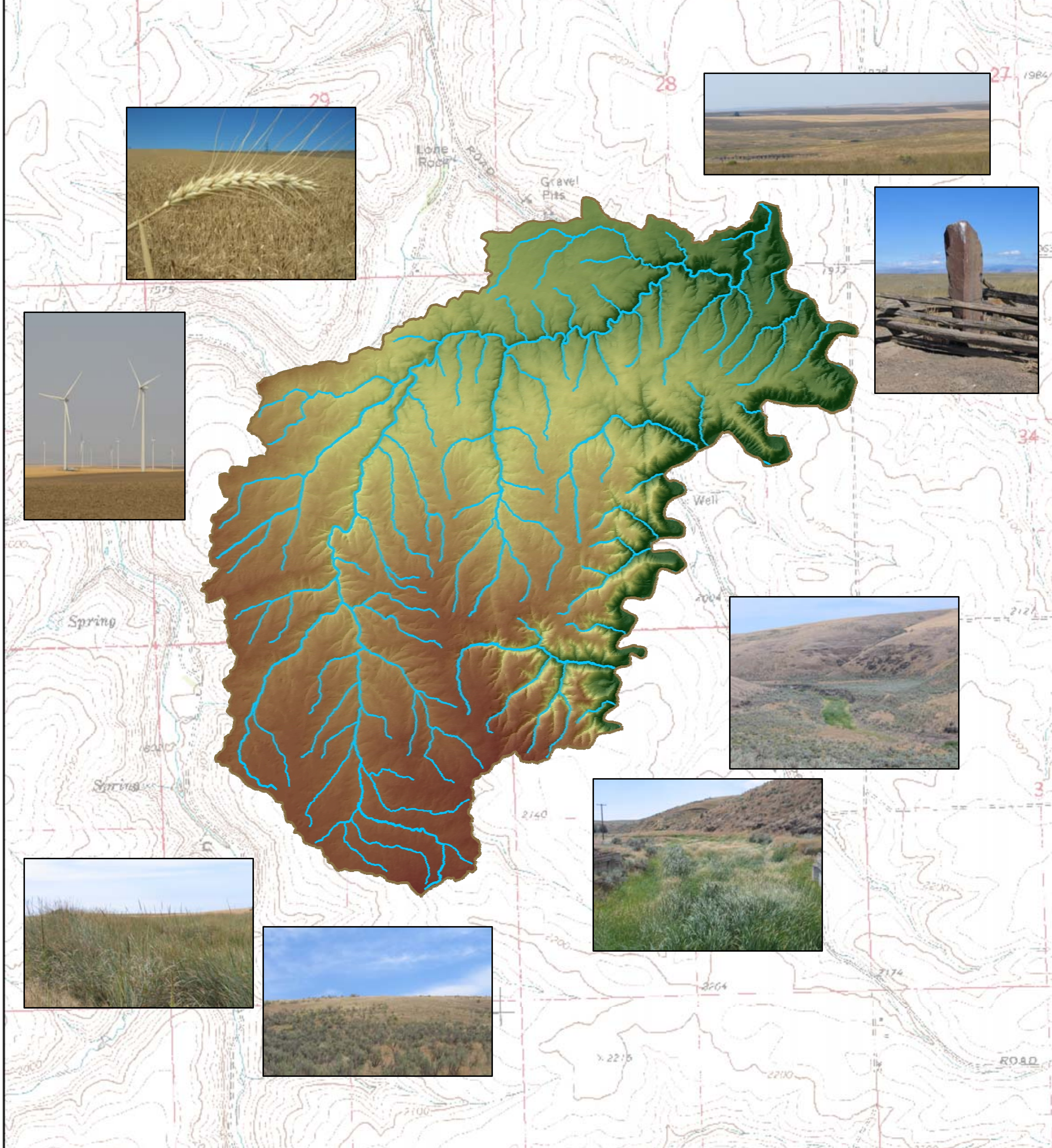
Grass Valley Canyon Watershed Assessment



Sherman County Soil and Water Conservation District
P.O. Box 405 Phone: (541) 565-3216 Fax: (541) 565-3430

Grass Valley Canyon Watershed Assessment

Sherman County Soil and Water Conservation District
P.O. Box 405
Moro, OR 97039

August 2006

Supported By:

Oregon Watershed Enhancement Board,
Grass Valley Canyon Watershed Council,
Sherman County Soil and Water Conservation District

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Introduction

Purpose and Scope of the Assessment

There are two main purposes for this assessment. The first is to analyze significant factors affecting the health and function of Grass Valley Canyon Watershed. We are seeking to identify current and historic land use, inventory resource availability, watershed condition, and provide an overall picture of how this watershed is currently utilized. This means bringing together as many aspects of the watershed to create an image of how these forces interact to affect the watershed function and health. Land used for agriculture, grazing, residential areas, roads, in combination with soil types, topography, wildlife and weather are all factors influencing a watershed.

The second objective of this document is to identify the specific cumulative impacts of land use patterns in the watershed, from which subsequent restoration priorities will be determined. Upon completion of this assessment we will be able to identify aspects that require additional information. Programs can be implemented to collect water quality data, form benchmarks for rangeland health or identify agricultural management practices and their affects on watershed function. Areas can be identified that will benefit from additional restoration or conservation activities. Lastly this assessment can be used for outreach to residents of the watershed who may be interested in restoring and enhancing their land.

Methods

This assessment was developed following the layout and procedures provided in the Oregon Watershed Assessment Manual, developed for the Governor's Watershed Enhancement Board (now the Oregon Watershed Enhancement Board) by Watershed Professionals Network. ArcView 3.2 and ArcInfo 8.3 Geographic Information Systems (GIS) software were used extensively for analysis and inventory of watershed geographic and hydrologic conditions. Georectified orthophotography and USGS topographical maps along with both regionally and locally developed GIS layers were utilized in ArcView to conduct the assessment. Some methods used in the assessment manual were modified to make use of the available electronic tools and data. Some data collected from electronic tools was verified by landowners during on site visits where producers took an active role in providing inventory of their operations.

Landowners were again crucial in identifying previous conservation practices on their property. Individual maps were sent to each of the producers in the watershed which they in turn identified resources, land use and conservation work. Technicians with the Sherman County Soil & Water Conservation District performed on site inventories for areas to fill in gaps, collect and verify additional data.

Contributors

Grass Valley Canyon Watershed Council originated on January 7, 1998. The council consists of seven board members appointed from different geographic regions within the watershed. Representation is given to all interested parties including agricultural, residential, agency, and government. The watershed council works in close partnership with the Sherman County Soil & Water Conservation District (SWCD). The watershed council provides the SWCD with guidance to restoration priorities allowing efforts to be focused with local participation.

During the development of this assessment many people were crucial in contributing information and review of the data. Private landowners and operators in the watershed, state agencies, federal agencies, local agencies, and citizens were all generous in providing their resources to complete this document. We would like to name all those individuals who participated, however the list would be multiple pages so we would like to identify and thank them by groups for their efforts.

Grass Valley Canyon Watershed Council
Agricultural Producers of Grass Valley Watershed
Sherman County Court
Sherman County Historical Society
Sherman County Soil & Water Conservation District
Sherman County Weed District
Oregon Department of Fish and Wildlife
USDA Farm Service Agency
USDA Natural Resources Conservation Service
Bureau of land Management

Chapter Descriptions

Chapter 1- Locations, Social & Economic Background, Land Use

Provides a description of where the watershed is located and general background information. It is important to have this information to develop a picture of how the watershed exists in its current state. The people who live and use the land, how the land is used, and who they share their land with are described in this chapter.

Chapter 2- Historic Climate, Geology, Vegetation, Settlement, and Land Use

This chapter will summarize gathered information on historic vegetation, settlement, and changes in land use within the watershed over the past 200 years. Examining the changes in land use and vegetation since Sherman County was settled by pioneers in the early 1800's can provide indications of how historic management affected conditions and changed the overall landscape.

Chapter 3- Channel Habitat Type

The channel habitat system uses criteria such as channel pattern, degree of confinement, geology, gradient, substrate, and valley shape to classify streams channels into one of 15 habitat definitions

Chapter 4- Historic Stream Flow, Land Use Effects

This chapter will identify hydrologic soil groups and road densities within the watershed. Effects will then be associated between precipitation, runoff, and effects of these factors in relation to soil type and road densities.

Chapter 5- Water Quality

This chapter will examine water quality concerns within the Grass Valley Canyon Watershed based on available information from the Oregon Department of Environmental Quality

Chapter 6- Upland Vegetation, Noxious Weeds, Fish & Wildlife

This chapter will discuss the current habitat available in the watershed as related to fish and wildlife species. The watershed is home to multiple species of resident and migratory, game and non-game fish and wildlife. A growing concern in this area is invasion of noxious weeds. This concern is reflected in statewide efforts to identify weed invasions, and plan for control or eradication of invasive populations.

Chapter 7- Evaluation

Provides a summary of the assessment along with the identification of gaps in inventory data and results for development of an action plan with treatment priorities.

Chapter 1: Watershed Description

This chapter will identify watershed location and boundaries. It will in addition provide background on the people who make a living using the watershed and its resources, and what those land uses are. Ownership of land indicated in this section within the watershed boundary can have a significant affect on how the resources are used. The area of the watershed and its association with Sherman County can make it difficult to distinguish one from the other. The watershed covers an area that represents the county both socially and economically. Grass Valley Canyon Watershed is representative of all economic scales, land use, and social outlook that exist within the county. Some information within the assessment is specific to the county, the assumption is that the information can be applied to the watershed as it is an accurate representation of Sherman County.

Locations

Sherman County, Oregon, established February 25, 1889, lies between the deep canyons of the John Day River on the east and the Deschutes River on the west in north central Oregon. The Columbia River forms the boundary on the north. Much of the boundary on the south is defined by the rugged canyons of Buck Hollow, a tributary of the Deschutes. The county seat is Moro, elevation 1,807 feet. The County's economy is based on wheat, barley, cattle and tourism. The open rolling hills and steep narrow canyons of the county’s 831 square miles, approximately 20 miles wide and 42 miles long, range in elevation from 185 feet on the Columbia River to 3,600 feet on the plateau in the south.

Sherman County enjoys four distinct seasons with numerous windy days. Summers are warm, dry and clear. Winters are relatively mild with heavy snowfall infrequent and brief. Temperatures range from below zero to over 100 degrees, but extreme temperatures are never prolonged. Average rainfall is 11.56 inches a year, about half occurring November through February. (http://www.sherman-county.com/INDEX.HTM).

Grass Valley Canyon watershed occupies the central eastern portion of Sherman County beginning south of the town of Grass Valley and terminating 36 miles to the North East at the

John Day River. Grass Valley Canyon Creek and its tributaries, the major of which are: Rosebush Creek, Hay Canyon, and Barnum Canyon encompass 184,486 acres or 288.4 square miles. This report also covers watersheds that do not flow directly into Grass Valley Canyon Creek, but rather terminate directly into the John Day River.

The headwaters of Grass Valley Canyon Creek occur at an elevation of 2,420 feet, eventually emerging into the John Day River at an elevation of 414 feet. The point of highest elevation within the watershed is 2,660 feet at the watershed's southern border, while the lowest elevation is 400 feet at the John Day River. Grass Valley Canyon creek travels to the northeast for nearly the entire length of the watershed before turning east as it flows toward the John Day River.

Boundaries for the Grass Valley Canyon watershed assessment were derived from geographic, social, and ecologic factors. The Grass Valley Canyon Watershed Council boundary area was used as a base to identify assessment boundaries. The watershed council boundary includes the Grass Valley Canyon 5th field watershed in its entirety. It also includes two sections that drain outside of Grass Valley Canyon. These areas consist of small watersheds within the Sherman County boundary line that either drain directly into the John Day or directly into the Deschutes Rivers. For the purpose of this assessment only those watersheds that drain directly into the John Day River are considered in this assessment due to their similarity in vegetation and geography to the lower section of Grass Valley Canyon. Those that drain into the Deschutes will be considered in another assessment.

Hydrologic units are drainage areas that are delineated to layer into a multi-level hierarchical drainage system. Grass Valley Canyon Watershed is a 5th field watershed that can be subdivided into five watersheds at the 6th field level. These subdivisions are: Upper Grass Valley Canyon, Rosebush Canyon, Hay Canyon, Lower Grass Valley Canyon, and Barnum Canyon. McDonalds Ferry, Esau Canyon, Devils Canyon, Cow Canyon, and Little Ferry Canyon are the remaining 6th field watersheds within the scope of this assessment. Of those five watersheds, only Little Ferry Canyon resides entirely within the assessment area. Only the portions of McDonalds Ferry, Esau Canyon, Devils Canyon, and Cow Canyon that reside within the Sherman County border are included in this assessment.

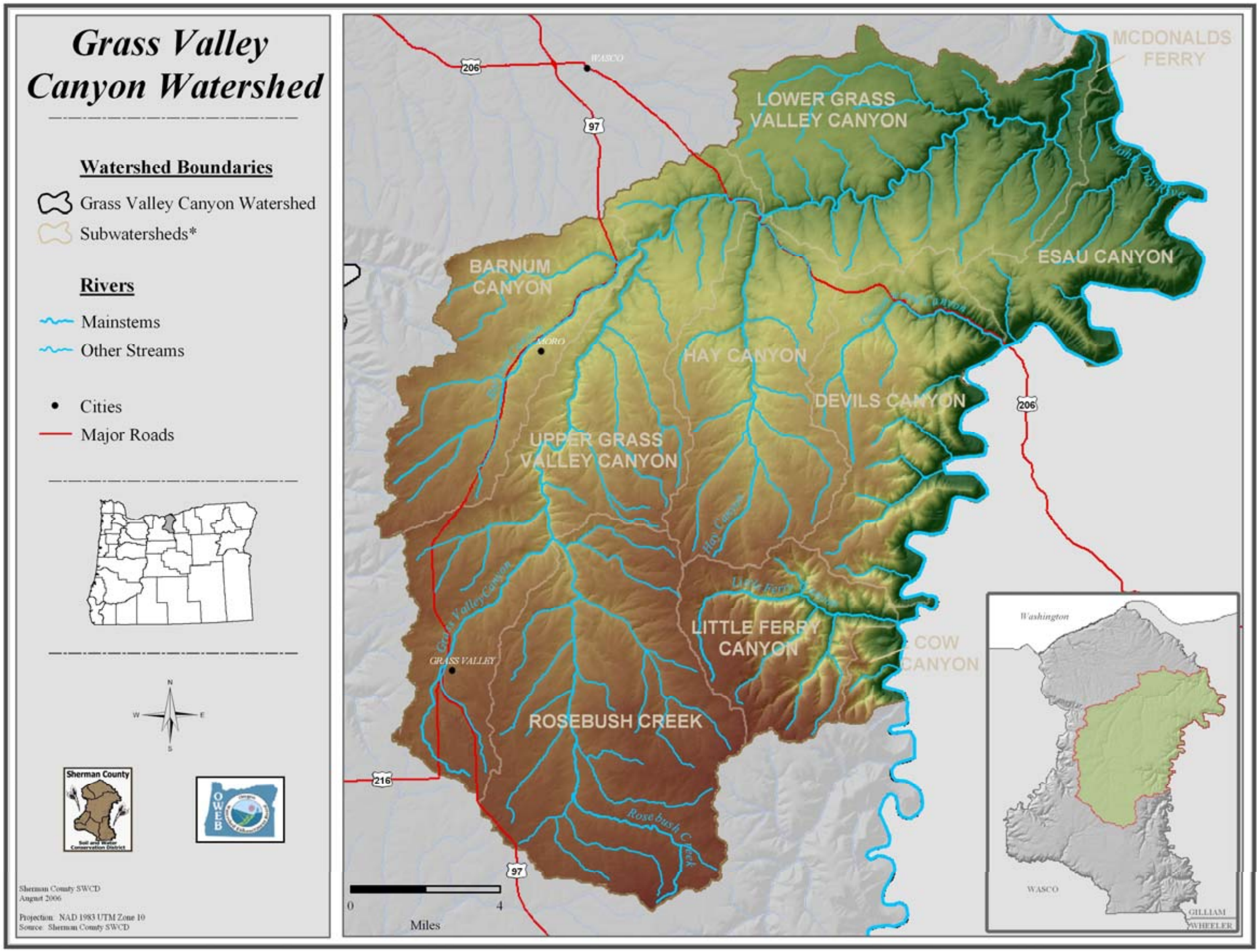


Figure 1.1: Overview of Grass Valley Canyon Watershed (*Subbasin names are based on the National 6th Field Hydrologic Unit Code Layer)

Social and Economic Background

The primary occupation in this area is the production of wheat, and the services that support that production. Information gathered from the USDA Farm Service Agency presented in Table 1.2 provides a demographic of agricultural producers within the watershed. Employment outside of agriculture consists primarily of local and state government services, and school districts.

Sherman County had a population of 1,934 in the year 2000, dropping to an estimated 1,712 in 2004 according to the U.S. Census Bureau. Within the Grass Valley Canyon Watershed, the city of Moro had an estimated population of 296 in 2004, down from 337 in 2000, and the city of Grass Valley, an estimated 150 in 2004, dropping from 171 in 2000. The county wide population had increased 0.8% from 1990 to 2000. As of the 2000 census, Sherman County had an average population density of 2.3 people per square mile (U.S. Census Bureau).

HIGHLIGHTS FOR SHERMAN COUNTY	
Total population change (2004-2005)	1%
Total population (2005)	1,749
Poverty Rate (2003)	13%
Number of jobs (2004)	1209
Annual average wage per job (2004)	$27,419
Unemployment rate (May 2006)	5.3%
Physician count (per 1,000 population)	N/A

Table 1.1: Highlights for Sherman County (Northwest Area Foundation)

Assuming Grass Valley Watershed is representative of Sherman County these statistics can be applied to the population of the watershed. According to the U.S. Census Bureau, 96.8 percent of Sherman County's population is white, 49.5 percent are female, 19 percent have a bachelor's degree or higher, earn on average $17,448 per capita, and 19.8 percent work in non-farm industries.

GRASS VALLEY CANYON WATERSHED AGRICULTURAL DEMOGRAPHIC			
CROP SHARE OPERATORS (non-owners producing a crop for a share in the profits)			
Total number of operations	**44**		
individual non-minority operators	21	partnership non-minority operators	39
individual minority operators	0	partnership minority operators	15
AGE DISTRIBUTION		AGE DISTRIBUTION	
30 and under	5	30 and under	2
31-40	2	31-40	5
41-50	0	41-50	15
50 and over	14	50 and over	32
Total operations involving cattle production	*18*		
OWNER OPERATORS (property owners producing a crop on their own property)			
Total number of operations	**36**		
individual non-minority operators	23	partnership non-minority operators	7
individual minority operators	4	partnership minority operators	6
AGE DISTRIBUTION		AGE DISTRIBUTION	
30 and under	0	30 and under	0
31-40	0	31-40	0
41-50	6	41-50	5
50 and over	21	50 and over	8
Total operations involving cattle production	*9*		
TOTAL NUMBER OF PRODUCTION LAND OWNERS		**256**	
non-minority owners 103			
Trusts & Estate Entities	18		
Absentee Owners	52	**TOTAL NUMBER OF FARMS**	**179**
Owners With Multiple Farms	33		
Owner With Cattle Production	15	**FARMS WITH IRRIGATION**	**6**
Owners With Multi County Farms	10		
minority owners 150			
Trusts & Estate Entities	17		
Absentee Owners	92		
Owners With Multiple Farms	50		
Owner With Cattle Production	9		
Owners With Multi County Farms	5		
minority / non-minority partnership	3		
Absentee Owners	1		

Table 1.2: Agricultural demographics in the Grass Valley Canyon Watershed

Land Use and Ownership

Land use within the Grass Valley watershed can be separated into eight categories: cropland and pasture, mixed rangeland, shrub and brush rangeland, residential, other agricultural land, commercial and services, strip mines, and other urban or built-up (see Figure 1.3).

Dry cropland, typically small grains production, and pasture occupy 138,998 acres or 75% of the watershed. Cropland originates on ridge tops, and extends down in elevation until the terrain becomes too steep for tillage or suitable soil type and depth is diminished. Virtually all land that is suitable for crop production is actively farmed for production. Six farms within the watershed include irrigation in their crop production. Water for the irrigation comes from wells accessing ground water reserves. The Conservation Reserve Program (CRP) has affected land use within the watershed more than any other practice in the previous 80 years since tractors with a gasoline powered internal combustion engines became standard.

The Conservation Reserve Program (CRP) is a voluntary program for agricultural landowners. Through CRP, you can receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible farmland.

The Commodity Credit Corporation (CCC) makes annual rental payments based on the agriculture rental value of the land, and it provides cost-share assistance for up to 50 percent of the participant's costs in establishing approved conservation practices. Participants enroll in CRP contracts for 10 to 15 years.

