_FORESTS/docs/management/annual_reports/2009_CFTLC_Report_FINAL.pdf

40. ODF. Oregon Forest Practices Act as Amended, January 2010 http://www.oregon.gov/ODF/privateforests/docs/guidance/FPArulebk.pdf

41. Reed, Mark, Oregon Department of Forestry. Personal contact Feb. 2011

# SECTION III: NATURAL RESOURCES ANALYSIS

Since the early formation of soil and water conservation districts in the 1940's and the presence of USDA-Soil Conservation Service (now the Natural Resources Conservation Service) around that same time, conservation efforts in Columbia County have concentrated activities on private agricultural lands (hayland, pasturelands and cropland) and some private forestlands.

Other state and federal agencies focused their efforts more specifically, (i.e. ODFW – fish habitat and wildlife habitat, ODF – timber production and regulation).

Conservation Districts and SCS/NRCS have taken more of a broad stroke through our conservation planning efforts which addressed multiple resource concerns on multiple land units. Our efforts however, have been difficult to quantify because our services and programs were offered to whoever expressed interest countywide on a first come – first serve basis.

Although properties have changed ownership, and operations have changed significantly over time, these conservation planning efforts have been NRCS's contribution to rural America's natural resource management for three-fourths of a century.

## Then and Now

The goals and objectives of conservation districts in Columbia County haven't changed dramatically in over 60 years. Similar to a constitution, the founders of these first conservation districts envisioned a need to address natural resources specific to the county that would extend into the future. Most of these efforts were accomplished on a voluntary basis with an extremely limited budget.

These objectives were to help all of the landowners…..conserve, improve and develop their soil and water resources and to work together to correct soil erosion, drainage, flood control, watershed protection and other resources of the area (16).

**Historical Activities** – To accomplish these objectives the following list represents some of the activities of SCS and SWCD's in Columbia County during the early years. Some of these practices are still common. Others were determined to have negative ecological impacts and therefore no longer encouraged:

Riprap – Thousands of feet of rock riprap were installed to stabilized streambanks throughout the county. When installed properly, these structures were very effective for erosion control, at least on those specific properties. Many are still visible today. Later rock riprap was determined to have negative habitat impacts to many fish and aquatic organisms. Additionally, the hardened banks could redirect the streams energy to other adjacent properties as well as increase the velocity of the stream.

Surface and Subsurface Drainage – Hundreds of miles of wood, clay and plastic subsurface tiles were installed with SCS's assistance to improve drainage and crop production, especially in Columbia County's drainage districts. Large areas of hydric soils were converted for annual tillage through tiling and open field ditches during America's agriculture expansion. These soils were highly productive. Agriculture

productivity however was a trade-off for hundreds of acres of wetland conversion and miles of waterways no longer accessible to fish.

Pasture and Hayland Improvements – Hundreds of acres of grazing lands were reseeded to new and improved pasture mixes as research developed better seed varieties. Bentgrass and reed canarygrass were commonly seeded varieties that have now spread to all areas of the county, creating monocultures, and in some cases negatively impacting wildlife habitat.

Forest Productivity – SCS and Oregon Department of Forestry encouraged timber owners to replant thousands of acres of forestland to Douglas fir after harvest. Red alder and other lower value forest species were controlled. Forest understory shrubs and other vegetation were eliminated where possible creating a generic plantation style woodlot. This reduced forestland diversity and wildlife values. Many sites are now seeing issues with diseases such as laminated root rot from replanting fir after fir.

Pond Construction – Throughout the first 45 years or so, SCS helped design and install many farm ponds for fish, wildlife, aesthetic values and some small irrigation projects. Many of these early constructed ponds have silted in or have structural problems, changed the hydrology and/or blocked fish passage.

Erosion Control – SCS and SWCD assisted where possible on farmland with erosion from gullies and sheet and rill erosion. Some terraces, cover crops and water control structures were installed. Many of these fields are no longer in cropland after being subdivided into small acreage rural residential lots for home sites. Others were taken out of production as local commodity markets disappeared.

**New Activities** - In the past 10 to 20 years, as public priorities have evolved regarding environmental concerns of point and nonpoint pollution sources, endangered species legislation, and other concerns, NRCS, Columbia SWCD and their partners in Columbia County have refocused our conservation delivery. Conservation practices that were uncommon before are now a common focus. Some of these practices include; wetland restoration or enhancement, fish passage and/or fish stream improvements, riparian forest buffers, water quantity practices, invasive species control and many water quality practices that stem from the Clean Water Act of 1987 and other regulations.

## Natural Resource Analysis and Assessment Material

Several high quality attempts have been made to assess specific natural resource concerns in the North Coast of Oregon, Columbia County, and on a watershed scale. Many of these documents/assessments were used to help determine the strategic focus important to Columbia County and the formation of priorities for NRCS. The following lists several examples and provides a brief explanation of relevance:

- **NRCS Strategic Plan for the North Coast Basin (updated in 2006)** – HIGH -This document explains strategic natural resource issues in the basin, sets targets and action items for addressing the issues with NRCS and conservation district staff. A predecessor of this current document, the North Coast Strategic Plan helps set recent historical profiles for the North Coast Basin. It recommends priorities and action items important for all natural resources in the basin.

- **Fish and Wildlife Habitat** – The plan stresses the importance of riparian restoration, wetland enhancement, temperature and sediment reduction, groundwater recharge and flood damage reduction. It also addresses the difficulty of treating these concerns due to invasive weeds, streambank instability and livestock management issues.
- **Grazing Lands** – The plan identifies the significance of the small (20 acre of less) livestock operations and the need to provide outreach and technical assistance to these operations. As a whole, these operations have a significant impact on water quality. The plan places high priority on grazing lands for water quality, plant condition and fish and wildlife habitat.
- **Forestlands** – The plan identifies that forest operators are extremely important in the Basin but have been underserved by NRCS programs in the past. Large forest tracts have been split up into smaller parcels and that as a whole these small ownerships control a large portion of timberland. It states that there is heavy interest in forestland program assistance but the programs are underfunded. Erosion on forestland from roads and slide prone slopes has been documented by ODF.
- **Air Quality** – The plan identifies that 16% of small private forestland in the United States are in poor health and that nearly 4 million acres of private forestlands in the west are in poor health. Poor forest health reduces the ability to provide carbon sequestration.
- **Urban/Residential Lands Conversion** – Between 1982 and 1997, the National Resource Inventory estimated that 3700 acres of pastureland, 700 acres of cropland and 4900 acres of forestland in the Basin were converted to urban and/or residential uses.

- **North Coast Basin Wildlife Committee (2008**) – HIGH - As an extension of the North Coast Basin Work Group, NRCS formed a wildlife committee to set fish and wildlife resource priorities on a basin and county level. It was intended to assist NRCS in focusing our efforts to the highest priority wildlife concerns for future program delivery and determine methods of utilizing partnerships to address common priorities. The committee included representatives from NRCS, SWCD's, Watershed Councils and ODFW. They identified several priority resource concerns in Columbia County including: fish passage, loss of connectivity between uplands and lowlands, loss of connectivity of streams and wetlands, large woody debris, tidal and floodplain restoration, water quality issues such as temperature and sediment, wetland creation and Columbian white-tailed deer habitat. The committee also prioritized streams and watersheds. Their list included the Deer Island area, Rock Creek near Vernonia and Scappoose Creek. *The results of this committee's efforts are highly relevant to the strategic approach of NRCS because it establishes, based on local knowledge, important fish and wildlife priority areas and habitats in the county to target.*
- **North Coast Basin Agricultural Water Quality Management Area Plan (September, 2009**) – MEDIUM - Oregon Department of Agriculture with assistance from the North Coast Advisory Committee completed the area plan to address agricultural water quality concerns. The plan assesses the current condition and lays out strategies to reduce water pollution from agricultural uses. The NC Water Quality Management Plan stressed water quality outreach to rural communities and water quality planning to address all TMDL elements. Riparian buffers

and filter strips are high on the list of best management practices. *This Ag Water Quality Plan is important to NRCS's strategy because it addresses water quality on agricultural lands, where NRCS direction and programs can have the most impact.* Concentrating on DEQ's 303d parameters, the plan is specific to North Coast Basin streams. It provides general strategies to improve water quality.

- **Columbia SWCD Ag Water Strategy (2010-2014)** – HIGH - The Columbia SWCD outlines their approach to delivering water quality conservation throughout the county over a 5 year period. The plan breaks the county into regions that will have a phased outreach, development, implementation and monitoring delivery. The plan begins with regions of the county that have been underserved in the recent years. Although this plan is designed for modification, the intent is to conduct outreach in the Vernonia area first. District efforts, including mailings and door to door follow-up have already begun. *The partner relationship between the Columbia SWCD and NRCS has been established for more than 50 years. The CSWCD and NRCS share office space. NRCS has traditionally relied on the District for technical and outreach assistance and conservation priority direction within Columbia County. Therefore, it would make sense to concentrate efforts together to draw on each other's abilities.*
- **The Oregon Conservation Strategy of Oregon Department of Fish and Wildlife (February, 2006)** - MEDIUM - ODFW vision for long-term conservation of Oregon's native fish and wildlife. The plan outlines eco-regions and opportunity areas throughout the state and recommends approaches to solving resource problems specific to fish and wildlife. In Columbia County the following opportunity areas are outlined in the plan: CR-02 Columbia-Clatskanie Area, CR-03 Clatskanie River and WV-01 Columbia River Bottomlands. *Along with the Basin Wildlife Committee (above), The Oregon Conservation Strategy is very relevant to NRCS's strategic approach in Columbia County because it helps establish key areas and habitats that specifically address fish and wildlife. It however is somewhat general because it is a statewide plan.*
- **Nehalem River Watershed Assessment (1999**) – MEDIUM -This assessment completed by the Upper Nehalem Watershed Council, assesses the impacts of human activities on salmon populations in the Nehalem River Watershed.
- **Scappoose Bay Watershed Assessment (2000) -** MEDIUM **-** Completed by the Scappoose Bay Watershed Council, this comprehensive assessment provides a broad foundation for effective restoration of native fish species and their aquatic habitat for Scappoose Bay Watershed.
- **Watershed Assessment of the Lower Columbia-Clatskanie Sub-basin of Oregon (2001) –** MEDIUM **-** Completed for the Lower Columbia River Watershed Council, it covers the remaining portion of Columbia County with the similar purpose of assessing native fish habitat.
- **Comprehensive Assessment of Fish Passage Barriers in the Scappoose Bay Watershed (2001)** – MEDIUM - The document provides a fish barrier assessment and attempts to prioritize their removal and associated stream restoration. Several of the highest priority barriers have already been removed or modified in this watershed based on this barrier assessment with the use of OWEB and LCREP funding.
- **Lower Columbia River Conservation & Recovery Plan for Oregon Populations of Salmon and Steelhead (2010)** – MEDIUM -ODF&W with the assistance of a stakeholder team summarizes

threats, limiting factors and actions for streams in the Lower Columbia Watershed. Two of the streams recognized as high priority for restoration are found in Columbia County (Scappoose Creek, Clatskanie River). Although there have been strong efforts including a barrage of funding sources to address the salmon issue, conservationists are still learning. This plan lays out some priority streams with the highest probability of impacting salmon recovery. The next phase of the plan is forming partnerships to implement these recommendations. *NRCS can use this plan to develop partnerships with other organizations desiring the same outcome. By focusing our efforts together we can accomplish high priority projects with current staff and funding shortages.*

- **Coordinated Resource Management Plan for the Lower Clatskanie River (2009)** – MEDIUM - Through the CRMP process, this plan completed by the NRCS Watershed Planning Team assesses the Lower Clatskanie River, outlining the CRMP priorities. More than 30 agency, groups and private landowners have taken part in the process. Some of the highest priorities include streambank erosion, flooding, deposition of waterways and T&E species.
- **Northwest Oregon RC&D Plan of Work (2008-2012)** – LOW -This plan discusses the RC&D's priorities and project work. Several ongoing RC&D projects are in Columbia County. The county has been strong supporters of RC&D efforts. *The plan is relevant to NRCS because of the ability of RC&D to concentrate on projects outside of NRCS's realm. Many of these priority projects could be accomplished in a combined effort with NRCS.*
- **Watershed Profiles (2005)** – MEDIUM - Three of the watershed profiles completed by the NRCS Watershed Planning Team are found in Columbia County including the Lower Willamette, the Lower Columbia-Clatskanie, and the Nehalem River. *The profiles are relevant in the sense of creating a baseline of the watersheds. Much of the information in this strategy about watersheds within Columbia County was gleaned from the watershed profiles. They don't however, set specific guidance on prioritizing resource concerns.*
- **Lower Columbia-Clatskanie River Rapid Watershed Assessment (2009)** – MEDIUM -The Oregon NRCS Watershed Planning Team completed this rapid watershed assessment in 2009. This assessment is a tool used to calculate initial estimates for potential costs and opportunities for implementing conservation systems over a 5 year period.
- **Columbia County Comprehensive Plan and Zoning Amendments** – LOW -This regulatory policy provides direction for Columbia County development and includes policy for natural resource protections.
- **Water Conservation and Protection Committee** – LOW -A technical advisory committee was formed in the last 2 years to address ground water availability and quality. Members include Columbia County Land Development, Columbia SWCD, NRCS, OSU Extension, Oregon Department of Water Resources, Watershed Councils and Northwest Oregon RC&D. Starting in 2010, a groundwater monitoring and outreach effort will begin in the Scappoose Area conducted by Portland State University.

## Human Resources Analysis

The human resource element is a common component in all natural resources management. All resource activities on every land use rely on human decision-making, natural resource attitudes, public priorities, changing ownership and land use planning decisions (both private owner and regulatory).

In Columbia County these factors bear consideration in order to effectively strategize and eventually deliver conservation effectively.

**Ownership and Operation Size** – As outlined in Section II of this document, information gathered from the 2007 Agriculture Census as well as the US Census indicates trends in Columbia County.

- Operations are small - The median sized farm is only 23 acres. This element indicates NRCS's target audience is small operations. Most of the larger farms have already had conservation plans developed, which are in varying stages of implementation.
- Diminishing agricultural operations - The number of farms has declined by 8%, from 878 in 2002 to 805 in 2007. Columbia County's agricultural operations are being lost due to development, land use conversion for other purposes and lack of farming interest from the younger generation. Also, the small operations are more prone to ownership turn-over. The "generational family farm" is no longer common in the county.
- Declining agricultural acreage - The acreage in agricultural use has dropped by 7% from 62,398 acres in 2002 to 57,758 acres in 2007.
- Outside occupations - Only 310 farms in the county consider farming their primary occupation. Many of these may also be retired residents living on rural properties.
- Low profitability and part time farming - Only 6% of farms (49 farms) have farm sales exceeding $25,000/year. This indicates that the vast majorities of potential customers are not full time farmers and may have objectives other than farming for profit.
- Aging ownerships – The average age of operators is 57.7 which indicate the trend away from the family farm will continue. Beginning farmers may be an important target for future technical and financial assistance.

**Land Use Planning and Conversion** - An important note in analyzing the past and future conservation needs in Columbia County has to include county land use planning.

- Thousands of acres of former cropland are no longer used for that purpose. Farmland once used for high value crops like strawberries, peppermint, vegetables and grains has been converted into small units of 5 to 20 acres for rural residential housing. This is especially true near urban areas such as Scappoose, Warren and St. Helens.
- Many hundreds of acres of highly productive cropland are now used for pasture and hayland with very little to no inputs or capital improvements. The drainage districts near Clatskanie and Rainier are prime examples of previously high value farmland currently being used for small livestock operations and low maintenance inputs such as low value hay.

- Owners of small agricultural operations are not reinvesting dollars into production, maintenance or improvements because it is not economical to operate these small farms for livestock or hay production. Instead these operations use livestock or haying as a bare minimum attempt to keep vegetation controlled. Many owners actually pay someone else to cut their fields or graze livestock at minimal costs.
- Many small operations have limited funds or in some cases limited motivation to make improvements for natural resources or productivity. They do not rely on their properties for a source of income. Rural living is more of a "way of life" than a means of sustainability.
- In the other extreme, industrial forestland continues to expand, also, commercial operations such as hybrid poplar farms and the large nursery enterprises have expanded, purchasing or leasing parcels once used for small to medium sized operations. Industrial uses and urban growth also have grown in the recent past. The Port of St. Helens has recently purchased several hundred acres of previously farmed lands near Quincy for future industrial enterprises. The City of Scappoose, which is speculated to double in population in the next 5 to 10 years, has applied to the County to take several hundred acres of prime farmland and convert to industrial and residential properties. Industrial gravel mining continues to convert previously farmed lands to surface mining.

**Public Priorities** – The public values natural resource protection. Several public regulations have been legislated to maintain those values. Threatened and endanger species, clean, potable water, wildlife habitat, clean air, control of invasive species, flood protection and an aesthetically pleasing countryside are all high priorities and help dictate where technical and financial assistance is needed.

**Conservation Participation and Attitudes** – Many of the small operations are ineligible to participate in farm bill programs because they fail to meet the definition of an agricultural operation. The large enterprises such as industrial forest operations, nurseries and tree farms may also be ineligible because of their sheer size and income. According to the 2007 Ag Census, government program participation is low. Many operators value their independence. Only 29 farms have acknowledged receiving government assistance for a total of $181,000 in Columbia County. This number however is much lower than NRCS's calculations for programs such as CSP, EQIP, WRP and WHIP.

Columbia County voters care about conservation based on results from the 2008 general election. Columbia Soil and Water Conservation District acquired a property tax levy at that time, indicating county voters do care about improving natural resources in a county that has a track record of not supporting most new tax initiatives.

The Columbia SWCD has approximately 1300 registered district cooperators. About 300 of these are active. Conservation farm plans were developed for most cooperators however the majority of these plans are obsolete. It is estimated that 35 of these plans meet an RMS level of planning.

During the period between 2000 and 2010, the following programs and activities have been carried out in Columbia County by NRCS.

**Conservation Security Program (CSP)** – In 2005, the Lower Willamette Watershed was one of the nationally chosen watersheds for CSP. It includes the area in the southeast portion of Columbia County. 6 CSP contracts were obtained with some of the best agricultural operations in the county. These CSP contracts cover 1253 acres of cropland and pasturelands in the southeast portion of the county. Through the CSP in Columbia County $362,127 has been distributed.

