

# North Yamhill Watershed Assessment Summary

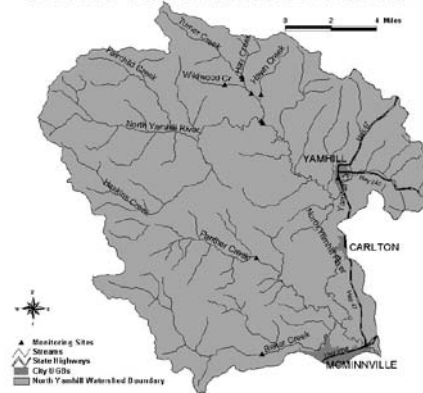
## Yamhill Basin Council

### Yamhill & Polk Counties, Oregon

#### Background

- Nearly the entire 113,441-acre watershed, which includes 445 miles of waterways, is in Yamhill Co.
- Major streams include N. Yamhill River, Panther Creek, Baker Creek, Turner Creek, Fairchild Creek, and Haskins Creek.
- Residents are concentrated in Yamhill and Carlton.
- Soils have volcanic and sedimentary parent material.

#### North Yamhill Watershed



#### Native Peoples and Practices

- Regular burning by the native Kalapuyans maintained the oak savanna and prairies for at least 4,000 years while preventing Douglas fir forests from developing.
- Fire suppression crews were organized and working to suppress wildfires to protect valuable timber by the early 1930s.

#### Land Use

- Approximately 60% of the land is used for agriculture. Varied topography allows water to be channeled into streams for cultivation during the wetter part of the year, but also alters hydrology. 22% of the watershed is cultivated for perennial grass seed.
- Forests are the 2<sup>nd</sup> highest land use, about 37%.
- One rock pit and three quarries are shown on USGS topographical maps of the watershed. Rock is mined for road construction, fill, asphalt paving, or ready mix concrete.

#### Channel Habitat & Modification

- Most of the surveyed stream segments in the watershed are classified as low gradient flood plains or narrow valley channels.
- Stream incision results from: dredging, dike building, straightening, damming, draining, removing large woody debris, hardening banks with rip-rap (rocks) or concrete.
- Agriculture has had the greatest impact on stream morphology in the watershed.
- Roads run parallel to many streams in the watershed. Since roads require bridges or culverts to access property on the other side of the stream, meandering to dissipate energy is prevented. High velocities are maintained, which begins to downcut and erode the channel. There are 391 stream and road intersections.

#### Native, Exotic and Rare Species

- Small mammals and 28 cavity-seeking birds are common in oaks.

- Non-native species introduced from other regions or continents occasionally do extremely well and become invasive. The OR Department of Agriculture identifies noxious weeds as plants having the potential to cause economic losses. Cost is high to eliminate weeds once they are established.
- The federal or state government lists 14 species native to the watershed as rare, threatened, or endangered. The BLM lists many additional species as special status or sensitive.

### **Riparian Zones**

- Riparian areas adjacent to streams, rivers and wetlands have higher levels of moisture than adjacent upland areas. Trees in the area provide large woody debris that diverts channels and obstructs flow, thus increasing habitat complexity.
- Riparian vegetation influences fish habitat and water quality by decreasing daily water temperature fluctuations and providing fish with cover from predation. It also stabilizes stream banks, provides habitat for insects and macro-invertebrates and provides nutrients to the ecosystem.
- 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.
- Today, 18.3% of streams and in-stream reservoirs in the watershed have only brush or grass and 49.3% have only hardwoods. Ideally, all of these areas should have some mature conifers.

### **Wetlands**

- Wetlands have abundant water, hydric soils, and specially adapted wetland plants. Today, most wetlands have been drained and cultivated.
- Wetlands connect uplands and aquatic ecosystems, connect lakes, streams, rivers and riparian areas to each other, and capture sediment from run-off. They also remove nutrients, improve groundwater recharge, and maintain base flows to streams. Wetlands are important for providing water storage during high flows and habitat to wildlife.
- Historically wetlands were much more extensive than they are today. Wet prairie is now almost non-existent.

### **Sediments**

- There are about 1,307 acres of land that are considered unstable above Pike due to steep (>60%) slopes.
- A major concern about erosion is the contribution from forested areas that are being logged. There are 1,666 acres at high risk for debris flows and 24,447 acres at moderate risk. Debris flows are initiated by landslides on steep slopes that quickly transform into semi-fluid masses of soil, rock, and other debris.
- Landslides that contribute sediment continually are located on Fairchild, Perkins and Turner Creeks. Petch Creek is vulnerable to sediment loading. The headwaters of Panther and Baker Creeks are vulnerable to slides. Potentially unstable road crossings on private lands occur in upper Maroney, Perkins, and Turner Creeks.
- Yamhill County mows ditches where visibility is an issue. Polk County applies herbicides to manage the vegetation. Ditches in Yamhill are re-ditched on a ten-year

rotation during the entire year. Everything that is in the ditches eventually makes it to streams and creeks.

- ODFW stream surveys of Cedar Creek (the lower 6,300 ft) and the North Yamhill main channel (from river mile 20 to river mile 30) show that both channels were rated as having poor stability with approximately 59% and 21% (respectively) of the area examined actively eroding.

## **Hydrology & Water use**

- Streams are influenced by precipitation, withdrawals for irrigation and drinking water, stream channel modifications, changes in land use, and practices and upstream vegetation removal.
- Drainage tiles, ditching, rip-rapping stream banks, and channel straightening all change the way water flows across the land and enters a stream.
- Low flows lead to increases in stream temperatures, decreased water quality conditions, and restriction of water use for consumption by junior users.
- Under Oregon law all water is publicly owned. Water rights are required prior to use or consumption. Streams in the watershed are over appropriated and would run dry during the low flow time of year if everyone exercised their water rights simultaneously. Low streamflow harms aquatic life and prevents sufficient dilution of pollutants.
- The major reservoirs in the watershed are the Haskins Creek Reservoir, water supply for McMinnville, Carlton Lake Reservoir, water supply for Carlton, and a reservoir on Turner Creek that supplies water to the city of Yamhill. Rainbow Lake is a reservoir on Baker Creek but it is not a water supply for any community.

## **Water Quality**

- Benefits of the watershed are domestic water supply, salmonid fish passage, salmonid fish rearing, resident fish and aquatic life, fishing, water contact recreation, aesthetic quality.
- Streams that do not meet set standards of water quality are listed under section 303(d) rules. N. Yamhill River, mouth to Turner Creek is listed for bacterial pollution and warm summer temperature levels. N. Yamhill River, Turner Creek to headwaters and Turner Creek, mouth to Severt Creek are listed for warm summer temperature levels. N. Yamhill River, mouth to Turner Creek is listed for flow modification. Other contaminants that are tested for include nutrients, sediment, organic compounds and solvents and metals.
- High temperatures result in stress, increased metabolism, decreased competitiveness, decreased appetite, and even death of native fish. DEQ's maximum seven day average temperature standard for streams is 64°F.
- Minimum concentrations of dissolved oxygen are essential to support aquatic life and particularly for salmonid species. The screening level of this assessment desired 8 mg/l. For the North Yamhill River, mouth to Turner Creek, three samples out of 111 samples at river mile 4.5 were at 6.2 mg/L and in violation of standards.
- Water pH is an important indicator of the chemical forms and availability of nutrients, as well as the presence of toxic chemicals in the system. Oregon Water Quality standards specify the approved pH range as 6.5-8.5. During the fall, winter

and spring, the DEQ data in the North Yamhill River from river mile 1.5 to 10.0 violated the standard at two sites between 1986 and 1998.

- Elevated levels of nutrients such as phosphorus and nitrates can cause algae and aquatic plant growth to become a problem and even be lethal. Growth also lowers dissolved oxygen levels.
- Turbidity is a measurement of water clarity, with high values indicating high amounts of suspended sediments or particles in the system that can damage fish gills and/or reduce their ability to see prey. Sediments can clog spawning gravel.
- Several pesticides are likely to exist in the streams and rivers of the watershed. There are likely to be a number of agricultural contaminants in the water. Residents likely contribute significant amounts of lawn or garden chemicals.
- There are 11 water discharge permits in the watershed that allow discharge of waste pollutants into the waters of the state or ground.

## **Fish**

- Cutthroat trout are the watershed's most plentiful salmonid. They are native and never have been stocked.
- Winter steelhead were released into the North Yamhill River from 1966 until 1989. Coho salmon were released into North Yamhill River from 1962 until 1988. The stocking program was ended due to concerns over the effect of Coho on native cutthroat trout and winter steelhead.
- Fish barriers such as culverts, dams, waterfalls, logjams, and beaver ponds prevent fish from moving upstream and downstream to adjust to changing habitat conditions. There are 16 barriers on public roads and 10 dams in the watershed.

