Molalla/Pudding – 17090009

8-Digit Hydrologic Unit Profile

FINAL

SWCD	Acres
Clackamas	305,115
Marion	254,489

Introduction

The Molalla/Pudding 8-Digit Hydrologic Unit Code (HUC) subbasin is comprised of 560,000 acres in Marion and Clackamas Counties. Fifty-one percent of the land is forested, and thirty-one percent is grass, hay, and pasture, which includes commercial dairy and beef operations. There are 45 permitted CAFOs in the subbasin.

Resource concerns associated with these land uses include soil condition, soil erosion, surface water quality contamination, increasing land use constraints, the need for timely technical assistance, high costs, and the urban-rural land use controversy.

There a 3,141 agricultural operations in the subbasin and 5,053 operators. Seventy-two percent of the operations are relatively small (less than 50 acres) and are owned by part-time hobby farmers. Increasing landowner awareness and urgency of local resource concerns may accelerate the diffusion of conservation throughout the subbasin.

Conservation assistance is provided by two NRCS service centers, two soil and water conservation districts, the Northwest Resource Conservation and Development (RC&D) office, and other local conservation organizations.

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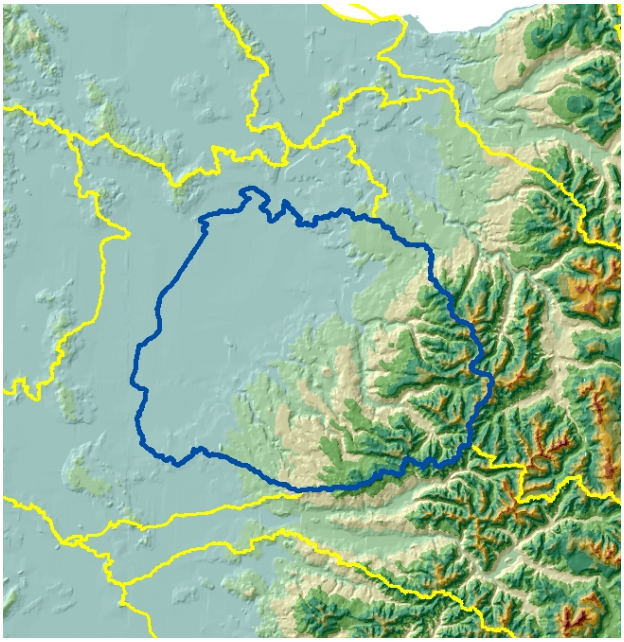

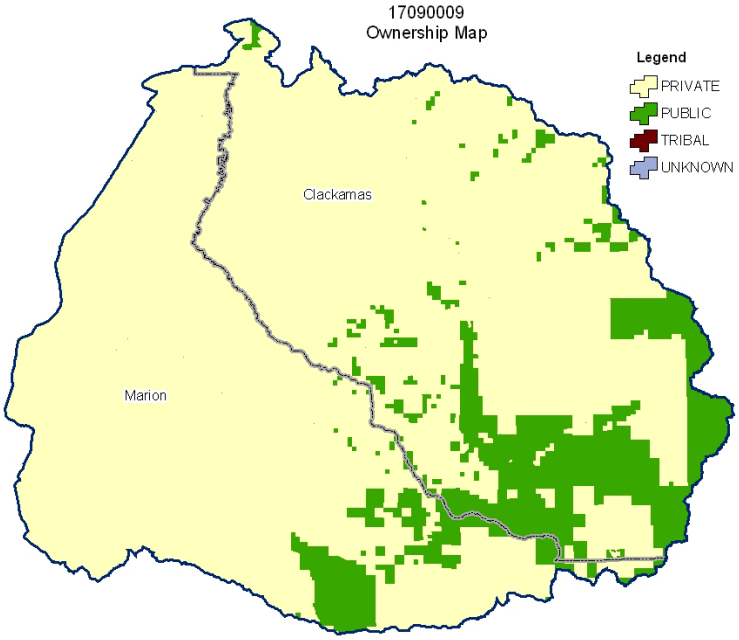

Produced by the Water Resources Planning Team Portland, OR

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Physical Description

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ALL NUMBERS IN THIS PROFILE ARE FOR OREGON ONLY

Land Cover/Land Use (NLCD[12])	Ownership - (2003 Draft BLM Surface Map Set[11])							
	Public		Private		Tribal		Totals	%
	Acres	%	Acres	%	Acres	%		
Forest	77,200	14%	208,700	37%	0	0%	**285,900**	**51%**
Grain Crops	*	---	23,200	4%	0	0%	**23,200**	**4%**
Conservation Reserve Program Land [a]	0	0%	*	---	0	0%	*****	**---**
Grass/Pasture/Hay	*	---	171,000	31%	0	0%	**173,500**	**31%**
Orchards/Vineyards	0	0%	19,600	4%	0	0%	**19,600**	**4%**
Row Crops	*	---	42,300	8%	0	0%	**42,300**	**8%**
Shrub/Rangelands	*	---	*	---	0	0%	*****	**---**
Water/Wetlands/Developed/Barren	*	---	12,700	2%	0	0%	**12,800**	**2%**
Oregon HUC Totals [b]	**80,100**	**14%**	**479,500**	**86%**	**0**	**0%**	**559,600**	**100%**

**: Less than 1 percent of total acres. See below for special considerations.*
a: Estimate from Farm Service Agency records and includes CRP/CREP.
b: Totals are approximate due to rounding and small unknown acreages.

