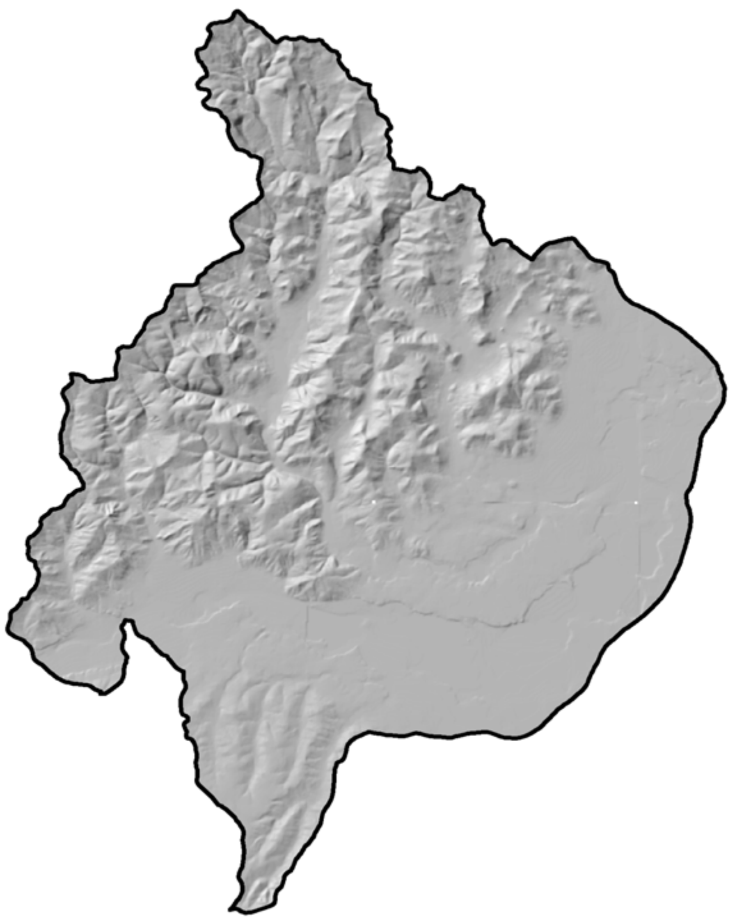
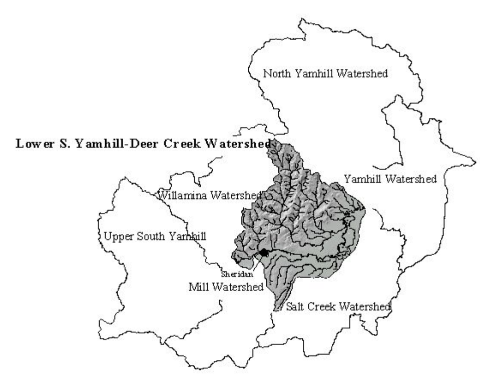
Yamhill Basin Council **_September 20, 2000_**

Lower South Yamhill-Deer Creek Watershed Assessment





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List of Abbreviations and Acronyms

Bureau of Land Management	**BLM**
Channel Habitat Types	**CHTs**
Coarse Woody Debris	**CWD**
Cubic Feet per Second	**CFS**
Department of Environmental Quality	**DEQ**
Department of Geology and Mining Industries	**DOGAMI**
Dissolved Oxygen	**DO**
Division of State Lands	**DSL**
Environmental Protection Agency	**EPA**
Geographical Information Systems	**GIS**
Large Woody Debris	**LWD**
Local Wetland Inventory	**LWI**
National Wetland Inventory	**NWI**
Natural Resource Conservation Service	**NRCS**
Oregon Department of Fish and Wildlife	**ODFW**
Oregon Department of Forestry	**ODF**
Oregon State University Extension Service	**OSUES**
Oregon Watershed Assessment Manual	**OWAM**
Oregon Watershed Enhancement Board	**OWEB**
River Mile	**RM**
Soil and Conservation Service	**SCS**
Total Maximum Daily Load	**TMDL**
United State Geological Survey	**USGS**
Water Resources Department	**WRD**
Yamhill Basin Council	**YBC**
Yamhill Soil and Water Conservation District	**YSWCD**

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Letter to the Reader

I moved to Oregon in December of 1999 with the intention of starting a graduate program at Oregon State University in Corvallis. It was through a professor there that I learned of the Americorps program RARE (Resource Assistance for Rural Environments). The program offered me a position as the Project Manager to write assessments for the Yamhill Basin. I was apprehensive about taking the position. I had never heard of anadromous fish (salmon aren't a topic of study at the University of Minnesota where I received my undergraduate degree). Seasonal rains that pour October through April and then stop were unheard of to this daughter of mid-western plains farmers, and when I saw the instruction manual with the guidelines for writing the assessment, I wondered if graduate school might be easier than tackling this mighty task. These some 10 months later have been the best educational experience of my life.

> *The water quality, quantity, and fish species of the Lower South Yamhill-Deer Creek watershed depend on you.*

I am finishing my term of service with RARE by December of this year. I will have finished two watershed assessments, the one in your hands, and another for the North Yamhill watershed, and I will be starting a graduate project at OSU. I do not live in the Yamhill Basin, nor do I own property here; I do not fish in its streams, and I do not drink the water. I wrote this document, this hefty sheaf of paper is all that I know about the place you call home. It doesn't do any good for the watershed if I am the only person who has done the reading and looked at the available research and see the data gaps.

This document is the start for you. It is the start of learning more about the place where you live, the water you drink, the effects on the watershed of your land use practices and those of your neighbors. I have been regaled with tales of cutthroat trout that were as long as a man's forearm, heard of days when kids and adults alike splashed in the streams without worries of getting sick from the water. These days were not that long ago – maybe only 20 years ago. There are no big industrial polluters along the waterways, little urban area or sprawl, no big chemical spills, there is no villain to point a finger at to say, "Hey you, stop polluting our water!" The changes that have occurred in this watershed, to Deer, Muddy, Dupee, Beaver, Ash, Rock and Cronin creeks have not been catastrophic. They have been incremental changes, a year at a time, cumulative changes that have altered the way water moves across the landscape outside your windows. A wetland drained here, a bank rip-rapped there, a few trees removed from the riparian area, a field ditched and tiled, none of which seem that significant individually. Collectively, they have impacted the entire watershed. Have some of our actions changed to improve watershed health over the years? Absolutely. Sheridan dumped raw sewage into the South Yamhill River for years, timber harvesters removed trees all the way to the water's edge, wetlands were drained and tiled, all actions we now question. Are we finished yet? Absolutely not. But now, the difficult work begins, assessing our own impacts, deciding what we can do to help improve the quality of water. Whether we live in town, on the farm, or in the woods – we all live on the land, and we all live downstream. The path ahead involves complicated directions: collaboration, education and struggling with where to begin. Does that mean everyone should stay home and forget about it? I hope not.

This watershed is not a priority for those in the state working to restore salmon habitat. ODFW's fish biologist for the region has only been here once or twice. The watermaster from WRD visits only to hear resident complaints and DEQ has the basin scheduled for the TMDL process in 2007, near the bottom of the list. I write this not to discourage you from getting involved, but to point out that no one is going to do this for you, not in the near future, and maybe not ever. The water quality, quantity, and fish species of the Lower South Yamhill-Deer Creek watershed depend on you. Read this document, question it, talk to your agency personnel, get angry, and get involved. This is your watershed, and your home, and if you don't care – who will?

Chapter 1 Introduction and Watershed Overview

Purpose

The Lower S. Yamhill-Deer Creek watershed assessment was prepared for the Yamhill Basin Council (YBC), watershed residents, and landowners. It contains technical and educational information about the past and current watershed conditions. The primary purpose of the assessment is to evaluate how natural and human processes influence the watershed's ability to produce clean water and suitable habitat for aquatic life. It will serve as a baseline for developing and prioritizing restoration activities. The information collected in this assessment is intended to aid the YBC and the community in developing restoration projects and monitoring plans for the watershed. Monitoring can assist us in adjusting our approach and priorities. This is considered a living document and is to be amended, added to, or changed over time and as it is used.

Several public meeting were conducted over the course of preparing this document. Landowner concerns about fish, water quality and quantity, endangered species, erosion, and where to go for further information and assistance are addressed. These findings are being presented at public meetings, to the Sheridan City Council, Yamhill Basin Council, Soil and Water Conservation District and copies are distributed to public agencies.

Methods

The guidance to develop and write this assessment came from a watershed assessment manual developed specifically for Oregon. This manual, referred to as the Oregon Watershed Assessment Manual (OWAM), provides information on the resources available to do the assessment, information on watershed functions in Oregon, and a chapter with the steps to take to complete each section of the assessment.

Data from a wide variety of sources was utilized in the preparation of this document. The Bureau of Land Management's 1998 *Deer Creek, Panther Creek, Willamina Creek, and South Yamhill Watershed Analysis* was of great assistance in the preparation of this document. Interviews with natural resource personnel from a wide variety of federal, state, and local agencies as well as local residents were valuable sources of information.

Oftentimes in doing research the most valuable things learned are not the questions that were easily answered, but those areas that are missing data, because they also tell a story. The Lower S. Yamhill-Deer Creek watershed has not been studied extensively. There is little documented information on the historic or current fish species. Only scattered flow data and stream surveys exit for Deer Creek and no data exists for many of the tributary streams. Little water quality monitoring has been done on Deer Creek and the South Yamhill River, and none on any of the other tributaries. It is difficult to make conclusions on the condition of the watershed without information in these areas. This watershed has the potential for further investigation and data collection. The Yamhill Basin Council will do stream temperature monitoring in the watershed the summer of 2000. The last year that data was collected for lower Deer Creek was 1988. The private timber company Boise Cascade did some temperature monitoring in the headwaters of Deer Creek in the late 1990s.

Geographic Information Systems

All of the maps for this document were produced with a computer program called ArcView 3.1. This program allows maps to be produced from geographic coordinates. These maps are very versatile and allow many watershed features to be displayed together or separately. For example, the streams and watershed boundaries appear on every map in this document, but the wetlands do not. The wetlands, streams, and soils can all be displayed simultaneously to provide a better picture of the watershed conditions.

This technology makes some types of calculations very easy, for example, miles of roads in the watershed or acres of land under cultivation. However, the scale these maps are produced at for this document makes some features difficult to see on paper. The watershed area of approximately 80,000 acres is being printed on a scale that fits on 8.5 x 11 paper. Some of the detail is lost, especially with the vegetation and hydric soils. The maps are only for approximating locations. Further site specific information would be needed to determine actual restoration locations.

The production of these maps would not have been possible without the data layers produced by the BLM. The data layers used in this assessment are provided in Table 1, those produced by the BLM are indicated with an asterisk.

Table 1. S. Yamhill-Deer Creek Watershed GIS Data Layers

- Watershed boundaries*
- Streams*
  - -perennial
  - -intermittent
- Roads*
- Land-use
- Land ownership*
- Urban growth boundaries*
- Current vegetation
- Historic vegetation
- Soils
- Geology*
- Irrigation rights
- Wells
- Dams*
- FEMA floodplain
- Debris flow
- Township, range, section lines

* BLM data layer

Lower South Yamhill-Deer Creek Watershed Background

Location

The watershed is part of the Yamhill River Basin in the northwestern Willamette Valley. The 76,230-acre watershed is on the eastern side of the Coastal Mountain range. Approximately one-sixth of the watershed is within Polk County, while the remainder is in Yamhill County. *See Figure 1 for watershed location.*

Mainstem tributaries generally flow south toward the South Yamhill River. The Bureau of Land Management recognizes 307 miles of stream in the watershed (BLM, 1998). Major streams in the watershed include Ash, Rock, Beaver, Deer, Little Deer, Muddy, Dupee, Grohe, Gill, and South Yamhill River. There are many perennial or blue line[1] streams throughout the watershed without official names. The streams with headwaters in Polk County are without names on the USGS topographical maps, and are named the "Muddy Valley Streams" by local residents.

Elevations in the watershed range from 120 feet above sea level where the South Yamhill leaves the watershed on the east side, to 2,371 feet at Stony Mountain in the northwest corner of the watershed in the Coast Range. Other major geographical features include Eagle Point (1,114 ft), Slide Mountain (2,100 ft), Gopher Valley, and Muddy Valley.

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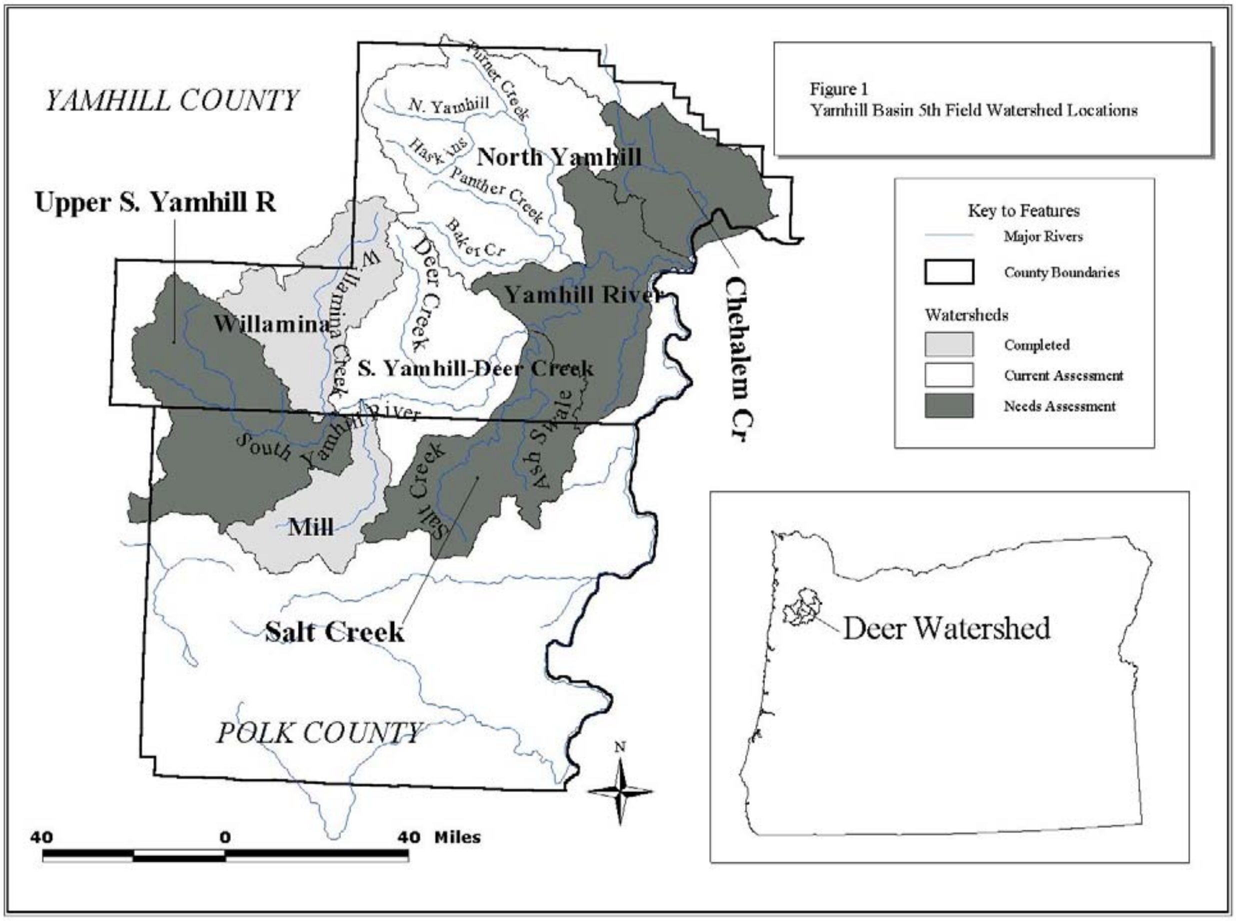
[1] Blue line refers to the streams recorded in blue on USGS topographical maps



The watershed was divided into five sub-watersheds based on the guidelines set forth in the Oregon Watershed Assessment Manual (OWAM). The five sub-watersheds are Rock, Upper Deer, Lower Deer, Muddy, and Lower South Yamhill. These sub-watersheds break the larger area into pieces with similar topography, land-use, and vegetation. It allows us to examine the forested headwater streams separate from the low gradient floodplain streams. See Figure 8 in Chapter 5.

Population

The human population density of the watershed is concentrated mainly in the Lower South Yamhill sub-watershed in the town of Sheridan. Sheridan is located on the South Yamhill River. Landview III Environmental mapping software (USDC, 1995) was used to estimate the population of Sheridan as 3,979 in 1990. Signs as you come into the town give the population as 4,800. The population for Yamhill County was estimated to be 65,551 using 1990 census data.

Mike Sauerwein, city manager of Sheridan, estimates the population growth of Sheridan at three percent over the past five to seven years. He expects this growth rate to continue. What does this mean for the resources in the area? Water is not in short supply for the community according to Sauerwein. The town receives 75% of its water from springs outside the watershed boundaries. The springs known as La Toutena Mary springs are in Willamina watershed west of the S. Yamhill-Deer Creek watershed in the Coast Range foothills. The remaining 25% is supplied by the South Yamhill River during the summer months when the springs do not have adequate water to supply the demand.

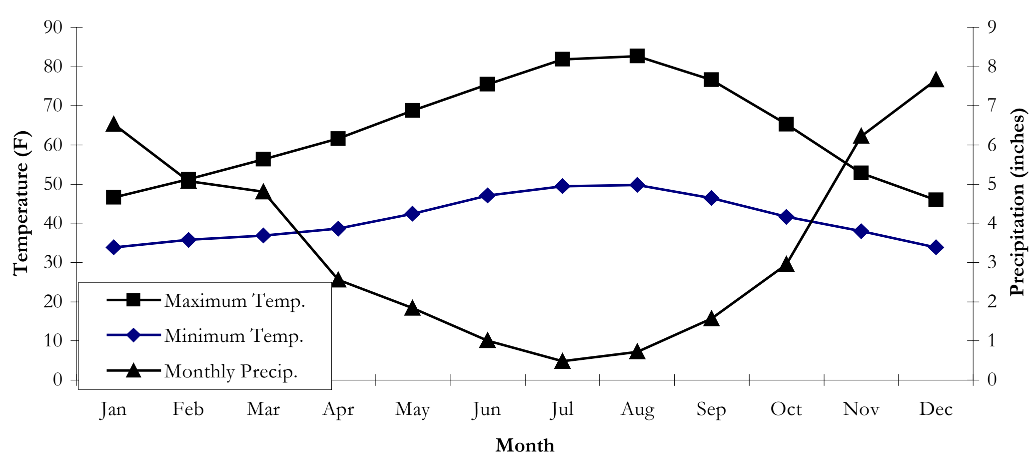
The city is gradually replacing its aging water transport infrastructure that brings the water from the springs into Sheridan. Water is gravity fed down a pipe approximately 10 miles in length. This pipe was originally installed in the 1950s. Slowly, the city is replacing sections of the pipe, as funds become available. This year, one and a half miles of new pipe will be put in place (Sauerwein, 2000).

On a side note, some Sheridan residents expressed concern that the Federal prison located south of Sheridan was using more than its' share of water, creating a need for Sheridan to increase its storage capacity. City Manager Mike Sauerwein says this is not the case and in fact, the revenue generated by the prison's water use has made it possible to do the improvements the city's aging system needs. The prison pays for their water and as a large user, contributes nearly 40% of the total revenue the water users generate.

Climate and Topography

The watershed's climate is marine-influenced with extended winter rainy seasons and hot, dry summers. Snow and ice does not accumulate in the higher elevations during winter, it is not usually cold enough for long enough. 'Rain on snow'[2] events are rare due to the few days of during the year when sufficient snow accumulates. However, during the 1964 and 1996 winter storms, enough snow accumulated in the Coast Range to contribute to the record flooding that occurred.

Figure 2. Average Monthly Temperatures and Precipitation McMinnville 1961-1990



Average annual precipitation estimates were made from a map available from the Oregon Climate Service. Rainfall amounts vary from north to south in the watershed. The northern most

2 'Rain on snow' events occur when heavy snow accumulation is followed by intensive spring rains and can increase the magnitude of the flooding.

section with the highest elevations receives 80 to 100 inches of precipitation annually. The low elevations receive 40 to 60 inches annually, while the middle elevations receive 60 to 80 inches annually.

As is typical for the west side of the state, the rainfall is not spread evenly over the calendar year, but rather falls during the winter and spring months in a water year that runs from October 1st to September 30th. Figure 2 shows the average monthly temperatures and precipitation at McMinnville as recorded at the Oregon Climate Service at Oregon State University. There is no monitoring station in the watershed. The city of McMinnville most closely approximates the elevation and location in the valley that is typical for the greatest area within the watershed.

Geology and Soils

The geology of the watershed is summarized in Table 2. This information helps us understand the formation of the local landscape as well as to determine the parent material of the soils, and to understand how river channels may react to channelization and bank destabilization.

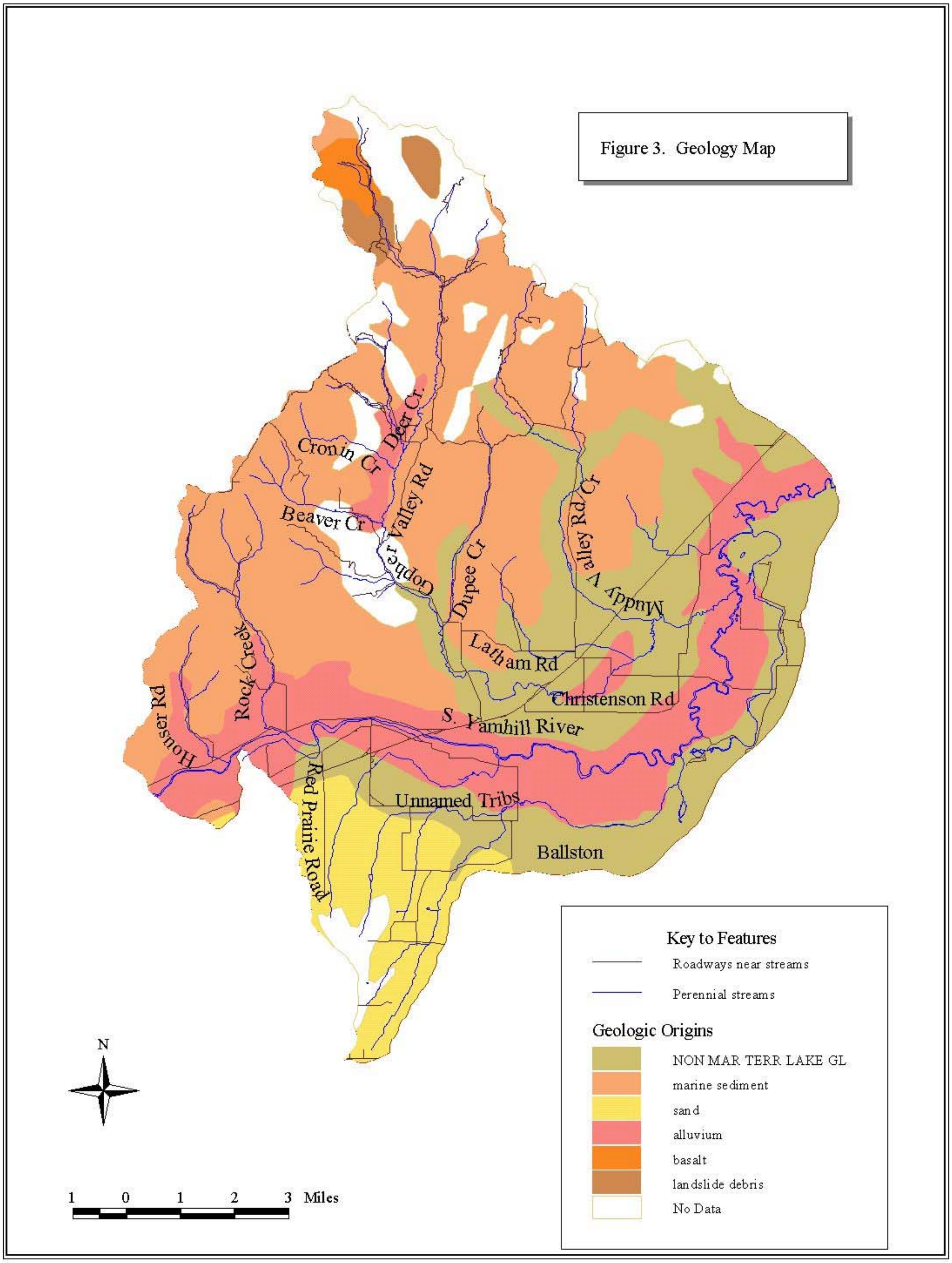
Table 2. Geology of Lower S. Yamhill-Deer Creek watershed

Formation	Siletz River Volcanic series	Intrusive rocks	Nestucca formation	Recent alluvium	Yamhill formation	Decomposed sediments
Description	Flows, breccia, tuffs, and interbedded marine tuffaceous sedimentary rocks	Basalt and gabbro sills and dikes	Volcanic flows, tuffs, marine siltstone, and sandstone.	Unconsolidated silt, sand, and gravel.	Medium-gray marine siltstone with intercalated sandstone and limestone lenses.	Weathered silt, sand, and gravel.
Location	Upper Deer Creek	Outcroppings in northern 2/3rds of watershed	Most of area north of Yamhill River and West of Hwy 18	Along Deer Creek in Gopher Valley	Most of area south of Yamhill River	Area known as the Red Prairie in Polk County

The watershed's soils are of basaltic colluvium, and sedimentary origins. Basalt rock underlies the soils closest to the Coast Range with alluvial deposits layered over. The valley floor and Coast Range foothills have underlying sedimentary rock with deep alluvial deposits layered over (SCS, 1974). The geology of the watershed can be seen in Figure 3.

The Soil Survey of Yamhill County (SCS, 1974) and the Soil Survey of Polk County (SCS, 1982) list 6 main soil associations for the watershed. In-depth information on the soils and their locations can be found in those publications. The soils along the Yamhill River, Deer Creek, and Dupee Creek are of the Wapato-Cove association and are poorly drained silty clay loams and clays. The soils along Muddy Creek, between Deer Creek and the South Yamhill River, and south of the Yamhill River in Polk County, are of the Woodburn-Willamette association and are silt loams and silt loams over silty clay loam.

Just north of Sheridan and between Deer Creek and Muddy Creek is the Willakenzie-Hazelair association of silty clay loams formed over sedimentary rock (siltstone). The area just north of Sheridan west of Deer Creek is of Peavine association with silty clay loams over silty clay formed over sedimentary rock (shale). The Coast Range northern section of Deer Creek is in the Olyic association with silt loams over silty clay loam over basalt. South of the South Yamhill



River is Helmick-Steiwer-Hazelair association of silt loams. Further information on the watershed's soils can be found in Chapter 7 of this document.

Vegetation

The vegetation in the watershed changes dramatically from north to south. The steep northern section including Upper Deer, Rock, and west Lower Deer subwatersheds, is mostly forested while the middle section with its flat topography is dominated by agricultural uses including grass seed, vineyards, orchards, row crops and pasture. The vegetation including current, and historic conditions, riparian conditions, species of special concern, wetlands, and noxious weeds are addressed in detail in the chapter on vegetation.

Fire History

For at least four thousand years and possibly as long as ten thousand years, humans had systematically burned the Willamette Valley, which played a major role in the evolution of valley ecosystems.

The watershed was occupied by the Kalapuyan people and regularly burned by them. They evolved a system of what could be called "wildland management" in order to create and maintain favorable plant community characteristics. *See Kalapuya sidebar in Chapter 4.*

It is difficult to know precisely the history of fire in forested areas. The BLM did a study to reconstruct the changes in forest stand age classes from 1850 to 1940 (Teensma et al, 1991). Most of the Upper Deer subwatershed burned at sometime during these years, as did northern Rock subwatershed.

The impact of settlement on the frequency and location of fires is not well documented. Fire occurrence appears to have been commonplace from fires escaping control during the burning of slash piles and carelessness. Many fires occurred in 1902 and in 1910, heightening public awareness of the dangers were the number of deaths and loss of property during these years. By the early 1930s, fire suppression crews were organized and working to suppress wildfires

> *Fire was used by early settlers for a variety of reasons including hunting, cooking, land clearing, amusement, (i.e. setting fires for fun), and trail building. It was not uncommon in the late 1800s and early 1900s to abandon burning campfires in the woods. Fires set to clear land were kept burning through even the most dangerous fire periods (BLM, 1998).*
>
> *The settlers forced the Kalapuyans to stop burning during the late 1840s. During the 1850s, the Coast Range experienced an increase in forest fires. Most of the fires set during this period have been attributed to settlers (BLM, 1998).*

> **Fire in Yamhill County**
>
> *"One of Yamhill county's greatest forest fires—the burn of 1949—chewed and crowned its way through 18,000 acres of slashings and second growth timber before a combination men's fire-fighting ability and nature's change of wind direction tipped the scales to quell the flames.*
>
> *One of the toughest battles in the Gopher Valley area developed around the Thomson mill and the Robert Nash home where fire fighters were completely surrounded Monday night. Both the mill and the Nash residence were saved but a garage on the Nash place burned. According to Mrs. Harry Wilder, T-R correspondent from Gopher Valley, a prune dryer on the Kenneth Miller farm burned Monday night. It was located one-half mile northwest of the Olman-Gross mill. She also reported a packing shed on the Robert Eskridge estate northeast of Highland school leveled by flames.*
>
> *By 3 a.m. Wednesday the tide had definitely turned in the East Creek and Gopher Valley areas. A light rain commenced to fall Wednesday morning and Fire Chief Cecil Harrison of Sheridan pulled his men and equipment off the fire in that area.*
>
> *At 1 a.m. Tuesday the State Forestry Department sent in a crew of 50 men to protect state timberlands north of East Creek and this area was saved.*
>
> *Mop-up will comprise the bulk of the work now remaining, unless a sudden drop in humidity or a rising wind puts the various fires on the march again. Considerable work will be necessary before the fires can be definitely marked off. Fire trails will have to be circled around every blaze and spark-showering snags felled before the burn of 1949 can be marked off as "finished"* (Telephone Register, 1949)."