## **Restoration & Enhancement**

- Passive restoration can simply mean end disturbance and allow nature to recover on its own. Active restoration tries to speed up ecological recovery by rebuilding natural functions but is more complicated because of the difficulty of identifying the causes.
- Ted Gahr restored 30 acres of wetland on his land.
- Over a half million dollars has been spent in the watershed by industry and ODFW to restore steelhead habitat.

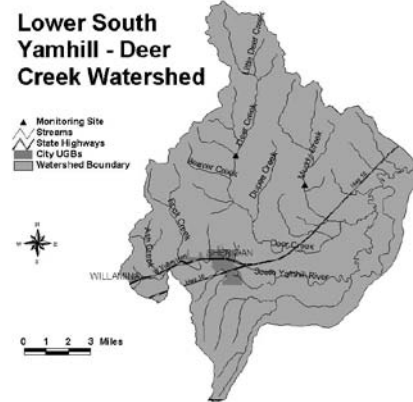
# Lower South Yamhill Watershed Assessment Summary

## Yamhill Basin Council

### Yamhill & Polk Counties, Oregon

#### Background

- Most of 76,230-acre watershed is in Yamhill Co while approx. 1/6 is in Polk Co.
- Major streams include Ash, Rock, Beaver, Deer, Little Deer, Muddy, Dupee, Grohe, Gill, and S. Yamhill River. The BLM recognizes 307 miles of stream in the watershed.
- Residents are concentrated in Sheridan.
- Climate is marine-influenced, rainfall amounts vary, and snow & ice do not accumulate often. Soils have basaltic colluvium and sedimentary parent material.



#### Fire History

- Regular burning by the native Kalapuyans maintained the oak savanna and prairies for at least 4,000 years while preventing Douglas fir forests from developing.
- Fire suppression crews were organized and working to suppress wildfires to protect valuable timber by the early 1930s.

#### Land Use

- Approximately 92% of the land is privately owned. The Upper Deer, Lower Deer, and Rock subwatersheds are forested and used for timber production. Conifers make up 30% and hardwoods comprise 70%.
- Approx. 53% of the watershed is non-forested. Agriculture is a significant land use in Lower Deer and Rock subwatersheds. Perennial grass accounts for 38.4% of the land. Most of the area under cultivation has been tilled or drained to some degree.
- One rock pit and three quarries are shown on USGS topographical maps of the watershed. Rock is mined for road construction, fill, asphalt paving, or ready mix concrete.

#### Channel Habitat & Modification

- Most of the surveyed stream segments in the watershed are classified as low gradient flood plains or low gradient moderately constrained channels.
- Stream incision results from: dredging, dike building, straightening, damming, draining, removing large woody debris, hardening banks with rip-rap (rocks) or concrete.
- Agriculture has had the greatest impact on stream morphology in the watershed.
- Roads run parallel to nearly every stream in the watershed. Of 171 miles of perennial stream, 140 miles have road within 200 ft of them. This prevents meandering to dissipate energy and maintains high velocity, which begins to downcut and erode the

channel. Additionally, roads require bridges or culverts to access property on the other side of the stream.

### **Native, Exotic and Rare Species**

- Small mammals and 28 cavity-seeking birds are common in oaks.
- Non-native species introduced from other regions or continents occasionally do extremely well and become invasive. The OR Department of Agriculture identifies noxious weeds as plants having the potential to cause economic losses. Cost is high to eliminate weeds once they are established.
- Noxious weeds invade disturbed areas such as clearcuts and roadside disturbances and form monocultures that make regeneration of native species very difficult.
- The federal or state government lists 9 species native to the watershed as rare, threatened or endangered. The BLM lists 16 additional species as special status and 7 as sensitive species.
- The South Yamhill River historically would have been a meandering river that would routinely flood its banks, change directions, and carve side channels. Currently, the river is restricted to one channel and no longer routinely floods.

### **Riparian Zones**

- Riparian areas adjacent to streams, rivers, and wetlands have higher levels of moisture than adjacent upland areas. Trees in the area provide large woody debris that diverts channels and obstructs flow, thus increasing habitat complexity.
- Riparian vegetation influences fish habitat and water quality by decreasing daily water temperature fluctuations and providing fish with cover from predation. It also stabilizes stream banks, provides habitat for insects and macro-invertebrates, and provides nutrients to the ecosystem.
- 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.
- Today, 9.1% of streams and in-stream reservoirs in the watershed have only brush or grass and 77% have only hardwoods. Ideally, all of these areas should have some mature conifers.

### **Wetlands**

- Wetlands have abundant water, hydric soils and specially adapted wetland plants. Today, most wetlands have been drained and cultivated.
- Wetlands connect uplands and aquatic ecosystems, connect lakes, streams, rivers and riparian areas to each other, and capture sediment from run-off. They also remove nutrients, improve groundwater recharge and maintain base flows to streams. Wetlands are important for providing water storage during high flows and habitat to wildlife.
- Historically wetlands were much more extensive than they are today. Wet prairie is now almost non-existent.

### **Sediments**

- A major concern about erosion is the contribution from logged forested areas.

- Debris flows are initiated by landslides on steep slopes that quickly transform into semi-fluid masses of soil, rock and other debris.
- Yamhill County mows ditches where visibility is an issue. Polk County applies herbicides to manage the vegetation. Ditches in Yamhill are re-ditched on a ten year rotation during the entire year. Everything that is in the ditches eventually makes it to streams and creeks.

### **Hydrology & Water use**

- Streams are influenced by precipitation, withdrawals for irrigation and drinking water, stream channel modifications, changes in land use and practices and upstream vegetation removal.
- Drainage tiles, ditching, rip-rapping stream banks, and channel straightening all change the way water flows across the land and enters a stream.
- Low flows lead to increases in stream temperatures and decreased water quality conditions.
- Under Oregon law all water is publicly owned. Water rights are required prior to use or consumption. Deer Creek is over allocated and would run dry during the low flow time of year if everyone exercised his or her water rights simultaneously. Low streamflow harms aquatic life and prevents sufficient dilution of pollutants. 70% of water rights are for irrigation, 21% are for domestic uses and 9% are for agriculture.
- The only major reservoirs in the watershed are for the water supply for Sheridan.

### **Water Quality**

- Benefits of the watershed are domestic water supply, salmonid fish passage, salmonid fish rearing, resident fish and aquatic life, fishing, water contact recreation, aesthetic quality.
- Streams that do not meet set standards of water quality are listed under section 303(d) rules. Deer Creek, mouth to headwaters, is listed for bacterial pollution. Deer Creek, mouth to Little Deer Creek, is listed for warm summer temperature levels. S. Yamhill, Salt Creek to Willamina Creek, is listed for bacterial pollution, flow modification and warm summer temperature levels.
- High temperatures, DEQ maximum standard for streams is 64°F, result in stress, increased metabolism, decreased competitiveness, decreased appetite and even death of native fish.
- Minimum concentrations of dissolved oxygen are essential to support aquatic life and particularly for salmonid species. The screening level of this assessment desired 8 mg/l. For Deer Creek, the DO samples range from 5.4-13.0 mg/l. On the South Yamhill River, samples range from 8.5-13.5 mg/l. Both meet the standard.
- Water pH is an important indicator of the chemical forms and availability of nutrients, as well as the presence of toxic chemicals in the system. Oregon Water Quality standards specify the approved pH range as 6.5-8.5. Data collected between 1970-88 show values ranging from 6.9-7.9 in the South Yamhill River, and data collected between 1986-1991 show values ranging from 6.9-7.0 in Deer Creek.
- Elevated levels of nutrients such as phosphorus and nitrates can cause algae and aquatic plant growth to become a problem and even be lethal. Growth also lowers dissolved oxygen levels.

- Turbidity is a measurement of water clarity, with high values indicating high amounts of suspended sediments or particles in the system that can damage fish gills and/or reduce their ability to see prey. Sediments can clog spawning gravel. 1986-1988 DEQ data showed turbidity levels in the South Yamhill River from 1.0-34.0 Hach FTU and in Deer Creek from 1.0 to 65.0 Hach FTU.
- Several pesticides are likely to exist in the streams and rivers of the watershed. There are likely to be a number of agricultural contaminants in the water. Residents likely contribute significant amounts of lawn or garden chemicals.

## **Fish**

- Cutthroat trout are the watershed's most plentiful salmonid. They are native and never have been stocked.
- Coho salmon were released into Deer Creek from 1965 until 1985. The stocking program was ended due to concerns over the effect of Coho on native cutthroat trout and winter steelhead.
- Fish barriers such as culverts, dams, waterfalls, logjams, and beaver ponds prevent fish from moving upstream and downstream to adjust to changing habitat conditions. There are 5 barriers on public roads and 6 dams in the watershed.