Special Considerations for this 8-Digit HUC:

- Thirty-two percent of the private forestland is under industrial forest ownership (OSU, Forestry Sciences Laboratory).
- Grain is commonly grown in rotation with grass seed and other crops.
- Orchards/Vineyards/Berries includes other perennial crops, such as hops, mint, nursery stock, and Christmas trees. (Pacific Northwest Ecosystem Research Consortium)
  - Orchard/vineyards - 11,700 acres
  - Hops and mint - 200 acres
  - Nursery stock - 7,000 acres
  - Christmas trees - 7,600 acres
- Grass/Pasture/Hay includes approximately:
  - 31,300 acres of grass seed (field office estimate)
  - 50,700 acres of pasture (Pacific Northwest Ecosystem Research Consortium)
  - 25,100 acres of hay (Pacific Northwest Ecosystem Research Consortium)
- Pasture includes commercial dairy and beef operations as well as small farms and ranches.
- Row crops primarily consist of corn, beans, and cole crops grown for cannery processing or fresh market.
- Urban land makes up 16,300 acres.

Irrigated Lands (1997 NRI[13] Estimates for Non-Federal Lands Only)	Type of Land	ACRES	% of Irrigated Lands	% of HUC
	Cultivated Cropland	52,500	73%	9%
	Uncultivated Cropland	12,900	18%	2%
	Pastureland	6,700	9%	1%
	Total Irrigated Lands	**72,100**	**100%**	**12%**

(Continued on the following pages)

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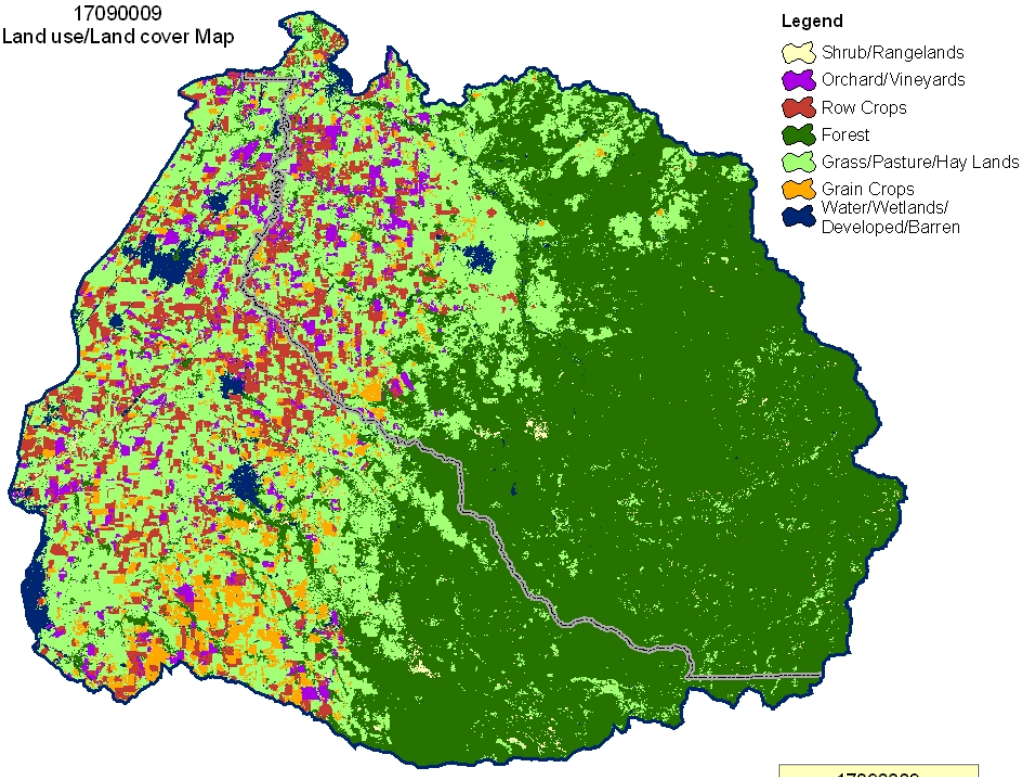