**Wildlife Habitat Incentives Program (WHIP)** – Four WHIP contracts have been written to improve threatened and endangered salmonid and steelhead habitat. These projects included fish passage, channel restoration, streambank protection and fish stream improvements. More than 16 miles of high quality streams were opened up with the assistance of WHIP. The total implementation costs exceeded $420,000. NRCS has only scratched the surface of WHIP potential in the County. Many excellent habitat improvement projects would benefit from WHIP. WHIP program limitations however have reduced the effectiveness of the program.

**Wetland Reserve Program (WRP)** – Columbia County has 2 permanent WRP easements that cover 436.7 acres. This program will restore the wetland values to previously operated agricultural lands. These properties provide high quality fish and wildlife habitat for migratory waterfowl, salmon, amphibians and upland game. They also deter future development and potential gravel mining. Restoration and maintenance efforts continue on these easements. Through partnership efforts, the restoration activity on one of the WRP easements has been fully funded through the Scappoose Bay Watershed Council with grants from OWEB, USFWS and LCREP. WRP has not been widely accepted in Columbia County due to the loss of control of land and the reduction in agricultural use. Also, easement CAP rates are well below the land values making it unattractive.

**Conservation Reserve Enhancement Program (CREP)** – There are 8 CREP contracts establishing 388 acres of buffers, all located in the Nehalem River valley in Columbia County. The CREP program implemented riparian forest buffers along anadromous fish streams. Through CREP, practices including riparian forest buffers, access control, upland wildlife habitat, livestock watering systems and exclusion fence were installed. More than $582,000 in annual rental payments will be distributed to participants over the 15 year contract period. Establishing riparian forest buffers is a high priority in the County. However, due to the small ownership sizes, the pay-off for most owners is more of a deterrent than an attraction to participate.

**Conservation Stewardship Program (CStP)** – In 2010, with the roll-out of the new Conservation Stewardship Program, 17 new CStP contracts have been written on cropland, pastureland and forestland covering approximately 5505 acres. CStP will not be a widely used program in Columbia County due to the lack of medium to large farms.

**Emergency Watershed Protection (EWP)** – Due to the December 2007 flood that devastated portions of Columbia County, the EWP program was implemented. Approximately 150 program inquiries were taken by NRCS and conservation district personnel. 19 EWP projects benefiting more than 30 landowners were constructed. Conservation practices included streambank protection, channel

vegetation and debris removal. Over $1 million in funds were acquired to protect from loss of property and life

**Environmental Quality Incentives Program (EQIP)** – From 2000 to 2010, 71 EQIP contracts have been written in Columbia County to treat natural resource concerns for a total contract cost of $1,632,615. Approximately 7758 acres of agriculture and forestland have been addressed in some fashion with EQIP funds during this period. The table below indicates the resource concerns addressed by EQIP by contract over the past 10 years. The table also indicates that the broad approach used with the EQIP program to date has created program interest that didn't exist in the past. Many program participants have begun to tell their neighbors about NRCS programs. The broad resource approach has made agricultural operators aware that technical and financial assistance may be available. The accomplishments to date however, cannot accurately capture whether or not resource problems have been fully addressed. Due to the type of operations, as explained above, and the lack of concentrated agricultural areas, it has been difficult to target specific areas in the county for prioritizing resource treatment. Therefore the EQIP program is still in an enterprise building phase. In other words, creating high interest in conservation and program participation is of high importance.

**OWEB Small Grants** – Through Oregon Watershed Enhancement Board funding, the Columbia SWCD has been able to implement several water quality and fish stream improvements. Two small compost facilities were recently installed, two fish passage projects, heavy use areas for livestock confinement and others. Combined with NRCS programs such as EQIP or WHIP, this program in partnership has been effective.

**Weed Grants** – Columbia SWCD has obtained several invasive weed grants for control of noxious weeds such as Japanese Knotweed, purple loosestrife, yellow flag iris, garlic mustard and others.

**Other program efforts** – OWEB, LCREP and DEQ-319 grants have been used effectively by other agencies in Columbia County to make improvements for salmon habitat. Used in concert with NRCS programs and technical assistance where applicable, several of these programs can have greater impacts. The greatest hindrance to most programs including NRCS programs is the ability to receive funding for preliminary efforts needed that precede implementation. Funding for studies, analysis and design portions of the project are not widely available. Most grantors want to use their funds on activities directly related to implementation. This approach however doesn't always yield the best, well studied projects.

## Columbia County Resource Concerns Addressed with EQIP 2000-2010

## Number of Contracts – 71 total

| Resource Concern Addressed | Pastureland | Crop/Hayland | Headquarters | Wildlife land | Forestland |
|---|---|---|---|---|---|
| Surface Water Quality-Nutrients & Organic | 17 | 16 | 19 | | |
| Surface & Ground Water Quality – Pest Management | | 7 | 1 | | |
| Plants - Pasture Productivity | 18 | 16 | | | |
| Soil Erosion-Streambank Erosion | 4 | | | | |
| Animals -T & E Fish & Wildlife | 5 | | | 2 | 2 |
| Surface Water Quality-Sedimentation | 3 | | | | |
| Animals-Wildlife Habitat | 8 | 2 | | 2 | 6 |
| Riparian Improvement | 5 | | | | 3 |
| Soil Condition - Compaction | | 3 | | | |
| Plants-Forest Productivity | | | | | 7 |
| Water Quantity - Efficiency | 1 | 4 | | | |
| Soil Erosion-Soil Mass Move | 1 | | | | |
| Forest Man Plans | | | | | 11 |
| CNMP's | | | 3 | | |
| Soil Erosion – Road Erosion | | | | | 3 |
| Surface Water Quality – Temp | | | 1 | | |
| Water Quantity - Flooding | | | 1 | | |
| Plants – Invasive Species | 1 | | | | 1 |

## Soil Resources Analysis

A published soil survey for Columbia County was completed in November of 1986. It has a wealth of information about the soils in general and also includes soils interpretations for most resource concerns. Beyond the soil survey, Natural Resource Inventory (NRI) data and land cover surveys have been conducted in the recent past.

Soil resource concerns have been, and some continue to be high profile concerns ever since the formation of conservation districts and USDA's Soil Conservation Service. According to local knowledge, feedback from the local work group and several assessments, the following information represents soil resources in the county.

**Soil Erosion – Sheet and Rill** – Sheet and rill erosion is no longer a common concern in the county. Most highly erodible farmland has been converted to permanent cover such as grass & legumes for pasture or hay, and in some cases returned to woodland. The vast majority of tilled farmland remaining in Columbia County is found on floodplain soils that are not prone to sheet and rill erosion.

In the 1980's a STEEP project was implemented on highly erodible strawberry fields. The project received national attention for the use of hillside drains to control sheet, rill and ephemeral gully erosion (36). At one time, more than 5000 acres of cropland in the St. Helens area were in strawberries. Almost all of these fields are no longer in production.

***Location and Severity –*** *Sheet and Rill can still be found in small pockets of cropland in the foothills of the Coastal Range. These are typically very small fields. Occasional sheet and rill can also be found on pasture or hayland fields that are being renovated throughout the county. It is not currently a common problem.*

**Common gully erosion on strawberry fields in the 1980's near St. Helens**

**Strawberry fields near St. Helens with rill erosion in 1980's**

**Streambank Erosion and Soil Mass Movement** – Soil erosion in the form of streambank erosion and soil slides (mass movement) is still common in many areas of the county. As previously mentioned in Section II, many of the streambank and floodplain soils are entisols which are structurally weak. This is also true for many steep forest soils which are young inceptisols. Both soil classes can be very unstable when disturbed. Floodplain pasture and hayland are especially susceptible to streambank erosion because of the lack of stabilizing roots that trees provide, holding the bank in place. Aging red alder can also be a cause of streambank erosion. As they die and fall over, they commonly create large holes in the bank. When no regeneration exists, because the riparian area has been grazed, there is nothing to halt future bank instability. It can also be commonly found on forestland. Soil slips are typically seen on steep forest sites and sometimes along unstable pasture slopes. On pasturelands, livestock access combined with unstable bank toes will allow soil slides to advance.

***Location and Severity*** *– Streambank erosion is common on almost all stream systems in the county. It is especially severe on the Nehalem River and its major tributaries such as Fishhawk Creek, Rock Creek and Beaver Creek due to the weak structure of the soils in that area and in some cases the lack of riparian buffers. Major flood events in the last 2 decades have produced debris flows that have created additional areas of streambank erosion such as Scappoose Creek and the Clatskanie River system. Streambank erosion created by unstable slopes is also becoming more common along tidal sloughs with drainage district dikes in the Clatskanie area.*

*Soil mass movement is primarily found on very steep forestland soils, occurring after the slopes are logged. These steep slopes are located in large part in the Clatskanie area. Townships 7N-R4W, T7N-R5W, T7N-R6W and T8N-R6W. Oregon Department of Forestry's main concern for soil slides is in regards to life safety and protection of resources. ODF doesn't consider soil mass movement a common concern. (41).*


**Streambank erosion on the Nehalem River near Vernonia**

**A soil slide on pastureland near Clatskanie**

**Road & Roadside Erosion** – Columbia County has hundreds of miles of forest roads. Many are unstable, poorly constructed and creating sedimentation issues in waterways, a serious concern for T&E salmonids and other aquatic organisms. Forestland has the most problems with road erosion.

***Location and Severity*** – *Road and roadside erosion is largely a problem on private non-industrial forestland throughout the county. The severity varies significantly from site to site. No data is available that identifies specific areas of road erosion concentration.*

**Roadside erosion along county road**

**Soil Condition – Soil Compaction** – Compaction of cropland and pastureland is common due to the types of soils, the climate and the level of management. Hybrid poplar production in the Columbia River floodplains requires heavy equipment for site preparation and harvest that can cause serious soil compaction. Compaction of pastureland is most commonly caused by winter grazing, also known as pugging on saturated soils.

***Location and Severity*** *– Soil compaction on pasturelands can be found throughout Columbia County but is most prominent in floodplains along the Columbia River. Operators with limited pasture acres and inadequate winter housing have the most issues with compaction. Soil compaction on farmland is not as common. It is only prominent on hybrid poplar operations of the Clatskanie area, primarily because harvesting operations are commonly performed during winter months with very heavy equipment.*


**Soil compaction on a winter grazed pasture**

**Soil Condition – Low pH soils** – Almost all of the soils of Columbia County are acidic as basic elements are leached out or tied up in the soil. The low pH soil has created productivity issues on pasture, hayland and cropland and invites invasive weeds. Levels of pH have been measured as low as 4.0 in the Quincy area. Low pH soils can be corrected on a temporary basis with the use of soil amendments such as lime. However, lime is very expensive and as previously stated, most small operations are not able to make costly inputs economical.

***Location and Severity*** *- The most concentrated area high value crops with low pH soils is in the drainage districts in the northwest portion of the county, bordering the Columbia River. The resource impact is primarily production based however, these low pH soils invite noxious weeds and aluminum toxicity for many crop and forest types.*

**Soil Condition – Subsidence** – Soil Subsidence is isolated in the county to a region in the floodplains near Clatskanie. This area contains organic soils which have subsided as organic material has decomposed primarily due to tillage management and water management. There is no known data showing baseline elevation vs. current elevations of these areas, however, local landowner knowledge indicated some areas of rapid subsidence over the past 50 years.

***Location and Severity*** *– As stated above, subsidence is only an issue on organic (peat)soils in the floodplains of the northwest portion of the county. Histosols only occur on about 1% of the county, almost all concentrated in this area. Subsidence has occurred in the recent decades but the severity has not been well documented. The main resource issue is the loss of productive farmland.*

## Water Resources Analysis

Due to factors outlined in the inventory section, Columbia County's water resource issues are now at the forefront of most conservation efforts. Addressing water resource issues is not new in Columbia County however not until recently has a concerted partnership effort been made to address some of them. Below are some of the most common resource problems according to local on-the-ground experience and a wealth of information from assessments.

### Water Quality Concerns

**Surface and Ground Water Quality – Nutrients and Organics & Pathogens** – Most conservation efforts have occurred in the last 10 years to address nutrient and organic water quality concerns. Prior to that, very few projects specifically engaged that issue on agricultural lands. Most of NRCS's recent efforts have concentrated on animal feeding operations, where livestock are confined at least part of the year.

A livestock inventory conducted in 2007 around Scappoose, Oregon, indicated that out of 74 livestock operations evaluated, 52% were in fair or poor condition. The inventory ratings were based on pasture and headquarter conditions. Most of these operations were overgrazing their pasture and had poor drainage, heavy mud and manure concentrations and inadequate buffers with high potential for organic and nutrient pollution to nearby watercourses.

Columbia SWCD and NRCS have taken the lead on this resource concern. With the use of EQIP and OWEB's small grant programs, 1 waste storage pond, several dry waste storage facilities, roof runoff structures, heavy use protection areas and riparian forest buffers have been installed on pastureland and headquarters to improve this concern. NRCS has also provided assistance with the development of CNMP's (comprehensive nutrient management plans) on all 4 of the counties CAFO's, and has had at least 2 additional CNMP's developed for non CAFO's recently.

Nutrient and organic water quality concerns continue to be a resource to address in Columbia County. Due to the heavy turn-over of many small livestock operations and the early reluctances of many landowners to participate in government programs, only a small portion of the counties livestock operations have adopted conservation practices to address this concern.

NRCS has also addressed nutrient management concerns on cropland. Over 1800 acres of cropland have had nutrient management plans developed for their hayland or cropland with CTA planning and EQIP funds. NRCS has addressed this concern on most of the largest cropland operators in the county.

***Location and Severity*** – *The location and severity of nutrient, organics and pathogen issues is very difficult to pinpoint because the problem fluctuates as operations change hands. The problem is a county wide issue. The heaviest concentration of operations that could be potential contributors is found along the Columbia River, Scappoose Creek, the Nehalem River, and operations near the cities of St. Helens, Scappoose, Rainier and Clatskanie.*


**A small compost facility installed near Clatskanie, Clatskanie River in background**

**Surface Water Quality – Sediments** – Sediments are a concern on DEQ's TMDL list for some streams in Columbia County. Sediment delivery and deposition are primarily a concern in streams that provide fish habitat. Human development almost always results in increased erosion of hill slopes. Rural road surfaces and agricultural lands are sources of fine sediments that create turbidity in streams, impeding salmon and trout on their migration to spawning areas and reducing the percentage of young fish that survive and emerge from the red (29). Slope failures on forestland contribute substantial amounts of sediment to these stream systems (29). Streambank erosion on all land uses also contributes to stream sedimentation concerns. During the recent 2007 flood, thousands of tons of sediments and debris were transported and deposited into streams and tidal sloughs of Columbia County.

Erosion rates on pasture and cropland is a minor source of sediment. Most pasture and cropland acres have permanent cover or are located in floodplains with low rates of erosion. The exception to this would be the instability of streambanks and field drainage ditches.

Through programs such as the Conservation Reserve Enhancement Program (CREP), hire the fisherman , WHIP and EQIP, NRCS, the conservation district and watershed councils have installed buffers to reduce streambank erosion and slow deposition rates.

Several miles of streams on pasture have had riparian plantings, fencing and off channel livestock watering systems installed to reduce sedimentation and address other resource concerns.

This resource concern has only been addressed in part. It continues to be an important issue that will require attention in future years.

***Location and Severity*** *– The largest contributor to sediment delivery and stream turbidity is forest harvesting activities, inadequate forest roads and streambank erosion. It is only severe after heavy rainfall or flood events. Riparian pasturelands also contribute but to a lesser degree primarily because there are fewer acres of pasture. The problem is most notable to the Clatskanie region and the Nehalem Watershed, but does occur on all major streams in the county.*

**Surface Water Quality – Temperature** – All three watershed council assessments pinpoint stream temperature concerns as a major hindrance to fish and other aquatic organisms throughout the county. Natural geomorphic condition of some creeks and rivers, such as the Nehalem, create temperature issues because the stream channel is shallow and wide. The main approach to resolving temperature issues on agricultural lands and forest lands is to provide shade on the stream.

NRCS, Columbia SWCD and all three of the counties watershed councils have made concerted efforts to install riparian forest buffers that will eventually provide shade, stabilize streambanks and provide large wood recruitment.

In the past 10 years, NRCS and FSA (Farm Service Agency) have funded 388 acres of riparian forest buffers In the Upper Nehalem River Watershed using the CREP. Watershed Councils have installed tree plantings on several miles of streams with state funding.

Temperature issues are a very high priority when addressing T&E fish species. The resource concern will require additional attention over the next several years.

***Location and Severity*** *– Temperature is considered a high priority for the recovery of threatened and endangered fish. The highest priority is along stream reaches with listed species which include the Nehalem River, Scappoose Creek and the Clatskanie River and their tributaries. See Section 2 Surface Water Quality map for location of DEQ's 303d listed streams.*

**Surface and Ground Water Quality – Pesticides** – Pesticide applications are somewhat minor in Columbia County compared to most highly agricultural counties. Most small operations only use pesticides on a spot treatment basis or periodically based on infestations. A few of the largest operations use pesticides on a regular basis. Some of these such as the tree farm and nurseries have been outside of NRCS's program eligibility and therefore NRCS has provided minimal technical assistance.

NRCS, with assistance from OSU Extension has been the most active agency to assist landowners with pest management. Through the EQIP program, NRCS has provided pest management on approximately 700 acres of cropland.

***Location and Severity*** *– To NRCS's knowledge, pesticides in surface or groundwater is not a major issue any longer on private noncommercial operations. As stated above, concentrations of significant use are most likely associated with commercial nurseries, tree farms and industrial forest operations which NRCS has not assisted. Most of the farming operations have already had pest management assistance from NRCS.*

**Water Quantity Concerns**

**Water Quantity – Flooding and Ponding, Reduced Capacity of Conveyances by Sedimentation, Excessive Subsurface Water–** Most of the agricultural land in Columbia County is found in artificial drainage/flood control districts along the Columbia River. These floodplains have unique resource concerns that continue to become more prevalent. In recent years, Columbia County has had devastating flood events that have displaced thousands of tons of soil and debris, depositing them in low reaches of streams and tidal sloughs. Also, many of the drainage districts are struggling economically. The infrastructures of these systems are failing. Subsurface drains, field ditches and sloughs are not being maintained on many properties which is creating higher water tables, ponding, invasive weed problems and low value cropland or pasture. According to ODFW the lower reaches of these systems are crucial habitat for T&E fish species. Agencies have contrary opinions about these water quantity concerns. Some believe that certain drainage districts should be abandoned to create off channel habitat for fish, others believe that this highly productive agricultural land, some of the only remaining agricultural land in the county, should continue to be maintained for agricultural uses.