## **Restoration & Enhancement**

- Passive restoration can simply mean end disturbance and allow nature to recover on its own. Active restoration tries to speed up ecological recovery by rebuilding natural functions but is more complicated because of the difficulty of identifying the causes.
- Ted Gahr restored 30 acres of wetland on his land.
- Over 2,000 native shrubs and trees were planted in a riparian area along Swale Creek at Koester Farms.



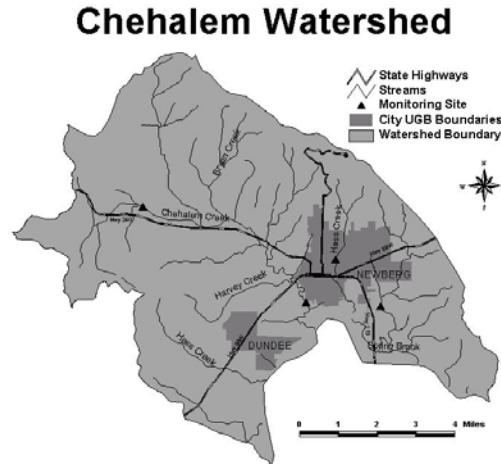
# Chehalem Watershed Assessment Summary

## Yamhill Basin Council

### Yamhill & Polk Counties, Oregon

#### Background

- The entire 43,000-acre watershed is in Yamhill Co.
- Major streams include Chehalem Creek, Hess Creek E. of Newberg, Hess Creek near Dundee, and Spring Brook.
- Residents are concentrated in Newberg and Dundee.
- Climate is marine-influenced, rainfall amounts vary, and snow & ice do not accumulate often. Soils have volcanic and sedimentary parent material and vegetation correlates well with geology.



#### Native Peoples and Fire History

- Indigenous Che-ahm-ill people were a sub-group of the Kalapuyan culture. Plants such as camas, tarweed and berries accounted for more of their nutritional intake than meat.
- For at least 4,000 years their regular burning maintained the oak savanna and prairies while preventing Douglas-fir forests from developing.
- Since the 1930s fire suppression crews have become better trained and organized.

#### Land Use

- Approximately 55% of the land is used for agriculture. Varied topography allows water to be channeled into streams for cultivation during the wetter part of the year, but also alters hydrology. 25% of the watershed is cultivated for perennial grass seed. Forests are the 2<sup>nd</sup> highest land use, about 36%.
- Six quarry permits are held in the watershed.

#### Wetlands and Forests

- Wetlands have abundant water, hydric soils and specially adapted wetland plants.
- Wetlands connect ecosystems and bodies of water, capture sediment, consume nitrogen from agricultural runoff, slow peak flows, and provide habitat.
- Approx. 1/3 of the prairie that used to dominate the Willamette Valley was “wet prairie” and home to species such as tufted hairgrass. Today, most of the wetlands have been drained and cultivated.
- Current fire suppression has resulted in much less oak savanna & prairie, more Douglas-fir, and contributes to a fire hazard in the forested areas of the watershed.
- Historically, open oak savanna covered a large portion of the watershed. Small mammals and 28 cavity-seeking birds are common in oaks. Today, it remains

- primarily in isolated remnants on wildlife refuges or in thin bands where woodlands transition into agricultural and residential areas.
- Historically, there was relatively little pure conifer stands in the watershed. Today, approximately 20% of the watershed is conifer forest.

### **Exotic and Rare Species**

- Non-native species introduced from other regions or continents occasionally do extremely well and become invasive. The OR Department of Agriculture identifies noxious weeds as plants having the potential to cause economic losses. Cost is high to eliminate weeds once they are established.
- English ivy is a noxious weed that can grow in deep shade, choking out native vegetation, including tree seedlings. Birds eat and disperse its seeds. Vines weigh down and break tree branches.
- The federal or state government lists 9 species native to the watershed as rare, threatened or endangered. The BLM lists 16 additional species as special status and 7 species as sensitive.

### **Riparian Zones**

- Riparian zones have higher moisture levels that support a more diverse and productive ecosystem. Vegetation provides shade, balanced water chemistry, and nutrient assimilation. Riparian vegetation also stabilizes stream banks, and provides habitat for insects and macro-invertebrates.
- Large woody debris retains gravel and sediment, helping to create flood terraces, meanders, larger riparian zones, a pool and waterfall pattern, and less powerful floods. Additionally, LWD provides fish cover, reduces erosion, and adds in-channel habitat diversity.
- Today, 5.1% of streams and in-stream reservoirs in the watershed lack riparian vegetation, 25% have only brush or grass and 33% have only hardwoods. Ideally all of these areas should have some mature conifers.
- Landowners grazed riparian areas so they could grow crops on the more level tillable land, used them as a source of lumber and used creeks for power and transportation. In the past, the area would re-seed itself, but in 1940s foresters introduced the idea of actively replanting trees.

### **Channel Habitat & Modification**

- Many streams are incised, greatly impacting natural meandering and seasonal flooding. Stream incision results from: dredging, dike building, straightening, damming, draining, removing large woody debris, hardening banks with rip-rap (rocks) or concrete. Constraining streams results in high velocities during heavy flows that erode channels and lead to incision.
- Many of the bottomland areas would naturally be in the flood plain category but are now low gradient moderately confined streams due to downcutting of stream banks.
- Natural meandering finds the stream's natural curvature to best dissipate energy.
- Agriculture has had the greatest impact on stream modification in the Salt Creek watershed. Building roads by streams and stabilizing the banks with rip-rap prevents natural channel movement.
- Fish barriers such as culverts, dams, waterfalls, logjams, and beaver ponds prevent fish from moving upstream and downstream to adjust to changing habitat conditions

such as temperature. Barriers separate fish populations and prevent escape or repopulation from catastrophic events. There are 49 barriers on public roads and 7 dams in the watershed.

## **Sediments**

- Major sources of runoff include cultivated fields, construction sites, landslides, roads, pavement, and insufficiently vegetated stream banks. Transformation of agricultural lands to highly urbanized lands can increase the rates and volumes of storm runoff by a factor of two to four.
- Impervious surfaces and rural road ditches collect oil, gas, steering fluid, exhaust particulates, rubber from tires and anti-freeze from cars. Agricultural land runoff contains nitrogen and phosphorus from fertilizers. Industry and consumer products also pollute runoff.
- Contaminants are most effectively removed by passing through an area where plant uptake of nutrients is significant and where heavy metals and toxins can either settle out or be consumed in a safe way before entering a stream.
- Sediment catch techniques include straw bales, silt fences, woven matting, detention ponds, and temporary swales. Gravel exit routes help remove mud from tires and keeps soil off of pavement and thus out of streams.

## **Hydrology & Water use**

- Streams are influenced by precipitation, withdrawals for irrigation and drinking water, stream & wetland modifications, changes in land use and water-related technology and removal or addition of vegetation.
- Streams left in natural state exhibit greater meandering, greater water exchange with wetlands and riparian areas, deeper flood plain soils for water storage and plant growth, increased number and depth of pools, less flows fluctuation, more minor localized flooding, and less major flooding.
- Parts of the watershed are classified as a “Ground Water Limited Area.”
- Newberg’s water treatment plant treats water using sediment settling, filtration and disinfection by chlorine. Newberg residents consume about 80 gallons of water per capita per day for domestic uses.
- Area land yields 15 inches of runoff in an average year.
- Under Oregon law all water is publicly owned. Water rights are required prior to use or consumption. Streams in the watershed are over appropriated and would run dry during the low flow time of year if everyone exercised their water rights simultaneously. Low streamflow harms aquatic life and prevents sufficient dilution of pollutants.

## **Water Quality**

- Benefits of the watershed are domestic and industrial water supply, irrigation, livestock watering, fish passage, fish rearing, resident fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, and hydro power.
- Native cutthroat trout year- round presence and health indicates the overall health of the watershed streams. Native winter steelhead are threatened and only use the watershed for a part of the year.

- Streams that do not meet set standards of water quality are listed under section 303(d) rules. Willamette River, from Willamette Falls to the Yamhill River, is listed for toxins, bacterial pollution, warm summer temperature levels and biological criteria. Other contaminants that are tested for include nutrients, sediment, organic compounds and solvents and metals.
- Elevated levels of nutrients such as phosphorus and nitrates can cause plant growth increases. Growth lowers dissolved oxygen levels and can be toxic.
- The Newberg wastewater treatment plant removes ammonia with bacteria and composts solid wastes. Liquid wastewater is disinfected with chlorine.
- High temperatures result in stress, increased metabolism, decreased competitiveness, decreased appetite, and even death of native fish. DEQ's maximum seven day average temperature standard for streams is 64°F.
- Minimum concentrations of dissolved oxygen are essential to support aquatic life and particularly for salmonid species. The screening level of this assessment desired 8 mg/l. In Yamhill County, samples range from 8.5 to 13.5 mg/L.
- Water pH is an important indicator of the chemical forms and availability of nutrients, as well as the presence of toxic chemicals in the system. Oregon Water Quality standards specify the approved pH range as 6.5-8.5.
- Turbidity is a measurement of water clarity, with high values indicating high amounts of suspended sediments or particles in the system that can damage fish gills and/or reduce their ability to see prey. Sediments can clog spawning gravel.
- Several pesticides are likely to exist in the streams and rivers of the watershed. There are likely to be a number of agricultural contaminants in the water. Residents likely contribute significant amounts of lawn or garden chemicals.