(BLM, 1997). The Sheridan Sun newspapers from the 1950s contain many ads asking readers to prevent forest fires. Fire control was seen as necessary to protect the valuable timber in the region, a policy that has continued to this day. *See Fire Sidebar*.

Severe windstorms have also been significant in determining the age class distributions and composition of the vegetation in the watershed. The Columbus Day Storm of 1962 caused blowdowns on the average of 80 acres per square mile (which is 80 acres per 640 acres). An even larger area had between 10 and 39 acres of downed wood per square mile. The total amount west of the Cascades killed during this storm equaled the acreage burned during the 1933 Tillamook Burn (BLM, 1997). The area burned is estimated at 240,000 acres (Upton, 2000).

Present day rural residential developments may face catastrophic fires not unlike the one described in the sidebar on the previous page. The lack of fire breaks surrounding the properties, limited water availability, and the absence of fire over the last 100 or more years contribute to a fire hazard in the forested area of the watershed. Fire suppression has shaped the species we see as current vegetation just as historically, burning created a very different mix of vegetation. The watershed has a greater acreage of Douglas-fir and much less oak savanna and prairie due to the absence of fire. See Figures 6 and 7 for maps of the current and historic vegetation.

Currently in Yamhill and Washington counties, plans are under development for an integrated fire response training program that combines fire fighting personnel from industry, rural departments, logging contractors and ODF. Training burns are planned for Fall 2000. Participants will have the opportunity to acquire fire fighting skills and network with the people they would work with on most real fires. Professional forestry crew currently perform the bulk of woods work including fire fighting. The training will produce more people capable of fighting the fire locally (Upton, 2000). Timber landowners may contract with ODF for protection from fire. Most large industrial land owners participate along with a number of small woodland owners. There is a formal organization that governs local arrangements, calculates assessments, and works with ODF on fire protection and suppression issues. The focus is on prevention and early suppression (Upton, 2000).

Land Ownership/Use Summary

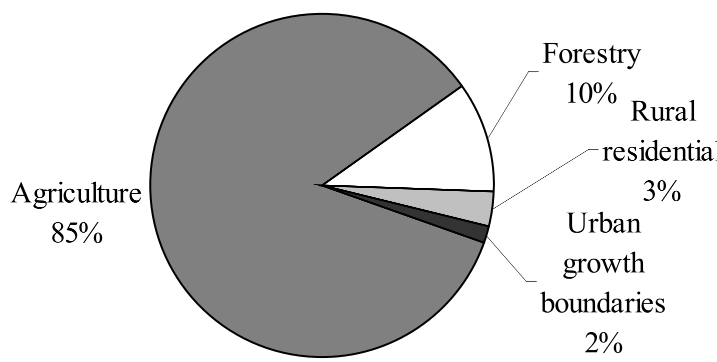
An estimate of land ownership was conducted using land ownership maps provided by Boise Cascade, ODF, and BLM data. The majority of the watershed, 67,296 acres, is privately owned. Industrial private landowners including Hampton Forests, Boise Cascade, Willamette Industries, and Stimson Lumber Company collectively own 7,434 acres in the Upper Deer, Rock, and Lower Deer subwatersheds. The BLM owns 1,497 acres in the Upper Deer subwatershed (see Table 3). This reflects the land use in the watershed. The Upper Deer, Lower Deer, and Rock subwatersheds are forested and used for timber production.

Agriculture is a significant land use in Lower Deer and Rock subwatersheds. Table 3 shows general land use categories. The county uses many more zoning categories. Figures on more specific land uses (i.e. Ag-for, Mixed-EFU, etc) are available by contacting the Yamhill County Planning Department.

Table 3. S. Yamhill-Deer Creek watershed land ownership

Ownership	Acres	Percentage
Private	75,192	92%
Bureau of Land Management	2,090	3%
Private Timber Companies	4,212	5%
Total	81,494	100%

Figure 4. General Land Use



Figures derived from ArcView analysis of Yamhill county data provided to the BLM in 1998.

Mining

The Lower S. Yamhill-Deer Creek watershed gravel quarries mine rock for road construction, fill, asphalt paving, or ready mix concrete. They are required to obtain permits from the Department of Geology and Mining Industries (DOGAMI). The Grant of Total Exemption Rule (DOGAMI) states that person(s) disturbing less than 5,000 cubic yards and/or less than one acre in a 12-month period need not apply for a permit with the state. Thus, small amounts of earth are allowed to be moved without permit – unless they are near a wetland or waterbody, in which case, the Department of State Lands would need to issue a permit.

Permits are filed with the DOGMAI office in Albany, Oregon if more than 5,000 cubic yards is being disturbed. This permitting process became law in 1974, making records of mines and quarries before that date unknown or anecdotal. One rock pit and three quarries are shown on the USGS topographical maps of the watershed. For further information on these quarries, contact the USGS office in Portland.

Table 4. Quarry Permits

Permit Number	Status	Name of Permit Holder	Type of Permit
36-0035	Permitted	Art Reid Trucking, Inc.	Quarry
36-0040	Permitted	Stone Norman	Quarry
36-0022	Closed	Polk County Road Dept. Camp	unknown

From DOGAMI office in Albany, Oregon.

Agriculture

Since Yamhill and Polk counties were organized in the 1840s, agriculture has been an important part of the economy. The Lower Deer and Polk subwatersheds' dominant land use is agriculture. From the information in historical accounts it is difficult to know what information pertains only to this watershed. Therefore, the following information describes Yamhill and Polk counties and is excerpted from Bob Bower's Mill Watershed Assessment that describes the agricultural history of the region, except where interviews with residents are cited. Those interviews were conducted as a part of this assessment.

During the years following the settlement of the watershed, agriculture meant cattle grazing and subsistence farming. During the first 20 years, "the valleys were settled rapidly, the range cattle were pushed back into the hills, and the growing of wheat on the level lands became the dominant industry" (Bower, 2000). A census by the United States in 1880 reported wheat, oats, and hay accounted for 99 percent of the agricultural production in the area.

During the 1880s, farmers were so successful in growing clover that it became the dominant cash crop. "By 1900, this crop occupied 1,216 acres, wild grasses 250 acres, tame grasses 8,007 acres while 3,033 acres of grain were cut green for hay" (Bower, 2000). With an increase in clover production the livestock industry flourished. Hops also became a significant part of the local agricultural economy with a 1900 census reporting 1,801 acres in production in Yamhill County alone.

From 1900 to 1910, the dairy industry came into being and gradually expanded in the area. The increase in dairy cattle increased the production of clover, grasses and hay. By 1909, clover production showed an increase of nearly 500% and acres of grain cut green for hay had increased by 600%. Fruit and nut production started as well and contributed significantly to the agricultural economy by 1909. Production of hogs, sheep, goats and poultry continued to make large contributions to the agricultural economy.

After 1919, wheat production decreased while dairy and prune production increased. By 1925, it was reported that there were 2,864 farms in Yamhill County with an average size of 83.56 acres per farm. The twenty-five year period between 1925-1950 witnessed a drop in the fruit tree production of apples and pears while filbert production increased.

Commercial production of berries came into play following World War I. Loganberries strawberries, raspberries, blackberries, and gooseberries comprised the initial berry crops with strawberries the dominant crop. Walnuts and Franquette nuts also became an important part of this history.

During the 1930s, the federal government started to encourage the planting of cover crops during the winter to hold soil. Grass seed crops became important between 1935 and 1939, and the acreage for lawn grass seed continued to increase to its present day levels.

Stan Christensen, farmer and life-long resident of the watershed provided the following historical and agricultural information to the assessment.

Early to mid 1900's most of the landowners in the Deer Creek and Muddy Creek valleys were highly diversified. It was not uncommon for one farmer to grow wheat, oats, barley, clover, alfalfa, and some grass seed. The size of the farm equipment available meant smaller farm fields. As well, these farms supported a wide range of animals including sheep, poultry, cattle, and pigs. Most of the fields were fenced to either keep animals in or out.

As technology improved, farmers could increase the size of their fields and increase their yields with the application of pesticides. However, increasing yields forced down prices and many farmers quit growing small grains. As well, the market changed to favor large producers. Many diversified into plum orchards, but these did not last long. In 1962, the October 12th Columbus Day storm cleaned out prune orchards, knocking flat most of the trees. Land at this time could have been sold for 100 dollars an acre, but no one wanted to buy it.

In 1970, the vineyard industry sprang up in the valley in the aftermath of the fallen prune trees. Grapes were not uncommon in the valley prior to the fall of the prune trees. Many farmers had their own vines and produced their own wine prior to prohibition, but wine grapes were not a commodity crop until the seventies.

The advent of grass seed production has dramatically changed agriculture in the Willamette Valley. Pieces of land that were too wet for too much of the year to farm without extensive drainage projects could now be put into grass seed production. Grass seed is an ideal crop for much of the land in the watershed. This is a crop that can withstand the heavy winter rains, and once planted can stay in the ground for up to 7 years. It is harvested mid-summer which coincides with the time of year with the least amount of precipitation. It is estimated that 85% of the grass seed in this country is grown in the Willamette Valley.

Stan estimates that most of the area under cultivation in the watershed has been tiled or drained to some degree. The land has enough topography to provide outlets for drainage systems, unlike the central Willamette Valley, which is too flat to provide adequate drainage. Outlets for drainage systems allow water to be channeled off the surface and into the stream network, making cultivation during more of the year possible. Tiling is further discussed in the sediment sources section.

For specific crop information, contact the Farm Service or Oregon State University County Extension, both located in Dallas and McMinnville.

References for Introduction and Watershed Overview and Historical Conditions

Bureau of Land Management (BLM). 1998. *Deer Creek, Panther Creek, Willamina Creek, and South Yamhill Watershed Analysis.* Tillamook Resource Area, Salem District, Tillamook OR.

Christensen, Stan. *Personal communications*. Winter, Spring 2000. Farmer and landowner in watershed**.**

Department of Geology and Mining Industries (DOGAMI). Quarry and mining records. E-mail communication, February, 2000.

Grauer, Glen. *Personal communications.* 2000. Resident in watershed.

Hanson, Dave. *Personal communications.* 2000. Resident in watershed.

Jordan, Dick. *Personal communications.* 2000. Resident in watershed.

Northwest Habitat Institute. Corvallis, OR. http://www.nwhi.org

Oregon Climate Service. Corvallis, OR. http://www.ocs.orst.ed

Oregon Department of Fish and Wildlife. *Willamette Valley Land Use/Land Cover Map*. 1998.

Oregon Department of Forestry. *Land Ownership Map.* Forest Grove Unit. Northwest Oregon Protection District. 1998.

Oregon Natural Heritage Program. 1998.

Sauerwein, Mike. *Personal communications.* 2000. Sheridan City Manager.

Teensma, Peter D.A., Rienstra, John T., Yeiter, Mark A. "Preliminary Reconstruction and Analysis of Change in Forest Stand Age Classes of the Oregon Coast Range from 1850 to 1940" BLM Technical Note T/N OR-9 9217; Bureau of Land Management, Department of the Interior, October 1991.

Upton, Dan. Willamette Industries. *Personal communications.* 2000.

U.S. Department of Agriculture, Soil Conservation Service. (SCS). 1982. *Soil Survey of Polk County, Oregon*. Yamhill County NRCS office, McMinnville, OR.

U.S. Department of Agriculture, Soil Conservation Service. (SCS). January, 1974. *Soil Survey of Yamhill County, Oregon.* Yamhill County NRCS office, McMinnville, OR.

U.S. Department of Commerce (USDC). 1995. *Landview III Environmental Mapping Software-Census Data.* Oregon State Archives, Salem, OR

U.S.G.S. topographical quadrant maps. Amity, Ballston, Fairdale, McMinnville, Muddy Valley, Sheridan, Stony Mountain, Trask Mountain.

Willamette Basin Task Force, Pacific Northwest River Basins Commission. *The Willamette Basin Comprehensive Study of Water and Related Land Resources.* 1969.

Yamhill County Forest Fire: *Telephone Register*, Sept. 29, 1949.

Chapter 2 Historical Conditions

Introduction

This chapter compiles a timeline of ecological events that have shaped the watershed over the last 200 years. By understanding the ecological history of the watershed, the natural and human made changes that have occurred, it is hoped that the planning of restoration and enhancement projects can take this knowledge into account.

> *When settlers first arrived, they did not farm the valley floor. The threat of floods was too great, and the soils were poorly drained. Rather, they chose the lands on the open foot slopes of the hills. The soils of the hillslopes however, were not as fertile and they were subject to severe erosion during the winter rainy season when they were left bare. Eventually, systems of crop rotation and cropping in alternate years with summer fallow between were developed. Soil erosion though continued to be severe (Willamette Basin Task Force, 1969).*

Methodology

Historical information was collected using the guidelines set forth by the *Oregon Watershed Assessment Manual*. Sources of information included the Oregon State

Library archives in Salem, *The Sheridan Sun* newspaper, Mill Watershed Assessment, and Oregon State University Library in Corvallis. Local historians and residents Dave Hanson and Dick Jordan were of immeasurable assistance in compiling the information used in this section. Special thanks to Glen Grauer for taking his time to give me a tour of the watershed.

Arrival of Europeans brought many changes to the landscape of the Willamette Valley. Specific information on the early history of the watershed is difficult to find, but general information on the Willamette Valley is substantial.

Historical Information
The following timeline is a chronological list of some important events that contributed to the current watershed conditions. A brief narrative of these events is given in the italicized sidebars.

Watershed Timeline
Pre-European Kalapuya Indians use fire as a tool; low elevations of the watershed mostly grasslands maintained with use of fire.

1782 Willamette Valley Indians exposed to smallpox and the population severely declines. Valley vegetation burns subsequently decrease.

1800s Large scale fire mapped on BLM 1850 fire maps shows the west side of the watershed burned sometime the early 1800s.

1812 European Americans in direct contact with Indians of Willamette Valley (Boyd, 1985).

1831 Start of malaria outbreak in Indian population.

1840+ Wetland areas tiled and drained to make land available for agriculture and residential development

1841 Kalapuya population estimated at 600 for Willamette Valley. Malaria outbreaks continue a mounting toll on the Kalapuya population. Open areas in the valley reclaimed by forests.

1848 Nestucca fire possibly burns part of watershed forested lands.

1849 Kalapuya population down to 60.

1855 Kalapuya, Umpqua, and Takelma peoples moved to the Grand Ronde Reservation. Congress ratifies treaty with Confederated Bands of Grande Ronde.

1861 Large flood on the South Yamhill River and its tributaries. Estimates of magnitude comparable to those of 1964 flood levels.

Between 1910 and 1930, more prune orchards were planted than any other fruit, and more acres in the area surrounding Sheridan were planted than any place else in the Willamette Valley (The Sun, 1980, 25 A). Sheridan was for a time one of the largest prune growing and shipping centers in the U.S. Local dryer operations turned plums into prunes for ease of storage and shipment. Due to a number of factors including crop failures, market declines, and primarily low crop selling prices, by 1939, prune growing all but discontinued. As the trees aged, instead of being replaced with prune trees, houses and row crops took their place. The dryers used for the prunes were turned into dryers for foxglove leaves, used to make the heart medication digitalis.

1877 Area farmers organize a railroad called the Dayton and Sheridan Narrow Gauge Railroad Co. to assist in hauling grain to the boats on the Yamhill River in Dayton. The line was completed in 1878. (The Sun February, 25, 1998)

1880 The town of Sheridan is incorporated by an act of Oregon Legislature on Oct. 26, 1880 with a population of approximately 200.
The town is named for the General Phillip Henry Sheridan, who had little or no direct contact with the town (The Sun, 1980). Phil Sheridan was assigned to Fort Yamhill at Grande Ronde Indian Reservation 1856 – 1861 before being called to fight in the Civil War. Later, he was given command of the fort (The Sun, 1998).

1883 Sheridan's second flourmill erected by James Morrison and Benton Embree. Water to run the mill flowed from Mill Creek to Sheridan in a ditch 1,100 rods long with a fall of 60 feet (Bower, 2000).

1892 First "cleaning" of the mainstem Yamhill River. An estimated 1200 trees and snags cut and floated out of the lower 17 miles of river to allow greater river access for commercial traffic. Clearing the channel also made log drives easier. The impacts of channel clearing and log drives include: simplification and widening of the channel, loss of instream cover for fish, scouring of gravels needed for salmonids spawning, and the loss of vegetation and soils from the channel sides (BLM, 1998 p. 56).

1894 Population of Sheridan 400. (The Sun, 1998)

1900+ Nearly all of Upper Deer, Rock, and Lower Deer sub-watersheds heavily logged. This creates present day seral stages from early (0-39 years) to middle (40-80 years).

1900s Row crops such as wheat and hay gave way to a valley-wide orchard boom in the early 1900s. Largely clean cultivated, orchards tended to suffer serious erosion and to be permanently damaged (Willamette Basin Task Force, 1969).

1902 Lock and dam built at Lafayette rapids on Yamhill River. Fish barrier for anadromous fish, no working fish ladder ever constructed on the locks.

The Legacy of Timber Harvest

Historically, the timber industry also made significant changes in the flow of water in the area. The most dramatic was the building of splash dams. These human made dams were constructed to hold back a stream and provide storage for felled logs. Once the desired amount of timber was in the stream, these dams were then blasted out, carrying the logs downstream with the rush of water. This scoured the streambed, tore away protective stream vegetation, and left the area susceptible to future rain events and further erosion.

Historically logging roads were constructed with little thought to erosion processes. Thus, roads easily washed away during powerful storms, and fill material was placed directly into streams. Prior to World War II, huge areas were deforested and then abandoned. Tracts of private land reverted back to the county as tax delinquent as soon as the timber was harvested.

1904 Sheridan gets its first electricity and street lights, installed by Yamhill Power and Light Company. A 10-mile long race dug from Mill Creek into Sheridan diverts water down hill to generate power for two turbines running a 300 horsepower engine and generators. Yamhill Power and Light Company supplied local power and milled Sheridan's wheat. Sheridan's power supply for over 20 years (Dick Jordan, Feb. 7, 2000 conversation). Yamhill Electric Company eventually purchased the power plant. Origins of the plant go back to Elias Buell who established a flour and lumber mill on Upper Mill Creek in 1849.

1905 Elias Yeaton, H. Johnson, and Mr. Stephens bought the Cyrus Buell mill located at the present site of Mill Creek Park. Built two dams, two camps, and a 10-mile long flume from Upper Mill Creek to Sheridan, and a plant in Sheridan, which became the Sheridan Lumber Co. The 10-mile flume was built in 1906, 80 feet tall at its highest point. Carried cants of lumber, not logs. A cant is a log that has been rough cut into large squares. They were sent from the Mill lumber mill to Sheridan to be cut into smaller boards. (The Sun, Dec. 29, 1999)

1911 First track type tractor developed. Lumber companies replace animals with tractors for logging on gentle slopes (BLM, 1998).

1913 On July 18th, virtually the entire downtown Sheridan was destroyed by a fire that burned 56 buildings. Fires started with a gasoline explosion in a restaurant at the corner of Bridge and Harney Streets. Such a severe fire, all the trees on a 50-ft swath on the river were scorched and killed. Economy of Sheridan so strong that downtown is rebuilt by 1914. Population over 1,200.

1920 Population of Sheridan declined from 1,200 to 979 due to closing of the big lumber mills including the Sheridan Lumber Co.

1922 A fire on June 3rd burns through the business on Sheridan's West Side and destroys several historic buildings including Fanning's Opera House and the Red Front Livery.

> *Lands along the South Yamhill and its tributaries have undergone tremendous change in the last 50 years. Natural vegetation was removed; land was converted to cropland through a system of drainage ditches and tiling. At least six tile factories have operated continuously in the Willamette Basin for more than 50 years" (Willamette Basin Task Force, 1969).*

1923 Hydraulic sheave mounted to rear of tractors, allowing line logging on steep hillsides (BLM, 1998).

1929 Water meters installed in Sheridan for the first time to help regulate irrigation usage. This year is the first year La Toutena Mary Spring failed to keep the city of Sheridan's reservoir full.

1930s The Depression greatly affected agriculture and ended the production of hops and prunes as major crops. Hops farmers lost the market due to prohibition. The next big change in land use came in the 1930s with the development of the seed industry. Production of hairy vetch seed largely replaced grain production in the valley, and eventually perennial grass seed came into production, which meant the ground was covered year round.

July 5, 1935, with labor from the Civil Works Administration, construction on a second reservoir for Sheridan's water supply completed. Prior to its completion, the city was losing half its water from cracks in the old cement reservoir.

Nov. 21, 1935, The Sun reported, "The portion of the main sewer emptying into the river below the bridge on the south side (of the South Yamhill River) has been prepared for the pouring of concrete." The end of the sewer pipe that emptied straight into the river was angled with the current to permit an "outward flow at all times. The work was a Civil Works Administration project.

1948 Tansy ragwort, an invasive and aggressive plant introduced from Europe, seen on the South Yamhill River banks. Tansy ragwort quickly colonizes areas of disturbance such as cut-over areas, roadside ditches, and overly grazed pastures.

1949 One of Yamhill County's greatest forest fires burned several thousand acres in the Gopher Valley and East Creek. See the section on Fire History for further information.

1952 Survey completed by Robert L. Brown, principal of Chapman Grade School finds Sheridan's greatest source of farm income was from dairy and turkey production, while wheat and walnuts are its greatest producing crops. Brown cited decline in water volume, insufficient electrical power, and declining timber supplies as reasons to worry about Sheridan's health.

1953 Sheridan voters twice defeated a bond issue to build a sewage treatment plant. Sewage emptied directly into the Yamhill River. The State Sanitation Department gave the city council until the end of the year to have a plan ready, but without the voters' consent, the council could do nothing.

1955 Sheridan built a sewage treatment facility to accommodate 2,500 people. Tansy ragwort takes a hold on Yamhill County.

1964 Dec. 22 and 23, tremendous floods up to three feet deep bring high water through the streets of Sheridan. Significant flooding of agricultural lands also takes place as rivers leave their banks and flow across the landscape.

The floods of 1964 did considerable damage to agricultural lands. An estimated 20 million tons of soil was washed into streams by this flood. As well, significant damage occurred from the accumulation of logs and other logging debris on agricultural lands when the wood was washed into swollen streams and then deposited in fields as the waters subsided. Bridges were destroyed when the accumulation of woody debris in a channel jammed against a bride causing it to wash out. A total of $32,750 dollars was spent in 1965 to repair the damage done by this flood event, including the restoration of 26,000 feet of stream channels. (No records exist to know if this was riprap or some other stream stabilization method).

1965 First hatchery raised coho salmon introduced to the watershed. Releases would continue into the 1980s, but with little or no success.

1970s Land use planning, Sheridan develops its comprehensive plan.

1980s Hatcheries stocking of coho salmon and rainbow trout discontinued after biologists begin to question the interactions between wild and stocked species.

1996 Large-scale flooding in the watershed and throughout the Willamette Basin (100+ year event). DEQ lists Deer Creek and the South Yamhill River on 303(d) list of water quality limited streams. *See the chapter on water quality for further information.*

1998 Headwaters of Deer Creek removed from 303(d) list for temperature after Boise Cascade's monitoring data provided.

1998 Winter Steelhead in Upper Willamette watershed, including the Lower S. Yamhill-Deer Creek watershed, is listed as threatened under the Federal Endangered Species Act.

2000 Currently, Willamette Industries and Hampton Forests logging Upper Deer subwatershed. Yamhill Basin Council scheduled to begin stream temperature monitoring on Deer and Muddy creeks.

Chapter 3 Channel Habitat Types

Introduction

The 1999 OWAM draws on several stream classification systems to create a volunteer friendly system for classifying streams based on channel habitat types. CHT classifications allow for the partitioning of streams into segments based on stream gradient, channel confinement, and stream size. These segments will be used later in the assessment, along with the other components, to determine a stream's sensitivity to restoration efforts. This classification will aid in identifying those stream reaches with the greatest potential for response to restoration efforts.

Methodology

Identifying CHTs was done by gathering the aerial photos and USGS 1:24,000 topographical quadrant maps. Only perennial (streams with water year-round) streams were examined due to time limitations. Each stream was measured using a map wheel, and then split into segments depending on the elevation changes. Segments of at least 1,000 feet and with at least 60 feet change in elevation were marked on the map.

The next step was to break the streams into channel gradient classes. Descriptions of each CHT are provided by the OWAM. Using these characteristics together with the information collected off the topographic maps, CHTs were assigned to each segment. This data was then added to a stream shapefile in ArcView as a new feature. This was not done with digitizing. The topographic map with a clear overlay of the CHTs was examined, then each stream segment was highlighted and assigned a CHT in the shapefile.

The map in this document is only a representation of the CHT locations. For more exact locations, consult the YBC who retain the actual maps with the reach sections used to determine the CHTs marked and measured. The final step involved field verifying the designations and areas of uncertainty.

Channel Habitat Types

The channels of the watershed do not neatly conform to the choices available in the OWAM. Many of the stream beds in the lower watershed are deeply incised or downcut. Historically these areas would have been flood plain, but currently, they more closely fit the description for low gradient, moderately confined. These streams however (see Table 5) do not meet the description of "variable confinement by low terraces or hill slopes," rather, the confinement is from the downcutting of the stream banks.

The stream processes creating this situation are too lengthy to address in this document. So this is only to bring the situation to attention, further data would be needed to analyze how this is happening and what can be done to address it.

Possible reasons for stream incision:

- Loss of historic flood plain due to tiling and drainage projects. Larger quantities of water being forced into the system during a shorter period of time causes higher velocities of water to move through the system. These higher velocities carry more energy and have more erosional power and the ability to scour the channel.

- Loss of large wood debris in the system. Large wood debris was removed from the streams during the 1960s with the hope of increasing fish habitat quality. LWD decreases the velocity of the water as it moves down stream and creates pools of slower moving water upstream.

- The watershed has been logged repeatedly and large wood is in short supply in the system.

- Stream bank modifications such as hardening of the bank with rip-rap (rocks that hold the soil in place) or concrete. These prevent the stream from changing its meanders and finding the best way to dissipate energy.

The channel habitat type descriptions are noted in Table 5. Figure 5 shows the locations of the streams and the color of the stream denotes the channel habitat type.

Table 5. Channel Habitat Types and descriptions

Channel Habitat Type	Miles of stream	Description	Fish Utilization
Low Gradient Large Floodplain **(FP1)**	33.5	Lowland and valley bottom channels. Normally, these channels have extensive valley floodplains and river terraces. Sloughs, oxbows, wetlands, and abandoned channels are common. Numerous overflow side-channels are characteristic.	Anadromous: Potential steelhead rearing. Resident: Potential overwintering.

Low Gradient Small Floodplain Channel (**FP3**)	24.3	Located in valley bottoms and flat lowlands. Usually adjacent to toe of foot slopes or hill slopes within the valley bottom. May contain wetlands. Beavers can dramatically alter channel characteristics. Sediment from upstream temporarily stored in these channels and on the adjacent floodplain.	Anadromous: Potential steelhead rearing. Resident: Potential overwintering.
Low Gradient Moderately Confined Channel (**LM**)	39.7	Low gradient reaches that display variable confinements by low terraces or hill slopes. A narrow floodplain approximately two to four times the width of the medium to large sized channel.	Anadromous: Potential steelhead spawning and rearing. Resident: Potential spawning, rearing, and overwintering
Moderate Gradient Moderately Confined Channel (**MM**)	12.8	Variable controls on channel confinement. Alternating terraces and /or adjacent mountain-slope, foot-slope, and hill-slope landforms limit channel migration and floodplain development. Similar to LM channels. Narrow floodplain usually present.	Anadromous: Potential steelhead spawning and rearing. Resident: Potential spawning, rearing, and overwintering.
Moderate Gradient Constrained Channel (**MC**)	3.81	Narrow valleys with little river terrace development, or deeply incised into valley floors. Hill slopes and mountain slopes composing the valley walls may lie directly adjacent to the channel. Bedrock steps, short falls, cascades, and boulder runs may be present; these are usually sediment transport systems. Moderate gradients, well-contained flows, and large particle substrate indicate high stream energy.	Anadromous: Potential steelhead spawning and rearing. Resident: Potential spawning, rearing, and overwintering.
Moderate Gradient Headwater Channel (**MH**)	8.22	Common in plateaus in Columbia River basalts, young volcanic surfaces, or broad drainage divides. May be sites of headwater beaver ponds. Similar to LC channels, but exclusive to headwaters. Potentially above the anadromous fish zone.	Anadromous: Potential steelhead spawning and rearing. Resident: Potential spawning, rearing, and overwintering.
Moderately Steep, Narrow Valley Channel (**MV**)	9.3	Moderately steep gradient, confined by adjacent moderate to steep hill slopes. High flows are generally contained within the channel banks. A narrow floodplain, one channel width or narrower.	Anadromous: Potential steelhead spawning and rearing. Resident: Potential spawning, rearing, and overwintering.
Steep Narrow Valley Channel (**SV**)	6.8	Constricted valley bottom bounded by steep mountain or hill slopes. Vertical steps or boulders and wood with scour pools, cascades and falls are common. Channels are found in the headwaters of most drainages or side slopes to larger streams. May be shallowly or deeply incised into the hill slope. Channel gradient may be variable due to falls and cascades.	Anadromous: Lower gradient segments may provide rearing. Resident: Limited spawning and rearing.