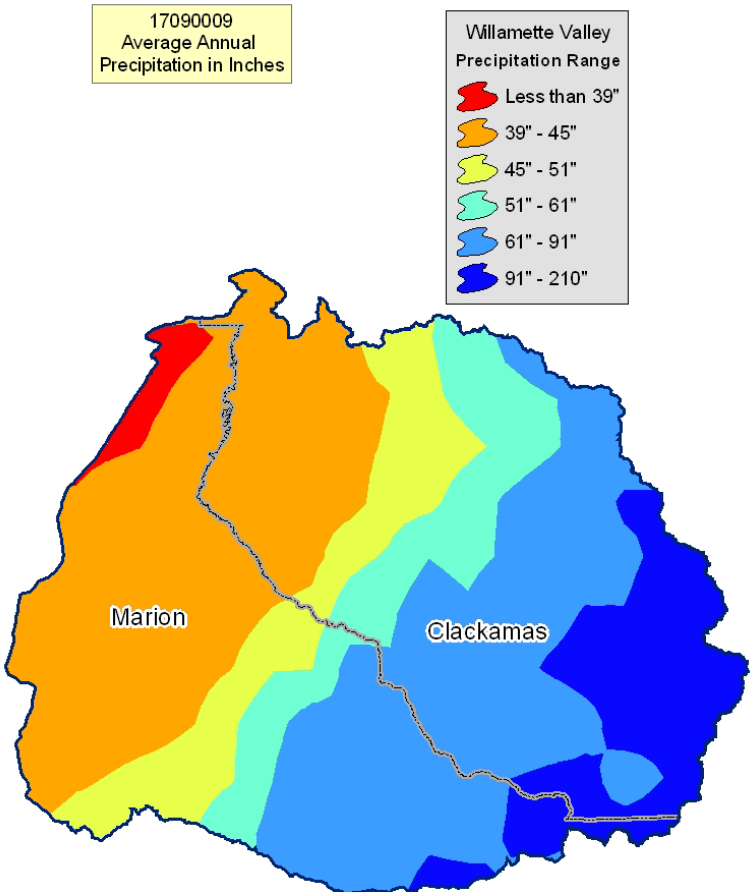

Common Resource Area Map

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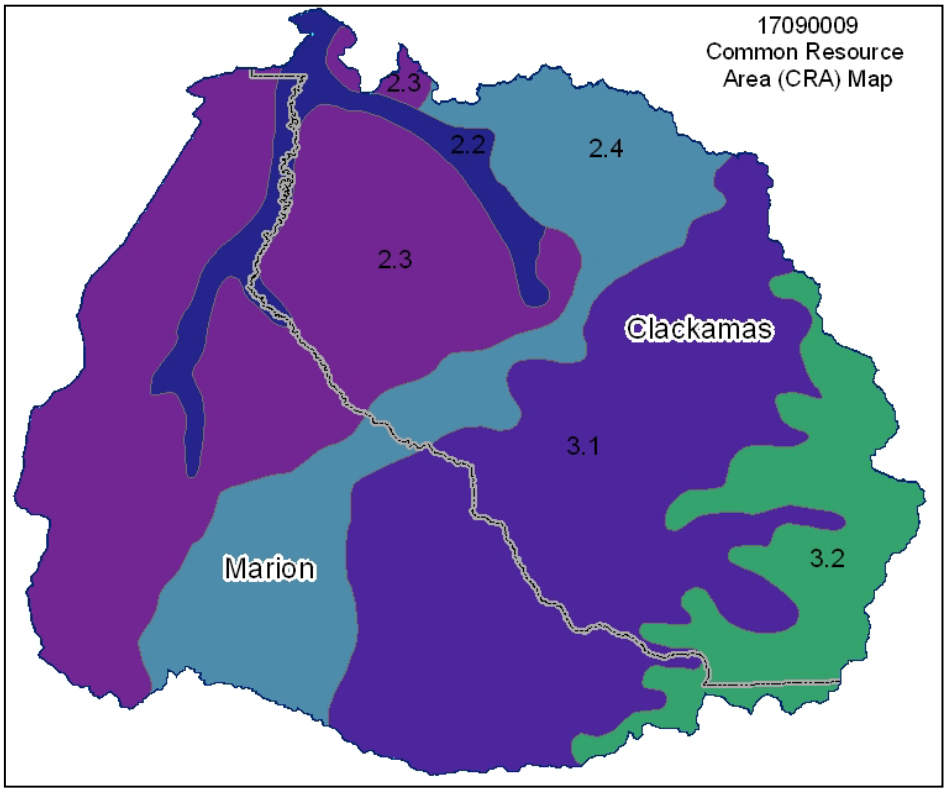
Only the major units are described below - for descriptions of all units within the HUC, go to: http://ice.or.nrcs.usda.gov/website/cra/viewer.htm



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

2.4 – Willamette and Puget Valleys - Valley Foothills: This unit is comprised of the foothills of the Willamette Valley. The soils are underlain by basalt and sedimentary rock and are typically red and clayey. The vegetation is Douglas fir and Oregon white oak. The temperature regime is mesic, and the moisture regime is xeric. The unit does not support western hemlock, which is characteristic of the adjacent units in the Coast and Cascade MLRA's.

3.1 – Olympic and Cascade Mountains - Western Cascades Lowlands and Valleys: This unit comprises the lower elevations of the Cascade Mountains, adjacent to the Valley Foothills unit (2.4). The soils are underlain by basalt, andesite, and rhyolite. The vegetation is Douglas fir and western hemlock. The unit is one of the most important timber-producing areas in the Northwest. The temperature regime is mesic, and the moisture regime is udic.

3.2 – Olympic and Cascade Mountains - Western Cascades Montane Highlands: This unit comprises the middle to high elevations of the Cascades. The vegetation is Douglas fir, western hemlock, mountain hemlock, Pacific silver fir, and noble fir. Elevation is typically more than about 3,000 feet. The mountains are highly dissected and have steep slopes. The temperature regime is frigid and "warm" cryic, and the moisture regime is udic. The unit normally has a deep annual snowpack.

Physical Description – Continued

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		ACRES	ACRE-FEET
Irrigated Adjudicated Water Rights *(OWRD[4])*	Surface	39,230	100,041
	Well	87,968	224,330
	Total Irrigated Adjudicated Water Rights	127,197	324,371
Stream Flow Data	USGS 14200000 MOLALLA RIVER, NEAR CANBY, OR	**Total Avg. Yield**	827,816
		May – Sept. Yield	130,290
		MILES	**PERCENT**
Stream Data[5] **Percent of Total Miles of Streams in HUC*	Total Miles – Major (100K Hydro GIS Layer)	881	---
	303d/TMDL Listed Streams (DEQ)	233	26%
	Anadromous Fish Presence (StreamNet)	99	11%
	Bull Trout Presence (StreamNet)	0	0%
		ACRES	**PERCENT**
Land Cover/Use[2] Based on a 100-foot stretch on both sides of all streams in the 100K Hydro GIS Layer	Forest	14,063	54%
	Grain Crops	615	2%
	Grass/Pasture/Hay	8,987	34%
	Orchards/Vineyards	705	3%
	Row Crops	1,069	4%
	Shrub/Rangelands – Includes CRP Lands	103	0%
	Water/Wetlands/Developed/Barren	666	3%
	Total Acres of 100-foot Stream Buffers	**26,208**	**---**
Land Capability Class *(Croplands & Pasturelands Only)* *(1997 NRI[3] Estimates for Non-Federal Lands Only)*	**1** – slight limitations	13,300	8%
	2 – moderate limitations	98,700	58%
	3 – severe limitations	36,400	21%
	4 – very severe limitations	16,900	10%
	5 – no erosion hazard, but other limitations	0	0%
	6 – severe limitations; unsuitable for cultivation; limited to pasture, range, forest	4,700	3%
	7 – very severe limitations; unsuitable for cultivation; limited to grazing, forest, wildlife habitat	0	0%
	8 – miscellaneous areas; limited to recreation, wildlife habitat, water supply	0	0%
	Total Croplands & Pasturelands	**170,000**	**---**