## **Fish**

- Cutthroat trout are the most plentiful and widespread native salmonid in the Yamhill basin.
- Stocking programs did not release fish in the streams of the watershed because the streams are generally too small.
- Chehalem Creek is spring Chinook salmon habitat for rearing and migration.

## **Restoration & Enhancement**

- Passive restoration can simply mean end disturbance and allow nature to recover on its own. Active restoration rebuilds natural functions but is more complicated.
- Gradual restoration is preferable to a quick, machinery-intensive makeover.
- James Stonebridge built 6 ponds on his field with the help of cost-share funding from the federal government. He succeeded in his goal of attracting waterfowl.
- Doug Rasmussen planted native trees & shrubs along a stream and established a wet prairie plant community with the financial assistance of the Conservation Reserve Enhancement Program.
- Ted Gahr restored 30 acres of wetland on his land.
- Kareen Sturgeon diverts gutter runoff into her backyard where she planted water-loving natives.
- Jacqueline Groth gradually turned her small lot into an island of native vegetation.

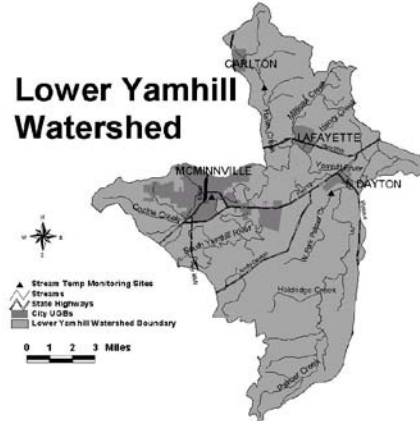
# Lower Yamhill Watershed Assessment Summary

## Yamhill Basin Council

### Yamhill & Polk Counties, Oregon

#### Background

- Nearly the entire 63,747-acre watershed is in Yamhill Co.
- Major streams include Cozine Creek, S. Yamhill River, Hawn Creek, Millican Creek, Henry Creek, and Palmer Creek.
- Residents are concentrated in McMinnville, Dayton, Lafayette and Carlton.
- Climate is marine-influenced, rainfall amounts vary and snow & ice do not accumulate often. Soils have volcanic and sedimentary parent material and vegetation correlates well with geology.



#### Native Peoples and Fire History

- Indigenous Che-ahm-ill people were a sub-group of the Kalapuyan culture. Plants such as camas, tarweed and berries accounted for more of their nutritional intake than meat.
- For at least 4,000 years their regular burning maintained the oak savanna and prairies while preventing Douglas-fir forests from developing.
- Since the 1930s fire suppression crews have become better trained and organized.

#### Land Use

- Approximately 70% of the land is used for agriculture. Varied topography allows water to be channeled into streams for cultivation during the wetter part of the year, but also alters hydrology. 45% of the watershed is cultivated for perennial grass seed.
- Forests are the 2<sup>nd</sup> highest land use, about 22%.
- Five quarry permits are held in the watershed.

#### Wetlands and Forests

- Wetlands have abundant water, hydric soils, and specially adapted wetland plants.
- Wetlands connect ecosystems and bodies of water, capture sediment, consume nitrogen from agricultural runoff, slow peak flows, and provide habitat.
- Approximately 1/3 of the prairie that used to dominate the Willamette Valley was "wet prairie" and home to species such as tufted hairgrass. Today, most wetlands are drained and cultivated. About 22 acres of tufted hairgrass remain in the watershed today.
- Current fire suppression has resulted in much less oak savanna & prairie, more Douglas-fir, and contributes to a fire hazard in the forested areas of the watershed.
- Historically, open oak savanna covered a large portion of the watershed. Small mammals and 28 cavity-seeking birds are common in oaks. Today, it remains

primarily in isolated remnants on wildlife refuges or in thin bands where woodlands transition into agricultural and residential areas.

- Historically, there was relatively little pure conifer stands in the watershed. Today, approximately 10% of the watershed is conifer forest.

### **Exotic and Rare Species**

- Non-native species introduced from other regions or continents occasionally do extremely well and become invasive. The OR Department of Agriculture identifies noxious weeds as plants having the potential to cause economic losses. Costs are high to eliminate weeds once they are established.
- The federal or state government lists 9 species native to the watershed as rare, threatened or endangered. The BLM lists 16 additional species as special status and 7 species as sensitive.

### **Riparian Zones**

- Riparian zones have higher moisture levels that support a more diverse and productive ecosystem. Vegetation provides shade, balanced water chemistry, and nutrient assimilation. Riparian vegetation also stabilizes stream banks and provides habitat for insects and macro-invertebrates.
- Large woody debris retains gravel and sediment, helping to create flood terraces, meanders, larger riparian zones, a pool and waterfall pattern and less powerful floods. Additionally, large woody debris provides fish cover, reduce erosion, and add in-channel habitat diversity.
- Today, 28% of streams and in-stream reservoirs have only brush or grass and 47% have only hardwoods. Ideally, all of these areas should have some mature conifers.
- Landowners grazed riparian areas so they could grow crops on the more level tillable land, used them as a source of lumber and used creeks for power and transportation. In the past, the area would re-seed itself, but in 1940s foresters introduced the idea of actively replanting trees.

### **Channel Habitat & Modification**

- Many streams are incised, greatly impacting natural meandering and seasonal flooding. Stream incision results from: dredging, dike building, straightening, damming, draining, removing large woody debris, hardening banks with rip-rap (rocks) or concrete. Constraining streams results in high velocities during heavy flows that erode channels and lead to incision.
- Many of the bottomland areas would naturally be in the flood plain category but are now low gradient moderately confined streams due to downcutting of stream banks.
- Natural meandering finds the stream's natural curvature to best dissipate energy.
- Agriculture has had the greatest impact on stream modification in the Salt Creek watershed. Building roads by streams and stabilizing the banks with rip-rap prevents natural channel movement.
- Fish barriers such as culverts, dams, waterfalls, logjams, and beaver ponds prevent fish from moving upstream and downstream to adjust to changing habitat conditions such as temperature. Barriers separate fish populations and prevent escape or repopulation from catastrophic events. There are 6 barriers on public roads and 10 dams in the watershed.

### **Sediments**

- Erosional features actively contributing sediment to streams are fields, construction sites, landslides, roads, and stream banks. Transformation of agricultural lands to highly urbanized lands can increase the rates and volumes of storm runoff by a factor of two to four.
- 2/3 of McMinnville's 11,505 acres are drained by Cozine Creek. This results in 75% of the total storm water being drained by the South Yamhill River.
- Impervious surfaces and rural road ditches collect oil, gas, steering fluid, exhaust particulates, rubber from tires, and anti-freeze from cars. Agricultural land runoff contains nitrogen and phosphorus from fertilizers. Industry and consumer products also pollute runoff.
- Contaminants are most effectively removed by passing through an area where plant uptake of nutrients is significant and where heavy metals and toxins can either settle out or be consumed in a safe way before entering a stream.
- Sediment catch techniques include straw bales, silt fences, woven matting, detention ponds, and temporary swales. Gravel exit routes help remove mud from tires and keeps soil off of pavement and thus out of streams.

### **Hydrology & Water use**

- Streams are influenced by precipitation, withdrawals for irrigation and drinking water, stream & wetland modifications, changes in land use, and water-related technology and removal or addition of vegetation.
- Streams left in natural state exhibit greater meandering, greater water exchange with wetlands and riparian areas, deeper flood plain soils for water storage and plant growth, increased number and depth of pools, less flows fluctuation, more minor localized flooding, and less major flooding.
- Area land yields 15 inches of runoff in an average year.
- Palmer Creek Irrigation District takes water out of the Willamette River and uses the Creek to distribute it to irrigation users.
- Under Oregon law all water is publicly owned. Water rights are required prior to use or consumption. Streams in the watershed are over appropriated and would run dry during the low flow time of year if everyone exercised their water rights simultaneously. Low streamflow harms aquatic life and prevents sufficient dilution of pollutants.