(From the Oregon Watershed Assessment Manual, 1999)

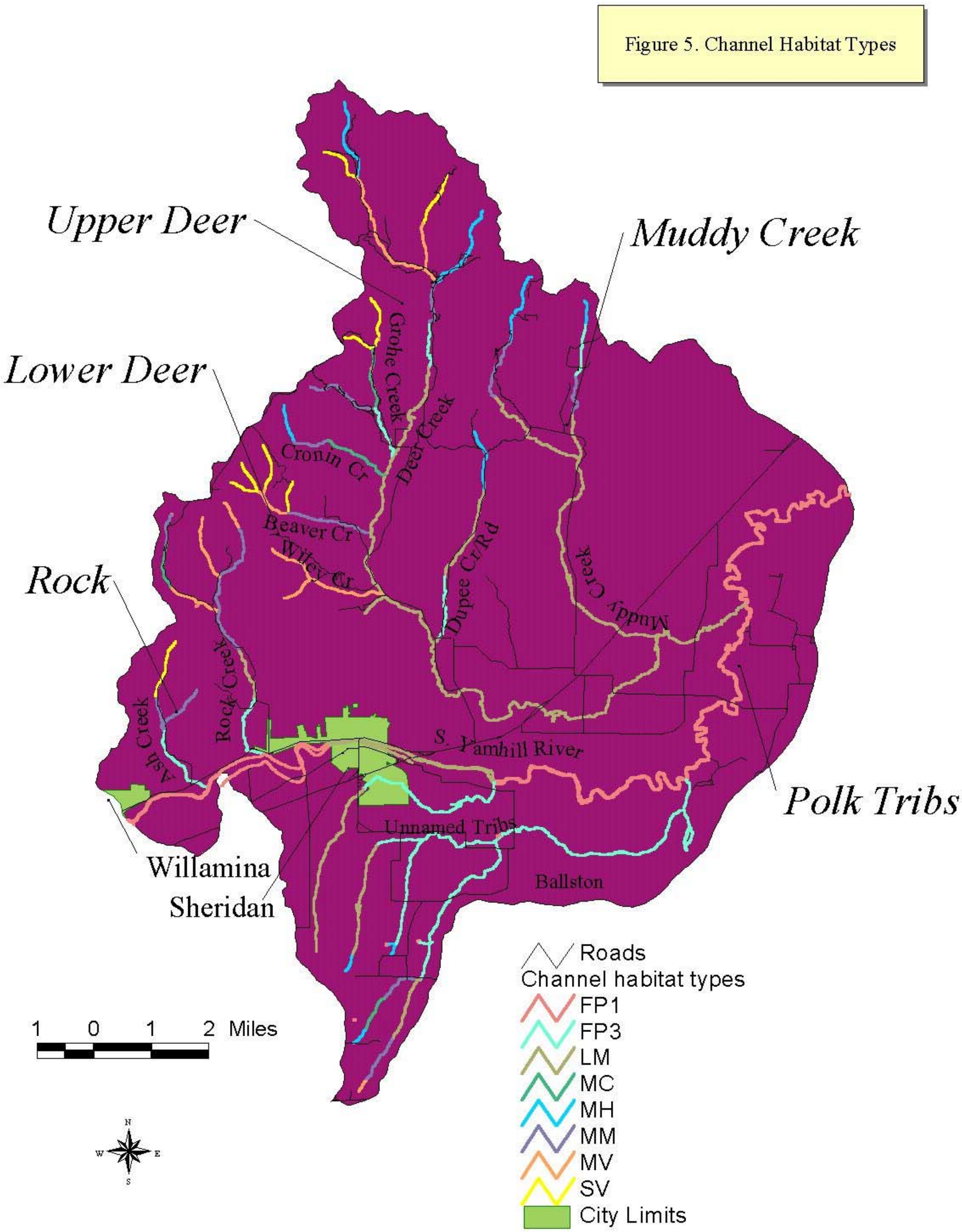


Figure 5. Channel Habitat Types
Upper Deer
Muddy Creek
Lower Deer
Rock
Polk Tribs
Willamina
Sheridan
Grohe Creek
Deer Creek
Cronin Cr
Beaver Cr
Wiley Cr
Dupee Cr/Rd
Muddy Creek
Rock Creek
Ash Creek
S. Yamhill River
Unnamed Tribs
Ballston
Roads
Channel habitat types
FP1
FP3
LM
MC
MH
MM
MV
SV
City Limits
1 0 1 2 Miles
N
W
E
S

Table 6 provides descriptions of the gradient, channel confinement, stream size, and the sensitivity of that channel to restoration as provided by the OWAM. Stream gradient is the steepness of the channel. The gradient is highest near the headwaters and lowest in the valley where the land is flat. Confinement describes whether that stream is connected to its floodplain. An unconfined stream would be allowed to meander freely, flooding during high flows and cutting new banks and creating a new channel. A confined stream would have limits, such as steep valley walls, prohibiting lateral movement. Confined streams do not carve oxbows or create meanders. A moderately confined stream is somewhere between these two descriptions.

Channel sensitivity describes how receptive streams are to enhancement and restoration work. Table 7 provides descriptions of the restoration potential associated with the each channel habitat type.

Table 6. Channel Habitat Types

Channel Habitat Type	Gradient	Channel Confinement	Stream Size	Sensitivity
Low gradient large floodplain **(FP 1)**	<1%	Unconfined	Large	High
Low gradient small floodplain **(FP3)**	<1%	Unconfined	Small to medium	High
Low gradient moderately confined **(LM)**	<2%	Moderately confined	Variable	High
Moderate gradient moderately confined. **(MM)**	2-4%	Moderately confined	Variable	High
Moderate gradient confined **(MC)**	2-4%	Confined	Variable	Medium
Moderate gradient headwaters **(MH)**	1-6%	Confined	Small	Medium
Moderately steep narrow valley **(MV)**	3-10%	Confined	Small to medium	Medium
Steep narrow valley **(SV)**	8-16%	Confined	Small	Low

Channels respond to change differently based on their position in the watershed. The headwaters of Deer Creek, Little Deer Creek, Grohe Creek, and Ash Creek are steep, with low sensitivity to changes in channel pattern, location, width, depth, sediment storage and bed roughness. These are not areas to focus on for enhancement projects. The segments labeled moderate gradient, moderately confined including those on Ash, Rock, Beaver, Cronin, Grohe, Deer, and Muddy Creeks are highly sensitive to change making them more likely candidates for enhancement projects. *See Figure 8.*

The low gradient streams that are most responsive to change are also the ones in the most developed parts of the watershed where the land is under cultivation. (Refer to Figure 6). Deer, Dupee, Muddy and the unnamed tributaries in Polk County each have significant stretches that could be enhanced. With the current land use, and the proximity of the road to the waterways, these areas would benefit most from riparian enhancement projects that would not encourage meandering or flooding, but would improve the quality of the vegetation along the channels. (Refer to chapter 5 of this document for more information.)

Table 7. CHT restoration potential

Channel Habitat Type	Riparian Enhancement Opportunities
Low gradient large floodplain **(FP1)**	Due to the unstable nature of these channels, the success of many enhancement efforts is questionable. Opportunities for enhancement occur where lateral movement is slow. Efforts to restrict meandering will often result in undesirable alteration of channel conditions downstream. Smaller side-channels may be candidates for efforts that improve shade and bank stability, but it is likely that these efforts may be more beneficial and longer-lived elsewhere in the basin.
Low gradient small floodplain **(FP3)**	The limited power of these streams [i.e. low stream flows] offers a better chance for success of channel enhancement activities than the larger floodplain channels. While the lateral movement [i.e. meandering] of the channel will limit the success of many efforts, localized activities to provide bank stability or habitat development can be successful.
Low gradient moderately confined **(LM)**	Like floodplain channels, these channels can be among the most responsive of channel types. Unlike floodplain channels, however, the presence of confining landform features … help limit the destruction of enhancement efforts common to floodplain channels. Because of this, LM channels are often good candidates for enhancement efforts. In forested basins, habitat diversity can often be enhanced by the addition of wood or boulders. Pool frequency and depth may increase, and side-channel development may result from these efforts. Channels of this type in nonforested basins are often responsive to bank stabilization efforts such as riparian planting and fencing. Beavers are often present in the smaller streams of this channel type.
Moderate gradient moderately confined **(MM)**	Same as LM, except that the slightly higher gradients impart a bit more uncertainty as to the outcomes of the enhancement efforts when compared to LM channels.
Moderate gradient confined **(MC)**	Same as LC.
Moderate gradient headwaters **(MH)**	These channels are moderately responsive. In basins where water temperature problems exist, the stable banks generally found in these channels lend themselves to the establishment of riparian vegetation. In nonforested land, these channels may be deeply incised and prone to bank erosion from livestock. As such, these channels may benefit from livestock access and control measures.
Moderately steep narrow valley **(MV)**	Same as LC and MC.
Steep narrow valley **(SV)**	These channels are not highly responsive and in-channel enhancements may not yield intended results. Although channels are subject to relatively high energy, they are often stable. Where stable banks exist, opportunity for riparian enhancement. This may serve as a recruitment effort for large woody debris in the basin.

(From Oregon Watershed Enhancement Board Manual, 1999)

Covered:
Channel gradient designations using blue line streams of USGS topographical maps.

Channel habitat types using maps, aerial photos and field verification visits.

Not Covered:
CHTs were determined only for blue line streams. CHTs should be determined for many of the intermittent streams in the watershed.

Chapter 4 Vegetation

Introduction

In order to better understand the current and historic vegetation patterns, including current forest age classes, sensitive/threatened species, and exotic plant species, all of these areas were combined in one chapter. Information is provided on the vegetation patterns and dominant species. It is not a comprehensive list of all species in the watershed. It does provide general information on historic and current conditions.

Watershed Vegetation Overview

Figure 6 shows the current watershed vegetation. This watershed scale map was created from a map of the vegetation of the Willamette Valley produced in 1998 by ODFW Ecological Analysis Center and the Northwest Region Habitat Program (NWHI). NWHI mapped ninety percent of the vegetation with field verification and the other 10 percent using aerial photos. The accuracy for Yamhill County is given as 83% and for Polk County as 85%. Most of error is in determining the difference between annual and perennial grasses. Any changes to land use since the late 1990s are not mapped. However, there has been little change in the dominant vegetation in the watershed during this time. Descriptions of the land uses and some explanation on how they are mapped are given in Table 8.

Table 8. Vegetation and land use types

Vegetation/Land use	Acres	Percent of Watershed	Explanation of vegetation and land use classes
Row crops	295	0.4%	Farmland could be vegetables or herbs.
Annual grass	3,312	4.3%	Farmland for production of wheat, oats, barley, and rye. Generally, without irrigation.
Perennial grass	29,254	38.4%	Farmland for production of perennial grass such as grass seed and hay. Generally grown without irrigation.
Orchards, berry farms, nurseries	2,105	2.8%	Farmland used for fruit trees, berries, Christmas trees, and nursery stock. High volume of irrigation.
Unmanaged pasture	5,473	7.2%	Farmland that appears to have no active management such as fertilizer application, irrigation or weed control. Might be grazed. Land usually has been cleared and farmed intensively in the past.
Recreational fields/parks	2.6	0.003%	Too small to be seen on this map. Does not include Deer Creek Park.
Urban/industrial	1,153	1.5%	Includes area consisting of industry or housing on

			the subdivision level. Does not follow urban growth boundaries. It depicts actual land use at the time of map construction.
Water	436.4	0.6%	Only areas of water that could fit the scale of the map are included – this is why Deer and Muddy creeks don't show up as water.
Black hawthorn riparian/hedgerows	1,093	1.4%	Many of these areas are too small to be seen clearly on the map at this scale.
Cottonwood riparian	34	0.04%	Located along waterways. These areas are too small to be seen on the map at this scale.
Willow	62	0.08%	Expect willow along most waterways. These areas are too small to be seen on the map at this scale.
Reed canary wetland	121	0.16%	Exotic species! See Non-native section of this document for more information.
Cattail – bulrush	8	0.01%	Most area that would support cattails has been converted to farmland.
Ash/cottonwood/maple bottom pasture	2,705	3.5%	This habitat is usually a seasonal wetland, bordering streams.
Oak/Douglas-fir oak>50%	4,983	6.5%	Usually very diverse habitat with many species of forbs and grasses in the understory.
Douglas-fir/oak >50% Douglas-fir	5,341	7.0%	These areas mapped up to the edges of the valley – not into the Coast Range.
Oak/madrone	35	0.04%	Not possible to see this easily at this scale, all pockets of it are on the NW side of the watershed in the edge of the unclassified forest at the map's edge.
Maple/alder/fir Hardwoods dominant	622	0.82%	Along Deer creek and tributaries. Developed in response to logging or fire or failure to replant with coniferous species.
Douglas-fir	850	1.1%	This only represents the areas in the foothills of the Coast Range. Any small Christmas tree plantings likely got this classification.
Gravel bars/sand	25	0.03%	Shows areas where there is commercial gravel and sand operations.
General forest unclassified	18,314	24.0%	Area not examined in detail.
Total	76,234	100%	

Table 9 shows the seral stage and age class distribution of vegetation in the watershed taken from the BLM 1998 watershed analysis of the area. The number of acres is different in this table than the in other tables because the numbers are from the report, not the GIS maps of the area.

In the BLM classification, non-forest dominates the watershed and designates agricultural lands. 'Early' seral stage is vegetation between 0-10 years, which includes recently planted forested lands. The 'Open' and 'Closed' sapling seral stages designate growth between 20-30 years and 40-70 years respectively. The 'Mature' designation is for vegetation 80-110 years old. Old growth designation is for land with vegetation over 200 years old.

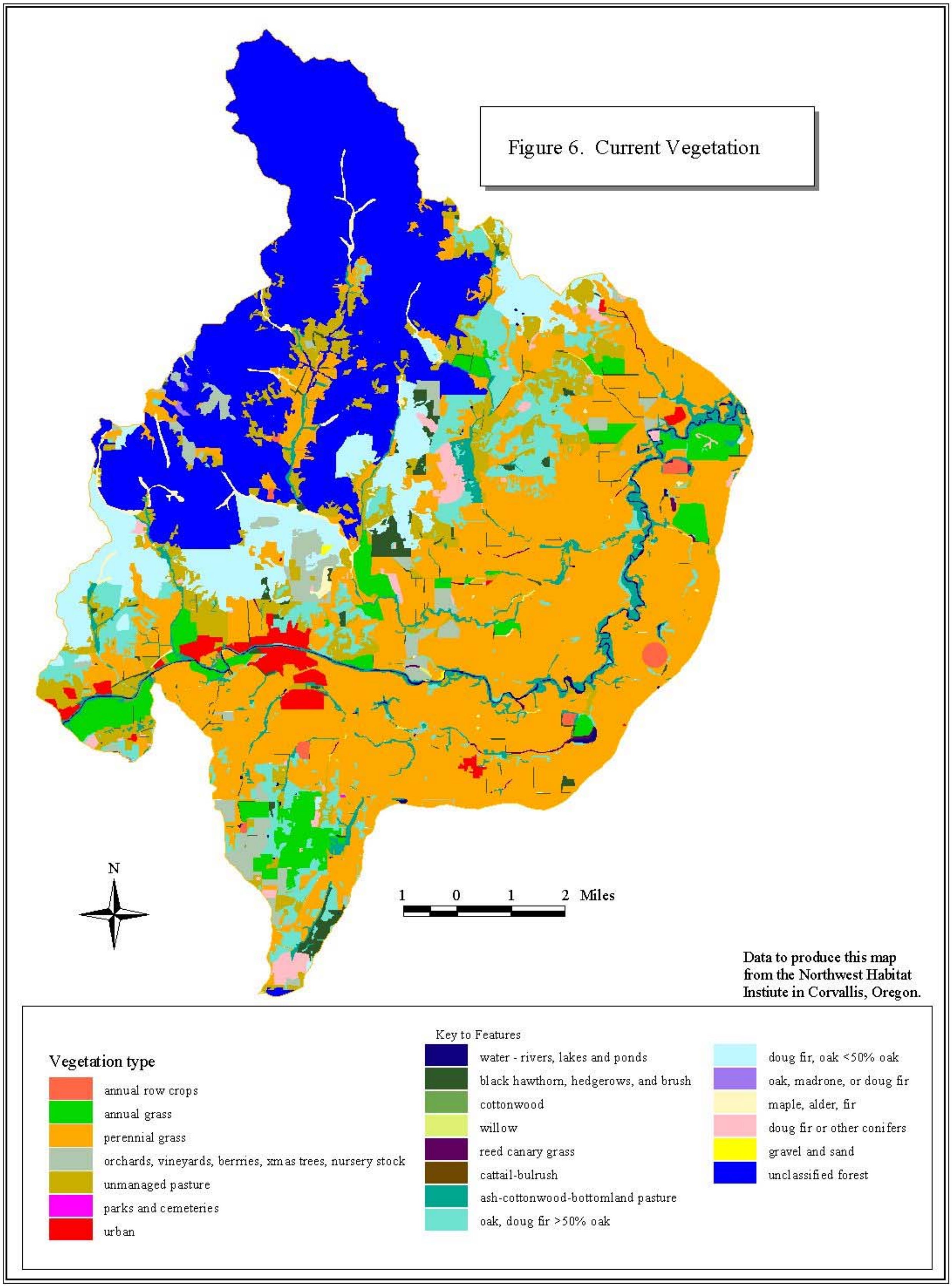


Figure 6. Current Vegetation

Table 9. Distribution by acres of seral stages and land ownership (BLM, 1998).

Land Owner	Non-forest	Early Grass-forb	Open sapling	Closed Sapling	Mature	Old Growth	Total
BLM	18	98	203	1,470	237	14	2,090
Industrial private	211	1,173	0	2,684	144	0	4,212
Other private	42,918	16,389	<1	14,031	1,854	<1	75,192
Percent of total	53%	22%	.2%	22%	3%	.0001%	
Total	43,147	17,660	203	18,185	2,235	14	81,444

Approximately 43,147 acres or 53% of the watershed is non-forested. The non-forested designation is for lands under cultivation. On the forested land, conifers make up 30% of the landscape while hardwoods comprise 70%. The conifer/hardwood (Douglas-fir and Oregon white oak) and oak/savanna (white oak and grassland) transition zone is between the coniferous forestlands in the north and the agricultural lands to the south (BLM, 1998)

Laminated root rot is present in the watershed. The fungus Phellinus weirii, a native root pathogen that attacks and kills Douglas-fir, causes laminated root rot. *Phellinus weirii* greatly affects Douglas-fir stands because it travels by root contacts. The infected trees are subject to windthrow, which makes openings in the stands. They are then also susceptible to attack by the Douglas-fir beetle *Dendroctonus pseudotsugae* causing additional openings in the stands. (BLM, 1998). This process creates small scale openings that provide habitat for species other than Douglas-fir and increase the forest diversity. Historically, laminated root rot was a major player in Coast Range forests and created small scale openings with some regularity (Hooper, 2000).

Gaps in the canopy provide habitat for shrubs, hardwoods, and shade and disease tolerant species. Since western redcedar and western hemlock have a greater resistance, they are being planted in many infected areas on federal lands. The dying of the Douglas-fir also provides snags and a source of coarse woody debris (BLM, 1998).

The lower watershed lacks large wood debris and diverse riparian vegetation. It is intensively managed for agriculture. Most of the vegetation is a narrow one to two tree strip of vegetation along the stream bank. In many areas, non-native blackberry dominates the streambanks. If there are woody plants present, the dominant species is red alder with a few big leaf maple and willow present and even fewer large conifers (BLM, 1998).

Vegetation Patterns

This section of the report was researched and written with extensive assistance from Dave Hanson, a local resident and historian.

There are four main habitat types in the Willamette Valley ecoregion that all evolved in relation to fire—riparian forest, wet and dry prairie, woodlands, and oak savanna. Historically, these vegetation patterns dominated the watershed. These habitats sustained large populations of wildlife.

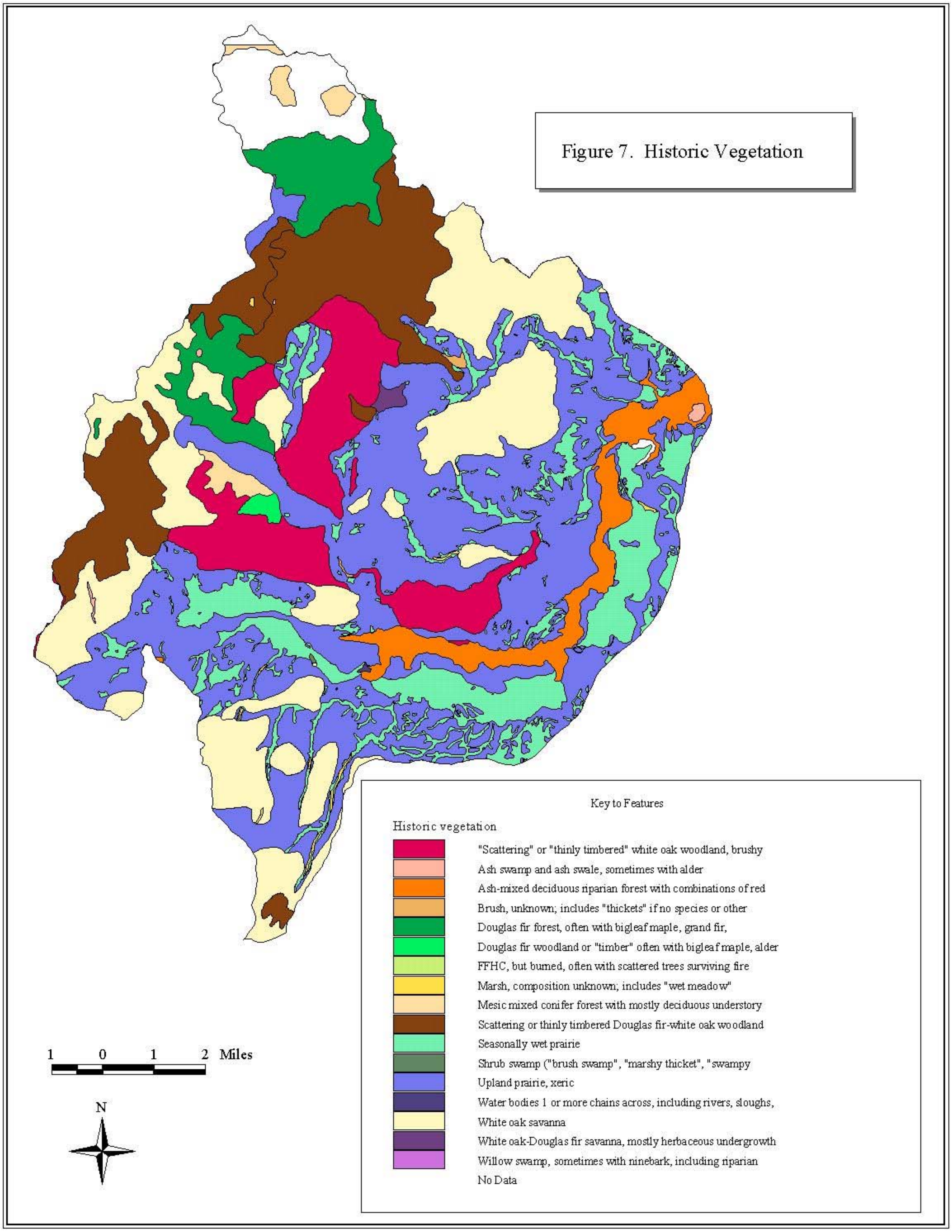


Figure 7. Historic Vegetation

The historic vegetation map (Figure 7) shows the approximate vegetation of the watershed in 1851, prior to European American settlement. The data to produce this map was collected by the Nature Conservancy. The land descriptions written by surveyors for the Government Land Office in the mid 1800s were used to construct maps of the historic conditions and vegetation. These sometimes very detailed descriptions give the best information on what the area looked like before it was densely inhabited.

The historic and current vegetation maps are most instructive when compared side by side. The current vegetation is more specific and can be viewed with greater certainty. The historic vegetation represents the best reconstruction, as actual data do not exist. Even so, note that the wet prairie habitat is not present in the current watershed. Additionally, the amount of land classified as forest has increased. The absence of fire and Douglas-fir planting has allowed Douglas-fir to expand within its range. There is still obvious transition zone of Douglas-fir and oak between the valley and the coast range. The areas of wetlands are now cultivated land, with scattered pockets of wetland remnants. Compare these maps with Figure 15 of the acreage under irrigation. Note that the areas with irrigation rights along the South Yamhill River are also former wet prairies.

Lowland Riparian Forest

In the lower elevations of the watershed, historically, the rivers and streams had extensive floodplains with closed-canopy forests of deciduous trees like Oregon ash, alder, black cottonwood, and big leaf maple, and grew mixed together with conifers like Douglas-fir, grand fir, and ponderosa pine. Western redcedar may have occasionally been present but since it is very fire sensitive it would not have been common. As elsewhere in the valley, fires were set by humans to burn off brush, grasslands, and trees. But the high levels of soil moisture present in the riparian areas made them resistant to burning and they tended to develop a dense understory of shrubs. Generally these forests were within 50 feet of rivers, and transitioned into wet prairies see Figure 7.

In the valley bottoms with a low gradient slope, the streams tended to develop a meandering, sinuous channel pattern. Beavers were plentiful in the region, and produced dams that slowed the water and trapped and stored sediment. As the beaver ponds filled in, a new channel would be created around the obstructing dam and this led to the creation of multiple side-channels. Other dams were produced by fallen trees and log jams of large, woody debris carried downstream from the forested uplands, this also resulted in the formation of shallow, multiple channels. The strong forces of floodwaters and debris flows were slowed and dissipated by these dams along with the dense riparian vegetation and were

The Kalapuya burned prairies in the valley and foothills of the Coast Range to elevations of 1000 feet. Robert Boyd has reconstructed a likely scenario for burning: *In late spring and early summer the Indians were probably concentrated at "primary flood plain" sites in the wet prairies, where root crops such as camas were collected and processed. There was no burning at this time. During midsummer (July and August) the focus shifted to the dry prairies and "narrow valley plain" sites were more intensively occupied. Burning in July and August was apparently sporadic, most likely occurring after the harvesting of seasonally and locally available wild foods (grass seeds, sunflower seeds, hazelnuts and blackberries), in limited areas. The intermediate effect of the early burns would be a "cleaning up" process; the long-term result would be to facilitate the re-growth, in future seasons, of the plants involved. In late summer fire was used, on the high prairies, as a direct tool in the gathering of tarweed and insects. This was followed, in October, by firing of the oak openings after acorns had been collected. Finally, from the "valley edge" sites, the Kalapuya initiated large-scale communal drives for deer, which provided a winter's supply of venison. The sequence ended as they returned to their sheltered winter villages along the riverbanks.*

dispersed over the adjacent floodplains. Sediments accumulated on these floodplains and their seasonal inundation recharged groundwater levels, essential to maintain sufficient flows and cool stream temperatures during the dry summers.

The Columbia white-tailed deer was wholly dependent on these riparian forests. It has been locally extirpated since the 1800s and is a federally listed endangered species.

Upland Riparian Forest

In the upland regions of the watershed with greater steeper stream gradients and less frequent fire, riparian species were typically alder, maple and conifer species including Douglas-fir, hemlock, yew and western redcedar.
The previously forested riparian corridors are now primarily red alder. Several bird species, deer, and elk that thrive on disturbance or early seral stage habitats benefit from this shift in the dominant vegetation. Non-native vegetation dominates many stream banks in the lower watershed. Once non-native plants such as Scotch broom or Himalayan blackberry are introduced, it takes intense effort and constant vigilance to remove them and re-establish native vegetation.

Forested riparian areas with large conifers provide shade to the streams as well as large woody debris to the stream channels. The current riparian corridor is providing shade to the streams, but the size of the trees does not provide LWD that will remain in the channel (BLM, 1998). The trees that do line the riparian corridors are too small to be advantageous for creating complexity in the stream channels. Chapter 5 on riparian areas provides further information.