In the past, SCS assisted landowners with subsurface and surface drainage. Some watercourses were maintained by the US Army Corps of Engineers. With current swampbuster and wetland conversion

concerns, and with permitting impossibilities for channel cleanouts, most of these issues are no longer addressed.

In 2008, the Emergency Watershed Protection program (EWP) was used to protect property in danger after the December 2007 flood. The two hardest hit areas of the county included the Nehalem River Valley and the Clatskanie/Westport area. Some major creeks including Olson Creek and Graham Creek had sediments removed to protect adjacent homes.

Whether or not NRCS or other agencies can play a role in improving this resource concern is unclear. The CRMP for the Lower Clatskanie River system was formed with this resource as a top priority. The Lower Columbia River Watershed Council and the Columbia Soil and Water Conservation District have submitted a grant for an H&H study of the area. They have also consulted with Fluvial Geomorphologists from the US Fish and Wildlife and NRCS.

***Location and Severity*** *– This is a very high priority concern of the Columbia SWCD and county residents. It is unclear the role NRCS can provide with these resource concerns. The problem is specific to the northwest floodplains of Columbia County.*

**Flooded Pasture land near Clatskanie**


**Recently formed sediment island in slough near Clatskanie reducing capacity**


**Reduced capacity of a creek near Clatskanie from flood deposits**

**Interior field drainage ditch requiring maintenance**

**Water Quantity – Inefficient Water Use on Irrigated Lands –** According to the 2007 Agricultural Census, only 2535 acres are irrigated in Columbia County. This resource concern has been addressed by NRCS in the last few years on several hundred acres of cropland. In 2009, two pivot irrigation systems were installed covering about 200 acres, irrigation water conveyance, high efficiency irrigation pumps and IWM are all being implemented with EQIP assistance.

***Location and Severity*** *– The Columbia River drainage districts including the Beaver District and Scappoose Drainage District are the primary locations for irrigation efficiency improvements. There is good potential for implementing 2 to 3 irrigation improvements on approximately 500 acres if considered a priority.*


**Pivot irrigation system installed near Clatskanie irrigating peppermint**

**Water Quantity – Aquifer Overdraft** - The scarcity of high quality potable water in Columbia County is evident. In the last 2 years, the Water Conservation and Protection Committee was formed to address this issue for future development and other uses. Groundwater availability in much of the county is limited by geologic formations. Some small aquifers in rural areas are already over tasked. Several of the county's community water systems are aging, in disrepair and over-tasked.

Columbia SWCD and NRCS are looking at alternative water sources and capture methods to provide water for small agricultural uses. Systems such as roof runoff harvesting for small irrigation and livestock watering are being considered. Columbia SWCD is funding a ground water study in the Dutch Canyon area near Scappoose, which is being carried out by Portland State University. The information gathered from the study will be used to create a model for the entire county's groundwater resources.

***Location and Severity*** *– Specific areas such as Dutch Canyon near Scappoose, the Nehalem River Valley, and outlying regions. Although a long time problem, this concern is more prevalent due to water resource limitations and continued land development.*

## Air Quality and Energy Analysis

Columbia County has no immediate air quality resource concerns. Very little has been done on rural lands to specifically address air quality in the county in recently years.

In the last few years, as carbon-based fuels become more expensive and scarce, there is a new interest in renewable energy and energy efficiency. Some examples of renewable sources worth consideration in Columbia County include bio-fuel sources and uses, solar driven pumps and chargers and wind turbines. The use of high efficiency pumps, lighting, cooling and heating systems all have potential.

## Plant and Animal Resource Analysis

**Plants – Noxious and Invasive Plants** – In the last 10 years, a more concerted effort has been made to control noxious and invasive plant species. In the last 4 years, the Columbia SWCD has been assigned the duties of managing invasive weeds for Columbia County. Since 2006 they have obtained grant funds of approximately $121,000 for the control of some of the most invasive species such as Japanese knotweed, yellow flag iris, purple loosestrife, garlic mustard and others. With these funds they have treated approximately 280 acres of primarily private owned lands. Some of these sites are very remote and many line streams and wetlands that are difficult to access. The district will receive an additional $150,000 for noxious weed control from 2010 to 2014. As the financial nexus, the Columbia SWCD is working with the watershed councils countywide to ensure delivery of the noxious weed program.

***Location and Severity*** *- All three of the watershed council assessments, ODF&W's Conservation Strategy, the Local Work Group, the North Coast Weed Management Committee and others recognize that invasive plant control is a high priority. Many of the county's waterways have become monocultures of invasive weeds like Japanese knotweed that choke out native plants. The 2010 Local Work Group identified the highway 30 corridor as a top priority for noxious weed control as well as major infestations of priority weeds along critical habitat streams.*


**Giant knotweed patch at Mist, Oregon**

**Plants - Productivity, Health and Vigor, Forage Quality and Palatability** – Plant Productivity has and continues to be a major resource concern for many agricultural and forest operators. Productivity is directly related to several other resource factors.

- Soils – The soil type dictates productivity of the site. Pasture, forestland and some cropland interpretations are available in the Columbia County soil survey.
- Water Management – Soil types that require drainage management, irrigation, or both to remain productive have bearing on the sites ability to be healthy and productive.
- Nutrient Management – Nutrient availability and soil pH affect the production of the site.
- Competition Control – When a stand is lacking biomass, invasive plants and diseases will reduce the productivity.
- Human Management Level - As pointed out in the human resources section, many of the operations do not manage with ultimate site productivity in mind due to expenses.

**Pasture and Hayland Productivity** - On pasture and hayland, low productivity is a common issue due to the limiting factors above. Due to expenses of fertilizer, lime, drainage, irrigation and weed control, these fields are typically well under their production capabilities. During the past 10 years, NRCS has assisted with practices that improve pasture and hayland productivity including 2300 acres of prescribed grazing and 578 acres of forage harvest management. Additionally, 337 acres of pasture/hayland plantings have been cost shared through EQIP.

Many pasture sites have grown into nonproductive species that are not only low in productivity but also low in quality and palatability. Bentgrass, reed canarygrass, sweet vernal, meadow foxtail, velvet grass

and other weedy grasses and broadleaf species provide stemmy, low protein and low palatability cover of low value.

***Location and Severity*** *– Productivity concerns are found county wide. The most wide reaching areas include the Rainier, Clatskanie and Nehalem floodplains. Other interior pasturelands, such as the Goble area, also have productivity concerns.*

**Forestland Productivity** - Forestland productivity is also a major concern in Columbia County due to the sheer number of privately owned nonindustrial forest operations. As pointed out in the forest operations in section II, over 3000 nonindustrial forest operations exist in various sizes. Many of these operations do not manage with production in mind. Poorly managed plantings after timber harvests have resulted in timber of little value (multiple stemmed maple and alder, vine maple, shrubs, woody invasive species). NRCS has just recently begun addressing forest production in 2009 and 2010. 11 forest management plans have been written, pre-commercial thinning, release and tree plantings have been planned. NRCS has provided outreach along with ODF and OSU Extension to small woodland owners.

***Location and Severity*** *– The problem with forest health issues is county wide and has not been well identified. Forestland productivity not only affects economics of the area but also fish and wildlife habitat, sediment delivery, erosion, invasive species and other water quality issues.*

**Animals – Fish and Wildlife – Threatened and Endangered Species**- In Columbia County a great majority of the current assessments, research and resource analysis directly or indirectly relates to threatened and endangered fish (primarily salmon and steelhead). All three of the county's watershed council activities revolve around salmon restoration. The majority of OWEB, Lower Columbia River Estuary Partnership, BPA and DEQ-319 funds are dedicated to salmon habitat. The US Fish and Wildlife (FWS) and the Oregon Department of Fish and Wildlife (ODFW) dedicate several full time staff to salmon improvements. The recently completed Lower Columbia River Conservation & Recovery Plan for Oregon Populations of Salmon and Steelhead elevates two major Columbia County streams for restoration. They include the Clatskanie River and tributaries and Scappoose Creek. Fish arrays have been placed on Merrill Creek and Tide Creek to monitor fish access as part of Columbia SWCD and Lower Columbia River Watershed Councils Deer Island Study.

NRCS with other partners in recent years has used program funding such as WHIP and EQIP to implement several fish practices. Nine fish passage projects have been implemented that provide access to approximately 30 miles of aquatic habitat. Riparian forest buffers and plantings have been installed on 509 acres through EQIP, CREP, WHIP and CTA.

This resource concern has the most probability for partnership participation. Already, many of the fish restoration projects have multiple partners all bringing their expertise and funding for a common goal.

The subpopulations of Columbian white-tailed deer are another endangered species in Columbia County. The only refuge system in the northwest part of the county is dedicated to habitat for Columbian white-tailed deer.

***Location and Severity*** *– The locations include most major streams in Columbia County without major fish barriers. It also includes Oregon Department of Fish and Wildlife's opportunity areas. See map in Section II.*

**Animals – Fish and Wildlife – Fragmentation/Connectivity** – The North Coast wildlife committee convened in 2008 rated habitat fragmentation or connectivity as one of the highest priority resource concerns relating to wildlife. Loss of connectivity between uplands, lowlands, wetlands and streams has limited wildlife ability to move safely throughout their range. Fragmentation has also reduced pollinator habitat in Columbia County.

Riparian plantings, wetland restoration, hedgerows, access control and other practices might be encouraged to improve this concern.

***Location and Severity*** *– The locations are not well defined but constitute the majority of agricultural lands in the county. Marginal agricultural lands in floodplains may be considered for potential off-channel habitat. Creating corridors with the use of windbreaks, riparian forest buffers and wildlife islands has potential. As mentioned above, this is considered a high priority for fish and wildlife restoration.*

**Wetland Reserve Program Restoration near Scappoose**

## Summary

In the last 10 years, good strides have been made towards the treatment of natural resource problems in Columbia County. The Columbia SWCD has received a tax base for their future funding which indicates that the public cares about natural resources and the future of conservation. Partnerships are being used much more effectively. Several great examples of partnership projects that made difficult projects successful by combining technical, engineering, permitting and funding services have been implemented.

## Cropland

**What has been done:**

- Pest Management has been address on the larger independent farms.
- Nutrient Management on the majority of cropland has been addressed.
- Sheet and rill erosion is no longer a common concern on existing cropland.
- Operations that irrigate, although there is only a hand full, have made major improvements to delivery and efficiency and are currently implementing irrigation water management.

**What may still need additional conservation:**

- Plant Productivity – Very low pH soils require liming to improve nutrient management and maintain productivity. Productivity of agricultural lands is important to encourage operators to increase buffers along open water courses.
- Invasive weed control, especially on hayland is needed. Many problems exist with Canada thistle, water hemlock, tansy ragwort and many other noxious species.
- Protection of sensitive areas such as riparian areas and wetlands is needed with the installation of buffers and fence.
- Encouragement of beneficial organism and increasing pollinator habitat.
- Drainage system maintenance is needed to manage high water table soils

## Pasture

**What has been done:**

- Pasture improvements have been made to increase grazing management.
- The implementation of prescribed grazing, cross fencing and livestock water systems have been completed on a limited scale through programs like EQIP.
- Some streambank protections projects have been implemented.
- Riparian forest buffers and livestock exclusions have been installed. Forest soils converted to marginal pasture have been replanted to trees.

**What may still need additional conservation:**

- Plant Productivity – Similar to the cropland, low pH soils invite weeds and reduce competitive ability of grass and legumes. Productivity should be encouraged to improve economics of pasture production while protecting sensitive areas from grazing such as riparian areas and wetlands.
- Soil Compaction – Small acreage pastures still have problems with compaction due to winter grazing.
- Invasive weed control is needed. Better nutrient and pest management should be encouraged
- Streambank erosion is a common problem due in part to livestock access to streams and rivers
- Drainage system maintenance is needed to manage high water table soils.
- Fish and Wildlife connectivity still needs attention. Practices such as field windbreaks, riparian forest buffers, access control, prescribed grazing, upland wildlife habitat management and hedgerows will help reduce fragmentation and connect pasture and open areas to permanent covers.
- T&E species such as Columbian white-tailed deer and salmon will require additional habitat improvements on pastureland.

## Headquarters

**What has been done:**

- Several compost facilities and waste storage facilities have been installed with willing operations to reduce organic and pathogen pollution.
- Roof run-off structures, animal trails and walkways and heavy use areas to control manure and mud and maintain animal health have been installed to improve water quality.
- Water control structures and diversions are planned to reduce overland flooding of barnyards through EQIP.

**What may still need additional conservation:**

- Pollinator habitat by encouraging hedgerows
- Roof water harvesting systems to reduce draws on limited groundwater and surface water flows
- Additional compost facilities, waste storage, heavy use areas, roof runoff structures and manure transfer systems to address nutrient and organic water quality concerns.
- Headquarters located in flood prone areas could be encouraged to consider other options such as floodplain easements.

## Forestland

**What has been done:**

- Until the last few years, very little technical or financial assistance has been offered to forest owners, especially small 5 to 40 acre operations. Although this is the largest land use category in Columbia County, with more than 3000 small forest operations, assistance has been limited.
- In the last two years, 11 forest management plans have been contracted through EQIP.
- At least 3 fish passage and fish stream improvement projects have been installed by NRCS. Watershed councils have implemented several fish passage and fish stream projects throughout the county.
- Riparian plantings, forest stand improvement and forest access roads have been installed with the use of EQIP on a few forest operations.

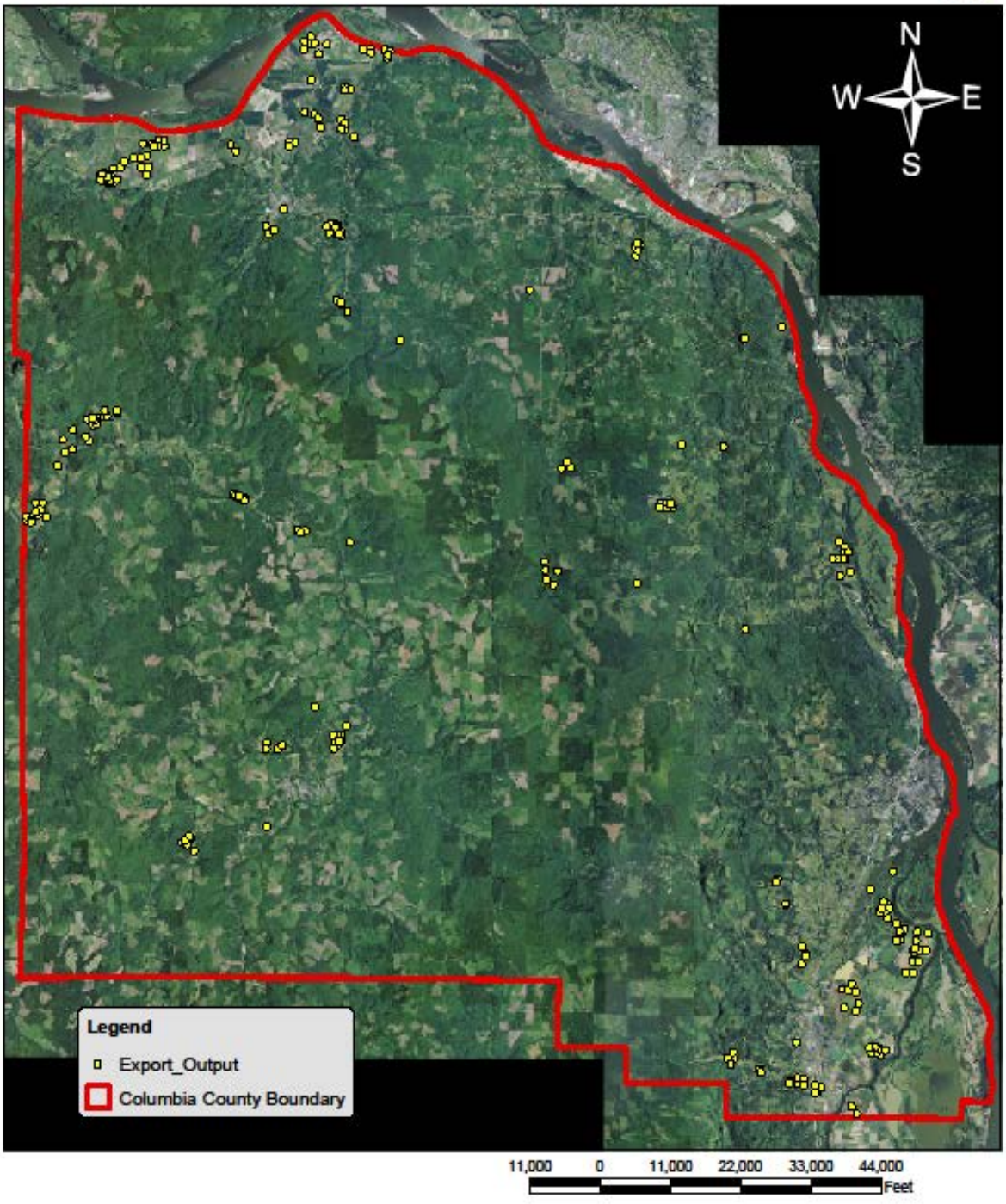
**What may still need additional conservation:**

- Forest Productivity – low levels of management on small forestland tracts is common in the county. Forest health issues are a major resource concern
- Noxious weeds such as scotch broom, Himalayan blackberry
- T&E species – salmon, steelhead and Northern spotted owl improvements are needed. Reducing temperature by providing riparian forest buffers, improving fish passage, providing structure in streams by installing large wood, reducing streambank erosion as appropriate are all potential needs.
- Forest road erosion is a major contributor to sediments in the waterways of the county. Soil mass movement on steep forestland continues to create potential flood concerns and debris flows in the lower reaches where residential properties exist.