### **Water Quality**

- Benefits of the watershed are domestic and industrial water supply, irrigation, livestock watering, fish passage, fish rearing, resident fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality and hydro power.
- Native cutthroat trout year-round presence and health indicates the overall health of the watershed streams.
- Streams that do not meet set standards of water quality are listed under section 303(d) rules. Palmer Creek, West Fork, from mouth to headwaters is listed for toxics. Yamhill River, mouth to confluence of N&S Yamhill Rivers is listed for bacterial pollution and warm summer temperature levels. South Yamhill River, from mouth to Salt Creek, is listed for bacterial pollution and warm summer temperature

- levels. Other contaminants that are tested for include nutrients, sediment, organic compounds and solvents and metals.
- Elevated levels of nutrients such as phosphorus and nitrates can cause plant growth increases and can be a problem. Growth lowers dissolved oxygen levels and can be toxic.
  - McMinnville's Water Reclamation Facility removes bacteria and most nutrients.
  - High temperatures result in stress, increased metabolism, decreased competitiveness, decreased appetite and even death of native fish. DEQ's maximum seven day average temperature standard for streams is 64°F.
  - Minimum concentrations of dissolved oxygen are essential to support aquatic life and particularly for salmonid species. The screening level of this assessment desired 8 mg/l. On the South Yamhill River, samples range from 8.5 to 13.5 mg/L.
  - Water pH is an important indicator of the chemical forms and availability of nutrients, as well as the presence of toxic chemicals in the system. Oregon Water Quality standards specify the approved pH range as 6.5-8.5. The South Yamhill River pH ranged from 6.9-7.9 in ODEQ data from 1970 to 1988.
  - Turbidity is a measurement of water clarity, with high values indicating high amounts of suspended sediments or particles in the system that can damage fish gills and/or reduce their ability to see prey. Sediments can clog spawning gravel. South Yamhill River turbidity levels in 1986-1988 were between 1.0-34.0 Hack FTU.
  - Several pesticides are likely to exist in the streams and rivers of the watershed. There are likely to be a number of agricultural contaminants in the water. Residents likely contribute significant amounts of lawn or garden chemicals.

## **Fish**

- Cutthroat trout are the most plentiful and widespread native salmonid in the Yamhill Basin.
- Stocking programs released fish in headwater streams as opposed to the Lower Yamhill for reasons of water quality and habitat.

## **Restoration & Enhancement**

- Passive restoration can simply mean end disturbance and allow nature to recover on its own. Active restoration rebuilds natural functions but is more complicated.
- Gradual restoration is preferable to a quick, machinery-intensive makeover.
- James Stonebridge built 6 ponds on his field with the help of cost-share funding from the federal government.
- Doug Rasmussen planted native trees & shrubs along a stream and established a wet prairie plant community with the financial assistance of the Conservation Reserve Enhancement Program.
- Ted Gahr restored 30 acres of wetland on his land.
- Kareen Sturgeon diverts gutter runoff into her backyard where she planted water-loving natives.
- Jacqueline Groth gradually turned her small lot into an island of native vegetation.



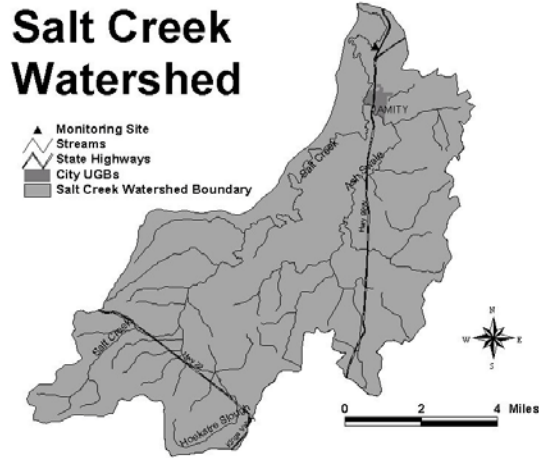
# Salt Creek Watershed Assessment Summary

## Yamhill Basin Council

### Yamhill & Polk Counties, Oregon

#### Background

- Rain that falls in the watershed flows into Salt Creek, then into the South Yamhill, the Yamhill, the Willamette, and finally the Columbia River.
- 78% of the 63,000-acre watershed is in Polk Co. while the remaining 22% is in Yamhill Co. Major streams include Salt Creek and Ash Swale.
- Amity has 1,478 residents, a 25.8% increase from 1990.
- Climate is marine-influenced, rainfall amounts vary and snow & ice do not accumulate often. Soils have volcanic and sedimentary parent material and vegetation correlates well with geology.



#### Native Peoples and Fire History

- Indigenous Che-ahm-ill people were a sub-group of the Kalapuyan culture. Plants such as camas, tarweed and berries accounted for more of their nutritional intake than meat.
- For at least 4,000 years their regular burning maintained the oak savanna and prairies while preventing Douglas-fir forests from developing.
- Since the 1930s fire suppression crews have become better trained and organized.

#### Land Use

- Approximately 70% of the land is used for agriculture. Varied topography allows water to be channeled into streams for cultivation during the wetter part of the year, but also alters hydrology.
- Forests are the 2<sup>nd</sup> highest land use, about 29%.
- Three quarry permits are held in the watershed.

#### Wetlands and Forests

- Wetlands have abundant water, hydric soils, and specially adapted wetland plants.
- Wetlands connect ecosystems and bodies of water, capture sediment, consume nitrogen from agricultural runoff, slow peak flows, and provide habitat.
- Approx. 1/3 of the prairie that used to dominate the Willamette Valley was “wet prairie” and home to species such as tufted hairgrass. Today, most of the wetlands have been drained and cultivated.
- Current fire suppression has resulted in much less oak savanna & prairie, more Douglas-fir, and contributes to a fire hazard in the forested areas of the watershed.
- Historically, open oak savanna covered at least 25% of the watershed. Small mammals and 28 cavity-seeking birds are common in oaks. Today, approx. 8% of the watershed is oak forest, mostly with Douglas-fir.

- Historically, pure conifer stands accounted for less than 5% of the watershed. Today, approximately 16% of the watershed is conifer forest.

### **Exotic and Rare Species**

- Non-native species introduced from other regions or continents occasionally do extremely well and become invasive. The OR Department of Agriculture identifies noxious weeds as plants having the potential to cause economic losses. Cost is high to eliminate weeds once they are established.
- English ivy is a noxious weed spread by birds that can grow in deep shade, choking out native vegetation, including tree seedlings. Vines break tree branches.
- The federal or state government lists 9 species native to the watershed as rare, threatened or endangered. The BLM lists 16 additional species as special status and 7 species as sensitive.

### **Riparian Zones**

- Riparian zones have higher moisture levels that support a more diverse and productive ecosystem. Vegetation provides shade, stream bank stabilization, habitat for insects and macro-invertebrates, nutrients and large wood. Large woody debris provides fish cover, diverts channels, increases pool depth, reduces erosion, and adds in-channel habitat diversity.
- Today, 10.2% of streams and in-stream reservoirs in the watershed lack riparian vegetation, 38.9% have only brush or grass and 29.5% have only hardwoods. Ideally, all of these areas should have some mature conifers.
- Landowners grazed riparian areas so they could grow crops on the more level tillable land, used them as a source of lumber and used creeks for power and transportation. In the past, the area would re-seed itself, but in 1940s foresters introduced the idea of actively replanting trees.

### **Channel Habitat & Modification**

- Many streams are incised, greatly impacting natural meandering and seasonal flooding. Stream incision results from: dredging, dike building, straightening, damming, draining, removing large woody debris, hardening banks with rip-rap (rocks) or concrete. Constraining streams results in high velocities during heavy flows that erode channels and lead to incision.
- Many of the bottomland areas would naturally be in the flood plain category but are now low gradient moderately confined streams due to downcutting of stream banks.
- Natural meandering finds the stream's natural curvature to best dissipate energy and decrease erosion.
- Agriculture has had the greatest impact on stream modification in the Salt Creek watershed. Building roads by streams and stabilizing the banks with rip-rap prevents natural channel movement.
- Fish barriers such as culverts, dams, waterfalls, logjams, and beaver ponds prevent fish from moving upstream and downstream to adjust to changing habitat conditions such as temperature. Barriers separate fish populations and prevent escape or repopulation from catastrophic events. There are 27 barriers on public roads and 26 dams in the watershed.

## **Sediments**

- Major sources of runoff include cultivated fields, construction sites, landslides, roads, pavement, and insufficiently vegetated stream banks.
- Impervious surfaces and rural road ditches collect oil, gas, steering fluid, exhaust particulates, rubber from tires, and anti-freeze from cars. Agricultural land runoff contains nitrogen and phosphorus from fertilizers. Industry and consumer products also pollute runoff.
- Contaminants are most effectively removed by passing through an area where plant uptake of nutrients is significant and where heavy metals and toxins can either settle out or be consumed in a safe way before entering a stream.
- Sediment catch techniques include straw bales, silt fences, woven matting, detention ponds, and temporary swales. Gravel exit routes help remove mud from tires and keeps soil off of pavement and thus out of streams.