Prairie, wet and dry

Historically, prairies dominated the valley floor, a result of the periodic burns set by the native people. One third of the prairie was wet prairie. The grass species tufted hairgrass (*Deschampsia cespitosa)* dominated the extensive wet prairies of the Willamette Valley. This tall perennial grass was well adapted to both periodic fires and hydric soils. It provided forage for the herds of deer, elk, and pronghorn, which the Native American tribes hunted for food.

Growing intermixed in the prairies with the grasses were numerous species in the lily family that that had been semi-cultivated for centuries by humans, and were also adapted to the annual burning practices of the Kalapuyan people. The fires burned back the more competitive grasses allowing the wildflowers to flourish and utilize the nutrients released by burning. The primary species among these bulbs was camas (*Camassia quamash*), which formed a staple crop for many tribes in the west, although many other members of the lily family were also utilized for food.

The dominant grass of the dry prairies was red fescue (*Festuca rubra rommerii*). In both the wet prairies and the dry prairies, shrubs and small trees like hazel, serviceberry, and cascara grew, and burning would kill them back and force a burst of sprouts in the spring. This re-sprouting was the source for most of the native people's fiber materials.

The BLM report focuses on species affected by timber management. Since the lower half of the watershed is non-forested, there is little information available on how the grassland animal species have been affected by loss of native vegetation in Lower Deer, Polk Tribs and Muddy sub-watersheds. Agriculture has decreased the acreage of oak woodland habitat. Species such as acorn and Lewis' woodpeckers and gray squirrels that depend on it, live in a habitat in declining condition (BLM, 1998).

Conifer Forest

If given sufficient time without disturbance, western hemlock and western redcedar would dominate the northwestern section of the watershed closest to the coast range. The 400 to 600 year old stands would still support significant numbers of Douglas-fir (BLM, 1998).

Private commercial timberlands dominate Upper Deer subwatershed (5,885 acres/ 51%) and are intensively managed for timber production. This translates into a short rotation time and results in predominately even-aged Douglas-fir stands. The rotation currently in use is 60 to 70 years. In sub-watersheds, Upper Deer and Rock Creek, highly fragmented 30-50 year old timber dominates the landscape (BLM 1998).

This is not long enough to produce large wood debris of the size needed to increase channel complexity in the watershed. The trees left standing in the riparian area after a cut are the only source for large wood to the streams. The riparian vegetation map (see Figure 8) shows that the trees left in these buffer strips are a mix of deciduous and coniferous trees. Deciduous trees are less desirable because they do not attain a very large size and so do not remain in stream for long and they decompose more rapidly and do not provide in-channel structure for very long. Current Forest Practices Act regulations are working to address this by encouraging the conversion and active management of riparian areas that have grown into red alder or brush. The primary reason is the recruitment of LWD (Upton, 2000).

These sub-watersheds lack vegetation with age diversity. The interior forest habitat (undisturbed area without roads and edges) is now fragmented or non-existent due to clear-cutting. There are no large blocks of interior forest, or diverse riparian habitat areas. Many of the past management practices and natural disturbances (fire) have eliminated or severely limited these habitats. If continued, local extinction of some species may occur. Species such as the spotted owl, hairy woodpecker, northern flicker, western bluebird, northern flying squirrel and several bat species lack sufficient habitat. Large green trees, snags, and coarse woody debris provide shelter, nesting platforms, foraging or drumming substrates, lookout posts or perching habitat, hiding cover, or thermally regulated micro-habitats (BLM, 1998). The BLM is working to manage its lands to provide these functions (Hooper, 2000).

Currently, the Oregon Forest Practices Rules require 2 wildlife trees at least 30 feet tall and greater than 11 inches diameter at breast height (DBH), and 2 down logs at least 16 feet long and greater than 12 inches in diameter, per acre (50% of which may be hardwood) be left on the site after clearcuts. This may not be adequate to maintain populations of some species (BLM, 1998). New proposed rule changes to the Oregon Forest Practices Act will require leaving more, big trees in the outer portion of the Riparian Management Area and provide greater protection for non-fish bearing streams which currently have the most relaxed timber harvest regulations (Curry, 2000). According to research by the BLM, without snags of a diameter 20 in, the pileated woodpecker population will suffer. Without pileated woodpeckers making cavities in the trees, species such as flying squirrel and saw-whet owls that depend on these cavities for nests, will also decline according to BLM biologists. It is not known if these species exist in the watershed, population figures do not exist.

This is where forest management becomes complicated. As a society, we want affordable wood products. We also want healthy, diverse forests. Forests grow at a rate that makes experimentation difficult. The outcomes of forest practices implemented today will not be apparent for many more years. It is very different from agriculture where each year brings the opportunity to try alternative management practices. According to Mike Curry of the Oregon Department of Forestry, forest health and harvesting techniques have come a long way in the last 100 years. Curry acknowledges that mistakes were made in the past, but that foresters are managing the land very differently today. Timber companies are putting large wood back into streams, upgrading culverts and repairing roads to standards that exceed those of the state. He sees industry doing more than ever before to ensure the health of the watershed (Curry, 2000).

Dan Upton, Resident Forester of Willamette Industries,described how his company works with wildlife biologists, foresters, and others to harvest their land in a sustainable manner while maintaining as much wildlife habitat as possible. This includes leaving trees with extensive branching and irregular shapes, not logging areas with wetland species, logging practices such as logging with the use of cables and towers rather than ground harvesting equipment, and building roads that exceed the state requirements. He maintains that his company acts in a highly responsible manner toward the resource they use and they follow or exceed the state and federal guidelines for forestry management practices (Upton, 2000).

Oak Savanna Habitat

Where oak woodlands merge into valleys is the oak savanna habitat type. Oregon white oak is the dominant species; black cottonwood, red alder and Oregon ash are also present. Historically oak stands had more open area with large spaces between trees or groves of trees. Due largely to fire management practices, the canopy now is more closed (BLM, 1998). Oregon white oak stands provide more cavity habitat than any other cover type in the Coastal Range. Twenty-eight bird species use cavities in oak stands including white-breasted nuthatch and black-capped chickadee along with several mammals that are not usually found Douglas-fir dominated stands (BLM 1998).

Non-native Plants

Non-native plants (also known as exotics) are those species introduced to an ecosystem in which they would not naturally grow and have the potential to adversely impact the area to which they were introduced. The Oregon Department of Agriculture (ODA) identifies noxious weeds as plants having the potential to cause economic losses without control. It is very costly to eliminate them once they are established, and usually requires intensive herbicide treatment to manage the population. Some species have bio-control methods available, but these are by far the minority. The BLM identifies Scotch broom (*Cytisus scoparius*) and tansy ragwort (*Senecio jacobaea*) as two species of major concern. Scotch broom is listed due to its ability to over run land, and tansy ragwort is listed due to its toxicity to cattle.

The Native Plant Society of Oregon listed 37 noxious invasive species in 1997. These species are either being cultivated by naïve gardeners, sold by local nurseries, or introduced through some other means.

In 1999, SWCD in Yamhill County listed the species in Table 10 on its noxious weed list.

Table 10. Yamhill County Priority Noxious Weed List

Common Name	Scientific Name	ODA Class	List Date
High Priority For Control			
Italian Thistle	*Carduus pycnocephalus*	B	1-29-90
Meadow Knapweed	*Centaurea pratensis*	B	8-13-90
Purple Loosestrife	*Lythrum salicaria*	B	2-26-91
Gorse	*Ulex europaeus*	B, T	1-29-90
Spurge laurel	*Daphne laureola*	Not listed	May 2, 01
Important To Control *Agric.* - Denotes species that are primarily a problem in agricultural production.			
Milk Thistle – *Agric.*	*Silybum marianum*	B	11-13-89
Canada Thistle	*Cirsium arvense*	B	11-13-89
Tansy Ragwort	*Senecio jacobaea*	B, T	11-13-89
Scotch Broom	*Cytisus scoparius*	B	11-13-89
Field Bindweed - *Agric.*	*Convolvulus arvensis*	B	2-26-91
Large Crabgrass - *Agric.*	*Digitaria sanguinalis*	-	2-26-91
Blackgrass - *Agric.*	*Alopecurus myosuroides*	B	3-26-97
Velvetleaf - *Agric.*	*Abutilon theophrasti*	B	3-26-97
Field Dodder - *Agric.*	*Cuscuta pentagona*	B	3-26-97
Himalayan blackberry	*Rubus discolor*	B	5/23/00
Reed Canarygrass	*Phalaris arundinacea & aquatica*	Not on list	5/23/00
Puncturevine	*Tribulus terrestris*	A, B	3/03/93
English Ivy	*Hedera helix*	B	5 / 2 /01

ODA Classifications: (Yamhill County SWCD, Updated May, 2001)

"A" Weeds - a weed of known economic importance which occurs in the state in small enough infestations to make eradication/ containment possible; or is not yet known to occur, but its presence in neighboring states makes future occurrence in Oregon seem imminent.

"B" Weeds - a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties and is important to control where found.

"T" Weeds - a priority noxious weed designated by the Oregon State Weed Board as a target weed species on which the Department will implement a statewide management plan.

Noxious weeds such as Himalayan blackberry, reed canary grass, and Scotch broom invade disturbed areas such as clearcuts and roadside disturbances and form monocultures making regeneration of native species near to impossible without significant assistance (BLM, 1998).

Sensitive Species

The Federal or State government lists nine species found in the watershed as rare, threatened or endangered. These species have been field verified by the Oregon Natural Heritage Program (ORNHP, 1998). *See Table 11.* Additionally, the BLM lists 16 species as special status species and 7 species as sensitive species that may be present in the watershed. *See Tables 12 and 13.* Neither of the two BLM categories has been field verified for this watershed.

The Butte Research Natural Area is located in T4S, R5W Section 19 on the east side of Gopher Valley Road. This unique area is identified in the Oregon/Washington Natural Heritage Plan. The Biology Department at Linfield College in McMinnville uses this area for study (BLM, 1997).

> *From "The Oregonian" Friday, June 23,2000*
>
> *"Botany students at Linfield College in McMinnville also found rare species while doing an inventory of plants at Deer Creek County Park, a 23-acre site featuring prairie and wetlands. Their discoveries included Kincaid's lupine, one of 14 plants in Oregon listed as threatened or endangered by the U.S. Fish and Wildlife Service. The find will now be included in the Oregon Flora database.*
>
> *'That plant is significant because it is the host plant for the endangered Fender's blue butterfly,' said Kareen Sturgeon, biology professor at Linfield College and president of the Cheahmill chapter of the Native Plant Society of Oregon. 'Now we're working with the U.S. Fish and Wildlife Service and The Nature Conservancy, because we know if we enhance the area, we'll get butterflies.'"*

Historically, these species were much more widespread than they are today. The importance of preserving their habitat and working to ensure their future survival is nothing less than preserving Oregon's natural heritage for generations to come. With the loss of any species, whether it is plant, mammal, amphibian, or insect, a valuable piece of the ecosystem in which we live is also lost. Often we hear about the loss of genetic diversity and think that it is inevitable, natural, or that we have no role in it. This attitude prevents meaningful discussion about the role each of us has in making sure Oregon's unique and diverse species have a place to thrive.

The following lists give the names of the species that are in danger of disappearing from this watershed. Due to space limitations, further information on these species is not included in this document. Please consult one of the following organizations to learn more about any of these species listed here.

The Oregon Natural Heritage Program
821 SE 14th Avenue
Portland, OR 97124-2531
(503) 731-3070 ext. 335 or 338
http://ocelot.tnc.org/nhp/us/or/index.html#mission

Bureau of Land Management
Salem District Office
1717 Fabry Road S.E.
Salem, OR 97306
(503) 375-5646

Table 11. Threatened/endangered/sensitive plant and terrestrial animal species field verified in Deer Creek watershed.

Threatened species listed by ESA and state of Oregon		
	Sidalcea nelsoniana	Nelson's sidalcea
	Lupinus sulphureus ss Kincaidii	Kincaid's lupine
Candidate for protection under ESA		
	Icaricia icarioides fenderi	Fender's blue butterfly
Species of concern listed by ESA		
	Cimicifuga elata	Tall bugbane
	Megascolides macelfreshi	Oregon giant earthworm

Myotis evotis	Long-eared bat
Rhyacotriton variegatus	Southern seep salamander

State of Oregon candidate for listing as endangered or threatened

Delphinium oreganium	Willamette Valley larkspur
Sidalcea campestris	Meadow checker-mallow

Table 12. Special Status Species (BLM, 1998) possibly found in The watershed.

Aneides ferreus	Clouded salamander
Brachyramphus marmoratus	Marbled murrelet
Haliaeetus leucocephalus	Northern bald eagle
Accipiter gentilis	Northern goshawk
Strix occidentalis	Northern spotted owl
Dryocopus pileatus	Pileated woodpecker
Arborimus longicaudus	Red tree vole
Myotis evotis	Long-eared Myotis
Myotis thysanodes	Fringed Myotis
Myotis volans	Long-legged Myotis
Lasionycteris noctivangans	Silver-haired bat
Rhyacotriton kezeri	Columbia torrent
Rhyacotriton variegatus	Southern torrent salamander
Rana Aurora	Red-legged frog
Ascaphus truei	Tailed frog
Phenacomys albipes	White-footed vole

Table 13. Sensitive Species (BLM, 1998)

Agrostis howellii	Howell's Bentgrass
Castilleja levisecta	Golden paintbrush
Cimcifug elata	Tall bugbane
Delphinium leucophaeum	White rock larkspur
Delphinium pavenaceum	Peacock larkspur
Filipendula occidentalis	Queen-of-the-forest

Chapter 5 Riparian and Wetland Conditions

Riparian Conditions

Introduction

Riparian area describes the land closest to streams, rivers, and wetlands with unique plant and animal species. Some people refer to the land bordering waterways as buffer zone, referring to the vegetation's function to filter or "buffer" water moving through the landscape prior to entering the waterway. Riparian areas generally have higher moisture levels in the soil than the adjacent upland areas. The elevated moisture levels generally support a more abundant and diverse ecosystem.

Riparian vegetation influences fish habitat and water quality in a variety of ways including:

- Provides shade, which aids the decrease of daily fluctuations in water temperature and provides fish cover from predation.
- Stabilizes the stream banks, which decreases erosion and prevents downcutting of banks.
- Provides habitat for insects and macro-invertebrates, which are a food source for fish.
- Provides detritus or organic litter to the stream, which adds nutrients to the entire ecosystem.
- Riparian areas are also important sources of large wood recruitment to the stream system. Large wood is vital for fish habitat because it provides cover for fish, diverts channels and obstructs flows, which in turn increases channel and habitat complexity (OWAM, 1999).

The map of the historical vegetation provides background on what the vegetation looked like prior to extensive European settlement. *See Figure 7.* This map shows that the vegetation bordering the waterways was very different from what exists today. This map is not a snapshot of the vegetation at that time, but rather an approximation of what the vegetation was in the mid 1800s.

The town of Sheridan is built on top of what was once a seasonally wet prairie. The entire eastern area of the watershed that was once wet and upland prairie is now under cultivation. The riparian vegetation in these areas is mostly a one to two tree buffer of hardwoods. Refer to Chapter 3 for further information on historic conditions.

The Importance of Large Woody Debris

Throughout the entire watershed, there is a lack of large woody debris (LWD) and LWD recruitment. Large trees close to streams are needed to create in-channel habitat diversity. The size and diameter of the trees necessary to perform this function is directly related to the size of the stream.

Streams with higher flows and wider bankfull widths need larger wood in order for the wood to remain in place during winter storm events. Trees that can provide this function need to be close enough to the stream so that when they die and fall down, they land across the channel.

LWD across a stream slows down the water filling in behind it, which causes the sediment to drop out of it, creating an area with gravels upstream from the log. The downstream side will have a scour pool due to the velocity of the water moving over the LWD and its loss of sediment.

Methodology

Riparian conditions for the watershed were determined using the OWAM protocol to examine riparian width, vegetation types, and vegetation density, stream shading, and the continuity or interruption of the riparian zone from road crossings, streamside roads, and other land uses.

Black and white air photos on the scale of one inch equals 660 feet were borrowed from the Farm Service Agency in McMinnville to complete this analysis. The summer 1994 fly over was the primary source. However, summer vegetation makes it difficult to determine the difference between hardwoods and conifers. So, when further verification was needed, the 1980 winter fly over (same scale) was used. Additionally, the Yamhill and Polk county soil surveys were used to locate stream channels in the heavily vegetated areas of the watershed.

Small streams are very difficult to detect on air photos. It was assumed that where the channel was not visible in a narrow band of vegetation, that it would be in the center. This is why the Riparian Condition Units appendix does not differentiate between the right and left banks of the streams. It was not possible to discern the left or right stream banks for any stream other than the South Yamhill River with any degree of accuracy.

A map wheel was used to determine the length of each reach. The length of each segment was rounded to the nearest 50 feet. The vegetation width was divided into three categories: 0-25 feet, 25-50 feet, and greater than 50 feet. Within these categories, the type of vegetation was broken into 5 classes: hardwoods, conifers, mixed, brush/grass, or no vegetation.

Conditions

OWAM's protocol was to compare current riparian conditions with historical riparian conditions. The scale of the historical vegetation map and the current vegetation map do not allow specific species to be named for each waterway. Rather, general statements about the historic conditions versus current conditions can be made.

It should be noted that the 1994 air photos are limited in that they are 6 years old. Many changes have occurred in the upper watershed since these photos were taken. Several clearcuts have been made in the Upper Deer subwatershed. Where possible, these areas were field verified. An appendix is included with all the data sheets used to gather this information. The RCU (riparian conditions unit) number indicated in the first column refers to the numbers assigned to each segment examined. These segments can by viewed on the map of the watershed kept by the Yamhill Basin Council.

The reaches represented on the map included here represent approximations only and are not meant for use in determining precise locations for restoration or enhancement projects. More in-depth analysis of a specific area is recommended before proceeding with such projects. This map and information is meant to provide starting points and areas of concern, not to pinpoint specific locations. The map overlay kept by the Yamhill Basin Council has more accurate measurements. Please consult that source if you have specific questions.

The heavily forested Upper Deer sub-watershed has the greatest riparian widths of the watershed while the largely agricultural Polk Tribs subwatershed has the narrowest widths. Table 14 gives the miles of stream in each riparian class. The majority of streams surveyed are bordered by either a narrow or wide band of hardwoods. It is important to note that 5% of the streams surveyed were either bareground or short grass.

Ideally, the trees that function as LWD are conifers. Hardwoods decompose more easily and do not provide long-term structure in the stream. From the air photos and field verification, it was determined that conifers (and conifer recruitment) are lacking in most of the watershed. However, the air photos show that most streams are well-shaded. Thus, they are providing the desired effect of shading the water and helping keep the water temperature cooler.

Figure 8 shows the streams with different colors representing different riparian widths. The light blue segments indicate streams with little or no vegetation and should be areas of concern. This map only provides approximate locations. Further information and the map wheel measurements taken from the air photos can be found in Appendix A.

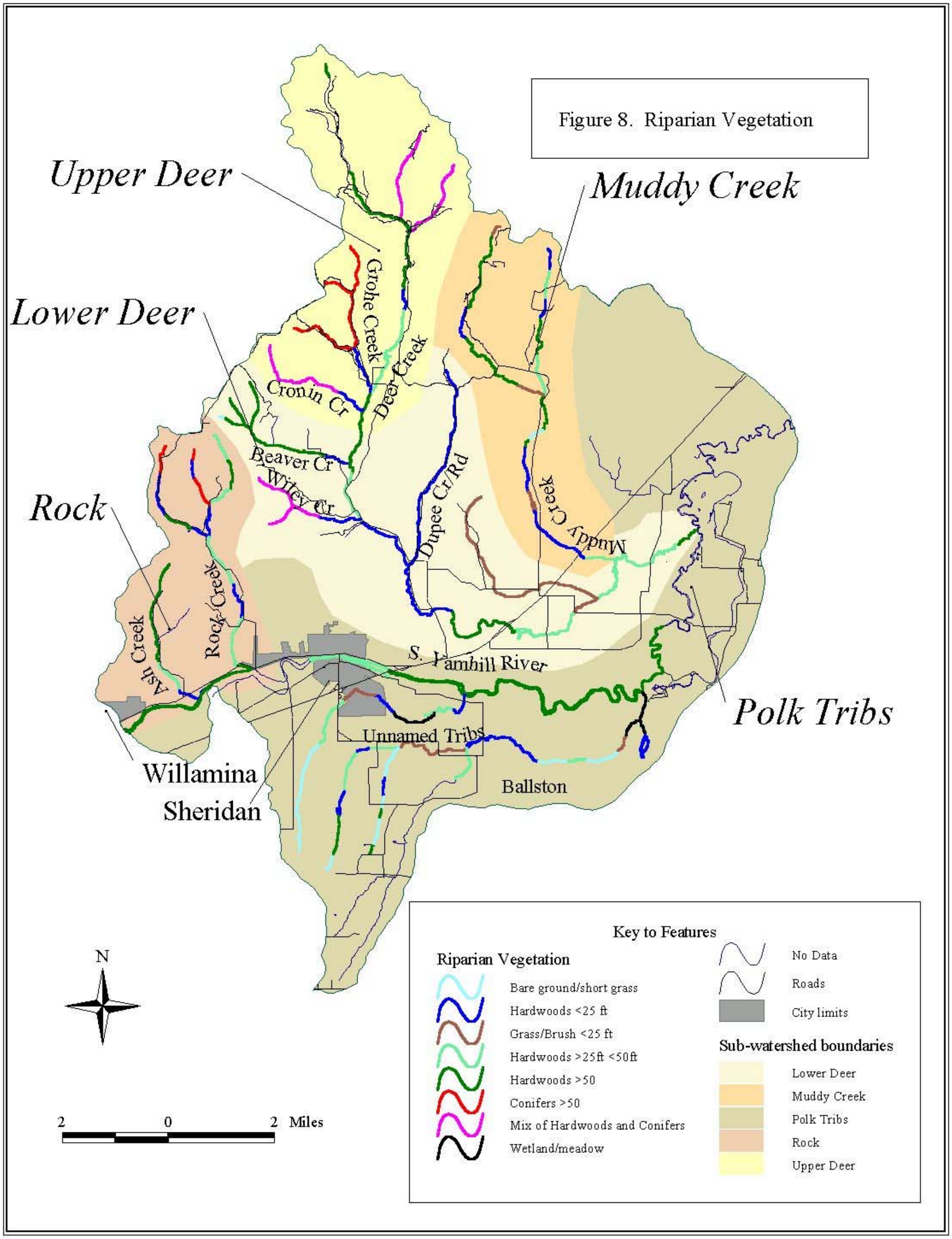


Table 14. Riparian Condition Units for Watershed

Riparian description	Length (miles)	Percent of total
Bare ground/short grass	5.5	5%
Hardwoods <25 ft	23.1	20.8%
Grass/brush <25 ft	4.6	4.1%
Hardwoods >25 ft < 50 ft	21.7	19.5%
Hardwoods > 50 ft	40.9	36.8%
Conifers > 50 ft	5.7	5.1%
Mix hardwoods/conifers	7.4	6.7%
Wetland/meadow	2.1	1.9%
Total	**111**	**100%**

Wetlands

Introduction

Oregon Division of State Lands defines wetlands for the removal-fill program as:

> [Wetlands are] those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

There are many different types of wetland, but they share three characteristics: water, saturated soil, and wetland plants.

1. An abundance of water from either high water table, rain water "perched" over impervious layers in the soil, frequent flooding, or groundwater seeps is necessary. However**, there does not need to be visible water year round**. This is the area of wetland determination that people find most difficult to understand. Water levels vary from year to year and season to season within a given year. That is why standing water is one of three components that examined.
2. Saturated soils called hydric soils.
3. A plant community called hydrophytes, plants with special adaptations for life in permanently or seasonally saturated soils (DSL, 2000).

Sometimes we refer to wetlands as swamps, marshes, or bogs. They can be wet meadows, swales, seasonal seeps, and sometimes ditches. Wetlands can be dry during the summer months. It is beyond the scope of this document to give in-depth explanations of the delineation and designation process as many volumes of information have been written on the subject. *Refer to the wetlands resources list at the end of this chapter for more information.*

In order to be considered a wetland, a piece of land must meet two of the three criteria. Agricultural areas are assessed on the basis of hydrologic conditions and soils since wetland vegetation is not present. The absence of wetland vegetation does make delineation more challenging, but if a piece of land meets the other two criteria, it is considered wetland. An area does not have to be mapped by the state or otherwise designated to fall under regulations (DSL, 1991).

Wetlands play several critical roles in watershed health. Their role includes:

- the ability to connect uplands and aquatic ecosystems
- the ability connect lakes, streams, rivers and riparian areas to each other
- the capture of sediment from run-off
- removal of nutrients from the system
- improve groundwater recharge
- maintain base flows to streams
- provide water storage during high flows
- provide habitat to wildlife and rare and endangered species
- provide humans open space, outdoor recreation, education, and for aesthetics.

Not all wetlands provide all of these benefits. Each type functions differently, and individual wetlands function at different levels. It is beyond the scope of this assessment to evaluate the functions and condition of each wetland in the watershed. Rather, this assessment will provide the background as a starting point for further investigation. *Refer to the wetlands resources list at the end of this chapter for more information.*

Several agencies are involved in the regulation and protection of wetlands including: Oregon Division of State Lands (DSL), State Department of Forestry under the Forest Practices Act, U.S. Natural Resources Conservation Service under the Farm Bill, and the U.S. Army Corps of Engineers under the federal Clean Water Act and Harbors Act. Permits for work taking place in wetlands or for their creation and enhancement are issued through DSL. If you are beginning a project and are not sure if you have wetlands or not, DSL is a good place to begin and find out what permits are necessary.

Methodology

The first step in examining the wetlands in the watershed was to gather the Soil Surveys of Yamhill and Polk counties with information on areas prior converted outlined by the Natural Resource Conservation Service (SCS, 1974 scale 1:20,000), National Wetlands Inventory (NWI) maps (NWI 1976, 1982, scale 1:24,000 and 1:62,500), USGS topographical maps (scale 1:24,000) and black and white aerial photos (1994 flyover, scale 1:660).

As part of the National Wetlands Inventory, the U.S. Fish and Wildlife Service has mapped the wetlands using color infrared aerial photographs with a scale of 1:58,000. Most wetlands on the map are not field-verified. The minimum acreage mapped is 2 acres, so smaller wetlands do not appear on the maps. Wetlands that are cultivated and cropped are not included in NWI maps, but may be regulated. *Further information on NWI maps available from the DSL publication: Just the Facts #1.*

The USGS streams and roads, and NWI wetlands were traced onto a base map. The hydric soils were outlined on the soil maps and added to the base map. The hydric soils for Yamhill County were available in a digital format and are shown in Figure 9. The hydric soils for the section of the watershed in Polk County do NOT appear on the map included in this document. They were not available in a digitized format in the same projection as the rest of assessment data. For questions regarding the location of these soils, contact the Yamhill Basin Council because they will have the base map with this information.

The shape and size of the wetlands is not represented in the map included in this assessment. Rather, the approximate locations are noted with striped polygons. Because the wetlands, for the most part, are too small to be seen at the scale of the map included here. The actual size and shape of the wetlands as well as more exact location can be viewed on the base map or on maps from NWI, again contact the Yamhill Basin Council.

The connection of the wetlands to surface water was also determined. This information is in the wetland data sheets (contact the Yamhill Basin Council for more specifics).

Wetland Distribution and Trends

The distribution and acreage of wetlands in the watershed is only a *rough* estimate of the total wetlands actually in the watershed. As was stated earlier, the NWI maps are not very precise at the small scale. The majority of wetlands in the watershed are linear wetlands – too narrow to be mapped in acreage.

On Figure 9, it can be seen that the area of hydric soils is much larger than the area that is currently designated as wetlands. Most of the wetlands occur in the low elevations and areas with low slopes and these have been converted for farmland. The entire town of Sheridan rests on hydric soils which is an indicator that the area was probably a wetland at one time as the historic vegetation map also indicates (See Figure 7).

As was stated earlier, the vast majority of the land under cultivation in the watershed, (greater than 50 percent and maybe up to 80 percent) also uses tile to drain excess water from the landscape. There has not been any monitoring to document this, and the records of tiles and drainage are not open to the public. However, this is the estimate by NRCS staff who work in the area. The drainage tiles have created a situation where the water isn't being stored in the system throughout the year. Now, many former wetlands are classified as prior converted. The designation of prior converted means that the area was wetland at one time, but has been converted to another use, in this instance farmland, prior to the enactment of legislation to protect wetlands.

Wetlands are most commonly classified using the Cowardin system of classification. The Oregon Department of State Lands uses this system to describe the wetlands in the state. These are also the descriptions that are used on the National Wetlands Inventory Maps. Use of this terminology makes it easy to compare wetlands across the state. More specific descriptions are used when developing Local Wetlands Inventories (LWI). Local wetland inventories are usually completed as a partnership between the Oregon Division of State Lands and a community.