# COLUMBIA COUNTY APPLIED PRACTICES
# NRCS ASSISTANCE 2000-2010

District: COLUMBIA SOIL & WATER CONSERVATION DISTRICT
State and County: OR, COLUMBIA

Field Office: ST. HELENS SERVICE CENTER
Agency: USDA-NRCS




Watershed Restoration Projects
Field Office: ST. HELENS SERVICE CENTER
District: COLUMBIA SOIL & WATER CONSERVATION DISTRICT
State and County: OR, COLUMBIA
N
W
E
S
Legend
OWRIpoints_OE
OWRIlines_OE
OWRIpolygons_OE
crp_a_or_2010
wrp_a_or
16,000
0
16,000
32,000
48,000
64,000
Feet

# SECTION IV and V: NATURAL RESOURCE PROBLEMS AND DESIRED FUTURE OUTCOMES

As discussed in Section II, resource inventory, and Section III, resource analysis of this document, Columbia County has several resource concerns of varying significance. This section of the strategic plan will build on the resource problems identified as high priority and the future outcome desired after treatment.

## Top Priorities in Columbia County in Order of Priority/Importance

1) **Degraded Plant Condition – Inadequate Structure and Composition**
2) **Inadequate Habitat-Habitat Degradation – Columbian White-tailed Deer**
3) **Degraded Plant Condition – Wildfire Hazard**
4) **Water Quality – Excessive Sediment in Surface Waters from Road Erosion**
5) **Water Quality Degradation – Excess Nutrients and Organics in Surface and Ground Waters from Small Animal Feeding Operations**

## Degraded Plant Condition – Inadequate Structure and Composition on Private Nonindustrial Forests (Forest Diversity and Sustainability)

**Current Condition/Severity of the Problem** – In the mid-19th century until the early decades of the 20th century the vast majority of old growth forests in Columbia County were logged with few regulatory requirements to replant or restore. European settlers attracted to the cleared lands began farming or

raising livestock wherever possible. For a few decades this practice changed the landscape from forest to an agricultural and pastoral setting. The fragile forest soils began to erode delivering massive sediment volumes to previously clear mountain streams that many fish and wildlife species relied on. As agricultural markets changed, economic feasibility of farming declined. Many farm operators were called away to world war conflicts leaving the lands untended. These marginal agricultural lands slowly began voluntarily reestablishing to trees and brush. However, the historic forest diversity had disappeared. Since then most forestland has been harvested on short rotations an additional 2 to 3 times.

Oregon forest regulations have encouraged species with high productivity, attractive to timber markets, primarily Douglas-fir. This direction has created a monoculture of dense even-aged stands, also known as closed single canopy. The previously diverse multi-layered stands of stand type 4 (layered) and 5 (old forest structure) with appropriate shade tolerant understory plants are no longer common. Oregon Department of Forestry estimates that only 4 percent of the conifer stands in the State owned forests have trees older than 85 years. Private owned forestland likely have an even lower percentage than this.

Forestland diversity is important to Northwest Oregon. The Oregon Conservation Strategy considers late successional conifer forests as a strategic habitat. This is defined by forest structure including characteristic multi-layered tree canopy, shade-tolerant species growing in the understory, large-diameter trees, and a high volume of dead wood such as snags and logs. In Columbia County, as part of the Coast Range Eco region, this would include the Douglas-fir dominated forests.

**What Are We Trying to Achieve?**

It is clear that forest soils, precipitation rates and topography vary greatly, sometimes even within small private nonindustrial units. Douglas-fir is the major forest cover type and planting and managing for it is appropriate. Many sites however, that would typically have been uneven aged Douglas fir, Western red cedar-Western hemlock or red alder stands, are all managed with dense almost woodlot type young Douglas-fir.

The Oregon Department of Forestry (ODF) document “Pathways to the Future for Northwest Oregon State Forests” outlines ODF’s future management plan on state forestland. It specifically emphasizes the importance of forest diversity for social, economic and ecological benefits to the state. The plan further declares that where it would take nature centuries to advance a forest to old-growth status, a similar type of forest diversity can, through planned practices, be developed in a matter of decades. ODF’s intentions are to mimic the historical diversity of nature’s patchy stands through management practices such as thinning, partial harvest and clear-cutting.

Based on the soil types, the topographical features, and the climatic zones of our forests, we are trying to recreate forest diversity by changing the structure and composition of young even-aged, single species stands. We will encourage private nonindustrial forest owners to reconsider their current forest management and adopt practices that change the course from single stand canopy (stand type 2) to stand type 3 (understory) and stand type 4 (layered). We will mix older and younger trees, develop mature tree stands and diversify native tree species.

**The benefits:**

*Fish and Wildlife Habitat* – A forest with large, uneven aged stands and mixed species provides habitat for many species of fish and wildlife. Downed wood, snags, understory vegetation at the correct percentage, along with forest openings and wildlife trails will promote balanced forest ecology. As an example, the Cope's giant salamander has a limited distribution in Oregon. They are only found in the extreme Northwest portion of Oregon. Their relative abundance has declined in recent years. Structure of mixed forest stands is critical to their lifecycle as they rely heavily on clear cold mountain streams. They are highly sensitive to siltation, warm stream temperatures and excessive logging activities. Another example is the purple martin. This state listed bird relies greatly on the forested watersheds of the northwest. This large swallow is a cavity dweller that needs older mature cavity trees or snags for their natural nests. Regarding fish species, both steelhead-Southwest Washington winter run and coho salmon-Lower Columbia River are endemic to this region. The refugia provided by diverse forests are critical to their survival and the possibility of their removal from the threatened category.

*Pest and Disease concerns* – Most conservationists are aware of the outbreak of Mountain pine beetle in the Rocky Mountain forests that have devastated millions of acres of monoculture lodgepole pine forests. According to the Colorado State Forest Service, an important method of prevention is creating stand diversity in age and structure that will create resilience. Most Colorado forests have about twice as many trees per acre as those forests which are more resistant. These characteristically overstocked stands are also common in the young forests of Columbia County. To say that Northwest Oregon forests can be compared to the devastation of Rocky Mountain forests is a gross overstatement, however the same characteristic overstocked stands lacking forest diversity exist. In western Oregon, Douglas-fir beetle can be found almost anywhere its hosts occur. Experts from USDA Forest Service state that the "best" control involves pro-active management including management of dense, overstocked stands. Diversity is also critical for the control of root rot infestations, Swiss needle cast disease and invasive plant and animal species. Douglas-fir deformities in some 3$^{rd}$ or 4$^{th}$ growth rotations are becoming more common due to lack of rotation and other unknown reasons. Planting species resistant or immune to root rot or Swiss needle cast, such as red alder, will keep the disease in check. By improving forest structure and composition the forest sites of Columbia County will be better prepared for potential catastrophic pest and disease outbreaks.

*Lack of understory structure* – Dense blocks of young, even-aged Douglas fir have little to no understory vegetation important for habitat, plant diversity and water quality. A structurally complex forest that provides varying degrees of sunlight to the forest floor will allow understory plants and late successional species to establish. The groundcover protects the soil from erosion and potential sediment delivery.

*Water Quality and Quantity* – A mixed stand with proportionate large mature trees (layered) will help harvest atmospheric moisture from fog which affects the microclimate of the site. It assists in recharging groundwater that will eventually impact the hydrology of the site, making water available for a longer period to streams. A mixed uneven aged stand maintains cooler water temperatures and the right type and amount of nutrients delivered to forest streams and wetlands. It helps create a layer of duff that

acts as a sponge for capturing, storing and slow release of water for plants and extended cool water recharge to streams.

*Fire Protection* – A mixed stand of evenly dispersed mature trees and native understory plants will maintain fuel loads at a lower level and promote elevated moisture levels on the forest floor. Large mature trees are adapted to withstand ground fires and are therefore more fire resistant.

Carbon Sequestration – Diverse forests capture, store and recycle massive amounts of carbon that on short rotation harvests could be released more frequently as atmospheric carbon.

**How Will NRCS and Partners Achieve This?**

The ODF Northwest Forest Management Plan for State Forests, states that to take a passive management approach that lets young forests evolve towards usable habitat would take centuries. Creation of healthy, diverse forests through natural selection will take 100 to 200 years. ODF on state forestland has established goals for stand structure to mimic what might be found in nature and that is achievable. They establish that 5-15% should be in a regeneration state (type 1), 10-20% in closed canopy (type 2), 15-35% in an understory type stand (type 3), 20-30% in a layered stand (type 4) and 20-30% in older forest structure (type 5). They establish that the first order of business is to align the young Oregon forests with the above percentages. The current estimate is that 63% of state forest lands are in the closed single canopy category.

The ODF plan also states that when treetops grow together so branches are touching, a type 2 stand, the stand should be thinned. Without thinning the forest floor is starved of sunlight that would allow it to develop into an understory stand and eventually a layered stand of young and older trees.

According to the Oregon Conservation Strategy, the approach of using active management to accelerate development of mature conifer forest structural elements in key areas is emphasized. The document spells out as an approach, the development of programs and incentives to create diversity, encourage longer rotations that create large diameter trees and where feasible, maintain or reintroduce structural elements such as large-diameter cull trees, snags and logs.

With the lead provided by Oregon Department of Forestry and Oregon Department of Fish and Wildlife, NRCS and its partners will target treatment on 30% of the Private Nonindustrial Forestlands in the identified watersheds through the use of conservation practices that encourage healthy stands and forest diversity. We will encourage management and implementation practices that promote from stand type 1 (regeneration) and type 2 (closed canopy) to type 3 stands or greater which will mimic more historical diversity percentages.

NRCS and our partners in recent years have a good start on outreach and education to our private nonindustrial forest owners. Over the past 3 to 4 years, NRCS in Columbia County, through our EQIP program, have assisted nearly 100 PNIF operators with the development of a forest management plan. The OSU Extension Service forester has supported that initiative by provided forest management

planning to more than a dozen forest owners. Many of these operators are now interested in implementing their plans which contain among other concerns, stand diversity practices.

**Alternatives Considered**

Due to limitations of NRCS's funding for financial and technical assistance and the ability of NRCS partners to carry this out independently in Columbia County, the following options are considered.

1) Do nothing – Status Quo of this resource concern will continue the current course of mono-cultural, even-aged stands. All of the resources influenced by diversity of stand structure and composition including fish and wildlife habitat, increases in disease and pest resistance, surface and groundwater recharge and others will continue a downward trend.
2) Treat the resource on a county wide scale – It is unrealistic that NRCS and its partners could make a difference in the next several years encouraging treatment of this resource concern on a county wide scale. The county has more than 107,000 acres of private nonindustrial forestland. Our funding and staffing abilities to achieve even a small percentage of the acreage would not be possible when spread throughout the county.
3) Choose key watersheds/areas for treatment – By targeting areas with the highest potential of adopting key practices, NRCS and its partners can strategically concentrate our limited funding and technical assistance. After discussion with the local work group forest committee, the following areas were identified using 12 digit HUC to define the watersheds with the highest percentage of stand type 2 (monoculture, young even-aged, closed canopy stands):
    a. Priority Area 1 – (See map) 12 digit HUC watersheds including Goble Creek, Tide Creek, Headwaters of the Clatskanie, Upper Clatskanie and Carcass Creek. This area has a high percentage of private nonindustrial forestland and a high percentage of operators interested in forest management plans and carrying out diversity practices. The area would include approximately 180 operators with 10 acres or more. Several of these operators have multiple tracts. The priority area will encompass a 30% treatment target rate equal to 3000 acres. To reach the 3000 acres goal, depending on the size of the participating operations, it may require working with an additional 50 to 100 operators.
    b. Priority Area 2 – (See map) 12 digit HUC watersheds including Milton Creek and Upper Beaver Creek. These watersheds also have a high percentage of PNIF with marginally managed forestland. This area would include a larger percentage of small operations. 400 operators with 10 acres or more which will encompass a 30% target rate equal to 3350 acres. A high percentage of forest management plans have been requested in this priority area already.

The initiative to address this priority will encourage PNIF owners to manage and maintain their existing mature forest parcels (stand types 4 and 5), as well as install conservation practices on stand types 2 and 3 (young, even-aged stands) that improve forest structure. A landscape approach similar to ODF's intentions on state forestland called structure-based management that follows nature's development patterns, but accomplishes it in fewer years will be used. The following conservation practices will be included:

**Forest Management Plans** – We will continue to offer forest plans to those interested in ways to manage for forest structure and diversity in the priority watersheds.

**Forest Stand Improvement** – Through assistance from the NRCS state forester, OSU extension, ODF and ODF&W we will consider practices such as pre-commercial thinning, brush management and release to manipulate a stand to improve its structure, and encourage appropriate understory forest plants.

**Tree and Shrub Establishment and Tree and Shrub Site Preparation** – These practices will be used to introduce species by soil type and ecotype to improve diversity and reduce monoculture stands. We will encourage trees and or shrub plantings that are missing by ecological site and plant association. Tree species that are resistant to diseases such as root rot will be included in infested areas.

**Forest Slash Treatment** – When appropriate, we will encourage the use of slash treatment as a method of creating diversity that doesn't create a fire risk.

**Restoration and Management of Declining Habitats** – NRCS with assistance from our partners will develop a specification that encompasses late successional conifer forests and includes offering incentives to manage mature stands by encouraging selective logging or commercial thinning where appropriate instead of the more common clear-cut method. This practice may also be used to develop a specification encouraging downed wood and snags on small private forestland. Currently, the Forest Practices Act requires 2 up/2 down but only on harvested acreage greater than 25 acres. There is currently no requirement for less than 25 acre harvests, which would apply to many of the small ownership harvests. This practice may also be used to encourage early seral plant communities (hardwoods, forbs, fruiting shrubs). Mature conifer forests characteristically contain these open patches.

**NRCS and Partners Assistance**

USDA-NRCS - NRCS will provide financial and technical assistance to private nonindustrial forestland owners through conservation programs such as EQIP and CSP.

Columbia Soil and Water Conservation District – The Columbia SWCD provide technical assistance and outreach opportunities as appropriate.

OSU Extension – The OSU Extension Forester will continue providing training to small forest owners including forest plan development. They will also provide technical assistance on management strategies, education and outreach.

Oregon Department of Forestry – ODF's local foresters will provide technical assistance and permit assistance for proposed projects.

Columbia County Small Woodland Owners Association - Will provide opportunities for PNIF owners to share ideas and spread the word about assistance available. Master foresters will assist PNIF owners when possible with direction and advice about forest management.

**Cost Estimate for Success**

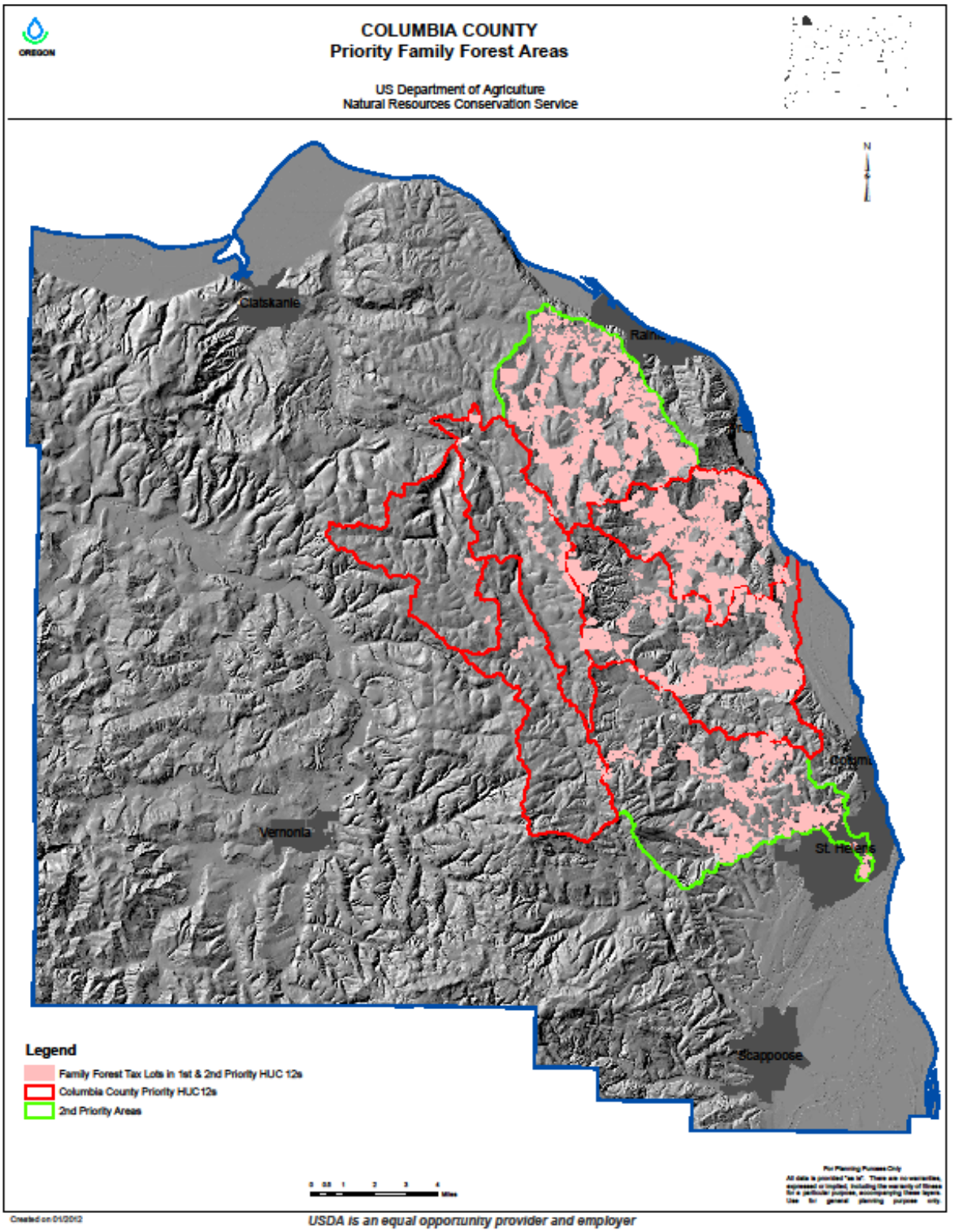
Based on preliminary cost estimates for practices that will lead to structural improvement, NRCS estimates a cost of $584,000 in priority area 1. Used over a 5 year period, this would average $117,000/year. See appendix 2 for greater detail.

**How Will We Know We Have Achieved This?**

This priority will be considered addressed when 30% of the PNIF acres in the targeted priority HUC (3000 acres) have had structural and composition changes that manage or implement practices to promote stand type 1 (regeneration) and type 2 (single species closed canopy) to type 3 or greater to improve forest diversity. A ranking and screening tool will be used to make sure the acreage is disbursed throughout the watersheds and not confined to only a few isolated areas.