## **Hydrology & Water use**

- Streams are influenced by precipitation, withdrawals for irrigation and drinking water, stream & wetland modifications, changes in land use, and water-related technology and removal or addition of vegetation.
- Streams left in natural state exhibit greater meandering, greater water exchange with wetlands and riparian areas, deeper flood plain soils for water storage and plant growth, increased number and depth of pools, less flows fluctuation, more minor localized flooding, and less major flooding.
- Water needs are increasing due to the rapidly growing population.
- Many lowland areas are of low permeability, so recharge during winter and spring is low. Columbia River Basalt Group groundwater levels are subject to long-term water-level declines due to pumping at a rate higher than annually recharged by direct infiltration of precipitation.
- Parts of the watershed are classified as a “Ground Water Limited Area.”
- Amity’s drinking water is from the South Yamhill R. and is treated with chlorine, aluminum sulfate, and soda ash.
- Area land yields 15 inches of runoff in an average year that is mostly gone by irrigation time.
- Under Oregon law all water is publicly owned. Water rights are required prior to use or consumption. Streams in the watershed are over appropriated and would run dry during the low flow time of year if everyone exercised their water rights simultaneously. Low streamflow harms aquatic life and prevents sufficient dilution of pollutants.

## **Water Quality**

- Benefits of the watershed are domestic and industrial water supply, irrigation, livestock watering, fish passage and rearing, resident fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, and hydro power.
- Cutthroat trout presence and health indicates the overall health of the watershed’s streams.
- Streams that do not meet set standards of water quality are listed under section 303(d) rules. Salt Creek, from mouth to headwaters, is listed for bacterial pollution,

low dissolved oxygen, warm summer temperature levels and chlorophyll a pollution. Other contaminants that are tested for include nutrients, sediment, organic compounds and solvents and metals.

- Elevated levels of nutrients such as phosphorus and nitrates can cause plant growth increases. Growth lowers dissolved oxygen levels and can be toxic.
- High temperatures result in stress, increased metabolism, decreased competitiveness, decreased appetite, and even death of native fish. DEQ's maximum seven day average temperature standard for streams is 64°F.
- Minimum concentrations of dissolved oxygen are essential to support aquatic life and particularly for salmonid species. The screening level of this assessment desired 8 mg/l. In the Yamhill basin, samples range from 8.5-13.5 mg/L.
- Water pH is an important indicator of the chemical forms and availability of nutrients, as well as the presence of toxic chemicals in the system. Oregon Water Quality standards specify the approved pH range as 6.5-8.5.
- Turbidity is a measurement of water clarity, with high values indicating high amounts of suspended sediments or particles in the system that can damage fish gills and/or reduce their ability to see prey. Sediments can clog spawning gravel.
- Several pesticides are likely to exist in the streams and rivers of the watershed. There are likely to be a number of agricultural contaminants in the water. Residents likely contribute significant amounts of lawn or garden chemicals.

## **Fish**

- Cutthroat trout are the most plentiful and widespread native salmonid in the Yamhill basin. It is probably the only year-round salmonid in the upper reaches of streams due to water quality and habitat diversity needs.
- Cutthroat trout, bullhead catfish, bluegill, largemouth bass, sculpin, and redbreast shiners were trapped in Ash Swale near Amity during an ODFW survey in 1999.
- Stocking programs did not release fish in the streams of the watershed for reasons of water quality and habitat.
- The lower 7.5 miles of Salt Creek are used by spring Chinook salmon and winter steelhead for rearing and migration.

## **Restoration & Enhancement**

- Passive restoration can simply mean end disturbance and allow nature to recover on its own. Active restoration rebuilds natural functions but is more complicated.
- Gradual restoration is preferable to a quick, machinery-intensive makeover.
- James Stonebridge built 6 ponds on his field with the help of cost-share funding from the federal government. He succeeded in his goal of attracting waterfowl.
- Doug Rasmussen planted native trees & shrubs along a stream and established a wet prairie plant community with the financial assistance of the Conservation Reserve Enhancement Program.
- Ted Gahr restored 30 acres of wetland on his land.
- Kareen Sturgeon diverts gutter runoff into her backyard where she planted water-loving natives.
- Jacqueline Groth gradually turned her small lot into an island of native vegetation.

# Mill Watershed Assessment Summary

## Yamhill Basin Council

### Yamhill & Polk Counties, Oregon

#### Background

- Most of 33,920-acre watershed is in Polk Co. Streams include Mill, Gooseneck, Panther, Tillaston, South Branch Mill, Bear, Wind, Cedar, Coffee, Pine, Shumway, Camp, Coldwater, Rowell, and Glenbrook.
- The four sub-watersheds are Upper Mill, Middle Mill, Lower Mill, and Gooseneck. Residents are concentrated in Lower Mill.
- 165.3 of the 336.7 miles in the watershed are intermittent and not included in the assessment.
- Climate is marine-influenced, rainfall amounts vary, and snow & ice accumulate at higher elevations. The five primary soil associations for the watershed are Salkum-Briedwell, Bellpine-Suver-Hazelair, Peavine-Honeygrove-McDuff, Kilchis-Klickitat, and Valsetz-Luckiamute.
- 49.1% of the watershed is early vegetation seral stage, 0-39 years, which include mostly agricultural and recently replanted forest. 40.1% is middle, or 40-79 years.
- Small landowners own the majority of land in Lower Mill and Gooseneck sub-watersheds. Lower Mill is zoned mostly agricultural and rural residential. Trees in Gooseneck are harvested for timber. BLM and Willamette Industries own nearly all of the Upper and Middle Mill where forestry is the dominant land use.
- There are a total of 15 quarry permits with only 6 considered open or active. Shenk's quarry is the only quarry known to be currently in operation.
- Current dominant crops in the Lower Mill, Gooseneck and Middle Mill sub-watersheds are grass seed, wheat, flower seeds, hay, and nursery stock. Additionally there are Christmas tree and vineyards in the area.



#### Historical Conditions

- Kalapuyan natives used fire for increasing yields of agriculture, hunting, communication, warfare, visibility, safety, and sanitation. They were moved to the Grand Ronde Reservation near present-day Willamina in 1855.
- Settlers first moved to and homesteaded in the watershed during the 1840s. European settlers used fire for trail building, amusement, agriculture, camping, hunting, logging slash, and incendiary.
- There have been two catastrophic fires since 1840 that have significantly affected the watershed. Current fire policy is to control and extinguish all fires that occur.
- Since the 1840s wetlands and low-lying areas have been tilled and drained for rural residential and agricultural uses.
- In the 1890s Gooseneck Creek was diverted from its natural channel into a man and horse dug diversion to allow easier access to fields.

## Channel Habitat Types

- The watershed consists of 7 different channel habitat types. 75% of the Gooseneck and 64% of Upper Mill sub-watershed is very steep headwater. Middle Mill sub-watershed is 46% moderately steep narrow valley and 32% very steep headwater. Lower Mill sub-watershed is 31% moderate gradient constrained, 28% low gradient constrained and 31% low gradient moderately confined.
- Moderately steep narrow valley channels have potential for anadromous steelhead and resident fish spawning and rearing. Moderate gradient constrained, low gradient moderately confined, and low gradient constrained channels have potential for anadromous coho and steelhead spawning and rearing and resident fish spawning, rearing and overwintering.

## Fish

- Fish present in the waters of the watershed include steelhead trout, coho salmon, pacific lamprey, western brook lamprey, cutthroat trout, longnose dace, rainbow trout, prickly sculpin, reticulate sculpin, riffle sculpin, torrent sculpin, redbelt shiner, and sucker.
- Steelhead prefer cold, fast moving streams with channel gradients of 0.5% or greater.
- Cutthroats are the only native trout species to the watershed. They prefer to spawn in the gradient tributaries and streams of the upper watershed.
- Warm water game fish and non-native bullfrogs are found in the lower reaches of the Yamhill river watershed. They live and breed in the lower reaches of the watershed preferring warmer slower moving water.
- ODFW considers the Yamhill Basin to be one of the most productive areas in the Coast Range Sub-watershed that makes up the western part of the Upper Willamette Valley with regards to native winter Steelhead. Historically the Yamhill Basin probably never supported large populations of winter Steelhead prior to stocking efforts in the 1950s.
- Coho salmon and rainbow trout are non-native to the watershed. Resident populations are considered introduced from hatchery stocking efforts.
- Three native species of crayfish are thought to be present. They are important to Oregon's fisheries due to their hypersensitivity to pesticides and water pollution. Anecdotal evidence indicates populations have decreased dramatically this century.
- Overall fish habitat condition for the watershed is considered poor partially due to the lack of deep pools and low numbers of coarse woody debris.
- Fish barriers are natural or human created obstacles that impede the passage of fish. Barriers include culverts, dams, waterfalls, log jams, and beaver ponds. As habitat conditions change fish need to move to locations with more favorable conditions.