Figure 10 shows the wetland classifications that apply to the watershed. The chart moves from the general description on down to more specific descriptions. Each wetland marked on a NWI map has a code associated with it. For this watershed, each wetland is assigned a general code of palustrine or riverine. More than 80% of the wetland in the Lower S. Yamhill-Deer Creek watershed are in the palustrine category. Then, the wetlands are described further by subsystem

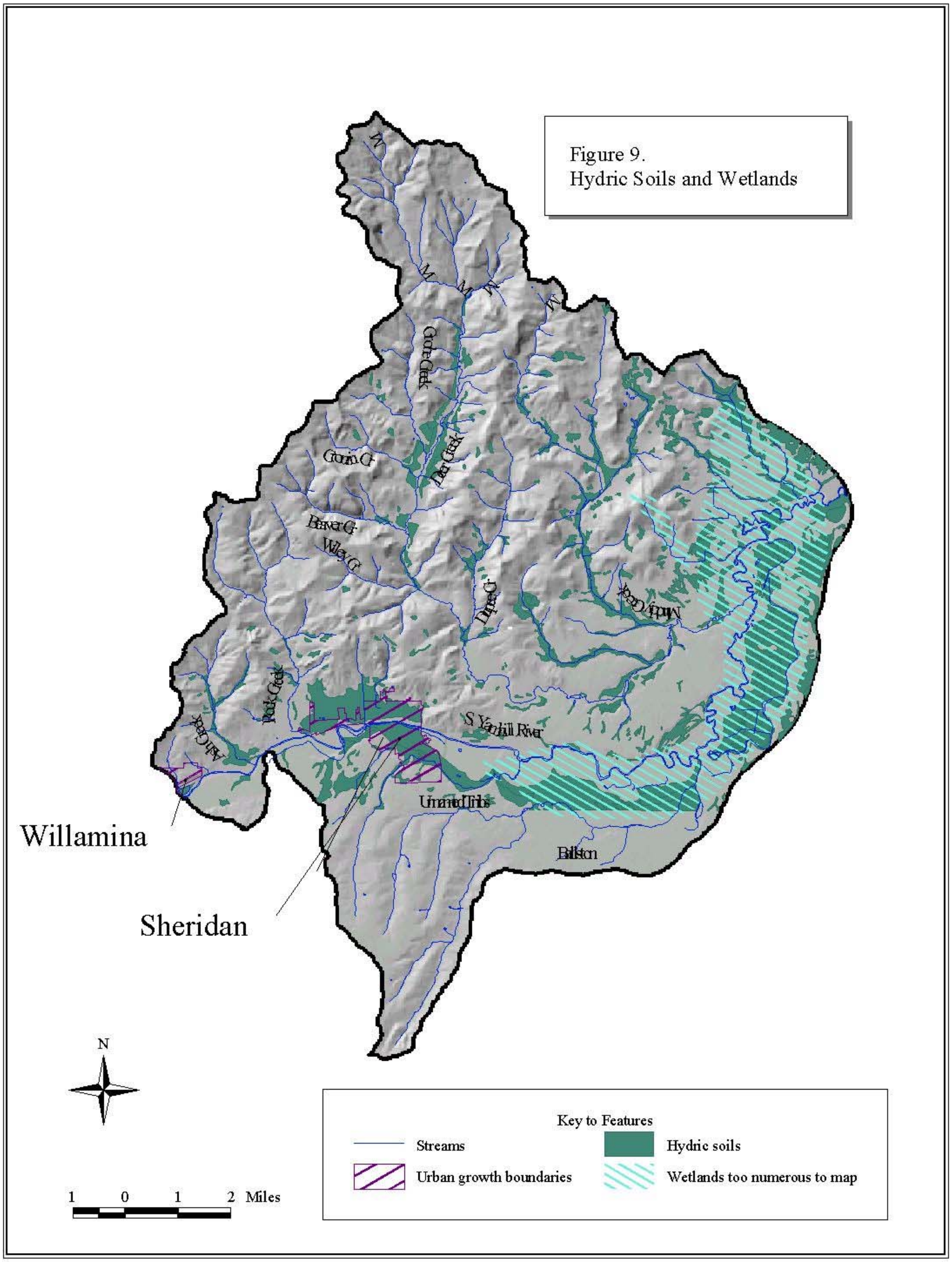


Figure 9.
Hydric Soils and Wetlands

codes which describe the hydrologic conditions (only applies to Riverine systems). The final level is the class level, which describes the vegetation or substrate. The classification system includes modifiers that can by applied to describe human alterations to the wetland.

Figure 10. Wetlands Descriptions

Ecological System

Palustrine (P) These are the freshwater wetlands commonly referred to as marshes, bogs, and swamps. Included are wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and some non-vegetated wetlands that do not meet the criteria for Lacustrine wetlands.

Riverine (R) River, creek and stream habitats contained within a channel, where water is usually, but not always flowing. Riverine systems are usually unvegetated but may include nonpersistent emergent vegetation; Palustrine (persistent vegetation) wetlands are often adjacent to Riverine system or contained within them as islands.

Classes

Aquatic Bed (AB)
Wetlands and deepwater habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season during an average year.

Emergent Wetland (EM)
These wetlands have rooted herbaceous vegetation standing above the water or ground surface.

Unconsolidated Bottom (UB)
Includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7cm) and a vegetative cover less than 30%.

Scrub-shrub Wetland(SS)
Wetlands dominated by shrubs and tree saplings that are less than 20 feet high.

Forested Wetland (FO)
Wetlands dominated by trees that are greater than 20 feet high.

Special Modifier

Farmed (I)
Farmed wetlands are wetlands which have been manipulated and cropped before December 23, 1985, but which continue to exhibit important wetland values. In addition, farmed wetlands include areas which pond water for 15 consecutive days during the growing season. Farmed wetlands are subject to federal wetland jurisdiction.

Diked/Impounded (h)
Created or modified by a manufactured barrier or dam that obstructs the inflow or outflow of water.

Excavated (x
Lies within a basin or channel excavated by human means.

Conclusions

Historically, wetlands were much more extensive than they are today. With European American settlement, the Kalapuya Indians' burning of these areas ended, allowing woody vegetation to move in. Over the past century and a half, wetland acreage has been significantly reduced through draining and tiling in order to make agricultural land available. Wet prairie is now almost non-existent in the watershed. It once played a significant role for providing habitat for fish and other wildlife, provided off-channel storage of flood waters, and groundwater recharge to the system during low flow summer months, to name a few of the valuable functions that are currently in deficit.

Wetland restoration and enhancement projects could help restore some of these functions to this system in localized areas. It is important to realize that the land that has been converted in many cases, such as the town of Sheridan, will not be reclaimed. The next steps will involve determining where the best opportunities exist to enhance or restore wetlands. A good place to start could be by completing a local wetland inventory for Sheridan. DSL funds are available to begin this process. Also, funds could be sought to assist local landowners with enhancement or restoration projects on land that floods seasonally. The NRCS office in McMinnville is a good place to start to gather information on what programs are available.

Resources for Further Information on Wetlands:

Oregon Freshwater Assessment Methodology (OFWAM)
Wetlands Program
Oregon Division of State Lands
775 Summer Street NE
Salem, OR 97310

Wetland Bioassessment Fact Sheets
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, and Watersheds Division
Washington, DC
EPA843-F-98-001

References

Farrell, Patricia. *Personal communications* Winter 2000.

Morlan, Janet C. Oregon Division of State Lands. Wetlands Program "Wetlands Inventory User's Guide. National Wetlands Inventory and Local Wetlands Inventory." 2000 May.

National Wetlands Inventory. Department of the Interior. Fish and Wildlife Service. Quads: Ballston, Sheridan, Muddy Valley, McMinnville, and Fairdale.

Oregon Division of State Lands. Wetlands Program. Just the Facts #1. 1991 June.

U.S. Department of Agriculture, Soil Conservation Service. (SCS). 1982. *Soil Survey of Polk County, Oregon*. Yamhill County NRCS office, McMinnville, OR.

U.S. Department of Agriculture, Soil Conservation Service. (SCS). January, 1974. *Soil Survey of Yamhill County, Oregon*. Yamhill County NRCS office, McMinnville, OR.

Chapter 6 Channel Modifications

Introduction

The OWAM describes channel modifications as dams, dredging or filling of water bodies or wetlands, splash damming, hydraulic mining, stream cleaning, rip-rapping or hardening of the streambanks. I am enlarging this category to include road and stream crossings and streams with a permanent discontinuity due to a road running parallel to the stream.

Channels are dynamic systems that respond to physical watershed features with or without human involvement. This section examines how humans have impacted the channel morphology or structure, and aquatic habitat. This information is a compilation of the historic conditions, CHTs, and channel modifications.

Methodology

The channel modification section was completed by gathering historic information from residents, fill and removal permits and streambank hardening projects (such as rip-rapping) were gathered from DSL, dam information was collected from WRD and the BLM, road discontinuities were gathered from aerial photos, and FEMA floodplain maps were also examined.

Historical Channel Modifications

The streams of the watershed (with the exception of the South Yamhill River) historically were not used as transportation for either logs or people according to life long resident Glen Grauer. Grauer has lived in the watershed over 70 years and remembers the old log flume that transported logs from upper Deer Creek to another mill closer to Sheridan. The flow in Deer Creek was not substantial enough to support log transport.

Agriculture has had the greatest effects on stream morphology in the watershed. Historical air photographs large flooded or wetland areas along the South Yamhill in 1948. The photos of the watershed in 1948 show the channels of Deer Creek, Muddy Creek, and the South Yamhill in virtually the same locations as they currently occupy. However, on the land adjacent to those streams, oxbows and flooded land are clearly visible (Oregon State University Library Photo Archive). On the air photos from 1994, some of the oxbows are still visible on the tilled land. Over the last 100 years, large areas of wetland have been drained and tiled to make more land available for cultivation. Estimates cultivated land in the watershed that has undergone drainage and tiling run upwards of 50 percent (NRCS personnel, 2000).

Roads parallel nearly every stream in the watershed as can be seen in Figure 11. This construction leads to the need for channel hardening and bank stabilization so that channel movement does not disrupt the extensive road network. This has affected the channels in two ways: first, by constraining the flow to one

> *Historic Roadways*
>
> *An 1878 map of the watershed shows an area intensely fragmented by homesteads and a network of access roads. Gopher Valley Road adjacent to Deer Creek, Latham Road connecting Gopher Valley with Muddy Valley, and State Highway 18 between Shipley and McMinnville are all visible on the historic map (BLM, 1998).*

channel bed, the stream loses its ability to meander to disperse energy. Second, due to being constrained, the stream maintains a high velocity, begins to downcut and erodes the channel. Other human interventions, such as draining and tiling of wetlands and removing intermittent streambeds by reshaping the land, have also contributed to the downcutting of the streams. Roads next to the stream also result in the loss of side channels, lateral pools, and riparian function.

Due to the proximity of roads to the streams, the roads have to cross the streams multiple times. Additionally, private residences that access their property on either side of a stream also require a bridge or culvert. Figure 11 shows each stream and road intersection in the watershed. From this, it is easy to see that the streams do not have much opportunity to meander. This is addressed in greater detail in the sediment section of this assessment. Table 15 gives the miles of roads and streams both perennial and intermittent. Notice that a road parallels nearly every mile of perennial stream. This is discussed further in Chapter 7 on sediments of this document.

It is also not uncommon for small natural drainages to be disked and plowed during the dry season. These small intermittent tributaries are also referred to as get-away ditches. The removal of these channels and the installation of drainage tiles allow land to dry out faster in the spring and permit farmers access to their fields earlier in the season. Small tributaries are likely to be farmed over as well, but these are difficult to find on air photos and none of the intermittent tributaries were examined for this assessment.

Table 15 Roads and Waterways

Streams	Roads
Miles of perennial stream **171**	Miles of road within 200 ft of perennial stream **140**
Total miles of stream in watershed both intermittent and perennial **427**	Total miles of road **343**

It is difficult to assess the extent and location of historic channel modifications other than those visible from air photos. The fill and removal permits database from the Division of State Lands was queried to find what historic modifications had taken place. Several of the files were missing, however those that could be examined found several instances of channel modification.

In 1978, DSL gave two permits to landowners along the South Yamhill River for the removal of over 50,000 cubic yards of gravel, silt and sand that had formed an island in the river. This gravel island resulted from the actions of a commercial gravel company forced out of operation in the 1950s. A diversion dike had been left in place in the river and had filled with gravel and sand over the 30 years, creating a large island and forcing the river's flow to the north bank.

According to the permit applicant, 5 to 15 feet of the bank eroded over a 700-foot stretch of stream in one year. The concern over continued erosion prompted the landowners to apply for a permit to dredge out this material and deposit it upland on the north side of the river. The file at DSL does not give any information on this project's outcomes. There are however several memos from a DEQ employee who expressed concern over the removal of this amount and type of material. He wondered why a permit would be granted to remove gravel that salmon need from a river to a location 400 feet away. These concerns are not further elaborated upon in the file.

Several other permits detail the hardening of Deer Creek and the South Yamhill in many locations. The waterways were rip-rapped and dredged in several locations during the 1970s in an attempt to control flooding. One project removed large trees from the banks of Deer Creek in order to place riprap.

In the 1990s, the permits reflect the changing attitudes toward water storage. Several permits were granted for projects to flood areas and restore wetlands in the watershed. One project removed a section of tile line to create a wetland and pond. Another created a wildlife stock pond and deepwater habitat. A building development that filled a wetland on the south side of town in Sheridan resulted in a mitigation project creating an educational wetland enhancement at the local middle school.

Dams are mapped on Figure 11. Dam types, purposes, and sizes are noted in Table 16 (Dam data available from the Water Resources Department web page).

Table 16. Dam locations and descriptions.

Dam I.D. Number	Name (number on map)	Year Completed	Owner Type	Purpose	Dam Length (ft)	Dam Height (ft)	Storage (acre/ft)	Surface Area	Drainage Area (sq. mi.)
OR-00485	Lillie Walker Irrigation Pond (1)	1969	Private	Irrigation	1800	10	98	19.40	0.30
OR-00510	Crowe Reservoir 2 (2)	1971	Private	Irrigation	570	24	80	10.50	1.06
OR-00618	Walker Reservoir 2 (3)	1977	Private	Irrigation	2740	10	152	17.70	0
OR-00662	Blue Earth Reservoir (4)	1979	Private	Irrigation	1950	12	82	11.50	0
OR-00983	GreenCrest Memorial Park Assoc. (5)	NA	Private	NA	NA	21	12.5	NA	0
OR-03017	Shaffer Reservoir (6)	1987	Private	Irrigation	450	15	13.0	2.80	0.64

Dam locations and dimensions are only given for those dams that meet the criteria to be monitored as such. According to Jon Faulk of WRD, only those dams that exceed 10 feet in height need a dam permit. Smaller structures would have water rights permits, and not be a part of this database. Faulk also notes that a structure less than 10 feet high could have a storage pond of 9.2 acre feet which is approximately 3 million gallons of water stored.

The dam structures with a zero in the drainage area column are off-channel storage. Those with a number in the drainage area column, representing the square miles being drained, are in-

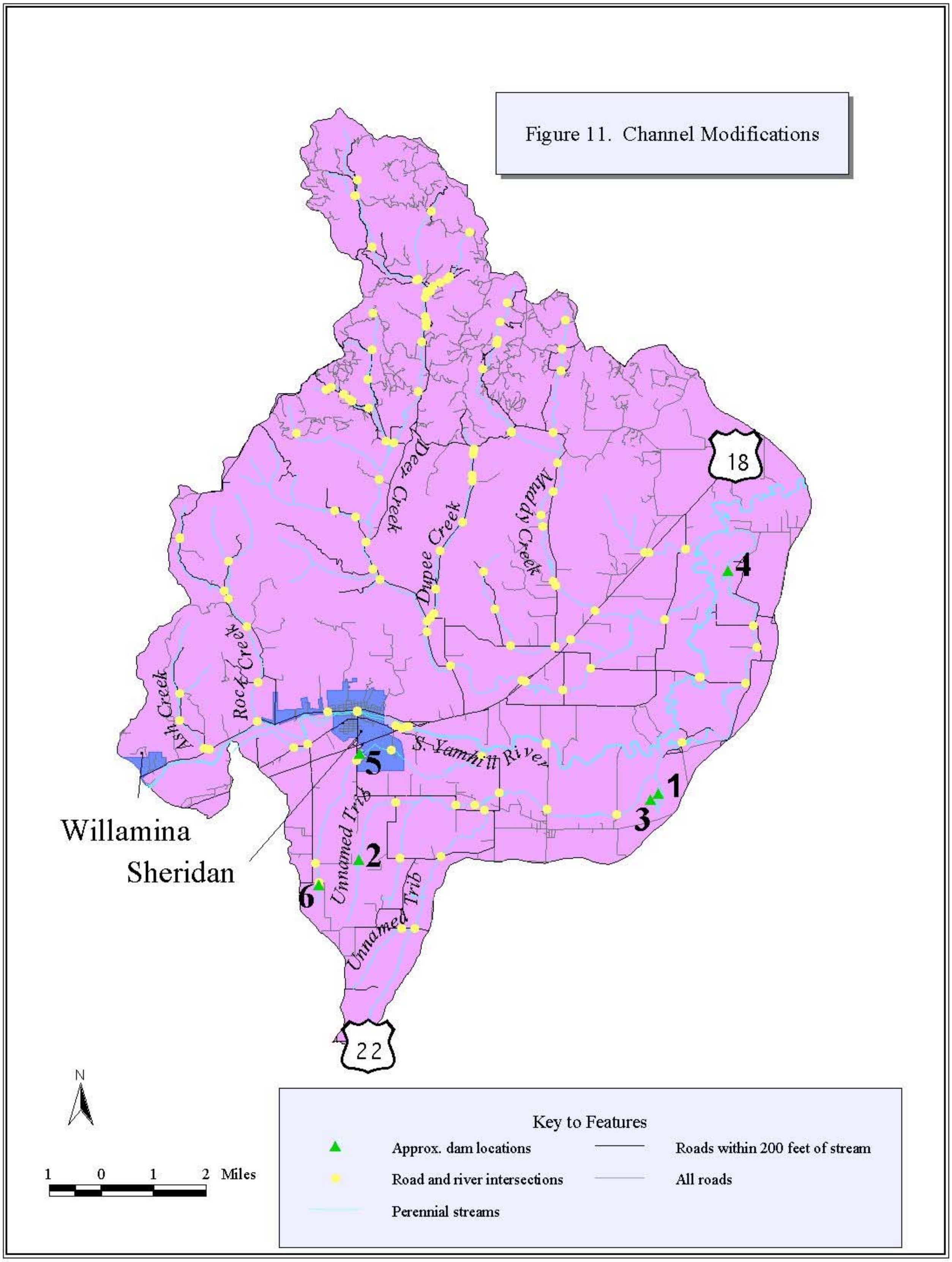


Figure 11. Channel Modifications
18
Deer Creek
Dupee Creek
Muddy Creek
Ash Creek
Rock Creek
S. Yamhill River
Unnamed Trib
Unnamed Trib
Willamina
Sheridan
1
2
3
4
5
6
22
N
1 0 1 2 Miles
Key to Features
Approx. dam locations
Road and river intersections
Perennial streams
Roads within 200 feet of stream
All roads

channel storage. In-channel storage is important to note because of its possible effects on non-native fish introduction, loss of spawning and rearing habitat, possible migration barrier, and water quality impacts. These dams need further investigation to determine if temperature or fish passage are issues for any of them.

The Federal Emergency Management Agency 100 year flood-plain map is included in this section as Figure 12. Unfortunately, it was not available in another format, so it is not the same size as the other maps. Figure 12 shows all of Yamhill and Polk counties instead of just the watershed. The names of the streams are written in, as is the town of Sheridan. Notice that the town of Sheridan is almost entirely within the 100 year floodplain of the South Yamhill River. By some accounts, residents of Sheridan reported that the South Yamhill did not flood into Sheridan during the 1996 floods. The flooding that occurred in town was a result of the old pipes in the storm water system that did not move storm water through the town quickly enough. As a result, some homes and streets backed up with storm water. The river however, stayed its banks.

According to others however, the river did make a significant impact on flooding in the neighborhoods closest to the river and water reached historic heights. This discrepancy in memory of the flood height could be attributed to which side of the river people's homes were located. The significance of 100 year flood plain information is explained further in the hydrology section of this document.

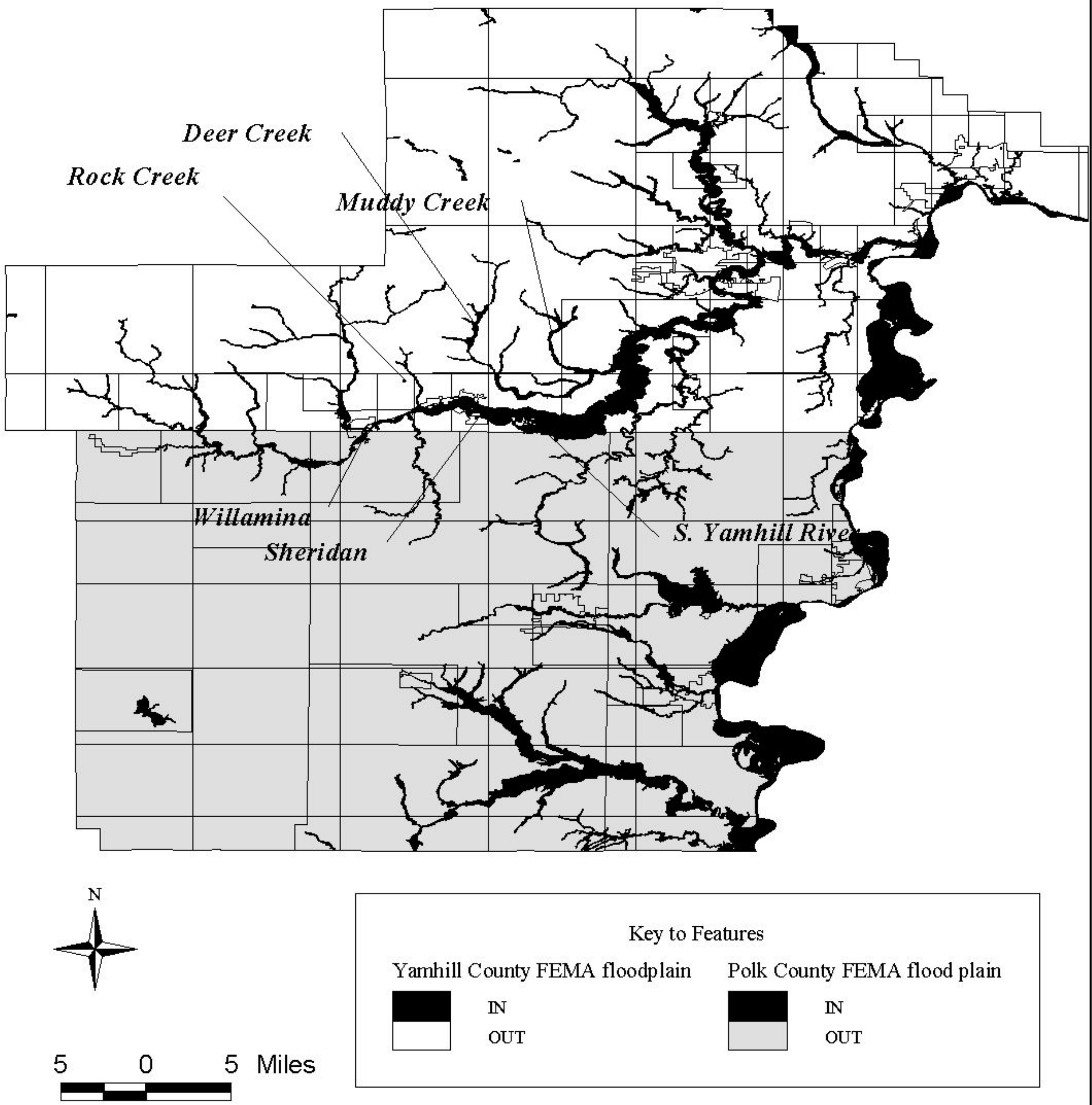
The South Yamhill River historically would have been a meandering river that would routinely flood its banks, change directions and carve side channels. The landscape there now clearly shows this, as does the historic vegetation map. Wet prairie and ash forests were the dominant vegetation along the river according to land surveys from the 1800s (see Chapter 4 on vegetation for a map of the historical conditions).

Currently, the river is restricted to one channel, has lost many of the side channels, and no longer routinely floods. It is unlikely the historic conditions will be returned. The river now flows through many communities on its way to the Willamette River and the land being farmed on its former flood plain is too valuable. What can be done to enhance the river as it exists? There are opportunities for enhancing the vegetation to provide more diversity. Where possible, land owners with land that floods year after year (such as the confluence of Deer Creek and the South Yamhill) could be encouraged to leave that land undeveloped and allow it to provide off channel water storage and a wetland area for wildlife. This is an area that needs further examination.

Deer Creek also has a significant flood plain that has been developed for housing and agriculture. Even now with the concern for protecting water quality and stream function, land is being developed along Deer Creek. Deer Creek is deeply incised, however it did top its banks during the 1996 floods and routinely floods along its slower moving sections during heavy winter rains. It cannot however change its course too dramatically because Gopher Valley Road parallels it along nearly its entire length.

The restoration and enhancement section of this document discusses some of the projects that have been done or are in the works that address some of these issues.

Figure 12.
100 Year Flood Plain



Covered
- FEMA (Federal Emergency Management Agency) 100-year flood plain maps.
- National Wetland Inventory (NWI) maps.
- USGS quadrangle maps 7.5 minute scale.
- USDA Farm Service Aerial photographs (1:660).
- Yamhill County road maps.
- Division of State Lands fill and removal permits

Not Covered
- Not all areas were field verified.
- Historical logging and county road maps.

Chapter 7 Sediments

Introduction

Sediments are of great concern in the watershed due to their effects on water quality and aquatic resources. Erosion features actively contributing sediment to streams are landslides, roads, and streambanks. Bank erosion potential is greatest in the lower elevation main channels where soils and banks contain mostly fine material and few coarse fragments so they erode easily. This is also where stream entrenchment encourages lateral scour of the streambanks (BLM, 1998). This is evident along Deer Creek, as well as the South Yamhill River.

Information on roads and their sediment contributions is limited to county and BLM roads. Private timber companies roads are not in the GIS database. In the watershed, there are 5 miles of BLM roads on BLM lands, 2 miles of private road on BLM lands, and 1 mile of BLM roads on private lands. Overall road density is 2 miles per square mile (BLM, 1998).

The water draining from roads can move considerable amounts of sediment from the inside drainage ditches and unpaved road surfaces. The road ditch is filled in with sediment from ravel, sliding and erosion of the road cut slope. Usually, roads are designed so water flowing through the ditch picks up this sediment as it flows into streams or small draws. It is important to remember ditches drain directly to streams.

The amount of sediment potentially contained in runoff from any single road is difficult to estimate because road conditions can change so rapidly. A road surfaced with high-quality rock can be quickly reduced to a quagmire if water is allowed to pool during wet weather and there is heavy truck traffic. Conversely, a road with a poor-quality surface may not degrade much at all it if used mainly during dry weather (OWAM, 1999).

Sediment contributions from agricultural land were not carefully examined for this assessment. The manual is concerned about areas with steep slopes and most of the land under cultivation in the watershed is on relatively low slopes.