Confined Animal Feeding Operations – Oregon CAFO Permit – 12/2004

Animal Type	Dairy	Feedlot	Poultry	Swine	Mink	Other
No. of Permitted Farms	23	2	11	5	4	0
No. of Permitted Animals	9,283	395	3,230,000	3,985	122,500	0

Resource Concerns

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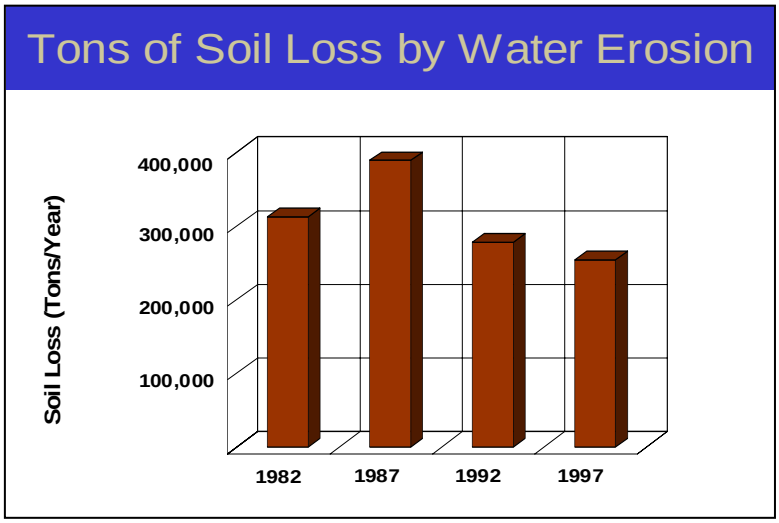
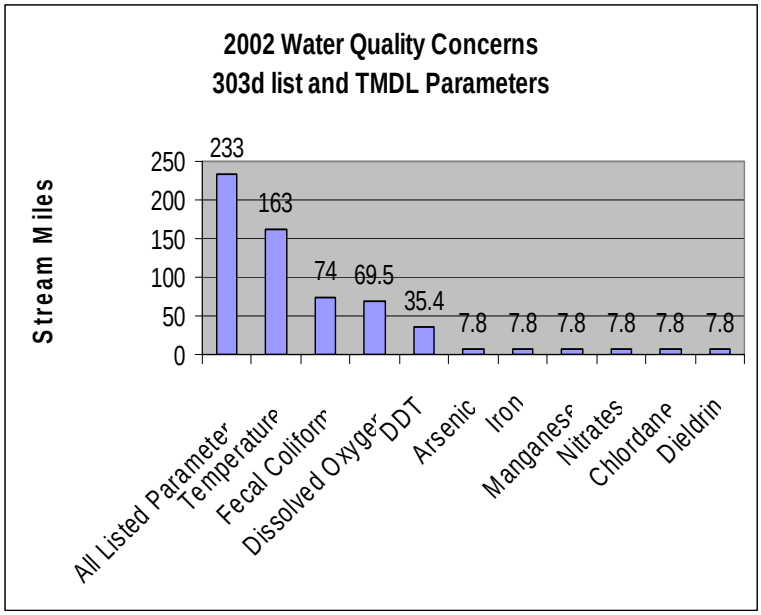


- Sheet and rill erosion by water on the cropland and pastureland have been reduced by nearly 60,000 tons of soil per year from 1982 to 1997.
- NRI estimates indicate that 21,500 acres of the agricultural lands still had water erosion rates above a sustainable level in 1997.
- Controlling erosion not only sustains the long-term productivity of the land, but it also affects the amount of soil, pesticides, fertilizer, and other substances that move into the Nation's waters.



- Almost 70 percent of the listed stream miles exceed State water quality standards for temperature. Elevated stream temperatures may be due to inadequate riparian shade, stream channel widening, and other anthropogenic or natural causes.
- Fecal coliform can be an indication of livestock waste runoff, but it also is typical of poorly functioning onsite sewage disposal systems.
- Nitrates and pesticides may be related to agriculture or residential use.
- Conservation practices that can be used to address these water quality issues include grazing management, nutrient and pest management, and use of riparian buffers.