The program is administered by the CCC through the Farm Service Agency (FSA), and program support is provided by Natural Resources Conservation Service, Cooperative State Research and Education Extension Service, state forestry agencies, and local Soil and Water Conservation Districts.
(http://www.fsa.usda.gov/dafp/cepd/crp.htm)

Land enrolled in the CRP program is taken out of active crop production and returned to a grass land community. This grass community is managed for plant health, and wildlife habitat. Currently 45,344.3 acres are enrolled under the CRP program representing 24.6% of the watershed, and 32.6% of the cropland acres.

The eastern boundary of the watershed consists of rangeland with mixed brush, shrub and grass under story. Rangeland accounts for 44,863.7 acres or 24% Grass Valley Canyon Watershed. Rangeland is principally used for livestock production. Soil type and topography do not allow for the production of tilled crops. Rangeland exists off the ridge tops where the canyons begin, and extend down to the lowest reaches of the watershed.

These lands are also becoming affected by conservation programs and land uses are changing from active production to passive conservation.

An offspring of the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP) is a voluntary program for agricultural landowners. Unique state and federal partnerships allow you to receive incentive payments for installing specific conservation practices. Through the CREP, farmers can receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible land. (http://www.fsa.usda.gov/dafp/cepd/crp.htm)

Buffer zones are established around riparian zones where livestock grazing is excluded, and conservation practices are established such as tree planting. Grazing can still occur outside the buffer zone, however fencing requirements can make it more practical to eliminate grazing altogether. One quarter of the livestock producers in Grass Valley Canyon Watershed have removed livestock from their operations as a result of enrollment in the CREP program.

Alternative land uses are growing within the watershed. Recreation, and wind energy are becoming more prevalent as the economics of agriculture make crop production less and less attractive. Operations are leasing land to recreational hunting and fishing interests, and designating large tracts of land as hunting preserves. In 2001 Northwest Wind Power installed 16, 1 megawatt wind turbines, in Grass Valley Canyon Watershed. The footprint of these original towers occupies 6.79 acres. Currently there are 67 total towers occupying 196.63 acres within the watershed boundary (Richard Stradley, Sherman County Assessors Office, personal communication).

Each of the General Electric brand turbines — capped by a huge three-bladed rotor — is more than 300 feet tall, about the height of a 32-story building and can generate 1.5 megawatts of electricity. All together, the 50 turbines will produce enough electricity to power 18,000 homes. Yet all the turbines and roads at Klondike II take up less than 2 percent of the total acreage of farmland, leaving plenty of land available for growing local crops. (*http://www.portlandgeneral.com/about_pge/current_issues/klondikeII/Default.asp?bhcp=1*)

93 % of the Grass Valley canyon watershed, 171,366.76 acres, is privately owned. The Bureau of Land Management administers 7% (13,000 acres) of the watershed land found primarily along the John Day River. The State of Oregon has an additional 118 acres. The city of Grass Valley occupies 329.24 acres in the southern portion of the watershed, and the centrally located city of Moro resides in 299.09 acres.

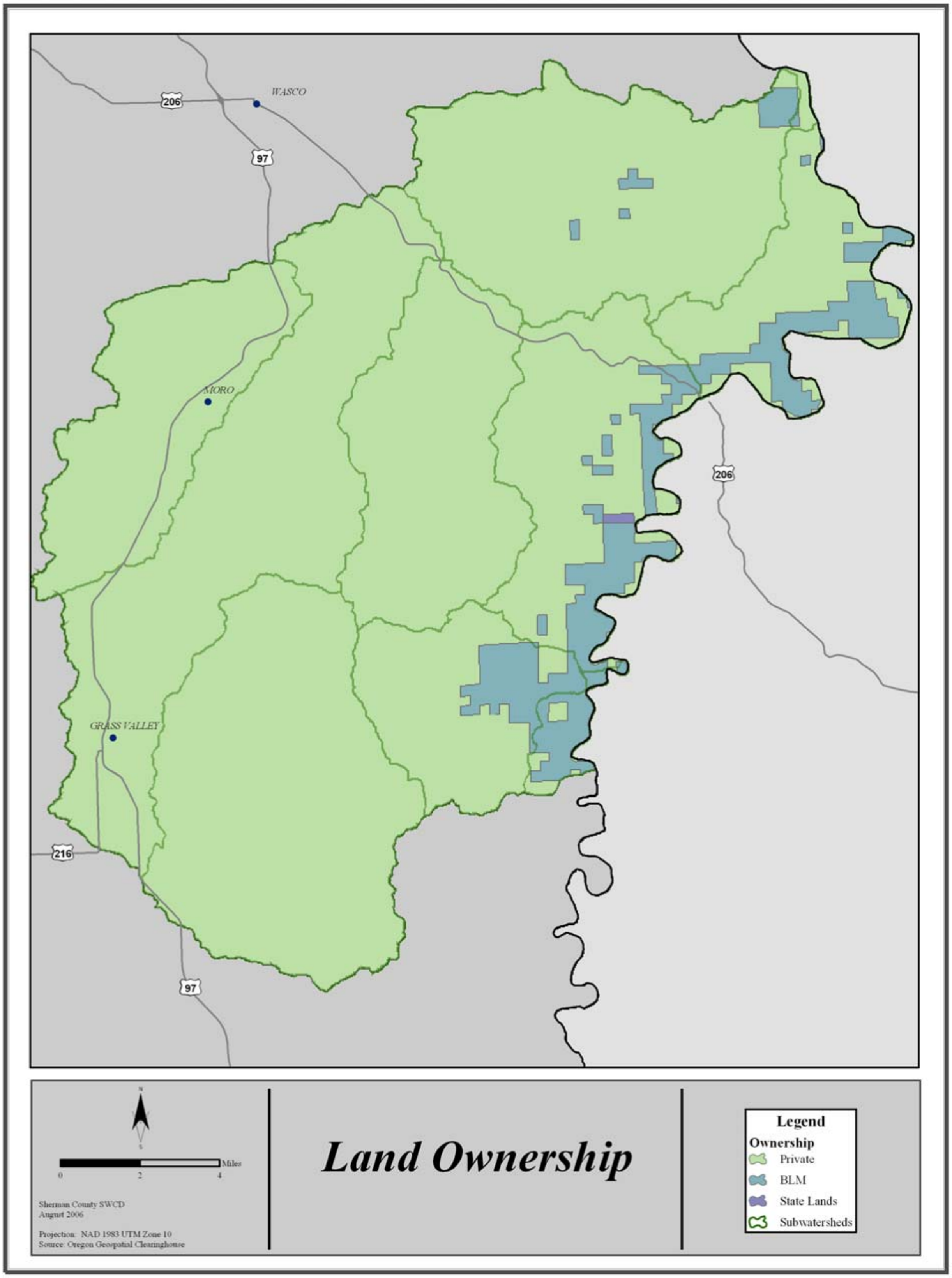


Figure 1.2: Land ownership within the Grass Valley Canyon Watershed

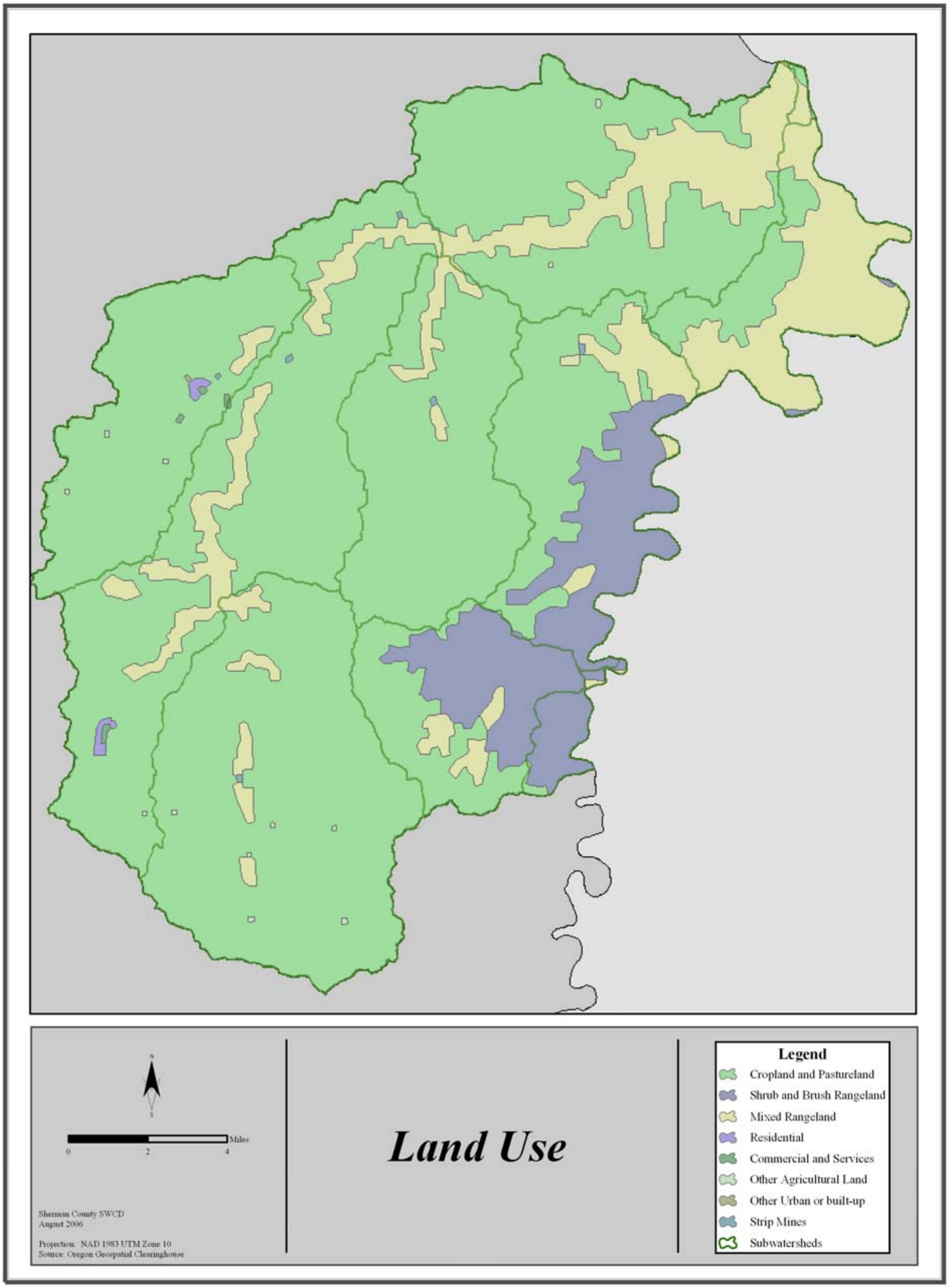


Figure 1.3: Land Use within the Grass Valley Canyon Watershed

Chapter 2: Historic Conditions

This chapter will summarize gathered information on historic vegetation, settlement, and changes in land use within the watershed over the past 200 years. Examining the changes in land use and vegetation since Sherman County was settled by pioneers in the early 1800's can provide indications of how historic management affected conditions and changed the overall landscape.

Historic Climate and Geology

Conditions in the creeks are controlled by the climate, hydrology, geology and land use of the surrounding drainage area from ridge-top to ridge-top. The Grass Valley Canyon Watershed falls within the North Central Oregon Climate Division (Division #6) according to the Oregon Climate Service (OCS). The region is semi arid, as it lies in the rain shadow east of the Cascade Mountains. Data compiled from 1971 through 2000 from the climate station at the city of Moro, located centrally within the watershed, shows an annual precipitation of 11.43 inches per year. This includes an average monthly low of 0.31 inches in July and an average high of 1.64 inches in November.

The geology of the region consists primarily of two major geologic formations. The Northern portion of the watershed is predominantly the Shutler Formation consisting of interbedded basalt flows and ashflow tuff that are about 4 to 9.7 million years old, and 1 to 3 feet thick. The Southern majority of the watershed is influenced by the Yakima Formation consisting of basalt and andesite flows and breccia that are 13 to 16 million years old. The soils and land types in this region have formed largely in deposits laid down by wind and water during the Ice Age, or Pleistocene epoch. During the retreat of continental glaciers wind blown sediment was deposited affecting soil formation throughout the region (Macdonald *et al*., 1999)

According to the Sherman County Soil Survey (Macdonald *et al*., 1999) there are six general soil map units; Wato-Anders, Walla Walla-Anderly, Mikkalo-Ritzville, Condon-Cantala, Lickskillet-Nansene, and Wrentham-Lickskillet-Rock Outcrop. Assuming Grass Valley Watershed is representative of Sherman County the values can be applied to the soil types of the watershed listed in Table 2.1 below.

Wato-Anders *Map unit comprises 3% of survey area*	Very deep and moderately deep, well drained very fine sandy loam that formed in loess over basalt in a 12 to 13 inch precipitation zone on mesas
Walla Walla-Anderly *Map unit comprises 33% of survey area*	Very deep to moderately deep, well drained silt loam that formed in loess over basalt in a 12 to 13 inch precipitation zone on mesas
Mikkalo-Ritzville *Map unit comprises 3% of survey area*	Moderately deep and deep, well drained silt loam that formed in loess over basalt in a 9 to 11 inch precipitation zone on mesas
Condon-Cantala *Map unit comprises 34% of survey area*	moderately deep and very deep, well drained silt loam that formed in loess over basalt in an 11 to 12 inch precipitation zone
Lickskillet-Nansene *Map unit comprises 12% of survey area*	Shallow and deep, well drained very stony loam and silt loam that formed I residuum derived from basalt and loess over basalt in a 12 to 13 inch precipitation zone in canyons.
Wrentham-Lickskillet-Rock Outcrop *Map unit comprises 15% of survey area*	Moderately deep and shallow, well drained silt loam and very stony loam that formed in loess over basalt and in residuum derived from basalt in an 11 to 12 inch precipitation zone in canyons.

Table 2.1: Soils types within the Grass Valley Canyon Watershed

According to the United States Environmental Protection Agency (http://www.epa.gov/wed/pages/ecoregions/level_iii.htm#Ecoregions), there are two major eco-regions within the watershed determined by a combination of climate and landscape. The predominate eco-region is the Umatilla Plateau, characterized by its arid climate, cold winters, hot summers, and low precipitation rates. Another feature of the Umatilla Plateau eco-region includes flood deposited silty loams, low-grade slopes, and low stream density. Natural vegetation within the region typically consists of a narrow band of brush and willows alongside streams and native bunchgrass in the uplands. The second eco-region within the watershed is the Deschutes / John Day Canyon region, consisting of steep-sided canyons that cut through the basalt plateaus. Attributes of this eco-region include clay to gravelly loam and moderate to steep gradient streams. Streamside vegetation is similar to the Umatilla plateau, but can include alder and cottonwood.

	Ecoregion 10 is an arid, sagebrush steppe and grassland that is flanked by moister, predominantly forested, mountainous ecoregions. The Columbia Plateau (10) is underlain by basalt up to two miles thick and partially covered by thick loess deposits. Where precipitation amounts are sufficient, its deep loess soils have been extensively cultivated for wheat. The Columbia River bisects Ecoregion 10; its water is subject to resource allocation debates involving fisheries, navigation, power production, recreation, and irrigation.
	The nearly level to rolling, treeless **Umatilla Plateau** ecoregion is underlain by basalt and veneered with loess deposits. Areas with thick loess deposits are farmed for dry land winter wheat, or irrigated alfalfa and barley. In contrast, rangeland dominates more rugged areas where loess deposits are thinner or nonexistent, such as in neighboring Ecoregions 10k and 10n. Mean annual precipitation is 9 to 15 inches and increases with increasing elevation. In uncultivated areas, moisture levels are generally high enough to support grasslands of bluebunch wheatgrass and Idaho fescue without associated sagebrush, which is more common in 10e.
	Deeply cut into basalt, the **Deschutes/John Day Canyons** fragment a lightly populated portion of the Umatilla Plateau (10c). Canyon depths up to 2,000 feet create drier conditions than on the plateau above. In the canyons, bunchgrasses, Wyoming big sagebrush, and cheatgrass grow on rocky, colluvial soil. Riparian vegetation in narrow reaches is often limited to a band of white alder at the water line; broader floodplains and gravel bars are dominated by introduced species, such as reed canarygrass, sweetclover, and teasel. The rivers support chinook salmon and steelhead runs.