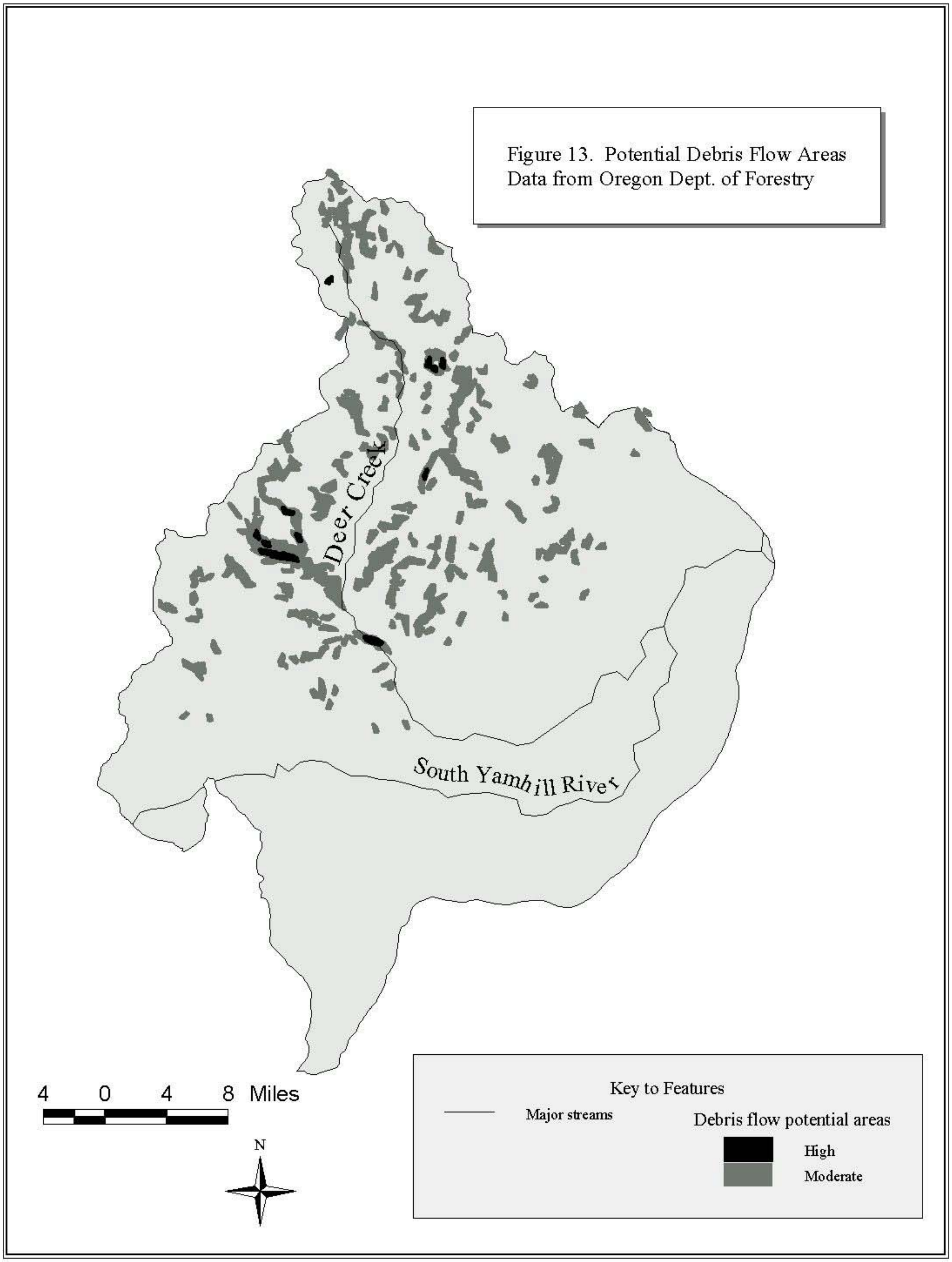


Figure 13. Potential Debris Flow Areas
Data from Oregon Dept. of Forestry

Unfortunately, there was not enough time to cover each area of the sediment assessment. What follows is a brief overview of sediment sources in the watershed, areas that are in need of further investigation, and some of the projects and concerns.

Conditions

A major concern about erosion is the contribution from forested areas that are being logged. Figure 13 shows the areas that the Oregon Department of Forestry has classified as having a moderate or high potential for debris flows. Debris flows are initiated by landslides on steep slopes that quickly transform into semi-fluid masses of soil, rock and other debris. Typically they scour materials for a portion of their travel distance and move rapidly down steep hillslopes and confined channels. Very small landslides can become large debris flows, so this map does not indicate minimum size (ODF, 1999).

These determinations were made with a model that took geology, slope steepness, information from the 1996 floods, historical information on debris flows, and fan shaped land formations below long steep slopes into account. They do not represent areas that have slides and they are not predicted slide areas. They are only to mark areas that have a high likelihood of sliding and thus contributing sediment to the system. The areas with the greatest potential are those closest to the Coast Range in the Upper Deer subwatershed. Private timber companies own most of this land. For further information on this map and how it was produced point your browser to: http://www.odf.state.or.us/his/pdf/debrismap.pdf

The contribution of forested areas to sediment load was not examined. The lack of steep slopes and absence of rain on snow events lead to the conclusion that forested areas do not contribute significant sources of sediment.

The roads section was given a cursory examination. Yamhill and Polk counties maintain all but a few dozen miles of the 342 miles of road in the watershed. The BLM maintains fewer than a dozen miles of road, as do private timber companies on their own land (these roads are not assessed for this section and are not mapped). Yamhill County maintains the vegetation in its ditches by mowing. However, Yamhill county does not mow all the ditches in the agricultural areas, only those where visibility is an issue are mowed. In Polk County, a herbicide is applied to manage the vegetation in the ditches.

Dave Carter of Yamhill County Public Works believes the rural roads in the watershed are high use roads. This is due to the amount of logging activity in the Upper Deer subwatershed and the surrounding forested land that is outside of watershed, but utilizes the roads in the Lower S. Yamhill-Deer Creek watershed. He also asserts that the maintenance load is about the same as it was ten to twenty years ago. There are not many new roads in the watershed.

Recognizing that rural roads contribute significant amounts of sediment to waterways, the Yamhill Basin Council formed a Roadside Water Quality Committee that meets to discuss how to change management practices related to county roads. Currently, the members include representatives from the Yamhill Basin Council, Yamhill and Polk County Public Works Departments, Yamhill Soil and Water Conservation District, Oregon State University Extension, and Oregon Department of Transportation. They have developed a plan for improving the conditions of the ditches in Yamhill County through a seeding project. The implementation of the plan is starting this summer. The goal is to improve the ability of the ditches to transport water while leaving the soil in place. This is accomplished through reshaping the ditch, preparing a good seed bed by eliminating weeds, and seeding a low growing grass such as creeping red fescue or the bluegrass "fowel" in the ditch.

Ditches in Yamhill county are re-ditched on a ten year rotation, seven to eight years would be ideal, but budget constraints prevent that schedule (Carter, 2000). Some areas have yearly maintenance and others only every twenty or so years. Ideally, re-ditching would be restricted to the driest months of the year to prevent sediment from the exposed surface from entering the waterways. However, due to the amount of work that needs to be done, road ditching is scheduled year round. Most gravel road grading occurs during the winter months when the road substrate has enough moisture to be reshaped.

County road maintenance personnel also respond to complaints from citizens on ditch failures or blockages. Often when ditch failures occur, there is an obvious source for the excess water or the blockage. Examples include: apple trees next to a ditch – the unpicked apples fall and plug the ditch; lawn waste dumped into ditches, drainage tile lines from agricultural land routed directly to a ditch, overwhelming the ditch system during high flows. These are actions that individuals can take responsibility for changing. Everything that is in the ditches eventually makes it to the streams and creeks.

If you would like further information on roadside seeding or other road related issues contact the following and ask for the "Roadside Vegetation Management" brochure:

Yamhill Soil and Water Conservation District
(503) 472-6403
2200 SW 2nd Street
McMinnville, OR 97128

Polk Soil and Water Conservation District
(503) 623-9680
580 Main Street, Suite
Dallas, OR 97338

Chapter 8 Hydrology and Water Use

Introduction

The general pattern of water movement is called the hydrologic cycle. It has six main components including precipitation, interception, surface run-off, ground water flow, transpiration, and evapotranspiration. Human activities influence all of these to some degree and affect some more than others. It is beyond the scope of this document to address all of these areas.

This section covers the hydrology of the watershed as it relates to flood history, land use and the probability that different land uses significantly affect peak low and high flows, and water rights. Precipitation was addressed in the introduction section, and will be covered briefly again in this section.

Floods

There is no USGS or OWRD gaging station within the watershed. Therefore, the records of Whiteson gaging station, with nearly the same elevation, precipitation, and geology are used to estimate flow patterns. The amount of water in the Yamhill River at Whiteson is very different from the amount of water in Deer Creek, but the pattern of precipitation and peak flow generating storms is similar so the data can be used to examine flow patterns and history.

Streamflow records at the Whiteson gaging station were used to document past floods in the year 1941 to 1991, see Figure 14. Following 1991, there are no records of continuous flow data at this location.

Table 17. Floods in the South Yamhill Watershed

Date of Crest
December 23, 1964
January 21, 1972
January 16, 1974
December 22, 1955
November 16, 1973

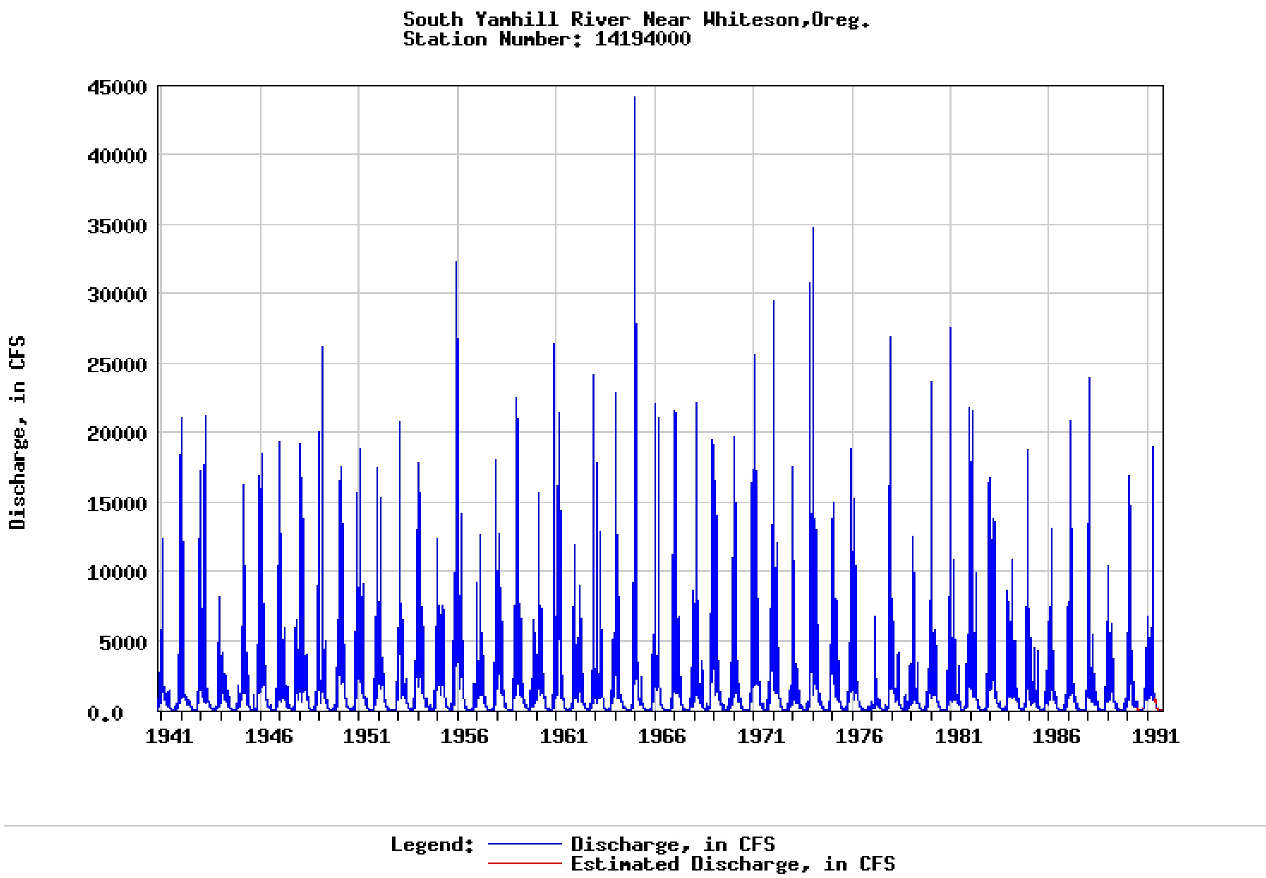
Peak flows describe the highest flow of water in a stream, usually measured annually. They are not necessarily floods. The rainstorms that cause peak flows in the watershed occur during the months of October through May in an average year. The watershed seldom receives significant amounts of snow.

The amount of precipitation that falls is not the only factor that influences the peak events. Stream flows are influenced by uses such as drinking water withdraws, irrigation withdraws, stream channel modifications, changes in land use and practices, and upstream vegetation removal such as clearcuts. These actions affect the amount of water that is present in the streams, as well as the rate of release of water into the stream, and how fast water enters a stream during a storm event. For example, if a formerly braided channel is channelized to one specific channel bed, that stream will no longer store water across the landscape. The flow will more rapidly enter the main channel during rain events, leaving less water available to gradually enter the channel over a longer period of time. Human changes in the landscape can cause areas to drain more rapidly than they would naturally which leads the stream to reach a higher peak faster than it would naturally.

Peak Flows

Drainage tiles, ditching, rip-rapping stream banks, and channel straightening all change the way water flows across the land and enters a stream. Drainage tiles provide a way for water to be transported quickly off the land and into the nearest body of water. These human changes can be seen in all the sub-watersheds. Although documenting their locations was not possible for this assessment due to time. Drainage tiles in agricultural lands and road ditches are widespread throughout the entire basin. Human influenced peak flows can cause flooding, increase bank erosion, or deepen channels through incision.

Figure 14. Historical Streamflow Daily Values Graph for South Yamhill River near Whiteson,OR (14194000) Peak and Low Events most Clearly Seen Values



Flow data was collected on the south Yamhill River at Whiteson gaging station (gage # 1419400) located just off Hwy 99 north of Whiteson where the river flows under the road. It drains an area of 502 sq. miles, and is located 82.3 feet above sea level (Water Resources website).

Low Flows

Low flows are the lowest flow rates for a given stream over a given time period, usually recorded annually. Low flows are important in order to understand stream heating and pollution. Low flows lead to increases in stream temperatures and decreased water quality conditions, which adversely affect aquatic habitat for some species. When there is less water in channel, it is easier for the sun to heat it. Also, low flows do not dilute pollution, and so water quality can be impaired. Low flows also restrict water use for consumption for junior users (this is covered in greater detail in the Water Rights section). Low flows are influenced by the same factors as high flows, ditching, tiling, etc. The two types of flow go hand in hand – if you have a stream that experiences extreme peaks, it will likely experience extreme dips.

Floods

By looking at the historic streamflow records it is possible to determine the probability that low or peak flow events will occur. However, this information is not available for the watershed other than the mainstem of the South Yamhill River. Models have been developed to examine the relationship between precipitation and land uses to predict flood recurrence levels without actual flow data. That is beyond the scope of this document. Even areas where flow records exist, predicting floods is not exact. The best records in Oregon only date back 100 years. Most areas have a much shorter record to examine. For the watershed, these records do not exist. We assume that the floods on the South Yamhill River were also flood events on its tributaries.

The state climatology service examines weather trends for Oregon and believes the state has a 20-year wet and 20-year dry cycle. The significance of this for flood information is that if data collected from a stream is for a 30 year period, and 20 years of that were during a dry cycle, the flood predictions will be different than if the data were collected during a 20 year wet cycle.

Concept of Flood Frequency

Flood recurrence levels are the way to express the likelihood of a given flood event occurring in a given year. Flood frequency is based on historic records of flow at stream gaging stations. It is a measure of probability. A one hundred-year flood has a 1 in 100 chance of occurring in a given year. Over the course of 30 years (the average length of a home mortgage), there is a 26% chance that there will be a 100 year flood. The longer one waits, the greater the possibility of a flood event occurring.

A map of the county and the flood plain as outlined by the Federal Emergency Management Agency (FEMA) has been included, Figure 12. The projection of this data did not match with existing data for the watershed. The four rivers in the watershed with floodplain are labeled.

Sources of Error in Determining Flood Levels:
1. Length of record that statistics are based on. The shorter the record, the greater the error. Many stream gages in Oregon have only been recording data for 30 years. For a record 25 years long, there is an 85% confidence level. This means that the probable height of a 100-year flood can be off by 15%.
2. Conditions in the watershed may change over time. Increasing urbanization tends to increase the size of a flood for the same amount of rain. This means the mapped 100-year flood plain may be out of date.

Summary

Peak and low flows are influenced by human land uses. Activities such as the clear-cutting in the Upper Deer subwatershed, agricultural practices in the Lower Deer, Polk Tribs and Muddy subwatersheds, and urban development along the South Yamhill River impact the speed with which water moves through the watershed. Some land use practices lead to an increase in the peak flows during winter storms and exacerbates low flows during the summer months.

What this means for salmon
Rearing habitat (streams where juvenile salmon live) requires certain flow. Whether or not the flow in Deer Creek is sufficient for this is unknown at this point since there are no measurements telling how much water is actually in that stream in the summer, nor is there data for the other South Yamhill tributaries in the basin. The data that does exist shows that water demand is higher than water availability and yet Deer Creek and the South Yamhill River do not run dry in the summer months. This is an area that needs further investigation, especially of flow and actual water usage.

Water Rights and Use

Under Oregon law, all water is publicly owned. Therefore, before surface water is used, a water right needs to be obtained. In some cases, water rights are needed for ground water as well. Water rights need to be obtained for the use of water from a creek, stream, or river even if the water is for domestic use. Landowners with water flowing through their property do not have an automatic right to use that water. They need to obtain a permit from the state (WRD, 1997). Water rights are issued through an application process administered by Oregon's Water Resources Department.

Seasonal water demands are exceeding water supplies with growing frequency. Competition between instream and out-of-stream uses is intensifying (Willamette Basin Report, 1992). At present, no further water rights are being allocated for Deer Creek. Applications are accepted and kept on file, but the present over-allocation during most of the year (April – December) prohibits further rights from being issued for those months (Ferber, 2000).

Since there is no historic streamflow data available for the watershed, OWRD determines the water availability with a computer model. More information on the model can be obtained from the WRD.

Deer Creek is currently over allocated. This means when summed, the allocated water rights are greater than the estimated flow in the river. If all water rights were exercised, the river would be dry. However, this simplification of the watershed does not take into account that water removed for uses such as irrigation or domestic use will flow back into the system, or that users may not exercise their entire right. Also the time of day that the water is used is not taken into consideration.

Oregon water law states that water rights that are not exercised for five consecutive years are forfeited. However, there is no system in place to monitor or regulate the amount of water withdrawn by users unless they have a meter, which is rare. Therefore, it is difficult to determine the amount of water actually being used by irrigation.

Figure 15 shows the land area with irrigation rights, as well as the points of diversion for wells. This map shows only approximate locations for wells and approximate acreage with water rights. The well diversion points are supplied by the well log database maintained by the Oregon Water Resources Department. The contractors who dig the wells supply the data to OWRD. That is

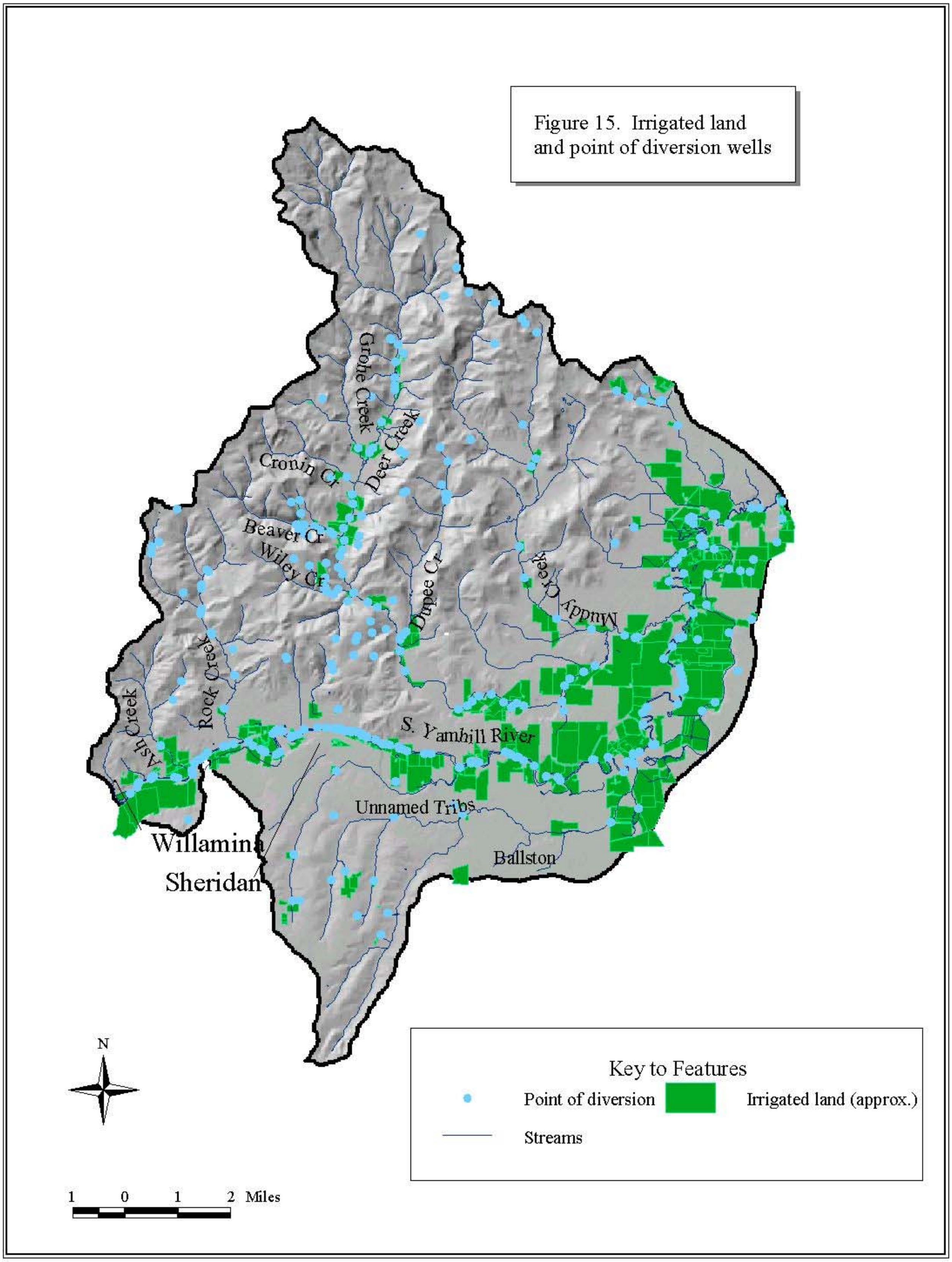


Figure 15. Irrigated land
and point of diversion wells
Grohe Creek
Deer Creek
Cronin Cr
Beaver Cr
Wiley Cr
Durpee Cr
Muddy Creek
Rock Creek
Ash Creek
S. Yamhill River
Unnamed Tribs
Ballston
Willamina
Sheridan
N
Key to Features
Point of diversion
Irrigated land (approx.)
Streams
1 0 1 2 Miles

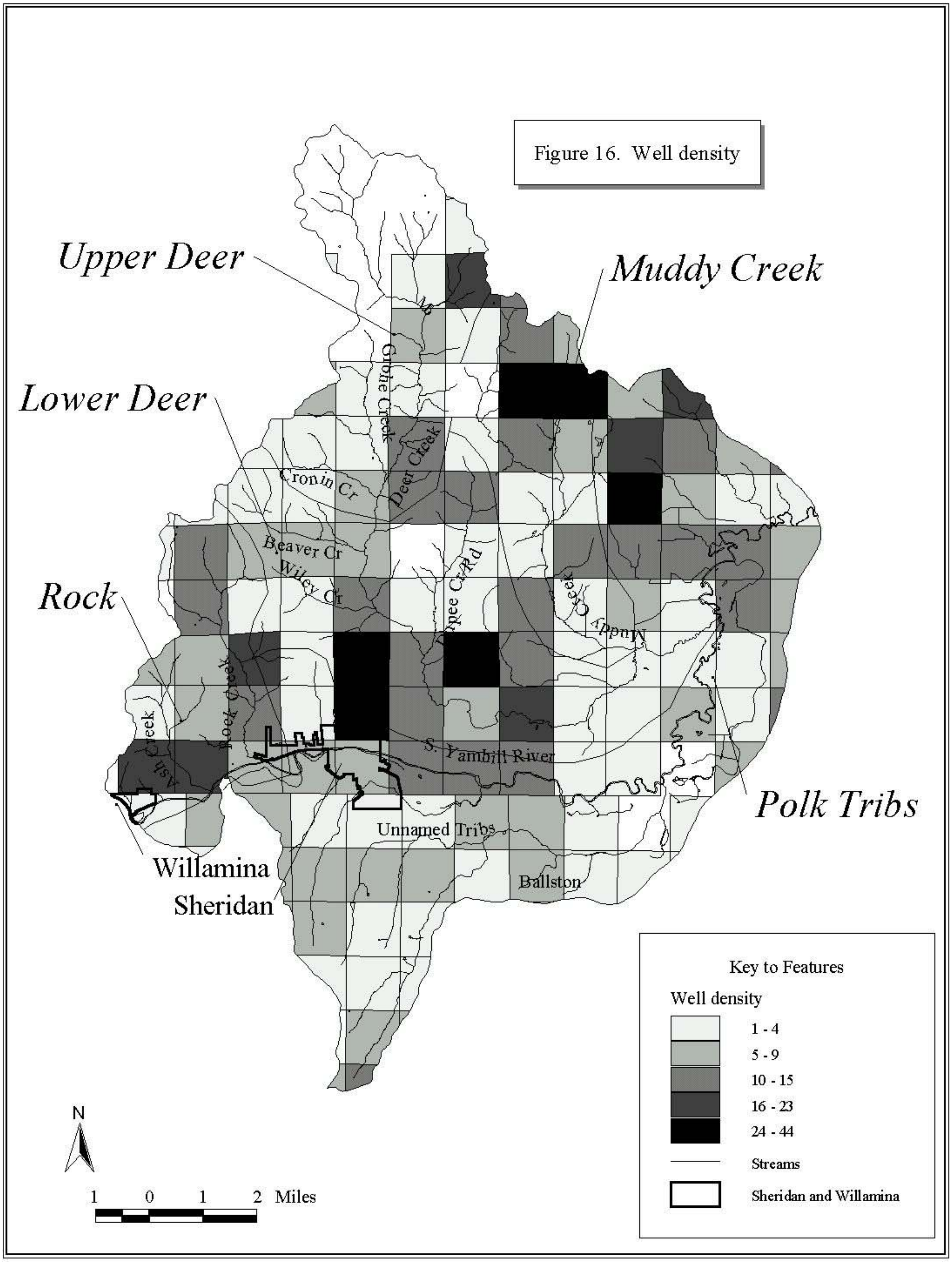


Figure 16. Well density
Upper Deer
Muddy Creek
Lower Deer
Rock
Polk Tribs
Willamina
Sheridan
Gobhe Creek
Deer Creek
Cronin Cr
Beaver Cr
Wiley Cr
Rock Creek
Ash Creek
S. Yamhill River
Muddy Creek
Unnamed Tribs
Ballston
Key to Features
Well density
1 - 4
5 - 9
10 - 15
16 - 23
24 - 44
Streams
Sheridan and Willamina
N
1 0 1 2 Miles

why the locations are approximate. Additionally, the dots do not represent specific wells, just the location within a township, section, and range. This map was developed with assistance from Karl Wozniak of the Oregon Water Resources Department. Wozniak cautioned that the polygons representing the area under irrigation were mapped in the early 1990s, and therefore may not capture all current water rights. However, this area of the basin has not seen much new irrigation development in the past 10 years, so the map is probably fairly accurate. As well, these polygons represent the areas with rights to irrigate that acreage. It does not mean those rights are being exercised and may not actually be irrigated. In fact, most of that area is in grass seed production (see Figure 6) and is likely not in need of irrigation.

The well data was analyzed using ArcView to look at the distribution and concentration of domestic wells by section. This analysis does include wells for irrigation, livestock, or monitoring. Local residents had expressed some concern that the homes built along Gopher Valley Road could be responsible for the drying out of some springs in the watershed. This map does not give an answer to that concern, but is a place to start when addressing the issue. Figure 16 illustrates that the highest concentration of wells occurs near the towns of Sheridan and Willamina, and along Peavine Road on the northeastern border of the watershed.

The flows in the South Yamhill River are also too low during summer months to meet out-of-stream demand and the instream water rights (Willamette Basin Report, 1992). Table 18 summarizes the quantity (cfs) and percentage of the total for each type of permit for Deer Creek and all its' tributaries. The right with the greatest number of permits is for irrigation with a distant second domestic use. Notice that fish and wildlife do have some water rights. However, these are likely junior rights, and they are for a very small amount. This means that in the event all the water rights needed to be exercised (if there was a drought for example) the more senior users would be satisfied first. The instream rights to protect water availability for fish are newer rights that would not be met unless all the more senior users were satisfied first (Ferber, 2000).

Table 18. Water Right Types by Quantity and Distribution

Water Right Type	Percent of Total	cfs
Irrigation	70%	17.74
Fish/Wildlife	0.01%	0.03
Agriculture	9%	2.31
Industrial	0	0
Municipal	0	0
Domestic	21%	5.37
Recreational	0.01%	.01
Miscellaneous	0.01%	.01
Total	100%	25.47

Water Storage

The only major reservoirs in the watershed are for the water supply for the town of Sheridan. The reservoirs receive their water from springs outside of the watershed. They also receive flow during the winter months. When these reservoirs are drawn down, Sheridan does have the capability of pumping water from the Yamhill River to the water treatment plant.

There are also a number of small dams throughout the basin that provide water storage to the individual landowners. Collectively, they are not storing significant amounts of water, but they may affect the stream they are built on by restricting all flow during summer months. These dam locations are marked on the map for the Chapter 6 Channel Modifications.

Water Rights and Stream Flow

Water rights in the watershed exceed the available flow during the summer months. When this happens, senior users are granted their full right and junior users are in line after them in order of permit date. Junior users can be told to stop using water if a senior user is unable to exercise his/her full right due to low flows caused by too many users.