Watershed Projects, Plans, Studies, and Assessments			
NRCS Watershed Projects[6]		**NRCS Watershed Plans, Studies, and Assessments[7]**	
Name	**Status**	**Name**	**Status**
None		Little Pudding River (Lake Labish)	Installed - 1958
ODEQ TMDL's[8]		**ODA Agricultural Water Quality Management Plans[9]**	
Name	**Status**	**Name**	**Status**
Pudding River Willamette Basin	Completed Draft for Review	Molalla-Pudding/North Santiam	Completed
OWEB Watershed Council[10]		**Watershed Council Assessments[11]**	**NWPCC Subbasin Plans and Assessments[18]**
Salem-Keizer Watershed Councils/Claggett Creek Watershed Council/Pudding River Watershed Council		Molalla River and Mill Creek Watershed Assessment	Willamette Subbasin Plan

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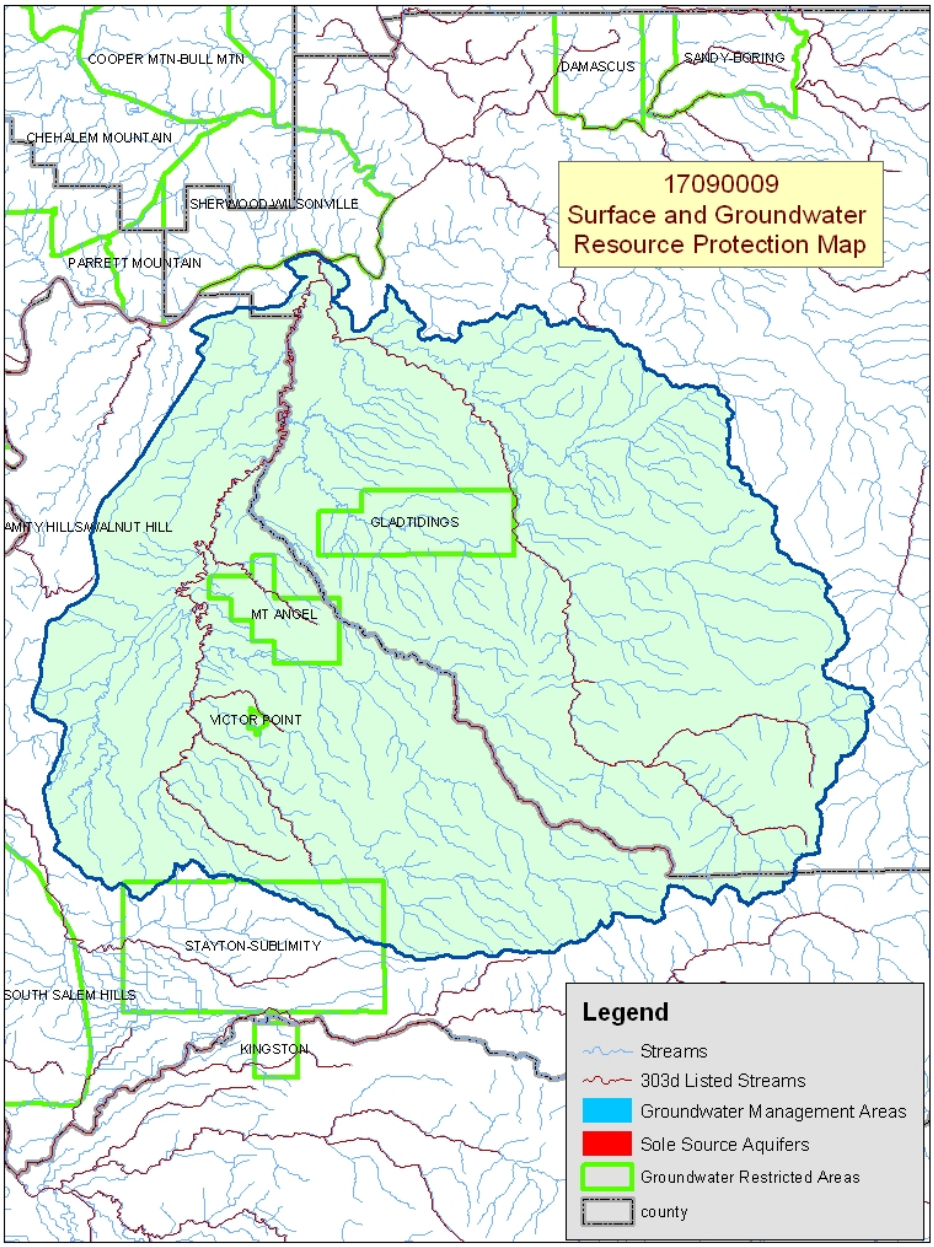

Map Footnote [17]

FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES[12]	
THREATENED SPECIES	**CANDIDATE SPECIES**
Mammals - Canada lynx **Birds –** Bald eagle, Northern spotted owl, Marbled murrelet **Fish –** Chum salmon, Steelhead, Chinook salmon, Bull trout **Invertebrates –** Fender's blue butterfly **Plants –** Golden paintbrush, Willamette daisy, Howellia, Bradshaw's lomatium, Kincaid's lupine, Nelson's checker-mallow	**Birds –** Yellow-billed cuckoo, Streaked horned lark **Amphibians and Reptiles –** Oregon spotted frog **Fish –** Coho salmon **Invertebrates -** Taylor's checkerspot **PROPOSED SPECIES** - None
ESSENTIAL FISH HABITAT[13] **-** Chinook	