**Columbia County Forest Diversity Initiative – Success so far.**

The Columbia County Forest Diversity Initiative was approved for funding beginning in the 2013 program year. (See the conservation implementation strategy). Due to budget constraints in 2013, the initiative, like most others in the state, was not fully funded. A total of 27 applications were received. Four of these were outside of the target area and therefore considered low priority. 12 contracts (as of 6/4/2013) have been funded through the initiative with a total of $230,131. These contracts will treat 381 acres of forestland with diversity practices. The treatment will benefit 2637 acres of total forestland. At this time, there is potential for additional funds from national that could fund up to 4 more contracts in 2013.

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## Inadequate Habitat-Habitat Degradation – Columbian White-tailed Deer

**HABITAT RECOMMENDATIONS FOR COLUMBIAN WHITE-TAILED DEER**

As North American agriculture expanded, populations of many wildlife species declined substantially. The Columbian white-tailed deer (*Odocoileus virginianus leucurus*) was no exception. Conversion of preferred habitat to agricultural lands, unchecked hunting and lopsided predator to prey ratios devastated the species (USFWS 2008).

Columbian white-tailed deer are considered the only white-tailed deer subspecies west of the Cascades (Baker 1984). Federally listed as endangered in 1968, only two geographically isolated populations still exist. The lower Columbia population continues to struggle with current numbers between 600 and 700 (David 2008).

In 1806, Lewis and Clark observed CWTD along the Columbia River from The Dalles to Astoria, Oregon (Thwaites 1905). By the early 1900's, CWTD had been extirpated throughout much of their historical range (Jewett 1914).

**PREFERRED HABITAT AND FOOD SOURCES**

Columbia white-tailed deer have relatively small home ranges which reflect their sedentary nature (Jackson etal. 1972). They are strongly associated with riparian forest, brushland and grasslands along the Columbia River (Brookshier 2004). The thermal and security cover are essential components for habitat choice. Does with fawns require edge habitats to reduce predation and climate exposure (Ricca etal. 2003). CWTD rarely wander beyond 250 meters from cover of trees and shrubs (Suring and Vohs 1979).

From visual observations, researchers on the Julia Butler Hansen Refuge concluded that Columbian white-tailed deer were primarily grazers (Suring 1974, Suring and Vohs 1979). Based on fecal analysis, CWTD diets consisted of 23% browse, 39% grasses and 38% forbs (Dubline 1980). CWTD actively avoid close associations with livestock and rarely feed within 30 m of grazing cattle (Suring 1974).

The degradation of riparian areas has the greatest negative impact to CWTD (Crews 1939). Predation of fawns by coyotes (*Canis latrans*) is a continual problem (David 2008).

Starting in the late 1940's, conservation measures began by the Department of the Interior to preserve the Columbian White-tailed deer (*Odocoileus virginianus leucurus*), a genetically distinct subpopulation whose primary range is the Columbia River floodplain. The subspecies was federally listed as endangered in 1968. Only two geographically isolated populations still exist (David, 2008). This work culminated in the creation of the Julia Butler Hansen Refuge for the Columbian White-tailed deer in a series of MOU's and acquisitions stretching across 6,000 acres of the Lower Columbia River floodplain from 1971 through 2003. A recovery plan was adopted by the US Fish and Wildlife Service in 1983 to detail measures to bring this distinct population up to a sustainable breeding population. A key measure of this recovery plan and subsequent updates are to "Ensure that at least 4,600 hectares (11,500 acres) of low-lying pastureland in private ownership will remain in agricultural production with farm management practices..." (USFWS, 2010, 1.7.6.1 Habitat Objectives).

Of Columbia County's total acreage (426,000), 13.6% (57,800 acres) is made up of agricultural lands. 5.5% (23,325 acres) of the County's total acreage is in floodplain areas protected by dikes that are ideal habitat for Columbian White-tailed Deer and make up their primary range.

11,900 acres exist within range of the Julia Butler Hansen Refuge for Columbian White-tailed Deer. The vast majority of refuge lands are located across the Columbia River in Washington State. Of the private agricultural lands in Columbia County which make prime Columbian White-tailed Deer habitat, 5,000 acres are currently in hybrid poplar production. The remaining 7,000 acres of priority agricultural lands (mostly grasslands) are the target of this plan. Predominately developed in the 19$^{th}$ and 20$^{th}$ centuries these agricultural floodplain lands are competing against a variety of other interests and are at great risk.

In the mid-20$^{th}$ century a large majority of the flood prone regions were diked to protect the farming operations underway in the historically productive floodplains. These flood protection projects undertaken by the US Army Corps of Engineers and some private operators included dikes and berms, tidegates, interior ditches, subsurface tile and pumping stations. This infrastructure is now primarily operated by a series of independent Flood Control Districts, Drainage Improvement Companies and private landowners.

One of the unintended results of floodplain protection measures undertaken by the US Army Corps was the preservation and maintenance of this critical habitat for Columbian White-tailed deer. As seen in recent years, the failure of levees and low level of management on these agricultural lands has degraded the quality of habitat available for these deer (Thomas, 2013). Properly planned agricultural activities greatly increase the forage available to Columbian White-tailed deer (USFWS, 2010, 2.8.1 Habitat Goals).

TABLE 1: **FOOD PREFERENCES OF THE COLUMBIAN WHITE-TAILED DEER**

{Compiled from (Brookshier 2004) and (Ricca etal. 2003)}

| | Type | Season of Use |
|---|---|---|
| Evergreen blackberry (*Rubus laciniatus*) | B | F |
| Red Elderberry (*Sambucus racemosa*) | B | W |
| Pacific ninebark (*Physocarpus capitatus*) | B | All year |
| Redosier dogwood (*Cornus stonifera*) | B | F-W |
| Salal (*Gaultheria shallon*) | B | F-W |
| Juniper (*Juniperus spp.*) | B | F-W |
| Western Red Cedar (*Thuja plicata*) | B | F-W |
| Apple, Plum, Pear, Acorn and Misc. Fruit | B | F-W |
| Foxtail (*Alopecurus spp.*) | G | All year |
| Orchardgrass (*Dactylis glomerata*) | G | All year |
| Tall Fescue (*Festuca arundinacea*) | G | All year |
| Mannagrass (*Glyceria spp.)* | G | All year |
| Timothy (*Phyleum pretense*) | G | All year |
| Yarrow (*Achillea millefolium*) | F | Sp-Su |
| Woodland Phacelia (*Phacelia nemoralis*) | F | Sp-Su |
| Red Clover (*Trifolium pretense*) | F | Sp, Su, F |
| Buttercup (*Ranunculus spp.*) | F | Sp-Su |

B-Browse, G-Grass, F-Forbs Sp-Spring, Su-Summer, F-Fall, W-Winter

**The Benefits of Improvements:**

*Fish and Wildlife Habitat* – The primary benefit to the planned practice implementation is habitat improvements for the endangered Columbian white-tailed deer. With specific improvements recommended by US Fish and Wildlife and Oregon Department of Fish and Wildlife on private agricultural lands, there is a good chance of stabilizing the population or even delisting the subspecies. Agricultural lands managed with fish and wildlife in mind can greatly improve habitat degradation and add to the food web for a wide variety of species. Managed pasture, hay and croplands will provide forage and cover for the ungulates. Besides the Columbian white tailed deer, other wildlife species will benefit from these improvements as well. Properly buffered streams and windbreaks will provide migration corridors for a variety of terrestrial and avian species in addition to breeding grounds. Detritus from native vegetation is forage for insects necessary for salmonid rearing and can greatly increase the survival and fecundity of resident and migratory populations. Shrub scrub wetlands provide forage and breeding grounds for native and migratory waterfowl.

**Secondary Benefits:**

*Water Quality* – Management improvements on these agricultural lands will in turn improve water quality. Properly grazed pastures, deferred grazing to benefit deer, proper management of hay lands and other cropland will improve water quality by reducing nonpoint source pollution. Vegetated riparian zones will decrease water quality problems to surface waters. These waters are important not only to fish and wildlife, but in many areas are the primary sources of irrigation for producers. There is a direct link between the quality of water for fish and wildlife and safety for irrigation and livestock uses.

*Soil Quality/Health* – With improvements to pasture and other agricultural lands using practices such as prescribed grazing and forage harvest management, organic matter will increase, compaction will be reduced and soil structure will improve.

*Plant Productivity* – Conservation practices such as a more intense level of prescribed grazing and forage harvest management will increase the health and productivity of grassland plants as well as reduce noxious and invasive plant species.

*Economic* – Agricultural lands provide for both food security and are major job creators within managed lands. Improvements made on agricultural lands will help keep these operations viable in the near and long term. A wide variety of local businesses thrive when agricultural operations succeed and are productive, and there is a ripple effect throughout the economy. These improvements will also keep local property values at a higher value.

Based upon recent efforts by the USFWS and ODFW, availability of forage and proper management on agricultural lands will significantly improve the landscape for Columbian White-tailed deer and allow for recovery of T&E populations. Habitat fragmentation, impassable fencing and lack of forage are the primary limiting factors facing deer populations within the Lower Columbia.

**How Will NRCS and Partners Achieve This?**

The USFWS Recovery Plan specifies the importance of active agricultural operations surrounding the refuges to provide the habitat necessary for all stages of Columbian White-tailed deer needs. Practices utilized by Refuge managers to improve habitat and forage for White-tailed deer range from rotational grazing and haying, maintaining a pasture grass height of 4-6 inches, applying fertilizer, and controlling invasive weeds (USFWS, 2010, p. 2-48), to establishing shrub scrub and riparian forest stands for cover habitats (USFWS, 2010, p. 2-54). Many of these practices would be attractive to livestock operators within the priority areas since they will provide an incentive to increase their level of management of pastures and border areas to balance the needs of wildlife along with livestock.

With the lead provided by local partners including the USFWS and the Columbia SWCD, NRCS and its partners will target treatment within 7,000 acres of agricultural lands in the identified watersheds with the use of conservation practices that encourage effective and balanced management of these agricultural lands. We will promote management and implementation of practices that promote the mutual goals of productive agricultural lands for both wildlife needs and agricultural operations. Local partners and the USFWS believe that the role NRCS and its partners can accomplish in the short term (next 5 years) is to concentrate our efforts on these targeted lands adjacent to the refuge system.

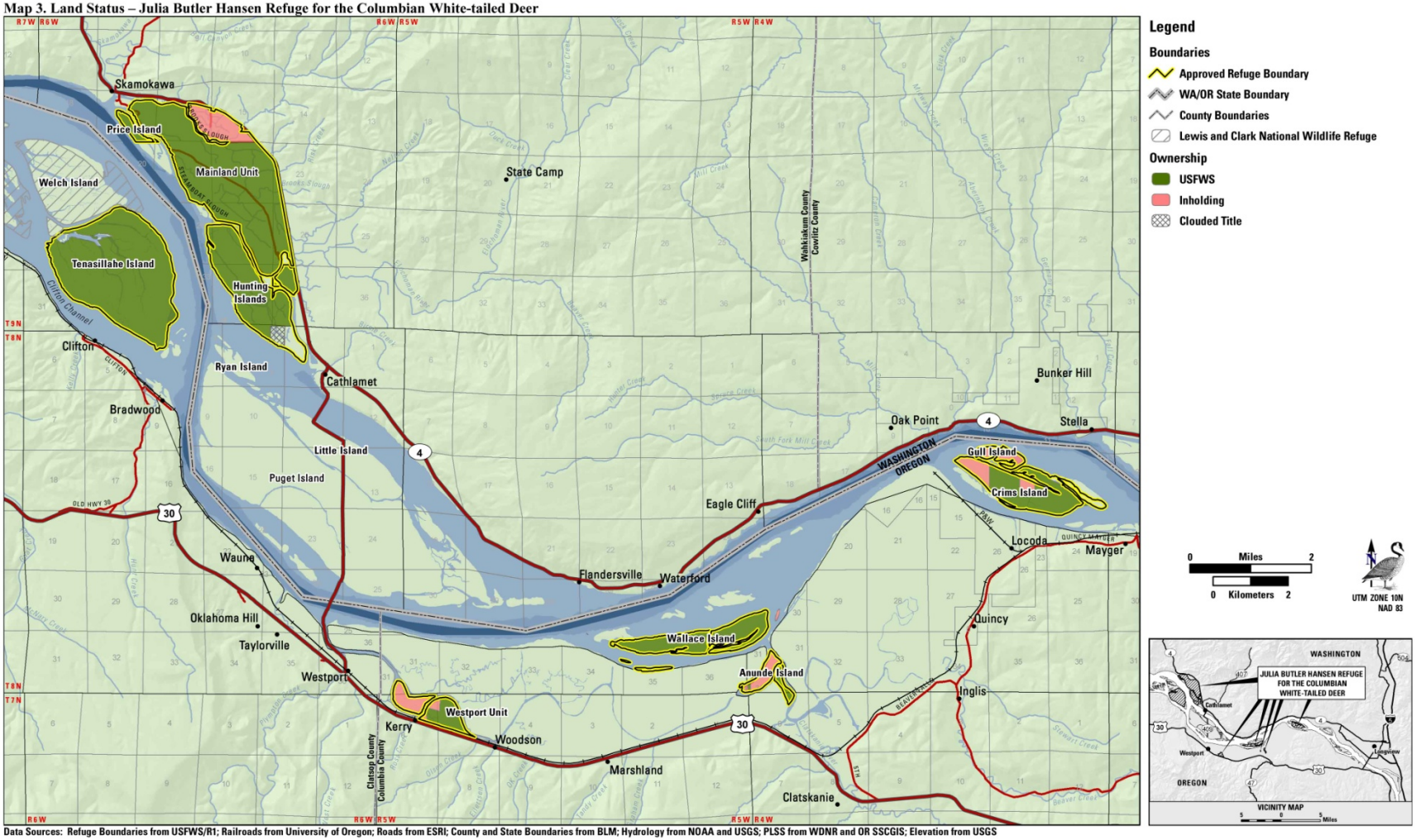
NRCS and our partners in recent years have a good start on outreach and education to private agricultural operators. Over the past decade, NRCS in Columbia County, through our EQIP program, have assisted a variety of agricultural operators within this priority area with the successful application of conservation practices. The Lower Columbia River WC and Columbia SWCD have planned and installed multiple habitat projects mainly aimed at T&E fish species within the targeted area and have established relationships with multiple producers. Several of these operators have expressed interest in conservation practices that meet partner goals and help improve their management of agricultural lands.

**Alternatives Considered**

Due to limitations of NRCS's funding for financial and technical assistance and the ability of NRCS partners to carry this out independently in Columbia County, the following options are considered.

1) Do nothing – Status Quo of this resource concern will continue the current course of habitat fragmentation and the lack of quality grazing and browsing areas. The lack of improvements will reduce the chances of full recovery of the Columbian white-tailed deer. Also the lack of good habitat may lead to deer damage on well managed agricultural lands due to an imbalance between agricultural and White-tailed deer habitat needs.
2) Treat the resource on a county wide scale – It is unrealistic that NRCS and its partners could make a difference in the next several years encouraging treatment of this resource concern on a county wide scale. The county has more than 37,100 acres of privately owned Columbia River floodplain lands developed for agriculture and mixed use which are potential habitat for Columbian White-tailed Deer. Our funding and staffing abilities to achieve a meaningful change would not be possible when spread throughout the county.
3) Remove lands from agricultural production through land acquisition and easement programs – The costs associated with purchasing the remaining agricultural lands within these drainage districts would be in the millions, money that is not available from any current funding source. The lands restored value as wetlands would be very low for Columbian White-tailed Deer, and would be counter to the recovery goals since properly managed agricultural lands provide much better forage for these deer . Research has shown that they rely on edge habitat and grasslands for forage and predator avoidance. A proper balance of wetlands and active agriculture is the ideal habitat for sustaining and recovering this population.
4) Choose key watersheds/areas for treatment – By targeting areas with the highest potential of providing quality White-tailed deer habitat, NRCS and its partners can concentrate our limited funding and technical assistance. After discussion with local partners including the US Fish and Wildlife Service, the Lower Columbia River Watershed Council and the Columbia Soil and Water Conservation District, the following areas were identified using 12 digit HUC to define the watersheds with the potential for Columbian White-tailed deer habitat:
    a. 22% of Priority Area – (See map, p. 9) 12 digit HUC watersheds including Lower Beaver Creek, Lower Clatskanie River and Columbia River Frontal. This area has a high percentage of private agricultural land in close proximity to established refuges for Columbian White-tailed deer (See map, p. 8). The priority area will encompass a 22% treatment rate equal to 1,500 acres out of 7,000 acres available. Priority will be given to those lands which currently have White-tailed deer. It is estimated that between 250 – 300 Columbian White-tailed deer already inhabit the Westport and Clatskanie area drainage districts, and that forage and habitat improvements on 1,500 acres will significantly address the limiting factors affecting these deer and help aid recovery efforts and implementation of the Recovery Plan. Treatment on all 7,000 acres is not feasible or necessary since not all lands within the priority area have limiting factors or are well suited to Columbia White-tailed Deer. Partners consider these watersheds high priority for agricultural productivity as well as potential habitat for a wide variety of threatened and endangered species.