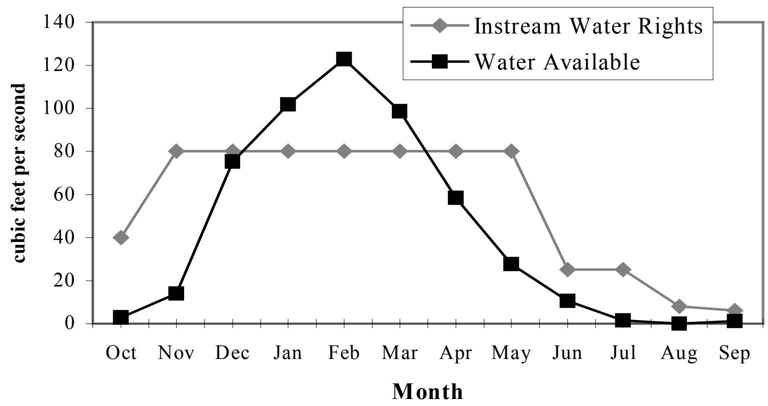
An *Online Introduction to Oregon's Water Law and Water Rights System* on the website for OWRD states,

> "Watermasters respond to complaints from water users and determine in a time of water shortage who has the right to use water. They may shut down junior users in periods of shortage.
>
> Watermasters work with all of the water users on a given water system to ensure that the users voluntarily comply with the needs of more senior users. Occasionally, watermasters take more formal actions to obtain the compliance of unlawful water users or those who are engaged in practices which "waste" water. The waste of water means the continued use of more water than is needed to satisfy the specific beneficial use for which the right was granted.
>
> Instream water rights are not guarantees that a certain quantity of water will be present in the stream. When the quantity of water in a stream is less than the instream water right, the Department will require junior water right holders to stop diverting water. However, under Oregon law, an instream water right cannot affect a use of water with a senior priority date (OWRD 1996)."

According to Bill Ferber, the WRD watermaster for this area, conflict seldom happens. On paper, Deer Creek appears over-allocated, in reality; users have not been denied access to water. How is this possible? Ferber has two hypotheses to explain this situation: 1) users are not exercising their full right since we have had good rain the past ten or so years, lowering irrigation demands, and 2) he suspects that much of the irrigation water eventually works through the water table and re-enters the stream. Another possibility is that users are not all taking the water from the stream at the same time of the day. Some may remove water at night or in the evening while others are removing water during the day.

When the human uses are combined with the instream water rights for Deer Creek, the actual flow is exceeded nine months of the year. This is illustrated in Figure 17. The net flow of Deer Creek comes from a model developed by the WRD and does not represent actual flow from a given year.

Figure 17. Net Flow Versus In-stream Water Rights



A lack of sufficient summer streamflow to dilute pollutants and support aquatic life (including salmonids) is an issue throughout the Willamette Basin, Lower S. Yamhill-Deer Creek watershed included. The primary source of water to the streams in summer is groundwater. Summer flows are naturally low due to the lack of precipitation in the valley during summer months, and the lack of snow melt in the Coast Range to augment flow. This condition is worsened by out-of-stream demands especially for irrigation (Willamette Basin Report, 1992).

At this time, there are no plans for the basin or the state to change the way water rights are allocated or to increase the enforcement of the "use it or lose it" policy. However, this discrepancy between available water and water rights has not been tested by a severe drought (necessitating that more users exercise their irrigation water rights) or by crops that necessitate large amounts of supplemental water, such as nursery crops (Wozniak, 2000).

Time constraints and the unavailability of some data resulted in some of the components of the hydrology section not being addressed. These are outlined below.

Covered:
- Flood history
- Peak and low flow analyses
- Road density
- Water use and availability

Not Covered:
- Impacts of land use on peak and low flows

Chapter 9 Water Quality

Introduction

This section provides a screening level assessment of the water quality in the watershed. This is a broad overview and addresses water issues not examined in the other sections including: temperature, dissolved oxygen, pH, nutrients, bacteria, chemical contaminants, and turbidity. This section provides a starting point to analyze the water quality of the watershed. It is important to note temperature, dissolved oxygen, pH, and bacteria data available for the watershed is for the years 1970 to 1988. No further monitoring or sampling for these areas has been done in the watershed since the late 80's with the exception of some temperature monitoring conducted by Boise Cascade in the headwaters Deer Creek in the summer of 1997.

Problem areas would need further evaluation before restoration or enhancement would take place. For example, the mainstem of Deer Creek is in violation of the temperature standard according to the available data. Before attempting to decrease the stream temperature by planting trees, an assessment of the water availability and stream temperature monitoring could be done to determine if the stream is out of compliance with the standard at this time and where to begin restoration or enhancement efforts.

The method of analysis for this section involved (1) identifying the beneficial uses for the watershed (2) selecting the appropriate water quality criteria to apply, and (3) assembling existing water quality data for the watershed.

Beneficial Uses

In-stream water quality is maintained to protect "beneficial uses." These are legally defined in the Oregon Water Quality standards to include: domestic water supply, fishing, aesthetic quality, resident fish and aquatic life, salmonid fish rearing, salmonid fish spawning, and water contact recreation.

In most cases, the most sensitive of these uses is maintaining water for the rearing and spawning of salmonids. Salmonids serve as an important indicator of the overall health of the stream. If salmon are not spawning in areas they were found historically, then the quality of that water body may be impaired. Salmonids need specific water conditions for spawning and rearing fry and juvenile fish. They are very sensitive to changes in water quality at these early stages in development.

Recognizing this need for specific conditions for the success of salmonid reproduction and growth, the state set standards to measure water quality. The national government also has standards for water quality. When the federal standards are violated, the stream becomes "listed" under the 303(d) rules of the Federal Clean Water Act. Listing means the water body is not in compliance with the law, and steps need to be taken to bring it into compliance. The Oregon Department of Environmental Quality administers the rules and manages the data that caused the stream listing.

In Lower S. Yamhill-Deer Creek watershed both Deer Creek and the South Yamhill River violate some of the standards. The details of these listings are shown on Table19.

- Bacteria (from the mouth to the headwaters in Deer Creek)
- Temperature (from the mouth of Deer Creek to Little Deer Creek)
- Bacteria, Flow modification, and Temperature (Salt Creek to Willamina Creek on the South Yamhill River).

The DEQ also maintains a list of water bodies that need to have more information collected. Deer Creek has two areas that need more information to determine if they should be on the 303(d) list or not: flow modification and sedimentation. The South Yamhill River has one area in need of further investigation; sedimentation. Table 20 lists these streams and the basis for the listing.

Table 19. Water Quality Limited Streams from 303(d) list

Stream Location	Parameter examined	Criteria	Season of concern	Basis for Listing	Supporting Data
Deer Creek, mouth to headwaters	Bacteria	Water contact, recreation	Winter, spring, summer, fall	DEQ data; d1 in 305(b) report (DEQ, 1994); NPS Assessment – segment 375: severe, observation (DEQ, 1988)	DEQ data: 19% (3 of 16) samples exceeded standard (data from 1986-1988)
Deer Creek, mouth to headwaters	Bacteria	Water contact, recreation	Summer	DEQ data, d1 in 305(b) report (DEQ, 1994); NPS assessment severe, observation (DEQ, 1988)	DEQ data 63% (5 of 8) samples exceeded standard (data from 1986-1991)
Deer Creek, mouth to Little Deer Creek	Temperature	Rearing of salmonids 64 F (17.8 C)	Summer	DEQ data (Temperature Issue Paper, 1994); NPS assessment moderate, observation (DEQ, 1988)	DEQ data 64% (9of 14) samples exceeded temperature standard in WY 1986 and 1988
S. Yamhill, Salt Creek to Willamina Creek	Bacteria	Water contact, recreation	Summer	DEQ data; d1 in 305(b) report (DEQ, 1994); NPS assessment, severe, observation (DEQ, 1988)	DEQ data, 44% (4 of 9) samples exceeded standard (1986-1988)
S. Yamhill, Salt Creek to Willamina Creek	Flow modification			USGS (1990), IWR (ODFW); WRD data; ODFW (1990); NPS assessment moderate observation (DEQ, 1988)	Cutthroat populations are a stock of concern with low flows and high temperatures constraining populations in some coast range streams (ODFW, 1992); in-stream water right is often not met at UGS gage 14194000
S. Yamhill	Bacteria	Water Contact,	Fall,	DEQ data, d1 in	DEQ data 20% (3 of

River Salt Creek to Willamina Creek		recreation	winter, spring	305(b) report (DEQ, 1994); NPS assessment, severe observation (DEQ, 1988)	15), 17 % (2 of 12) FWS values exceeded (1986 – 1988)
S. Yamhill River Salt Creek to Willamina Creek	Temperature	Salmonid rearing 64 F (17.8 C)	Summer	DEQ data (Temperature Issue Paper, 1994); NPS Assessment; moderate, observation (DEQ, 1988)	DEQ data 75% (9 of 12) samples exceeded temperature standard with exceedences each year

Table 20. Water Bodies of Concern

Stream Location	**Criteria**	**Basis for Consideration of Listing**	**Listing status**
Deer Creek, mouth to headwaters	Flow modification	NPS assessment, segment 375: moderate, observation (DEQ, 1988)	Need data
Deer Creek, mouth to headwaters	Sedimentation	NPS assessment, segment 375: moderate, observation (DEQ, 1988)	Need data
S. Yamhill River Salt Creek to Willamina Creek	Sedimentation	NPS assessment, segment 462: moderate, observation (DEQ, 1988)	Need data

Explanation of parameters used for listings

Fecal coliforms

Fecal coliforms are microorganisms that indicate when feces (animal or human) is present in the water and warn us of the associated pathogenic health hazards. Sources of bacteria include wastewater treatment facilities, faulty septic systems, runoff from animal husbandry, and wild animals. Figures 18 and 19 show DEQ's data that support the 303(d) listing for Deer Creek and the South Yamhill River.

Since the time of this listing, DEQ has changed the fecal indicator from the bacterial group of fecal coliforms to a subset of that group known as *Escherichia coli (E.coli).* The change is to improve the accuracy of the standard. Fecal coliform standards will be established for the watershed using this new technique during the total maximum daily load process scheduled for the Yamhill Basin in 2007. This process will assess the 'natural' or background concentrations of fecal pollution and then establish a threshold by which the watershed will be monitored (Bower, 2000).

Figure18. S. Yamhil River Fecal Coliform Data from DEQ (1986-88)

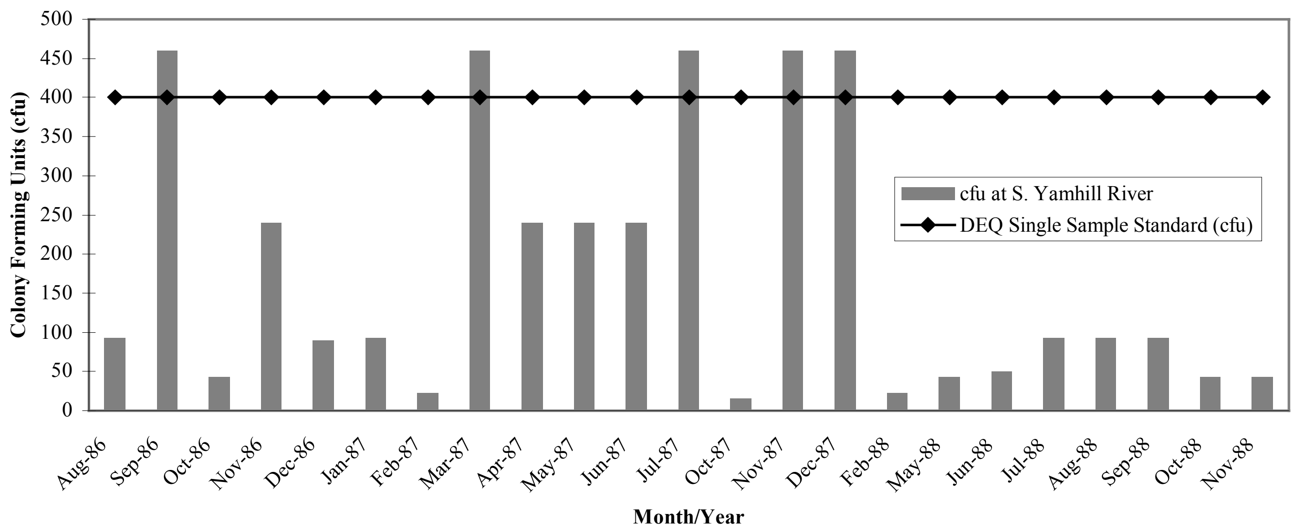
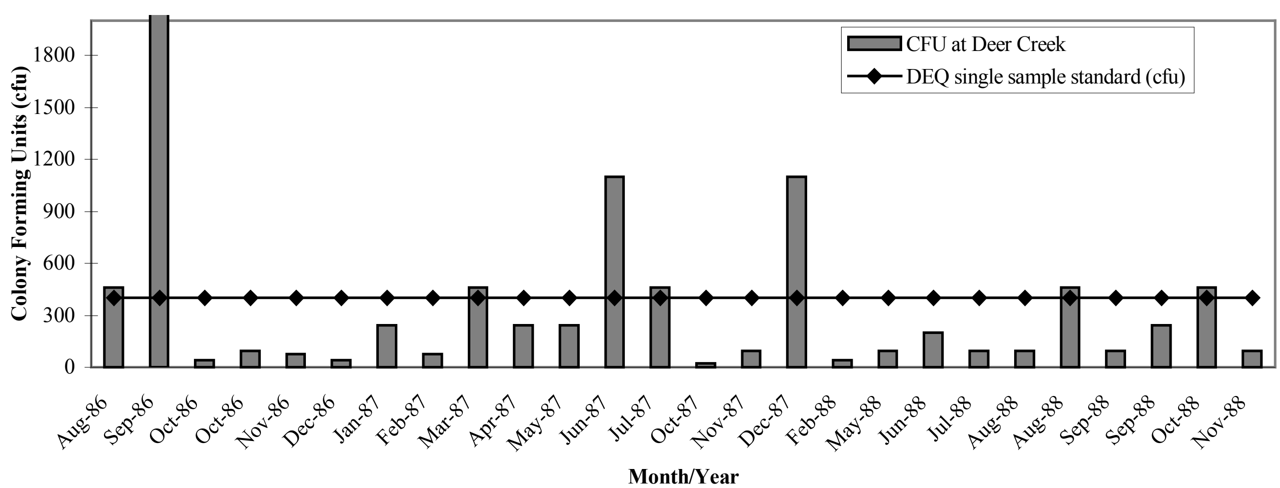


Figure19. Deer Creek Fecal Coliform Data (DEQ 1986-88)



Temperature

The maximum seven day average temperature standard for the watershed is 64°F. This means that over any seven-day period during the hottest time of the year, the average of those seven daily stream temperatures is not to exceed 64°F. During spawning season for winter Steelhead, the seven-day moving average temperature is not to exceed 55°F in order to support salmon spawning, egg incubation, and fry emergence from the egg and from the gravels. These standards are widely debated because temperature cycles vary daily and seasonally, and different life stages and species of fish exhibit different tolerances (OWAM, 1999).

How high temperatures affect fish

- High temperatures can be stressful to fish and even lethal.
- High temperatures increase metabolism, and fish cannot eat enough food to maintain body weight.
- As temperatures increase, salmonids become less competitive in catching food and lose their appetites (WSLG, 2000).

Deer Creek and the South Yamhill River are on the 303(d) list for temperature. This means they do not meet the temperature standard outlined above. Figures 20 and 21 show the data used to establish these listings. Deer Creek was listed from the mouth to the headwaters until 1997. Temperature data, collected by Boise Cascade, showed that from Little Deer Creek to the headwaters, the river did not exceed the standard. Now, the listing for Deer Creek is from the mouth to Little Deer Creek at river mile 12. DEQ temperature data for Deer Creek was taken where Delashmutt Lane crosses the creek.

The South Yamhill River is listed for temperature along its entire length. The readings used for the table are from DEQ data gathered below Sheridan where Highway 18 crosses the river.

No further temperature monitoring has been conducted at either site since the eighties other than the monitoring done by Boise on upper Deer Creek. The Yamhill Basin Council will have one site on Deer Creek and another on Muddy Creek the summer of 2000.

When DEQ begins working on the TMDLs for The watershed, they will examine temperature and determine if 64 degrees is an attainable temperature for the watershed. People have expressed concern that historically; Deer Creek and the South Yamhill River were not at or below 64 degrees. There is no historic temperature data to examine to make this determination. There is no current monitoring of the temperature along the length of the stream to determine the area where the temperature violates the standard. The DEQ readings that were taken during the 70s and 80s were taken near the mouth of Deer before it enters the South Yamhill. Deer Creek is likely at its warmest at that juncture.

Dissolved Oxygen

Dissolved oxygen (DO) is important to support cold-water organisms such as salmon and trout. Throughout their lifecycle, these species have different dissolved oxygen demands. The Oregon Water Quality Standards specify the amount of dissolved oxygen to meet the needs of these species. For the screening level of this assessment, the level of DO that is desired is 8mg/L. For Deer Creek, the DO samples range from 5.4 mg/L to 13.0 mg/L, with the majority of the samples in the 8.0 mg/L to 9.0 mg/L range, which meets the standard. On the South Yamhill river, samples range from 8.5 mg/L to 13.5 mg/L with the majority of the samples in the 9.0 mg/L to 10.0 mg/L range, which is also meets the standard.

Figure 20. DEQ Temperature Data for Deer Creek

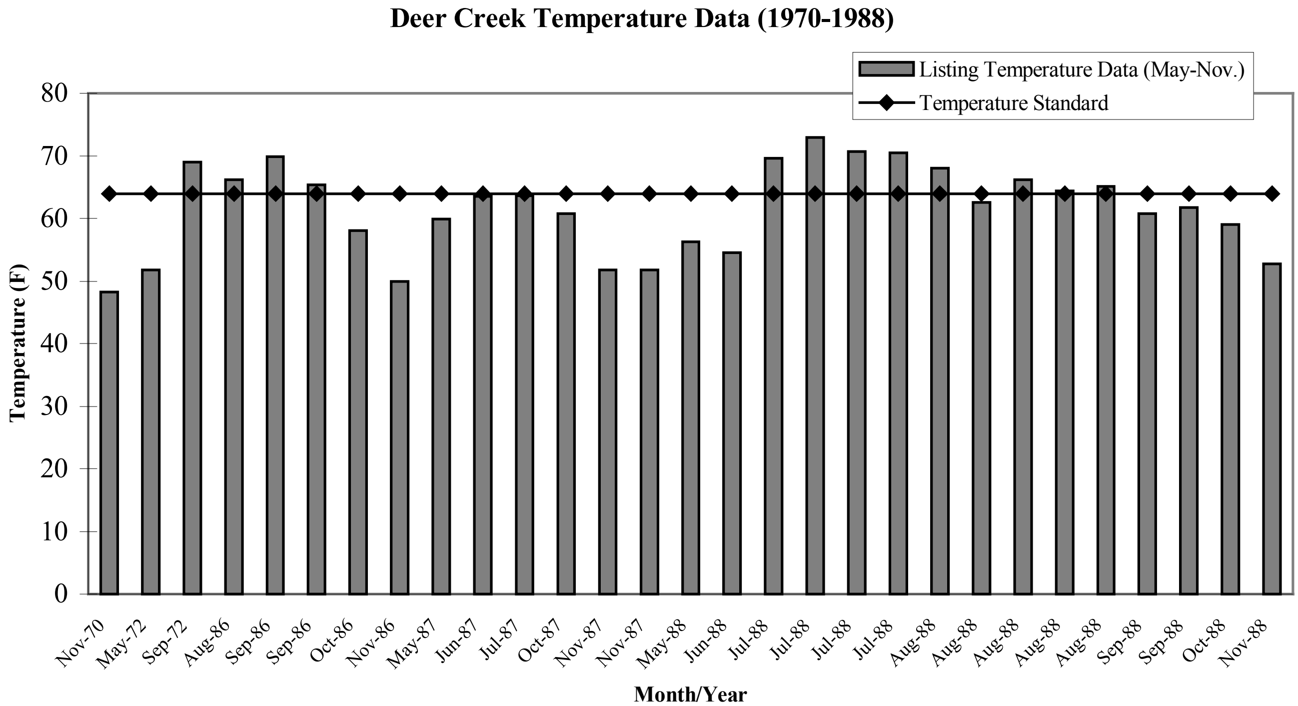
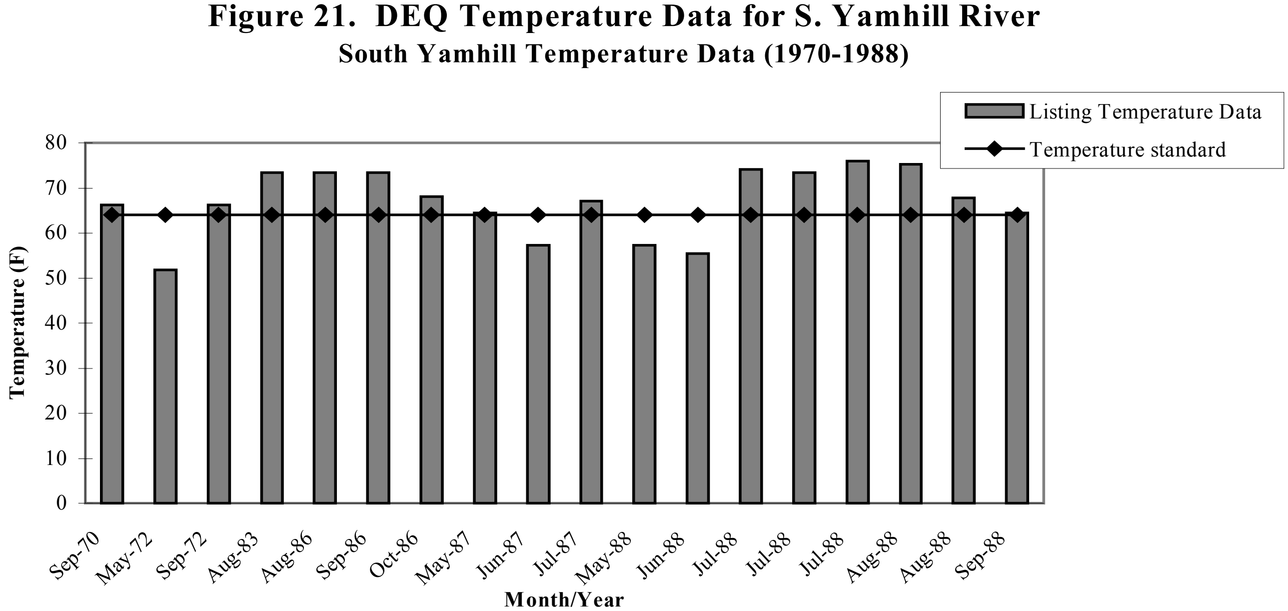


Figure 21. DEQ Temperature Data for S. Yamhill River



pH

The pH measures the hydrogen ion concentration in water. It is used to tell the relative acidity or alkalinity. Values greater than seven indicate alkaline conditions and those less than seven indicate acidic conditions. Knowing the pH of water tells us how available nutrients or toxic chemicals may be. The Oregon Water Quality Standards specify the expected pH range as 6.5 to 8.5 for basins west of the Cascades. It is important to note that pH values vary during different times of the year based on natural conditions such as photosynthesis and respiration cycles of algae present in the water.

In the South Yamhill River, pH ranged from 6.9 to 7.9 in the data from 1970 to 1988 taken from the same location as the temperature and DO readings. These readings do not violate the standards.

In Deer Creek, the pH data collected by the DEQ between 1986 and 1991 did not exceed the standards. The pH values ranged from 6.9 to 7.0. This data was taken from the same location as the temperature and DO readings.

Both of these waterbodies were within the standards when the readings were taken 9 to 12 years ago. No new data has been taken since then.

Nutrients

Total phosphorus is a way to measure the amount of phosphates in the water column and phosphorus in suspended organic material. Total nitrate is a way to measure the majority of nitrogen present in the water. Scientists identify the two as the major limits to plant growth. If there are excessive amounts of phosphorus and nitrates, plant growth increases and can be a problem in slow-moving water. Algae and other plants remove dissolved oxygen from the water, can interfere with recreation, and with certain algae, produce chemicals that are toxic to livestock and wildlife (OWAM, 1999).

A Total Maximum Daily Load (TMDL) for phosphorus has been established for both the South Yamhill River and the entire Yamhill watershed by DEQ and was approved in December of 1992. This TMDL is in the process of being implemented to control phosphorous at point sources within the basin.

Turbidity/Suspended Solids

Turbidity is a measure of water clarity. It can be caused by runoff of sediment or by suspended material such as algae. Turbidity is measured by recording the amount of light that passes through a water sample. High values (>50 Hach FTU) indicate high amounts of suspended sediments or particles in the system. Sediment affects salmonids by damaging their gills and reducing their ability to sight their prey. Sediments also clog the gravels salmonids use for spawning.

Data recorded by DEQ from 1986-88 showed turbidity levels in the South Yamhill River from 1.0 to 34.0 Hach FTU and in Deer Creek from 1.0 to 65.0 Hach FTU. This is an area DEQ lists as needing more information.

Other Contaminants: Organic Compounds, Pesticides, and Metals

The literature concerning pesticides and other water quality contaminants is extensive. Many studies have been conducted in the Willamette Basin. Most of the reports focus on the Willamette River with occasional references to the Yamhill. There is little specific information for the rest of the streams in the watershed.

In general, there are several different pesticides likely to exist in the streams and rivers of the watershed. The most commonly found pesticides in the Willamette basin are atrazine, desethylatrazine, simazine, metolachlor, and diuron (Anderson, et al, 1997).

Given the dominant upland vegetation and crops present, there are likely to be a number of agricultural contaminants in the water. According to Susanne Aldrich Markham of the OSU Extension Service out of McMinnville, diuron and metolachlor are used on grass seed fields in the basin. Atrazine and simazine are used on Christmas tree farms. Atrazine is no longer used on grass seed fields.

Aldrich-Markham asserts that glyphosate, marketed under the tradename Roundup, does not travel through the soil to reach the water table and thus doesn't pose problems for the watershed. However, according to a report by Oregon Pesticide Education Network,

> "Roundup, or glyphosate, has been publicized as an environmentally friendly herbicide that breaks down shortly after application. However, experiments have shown that glyphosate may persist in the environment for as long as 3 years (Torstensson et al. 1989). Its metabolite, AMPA, may persist even longer (World Health Organization 1994). Glyphosate is typical of many pesticides in that its breakdown is dependent upon the environmental conditions in which it is used and that the toxicity of its breakdown products is equal to or greater than the toxicity of glyphosate itself. Pesticides may remain in the environment much longer than expected or claimed, and the breakdown products may also be toxic to organisms (Oregon Pesticide Education Network, 1999)."

Roundup is applied by hand using backpack sprayers and is not used in large quantities, however it is important to note that while it has been touted as safe, there are some concerns associated with its use.

Additionally, the residents of Sheridan likely contribute significant amounts of chemicals from lawn or garden chemicals applied incorrectly. There is no direct study of this, but in the Anderson report, urban areas contributed significantly to the chemicals present in the watershed areas studied. It is likely that Sheridan is no different, although the town's relatively small population probably has a small effect on the river.

The data available on pesticides is beyond the scope of this document and could not be easily summarized. The parameters and explanations of how the research was designed are just too cumbersome to include. Additionally, the findings are so broad that it is difficult to know what is about this watershed specifically. Further information on effects of pesticides on aquatic life can be found by downloading the report found at: http://www.pond.net/~fish1ifr/salpest.htm

Covered

- Beneficial uses of water in the watershed
- Analysis of water quality data from EPA/DEQ.
- Identification of water quality limited sections of stream
- Well water information as available

Not Covered

- EPA publications pertinent to the watershed not sought.

References for Chapters 8 and 9

Aldrich-Markham, Susanne. May 2000. *Personal communications*. OSU Extension Service. McMinnville, Oregon.

Anderson et al. 1997. *Distribution of Dissolved Pesticides and Other Water Quality Constituents in Small Streams, and their Relation to Land Use, in the Willamette River Basin, Oregon 1996.* United States Geological Survey (USGS). Water-Resources Investigations Report 97-4268.

Bower, Robert. December, 1999. *Mill Watershed Assessment.* Yamhill Basin Council.

Environmental Protection Agency (EPA). 1998. *Yamhill Basin Data from STORET System Database.* Washington D.C. Contact (202) 382-7220.

Ewing, Richard D. February, 1999. *Diminishing Returns: Salmon Decline and Pesticides.* Oregon Pesticide Education Network.

Ferber, Bill. February, 2000. *Personal Communications* Water Master for Salem District, Water Resources Department. Salem, Oregon...

Oregon Department of Environmental Quality. Website: http://www.deq.state.or.us/

Oregon Water Resources Department Website http://www.wrd.state.or.us

Wozniak, Karl. March-May, 2000. *Personal Communications.* Hydrogeologist, Water Resources Department. Salem, Oregon.

Chapter 10 Fish Species, Habitat, History and Barriers

Introduction and Methodology

The objectives of this section are to identify fish species in the watershed, historical and current fish populations, current locations of these species, and to evaluate the current fish habitat conditions. The watershed has only one native anadromous species: winter Steelhead. Winter Steelhead are listed as an endangered species under federal law. But the watershed has several native fish species that will benefit from any restoration or enhancement projects and should be considered as well.