Table 2.2: Ecoregions within the Grass Valley Canyon Watershed

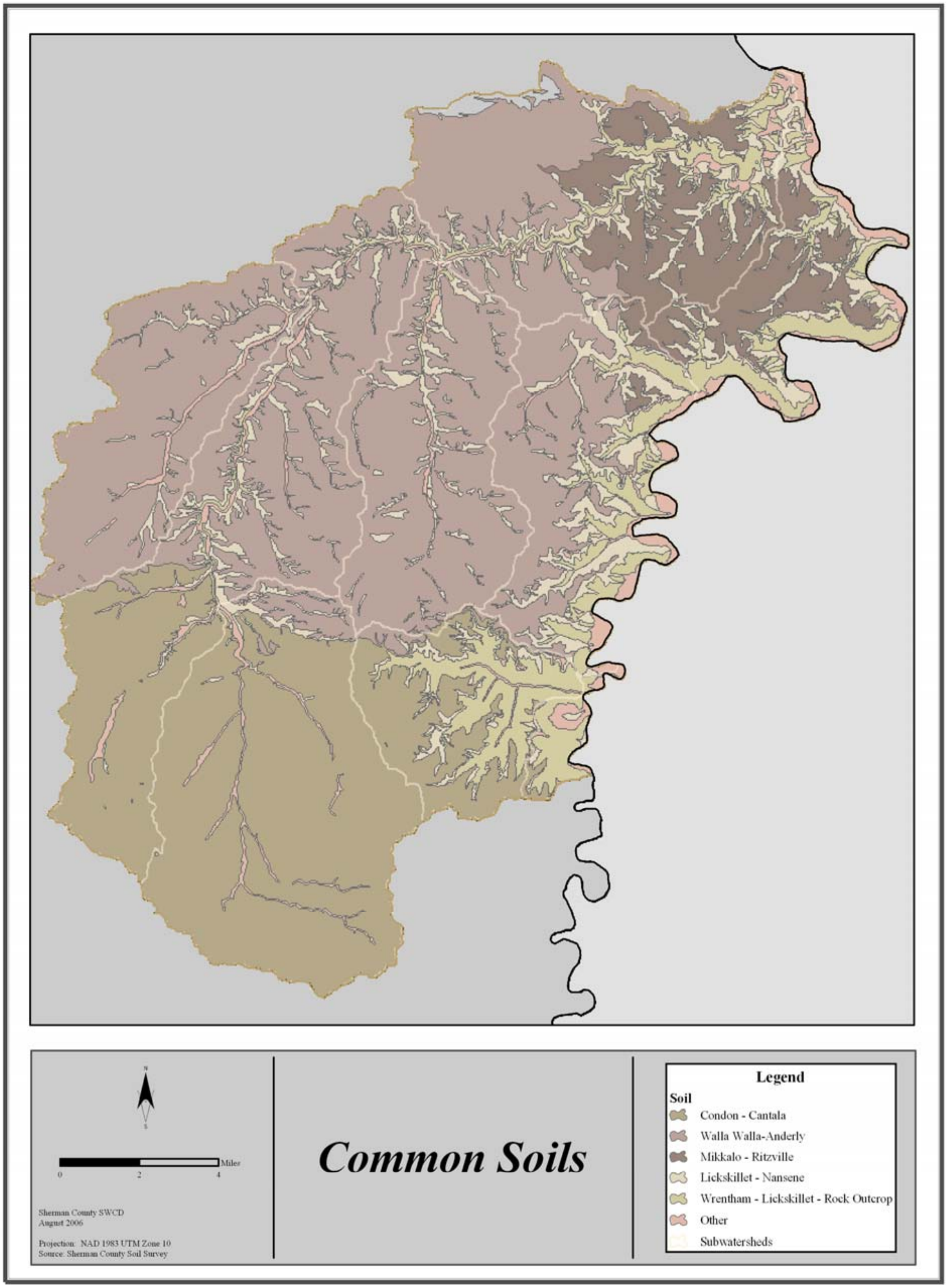


Figure 2.1: Common soils within the Grass Valley Canyon Watershed

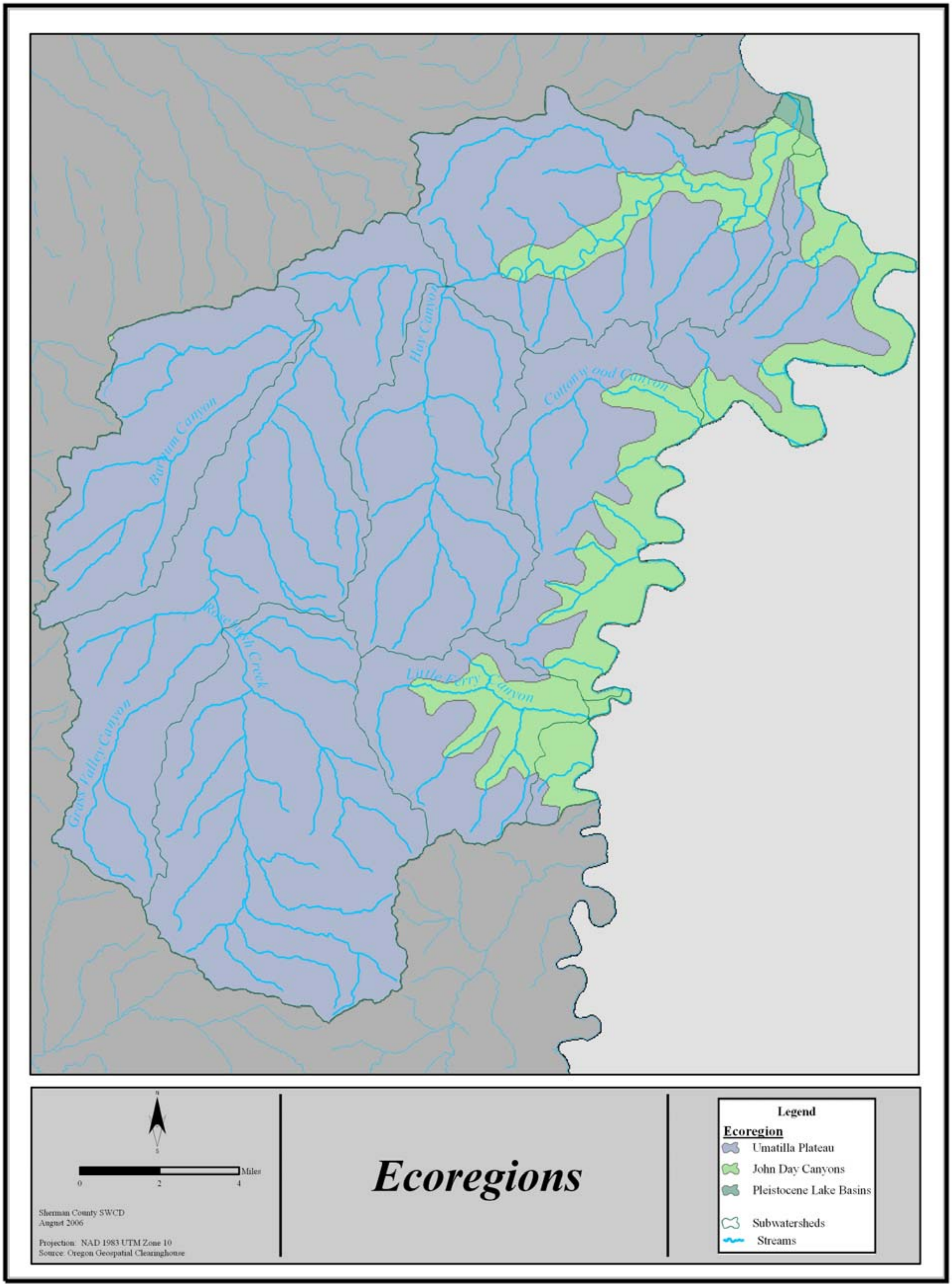


Figure 2.2: Ecoregions within the Grass Valley Canyon Watershed

Current Vegetation

Rangeland occupies 44,863.7 acres (24%) of the Grass Valley Canyon Watershed. Rangeland exists where soil types and topography do not allow tillage for crop production. Steep canyon sides and inaccessible bottom land provide areas for livestock grazing and wildlife. Additionally

rangeland can exist higher in the watershed where soil types do not provide the necessary depth for small grains production. Native upland range plant communities primarily contain bunchgrass with small percentages of forbs and shrubs. Bluebunch wheatgrass (*Agropyran spicatum*), Idaho fescue (*Festuca idahoensis*), and sandberg bluegrass (*Poa secunda*) comprise 90 percent of the potential native grass plant community (Macdonald *et al*., 1999, p.43). Improved rangeland, or pasture land can consist of native and non native mixed species such as Sherman big bluegrass (*Poa ampla)*, varying species of introduced wheatgrass (*Agropyron spp.*), and typically legumes such as dry land alfalfa (*Medicago spp.*).

The cultivar ‘Sherman’ big bluegrass was originally selected from a grassland site near Moro in 1932 by the Sherman Experiment station. The improved domesticated native strain of bluegrass has since become of economic significance to seed growers as the species has gained extensive use in restoration, and production avenues.

Versatility is a characteristic of our best conservation plants, and 'Sherman' big bluestem is no exception. Collected in Sherman County, Oregon, and selected in 1945 by the Pullman, Washington Plant Materials Center and the Agricultural Experiment Stations of Washington, Oregon, and Idaho, 'Sherman' is an important variety for seeding dryland pasture and range, stabilizing soil, reseeding burned lands, and restoring natural areas. It has been established on 527,000 acres for an ecological benefit of almost $36 million. This plant has distinctly blue leaves and is easy to establish from seed, reaching a height of 35 to 38 inches. It matures early in the growing season and has high seed, forage, and root production. 'Sherman' is adapted to well-drained soils in the Pacific Northwest and Great Basin states, at elevations of 300 to 8,000 feet with a 10- to 20-inch average annual rainfall. (NRCS Plant Materials Program,< http://plant-materials.nrcs.usda.gov/news/features/great_am_plant/sherman.html>)

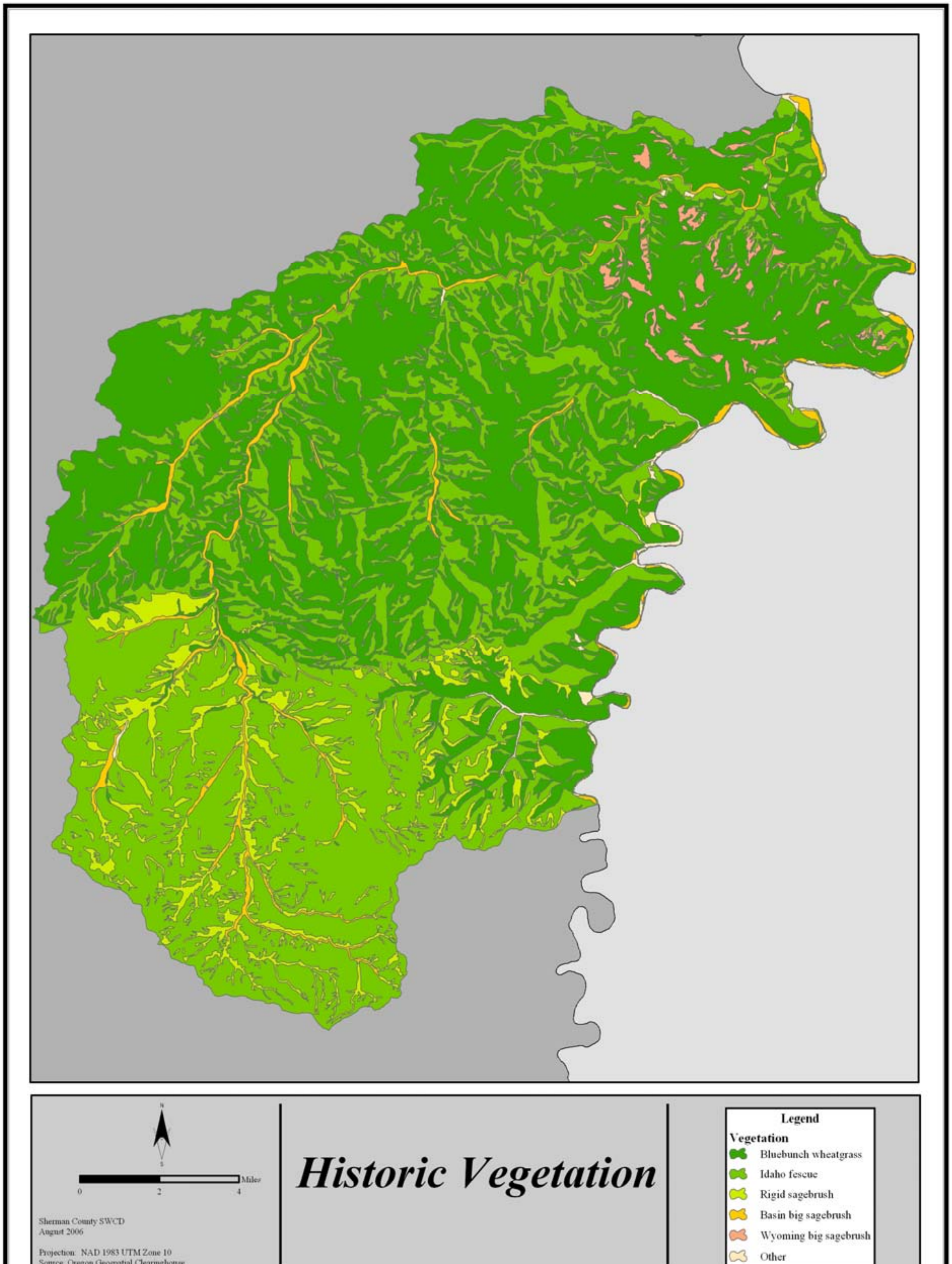


Figure 2.3: Historic vegetation within the Grass Valley Watershed

Shrub and forb communities comprise two to five percent of the rangeland. Species of forbes can include yarrow (*Achelles. spp*), phlox (*Phlox. spp*), fleabane (*Erigeron. spp*). Shrubs consist mainly of basin big sagebrush (*Artemisia tridentata*), rabbit brush (*Chrysothamnus greenei*), and broom snakeweed (*Gutierrezia sarothrae*). Though uniform distribution of plants can be demonstrated for each species monocultures have developed from disturbance, and invasion. Encroachment by an imported annual, medusaehead rye (*Elymus caput-medusae*), has occupied entire expanses of rangeland. This occupation has severely reduced the capacity of rangeland as the forage value of medusaehead is listed as practically worthless by the Range and Plant Handbook (1988).

Basin big sagebrush encroachment can overtake sites where soil depth and moisture permit. Bottom lands near perennial water sources with deep soil can see almost complete domination by the sage communities. Sagebrush has evolved several adaptations to increase water absorption and retention, as well as limiting competition by releasing a toxic compound from its leaves as they decay limiting growth of some potential competitors (Taylor, 1992).
Historic plant communities developed in these deep wet sandy soils consisted primarily of giant wild-rye (*Elymus condensatus*), a member of the same genus as medusaehead rye, this species can develop in masses up to 12 feet high.

Upon entering the valley where the town of Grass Valley now stands, Pioneer settlers reported rye grass so tall that it was well over a man's head, even when he was on a horse!
Photo of ryegrass taken at Grass Valley

Oregon Natural Heritage Foundation's definitions of eco-regions provides a projection for what land cover would have been circa 1909 (Figure 2.4). Using the Foundations' classifications it can be seen that the Grass Valley Canyon Watershed is comprised of two major eco-regions, the Umatilla Plateau and the John Day canyon regions. Vegetation in the Umatilla Plateau region consisted mostly of bluebunch wheatgrass and Idaho fescue in the uplands. Common streamside vegetation included narrow bands of brush and willows. In the John Day Canyon region, streamside vegetation was very similar to that found in the Umatilla Plateau region, but also included alder and cottonwood. Upland vegetation again included bluebunch wheatgrass and Idaho fescue.

The Umatilla Plateau region is second in Oregon to the Willamette Valley in terms of percentage of landscape converted to non-native habitats and human uses (Oregon.gov, http://egov.oregon.gov/ODF/PRIVATE_FORESTS/docs/LegacyAON/AppendixA.pdf, p.90). The majority of the watershed, not in residential areas, is suitable for production small grains. Of this area 83,561.9 acres or 60% is currently enrolled in the Conservation Reserve Program (CRP). The other 55,436.1 acres or 40% is producing the areas most important crop of winter wheat. Wheat is produced utilizing a crop rotation of wheat and summer fallow. In order to produce a crop, the fields are planted to grains every other year with the resting year left in fallow to collect winter moisture. Conservation tillage leaves crop residue on the surface to reduce erosion during this fallow year. Crops are typically sown in the fall, and harvested mid summer. Standing stubble is left over winter and the process of tillage for creating a seed bed, and weed control is begun in early spring.

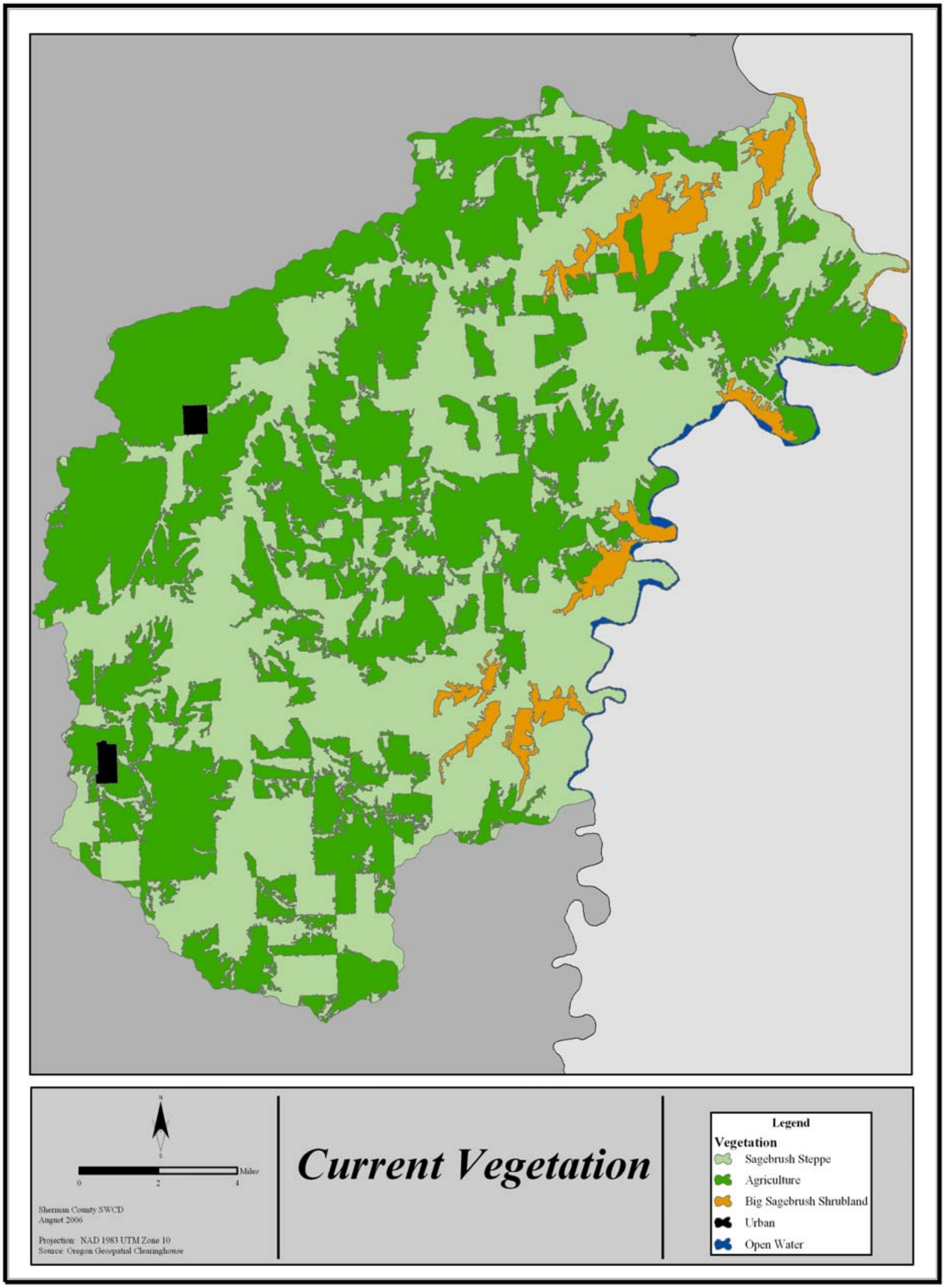


Figure 2.4: Current vegetation within the Grass Valley Canyon Watershed

Conservation Efforts

Conservation efforts began on a broad scale to mitigate the effects of agriculture in Grass Valley Canyon Watershed with the advent of Civilian Conservation Corps (CCCs) in 1935. Camp Moro was announced in mid May of 1935, and by the first week in November, 190 boys arrived from Massachusetts, twelve from Washington State, and fourteen technical men from Oregon (Moore, 1987). From that point on Sherman County, and Grass Valley Canyon Watershed began applying conservation work to address the reduction in natural grasslands as they turned under with the plow and began producing wheat for the nation. Projects consisted of pest control, grass seeding, and construction of erosion control practices like water and sediment control basins.

The first varieties of soft white wheat produced in this area left residue, or standing stubble so high that machinery at the time could not effectively till the land to produce a seed bed for the following crop. That residue was removed by burning the fields and turning the land over with a moldboard plow. As new varieties of wheat developed and technology improved machinery, stubble height began to decrease. In the early 1960's producers began to "make trash" a term still used today referring to mulch tillage. Mulch tillage leaves stubble residue on the surface to help reduce soil erosion.

In December of 1964 Grass Valley Watershed and much of Oregon experienced the Christmas Flood. Rain fell on snow that sat atop frozen soil, and when the water ran off it took tremendous amounts of topsoil off the fields and down the creeks. Producers saw the effects of erosion on tilled land first hand, and the loss that it can create. This event had the greatest impact on initiating conservation practices within the area. Structural treatment of cropland became the most prevalent practice. Terraces, then called diversion ditches, captured the runoff and conveyed it off the cropland before major soil erosion had a chance to start. The further development of trashy fallow (mulch tillage) began to provide additional protection against soil erosion.

The first trial of direct seeding, then called annual cropping, began in the early 1970's with home made machinery to reduce tillage even further. Early success was hindered with residue problems developing diseases for wheat, difficulty with residue plugging machinery, and weed infestation. In May of 1975 the Sherman County Soil and Water Conservation District (SWCD) developed the first project for erosion and sediment control for the Grass Valley Canyon Watershed. In February of 1979 the SWCD applied for a water quality special project through an Agricultural Conservation Program (ACP) administered by the Agricultural Stabilization and Conservation Service (ASCS) in Slaughterhouse Gulch at tributary to Grass Valley Creek. This project was completed and became the first watershed based conservation project in the Grass Valley Canyon Watershed.

Direct seeding was again applied as a management practice to farmland within the watershed on an annual cropping basis in the early 1980's. Difficulties again arose with seed and fertilizer placement, disease development and weed infestations. During this time the first commercially developed equipment became available for use in this crop management system. In 1985, the farm bill (Food Security Act) mandated acceptable levels of crop residue to remain on the surface to meet compliance with plans for erosion control. By this time mulch tillage had become an acceptable practice adopted by a majority of the watershed. Development in technology for equipment and other management practices allowed producers to manage their residue while keeping disease, and weeds under control. The late 1990's again saw a resurgence of direct seeding, now called no-till. This management practice began with improved commercially available equipment that allows producers to place seed and fertilizer in optimal locations for plant growth. Annual cropping has since given way to producing crops on land every other year with the fallow year remaining in standing stubble, and using herbicides to control weed infestations originating the term chem fallow.