**Map 3. Land Status – Julia Butler Hansen Refuge for the Columbian White-tailed Deer**




**Legend**

**Boundaries**
- Approved Refuge Boundary
- WA/OR State Boundary
- County Boundaries
- Lewis and Clark National Wildlife Refuge

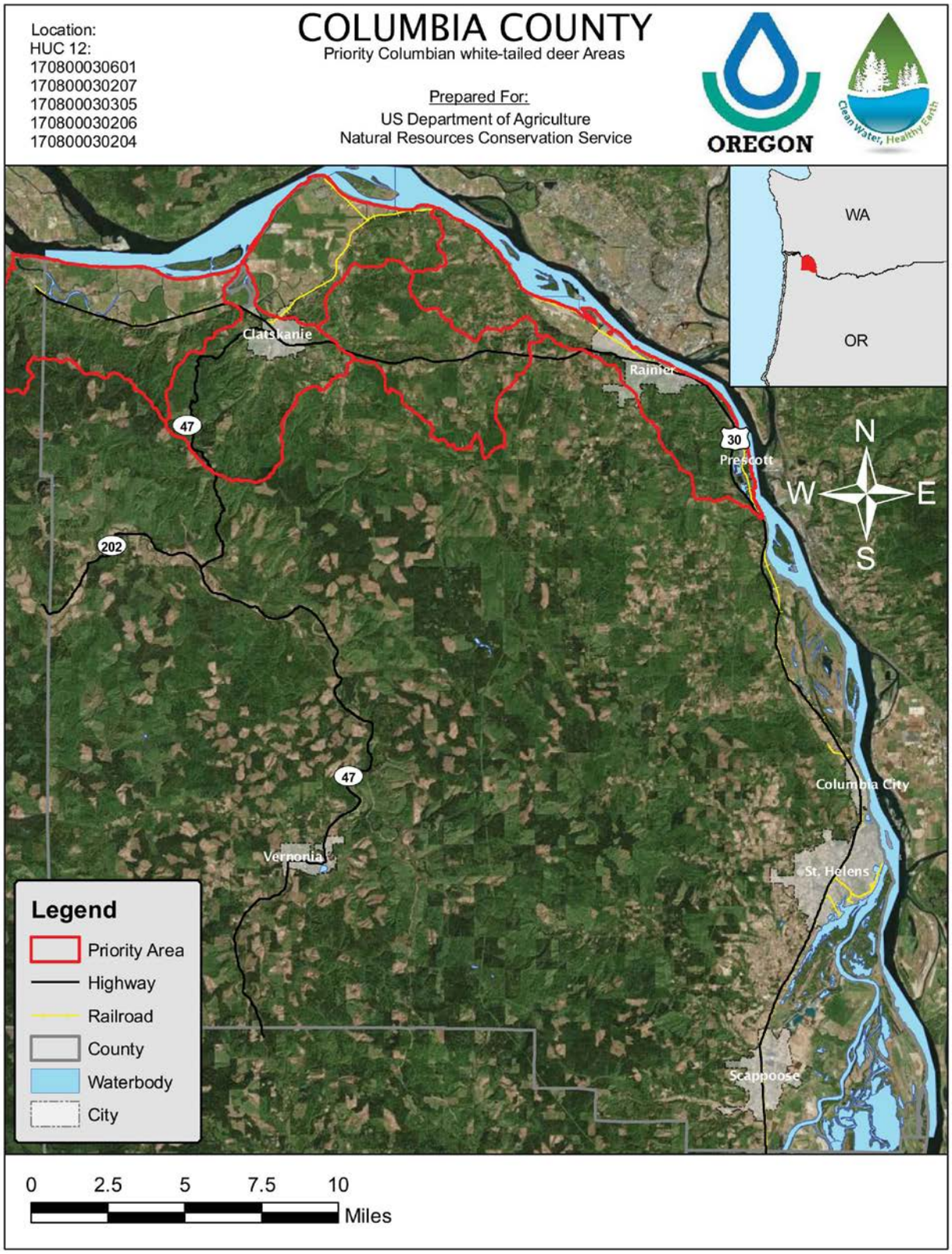
**Ownership**
- USFWS
- Inholding
- Clouded Title

0 Miles 2
0 Kilometers 2

UTM ZONE 10N
NAD 83




Data Sources: Refuge Boundaries from USFWS/R1; Railroads from University of Oregon; Roads from ESRI; County and State Boundaries from BLM; Hydrology from NOAA and USGS; PLSS from WDNR and OR SSCGIS; Elevation from USGS


Location:
HUC 12:
170800030601
170800030207
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170800030206
170800030204
COLUMBIA COUNTY
Priority Columbian white-tailed deer Areas
Prepared For:
US Department of Agriculture
Natural Resources Conservation Service
OREGON
Clean Water, Healthy Earth
WA
OR
Clatskanie
Rainier
Prescott
47
30
202
47
N
W
E
S
Columbia City
Vernonia
St. Helens
Scappoose
Legend
Priority Area
Highway
Railroad
County
Waterbody
City
0
2.5
5
7.5
10
Miles

**RECOMMENDED CONSERVATION PRACTICES AND ENHANCEMENTS**

To address this priority, we will provide incentives to agricultural operators to improve the management of their lands in ways that will support and benefit Columbian White-tailed deer habitat needs and potentially benefit their operations. Proven agricultural management techniques applied on the nearby refuges will be replicated on private lands helping achieve the long term recovery goals set out in the recovery plan (USFWS, 1983). The practice specifications will be customized to only provide program payments when Columbian white-tailed deer habitat has been improved. For example, prescribed grazing of livestock alone will not earn a program payment. The specifications, recordkeeping and photos will have to reflect actual deferred lands and management improvements associated with deer habitat. The following conservation practices will be considered to achieve this:

**Wildlife Friendly Fencing (382) –** Installation of new wildlife friendly fence and/or the retrofitting of existing fence will improve the ability for Columbian white-tailed deer to move throughout the landscape, reducing the fragmentation of available habitat and injury to deer.

**Upland Wildlife Habitat Management (645)** Through the use of food plots to provide seasonal high protein food sources and/or a fertility program, encouraging fertilizer applications on low producing pasture and hay lands, this practice will have a major impact on a key limiting factor for this species recovery. Fertilizer applications have been a proven practice for deer and elk populations used by ODFW and US Fish and Wildlife. Once participants see the benefit economically for their operation along with the benefit to habitat, they will more likely adopt a higher degree of management permanently. Fertilizer applications will be limited to 30 acres per contract for a maximum of 3 years. Additionally, this practice will also encourage the use of mineral blocks containing selenium. According to USFW, selenium which is lacking in our soils is an important element needed to correct health issues in deer populations (Davis, 2008)

**Tree/Shrub Establishment (612**) – Tree and shrub plantings in riparian zones, windbreaks and hedgerows will improve the ability of deer to move around and have close proximity to cover to avoid predators. This will also provide browse sources for the deer. Trees and shrubs that are known sources of browse will be encouraged. Research indicates that riparian areas are some of the most important habitat for this species. Tree plantings such as field windbreaks in open pastures will provide edge habitat and corridors to connect riparian areas and woodlands to grazing areas. They will provide thermal cover and shade, reducing energy needs.

**Tree/Shrub Site Preparation (490)** – This facilitating practice to tree/shrub establishment will be used to prepare the site for successful plantings.

**Brush Management (314)** – Areas with heavy invasive brush such as Himalayan blackberry will be treated so productive plants can be reestablished. Predators such as coyote have been known to trap deer in heavy thickets of blackberry, especially between tree rows.

**Clearing and Snagging (326)** – This practice will be used to remove old fence rows no longer needed in the operation or to remove for installation of wildlife friendly fence replacement. This will improve the ability of the deer to move around and reduce deer injury.

**Prescribed Grazing (528)** – Prescribed grazing will be encouraged on low management pastures. This in concert with access control will leave enough forage for deer populations. The specification will require no use intervals, minimum grass heights and rotational grazing, as well as customized language that primarily benefits Columbian white-tailed deer forage throughout the year.

**Forage Harvest Management (511)** – The harvesting of hay land will be improved to benefit deer populations. The specification will require wildlife friendly harvesting techniques, minimum stubble heights, encouraging nutrient management and harvest timing improvements to increase forage available for Columbian white-tailed deer.

**Herbaceous Weed Control (315)** – This practice will control undesirable grass and weed species on grasslands and around new tree/shrub plantings to reduce competition and improve desirable forage species.

**Access Control (342)** – With this practice, participants will exclude livestock from specific pastures for periods of time to allow regrowth for deer grazing. Columbian white-tailed deer tend not to graze within 100 feet of livestock. By excluding livestock, deer will have the separation they need to feel comfortable utilizing high quality forage.

**Forage Biomass Planting (512)** – Pasture and hay land plantings will be done on grasslands that can't be recovered by normal management practices. Plantings will be done with grass and legume species that deer prefer.

**Watering Facility (614), Livestock Pipeline (516), Pumping Plant (533)** – This suite of conservation practices will be used to provide clean water for Columbian white-tailed deer. It will also facilitate prescribed livestock grazing. Columbian white-tailed deer have been known to have serious health issues, even resulting in death caused by parasites from poor quality drinking water.

**Forest Harvest Management** – Harvest hybrid poplar plantations in a manner that doesn't fully displace deer. Stagger the planting and harvest intervals. Harvest in strips rather than blocks, always leaving escape areas and reducing fragmentation of the habitat.

**OTHER ENHANCEMENTS** – Some other suggestions for Columbian white tailed deer habitat include the following:

Wetland Enhancement – Hydrologic modifications have greatly altered the floodplain of the lower Columbia (USFWS 1983). Maintaining or improving existing freshwater tidal and palustrine emergent wetlands will provide summer grazing and reduce habitat fragmentation for CWTD.

Flood control and drainage management – Although not a natural situation, drainage maintenance can be important in concentrated population areas. Half of the Columbian white-tailed deer population was lost due to severe flooding during the 1996 flood. Maintenance of dikes and high ground will provide a safe area in case of these events.

Predator control – Coyote removal may provide short-term benefits to deer by increasing fawn survival (Brookshier 2004).

**NRCS and Partners Assistance**

**USDA-NRCS** - NRCS will provide financial and technical assistance to private agricultural owners through conservation programs such as EQIP.

**Columbia Soil and Water Conservation District** – The Columbia SWCD will provide technical assistance and outreach opportunities as appropriate. They will pursue grant funds for habitat and agricultural improvements in conjunction with this CIS and the efforts of NRCS Staff. This effort is also included as part of their strategic approach with the Oregon Department of Agriculture.

**Lower Columbia River Watershed Council –** The LCRWC will provide technical assistance and outreach opportunities as appropriate. They will continue to pursue a variety of grant funds for habitat improvement projects in coordination with other partners.

**USFWS Partners Program** – The USFWS will provide technical assistance on management strategies, education and outreach. They will assist with the biological evaluation process for individuals.

**Cost Estimate for Success**
Based on preliminary cost estimates for the practices listed above that will result in key habitat improvements for Columbian white-tailed deer, NRCS estimates a total cost over a 5 year period of $379,149, or approximately $76,000 per year in financial assistance. See the attached appendix 3 for specific cost details. The largest participation is expected in the first 3 years of the initiative. A request of approximately $100,000 will occur for 2014.

**Goals and Outcomes of the Initiative**
Goal – Improve habitat through proper management of Columbia County's floodplain agricultural lands to provide critical element such as cover, defragmentation and forage availability for endangered Columbian White-Tailed Deer.

Outcome Measure – Inadequate Habitat for Wildlife, Habitat Degradation – Land Condition (acres) – This initiative will be considered successful when wildlife habitat has been improved through the installation of conservation measures or management changes on 1,500 acres of private agricultural lands within the priority area. A ranking tool will be used to assure that the highest value habitat is funded first.

**Expected Participation Level – Outreach Activities**

Participation in this initiate is voluntary. Due to the significant partnership opportunities and high level of awareness of T&E issues among local area landowners, anticipated interest and participation is high.

A combination of workshops, mailings, newspaper articles and limited door to door visits will occur. The Columbia SWCD, the Lower Columbia River Watershed Council and NRCS staff will begin outreach efforts within the next few months. Because this is also a priority item in the Columbia SWCD and LCRWC action plans, this partnership effort will help ensure successful outreach.

**LITERATURE CITED**


Baker, R.H. 1984. Origin classification and distribution. Pages 1-18 in L.K. Halls, editor. White-tailed deer: ecology and management. Stackpole Books, Harrisburg, Pennsylvania, USA.

Brookshier, J. July 2004, Washington Department of Fish and Wildlife, Management Recommendations for Washington's Priority Species – Volume V: Mammals: 1-9.

Crews, A.K. 1939. A study of the Oregon white-tailed deer, *Odocoileus virginianus leucurus* (Douglas). Thesis, Oregon State College, Corvallis, Oregon, USA.

David, J. 2008. Manager, Julia Butler Hansen Refuge for Columbian White-tailed Deer, Personal communication: 11-6-2008.

Dublin, H.T. 1980. Relating deer diets to forage quality and quantity: the Columbian white-tailed deer (*Odocoileus virginianus leucurus*). Thesis, University of Washington, Seattle, Washington, USA.

Jackson, R.M., M. White, F.F. Knowlton 1972. Activity patterns of young white-tailed deer fawns in south Texas, Ecology 61:263-270.

Jewett, S.G. 1914. The white-tailed deer and other deer in Oregon. Oregon Sportsman 2:5-9

Ricca, M.A., Anthony, R.G., Jackson, D.H., Wolfe, S.A. 2003, Spatial Use and Habitat Association of Columbian White-tailed Deer Fawns in Southwestern Oregon, Northwest Science, Vol. 77, No. 1: 72-80.

Suring, L.H. 1974. Habitat use and activity patterns of the Columbian white-tailed deer along the lower Columbia River. Thesis, Oregon State University, Corvallis, Oregon, USA.

Suring.L.H. and P.A. Vohs, Jr. 1979. Habitat use by Columbian white-tailed deer. Journal of Wildlife Management 43:610-619

Thwaites, R.G., editor. 1905. Original journals of the Lewis and Clark expedition, 1804-1806. Volume 4, Dodd, Mead, and Company, New York, New York, USA

Thomas, A. (2013, January 16). Ridgefield may be new refuge for deer. *The Columbian*. Retrieved from http://www.columbian.com/news/2013/jan/16/ridgefield-may-be-new-refuge-deer/

U.S. Fish and Wildlife Service. (1983). *Revised Columbian White-tailed Deer Recovery Plan*. Portland, OR: Government Printing Office

USFWS 2008, Columbian white-tailed deer species profile, U.S. Fish and Wildlife Service,

http://ecos.fws.gov/speciesProfile/SpeciesReport.do?spcode=A002 (accessed Nov 2008).

USFWS April 2008, Columbian white-tailed deer species fact sheet, U.S. Fish and Wildlife Service, http://www.fws.gov/oregonfwo/Species/Data/ColumbianWhiteTailedDeer/ (accessed Nov 2008).

U.S. Fish and Wildlife Service. (2010). *Lewis and Clark National Wildlife Refuge and Julia Butler Hansen Refuge for the Columbian White-tailed Deer Comprehensive Conservation Plan.* Ilwaco, WA: Government Printing Office.

## Degraded Plant Condition – Wildfire Hazard on Private Nonindustrial Forest

**Current Condition/Severity of the Problem** – Concern over fire danger has greatly increased over the last decade in Columbia County. Although wildfire regimes historically played a critical role in shaping the forests of Columbia County, activities such as timber harvesting, fire suppression, introduction of exotic species and other human factors have disrupted natural fires cycles. These activities and the resulting studies that have been done over the last decade have intensified the fear of potential catastrophic fires and their potential to cause damage to much of the 21,000 residents that live in rural Columbia County.

The wild land-urban interface (WUI)—the area where human development mixes with forest land—is growing and according to the Columbia County Wildfire Protection Plan (CCWPP), "Fire Statistics show the fire incident rates, and therefore risks, are prevalent in the WUI areas." (2007).

It is estimated approximately 42,590 acres of private nonindustrial forestland are located in the WUI. Of this 42,590 acres in the WUI, approximately 18,748 acres fall into a high fire risk category. Approximately 1200 PNIF owners have property within these high fire risk boundaries but a percentage of them already have adequate protection measures in place for fire suppression.

Publically owned forestlands of Columbia County, primarily Bureau of Land Management, hold high values to the public. They provide aesthetic appeal, refugia and wildlife habitat. They protect the watersheds which are the sources for domestic water systems of communities such as Scappoose and St. Helens. Public environmental concerns have limited the intensity of management of these lands, which in some cases has elevated fuel loads, creating wildfire concerns. A catastrophic fire could potentially devastate thousands of acres of surrounding private forestland, endanger urban residential properties, infrastructure and domestic water sources.

**What Are We Trying to Achieve?**

In Columbia County, where a significant percentage of the population live in or near forestlands, we are trying to reduce the fire hazard rating in the WUI to protect life and property from catastrophic wildfires. This is especially the case near high risk and heavily populated communities such as the southeast portion of the county. This area includes the larger communities of Scappoose, St. Helens and numerous small subdivisions and small acreage properties that are near public lands.

As the fire return interval continues to be lengthened due to human suppression and other needs on the landscape, such as residential use and recreation, proper management of these fuels is of greatest importance. If the proper forest management and fuels reduction does not take place, catastrophic consequences will be very likely.

**How Will NRCS and Partners Achieve This?**

The private nonindustrial forestland is the land use where NRCS can contribute. Over a five year timeframe, we will begin addressing fire protection by targeting the forestland near public owned lands such as BLM property that are considered high risk for wildfire. This area will include the heaviest populated areas of the county, including the forestland around Scappoose and St. Helens as well as portions of the watershed that supply these communities with drinking water. NRCS will use the 12 digit

HUC watersheds near BLM lands that include South Scappoose Creek, North Scappoose Creek and Milton Creek and the acres identified as high risk in the wild land-urban interface (WUI) in those watersheds.

Of those projects that fall within that area, NRCS will elevate priority to NIPF owners who already have a forest management plan in place, by those projects where ODF has or will be assisting with structural protection through their fire protection grants, and by projects where Columbia SWCD's Title III fire protection grant applies.

Oregon Department of Forestry has obtained grants that continue at least into 2012 to assist rural residential property owners to implement fire protection practices within 100 ft radius of building sites. In addition, Columbia SWCD has secured a 5 year fire protection grant that will begin in 2012. This grant will provide $90,000 for financial and technical assistance. NRCS in partnership with Columbia SWCD will expand the ODF area by implementing practices with private nonindustrial forestland owners affecting rural structures, infrastructure and urban growth areas. Fire risks can be substantially reduced by reducing fuel loads using practices such as pre-commercial thinning, brush management and slash treatment within an additional 1000 feet radius of rural properties and major county roads and buildings.

To achieve these results, NRCS will rely on partnerships. Oregon Department of Forestry is the lead agency in Columbia County in regard to wildland fire protection and will lead the way. NRCS, Columbia SWCD and OSU extension will provide technical and financial assistance to private landowners. It is expected that other partners will provide assistance in achieving this goal. Examples of other partners would include; Bureau of Land Management, Columbia County Office of Emergency Management, Columbia County Fire Defense Board, Columbia County Wildlife Protection Plan Committee, Columbia County Rural Fire Districts, Oregon Small Woodlands Association, and Watershed Councils.

The primary NRCS conservation practices to be used are:

**Fuel Break (383)**- Create a minimum 60’ wide, highly thinned and understory managed buffer to retard the path of an oncoming fire.