Cutthroat trout play important roles in local aquatic ecosystems. Cutthroat trout are the watershed's most plentiful salmonid, and ODFW manages habitat for these species. Since this species is more widely distributed, the effects of habitat restoration programs can be more readily discerned by looking at this species rather than focusing entirely on winter steelhead. Much attention is focused on salmon, steelhead, and trout, even though there is a great diversity of fish that go largely unnoticed (Galovich, 2000).

By understanding the current and historical fish habitats and conditions, restoration and conservation efforts can focus on those areas where they will have the greatest potential impact.

The author used the 1999 OWAM as a guide for what to include in this section. Data provided by the ODFW, BLM, and agency personnel make up the bulk of the section.

Fish History

Historical fish population information is not available. It can be assumed that prior to habitat altering practices such as extensive timber harvest, road construction, and European American settlement, fish populations were higher and more diverse.

Historically, in-stream habitat was vastly different from present conditions. Large woody debris from upslope forests was deposited instream, fish passage impediments such as culverts and dams were non-existent, water quality was better, mature timber provided stream shade resulting in cooler water temperatures and greater dissolved oxygen, and stream meanders provided complex habitat with pools and riffles.

The streams in the watershed probably never supported great numbers of salmonids because of the presence of the Willamette Falls, which restricted anadromous fish runs. Streams in Western Oregon with monitoring of fish populations, are documenting declining populations of most salmonid species indicating that historically, fish populations were higher than at present.

Additionally, current salmonid populations were likely greatly affected by the locks and dam built by USCE in 1902 on the Yamhill River one mile upstream from Lafayette. It is hypothesized that this series of locks is responsible for the decrease in anadromous fish in the watersheds above the dam. The locks were not fish passable, although a fish ladder of sorts had been constructed, it was not kept in good repair (BLM, 1997). The dam remained in use until the 1960s when it was removed. The dam was recognized as a barrier to fish passage. Additionally, with the highway system in place, it was no longer needed to impound water to provide barge transport.

Since specific historical information on fish populations is not available, the list in Table 21 that follows is a general fish list for the watershed. These are species that are found or are likely to be found in the system given the habitat, water quality, connection with the South Yamhill River, and what ODFW has found in other similarly sized streams. It is important to note that some of these species may only be present seasonally. The list is general and uses the most common names to avoid confusion (Galovich, 2000).

This list does not include species that have been introduced into the waters by residents in the area. It is not uncommon to find species that have been stocked in private ponds that escape into open waters.

Table 21. Aquatic species found and likely to be found in Lower. S. Yamhill-Deer Creek watershed

Aquatic species (common name)
Winter steelhead
Cutthroat trout
Sculpin
Dace (speckled, longnose, etc.)
Redside shiner
Threespine stickleback
Pacific lamprey
Brook lamprey
Northern pike minnow
Sucker
Mosquitofish
Crayfish

Fish Hatcheries

Coho salmon are the only salmonid species that were hatchery raised and released directly into Deer Creek. Table 22 shows the years and number of coho released into Deer Creek.

Table 22. Coho releases into Deer Creek

Release Year	Number Released	Release Location
1965	64,152 fry	Deer Creek
1966	14,329 yearling	Deer Creek
1968	51 adult	Deer Creek
1968	103,000 fry	Deer Creek
1983	188,328 fry	Deer Creek
1985	418,865 fingerling	Deer Creek

The ODFW stocking program hoped to establish new coho runs and supplement the rapidly shrinking native coho population that was occurring all along the West coast. Coho salmon are not native above Willamette Falls, therefore these fish would not have been found historically in the watershed. Releases occurred in the 1950s to the 1980s. It is possible some of these fish found their way to the watershed to spawn in subsequent years, although this is not documented anywhere.

Hatchery winter Steelhead were never released directly into Deer Creek. However, hatchery fish were released into the South Yamhill River. It is possible that steelhead spawned in Deer Creek or its tributaries – however this has not been documented anywhere.

In the 1980s, concerns over the effect of coho on native cutthroat trout, winter steelhead and their effect on Oregon fisheries, caused ODFW to re-formulate their hatchery release plan for the basin. In introducing coho, ODFW did not want to decrease populations of native fish. There is a limit to how many fish an area can support under given conditions. If there are not fish in an area where historically there were fish, unless the habitat issues are resolved, the fish will not populate the stream.

Cutthroat trout in the basin are native, and have never been stocked. Although this species is not an endangered species, it is a species that is being managed for by ODFW. Since it can live its entire life in one watershed, it is easier to determine if habitat restoration efforts are impacting the survival of the fish. If a species is anadromous, the journey from stream to ocean and back could negatively affect the species, making the efforts of individual watershed restoration projects more difficult to discern (Galovich, 2000).

Table 23. Stocking history summary table

Fish Species	A=Anadromous R=Resident	Native	Non-native	Stocking Notes
Winter Steelhead Trout (*Oncorhynchus mykiss*)	A-Winter/Spring spawn	X		No hatcheries present in watershed. Not many fish present historically, hatchery releases into the S.Yamhill River 1964-82 from Big Creek stock. Area may not have any indigenous stock. STEP fry releases in recent years.
Coho Salmon (*Oncorhynchus kisutch)*	A- Late Fall early Winter		X	No hatcheries in basin. Stocking from Bonneville, Oxbow, Eagle Creek, Cascade, and Sandy and in 1983, from Cowlitz Hatchery in WA. In 1980s, number of streams stocked decreased to minimize effects on steelhead and cutthroat. Many releases in 60s and 70s, to supplement Columbia River run.
Cutthroat trout (*Oncorhynchus clarki clarki)*	A-some migrate R-some stay year round	X		Neither currently nor historically stocked.
Rainbow trout (*Oncorhynchus mykiss)*	R		X	Hatchery rainbow trout released to create fishery. Early as 1920s, 30s. until 1980s. No evidence of natural reproduction.

Table 24. Summary of fish life history patterns

Fish Species	Location	Spawning	Interesting Notes
Winter Steelhead Trout (*Oncorhynchus mykiss*)	No fish counting stations in basin. No documented runs. Prefer fast moving water, stream gradient>5%, cool waters, large woody debris	Late January – late April Juveniles stay 1-2 yrs. Migrate to the ocean in spring where they stay 2-3 years. Return to spawn in winter. May spawn more than once in a season. Ocean distribution not well understood. It appears steelhead move further offshore than other salmonids (OSUES, 1998).	Prefer fast moving water, stream gradient >5%, cool waters, large woody debris important component for their habitat
Coho Salmon (*Oncorhynchus kisutch)*	Spawning surveys from 60s and 70s, suspecting spawning	Juveniles rear throughout watersheds, live in pools in summer. Juveniles migrate to	Prefer gravel bars and upper watersheds.

	area:, River miles 7.0-15.5, S. Yamhill R. 42.0-60.5	ocean in Spring, rear just off OR coast. Adults return to rivers late fall/early winter. Spawn when 3 years old. Following spawning, they die.	
Cutthroat trout (*Oncorhynchus clarki clarki)*	Occur in most perennial streams, in some intermittent streams. Prefer smallest, highest tributaries in a basin.	Variable spawning and migration. Potanadromous cutthroat migrate into small headwater streams in fall/winter, spawn, return to larger streams. Some do not migrate at all. Some migrate to estuaries.	Only native trout in basin. Prefer slow moving water, overhanging vegetation.

Fish Habitat

The critical habitat maps produced by ODSL show known steelhead spawning and rearing habitat, and do not include any of Lower S. Yamhill-Deer Creek watershed. However, the website StreamNet, provides the ability to search for distribution maps by watershed, and this map shows the South Yamhill River as winter Steelhead habitat. According to Gary Galovich of ODFW, this does not necessarily mean the fish do not use the area, or would not use the area if the habitat were improved. It could be an area where juvenile steelhead rear even though they were spawned somewhere else in the system.

Other stream surveys done by ODFW in the 1980s did not find salmonids on streams in the watershed. Again, Galovich cautions that the examined sections of Deer and Muddy mainstems at one point in time do not represent the dynamics of fish life cycles. There is no continuous monitoring on any stream in the watershed. So, just because a species isn't sampled in that stream on a given day, doesn't necessarily mean it doesn't use the stream during some part of its lifecycle. Juvenile rearing is a very critical stage in salmonid development, and many streams support salmonids only for rearing.

An endangered salmonid may never enter a particular stream reach, but other species that contribute to conditions of the system do utilize that stream reach. The point isn't to be concerned about restoring only salmonid habitat, but rather to improve stream functions for all aquatic life because the salmon are only one part of the system.

Fish Barriers

Fish barriers are either natural or human created obstacles that impede the passage of fish. Barriers include culverts, dams, waterfalls, log jams and beaver ponds. These barriers can impede fish movements throughout the watershed for both anadromous and resident fish species. Anadromous fish utilize the watershed from freshwater steams the ocean and back again, and barriers can prevent migration. As habitat, population, or water quality conditions change throughout the year or lifetime of resident fish, they move to watershed locations with more favorable habitat conditions.

Fish barrier locations were collected from an ODFW database. These barriers are all culverts and currently are classified as low or medium priority. They are described in Table 18 below.

Table 25. Fish passage barriers

Stream Name/Number	Priority	Comment
Dupee Creek	Low	No downstream access for proper assessment. Velocity and drop inhibit fish passage.
DupeeCreek	Low	Velocity inhibits fish passage.
Unnamed Creek	Medium	Barrier, 2 miles N of intersection with Dupee Valley Road
Gill Creek	Medium	2.7 miles from Dupee Valley Rd., velocity barrier, debris at top.
Beaver Creek	Medium	Velocity barrier at most flows.

Anecdotal Fish Information

Since the watershed is lacking historic fish data, interviews with residents are excerpts from interview with residents are included here to give information on fish distribution in the area. (Need to get in touch with someone at ODFW about why no one can fish in Deer anymore.)

According to Glen Grauer, life long resident of the watershed, fishing used to be really good here about 25 or more years ago. Back when cows grazed right up to the river's edge. People from all around would come to the creek during fishing opener. All up and down the creek, cars would be parked, and people would be out fishing.

Covered

- Fish life history and patterns
- Important habitat areas
- Stocking history
- Known or suspected migration barriers
- Selected field verification

Not Covered

- Species interactions at the watershed scale
- Specific fish distribution information unavailable

Fish References

Bureau of Land Management (BLM). *Deer Creek, Panther Creek, Willamina Creek and South Yamhill Watershed Analysis.* Tillamook Resource Area, Salem District, Tillamook, OR. Pages 7-8, 66-68.

Galovich, Gary. February-September, 2000. *Personal Communications*. ODFW Fish Biologist. Adair Village Office.

Grauer, Glen. Personal communication. Winter 2000.

Oregon State University Extension Service. (OSUES) 1998. *A Snapshot of Salmon in Oregon.* Publications, OSU, Corvallis, OR. 97331.

Oregon Department of Fish and Wildlife. (ODFW) 1992. *Coast Range Sub-watershed-Fish Management Plan.* NRCS, McMinnville, OR.

Mirati A. (Fish passage coordinator). 1999. *Fish Passage Culvert Database from ODOT and County Roads.* Oregon Department of Fish and Wildlife, Portland, OR.

Chapter 11 Restoration/Enhancement Projects

Introduction

Before beginning any new restoration or enhancement programs, it is valuable to examine the efforts already underway. Coordination of efforts and monitoring can make for a more successful impact, as well as generate new ideas and share information.

The scope of this section is limited by the data reporting method. Currently, all information on projects is included from restoration practitioners who report on a voluntary basis. Many landowners are not aware of the existence of the effort to gather this data and make it available. The Oregon Plan Watershed Restoration Inventory maintains this database. The projects are summarized to be included in the Oregon Plan Annual Report. If you or a landowner you know would like to be included in this voluntary data base contact Bobbi Riggers by e-mail: Bobbi.Riggers@orst.edu.

The Farm Service Office in McMinnville cannot provide this information on federally funded projects. It is up to individual landowners to provide it. Therefore, the projects included here are limited to the ones in the database and unfortunately do not include those done on agricultural lands.

Types of Restoration

Restoration and enhancement do not always involve a lot of time and money. There are basically two types of restoration that are described here from a presentation by Barbara Ellis-Sugai.

Passive Restoration

Passive restoration can involve less time, money and maintenance. This type of restoration is "allowing nature to take its course." Basically, it is the removal of human made disturbances. For example, install cattle waterers to prevent cattle from entering the streams; allow the stream to recover naturally. It is a wait and see approach to restoration. It does not involve planting vegetation on the banks or re-structuring the streambank, although it could involve those steps, in which case it would be active restoration.

Active Restoration

Active restoration or enhancement is to speed up the recovery process in an attempt to restore function to a system faster than would take place if it were left alone, or to restore a function that might be outright missing from the system. If there is not a source of large woody debris in the system (such as in an urban setting) than it would have to be introduced because no matter how long you wait, it would not appear in the stream. Other examples of this include planting riparian vegetation, or the of use bioengineering techniques to compliment the natural recovery process. This can be trickier because done incorrectly, some types active restoration or enhancement such as placement of large woody debris, can actually do more harm than good.

Additionally, the use of native vegetation reduces the potential of introducing noxious weeds and natives are better adapted to the area and require less care to become established.

Project Information

The table below summarizes the projects listed with OPWRI and the accompanying map outlines their approximate locations. It is important to note that the map does not accurately portray the size of the restoration projects. The restoration areas on the map are only to represent location, not the size of the project.

Table 26. Restoration projects in OPWRI's database.

Location	Agency/Landowner	Project summary	Date completed
Deer Creek	Boise Cascade	ODF riparian forestry measures.	5/30/97
Beaver Creek	Private Landowner	Streambank stabilization, riparian planting.	9/1/96
Deer Creek	Willamette Industries	Green Top Road repair. Surface drainage improvements, culverts installed.	3/1/97
Deer Creek	Private Landowner	Riparian planting.	4/98
Deer Creek	Willamette Industries	Surface drainage improvements, culvert installed	7/99

The projects with the most information available are the Deer Creek Park projects. Because this project is still under development, it has not been included with the data table.

The project is to address the erosion taking place along and in Deer Creek. (See Channel Habitat Types section for more information on stream processes.) The project proposes to use bioengineering to change the streambank slope and redefine the geometry of the curves by placing large wood in the stream. There has also been planting of native vegetation along the newly daylighted portion of channel. This project is unique in the watershed in that it involves citizens and local and state government in plantings, instream work, and the project design.

Residents Speak about their restoration projects:
One long time resident of Rock Creek recalled the following when asked what the area looked like when she and her husband moved to the creek over 30 years ago:

"The land we own was all logged and was being grazed by sheep. All the vegetation was gone, down to the ground. My husband and I planted Douglas-fir to restore the land. We don't plan to harvest them. We are raising them because it is the best use for the land. Rock Creek used to run dry when we first moved here. Now it runs all year. The big Douglas-fir next to the river on our property died. It is that wet now." (Note: Douglas-fir cannot tolerate wet conditions year round. It needs several months of dry conditions to remain healthy. This is why you will not find Douglas- fir on the banks of perennial streams and creeks.)

This landowner realizes the complications with restoration projects. Increased in-stream flow provides more cooler water temperatures for salmonids and increases the dilution of pollutants, but in this case, had the unintended consequence of killing the trees along part of its banks.

This is why it is important to think of restoration projects not as restoring some pre-European, pre-settlement ideal. Humans have managed this landscape for many hundreds of years. Restoration is a way to restore a particular function back to an ecosystem such as provide sources of large woody debris, increase wetland acreage to provide protection from flood events, increase stream channel sinuosity to provide for sediment deposition. Restoration efforts look at the ways to improve some function of the system.

The East Fork of Muddy Creek is home to Ted Gahr and the site of a wetland and forest on-going enhancement project. Gahr has lived on the property for 32 years and has seen the decline of his land's ability to sustain the continuation of tilling and harvesting in just that short amount of time. He and his wife made a commitment to land stewardship and education and to making a living off the land in a new way.

He has created over 30 acres of wetland in an area that was formerly drained and under cultivation. He has watched the winter rains flood the banks of these newly diked wetlands and turn them into sanctuaries for a variety of waterfowl, amphibians, and plants – some of which are on the endangered species list. The wetlands are home to a large variety of wetland plants, most of which were not planted, but naturally re-vegetated the area after it was flooded. Gahr hypothesizes the seeds were in the soil all along, but while the land was under cultivation, the conditions prevented the plants from germinating.

He is also trying a new approach to forestry that goes beyond sustainable forestry practices. In addition to practicing the methods of selective harvest, he employs a sophisticated strategy to maintain the health and diversity of hardwoods and shrubs in the understory. He does this by maintaining open spaces in which shrubs and hardwoods can become established. The Douglas-fir are encouraged in other open areas and thrive on the rich soil produced by the deciduous trees. Gahr hypothesizes these Douglas-fir will be larger than those grown under traditional methods because of richness of the soil with his method. He sees the management of trees as more than the profit or bottom line – but as a responsibility to the forest to manage it as habitat rather than for only the tree species.

His forest not only supports a diversity of vegetation, but a diversity of wildlife. Natural seeps have been dredged to create forested wetlands. These are home to a many amphibians including the endangered red-legged frog. Additionally, they provide a water source for elk, deer, and other forest dwelling wildlife.

He feels fortunate to have bought land over 30 years ago when prices were much lower. This has made it possible for him to look at alternative methods of managing it since he does not have to worry about how to pay for it. He is concerned that the new generation of land owners will not have that luxury. The price of equipment and the need to make a profit, override the concerns over habitat enhancement and creation. He sees opportunity for small landowners that want to do things differently, and are willing to search out the government programs that provide the financial support. He thinks many more people would manage their land differently if they knew about the options for paying for it. He sees tourism such as bed and breakfasts as one way of providing income. People who take a vacation to the Gahr farm are treated to ecology hikes and offered the opportunity to see the restoration projects.

The NRCS, Yamhill Soil and Water Conservation District, and Farm Service Agency have cooperated on two streambank demonstration projects in the watershed. Along Swale Creek at Koester Farms in March 1998, over 2,000 native shrubs and trees were planted in a riparian area. This riparian zone had wet soils that made early season cultivation difficult and the area frequently became inundated with water from heavy winter rains. The buffer area was established to restore a formerly converted riparian wetland to provide food and cover for wildlife, reduce erosion by slowing out of bank flows, and intercept sediment, nutrients and other materials.

The other stream project took place on Deer Creek near Highway 18. The landowner was concerned about the severe erosion taking place on the creek's banks and wanted a method to stabilize the bank and improve the wildlife habitat. Over 1,000 plants were used in the project.

Both of these projects utilized support from the Environmental Quality Incentives Program (EQIP) established by the 1996 Farm Bill to provide a single, voluntary, conservation program for farmers and ranchers to address natural resource issues. Further information on EQIP and how you can find out if you are eligible for funds, contact: USDA Service Center 2200 SW 2nd Street, McMinnville, OR 97128. By phone: (503) 472-1474.

References

Ellis-Sugai, Barbara. February 23, 2000. Going With the Flow: A Lecture About Rivers.

Gahr, Ted. June 2000.*Personal communications*.

Riggers, Bobbi. ,March/April 2000. *Personal communications (e-mail).* Oregon Plan Watershed Restoration Inventory Data Specialist.

USDA Natural Resources Conservation Service. *Koester Farms Riparian Habitat Restoration Project.* March 1998.

US Department of Agriculture. *Suderman Streambank and Riparian Project.* April 1998.

Yamhill Basin Council. June 7, 1999. *Deer Creek Park Restoration Project Notes..*

Chapter 12 Watershed Conditions Summary

The Lower S. Yamhill-Deer Creek watershed is very similar to other areas of the Willamette Basin that have been impacted by the landuses of forestry and agriculture. Private ownership of more than 90% of the watershed leads to a wide variety of perspectives on restoration priorities and projects. This document hopefully will serve as a starting point to improve the water quality and habitat conditions in the watershed. What follows is a summary of each chapter's major findings, and a table with the subwatershed conditions and available information. Refer to the main document for further information.

Chapter 1: Introduction and Watershed Characteristics

1. Watershed's approximately 80,000 acres was divided into 5 subwatersheds based on drainage patterns. These include: Upper and Lower Deer, Rock, Muddy, and Polk Tribs subwatersheds.
2. The majority of the watershed, 75,192 (92%) acres is privately owned. Private timber companies own 4,212 (5%) acres and the Bureau of Land Management owns 2,090 (3%) acres.
3. Historically, fire played a very important role in the maintenance of oak savanna and prairie ecosystems in the watershed. The suppression of fire has allowed Douglas-fir to occupy more area than it did historically.
4. The watershed is home to nine federal or state listed endangered species.
5. Agriculture has been and continues to be an important part of the watershed's economy. While the history of the crops grown has ranged from plums to hops and now to grass seed, the acreage under cultivation has remained fairly constant. Nearly 40% of the watershed is under cultivation for perennial grass seed making it the largest single land use.

Chapter 2: Historical Conditions

1. Kalapuya Indians managed the land with fire. The watershed's lower elevations (including Lower Deer, Muddy, and Polk Tribs subwatersheds) mostly grasslands.
2. European settlement brought an end to the prairie burns and Douglas-fir reclaimed open areas.
3. The majority of the wetlands in the watershed were drained and tiled to make land available for agriculture, resulting in a loss of all but a tiny percentage of the wet prairie in the watershed.
4. Farm and orchard practices that left soil bare during the winter rainy season resulted in massive soil erosion during the 1800s into the 1900s, a problem that still exists, to a lesser extent, today.
5. Forests in the watershed have been logged extensively. Only a few acres of old growth forest remain in the watershed.

Chapter 3: Channel Habitat Types

1. Channel habitat types were assigned by examining USGS topographical maps and by field verification.
2. Channel habitat type classification assists in understanding the potential of the various channels to benefit from restoration or enhancement.
3. The majority of channels in the lowland areas of the watershed, including Deer and Muddy Creeks, were once floodplain type channels and are now deeply incised channels that meet the criteria for low gradient moderately confined channels. These channels pose the greatest challenge to restoration efforts but also have the greatest value for improving habitat.

Chapter 4: Vegetation: Current and historical vegetation

1. Vegetation in watershed varies dramatically from north to south. The steep northern section is forested while the low areas in the middle and lower sections are under cultivation.
2. Agriculture is zoned for 65,257 acres (85.6%) of the watershed.
3. Forestry is zoned for 7,492 acres (9.8%) of the watershed.
4. Estimations of historic conditions find wet prairie, white oak savanna, Douglas-fir and oak woodland, upland prairie, and ash-mixed deciduous riparian forest to be the dominant vegetation classes.
5. Current conditions show that farmed perennial grass and Douglas-fir forest are the dominant vegetation classes.

Chapter 5. Riparian and Wetland Areas

1. Riparian conditions were examined from aerial photos. The majority of the streams have some vegetation, although it is often hardwoods or brush with low recruitment for large woody debris.
2. Non-native plants present in the watershed compete vigorously with native vegetation in wetlands and in disturbed areas and pose significant problems to some types of restoration and enhancement projects.
3. The loss of wetlands due to drainage and tiling projects has contributed to the channelization of most of the streams in the watershed. The remaining wetlands are often in degraded condition, farmed or have been urbanized (Sheridan).

Chapter 6: Channel Modifications

1. The construction of over 140 miles of roads within 200 feet of 171 miles of stream has negatively impacted the ability of the streams to meander or flood.
2. The small dams constructed in the watershed for flood control or fire protection are likely not significant barriers to fish passage.
3. The removal of large amounts of gravel from the South Yamhill, in order to decrease the river's flooding and create a single channel, greatly reduced the amount and quality of fish habitat.
4. Channel hardening projects on the South Yamhill and Deer Creek were prolific in the 1970s according to fill and removal permit records at the Division of State Lands, and may have been even more so in the 1950s and 1960s, if those records existed.

Chapter 7: Sediments

1. Potential sources of sediment include erosion of rural road surfaces and ditches, urban runoff from impervious surfaces, slope failure on forest roads, and surface erosion from agricultural lands.
2. The ditches of the watershed are being managed to decrease their sediment contribution through roadside seeding and reshaping in cooperation with landowners. However, individual actions have great impact on the function of the ditches. Careless depositions of lawn debris, orchard trees with fruit falling into ditches and clogging them, and the position of drainage tiles all negatively impact the ability of the ditch to deliver water to streams. It is important to remember that all ditches drain to a waterbody.
3. Forested areas do not contribute greatly to the sediment in the watershed due to the relatively low slopes and lack of rain on snow events.
4. This is an area in need of further investigation.

Chapter 8: Hydrology and Water Use

1. The watershed lacks flow information. No gaging station has ever been located in the watershed. Estimates for peak and low flow analysis were made by examining a comparable location.
2. Peak flows in the watershed occur during the winter months when rain is the greatest. Low flows occur in the summer months due to a lack of precipitation and no contribution from snow melt.
3. Flooding areas have changed due to the hardening and deepening of the major stream channels.
4. Deer Creek and the South Yamhill River are over-allocated for water rights. This means that seasonal demands exceed the water supply. There has not been any conflict over this because most users are not exercising their full water rights.
5. Nearly 70% of the water rights are for irrigation the second highest allocation is for domestic use at 21%.
6. Irrigation rights are held for land parallel to the South Yamhill River and along Deer Creek. These areas historically

were wetland and are now drained and tiled.

Chapter 9: Water Quality

1. Water quality data is unavailable or of little value due to its age and imprecision of collection.
2. Deer Creek from where Little Deer Creek enters to its mouth is listed on the 303(d) list for temperature and fecal coliform bacteria standard exceedances. The data to produce this listing was collected in the 1980s and no new data has been collected for these reaches since. This is starting to be addressed by the Yamhill Basin Councils stream monitoring program.

Chapter 10: Fish

1. The only native endangered salmonid in the watershed is winter Steelhead.
2. Coho salmon were stocked throughout the 1970s and 80s, but this practice was discontinued due to concerns about the interactions between hatchery stocked fish and native fish.
3. Cutthroat trout were once abundant in the watershed and their sizes and numbers have steeply declined over the years (not documented, anecdotal information).
4. Cutthroat trout are a much better indicator of habitat conditions since they have the potential for abundance and are resident fish meaning they live in the watershed year round. Steelhead, use the watershed for only part of the year, and have the potential for many interactions away from this watershed.
5. Scattered stream surveys have been completed – but no comprehensive stream information exists.

Chapter 11: Restoration

1. Watershed residents have undertaken a variety of projects to improve the habitat conditions in the watershed including projects to create wetlands, improve riparian conditions, and improve upland conditions.
2. Registration is available to be included in a statewide inventory of restoration and enhancement projects. Registering your project means you will be included in the annual report of the Oregon Plan.
3. Individual actions are of great importance to the watershed because of the large percentage of private land.

Sub-Basin	Riparian Conditions	Wetland Conditions	Water Quality	Sediment Sources	Channel Modifications	Hydrology and Water Use
Upper Deer	Mostly forested with deciduous trees directly bordering the streams and conifers on the upland. No visible bare banks on air photos.	Very few wetlands. Only NWI mapped information available. No Local Wetland Inventory data available.	Deer Creek from the mouth of Little Deer to the headwaters removed from 303(d) list in 1997. Deer Creek listed for temperature and fecal coliform bacteria standard violations to its mouth by data collected in the 1980s. No further information available.	Mostly forested, very little pasture land and some perennial grass. Some debris flow hazard potential. Rural roads parallel to streams.	Historically riprapped and deepened.	Some irrigation, and domestic wells.
Lower Deer	Mostly narrow strip of hardwoods in the riparian zone, agriculture or pasture on the uplands.	See Upper Deer.	See Upper Deer.	Douglas-fir forest, mixed oak-Douglas-fir forest, annual and perennial grass. Some debris flow hazard. Rural roads parallel to streams.	See Upper Deer.	Some irrigation, heavily irrigated by the confluence of Deer Creek and the South Yamhill River. Many domestic wells
Muddy	No one dominant riparian type. Conifers and hardwoods of varying widths. Some significant areas of bare ground or short vegetation.	See Upper Deer.	No specific data available.	Doug-fir and oak forest, perennial and annual grass. Some debris flow hazard potential in the northmost area.	No specific data available.	Some irrigation, towards mouth of Muddy. Some domestic wells.

Rock	Forested with hardwoods and some conifer, no bare ground visible from air photos.	See Upper Deer.	No specific data available.	Mostly Douglas-fir-oak forest, some annual grass and pasture.	No specific data available.	Heavily irrigated on the South Yamhill River, domestic wells concentrated along Ash Creek.
Polk Tribs	Most degraded riparian areas in the watershed. Very narrow bands of vegetation with agricultural uses bordering closely. Several areas with bare ground or short vegetation.	Many wetlands along the South Yamhill river and its tributaries to the south. No information on specific conditions available. No Local Wetland Inventory available.	South Yamhill River on the 303(d) list for temperature and fecal coliform standard violations along its entire length in the watershed.	Mostly under cultivation of perennial grass, some annual grass, and orchards, vineyards, and Christmas trees.	Six small dams for irrigation.	Heavily irrigated along South Yamhill River, greatest acreage of irrigated land. Domestic wells widespread.