Resource Concerns - Continued

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Resource Concerns / Issues by Land Use							
SWAPA +H Concerns	**Specific Resource Concern / Issue**	**Pasture \ Hay**	**Grass Seed**	**Grain Crops**	**Row Crops**	**Orch / Vine / Berry / Nursery / Xmas**	**Forest**
Soil Erosion	Sheet & Rill		X	X	X	X	
	Concentrated Flow or Gully	X					X
	Streambank						X
	Irrigation Induced				X		
Soil Condition	Tilth, Crusting, Infiltration, Organic Matter		X	X	X		
	Soil Compaction	X		X	X	X	
Soil Contamination	Excess Animal Wastes & Other Organic Nutrients	X					
Water Quantity	Water Management For Irrigated Land				X		
Water Quality, Surface	Pesticides		X	X	X	X	
	Nutrients & Organics	X			X	X	
	Suspended Sediments & Turbidity		X	X	X	X	X
	Low Dissolved Oxygen				X	X	
	Temperature	X	X	X	X	X	X
	Pathogens	X					
	Aquatic Habitat Suitability		X	X	X	X	
Air Quality	Smoke Particulates Causing Safety/Health Problems		X			X	
Plant Condition	Productivity, Health, & Vigor	X					
Animal Habitat, Domestic	Management	X					
Human, Economics	Land Use Constraints/Restrictions	X	X	X	X	X	X
	High Capital/Financial Costs	X	X	X	X	X	
	High Labor Costs or Availability				X	X	
	High Management Level Required				X	X	
	Low or Unreliable Profitability	X	X				X
Human, Political	Inadequate Availability of Cost Share Programs	X	X	X	X	X	X
	Lack of Technical Assistance	X	X	X	X	X	X
	High Degree of Controversy	X	X	X	X	X	X

Pasture / Hay

- Forage and grazing management commonly are issues on pastureland on small farms and ranches.
- Proper waste management is needed for CAFO operations to maintain water quality and avoid soil contamination associated with nutrients and pathogens, especially around the livestock headquarters.

Grain, Grass Seed, Row & Perennial Crops

- Management of residue, nutrients, and pests and use of filter strips and buffers are needed to control erosion and maintain water quality. Irrigation water management is an issue for irrigated crops in groundwater restricted areas.
- Grass seed is commonly produced under contract and in rotation with grain. Pest management and erosion control are primary concerns during the years when the crop is being established.
- Smoke from burning stubble after harvesting sometimes creates issues for health and safety.
- Adopting integrated pest management in lieu of use of chemicals on high-valued orchards and vineyards is an economic risk.

Forest

- On non-industrial forestland, landowner objectives are commonly for aesthetic value, not timber production.

General

- Land use constraints and pressure to develop hinders investment in conservation. Viable production agriculture in the watershed is diminishing.
- Increasing land values and conflicting urban-rural land uses raise serious social, political, and economic concerns for resource management in the watershed.

Census and Social Data[/14]

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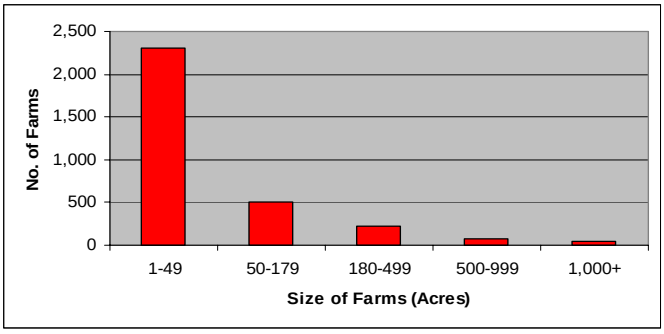


Number of Farms: 3,141

Number of Operators: 5,053

- Full-Time Operators: **931**
- Part-Time Operators: **4,122**

Estimated Level of Willingness and Ability to Participate in Conservation[/15]: Moderate to Low

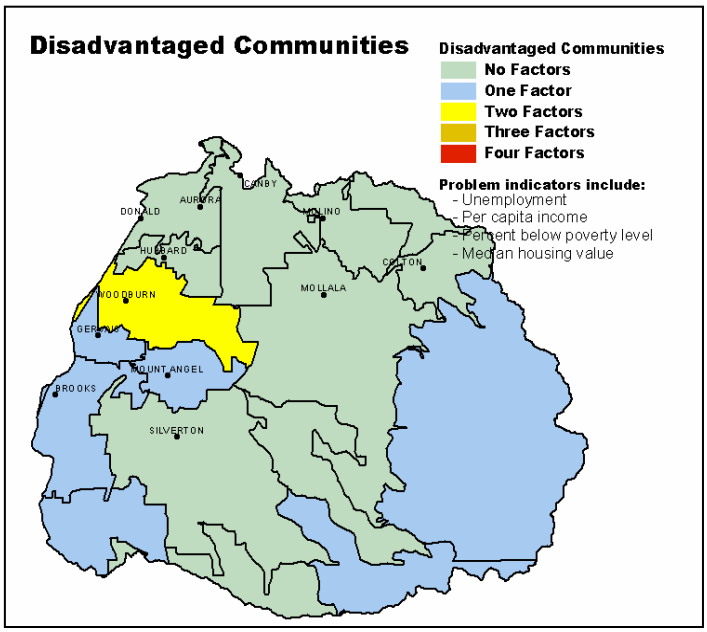
Operators of large farms in the subbasin are generally experienced resource managers with a positive stewardship attitude. Operators of smaller farms commonly need timely, extensive technical assistance.