## Riparian Conditions

- Riparian areas are regions adjacent to streams, rivers, and wetlands with characteristic plant and animal species unique to the habitat. They have higher levels of soil moisture and support a more abundant and diverse ecosystem.
- Riparian vegetation provides shade, stream bank stabilization, insect and macro-invertebrate habitat, organic litter for vital nutrients, and large woody debris (LWD) vital for fish habitat.

- Lower Mill has riparian widths averaging 43 feet with major vegetation small to medium-sized hardwoods (68%). 14% is exposed soil. Vegetation is sparse, overall shade quality and LWD recruitment potential is estimated to be low.
- Middle Mill has riparian widths averaging 49 feet with major vegetation hardwoods (60%). 12% is exposed soil. Vegetation was better along steeper tributaries and headwaters than along the main channel and roads, overall shade quality is low and LWD recruitment potential is low to medium.
- Upper Mill has riparian widths averaging 61 feet with major vegetation conifers (65%). 17% is exposed soil. Higher order stream segments are densely forested. Shade quality was higher in older stand areas and low near timber harvest and roads. Very little LWD was observed. Few mature or old growth stands, nearly all forest vegetation in early to mid seral age stages.
- Gooseneck Creek has riparian widths averaging at 79.5 feet with major vegetation small stands of hardwoods and conifers (both 34%). 9% is exposed soil. Riparian zones were narrowest along rural residential and agricultural land uses and wider along steeper gradient tributaries to Gooseneck Creek. Headwaters had zones over 100 feet consisting of a mix of hardwoods and conifers. Shade quality ranged from low to high. LWD recruitment potential was relatively better, however larger trees were not commonly observed.

### Wetland Conditions

- Wetlands are areas saturated or annually inundated with water for periods long enough to support particular types of “water loving” vegetation and hydric soil types. Wetlands absorb floodwaters, filter pollutants, recharge groundwater and provide habitat for wildlife.
- The watershed has approximately 42 separate palustrine wetlands totaling 111 acres. Most are in the Lower Mill sub-watershed. 63% of the wetlands are forested, 18% are emergent, 12% are unconsolidated, 2% are aquatic bed and 1% are scrub-shrub. 71% of the wetlands are unmodified, 15% are diked or impounded and 14% are excavated.

### Channel Modifications

- Historically Mill and Gooseneck Creeks were more sinuous and braided or had multiple stream channels. Damming, dredging, diversions, dikes, splash dams, and rip-rap alter the physical and biological characteristics of streams.
- Many channels have been downcut to the underlying bedrock.
- There is a relative absence of dikes, levees, dams, or channel dredging in the watershed. The most common modifications are culverts at road crossings and the effects from land management activities in the uplands such as road construction and rip-rap. Small landowners use rip-rap, driveway culverts, ditch diversions, and clear riparian vegetation.

### Hydrology and Water Use

- Precipitation, infiltration, and evapotranspiration primarily dictate both the quantity and the time of year that water is available in the watershed. Human land use activities, primarily urbanization, rangeland, forestry, and agriculture, can alter the hydrologic cycle and influence the water budget.

- Stream flows can be influenced by human land use activities such as irrigation withdraws and/or stream channel modifications that can affect the time and amount of water that is present in the stream.
- The watershed has an overall road density of roughly 3.1 miles per square mile.
- Under Oregon law all water is publicly owned. There are 135 surface water rights permits in the watershed. Irrigation rights are authorized to withdraw a total of 15.25 cfs during the irrigation season to provide water for 1328 acres of farmland in the watershed. The lowest annual stream flows also occur during this period.
- ODFW and DEQ determine instream water rights for fish habitat and pollution.
- The upper section of Gooseneck Creek has the only major reservoir in the watershed. It is recharged with winter flows and supplies domestic and agricultural water for nearly 300 homes and farms.
- Total surface water rights exceed flows from April through mid-December.
- Low flows make stream temperature and water quality problems worse.

## **Water Quality**

- The physical and chemical condition of the water in the watershed has important influences on habitats for maintaining aquatic life and for human uses of the water.
- Benefits of the watershed are domestic & industrial water supply, irrigation, livestock watering, fish passage, fish rearing, resident fish & aquatic life, wildlife, hunting, fishing, boating, water contact recreation, aesthetic quality and hydro power.
- Streams that do not meet set standards of water quality are listed under section 303(d) rules. Mill Creek, mouth to headwaters, is listed for bacterial pollution and temperature in the summer. It is also a water body of concern for sediments, flow modification and habitat modification. Gooseneck Creek, mouth to headwaters, is a water body of concern for sediments and flow modification.
- Fecal coliforms warn of associated pathogenic health hazards. The DEQ limit for a single fecal coliform sample is 400-cfu/100 mL.
- DEQ maximum temperature standard for streams is 64°F. Growth and reproduction of native species are adversely affected when water temperatures range outside the optimum. During the winter spawning period for Steelhead the stream temperatures are not to exceed 55°F.
- Elevated levels of nutrients such as phosphorus and nitrates can cause increase algae growth and low concentrations of dissolved oxygen both of which can be detrimental to watershed habitats. Sources include farm and home fertilizers.
- Dissolved oxygen is essential to support aquatic life, especially salmonid species. The evaluation criterion is set at a minimum of 6.5 mg/l. Data recorded by the DEQ and EPA between 1987-88 showed DO values ranging from 8.1-13.7 mg/l.
- Water pH indicates the availability of nutrients and the presence of toxic chemicals. Oregon Water Quality standards specify the approved pH range as 6.5-8.5. Data collected by the EPA and DEQ between 1970-88 show values ranging from 7.0-8.5.
- Turbidity is a measurement of water clarity. High values indicate excessive amounts of suspended solids in the system that can damage fish gills and/or reduce their ability to see prey. DEQ data between 1987-88 showed turbidity levels ranging from 1.0 to 29.0 FTU.



- Pesticides, herbicides and other organic chemicals move from land to streams through drainage, runoff, and erosion. Rain and irrigation water helps transport these chemicals to ground water. Synthetic chemicals can damage water quality and the health and reproduction of aquatic animal species.

## **Sediment Sources**

- Erosion of sediments is natural and varies depending on season and weather. Aquatic life has evolved to compensate for natural levels of sediments. It is difficult to determine what sediment load the watershed is adapted to handle and what human-induced sediment loads are exceeding this level.
- Road instability, slope instability, rural road runoff, and erosion from cropland were estimated to be the primary sources of sediment for the watershed.
- One of the most important factors in determining cropland contributions of fine sediments is to know where, when and how often cover crops are used to protect the topsoil from heavy winter rains and wind.
- The watershed is reported to have one of the highest slide risk areas in the region with rates predicted at one slide per 494 acres. Many slopes in upper elevations of the watershed exceed 90% gradients, classifying them as severe risks for landslides.
- Ratio of road-related landslides vs. forested area landslides was predicted at 7.7:1. Ratio of landslides in clearcut vs. forested areas was estimated at 7.2:1.
- Amount of sediment contributed by road runoff is variable and difficult to measure. Mill Creek road is above and near the creek, which indicates a high probability of fine sediment contribution.

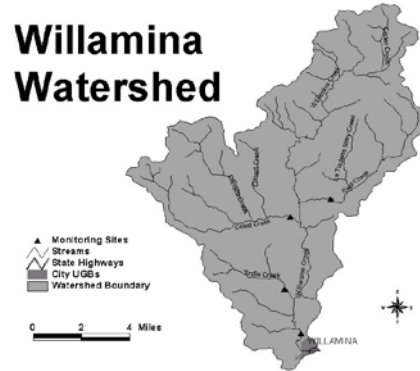
# Willamina Watershed Assessment Summary

## Yamhill Basin Council

### Yamhill & Polk Counties, Oregon

#### Background

- Most of 52,224-acre watershed is in Yamhill Co. Named creeks include: Willamina, East, Coast, Indian, Tindle, Burton, Canada, Gilbert, Baltimore, La Toutena Mary, and Cedar Creek.
- The four sub-basins are Upper Willamina, East Creek, Coast Creek, and Lower Willamina.
- Residents are concentrated in Willamina.
- Climate is marine-influenced, rainfall amounts vary, and snow & ice accumulate often. Soils have volcanic and sedimentary parent material. The three primary soil associations for the watershed are Wapato Cove, Peavine, and Hembre-Astoria-Klickitat silty clay loams.