**Slash Treatment (384)**- Natural slash or that produced by forest management activities will be treated using either a lop and scatter, slash removal, or chipping and scattering methods to reduce amount of possible fuels. The benefits and/or negative impacts to wildlife will be considered with all slash treatment.

**Forest Stand Improvement (666)**- Stands at a tighter density than is appropriate for the D class as outlined in NRCS Forestry Tech note 33 will be thinned to an appropriate spacing. Slash treatment will need to be considered with use of this practice. When practical, thinned material will be processed into firewood and donated to local low income residents of the county.

**Tree Pruning (660)**- Limbing low hanging branches up to higher than eight feet to reduce chance fire climbing to the crowns and starting a crown fire.

**Brush Management (314)**- removal of brush species such as blackberries, scotch broom and vine maple to reduce competition and reduce highly volatile fuels.

**Access Roads (560)**- Install access roads that meet the minimum NRCS and ODF requirements to allow better emergency transportation and management through forest management units as well as the ingress and egress as applicable.

**Tree and Shrub Establishment (612)** This practice will be used in those areas treated for brush or that have been denuded and it is deemed beneficial as a treatment for fire protection.

**Forest Management Plans (106)** Forest Management Plans will be encouraged to assist those landowners who are in critical areas but have not yet developed a comprehensive forest plan that addresses forest health and fire protection.

**Cost Estimate**

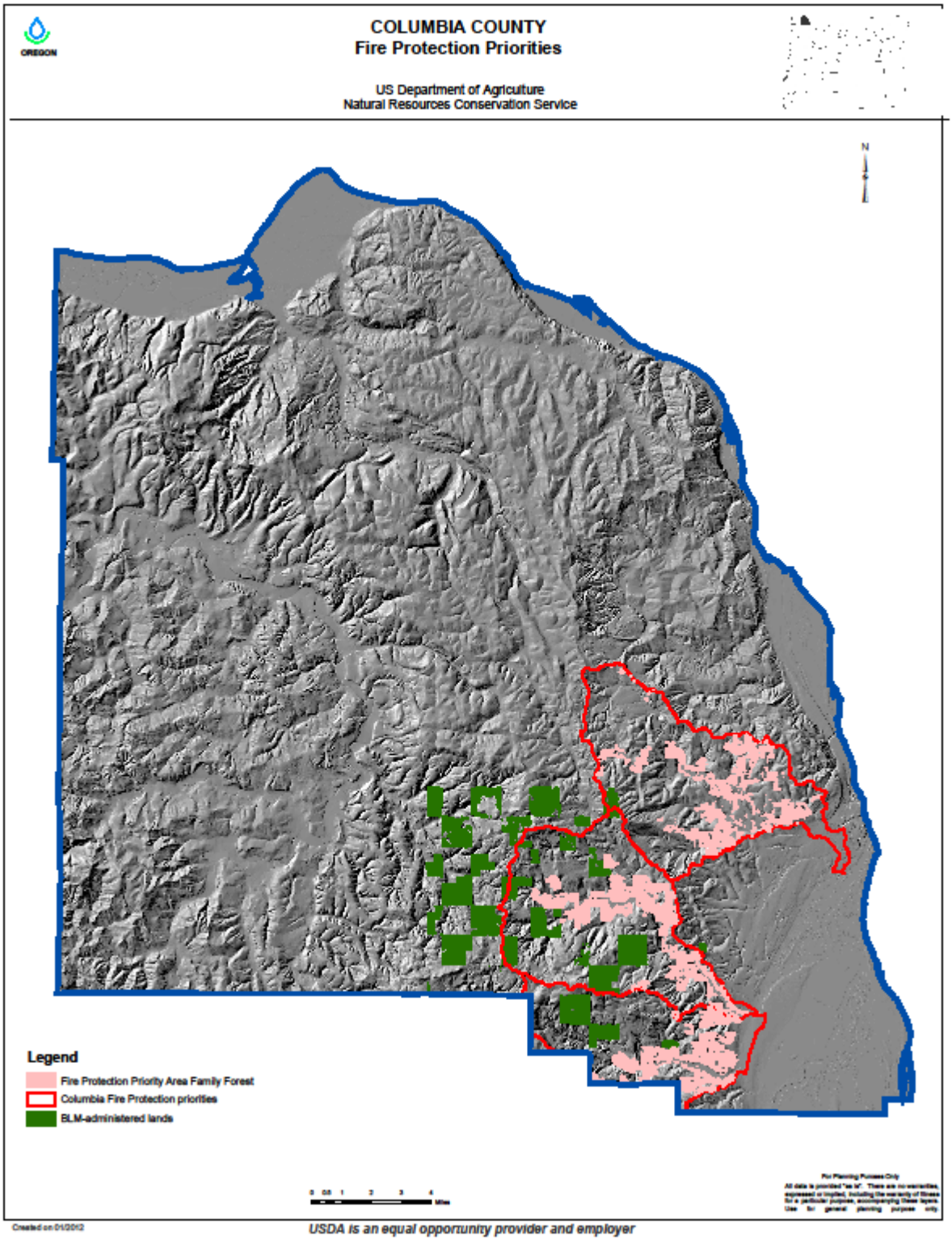
STILL WORKING ON THIS SECTION - AWAITING OPERATOR NUMBERS FROM JIM FOR THE RESPECTIVE WATERSHEDS SURROUNDING BLM LANDS.

Based on initial cost estimates, to satisfactorily address wildfire hazard in the 12 digit HUCs containing BLM lands,

on private nonindustrial forestland, it is estimated that 20% of the 42,350 acres in the WUI, or about 8000 acres will require some form of fire reduction practices. Assuming a cost of $250/acre, that would be $2,000,000 in financial assistance. Due to this high dollar figure for financial and technical assistance, NRCS will place priority on landowners interested in forest management plans that address fire hazard, landowners already working with ODF with their fire wise program, and landowners in the highest risk area for wildland urban interface.

**How Will We Know We Have Achieved This?**

NRCS and its partners, working with private nonindustrial forestland owners, will decrease wildfire potential from a medium risk to low risk by treating 100% of the identified critical acres within the next 5 years.


OREGON
COLUMBIA COUNTY
Fire Protection Priorities
US Department of Agriculture
Natural Resources Conservation Service
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Fire Protection Priority Area Family Forest
Columbia Fire Protection priorities
BLM-administered lands
Created on 01/2012
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## Water Quality Degradation – Excessive Sediment in Surface Waters From Road Erosion

**Current Condition/Severity of the Problem -** All three of Columbia County's watershed council assessments (Nehalem Watershed, Scappoose Bay, and Lower Columbia River) indicate the impact of roads on the health of their watershed and respective resources. The primary resource concerns attributed to roads are hydrological changes, fish passage in some cases, and sediment delivery to streams with threatened and endangered species. We can have little impact on the overall amount of roads or how they may change the hydrologic curve of a stream, but we can make improvements that reduce their ability to deliver sediment. Sediment deposition to open water systems is a major water quality problem in Columbia County. It causes stream turbidity and clogs spawning gravels with fines that impact salmon species and their life cycle. The volume of unstable roads including driveways, access roads and forest roads is high in the county. Some watersheds have more elevated sediment delivery concerns than others. As an example, the Nehalem Watershed Assessment states that unpaved roads with heavy traffic contribute the most sediment to streams. Most of the unpaved roads in the Nehalem Watershed are associated with logging. Roads that are within 200 feet of a stream are most likely to contribute sediment. Roads in the county that directly transport sediments are eroding due to poor quality surfacing material, have design problems such as a lack of sediment traps, cross drainage and crowning and in some cases lack access control and good ground cover.

**What Are We Trying to Achieve?**

We are trying to reduce sediment delivery to high priority salmon streams by treating roads on private nonindustrial forestland that are vulnerable to road erosion. Research and local experience indicates that hard rock surfacing on heavily used road systems reduces the fine sediments released into water solution. However, much of the surfacing material now used to create and maintain roads in the county is of poor quality. Sedimentary, marine deposited rock is more readily available for road surfacing in much of the county. Over a few years, this poor quality material slowly breaks down into fine soil particles that are carried by winter run-off and deposited in streams.

One of Columbia County's highest priorities is restoring fish habitat. This undertaking has proven to be overwhelming due to the financial and technical limitations of agencies. Especially when considering all of the restoration avenues (addressing stream temperature, fish passage, stream structure, off-channel habitat, etc.), the permit and consultation requirements.

NRCS however, can address sediment delivery on a small watershed scale in a reasonable timeframe with reasonable funding, and as watershed council assessments have indicated, sediment deposition is one of the greatest limitations to healthy streams for fish habitat.

**How Will NRCS and Partners Achieve This?**

We will prioritize small watersheds considered essential habitat for T&E salmon species which have exhibited sediment delivery concerns. NRCS and Columbia SWCD will conduct an inventory of unstable

road issues on private lands within 500 feet of streams and tributaries within the respective priority watershed.

**Alternatives Considered**

Do nothing - If NRCS and its partners choose to not address this issue, the sediment being delivered from poor roads will continue to occur. Habitat for listed fish species will continue to decline from high turbidity levels, poor water quality, reductions in macro-invertebrates which are sources of food, and high levels of fine particulates in spawning gravels. Threatened and endangered species such as coho salmon will continue to be on the endangered species list.

Treat fish habitat issues on a broad scale - This alternative would address all habitat concerns of fish species within a watershed or more broadly across the county. It would include improvements to in-stream structure, off-channel habitat, fish passage, sediment delivery, and temperature concerns. Addressing all of these problems would require heavy commitments from partners including financial assistance, technical assistance and permit consultation assistance. It is impractical to address this resource concern with our current financial and staffing budget constraints.

Treat sediment sources within small high priority watersheds - NRCS and its partners will target small watersheds placing highest priority on those with high interest, high levels of sediment delivery and appropriate partner support. Stabilizing roads can be very costly. To reduce sediment delivery rates in a cost effective manner, NRCS working with local partnerships will target access roads within 500 feet of the stream or stream tributary with direct sediment delivery.

> Priority Area 1 – (See map) 12 digit HUC watershed including Rock Creek. NRCS will start by conducting a reconnaissance inventory of poor roads in this watershed, including roads on private non-industrial forestland, agricultural access roads and residential driveways. Once identified, NRCS, Columbia SWCD and Upper Nehalem Watershed Council will contact landowners to confirm their interest in addressing road issues and construct cost information and technical assistance needs. Columbia SWCD will apply for grant funds to address residential driveways and agricultural access roads. NRCS will request funds to address the private nonindustrial forestland owners.
>
> Priority Area 2 – (See map) 12 digit HUC watersheds including Fishhawk Creek. The same process will be used as above for this watershed.

The following conservation practices will be used to improve roads and reduce their potential to delivery excessive sediment amounts:

**Access Road** – We will improve road designs within 500 feet of streams using NRCS standard designs. The primary road issues will include installing road surfacing materials that are less erosive, hard rock vs. sedimentary material. We will also improve cross drainage and stabilize long runs on medium to steep slopes.

**Critical Area Planting** - A grass/forb mix will be applied to all bare soil areas along road slopes and ditches. Where appropriate, roads that are infrequently used will be seeded to grass and access controlled for the rainy portion of the year.

**Sediment Basin -** When appropriate sediment traps will be installed. Road runoff will be diverted through the sediment basin before being discharged to watercourses.

**Access Control -** When appropriate, to control traffic from off-road vehicles, large gates will be installed on infrequently used or seasonal roads. This practice, along with critical area seeding will be used where possible to keep improvement costs low. An access control management payment will also be considered for those operators who choose to exclude vehicle traffic during the critical erosive period.

**Structure for Water Control** – When appropriate and required as part of the road improvement, culverts, drop structures and grade stabilization pipes with non-erosive outlets will be used.

**NRCS and Partners Assistance**

USDA-NRCS - NRCS will provide financial and technical assistance to private nonindustrial forestland owners through conservation programs such as EQIP or WHIP if available.

Columbia Soil and Water Conservation District – The Columbia SWCD will provide technical assistance and outreach opportunities as appropriate. Columbia SWCD will request grant funds to target residential driveways and agricultural access roads. District staff will meet with landowners and help identify potential projects. They will assist with the total design process and certification of completed projects.

Oregon Department of Forestry – ODF's local foresters will provide technical assistance and permit assistance for proposed projects.

Columbia County Small Woodland Owners Association - Will provide opportunities for PNIF owners to share ideas and spread the word about assistance available.

US Fish and Wildlife - The Habitat Conservation Biologist will assist with the completion of biological evaluations for ESA, consultation and permitting when needed.

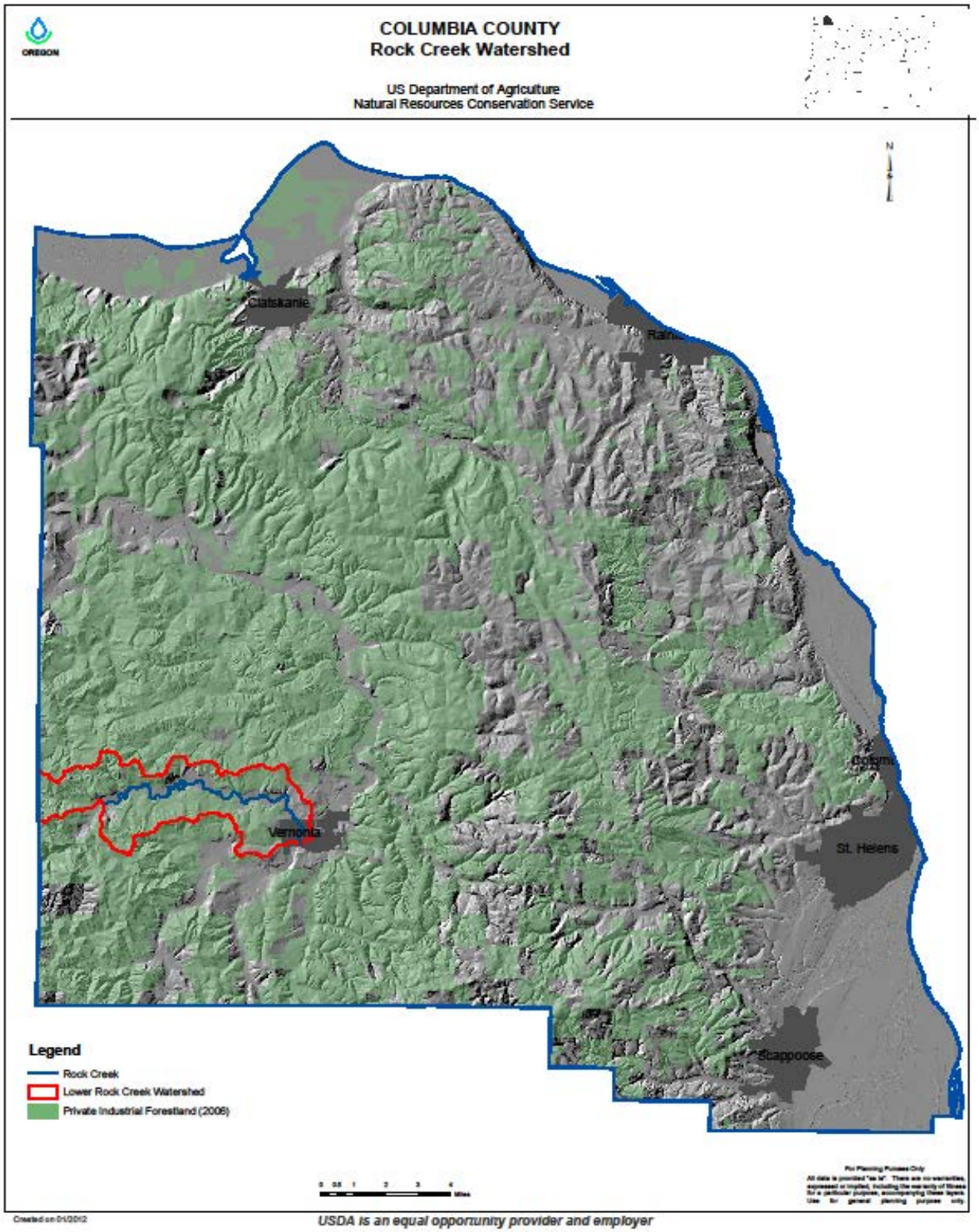
Upper Nehalem Watershed Council - The council staff will assist with outreach and door to door contact with landowners. They will assist with inventory of the watershed's roads and with stream turbidity monitoring over the length of the initiative.

**Cost Estimate for Success**

Cost information is not available at this time. Until the inventory is completed, the footage of unstable roads and the number of participants interested in addressing is unknown.

**How Will We Know We Have Achieved This?**

This priority will be considered addressed when 80% of the non-paved roads within the watershed have been stabilized and stream turbidity has been reduced.

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## Water Quality Degradation – Excess Nutrients and Organics in Surface and Ground Waters from Small Animal Feeding Operations

Columbia County has at least 600 small livestock operations with beef, horses, small dairies and other animals. Many of these are located near waterways throughout the county and deliver nutrients, organic material and potential pathogens to waters of the state.

Other livestock operations are found in the county's drainage/flood control districts which have water tables near the surface for several months during the year. These waters are delivered via drainage systems and sloughs to large pumping stations that discharge directly into the Columbia River. The vast majority of the county's agricultural lands and most productive soils are found in these floodplains. Although they can be major contributors to water quality problems, by statute they are exempt from several water quality parameters.

These livestock operations are usually not monitored by ODA or DEQ and don't require CAFO permits. A high percentage of such operations could be considered low management. Grazing occurs all year long on many of these. The headquarters and barn areas are typically muddy, ponded and have surface run-off with substandard housing and wintering areas. In some cases, livestock are not excluded from waterways or wetland access. Several of the operators are beginning farmers or limited resource operators. The vast majorities do not rely on their farms as a main source of income and do not invest in resource improvements.

The North Coast Basin Agricultural Water Quality Management Area Plan addresses specific water quality parameters in which ODA has enforcement authority for preventing and control of water pollution from agricultural activities. OAR 603-095-0840 discusses the recommended parameters for manure, nutrients, livestock, grazing and riparian condition. It also provides a list of NRCS conservation practices that will treat these concerns.

It is estimated that 30% (200) or greater of small livestock operations have poor to fair headquarter and pasture management. Grazing specialists state that Columbia County is not ideal for wintering livestock because of its extended humid, high rainfall winters that create serious water quality concerns, reduced health for breeding livestock herds and negative impacts on grazing lands.