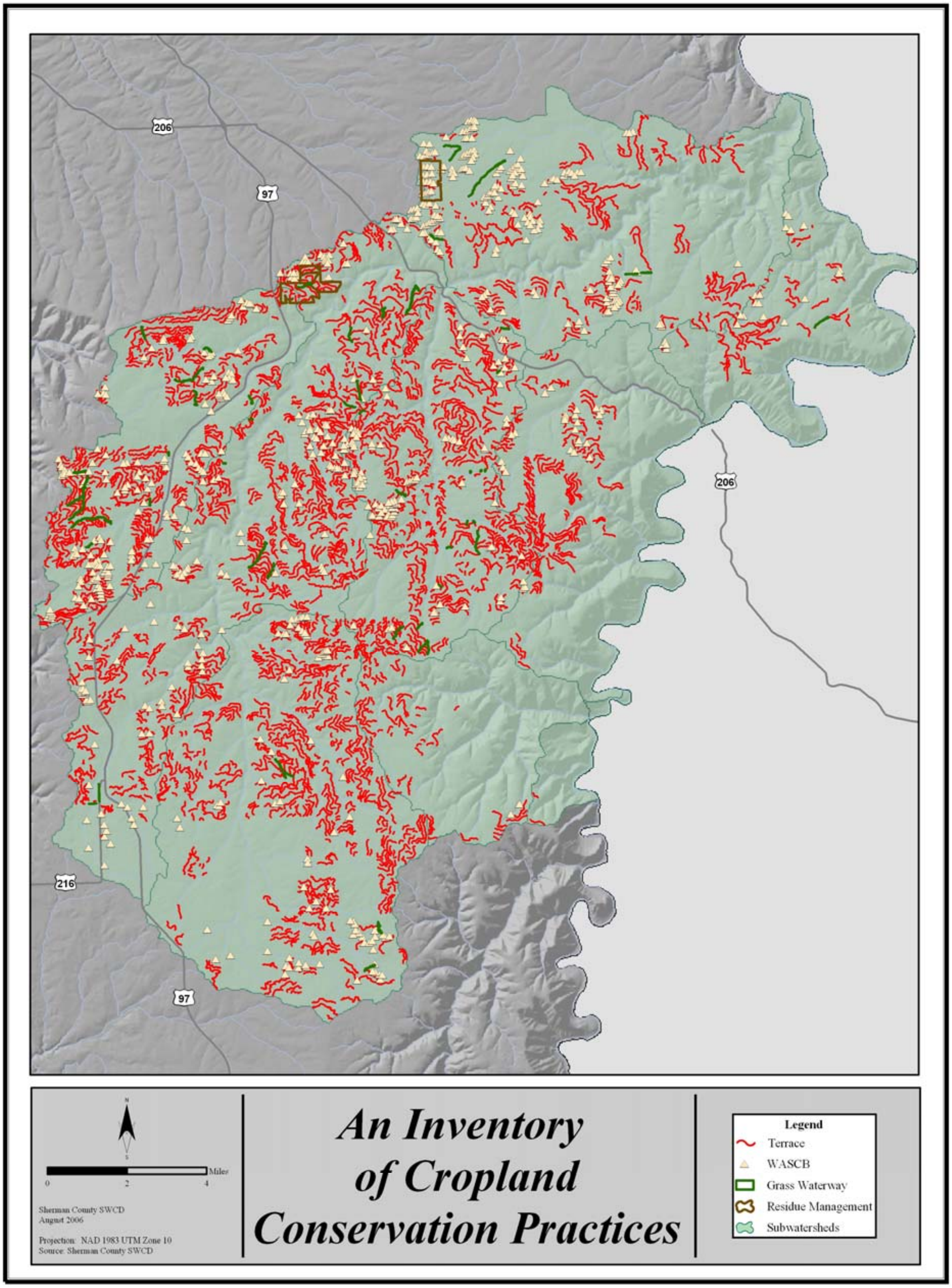


Figure 2.5: An inventory of cropland Practices taken in 2006

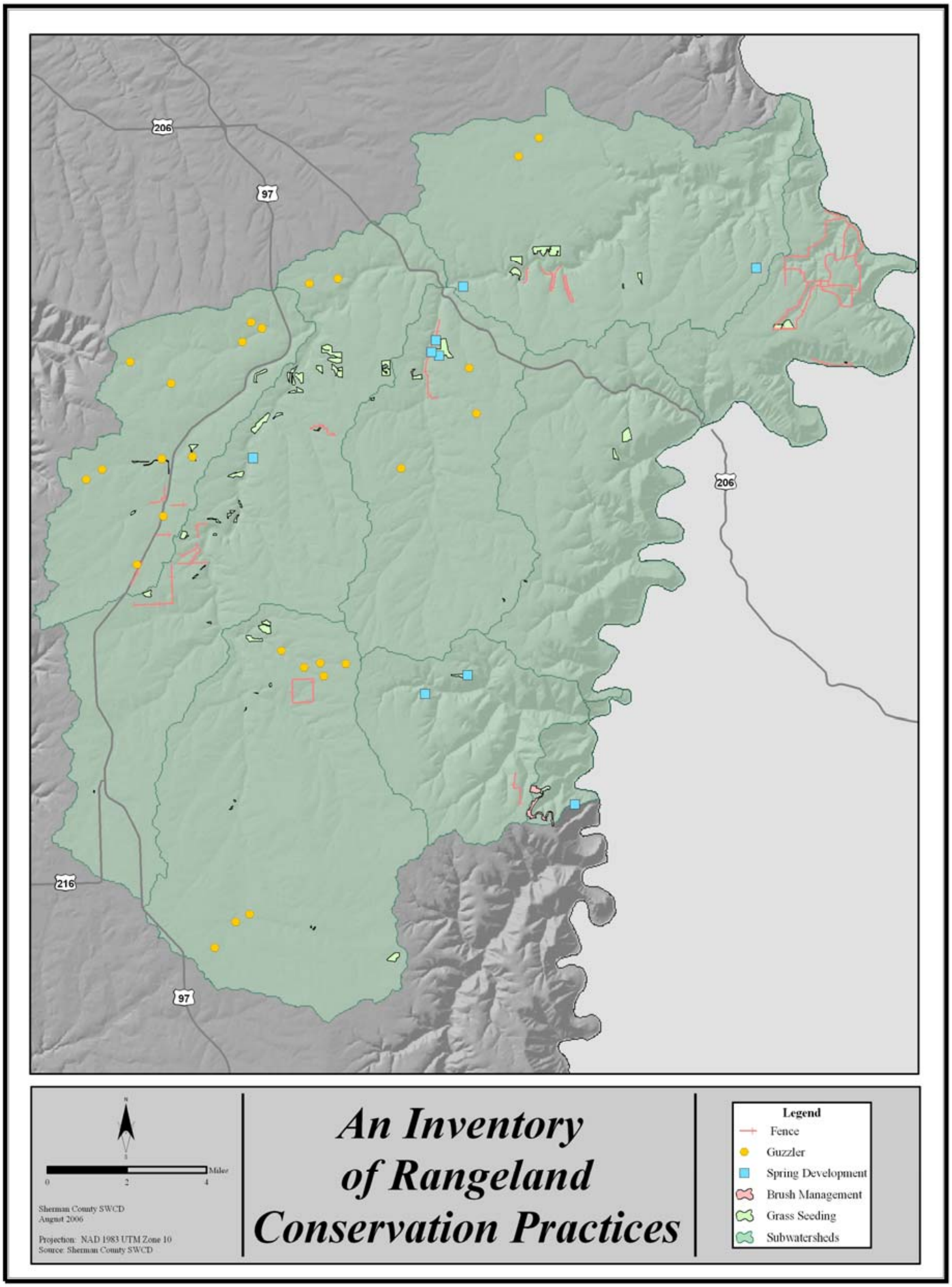


Figure 2.6: An inventory of rangeland conservation practices taken in 2006

Settlement and Land Use

Native Americans inhabited this region for centuries prior to being discovered and settled during westward exploration. Two tribes, the Columbia Basin Tenino and the Wyam, lived, hunted, fished and traded along the three rivers that border Sherman County, the Columbia, the Deschutes, and the John Day (Sherman County http://www.sherman-county.com/sc_history.html). Currently north central Oregon is home to a confederation of three tribes, Warm Springs, Wasco and Paiute tribes. The Warm Springs tribe is made up of the Upper Deschutes (Tygh), Lower Deschutes (Wyam), Tenino, and John Day (Dock-spus) bands. The Wasco tribe is made up of The Dalles (Ki-gal-twal-la) and Dog River bands. Several Paiute bands from southeastern Oregon were removed to the Warm Springs Reservation in 1869 (CRITFC, http://www.critfc.org/text/warmsprings.html)

Tribes in this area moved throughout the region according to natural cycles of weather, and food availability. During winter, bands settle into river valleys where the temperature was milder than higher elevations. At this time repairs were made to clothes, tools, and hunting weapons in preparation for spring. Spring saw the separation of large winter camps into smaller groups for hunting and gathering. Into the summer, roots and berries were gathered and meat from fish and game provided feasts for social gatherings celebrating the abundance of spring and summer. Fall meant final gathering of stores for the winter and drying of meats to carry the group through the months ahead.

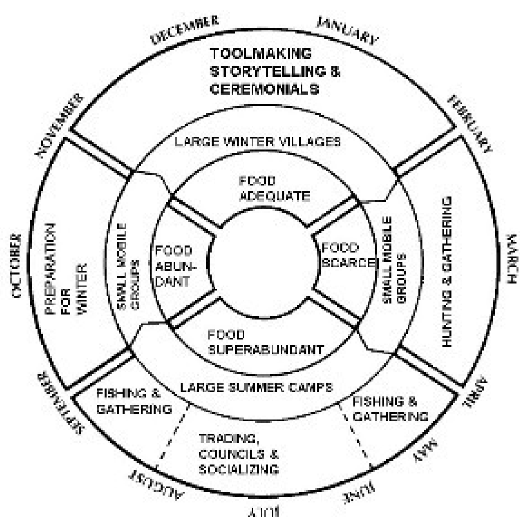


Figure 2.7: Oregon Indians: Culture, History and Current Affairs, 1983

Beginning in the 1840s, Oregon pioneers passed through Sherman County on the Oregon Trail, from the John Day River Crossing at McDonald to the mouth of the Deschutes River. Some emigrants destined for the Barlow Road took a shorter route know as the Barlow Road Cut-off. Travelers left the Oregon Trail just west of the John Day River proceeding southwesterly into Grass Valley Canyon where trails lead to present-day Grass Valley. From there it continued south down Hollenbeck Point into Buck Hollow and crossing at the Deschutes River.

The 1860's brought livestock herds that roamed openly over the bunchgrass covered hills. By the 1880's the government was offering land by the quarter section in exchange for people to come west to farm. Soon every quarter section of land was claimed, and the grasslands were plowed up to make way for crops. Winter wheat is the predominate crop produced in this area, with spring wheat, and barley used in rotation. Crops are produced every other year on each field with a fallow year used to collect the limited precipitation for next year's crop.

The first settler in present day Moro was Henry Barnum about 1868. Apparently the name for the city was selected in a drawing from a hat, Moro being the name proposed by Judge O. M. Scott, who came from Moro, Illinois. Moro, which became the county seat in 1892, was reached by the Columbia Southern rail branch line in 1898, and incorporated in 1899. Grass Valley was incorporated in 1900, and lies at the head of Grass Valley Canyon. The first settlers at this site were Dr. C.R. Rollins, John W. Dow, Mr. Locke, and Frank Richie in 1878. Grass Valley was platted in 1891 by Dr. Rollins and was reached by the Columbia Southern rail branch line in 1900.

Three major transportation routes have all passed through the city of Grass Valley from 1847 and the Barlow Road Cut-off, to 1867 and The Dalles Military Road, to present day U.S. Highway 97 first constructed in 1934. The Dalles Military Road Company received a grant of land from the government to build a road from The Dalles to Fort Boise. The road was used to transport freight by pack trains, and by freight companies.

The area of Grass Valley Canyon Watershed contained 18 communities consisting of a post office, school, or other services. These communities were established in the 1860's and began to consolidate their services into the incorporated towns in the 1930's. Originally school districts were placed in relation to how far a student would have to ride a horse in winter to attend class. Road improvements in the 1930's allowed faster travel in automobiles to the incorporated towns consolidating services such as mail delivery, and transportation to schools. Many of the original school houses were purchased by local residents and converted into homes, barns, and storage sheds which are still in use today.

Communities shown in Figure 2.8 include; Badger (now DeMoss Springs), Barzee, Biglow, Boardman, Bourbon, Eakin, Erskine, Fairview, Gorman, Harmony, Hay Canyon, Jacks, Klondike, McDonald, Monkland, Rosebush, and Rutledge. Though most evidence of these communities is gone, road names and references are still made to these geographic areas.

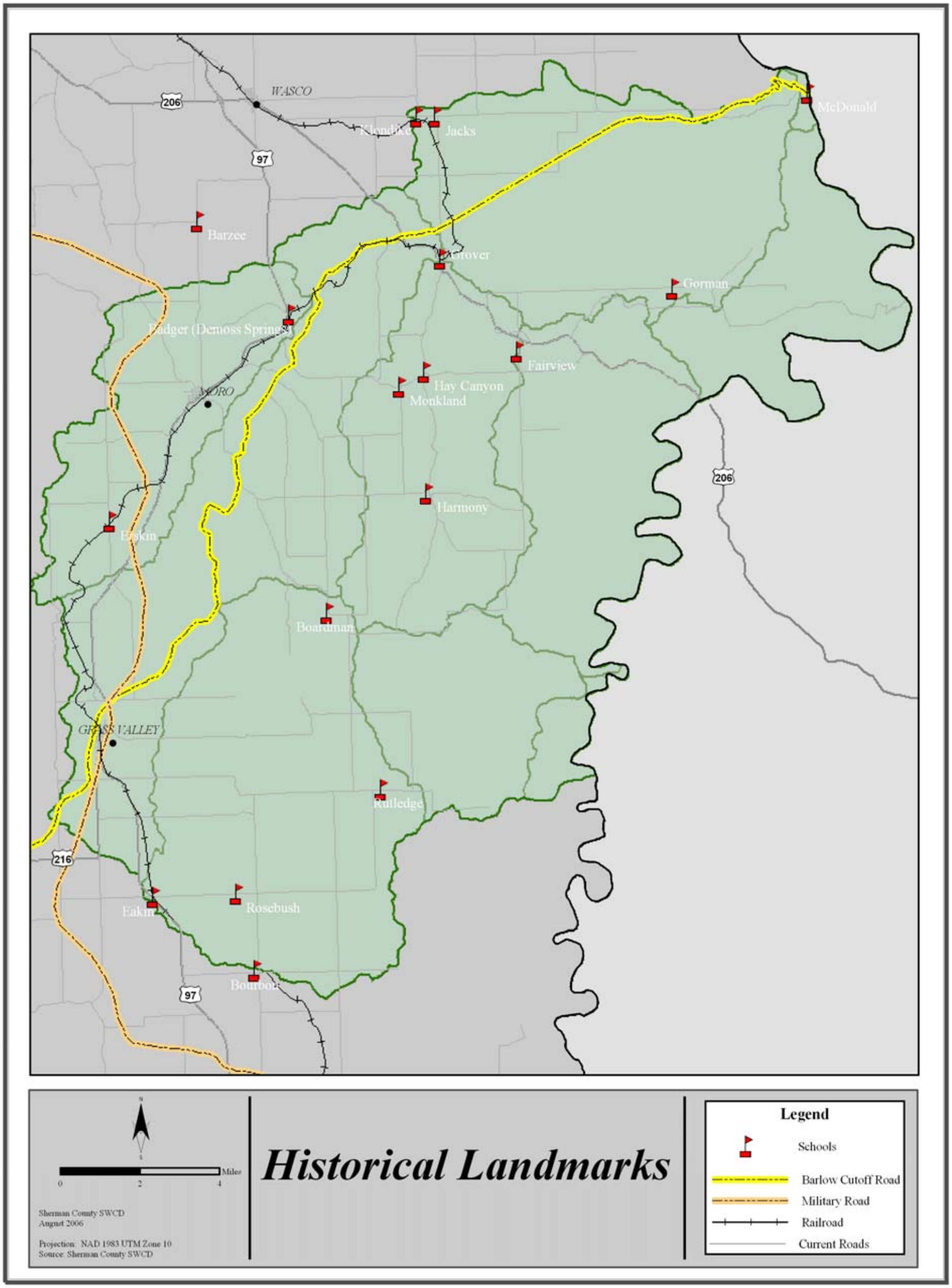


Figure 2.8: Historical landmarks within Grass Valley Canyon Watershed

Year	*Event*
10,000+ years ago	Native American people were present in the watershed area, especially along the rivers where they fished and traded with other tribes.
1805	Lewis and Clark explore the Northwest Territory.
1840's	Thousands of pioneers make the journey west, following the Oregon Trail. The cut-off to the Barlow Road took travelers southwest through Grass Valley Canyon
1858	The first permanent settler in Sherman County, William Graham, takes up residence at the mouth of the Deschutes River. Soon after, Innkeepers and stage and ferry operators began to arrive. They were followed by stockmen and their herds of horses, cattle and sheep.
1860	Stage, mail, and freight routes were established.
1868	Henry Barnum becomes the first settler in what would become the city of Moro.
1879	Henry Barnum establishes a trading post.
1880's	At the urging of the government, homesteaders begin to settle in Sherman County, changing the area from livestock country to farmland as they plowed the native grasses and put up fences.
1881	Oregon Railway and Navigation company completes a railroad that runs from the John Day River to Celilo. The railway connected to the transcontinental in 1883, bringing many more settlers to the area.
1889	Sherman County is created from the northeastern corner of Wasco County. It is bounded on three sides by the Columbia, Deschutes, and John Day Rivers.
1890	The population in Sherman County reaches 1,792.
1897	The Columbia Southern Railroad is built running from Biggs to Wasco, ending the days of hauling wheat to the river by wagon. By 1901 the railroad would reach Shaniko, a span of 70 miles.
1899	Moro is incorporated.
1901	Grass Valley is incorporated.
1910	Sherman County's population swells to 4,242 as rival businessmen race to build a railroad up the Deschutes River.
1950	The Sherman County Soil and Water Conservation District is formed.
1964	Major flooding throughout the northwest raises awareness for the need for structures such as terraces and sediment control basins.
1985	The Farm Bill / Food Security Act promotes erosion control plans by attaching commodity payments to observance of these plans.
1996	Flooding in the northwest.
1998	Formation of the Grass Valley Watershed Council.

Table 2.3: County settlement and development timeline

Chapter 3: Channel Types

Channel Habitat Type (CHT) is a classification method used for estimating the effects a stream system will incur in response to land use patterns and restoration efforts. This method requires analysis of stream segments within the watershed, each stream segment receiving a classification based on channel gradient, channel confinement, and the amount of flow the channel is subject to pass. Channel Habitat Types are useful in illustrating the effects that land use patterns can have on stream channels and are indicators for how stream segments will respond to restoration activities (Watershed Professionals Network, 1999). The desired outcome of this classification will be a map that shows stream segments divided into three classes based on their expected response to restoration activities. Table 3.1 describes the Channel Habitat Types present in Grass Valley Canyon Watershed.

Channel Habitat Type	Code	Gradient	Confinement	Size	Sensitivity
Low Gradient Medium Floodplain	FP2	<2%	Unconfined	Medium to Large	High
Low Gradient Small Floodplain	FP3	<2%	Unconfined	Small to Medium	High
Low Gradient Moderately Confined	LM	<2%	Moderately Confined	Variable	High
Low Gradient Confined	LC	<2%	Confined	Variable	Medium
Moderate Gradient Moderately Confined	MM	2-4%	Moderately Confined	Variable	High
Moderate Gradient Confined	MC	2-4%	Confined	Variable	Medium
Moderate Gradient Headwater	MH	1-6%	Confined	Small	Medium
Moderately Steep Narrow Valley	MV	3-10%	Confined	Small to Medium	Medium
Steep Narrow Valley	SV	8-16%	Confined	Small	Low

Table 3.1: Channel habitat types present in the Grass Valley Canyon Watershed

Stream Segment and Channel Habitat Type Delineation

Analyzed stream segments were chosen based on their presence in the 1998 U.S. Department of Commerce, Bureau of the Census, Geography Division hydrography layer. This method of stream selection was used as an estimate of which streams within the watershed had enough flow to warrant analysis. Segments that were not a part of the Census layer were not analyzed. Stream segments were first divided by gradient into four general categories based on measurements compiled from GIS analysis.

Channel Gradient Classes	Gradient
Low Gradient	<2%
Moderate Gradient	2-6%
Moderately Steep	6-12%
Steep	>12%

Table 3.2: Channel gradient classes

Segments were then assigned one of three classes based on their level of channel confinement. Confinement classes are defined by "the ratio of the bankfull width to the width of the modern floodplain. Bankfull width is the width of the channel at the point at which overbank flooding begins, and often occurs as flows reach the 1.5 year recurrence level." (Watershed Professionals Network, 1999)

Confinement Classes	Confinement Criteria
Unconfined	>4x bankfull width
Moderately Confined	>2x but <4x bankfull width
Confined	<2x bankfull width

Table 3.3: Channel confinement classes

After gradient and confinement were determined for all stream segments, stream flow measured in cubic feet per second (cfs) was used to separate the low gradient segments into their respective channel habitat categories. ODF Stream Classification Maps were unavailable for Grass Valley Canyon, so flow was determined by estimation using the same criteria as ODF and local knowledge of stream systems. It was determined that only Lower Grass Valley Canyon itself flows enough water to warrant a classification of medium size (> 2 and < 10 cfs annually). All other streams were classified as small (< 2 cfs annually).