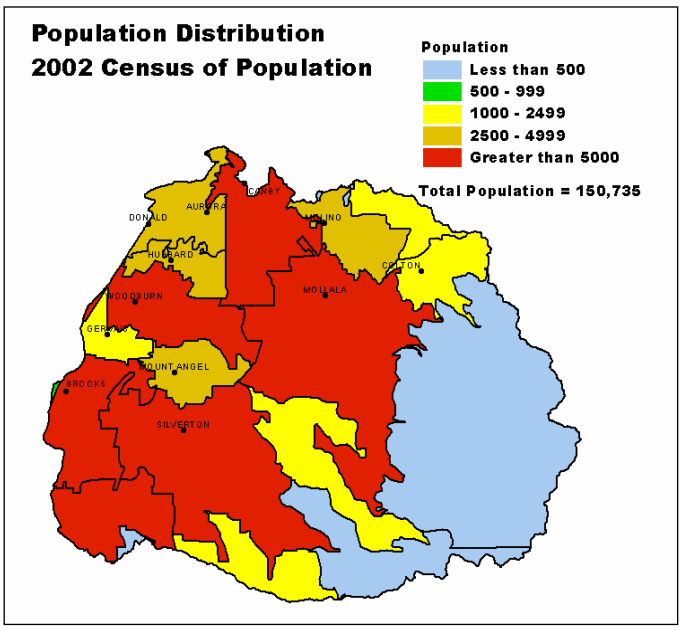
Conservation would likely increase if all operators in the subbasin became more aware of local resource concerns and the relationship of these concerns to their operation. The diffusion of conservation might also increase if recommended conservation practices and systems were more compatible to local operations, were easier to install, and could be implemented incrementally.

Evaluation of Social Capital[/16]: Moderate to Low

Social capital in the Molalla/Pudding subbasin and the ability of the community to effectively address local resource concerns could be better. The community's greatest assets include its willingness to participate in civic organizations, finish community projects, and include all residents, including minorities, if they perceive the activity to be important to them and their family.

The community might improve its ability to influence conservation and resource management if it were to perceive it to be a problem. Raising the awareness of the community, as a whole, to local resource issues might persuade local leadership to take a more active role in promoting conservation in the subbasin.





Progress / Status

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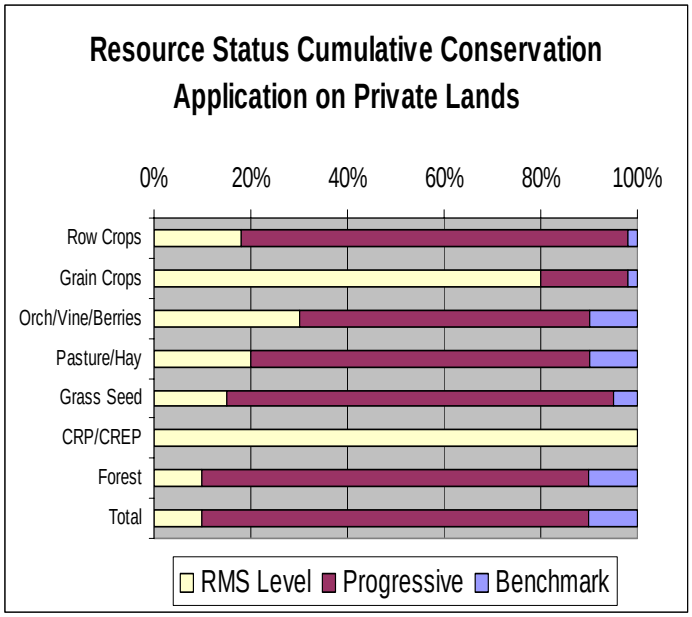
PRMS Data	FY99	FY00	FY01	FY02	FY03	Avg / Year	Total
Total Conservation Systems Planned (Acres)	1,382	1,512	756	1,228	378	1,051	5,256
Total Conservation Systems Applied (Acres)	70	614	234	266	341	305	1,525
Conservation Treatment Acres							
Waste Management (Number)	0	1	1	2	0	1	4
Buffers (Acres)	0	14	13	18	44	18	89
Erosion Control (Acres)	1	3	103	206	0	63	313
Irrigation Water Management (Acres)	0	2	0	0	0	0	0
Nutrient Management (Acres)	2	211	0	0	0	43	213
Pest Management (Acres)	2	156	0	1,006	55	244	1,219
Prescribed Grazing (Acres)	0	0	0	54	0	11	54
Trees & Shrubs (Acres)	11	99	17	31	17	35	175
Conservation Tillage (Acres)	0	166	62	439	0	133	667
Wildlife Habitat (Acres)	12	111	90	50	2	53	265
Wetlands (Acres)	0	2	0	0	31	7	33



Estimates are based on information received from local conservationists in the watershed.

- Progress over the last 5 years has been focused on:
  - Nutrient and pest management on CAFOs and cropland.
  - Erosion control on cropland.
  - Wildlife habitat management in riparian and wetland areas.
- Row crop (e.g. corn, beans, and cole crops) farmers commonly rely on crop consultants.
- Grain producers typically have not worked with NRCS but have adopted a high level of management.
- Most farmers who grow perennial crops generally operate at a high level.
- Much of the pasture that is at the benchmark level is on small farms.
- Private industrial forestland owners typically do not work with NRCS and SWCDs; however, their land commonly complies with State forest practice requirements.
- Much of the forestland is associated with riparian areas and oak savannahs that are not managed for forage or timber production.

Lands Removed from Production through Farm Bill Programs

- Conservation Reserve Program (CRP): **None**
- Wetland Restoration Program (WRP): **None**
- Conservation Reserve Enhancement Program (CREP): **64 acres**

Footnotes/Bibliography

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1. Ownership Layer – Source: The 1:24,000 scale public ownership layer is the land ownership/management for public entities, including Federal, Tribal, State, and local entities. This is a seamless, statewide Oregon Public Ownership vector layer composed of fee ownership of lands by Federal, State, Tribal, county, and city agencies. The layer is comprised of the best available data compiled at 1:24,000 scale or larger, and the line work matches GCDB boundary locations and ORMAP standards where possible. The layer is available from the State of Oregon GIS Service Center: http://www.gis.state.or.us/data/alphalist.html. For current ownership status, consult official records at appropriate Federal, State, and county offices. Ownership classes grouped to calculate Federal ownership vs. non-Federal ownership by the Water Resources Planning Team.