**What Are We Trying To Achieve On Small Livestock Operations?**

In Columbia County, we are trying to reduce nutrient and organics delivery to surface and ground waters by encouraging small livestock operations to change their management. Currently no water bodies in the county are listed on Oregon DEQ's 303d list for nutrient impairments and NRCS is not aware of any DEQ monitoring that is occurring. It is the intention of this plan to treat these livestock systems before they impair surface and/or groundwater and county water bodies are added to the 303d listing.

This will be accomplished by improving pasture management, providing adequate wintering areas and install permanent buffers in order to make significant improvements to water quality and plant health; so pastures or hayland can uptake the excess nitrogen before it impairs water quality . We intend to

inform livestock operators about proper buffers, manure and water management to improve the current condition.

**How Will NRCS and Its Partners Achieve This?**

An outreach plan will be developed with the Columbia SWCD and OSU extension that includes small landowner workshops. NRCS will promote conservation planning for these operations. We will encourage the adoption of proven conservation practices such as those listed below. NRCS and Columbia SWCD will promote farm programs as appropriate such as EQIP, OWEB small grants and DEQ-319 grants. We will conduct tours of good operations with water quality practices in place.

Knowing that funding is limited and the ability of partners to fund all such operations would be impossible, the following alternatives are considered to address water quality;

1) **Do nothing** – Without changes to the current management of small operations, more stream reaches may be listed as impaired for nutrients and organic run-off. In addition, more operations may be in violation of ODA's water quality regulations. Plant health will continue to decline as pastures are over-used and riparian condition will decline.
2) **Create additional demonstration and tour sites** – Work with 5 to 10 livestock operations in strategic locations around the county willing to allow public tours of their improvements. Assist them with technical and financial assistance to implement state of the art water quality practices. These projects would encourage adoption by other neighboring livestock operators. Willing participants would be chosen based on their motivation, management, and visibility of their operation to the public and accessibility.
3) **Prioritize and treat highest priority areas** - Stream reaches or flood control districts with the highest concentrations of small livestock operations in marginal condition that will collectively have the greatest impact to nutrient and organic delivery will be targeted.

Priority Area #1 – Flood/Drainage Control Districts. These floodplain areas have the highest concentration of livestock operations, the highest interest in participation, are home to the endangered Columbian white-tailed deer and their run-off is pumped through a point source delivery to the river.

Priority Area #2 – Operations along the Nehalem River and Rock Creek. The Columbia SWCD has already started outreach in this part of the county. Many of the small livestock operations in this area are marginal and due to the geography, are located in a flood prone valley with higher probability of direct nutrient delivery to watercourses.

Priority Area #3 – Scappoose Creek. Contains many small livestock operations. Resource inventory indicates over 70 operations of which 50% are fair to poor condition (headquarters water quality issues, pasture condition, livestock concentrations).

Priority Area #4 – Goble, Tide, Merrill and Beaver Creeks. These drainages near Rainier are another heavier livestock concentration area.

Priority Area #5 – Clatskanie River. Most of the Clatskanie has limited amounts of livestock operations and therefore less of a priority; however the ones that do exist are right on the river. This river is also very prone to high frequency flood events that potentially deliver high concentrations of nutrient and organic solids.

Priority Area #6 – Remaining areas of the county with small livestock concentrations.

4) **Two armed approach** – Demonstration sites and targeted priority areas.

From the above listed alternatives, the approach NRCS and its partners will take will be #4 (Two armed approach). We will target priority area #1 for treatment as well as work to get 3 to 4 additional projects in other areas to use as demonstration and tour sites. Potentially, many neighboring operators will be willing to adopt good conservation practices without additional assistance.

Cost Estimate to carry out Priority – To achieve these results, NRCS estimates the following costs (see cost estimate appendix for specific details):

3 Demonstration/Tour Farms @ $38,826 each = $116,478. To address the priority area #1 above as the top priority will cost $462,147. The total cost therefore including 3 demonstration sites and approximately 30 small livestock operations in priority area 1 = $578,625. Over a 5 year timeframe, this would require funding $115,725 per year.

To achieve these results, NRCS will rely on the following partnerships:

- Columbia SWCD - Will conduct outreach in priority areas, provide technical assistance by conducting farm visits, provide financial assistance as available through small grants and potential DEQ funds, and assist NRCS with a more comprehensive small livestock county wide inventory.
- OSU Extension Service - Will provide training, publications and outreach presentation in concert with the SWCD and NRCS.
- ODA - Will provide training, regulatory assistance, and outreach assistance as available.
- Watershed Councils - Will help identify key concentration areas of marginal livestock operations, as well as outreach assistance and information distribution.
- Small Groups and Granges - Provide venues for community outreach meetings.
- Oregon DEQ – Can provide monitoring on areas identified as high priority and potential DEQ 319 funding.
- NRCS - Will provide technical assistance, inventory, outreach and funding assistance as available.

Effective practices we will use to address nutrients and organics in surface waters:

- Comprehensive Nutrient Management Plans
- Riparian Forest Buffers or Tree/Shrub Plantings
- Access Control and Fencing
- Manure Storage and Management - Dry Waste Storage Facility, Compost Facility, Manure Transfer,
- Heavy Use Protection

- Roof Runoff Structures &  Outlets
- Nutrient Management and Prescribed Grazing
- Livestock Trails & Walkways & Stream Crossings
- Livestock Watering Systems – Pump, Pipeline, Trough, Spring Development
- Biomass Planting

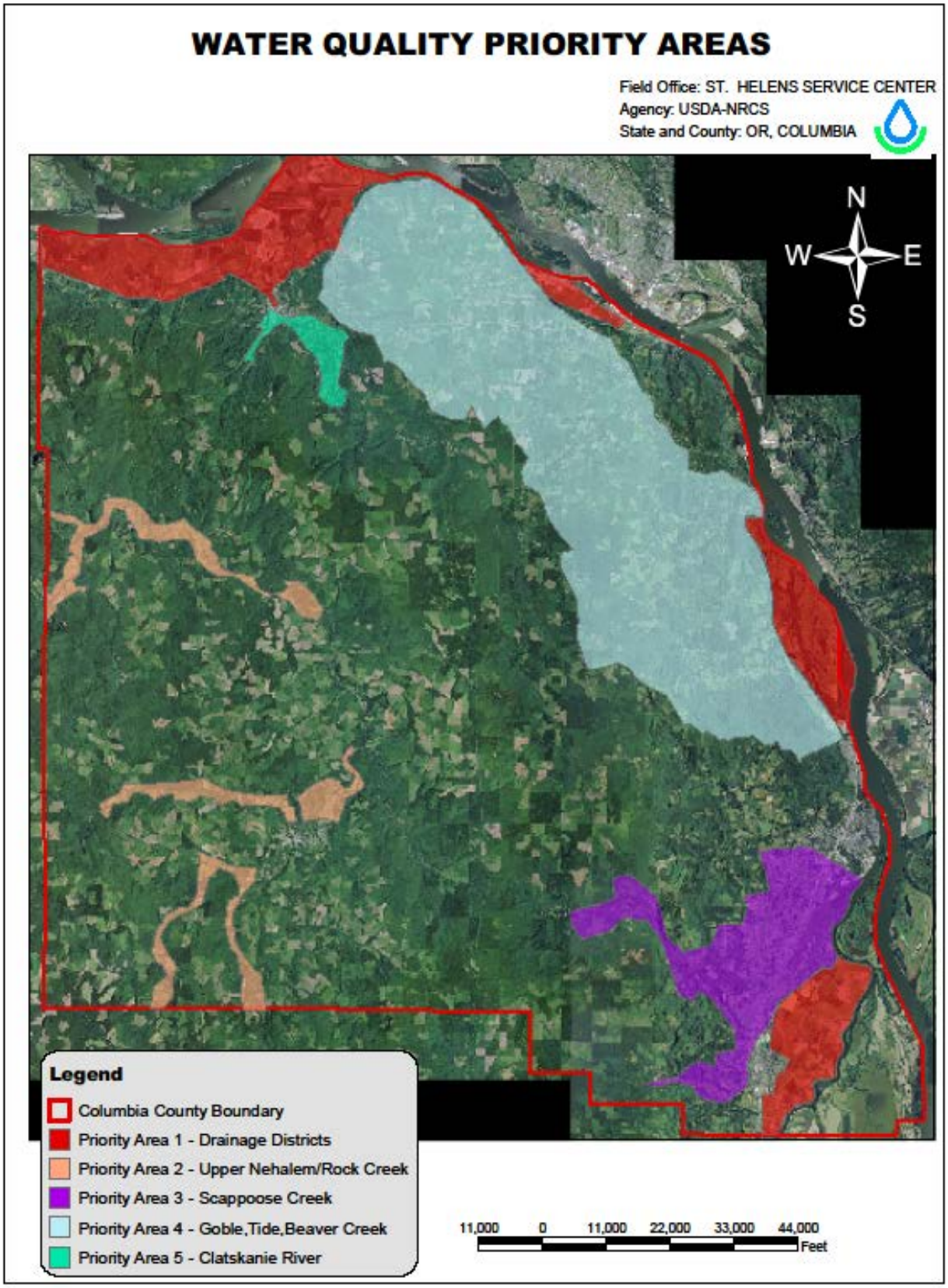
**How Will We Know We Have Achieved This?**

Nutrients and organic delivery levels are at an acceptable rate for the targeted area. Operations meet the North Coast Basin Agricultural Water Quality Management Area Plan criteria.

**What Information Do We Still Need?**

A comprehensive inventory of livestock operations and their condition is needed. Working with Columbia SWCD and watershed councils, we will encourage such an inventory in the county which will provide a baseline of livestock numbers and conditions as well as identifying concentration areas.

An economic analysis for small livestock operations that will help define conservation practice costs vs. returns. The analysis will help determine if certain improvements are feasible to install such as grassland improvements for grazing or haying. It will help NRCS define cost effective methods of treating small livestock resource issue in the region.


WATER QUALITY PRIORITY AREAS
Field Office: ST. HELENS SERVICE CENTER
Agency: USDA-NRCS
State and County: OR, COLUMBIA
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W
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S
Legend
Columbia County Boundary
Priority Area 1 - Drainage Districts
Priority Area 2 - Upper Nehalem/Rock Creek
Priority Area 3 - Scappoose Creek
Priority Area 4 - Goble,Tide,Beaver Creek
Priority Area 5 - Clatskanie River
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## Other Future Priorities in Columbia County

Several other high priorities besides the four listed above exist in Columbia County. In order to prioritize these and eventually create implementation strategies, more information is needed.

**Sedimentation** – Sedimentation of major watercourses, especially interior sloughs along the Columbia River is of concern to wildlife agencies, city and county governments, Columbia SWCD, drainage districts and property owners. Not enough is known about the source of the sedimentation and the best methods for resolving the concern at this time. The other potential cause of sedimentation includes rural forest roads. Identifying these concentration areas would be very important before creating a strategy to address it.

**Water Quantity** – The Columbia County Water Conservation and Protection Committee was formed in recent years to identify ground water quantity and quality concerns county wide. Water limited areas exist in many interior portions of the county. Assessment of the problem is recent enough that we don't have the information needed to form a solution. Interest in using effective roof runoff harvesting techniques already exists and may be a future alternative for some operations.

**Wetland Habitat** – Creating wetland habitat for species of concern such as Northern pond turtle, Northern red-legged frog and others is another priority, especially in the Columbia River floodplains. Identifying a target area is important before we create a strategy.

**Threatened &Endangered Fish** - Several fish species including coho salmon (*Oncorhynchus kisutch*), Chinook salmon (*Oncorhynchus tshawytscha*), chum salmon (*Oncorhynchus keta*) and steelhead (*Oncorhynchus mykiss ssp.)* are listed as threatened in Columbia County according to NOAA Fisheries. Other species are proposed or considered species of Federal or State concern such as coastal cutthroat trout (*Oncorhynchus clarki ssp*.) and Pacific lamprey (*Lampetra tridentate*). Efforts have been made to improve habitat in the past decade however, recent assessments by fish and wildlife agencies indicates that more is still needed. As one of the only counties considered a wild fish sanctuary (native fish runs, no hatcheries), this priority has wide support from multiple partners.

# Appendix 1

## Cost Estimate for Small Livestock Water Quality Priority

### For Demonstration Farms

Heavy Use Protection – Asphalt pad – 1.12/ft x 4000 sq.ft = $4480

Roof Runoff Structure – Gutters/Downspouts – 3.07/ft x 200 ft = $614

Underground Outlet – Plastic Pipe – 5.81/ft x 200 ft = $1162

Dry Waste Storage Facility – Small – 6.05/cu.ft x 3000 cu.ft. = $18,150

Fence – barbed wire exclusion – 1.63/ft x 1000 ft = $1630

Tree/Shrub Establishment – moisture conservation – 3.24/each x 600 = $1944

Nutrient Management – Small Farm Basic – 787.50/each x 3 yrs. = $2362

Fence – crossfence, barbed – 1.63/ft x 1000 ft = $1630

Manure Transfer – concrete slab – 187.50/cu.yd. x 3.7 cu.yd. (20x10x6”) = $694

Pipeline – Livestock pipeline – 1.64/ft x 500 feet = $820

Pump – Livestock Water Pump (electric) – 1522.50/each = $1523

Trough – 1.39/gal x 600 gallon (2@300 gal) = $834

Access Control – 11.25/AUM x 9 AUM/Ac x 5 acres = $506.25 x 3 yrs. = $1519

Brush Control – Mechanical Blackberry - $143/ac x 3 acres = $429

Pasture Planting – nonnative – 103.54/ac x 10 acres = $1035

**Total Costs of All Practices on demonstration farm = $38,826**

**3 demonstration farms with similar costs = $116,478**

### For Priority Area Practices

Heavy Use Protection – 10 farms @ 4480 = $44,800

Roof Runoff Structure – 15 farms @ 614 = $9,210

Underground Outlets – 15 farms @ 1162 = $17,430

Dry Waste Storage Facility – 5 farms @ 18150 = $90,750

Compost Bedded Pack – 2 farms @ 50,000 = $100,000

Fence – 30 farms @ 1630 = $48,900

Tree/Shrub Establishment – 5 farms @ 1944 = $9720

Nutrient Management – 30 farms @ 2363 = $70,875

Cross Fencing – 10 farms @ 1630 = $16,300

Manure Transfer – 3 farms @ 694 = $2082

Pump – 10 farms @ 1523 = $15230

Pipeline – 10 farms @ 820 = $8200

Troughs – 10 farms @ 834 = $8340

Access Control – 5 farms @ 1519 = $7595

Brush Control – 20 farms @ 429 = $8580

Pasture Planting – 4 farms @ 1035 = $4140

**Total Costs of All Practices in Priority Area = $462,147**

**Total Costs for Priority = $462,147 + $116,478 = $578,625/5 year priority = $115,725/yr.**

# Appendix 2

## Cost Estimate for Structure and Composition Improvements to Private Nonindustrial Forestland Priority Resource Concern

The priority 1 target acreage for structural improvements equals 3000 acres (30% of forestland >10 acres). The following practices will be included on portions of the acreage. Not all acreages will need the same type of treatment to meet the objective.

666 – Forest Stand Improvement – Pre-commercial Thinning – 1200 acres x $200/ac = $240,000

666- Forest Stand Improvement – Release – 400 acres x $150/ac = $60,000

643- Restoration and Management of Declining Habitats – 250 acres x $200/ac x 3 yrs. = $150,000

612 – Tree and Shrub Establishment – 100 acres x 330 trees/ac x $3.00 each = $99,000

490 – Tree and Shrub Site Preparation – 100 acres x $150/ac = $15,000

106 – Forest Management Plan (CAP) – 10 x $2000/each = $20,000

**Total Costs of All Practices in Priority Area = $584,000**

**Total Costs for Priority By Year = $584,000/5yrs = $117,000/yr.**

# Appendix 3

## Cost Estimate for Columbian White-Tailed Deer Habitat Improvement

**TOTAL ACRES NEEDING TREATMENT = 1500 Acres**

**PRACTICES AND COST ESTIMATES** (Costs from 2013 EQIP PPS Regular Rates)

**511 – Forage Harvest Management**

Improved Forage Quality – 1000 acres x $6.31/ac x 3 years = $18,930

**528 – Prescribed Grazing**

Pasture Basic – 500 acres x $17.78/ac x 3 years = $26,670

**645 – Upland Wildlife Habitat Management**

Fertilizer Application to Perennial Grasslands – (maximum 30 acres/year/property)

300 acres x $104.00/ac x 3 years = $93,600

**472 – Access Control**

Seasonal Exclusion – High Production – 300 acres x $40.69/ac x 3 years = $36,621

**314 – Brush Management**

Chemical High Cost – 100 acres x $48.66/ac = $4866

Mechanical Shrubs Heavy – 200 acres x $141.21/ac = $28,242

**315 – Herbaceous Weed Control**

Chemical High Cost – 500 acres x $48.66/ac = $24,330

Chemical Spot Treatment – 20 acres x $101.79/ac = $2035

**326 – Clearing and Snagging**

Fence Removal and Disposal – 10,000 ft x $1.42/ft = $14,200

**382 – Fence**

Wildlife Friendly Fence – 10,000 ft x $4.96/ft = $49,600

Wildlife Fence Retrofit – 20,000 ft x $0.70/ft = $14,000

**512 – Forage Biomass Planting**

Non-native species, high rate, w/o lime – 100 acres x $129.61/ac = $12,961

Non-native species, high rate, w/ lime - 50 acres x $233.31/ac = $11,666

**612 – Tree & Shrub Establishment**

1 gal pots, Hardwood – 20 acres x $823.47/ac = $16,470

**490 – Tree & Shrub Site Preparation**

Windbreak/Hedgerow Mechanical **-** 20 acres x $147.91/ac = $2958

**614,533,612 – Watering System**

Stock Trough >300 gal – 600 gal – 10 troughs @ 600 gallons x $1.92/gal = $11,520

Pump with pressure tank – 10 pumps @ 1HP x $580.06/HP = $5,800

Pipeline – PVC (iron pipe size) – 4000 ft x $1.17/ft = $4680

**TOTAL COST OF INITIATIVE = $379,149 (round to $380,000)**

**BY YEAR: 2014 – 26% = $100,000**

**2015 – 32% = $120,000**

**2016 - 26% = $100,000**

**2017 – 9% = $35,000**

**2018 – 7% = $25,000**