Once CHTs were assigned, field verification of the major streams in the watershed was conducted and compared with local knowledge of stream channel conditions to assign final

CHTs. Field and anecdotal analysis resulted in a small deviance from the analysis conducted with GIS, most of that deviance occurring in the Lower Grass Valley Canyon Subwatershed. Confidence in GIS analysis of lower gradient reaches was moderate because of the difficulty in determining floodplain interaction from topographic maps and digital orthophotography, thus the field verification was essential in providing an accurate depiction of current stream conditions.

Channel Sensitivity to Land Use and Restoration

A channel's sensitivity to changes in land use or restoration activities can be generalized by the CHT in which it is categorized (see Table 3.1 for comparison of CHT to channel sensitivity). Generally, steep channels (> 8% gradient) such as those categorized as SV & MV, are confined and not responsive to restoration activities due to the fact that high energy flows typically incise these channels to rock, making habitat element development difficult. As gradient lessens (4 - 8%), such as with categories MV & MH, floodplains may begin to develop and confinement can become less pronounced, making sensitivity to restoration moderately successful. Moderately graded channels (2 - 4%) are where significant impacts to restoration activities can begin to show in channels that are not significantly confined such as in MM, but can also respond slowly in more confined channels such as MH & MC. Low gradient channels (< 2%) like FP2, FP3, LM & LC are typically the most responsive to changes in land use or restoration efforts due to larger floodplains, slower flows and increased occurrence of habitat elements such as gravels and bankside vegetation. It should be noted that even at low or moderate grades, confined channels (LC, MC, MH) will generally be less responsive to changes in management until the stream is able to restore its natural hydrologic function and floodplain connectivity. CHTs show a direct correlation to land use patterns in that channels that are more sensitive to restoration efforts are also more susceptible to impacts from land use and management, while less sensitive channels are less susceptible. Table 3.4 shows the expected channel responsiveness and riparian enhancement opportunities for CHTs in the Grass Valley Canyon Watershed.

Channel Habitat Type	Code	Channel Responsiveness	Riparian Enhancement Opportunities
Low Gradient Medium Floodplain	FP2	Floodplain channels can be among the most responsive in the basin. The limited influence of confining terrain features and fine substrate allows the stream to move both laterally and vertically. Although often considered low-energy systems, these channels can mobilize large amounts of sediment during high flows. This often results in channel migration and new channel formation.	Due to the unstable nature of these channels, the success of many enhancement efforts is questionable. Opportunities for enhancement occur…in channels where lateral movement is slow. Lateral channel migration is common, and efforts to restrict this natural pattern will often result in undesirable alteration of channel conditions downstream. Side-channels may be candidates for efforts that improve bank shade and stability.
Low Gradient Small Floodplain	FP3	See FP2 for description	Floodplain channels are…prone to lateral migration, channel shifting, and braiding. [R]estoration efforts [should be] carefully planned [to respect]… the active nature of the channel. The limited power of these streams offers a better chance for success of channel enhancement activities than…larger floodplain channels. While…lateral [channel] movement…will limit the success of many efforts, localized activities to provide bank stability or habitat development can be successful.
Low Gradient Moderately Confined	LM	The unique combination of an active floodplain and hillslope or terrace controls acts to produce channels that can be the most responsive in the basin. Multiple roughness elements are common, with bedrock, large boulders, or wood generating a variety of aquatic habitat within the stream network.	Like floodplain channels, these channels can be among the most responsive of channel types. Unlike floodplain channels…the presence of confining landform features often improves the accuracy of predicting channel response to activities that may affect channel form [and] …help limit the destruction of enhancement efforts common to floodplain channels. Because of this, LM channels are often good candidates for enhancement.
Low Gradient Confined	LC	The presence of confining terraces or hill slopes and control elements such as bedrock limit the type and magnitude of channel response to changes in input factors. Adjustment of channel features is usually localized and of a modest magnitude.	These channels are not highly responsive, and in channel enhancements may not yield intended results. In basins where water temperature problems exist, the confined nature of these channels lends itself to establishment of riparian vegetation. In nonforested land, these channels may be deeply incised and prone to bank erosion from livestock. [T]hese channels may benefit from livestock access control measures.
Moderate Gradient Moderately Confined	MM	The unique combination of a narrow floodplain and hill-slope or terrace controls acts to produce channels that are often the most responsive in the basin. The combination of higher gradients and the presence of a floodplain set the stage for a dynamic channel system. Multiple roughness elements such as bedrock, large boulders, or wood may be common, resulting in a variety of aquatic habitats within the stream network.	[Same as LM except that]…slightly higher gradients impart a bit more uncertainty as to the outcome of enhancement efforts when compared to LM channels.
Moderate Gradient Confined	MC	See LC for description	[Same as LC except that]…channels are subject to relatively high energy, [but]…are often stable.
Moderate Gradient Headwater	MH	See LC for description	These channels are moderately responsive. In basins where water temperature problems exist, the stable banks generally found in these channels lend themselves to establishment of riparian vegetation. In nonforested land, these channels may be deeply incised and prone to bank erosion from livestock. [T]hese channels may benefit from livestock access control measures.
Moderately Steep Narrow Valley	MV	See LC for description	See LC and MC for description
Steep Narrow Valley	SV	[Same as LC except that]…channels are also considered source channels supplying sediment and wood to downstream reaches, sometimes via landslides.	These channels are not highly responsive, and in channel enhancements may not yield intended results. Although channels are subject to relatively high energy, they are often stable. In basins where water temperature problems exist, the stable banks generally found in these channels lend themselves to establishment of riparian vegetation. This may also serve as a recruitment effort for [large woody debris] in the basin.

Table 3.4: Channel Responsiveness and Riparian Enhancement Opportunities

(Watershed Professionals Network, 1999)

Results and Analysis

CHTs are designed to provide an indication of where the most impact can be seen from both conservation efforts and land management. Stream segments rated as highly sensitive should show the most immediate response to restoration, followed by medium and low segments respectively. Grass Valley Canyon Watershed contains 83 miles of stream that rated in the high sensitivity category. While this may provide a starting point for restoration prioritization, it shouldn't exclude sound projects in medium or low sensitivity stream reaches. CHTs should be used as a guide to suggest which areas may provide the most efficient use of funds at the greatest impact to the watershed. Sound scientific principles and on the ground observation should be the deciding factors in project selection and prioritization. Table 3.5 describes the sensitivity ratings for Grass Valley Canyon Watershed by stream miles per subwatershed.

Sensitivity Rating	Lower Grass Valley	Upper Grass Valley	Hay Canyon	Barnum Canyon	Rosebush Creek
High	14.8 (26%)	21.7 (35%)	3.4 (10%)	21.4 (76%)	21.7 (37%)
Medium	39.1 (69%)	40.8 (65%)	30.1 (90%)	6.6 (24%)	37.2 (63%)
Low	2.8 (5%)				
Total Miles	56.7	62.5	33.5	28.0	58.9
Sensitivity Rating	**Esau Canyon**	**Devil's Canyon**	**Little Ferry Canyon**	**Cow Canyon**	**Watershed Totals**
High					83.0 (28%)
Medium	12.3 (82%)	17.6 (69%)	18.3 (95%)		202.0 (67%)
Low	2.6 (18%)	8.0 (31%)	1.0 (5%)	1.6 (100%)	16.0 (5%)
Total Miles	14.9	25.6	19.3	1.6	301.0

Table 3.5: Sensitivity by Stream Miles per Subwatershed

More than 90% of Grass Valley Canyon Watershed ranked medium or higher in terms of sensitivity to land use changes or restoration efforts. This can be misleading because within each category there is still a level of gradation between which projects are the most beneficial. Projects proposed within the Moderately Steep Narrow Valley (MV) CHT are graded as moderately sensitive, yet the stream gradient can range from 3% to 10%. It is most likely that projects in the lower gradient range of this CHT are better suited toward restoration efforts while those in higher gradient reaches should be scrutinized more carefully to determine restoration success.

Stream sensitivity also mirrors topography and land use patterns. This is intuitive since the lower gradient sections that are located in the interior of the watershed are more responsive to change and generally better for farming and other beneficial land uses, while the steeper gradient areas that are less responsive to change are used mainly by wildlife and livestock and used less intensively by humans.

Restoration efforts in riparian areas should be designed in a way that allows channels the ability to function and respond naturally to environmental pressures. For instance, stream segments that have been stabilized by rip rap or that have been straightened for agricultural purposes usually increase stream velocities and must dissipate that increased energy further downstream. This can lead to bank erosion and downcutting in areas below the newly stabilized section. Practices that increase vegetation and provide habitat elements for fish and wildlife generally benefit stream function by adding roughness to channels, slowing water down and filtering sediment out of the stream. Practices that build stream banks and narrow stream channels will reduce water surface area to solar radiation and high ambient air temperatures.

Current restoration activities in Grass Valley Canyon Watershed that improve stream function and health are upland practices that mitigate the effects of reduced vegetation from farming and grazing practices, such as cropland terracing, water and sediment control basins (WASCBs), range enhancements, pasture fencing, pest management, use of minimum tillage practices and brush management. In addition to these practices other practices in the riparian cooridor reduce peak flows and reduce sedimentation of streams during storm events. Practices that directly impact riparian areas are tree & shrub establishment, herbaceous plantings, pasture cross fencing, off-stream watering facilities, exclusionary fencing, and pest management. These practices act to reduce sedimentation, stabilize banks, and provide shade and habitat elements to streams. Used in conjunction with knowledge of currently functioning restoration projects, CHTs can guide future project selection to enhance restoration efforts which have been underway in Grass Valley Canyon Watershed for half a century.

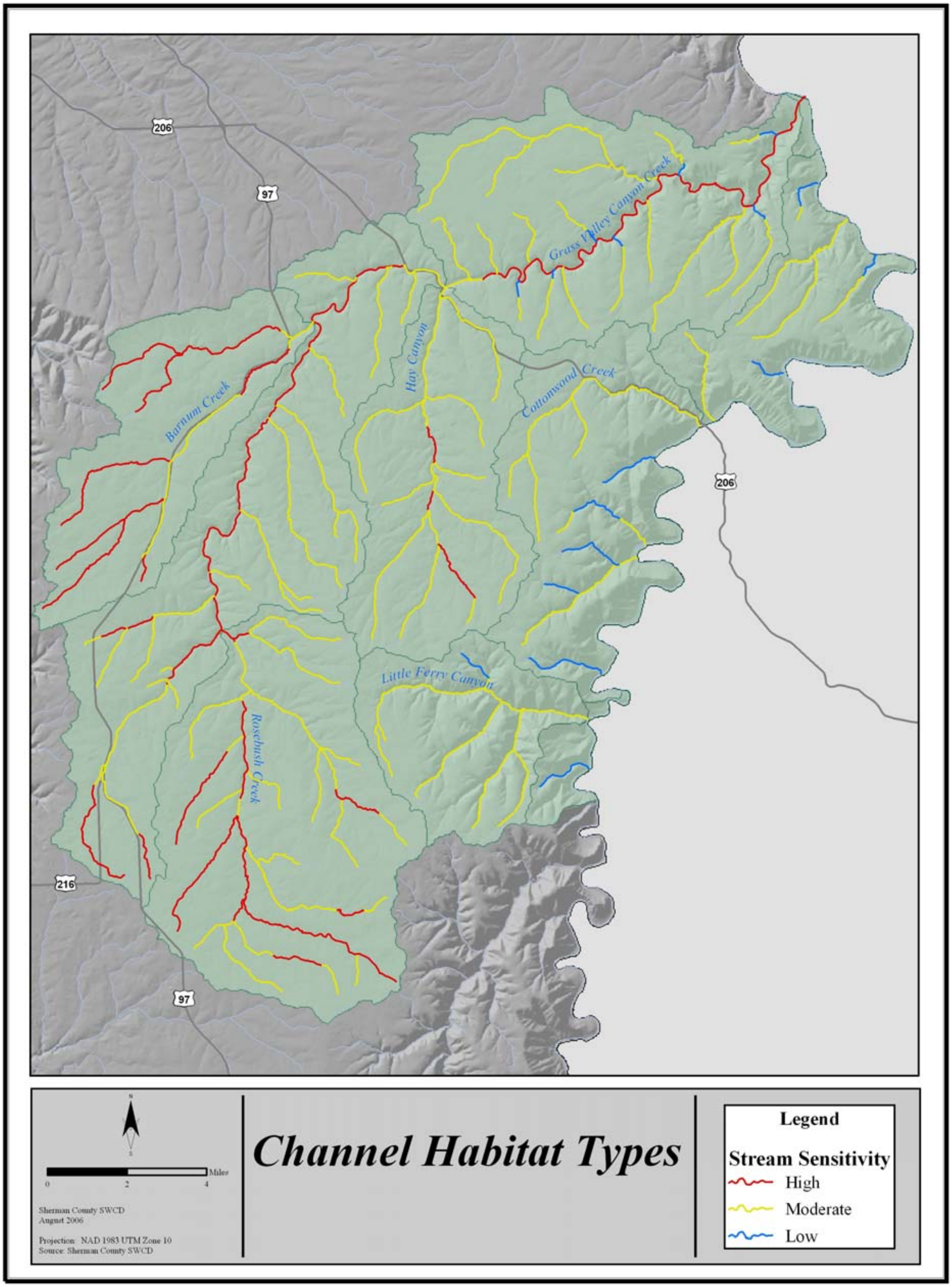


Figure 3.1: Channel habitat types within Grass Valley Canyon Watershed

Chapter 4: Stream Flow, Runoff and Erosion

Stream Flow History

The one stream gauge recording available data was located just north of Grass Valley, Oregon, recording the annual peak flow from 1958 through 1979. The peak flow consistently occurred between late December and mid-February. There is no peak stream flow reading available from 1964, in what is considered locally, the heaviest flood in the last fifty years. Based on the data available the average annual peak flow was nearly 292 cubic feet per second.

Water Year	Date	Gage Height (ft)	Stream flow (cfs)
1958	16-Feb	15.94	146
1961	5-Jan	16.3	200
1962	7-Jan	15.62	110
1963	2-Feb	18.83	588
1965	21-Dec	21.77	1,570
1966	3-Jan	17.92	440
1967	28-Jan	15.3	72
1969	11-Jan		30.0*
1970	23-Jan	16.04	166
1971	17-Jan	15.39	90
1972	21-Jan	15.86	138
1973	23-Dec		64
1974	16-Jan	16.68	256
1975	26-Jan	14.49	23
1976	17-Jan	14.55	25
1979	6-Feb	18.15	500

* -- Discharge actually greater than indicated value

Table 4.1: Peak Stream flow measured for Grass Valley Canyon from 1958-1979

Latitude 45°22'25", Longitude -120°46'27" (just north of Grass Valley, Oregon), (Source: USGS)

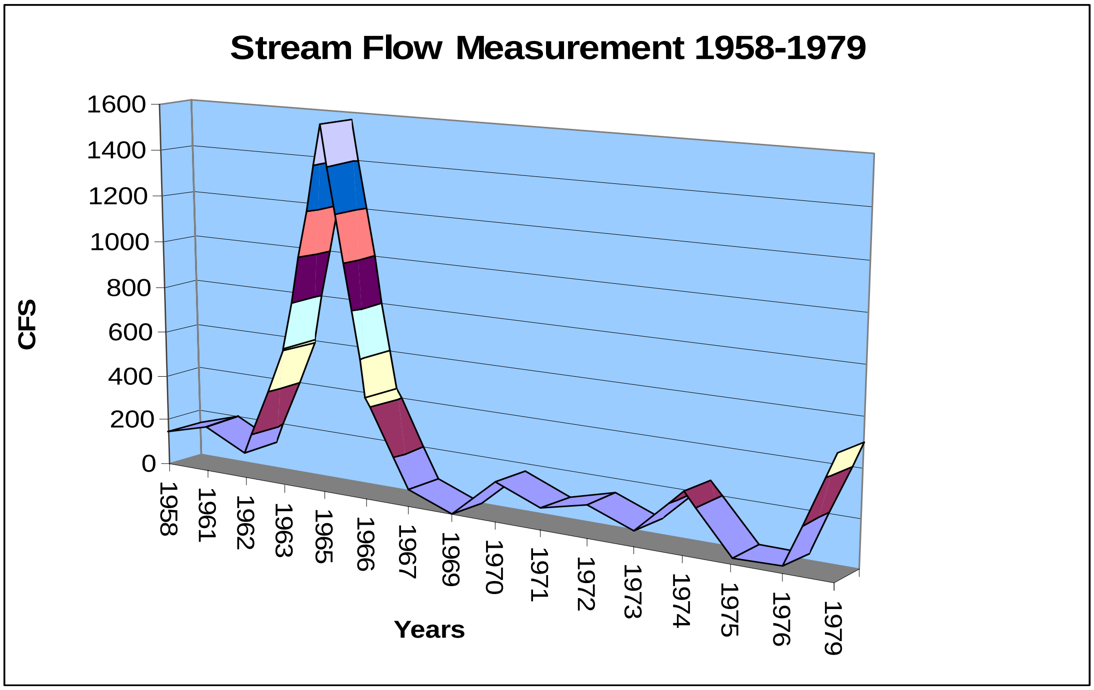


Figure 4.1: Peak stream flow for Grass Valley Canyon, measured from 1958-1979

Land Use Effects

The definition of runoff is the difference between precipitation and storage. Storage primarily occurs in the ground, and is influenced by infiltration rates and the moisture holding capacity of the soil. In areas with high infiltration rates and a high capacity for storage, runoff is unlikely to take place unless the precipitation event is very severe. Changes in soil structure or vegetation can affect the infiltration rate and alter runoff intensity. Agriculture, grazing, and fire are all changes that can be significant factors in altering runoff patterns.

Soils were mapped using data from the Sherman County Soil Survey and divided into four groups based on their depth and texture. These groups were labeled A, B, C, and D. For the purpose of this assessment we will look at soils from groups B, C, and D, as A is not found in the Grass Valley canyon watershed. Of the three groups, B has the fastest infiltration rates. B soils are typically deep silt-loams. B is also the most common soil type found in the watershed. C soils are intermediate in all properties and consist mostly of loam soils. Group D has the slowest infiltration rates and the highest amount of runoff, characteristically consisting of clay loams. D soils tend to be heavier or shallower soils.