2. National Land Cover Dataset (NLCD) - Originator: U.S. Geological Survey (USGS); Publication date: 19990631; Title: Oregon Land Cover Data Set, Edition: 1; Geospatial data presentation form: Raster digital data; Publisher: U.S. Geological Survey, Sioux Falls, SD, USA; Online linkage: http://edcwww.cr.usgs.gov/programs/lccp/nationallandcover.html; Abstract: These data can be used in a geographic information system (GIS) for any number of purposes, such as assessing wildlife habitat, water quality, pesticide runoff, land use change, etc. The State data sets are provided with a 300-meter buffer beyond the State border to facilitate combining the State files into larger regions.

3. ESTIMATES FROM THE 1997 NRI DATABASE (REVISED DECEMBER 2000) REPLACE ALL PREVIOUS REPORTS AND ESTIMATES. Comparisons made using data published for the 1982, 1987, or 1992 NRI may produce erroneous results. This is because of changes in statistical estimation protocols and because all data collected prior to 1997 were simultaneously reviewed (edited) as 1997 NRI data were collected. All definitions are available in the glossary. In addition, this December 2000 revision of the 1997 NRI data updates information released in December 1999 and corrects a computer error discovered in March 2000. For more information: http://www.nrcs.usda.gov/technical/NRI/

4. Irrigated Adjudicated Water Rights – Water Rights Information System (WRIS), Oregon Water Resources Department, http://www.wrd.state.or.us/maps/wrexport.shtml

5. StreamNet is a cooperative venture of the Pacific Northwest's fish and wildlife agencies and tribes and is administered by the Pacific States Marine Fisheries Commission. StreamNet provided data and data services in support of the region's fish and wildlife program and other efforts to manage and restore the region's aquatic resources. Official StreamNet website: http://www.streamnet.org/

6. Natural Resources Conservation Service, Watershed Projects Planned and Authorized, http://www.nrcs.usda.gov/programs/watershed/Purpose.

7. Natural Resources Conservation Service, Watershed Plans, Studies, and Assessments completed, http://www.nrcs.usda.gov/programs/watershed/Surveys_Plng.html#Watershed%20Surveys%20and%20Plan

8. Oregon Department of Environmental Quality Total Maximum Daily Loads, http://www.deq.state.or.us/wq/TMDLs/TMDLs.htm

9. Oregon Department of Agriculture, Agricultural Water Quality Management Plans, http://www.oregon.gov/ODA/NRD/water_agplans.shtml

Footnotes/Bibliography Continued

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10. Oregon Watershed Enhancement Board, http://oregon.gov/OWEB/WSHEDS/index.shtml

11. Watershed Assessments completed by local watershed councils following the Oregon Watershed Assessment Manual, http://oregon.gov/OWEB/docs/pubs/ws_assess_manual.shtml.

12. NRCS Field Office Technical Guide, Section II, Threatened and Endangered List.

13. Magnuson-Stevens Fishery Conservation and Management Act, Public Law 94-265. As amended through October 11, 1996.

14. Data were taken from the 2002 Agricultural Census and adjusted by percent of HUC in the county or by percent of zip code area in the HUC, depending on the level of data available. Data were also taken from the U.S. Population Census, 2000.

15. Conservation participation was estimated using NRCS Social Sciences Technical Note 1801, Guide for Estimating Participation in Conservation, 2004. Four categories of indicators were evaluated: Personal characteristics, farm structural characteristics, perceptions of conservation, and community context. Estimates are based on information received from local conservationists in the watershed.

16. Social capital is an indicator of the community's ability and willingness to work together to solve problems. A high amount of social capital helps a community to be physically healthy, socially progressive, and economically vigorous. A low amount of social capital typically results in community conflict, lack of trust and respect, and unsuccessful attempts to solve problems. The evaluation is based on NRCS Technical Report Release 4.1, March, 2002: Adding Up Social Capital: An Investment in Communities. Local conservationists provided information to measure social capital. Scores range from 0 to 76.

17. Surface and Groundwater Resource Protection Map
    a. 2002 303d Listed Streams designated by Oregon Department of Environmental Quality and approved by the Environmental Protection Agency, Section 303d Clean Water Act, http://www.deq.state.or.us/wq/303dlist/303dpage.htm
    b. Groundwater Management Areas designated by the Oregon Department of Environmental Quality, Oregon Revised Statutes – Ground Water ORS 468B.150 to ORS 468B.190, http://www.deq.state.or.us/wq/groundwa/wqgw.htm
    c. Groundwater Restricted Areas designated by Oregon Water Resources Commission, Oregon Department of Water Resources, http://egov.oregon.gov/OWRD/PUBS/aquabook_protections.shtml
    d. The Sole Source Aquifer (SSA) Protection Program is authorized by Section 1424(e) of the Safe Drinking Water Act of 1974 (Public Law 93-523, 42 U.S.C. 300 et. seq), http://www.epa.gov/safewater/ssanp.html

18. Subbasin assessments and plans are developed by local groups (SWCDs, watershed councils, tribes, and others) as part of the Northwest Power and Conservation Council's fish and wildlife program in the Columbia River Basin. This program is funded and implemented by the Bonneville Power Administration. http://www.nwcouncil.org/fw/subbasinplanning/Default.htm.