#### Land Use

- Approximately 91% of the land is heavily forested, 67% of which is conifer and 33% of which is hardwood.
- The Bureau of Land Management owns approximately 30% of the watershed and most of the remaining land is privately owned.
- In the early 1960s, there were 205 farms in the watershed, 3,190 acres of cropland, 480 acres of rangeland, and 2,000 acres of grazed forestland.

#### Exotic and Rare Species

- Nelson's sidalcea, Weak bluegrass, Loose-flowered bluegrass, Meadow checker, Northern spotted owl, Northern red-legged frog, Mountain quail and Winter steelhead are either protected by the Federal ESA or are of concern because of low population. There are several other species that may live in the watershed that have not been field verified.

#### Fire History

- Kalapuyan natives used fire for increasing yields of agriculture, hunting, communication, warfare, visibility, safety, and sanitation. They were moved to the Grand Ronde Reservation near present-day Willamina in 1856.
- European settlers used fire for trail building, amusement, agriculture, camping, hunting, logging slash, and incendiary. The town of Willamina was founded in 1879 with an initial population of 70.
- There have been three catastrophic fires since 1840 that have significantly affected the Willamina watershed. Current fire policy is to control and extinguish any fires that occur.

#### Channel Habitat & Modification

- Willamina watershed consists of nine different channel habitat types. A majority of the surveyed stream segments in the Lower Willamina sub-basin are classified as

flood plains, contrasting with the other sub-basins that are mostly classified as steep valleys or very steep headwaters.

- Generally the surveyed sections of the watershed were in good condition.
- Fish barriers such as culverts, dams, waterfalls, logjams, and beaver ponds prevent fish from moving upstream and downstream to adjust to changing habitat conditions. There are 58 barriers and fish passage culverts in the watershed.
- Willamina Creek is thought to have sustained the most splash damming and log runs of the South Yamhill watershed.
- There are innumerable modifications associated with small landowners including rip-rap, driveway culverts, ditch diversions, and riparian zone vegetation clearing.
- There are an estimated couple of hundred channel modifications, of which only 26 have been physically or verbally verified.

## **Fish**

- Coho salmon, Steelhead and cutthroat trout as well as other fish species use a significant portion of the watershed's streams and tributaries as habitat.
- Big Creek hatchery stocked of Steelhead in the watershed from 1964 to 1989. More than 500,000 winter Steelhead fry, fingerlings, yearling smolts, and adults were released into the watershed over that time period.
- From 1964 until 1983 most Steelhead were released into Willamina Creek. In 1983 local residents and private landowners were encouraged to release fry stock into the smaller streams and tributaries of the watershed.
- Willamina Creek is considered to have the best return for winter Steelhead in the coast range sub-basin of the upper Willamette.
- The Oregon Fish Commission released more than 110,000 Coho salmon into the Willamina watershed between 1953 and 1958.

## **Riparian Zones**

- Riparian areas adjacent to streams, rivers and wetlands have higher levels of moisture than adjacent upland areas. The watershed averages a riparian buffer of over 30 feet.
- Riparian vegetation influences fish habitat and water quality by decreasing daily water temperature fluctuations and providing fish with cover from predation. It also stabilizes stream banks, provides habitat for insects and macro-invertebrates, and provides nutrients to the ecosystem. Trees in the area provide large woody debris that diverts channels and obstructs flow, thus increasing habitat complexity.
- The Lower Willamina sub-basin has the most impacted riparian areas in the watershed. Rural residential and urban land use create a low to moderate potential for large woody debris contributions.
- The upper Willamina sub-basin has some sections of low and medium grade riparian coverage, however a large portion has high grade conditions and good conditions for large woody debris contributions.
- The Coast Creek sub-basin has mostly been designated as moderate grade conditions.
- The East Creek sub-basin has one section of grasses and wetlands that do not provide shade and large woody debris and a small section of moderately graded riparian conditions. Most of the riparian zone vegetation is continuous. East Creek has the highest majority of forested riparian zones.

## **Wetlands and Forests**

- Wetlands have abundant water, hydric soils, and specially adapted wetland plants.
- Wetlands are important for absorbing floodwaters, filtering pollutants, recharging groundwater, and supporting a variety of wildlife. There are about 563 acres of wetland in the watershed. They are predominantly agricultural types (farmed wetlands or prior converted).

## **Hydrology & Water use**

- Primary land use activities that impact hydrology are urbanization, rangeland, forestry, and agriculture.
- There are no known dams or reservoirs in the watershed with the exception of log ponds near Willamina that have been drained and are no longer in use.
- Average annual peak flow for the Willamina gaging station that measures flow for an estimated 63 square miles was determined to be 2715 cfs. Low flows range from 9-21 cfs with a mean flow of 13 cfs. Flows of 17 cfs or lower occur approximately 12% of the time. Lowest flows generally occur from late August to early October.
- Temperature and contaminant concentrations increase during low flow conditions. Dissolved oxygen in streams decreases with increased temperature, causing organisms to compete.
- Under Oregon law all water is publicly owned. Water rights are required prior to use or consumption. 45% of water rights are used for irrigation and another 45% are used municipally.
- Streams in the watershed are over appropriated and would run dry during the low flow time of year if everyone exercised their water rights simultaneously.

## **Water Quality**

- The physical and chemical condition of the water in the watershed has important influences on habitats for maintaining aquatic life and for human uses of the water.
- Benefits of the watershed are domestic and industrial water supply, irrigation, livestock watering, fish passage, fish rearing, resident fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, and hydro power.
- Streams that do not meet set standards of water quality are listed under section 303(d) rules. Willamina Creek, mouth to above East Creek, is listed for bacterial pollution in the fall, winter and spring.
- High temperatures affect the growth and reproduction of native fish. DEQ set the maximum seven-day average standard for streams at 64°F. Data recorded in Willamina Creek shows seven-day averages of 69.6°F.
- Elevated levels of nutrients such as phosphorus and nitrates can cause algae and aquatic plant growth to become a problem and even be lethal. Growth also lowers dissolved oxygen levels. Sources include fertilizers from agriculture and urban lawn maintenance. The DEQ established a Total Maximum Daily Load standard of 0.07 mg/L.
- Minimum concentrations of dissolved oxygen are essential to support aquatic life and particularly for salmonid species. The evaluation criterion is set at a minimum of 6.5 mg/l. Data recorded by the DEQ and EPA between 1970-88 showed DO values ranging from 8.5-12.7 mg/l.

- Water pH is an important indicator of the chemical forms and availability of nutrients, as well as the presence of toxic chemicals in the system. Oregon Water Quality standards specify the approved pH range as 6.5-8.5. Data collected by the EPA and DEQ between 1970-88 show values ranging from 6.9-7.8.
- Turbidity is a measurement of the clarity of water, with high values indicating excessive amounts of suspended solids in the system that can damage fish gills and/or reduce their ability to see prey.
- Synthetic chemicals such as pesticides, herbicides, and other organic chemicals can be transported from land to streams through a combination of drainage, runoff, and erosion. Infiltration of rain and irrigation water facilitate transport of these chemicals to ground water. Synthetic chemicals have the potential to damage water quality and the health and reproduction of aquatic animal species. Heavy metals can also move the same way from urbanized or mined areas.
- Willamina Lumber Company holds the only two active point source discharge permits in the watershed. They discharge storm water and heater cooling water discharge into surface water.

## **Sediments**

- Erosion of sediments is natural and varies depending on season and weather. Aquatic life has evolved to compensate for natural levels of sediments. It is difficult to determine what sediment load the watershed is adapted to handle and what human-induced sediment loads are exceeding this level.
- During peak flow events, the potential for fine sediments and other road materials to migrate to active channels in these flow paths was estimated to be high.
- Road densities for the watershed averaged 5.0 miles per square mile. Roads within 200 feet of an active channel, 11% of the roads in the watershed, are a high risk potential for contributing sediments. Roads located on slopes greater than 50%, 5% of the roads in the watershed, are an even higher risk.
- Off road vehicle use is another potential source of fine sediments. A Cooperative Management Agreement between the BLM and a club has 25 miles of trails open to motorcycles and small all-terrain vehicles. The trails are in the upper reaches of the watershed and never pass directly through streams or wet areas and thus impacts are considered to be negligible.
- Landslides, slumps and debris flows that occur near streams can cause chronic turbidity, which inhibits the breathing and impairs the prey sighting ability of fish. 569 acres of the watershed were rated by the BLM as “unstable” and an additional 240 acres as “potentially unstable”. Most soil found in the watershed was rated as having a “low” to “moderate” erosion factor.

## **Restoration Efforts**

- Bureau of Land Management restored a 5-mile stretch of Willamina Creek. They placed large woody debris in the streams, established multiple species of native trees & shrubs, and removed a culvert on an existing road.