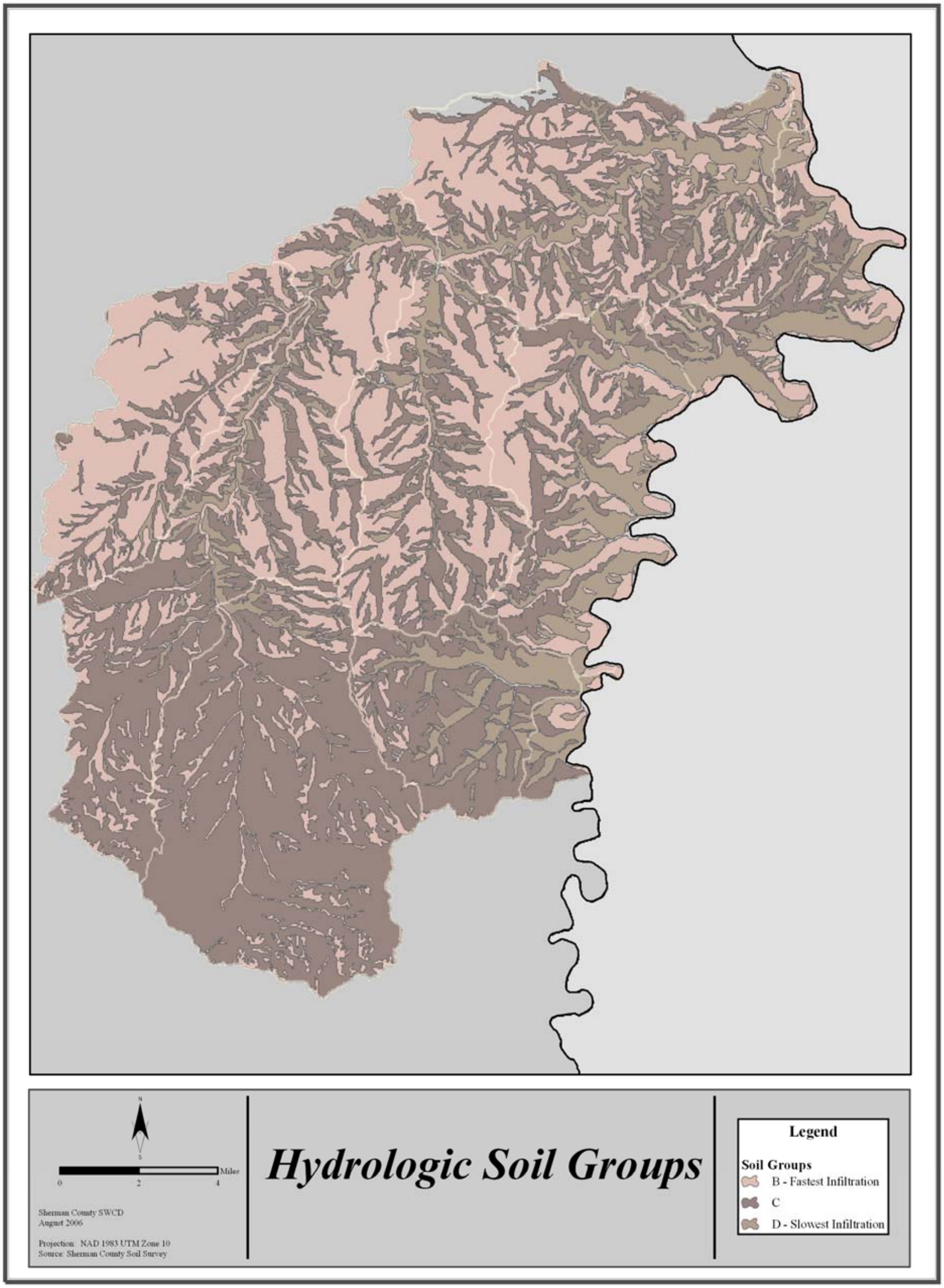


Figure 4.2: Hydrologic soil groups within the Grass Valley Canyon Watershed

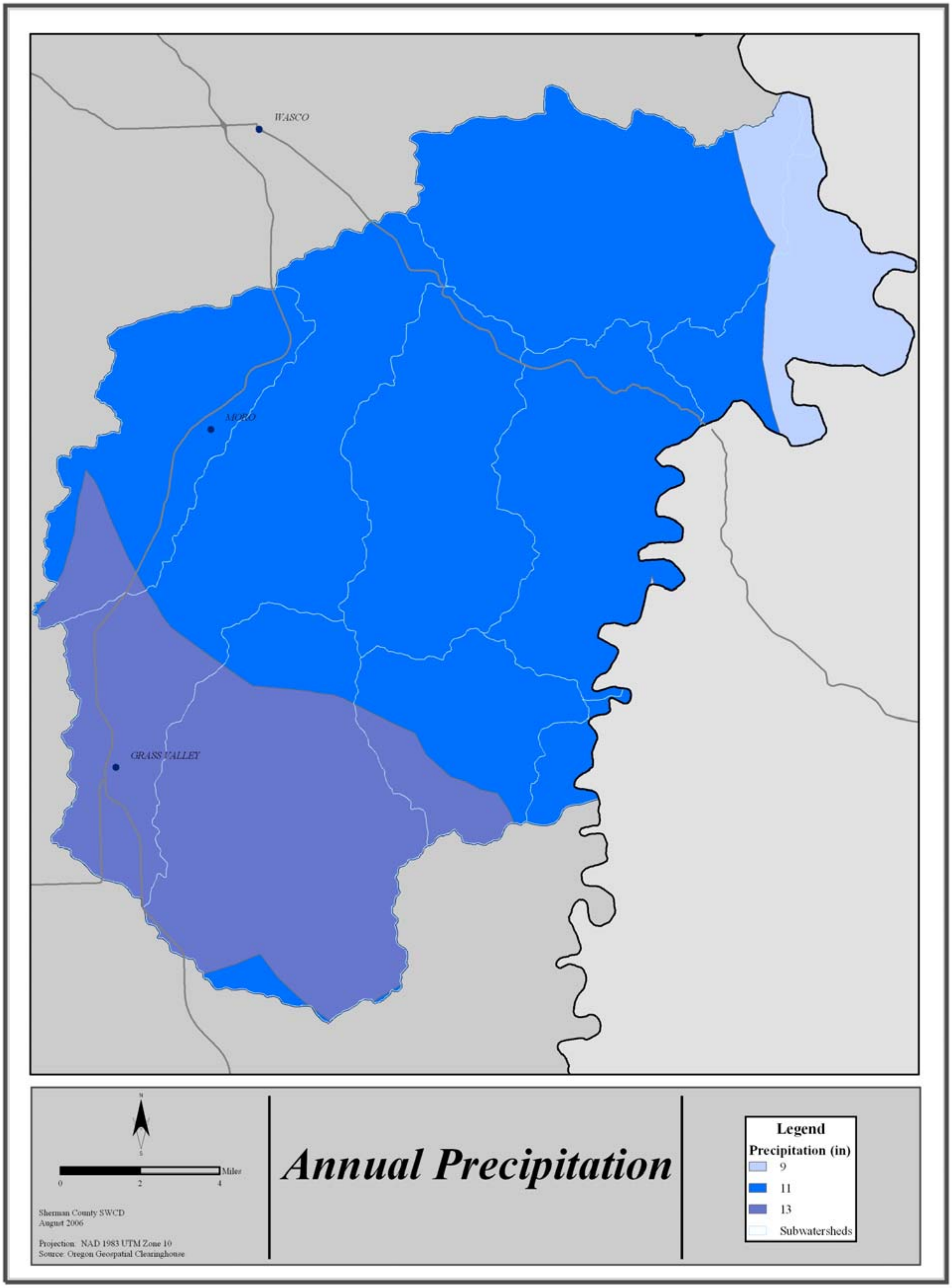


Figure 4.3: Annual precipitation within the Grass Valley Canyon Watershed

Road Density

There are two different ways in which roads can affect a watershed that were examined by this assessment. The first, overall road density, is often a sign of potential hydrological change and sediment delivery due to increased runoff. Urban and rural, paved and unpaved, road are compacted surfaces, offering little to no infiltration. In combination with roadside borrow pits, areas of high road density can lead to more runoff reaching streams at faster rates. Several factors can contribute to the amount of runoff generated by roads, including compaction, width, and surface type. Using digitized aerial photos in combination with a digital roads layer in ArcView, a map depicting roads throughout the watershed was assembled. Roads were broken into groups based on their surface, paved, graveled and dirt.

Along with a study conducted on the effect of rural roadways on Pacific Northwest watersheds (Bowling and Lettenmeier, 1997), the Oregon Watershed Assessment Manual assigns a high risk to rural areas in which more than 8% of the watershed is covered by roads. The Manual uses a standard of 35 feet in width, including the compacted roadway, shoulder and borrow pits in calculating for roads size. Based on these numbers an area with greater than 12.2 miles of road per square mile (8% of the surface area) would be assigned a high potential for impact. Areas at half that density (6.1 mi./sq.mi.) and up to 12.2 would be assigned a medium rating.

Road density for the entire watershed was calculated at 0.92 miles per square mile, including the urban areas of Moro and Grass Valley. Assessed individually the city of Moro had a road density of 11.66 mi./sq.mi. Grass Valley was calculated to have a road density of 10.31 mi./sq.mi. A 1997 study by C.W. May et al. determined that road densities in urban areas exceeding 5.5 mi./sq.mi. can cause increases in peak flows. Moro and Grass Valley, both well beyond this figure are both high risk areas by these calculations. Road densities for the subwatersheds can be found in table 4-2.

Subwatershed	Road Miles	Area (sq.mi.)	Road Density	Potential for Impact
McDonald's Ferry	0.18	0.58	0.31	Low
Barnum Canyon	44.79	28	1.60	Low
Upp G.V.Canyon	66.12	54.81	1.21	Low
Lwr G.V. Canyon	33.07	46.32	0.71	Low
Hay Canyon	39.67	32.04	1.24	Low
Rosebush Canyon	46.55	51.13	0.91	Low
Esau Canyon	7.51	20.24	0.37	Low
Devil's Canyon	14.14	31.87	0.44	Low
Little Ferry	6.26	19.87	0.32	Low
Cow Canyon	0	3.48	n/a	Low

Table 4.2: Road densities for sub watersheds in the Grass Valley Canyon Watershed

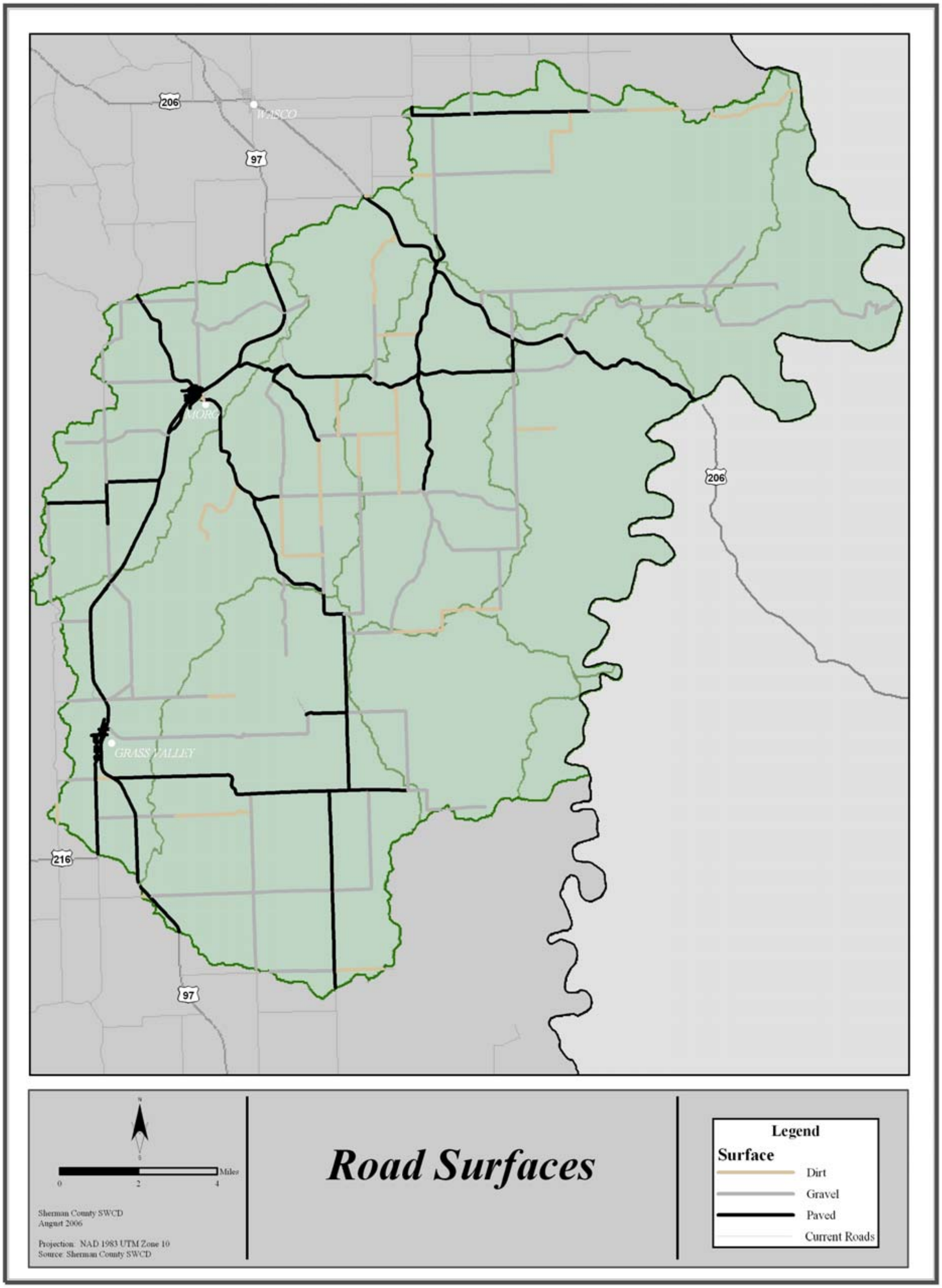


Figure 4.4: Road map used for road density calculations

Riparian Roads

The second way in which roads can influence watershed health is related to their placement in relation to streams. Roads within 200 feet of streams can supply considerable amounts of sediment due to concentrated runoff from the roads surface. By evaluating the overall density of these riparian roads, it is possible to assess what kind of impact each area will have on stream health.

Using the digitized streams layer (from earlier in this assessment), a digitized road layer, and aerial photos to check for accuracy, riparian road lengths were found for each subwatershed, including roads traveling parallel to streams channels and those crossing streams. The results are cataloged in Table 4.3, with a breakdown of miles of riparian roads per miles of streams for each subwatershed. Hay Canyon and Barnum Canyon featured the highest concentration of riparian roads, with 0.46 and 0.40 miles of riparian roads per mile of stream, respectively. Determination of specific effects on related streams will have to be assessed on a site specific basis.

Subwatershed	**Riparian Roads (mi.)**	**Stream Length (mi.)**	**Miles of Riparian Roads per Miles of Stream**	**Stream Crossings per Square Mile**
McDonald's Ferry	0	0	n/a	n/a
Barnum Canyon	11.04	27.9	0.40	0.71
Upp G.V.Canyon	17.89	62.03	0.29	1.02
Lwr G.V. Canyon	4.69	56.18	0.08	0.45
Hay Canyon	15.4	33.22	0.46	0.78
Rosebush Canyon	4.55	57.42	0.08	0.70
Esau Canyon	0.24	14.91	0.02	0.10
Devil's Canyon	2.25	25.19	0.09	0.19
Little Ferry	0.26	18.66	0.01	0.10
Cow Canyon	0	1.6	n/a	n/a
Total	56.32	296.11	0.17	0.54

Table 4.3: Sub watershed area, riparian road density, and stream crossing density for the Grass Valley Canyon Watershed. Roads include paved and unpaved roads. (Source: digitized USGS topographical maps and aerial photos, 2004).

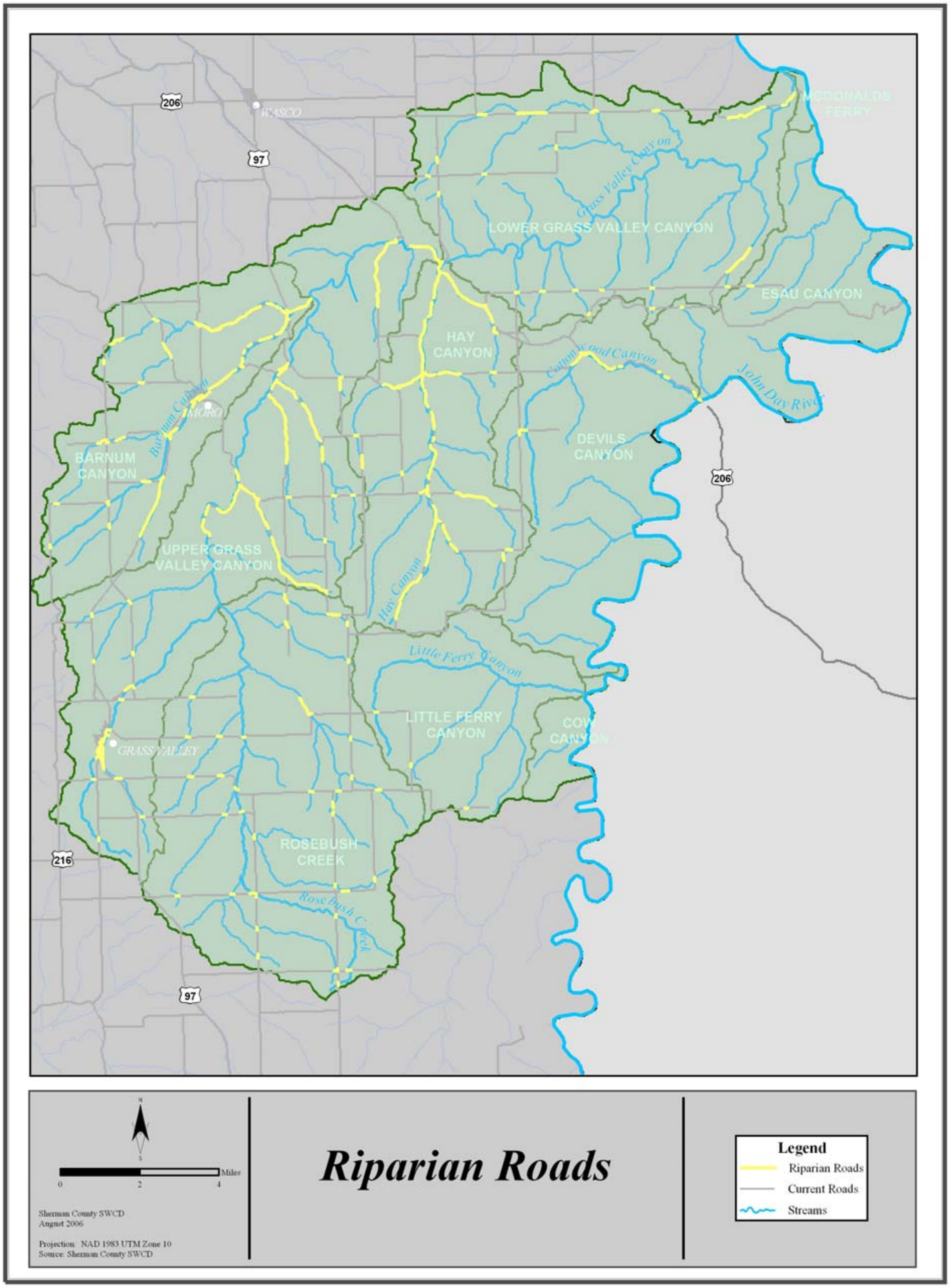


Figure 4.5: Riparian roads within the Grass Valley Canyon Watershed

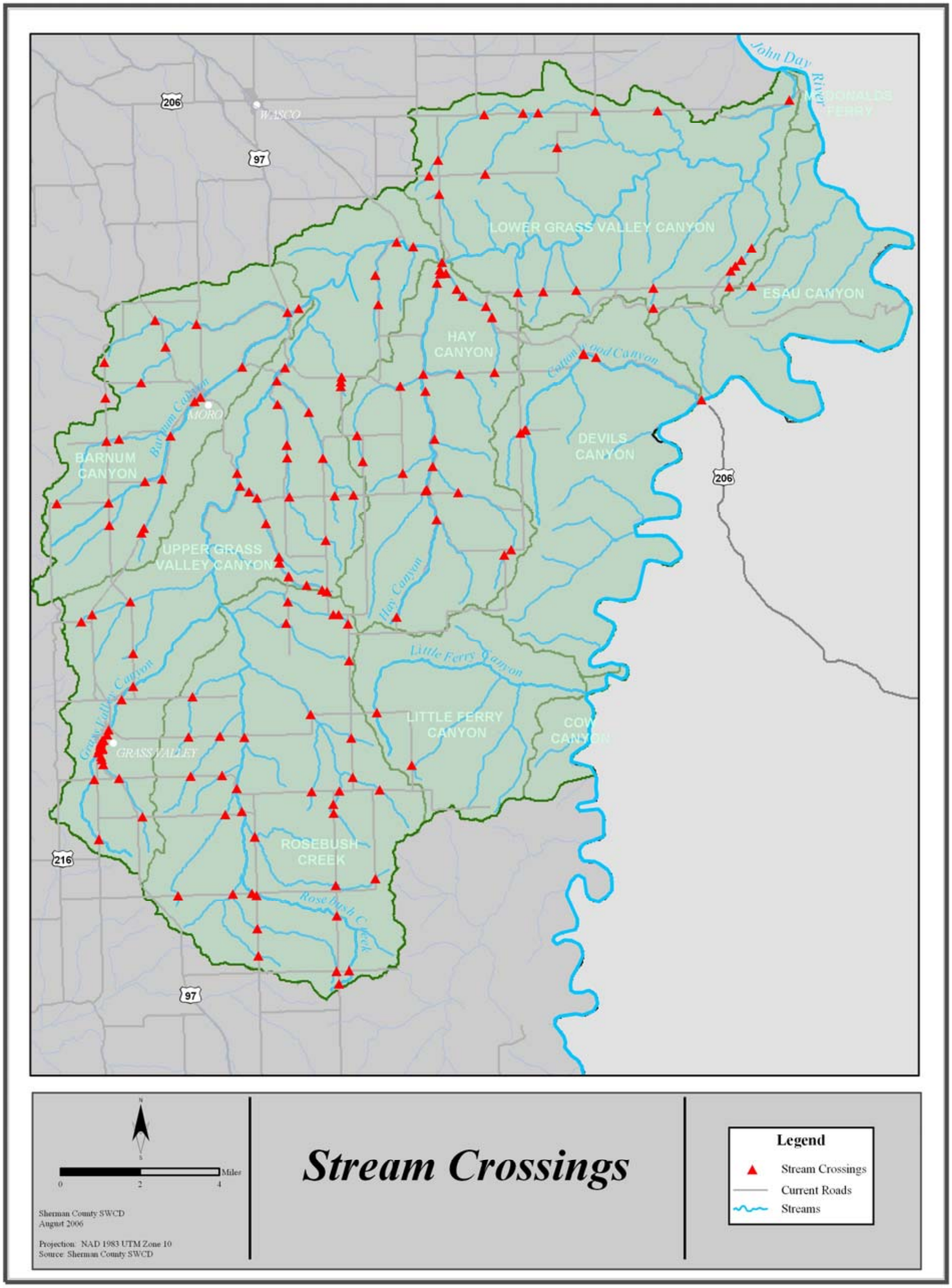


Figure 4.6: Stream crossings within the Grass Valley Canyon Watershed

Chapter 5: Water Quality

This chapter will examine water quality concerns within the Grass Valley Canyon Watershed based on available information from the Oregon Department of Environmental Quality (ODEQ). The ODEQ has set standards to ensure water quality to help protect the beneficial uses of Oregon's waters, as required by the Federal Clean Water Act in 1972.   Among the areas of concern examined by ODEQ are temperature, dissolved oxygen, pH, nutrients, bacteria, pesticides, turbidity and temperature. Land use practices such as livestock grazing, agricultural production, water storage, diversion, and soil erosion can have an impact on these criteria. Using standards put in place, ODEQ has developed a list of water bodies failing to meet the water quality criteria, known as the 303(d) list.

Major concerns for water quality throughout the state are impacts on beneficial use of water in stream. Among the beneficial uses for water in the Grass Valley Canyon Watershed listed by the Oregon Administrative Rule 340 are anadromous fish passage, and salmonid spawning and rearing. Salmonid spawning and rearing is regarded as the beneficial water use that is most sensitive to high temperature (http://www.deq.state.or.us /wq/wqrules/Div041/OAR340Div041.pdf).

In 1998 the entire reach of Grass Valley Canyon was included on the ODEQ's 303(d) list for failure to meet the water quality standard for temperature (Figure 5.1). Temperature measurements taken by the Bureau of Land Management in 1994 at two separate locations showed 7 day moving averages of 75.2 and 73.4 degrees Fahrenheit. The temperature standard set by the ODEQ is 64 degrees Fahrenheit. The same reach of Grass Valley Canyon again appeared on the 2002 303(d) list.

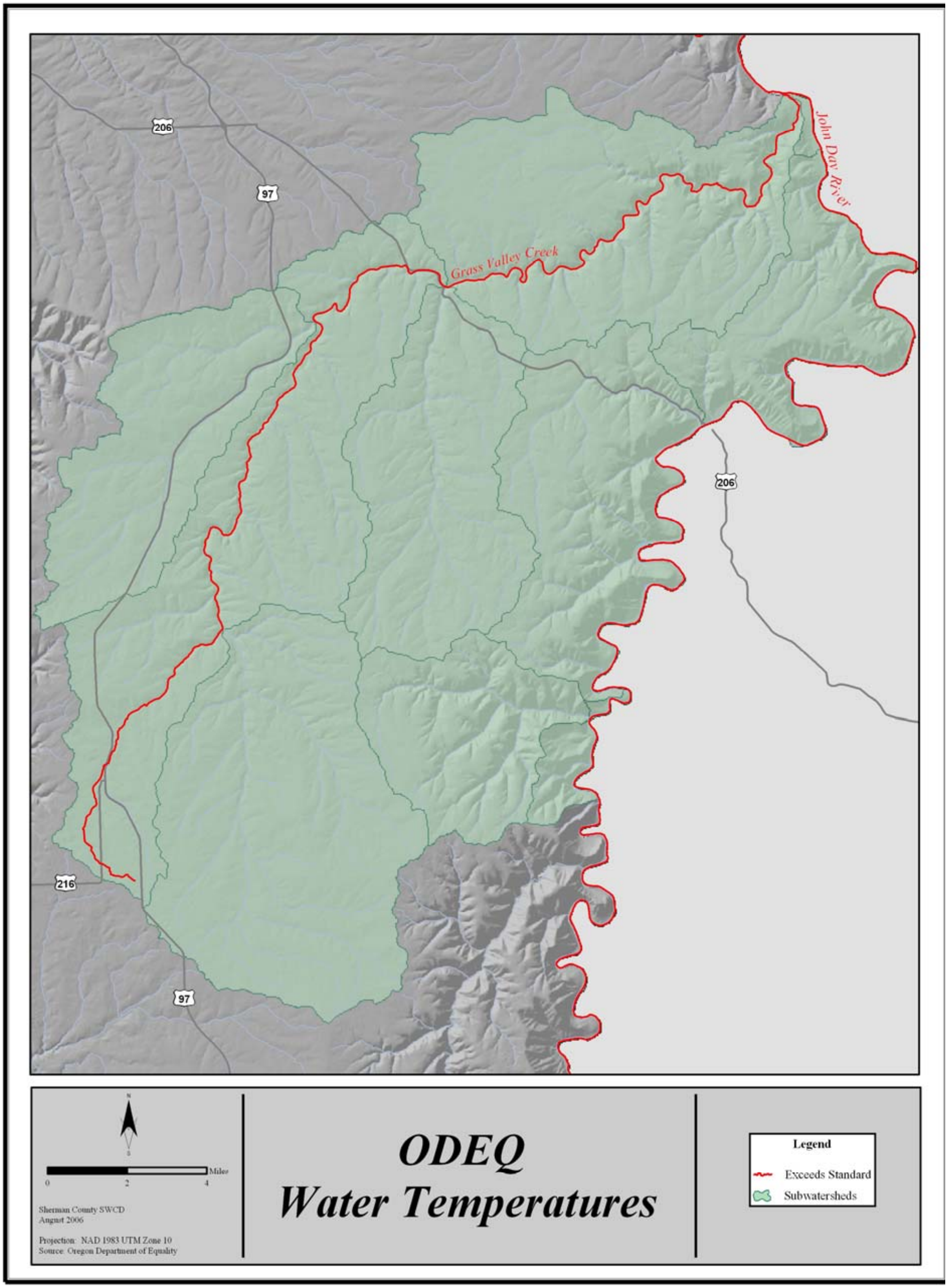


Figure 5.1: Water quality limited streams in the Grass Valley Canyon Watershed

Increases in water temperatures are unfavorable to cold water fish, as well as other aquatic species. Elevated temperatures can kill fish directly through the breakdown of physiological regulation of vital bodily processes such as respiration and circulation (Heath and Hughes, 1973). Elevated temperatures can also indirectly affect the mortality rate of cold water fish, as it can cause decreased metabolic energy for feeding, growth, or reproductive behavior, increased exposure to pathogens (viruses, bacteria, and fungi), and a decreased food supply (Brett, 1952; Hokanson et al., 1977).

Increases in stream temperature can be factors of natural and anthropogenic causes. Climate, geographic location, stream flow, morphology, and riparian vegetation can all contribute to variations in stream temperature. Stream flow, morphology and riparian habitat can be influenced by nearby land use activities. Reduction of riparian vegetation through activities such as livestock grazing or land use affecting the channel width can cause an increase in solar radiation reaching the water surface. In the summer, withdrawals from streams for irrigation or domestic water use can reduce the volume of stream flows.

Another potential concern for the area of river mile 0 to 39.8 is the pH level. Measurements taken at the same BLM sites where the 7 day moving temperature data was taken showed values ranging from 8.69 to 10 at one site and 8 to 10 at the second. The Oregon Water Quality Standards specify that the expected pH for eastside basins is 7.0 to 9.0, but to simplify the statewide screening-level assessment, pH values of 6.5 to 8.5 are often used when evaluating pH levels. Most aquatic organisms can tolerate a pH range of 6.5. The pH levels in a river can be influenced by a combination of the soil and rock types in the watershed, human activity (e.g. industry and automotive exhaust) and photosynthetic activity of algae in the water. Due to the photosynthesis and respiration cycles of the algae, the pH levels of a stream will vary throughout the day. An excessively high or low pH can create an environment that is toxic to aquatic life. At this time, there is not enough data available to add this stretch of the Grass Valley Canyon to the 303(d) list for pH levels of the creek.

Chapter 6: Habitat, Fish and Wildlife

This chapter will discuss the current habitat available in the watershed as related to fish and wildlife species. The watershed is home to multiple species of resident and migratory, game and non-game fish and wildlife. A growing concern in this area is invasion of noxious weeds. This concern is reflected in statewide efforts to identify weed invasions, and plan for control or eradication of invasive populations. The Sherman County Road Department has a progressive weed control program for County and State road right-of-ways. The Sherman County Weed District is responsible for preventing the establishment and spread of noxious weeds in accordance with County, State and Federal weed laws, and to encourage and assist in organization of noxious weed control and education programs and cooperate with governmental and private agencies and individuals in developing weed control measures and projecting long-term effects on the economic well being of Sherman County.

Noxious weeds

Noxious weeds are defined by the Oregon State Weed Board as exotic, non-indigenous plant species that are injurious to public health, agriculture, wildlife or recreation on private or public property. Non-native invasive weeds species are plants that reduce the productivity of agronomic, range and forestry systems by displacing desirable native species by capturing and utilizing valuable resources. They disrupt ecosystems by displacing native species with invasive monotypic weed stands which impact wildlife by altering habitat and food sources. Criteria for Determining Economic and Environmental Significance of Noxious Weeds as listed in the 2006 Noxious Weed Policy and Classification System retrieved from Oregon Department of Agriculture (ODA) Noxious Weed Control Program is based upon:

DETRIMENTAL EFFECTS

1. A plant species that causes or has the potential to cause severe production losses or increased control costs to the agricultural and/or horticultural industries of Oregon.

2. A plant species that has the potential to or does endanger native flora and fauna by its encroachment into forest, range, and conservation areas.

3. A plant species that has the potential or does hamper the full utilization and enjoyment of recreational areas.

4. A plant species that is poisonous, injurious, or otherwise harmful to humans and animals.

PLANT REPRODUCTION

1. A plant that reproduces by seeds capable of being dispersed over wide areas or that are long-lived, or produced in large numbers.

2. A plant species that reproduces and spreads by tubers, creeping roots, stolons, rhizomes or other natural vegetative means.

DISTRIBUTION

1. A weed of known economic importance which occurs in Oregon in small enough infestations to make eradication/containment possible; or not known to occur, but its presence in neighboring states makes future occurrence seem imminent.

2. A weed of economic or ecological importance and of limited distribution in Oregon.

3. A weed that has not infested the full extent of its potential habitat in Oregon.

DIFFICULTY OF CONTROL

A plant species that is not easily controlled with current management practices such as chemical, cultural, biological, and physical methods.

Table 6.1 Criteria for Determining Economic and Environmental Significance of Noxious Weeds (Source: http://www.oregon.gov/ODA/PLANT/WEEDS/docs/weed_policy.pdf)

Noxious weeds are established and spreading so rapidly across Oregon the state legislature passed ORS 570.505 to declare them a menace to public welfare. Oregon Department of Agriculture divides noxious weeds into two categories according to the noxious weed classification system. Designation “A” or “B” and may be given with an additional designation of “T”. The purpose of this Classification System is to act as an official guideline for ODA to prioritize and implement noxious weed control projects.

“A” Classified Weed – a weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence possible.

Recommended action*: Infestations are subject to eradication or intensive control when and where found.*

“B” Classified Weed – a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties.

Recommended action: *Limited to intensive control at the state, county or regional level as determined on a case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the main control approach. (“B” weeds targeted for biological control are identified with an asterisk).*

“T” Classified Weed – a priority noxious weed designated by the Oregon State Weed Board as a target on which the Oregon Department of Agriculture will develop and implement a statewide management plan. “T” designated noxious weeds are species selected from either the “A” or “B” list.

Canada Thistle	*Cirsium arvense*
Rush skeletonweed **“T”**	*Chondrilla juncea*
Kochia	*Kochia scoparia*
Diffuse knapweed	*Centaurea diffusa*
Russian knapweed	*Acroptilon repens*
Whitetop	*Lepidium draba*
Jointed goat grass	*Aegilops cylindrical*
Medusahead rye	*Taeniatherum caput-medusae*
Puncturevine	*Tribulus terrestris*
Dalmation toadflax	*Linaria dalmatica (L.genista)*
Yellow starthistle **“T”**	*Centaurea solstitialis*

Most noxious weeds found in Grass Valley Canyon Watershed are listed as “B” classified weeds. As of this assessment there are several “A” classified plants. Furthermore there are two species with the additional classification of “T” as indicated in the table.

Table 6.2 Noxious weed present in Grass Valley Canyon Watershed

Noxious weeds can create serious impacts on wildlife habitat within the watershed. Reduction in food and shelter are a direct result of invasion by weeds. Productivity of rangeland can diminish reducing the carrying capacity of wildlife species. Noxious weeds can also decrease the infiltration capacity of land. Replacement of perennial bunchgrasses with annual weeds can lead to a decrease in water absorption and increase

Whitetop taken in Barnum Canyon

in runoff leading to soil erosion.

Weeds are not only detrimental to rangeland productivity, they cost money. Weed infestations continue into agricultural lands where they reduce the capability to produce crops. Weeds in agricultural lands are controlled by tillage, and chemicals. A typical wheat producer can expect to spend from $7.00 to $30.00 per acre in chemical costs to control weed populations. Additional costs not reflected in that range include fuel, labor, and equipment which can add $3.00 to $5.00 per acre on top of chemical costs. On an average farm operation cropping 2,000 acres per year weed control can range from $20,000 to $70,000 for one crop year. Additional money is spent in efforts to eliminate source populations in non production areas such as range and scabland.

Weed infestation in cropland

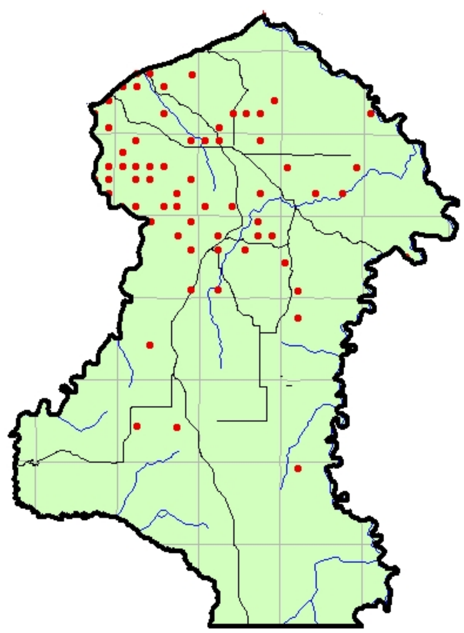


Figure 6.1: Rush skeletonweed location map (Source: http://www.weedmapper.org/chju_sherman.html)

Class	Common Name	Scientific Name
A	Blessed Milkthistle	Silybum marianum
	Camelthorn	Alhagi pseudahagi
	Canada Thistle	Cirsium arvense
	Common Crupina	Crupina vulgaris
	Gorse	Ulex europaeus
	Halogeton	Halogeton glomeratus
	Iberian Starthistle	Centaurea iberica
	Italian Thistle	Carduus pycnocephalus
	Jimsonweed	Datura stamonium
	Kochia	Kochia scoparia
	Leafy Spurge	Euphorbia esula
	Knapweed Complex	Centaurea
	Mediterranean Sage	Salvia aethiopis
	Musk Thistle	Carduss nutans
	Rush Skeletonweed	Chondrilla luncea
	Scotch Broom	Cytisus scoparius
	Spikeweed	Hemizonia pungens
	Tansy Ragwort	Senecio jacobaea
	Yellow Starthistle	Centaurea solstitialis
	Wild-proso Millet	Panicum miliaceum
B	Canada Thistle	Cirsium arvense
	Dalmation Taodflax	Linaria genistifolia-dalmatica
	Field Bindweed (morning glory)	Convolvulus arvensis
	Knapweed Complex	Centaurea
	Perennial Sowthistle	Sonchus arvensis
	Scotch Thistle	Onopordum acanthium
	Scouringrush	Equisetum laevigatum
	Showy Milkweed	Asclepias speciosa
	Whitetop (Hoary Cress)	Cardaria draba
	Wild Oat	Avena fatua
	Yellow Starthistle	Centaurea solstitalis
C	Bull Thistle	Cirsium vulgare
	Common Rye	Secale cereale
	Field Dodder	Cuscuta campestris
	Jointed Goatgrass	Aegilops cylindrical
	Klamath Weed (St. Johnswort)	Hypericum perforatum
	Little Bur (Bur Buttercup)	Ranunculus testiculatus
	Marestail	Contza Canadensis
	Medusahead Rye	Taeniatherum caput-medusae
	Perennial Pepperweed	Lepidium latifolium
	Poison Hemlock	Conium macalatum
	Prickly Lettuce	Lactuca serriola
	Puncturevine	Triulus terrestris
	Quackgrass	Elytrigia repens
	Russian Thistle	Salsola iberica
	Spiny Cocklebur	Xanthium spinosum
	Western Waterhemlock	Cicuta douglasii
	Wavyleaf Thistle	Cirsium undulatum

Table 6.3: Sherman County noxious weeds list (Source: Sherman County OSU Extension Service)

Fish Species

There are limited inventories and published data for fish populations within the Grass Valley Canyon Watershed. Most existing information is focused on summer steelhead (*Oncorhynchus mykiss*), and redband trout (*Oncorhynchus mykiss gairdneri*). There are other populations of fish which could potentially inhabit Grass Valley Creek. These populations may include species of dace, sculpins, suckers, the redside shiner, and Pacific lamprey. According to Oregon Department of Fish and Wildlife, the John Day River has historically been managed for wild summer steelhead. Hatchery steelhead were released in the John Day River between 1966 and 1969. Rainbow trout make up the majority of all hatchery fish species released into the John Day basin. "The mean annual stocking rate of hatchery *O. mykiss* in the John Day basin between 1925 and 1997 was 71,402 fish and ranged between 5,000 and 612,668 fish" (Carmichael, 2006, p.289) All release of hatchery stock was ended due to concern for competition with naturally occurring populations.

There is very little known about the life history of lamprey, and the data that is available is patchy and incomplete. Larval lampreys are referred to as ammocoetes. They are pale brown, have a fleshy toothless oral hood instead of sucker-like disc, and undeveloped eyes. They spend up to six years burrowed in the sediment, feeding on diatoms and detritus by filtering the water column. Physical cues initiate transformation and the River and Pacific lamprey enter a juvenile stage termed macropthalmia. At this stage the lampreys are silver in color, develop teeth and a sucker-like disc, and form true eyes. Physiological transformations occur that initiate migratory behaviors and enable them to tolerate sea water. They spend up to two years as adults in the ocean, feeding on fishes and mammals. Conversely, the western brook lamprey undergoes transformation directly into a non-feeding adult. All three species of lamprey are highly prolific, they spawn in freshwater during the spring, and die after spawning. (*Fish Passage Center [report online] lamprey data: USFW,CBFWA [19 July, 2006]URL.< http://www.fpc.org/lamprey/lamprey_home.html>.*

In the areas searched for this assessment, no data could be located for either distribution or life history of the redside shiner (*Richardsonius balteatus*), dace, or sculpins in Grass Valley Creek. However visual confirmation has been made of dace as high in the watershed as Rosebush Canyon. According to Oregon Department of Fish and Wildlife, there are two known species of dace in the John Day basin – longnose (*Rhinichthys cataractae*) and speckled (*Rhinichthys* *osculus*). There are also two species of sculpins cited as being present by most documents – mottled (*Cottus bairdi*) and torrent (*Cottus rhotheus*). A few documents reference Paiute sculpins (*Cottus beldingii)* as also being present. Dace appear to be ubiquitous throughout the basin. Sculpins are found in most areas with adequate water quality, except those at high elevations. The two species of suckers found in the basin are large scale (or coarse scale, *Catostomus macrocheius*) and bridgelip (*Catostomus columbianus*). Currently there has not been any basinwide study of sculpin, dace, or sucker distribution or species work. Another fish suspected to be present in Grass Valley Canyon Creek is northern pike minnow (*Ptychocheilus oregonensis*). Populations could exist in the lower sections that can be accessed from the John Day River. (Unterwegner, Tim, Oregon Department of Fish and Wildlife, written communication, July 20,2006)

In the central Columbia River, southeastern Washington, bridgelip suckers (Catostomus columbianus) were common in deep water with strong currents during daylight and moved into slower shallow water at night. Mean calculated fork lengths (FL) in millimeters at annulus formation were age I, 63; II, 148; III, 224; IV, 291; V, 335; VI, 36I; VII, 387; VIII, 401; IX, 408. Back-calculated lengths approximated lengths at capture for respective ages. The length-weight (W) relationship for both sexes was logeW = - 12.65 + 3.25 logeFL. Both sexes reached maturity at about 350 mm FL and age VI. Peak spawning in all years occurred during May in water temperatures of 8-13 C. Breeding males and females both exhibited a narrow red lateral line stripe. Estimated egg numbers per mature female ranged frown 9,955 to 21,040. Bridgelip sucker diet was almost entirely periphyton, except fish smaller than 150 mm FL utilized mainly aquatic insect larvae and zooplankton. Variability of taxonomic characters caused some difficulty in distinguishing bridgelip suckers from sympatric largescale suckers (C. macrocheilus). (Dauble, Dennis D., 1980)

The life of a steelhead in Grass Valley Creek begins when an adult female finds a suitable gravel bed to build her nest called a *redd*, and deposits eggs in the rocks along with sperm from an accompanying male. Depending on water temperature the eggs will hatch within four months to become an *alevin*. The alevin lives in the gravel with the egg sack still attached until they emerge into the stream becoming *parr*. They are named for their camouflage markings called parr marks, and live in the protective waters of the creek for 1 to 4 years until they undergo a physiological transformation to prepare for life in salt water called smoltification. The *smolts* as they are now called begin their migration downstream until they reach the Columbia River Estuary, and finally the Pacific Ocean where they will grow and mature preparing for the return trip home. Summer steelhead re-enter freshwater in the main stem Columbia River during mid summer after one to two years of life in the Pacific Ocean. On their journey to the John Day basin they must navigate three hydroelectric dams on the Columbia River -Bonneville, The Dalles, and John Day. Once in the John Day River, they must swim approximately 18.8 miles upstream to Grass Valley Canyon. Within the small tributary they will spawn and either expire, or begin a journey back to the ocean.

On March 25, 1999 steelhead in the Mid Columbia evolutionarily significant unit (ESU) were listed as endangered by the National Marine Fisheries Service (NMFS). The Mid Columbia ESU includes all naturally spawned populations above the Wind River in Washington, and the Hood River in Oregon up to and including the Yakima River in Washington, and excluding the Snake River subbasin. On September 2, 2005, NMFS published a final rule, 70 FR 52630, designating critical habitat for the Middle Columbia River steelhead which includes Grass Valley Creek.
A total of 30.84 miles of the Grass Valley Canyon, and 5.41 miles of Rosebush Canyon, a tributary to Grass Valley Canyon, are identified by Oregon Department of Fish and Wildlife as potential spawning and rearing habitat for summer steelhead. Another 1.49 miles extending into Hay Canyon, another tributary of Grass Valley Canyon are listed as rearing and migration areas for steelhead according to the Oregon Department of Fish and Wildlife (John Day Subbasin Revised Draft Plan, 2005).

Redband trout are found within the watershed year-round. The redband trout inhabit the same stream reach as the summer steelhead, the lower 30 miles of Grass Valley Canyon, to the point where the stream empties into the John Day River, as well as Rosebush Canyon and the lower three miles of Little Ferry Canyon. Resident trout follow the same life history strategies as the steelhead, but do not undergo the process of smoltification and migrate out of the local stream system. According to the Oregon Department of Fish and Wildlife there are currently no population counts available for either the summer steelhead or the redband trout in Grass Valley Canyon. Historic evidence of steelhead and trout distribution is available from the Oregon Department of Fish and Wildlife but there is no data available concerning current spawning and rearing of steelhead and trout in the Grass Valley Canyon Watershed.

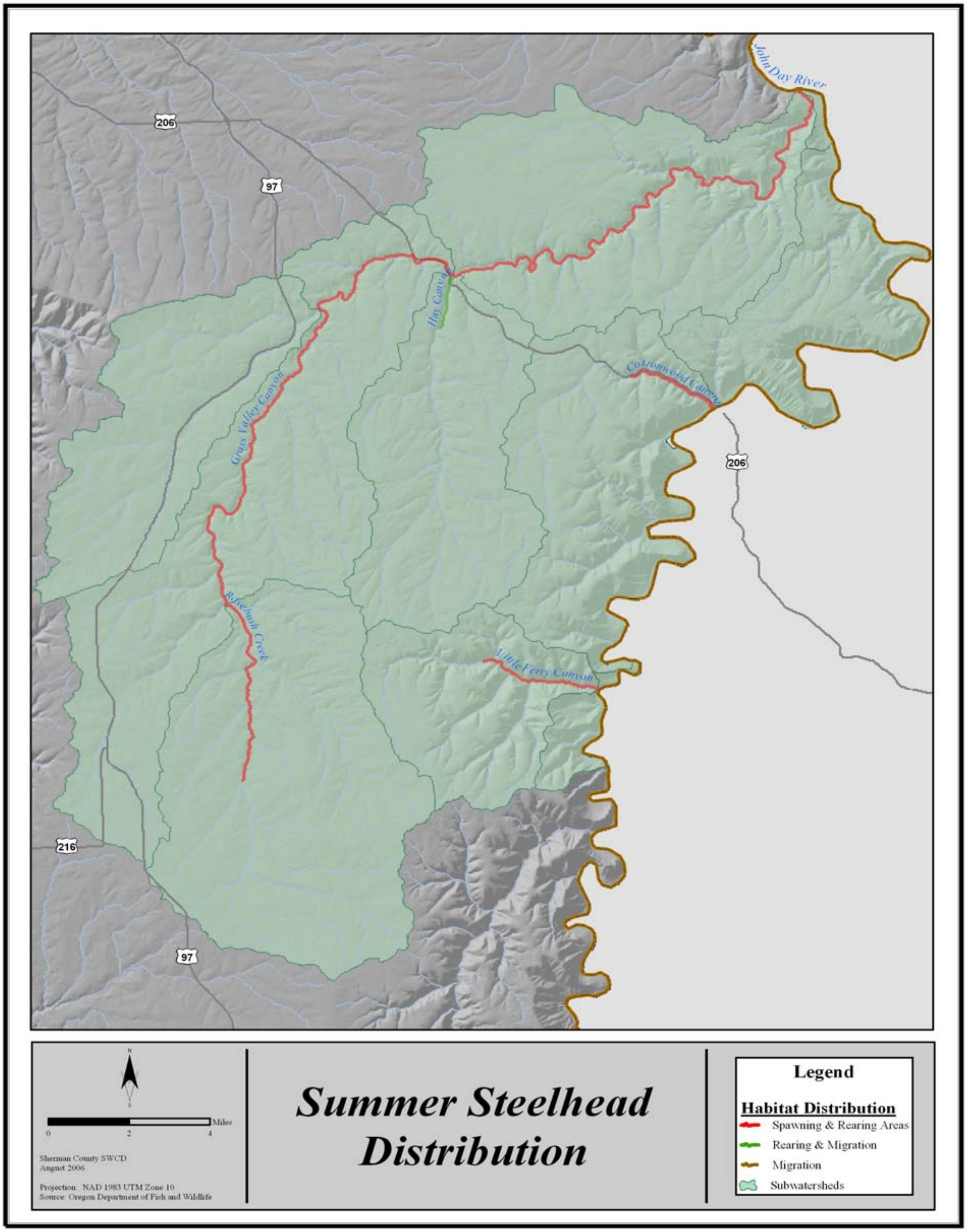


Figure 6.2: Summer steelhead distribution

Wildlife species

Wildlife populations in the watershed are influenced by location of available drinking water, and agricultural production. The Natural Resources Conservation Service (NRCS) wildlife upland habitat management practice code 645 indicates the optimal distance to water is one quarter mile from food and shelter. The semi-arid climate and lack of frequent perennial streams require wildlife to rely on natural springs, and man made watering sources throughout much of the watershed. Grass Valley Creek and its main tributaries provide perennial water in the lower reaches of the watershed. In the uplands non-natural watering sources are provided by livestock watering facilities, rain water collection cisterns (guzzlers), and water and sediment control basins (WASCBs).

Livestock watering facilities can consist of simple troughs filled from domestic wells, solar and wind powered livestock wells in remote locations, or natural springs developed and piped to troughs. Oregon Department of Fish and Wildlife currently operates 150 guzzlers within Sherman County. These units collect precipitation from a 4’x4’ roof and store it in 500 gallon cisterns accessible to wildlife for consumption. Water and sediment control basins primary purpose is to capture excessive surface runoff and store it to be safely released as groundwater inputs while capturing sediment generated from erosion above the structure. The runoff stored in these WASCB’s for the period of time, before it infiltrates into the ground, becomes an oasis to all resident wildlife species as a place to obtain drinking water and find shelter in tall grasses surrounding the structure. Migratory birds utilize these structures as resting spots during migration to find food, and nesting habitat.

Turning the grasslands under for crop production in the 1860’s altered habitat dramatically for wildlife species that depended on grass plant community. The conversion of native grasslands removed habitat for ground nesting species of birds, while simultaneously producing a more desirable habitat for non-native species such as pheasant. According to ODFW non-native game birds; Ringneck pheasant, Chuckar partridge, Hungarian (gray) partridge, and Valley (California) quail, were introduced beginning in the early 1950’s and continue to maintain populations within the watershed today. Bird counts from spring of 2006 completed by ODFW based on bird numbers per 10 mile transect show populations within Sherman County to be: Pheasant 0.1/10 mile, quail 14/10 mile, chuckar 52/ 10 mile, dove 20/10 mile and no data on Hungarian partridge.

No historical data could be found on populations of large mammals within Sherman County. Verbal accounts of the first mule deer sighting in the watershed occurred in Rosebush Canyon in the early 1920's with antelope following in the mid 1950's. The first account of Rocky Mountain Elk migrating through the watershed occurred in the late 1970's. In 1989 big horn sheep were introduced into the John Day canyon in the East John Day unit, with a following introduction on the West John Day unit in 1995. Oregon Department of Fish and Wildlife management unit boundaries do not coincide with Grass Valley Canyon Watershed, or Sherman County boundaries therefore population estimates within the watershed are difficult to conclude. County wide population trends however show mule deer populations to be slightly increasing, pronghorn antelope decreasing, elk slightly increasing, and big horn sheep stable and slowly increasing in numbers. Predator populations are difficult to census, but are believed to be healthy for coyotes, and at a low density of 3.8 mountain lions per 100 square miles according to Oregon Department of Fish and Wildlife.

Currently no data exists for non-game species of wildlife within the watershed boundaries. According to ODFW there are no bald eagle nests within Sherman County. There are no other documented wildlife species listed as endangered currently within Grass Valley Canyon Watershed.

Chapter 7: Evaluation

I) SUMMARY

A) *Current Inventory*:

1) **Conservation Efforts:** Inventory completed in Grass Valley Canyon Watershed reveals functioning conservation practices to be as follows:
   - (a) **Structural Erosion Control:** 842.66 miles of cropland terracing, 824 water and sediment control basins, 131.39 acres of grass waterways
   - (b) **Water Developments:** 9 spring developments, 30 wildlife guzzlers
   - (c) **Managed Grassland:** 257.57 acres of brush management, 946.68 acres of grass seeding, 83,561.9 acres of land enrolled in the Conservation Reserve Program and 44.23 miles of fencing
   - (d) **Riparian:** 51 miles of riparian buffers enrolled in CREP, and CCRP
2) **Uplands:** The majority of conservation efforts to date are located in the uplands focusing on mitigation for soil erosion in cropland. This upland work follows the philosophy of socially accepted practices in Sherman County. The treatment of a watershed beginning at the ridge tops and working progressively downward allows aggressive treatment of cropland, and assurance of systematic treatment of resource concerns. This treatment strategy also provides for passive restoration of riparian areas further down the watershed.
3) **Riparian:** In the previous six years, active riparian restoration practices have been applied to Grass Valley Canyon Watershed from enrollments in the Conservation Reserve Enhancement Program including riparian forested and herbaceous buffers. These efforts represent the first large scale restoration treatments directly focused on riparian areas for Grass Valley Canyon Watershed. Without prior conservation work in the uplands, riparian restoration could not be successful with high quantities of runoff delivered to riparian zones from agricultural lands.

B) *Inventory Gaps:*

1) **Water Quality Data:** During the completion of this assessment, data was not available for temperature, turbidity, pH, dissolved oxygen, or macro-invertebrate populations.
2) **Fish & Wildlife:** Specific data was not available for population density, or geographic location for any fish or wildlife species. Potential for habitat and historic range are identified for Mid Columbia ESU steelhead populations, but no data exists for redd counts, or current locations. Censuses for all other species populations currently are not available for this area.
3) **Stream Classification:** Channel habitat and stream type classifications are conclusions from analysis of topographic maps and GIS data with rapid assessment techniques employed.
4) **Wetlands:** During the completion of this assessment, inventory did not occur for determination of wetlands within Grass Valley Canyon Watershed. There is minimal data available for identification of hydric soils within Sherman County. National wetland inventory maps are available for this area.
5) **Road impacts:** Analysis from GIS mapping for road crossings indicated 169 individual stream crossings, and 56.32 miles of riparian roads. Additional analysis of concentrated flow and sediment delivery needs to be completed. Site-specific evaluation of each crossing is currently not available.
6) **Noxious weeds:** Noxious weeds are clearly present throughout the watershed and have been shown to cause ecological and financial impacts. Some inventory is available such as skeletonweed populations, however large tracts of rangeland could potentially hold populations not currently identified.
7) **Rangeland health:** Enrollment of land into conservation programs often removes livestock from rangeland and can lead to a decline in plant community health from lack of disturbance. Inventory of rangeland plant production and overall community health is available on site specific locations but not enough information is available to represent the entire watershed.
8) **Social and Economic Impacts:** Market price obtainable for soft white wheat has not increased with cost of production in the last forty years. Current production costs can

impact management practices and operation viability. Analysis can be included to determine how future market price, and overhead costs will affect dry land soft white wheat production.

II) RESULTS:

A) *Action Plan:*

1) Plan Development: Through the development of this assessment, eight areas have been identified that require additional inventory, or development of baseline data. There are three goals for the development of this action plan: first, is the completion of inventory and development of necessary baseline data, second is to implement practices that address each of the following priorities in order to obtain the third goal of re-introducing Mid Columbia ESU steelhead into Grass Valley Canyon Watershed.

B) *Priorities:*

1) Uplands:

(a) Cropland:

- **(i)** Continue implementation and management of cropland erosion control practices
- **(ii)** Develop new management strategies to address erosion and soil health and condition
- **(iii)** Develop alternative crops to be used in rotations for improved soil health, condition, and economic alternatives
- **(iv)** Further the development of land use for alternate renewable energy production such as solar and wind
- **(v)** Identify and prioritize locations for water and sediment control basins utilizing percent reduction in overland flow for a given storm event to maximize effectiveness of structure placement

(b) Conservation Reserve Program Lands:

- **(i)** Enhance decadent grass stands for higher productivity, healthier plant communities, and improved wildlife habitat
- **(ii)** Provide alternatives for marginal cropland no longer enrolled in CRP program

(iii) Develop grazing plans for lands no longer in CRP production that will support livestock production

(iv) Develop alternative crops to maintain economic viability and health of converted cropland

(v) Develop wildlife and recreational opportunities to maintain economic viability and health of converted cropland

(c) Rangeland:

(i) Increase opportunity for range management and develop strategies that maintain production on land while improving plant community heath

(ii) Develop new management alternatives for wildlife and recreation that maintain economic viability of rangeland

(iii) Identify and develop management plans to address noxious weed infestations

(iv) Identify and prioritize locations for water and sediment control basins utilizing percent reduction in overland flow for a given storm event to maximize effectiveness of structure placement.

2) Riparian

(a) Fish Habitat:

(i) Restore spawning and rearing habitat for Mid Columbia ESU steelhead in Grass Valley Canyon Watershed

(ii) Determine fish passage barriers and survey current habitat conditions

(iii) Develop a plan with designs for in-stream habitat restoration project on lower main stem of Grass Valley Canyon for reintroduction of Mid Columbia ESU steelhead

(iv) Establish a monitoring program that censuses populations, develops population potentials, and redd counts

(b) Water Quality Monitoring

(i) Establish at least one monitoring station in each 6th field hydrologic unit code area to establish baseline data on turbidity, stream flow, channel morphology, dissolved oxygen levels, pH, macro invertebrates, and temperature

(ii) Establish at least one hydromet station on Grass Valley Canyon Creek. Remote data collection will transmit water and environmental data via radio and satellite to provide cost-effective, near real-time water management capability.

3) **Urban and Residential Areas**

(i) Develop projects to reduce surface water impacts from urban runoff both quantitatively and qualitatively

(ii) Reduce impacts of runoff generated in agricultural land on urban areas

(iii) Develop programs for recycle and disposal of by-products generated from agricultural operations, and urban applications including: plastic chemical containers, used oils from motor hydraulic systems, and other chemicals

4) **Education & Outreach**

(i) Develop and implement outreach programs to inform watershed residents of ongoing restoration efforts in their watershed.

References Cited

BLM. 2005. Bureau of Land Management website, http://www.blm.gov/or/index.htm.

Bowling, L.C., and D.P. Lettenmeier. 1997. Evaluation of the Effects of Forest Roads on Streamflow in Hard and Ware Creeks, Washington. TFW-SH20-97-001, Water Resources Series Technical Report No. 155, University of Washington, Seattle.

Brett, J.R. 1952. Temperature tolerance in young Pacific salmon, genus *Oncorhynchus*. J. Fish Rex. Bd. Can., 9)6):265-323.

Carmichael, Richard W., January 17, 2006 DRAFT Recovery plan for Oregon's Middle Columbia River Steelhead, progress report., *John Day River Steelhead Program History,* p. 289-293.

Columbia River Inter-Tribal Fish Commission, August 4, 2006, online report, *The Confederated Tribes of the Warm Springs Reservation of Oregon,* <http://www.critfc.org/text/warmsprings.html>

Dauble, Dennis D.,1980, Life History of the Bridgelip Sucker in the Central Columbia River, *American Fisheries Society Online Journals Volume 109, Issue 1 (January 1980), http://afs.,allenpress.com/perlserv/?request=get-abstract&doi=10.1577%2F1548-8659(1980)109%3C92%3ALHOTBS%3E2.0.C%3B2*

Fish Passage Center [report online] lamprey data: USFW,CBFWA *[19 July, 2006]URL. http://www.fpc.org/lamprey/lamprey_home.html.*

FSA. 2006. History of the CRP website, http://www.fsa.usda.gov/dafp/cepd/12crplogo/history.htm.

Grass Valley, Oregon. 2003. Website, http://www.a2zgorge.info/towns/grassvalley.htm.

Hokanson, K.E.F., C.F. Kleiner, and T.W. Thorslund. 1977. Effects of constant temperatures and daily temperature fluctuations on specific growth and mortality rates and yield of juvenile rainbow trout, *Salmo gairdneri*. J. Fish. Res. Bd. Can., 34:639-648.

John Day Subbasin Revised Draft Plan, March 15, 2005,3.2.4 Aquatic Focal Species Population Delineation and Characterization-*Summer Steelhead*, p.71-90.

John Day Subbasin Revised Draft Plan. Macdonald, Gerald D., Lamkin, James M., Borine, Roger H., 1999,*NRCS published Sherman County Soil Survey* p.43

Moore, Patty, spring 1987, Civilian Conservation Corps, A history of camp Moro 1935-39, *Sherman County: For the Record*, vol. 5 NO. 1, p.3

Northwest Area Foundation [Online Report, 20 July, 2006]. URL<http://www.indicators.nwaf.org/DrawRegion.aspx?RegionID=41055

NRCS Plant Material Program, online report July 31, 2006, News Feature *Great American Plants, Sherman Big Bluegrass*,(http://plant-materials.nrcs.usda.gov /news/features/great_am_plant/sherman.htm)

ODEQ. 2002. Oregon's 2002 Section 303(d) list of water quality limited waterbodies. Oregon Department of Environmental Quality. Portland, OR.

ODEQ. 2006. Oregon Department of Environmental Quality website, http://www.deq.state.or.us/

ODF. 2005. Oregon Department of Forestry website, http://www.egov.oregon.gov/odf/private_forests/docs/legacyaon/appendixA.pdf.

ODF Oregon Ecoregion Description, online report, July 31, 2006, Forrest Legacy Assessment of Need, *Columbia Basin*, (http://egov.oregon.gov/ ODF/PRIVATE_ FORESTS/docs/LegacyAON/AppendixA.pdf, p.90)

Oregon Geospatial Data Clearinghouse. http://www.oregon.gov/DAS/IRMD/GEO/index.shtml.

Oregon Historical County Records Guide. 2002. *Sherman County History*. http://arcweb.sos.state.or.us/county/cpshermanhome.html.

Orr, Elizabeth L., and William N. Orr. 2000. *Geology of Oregon*. Kendall / Hunt Publishing Company, Dubuque, IA.

Sherman County, Oregon. 2003. Website, http://www.sherman-county.com/index.htm.

Sherman County http://www.sherman-county.com/sc_history.html

Streamnet. 2006. Pacific States Marine Fisheries Commision. *Fish Distribution for Grass Valley Canyon.* http://www.streamnet.org/online_data.html.

Taylor, George, C. Hale and S. Joos. 2005. *Climate of Sherman County*. Oregon Climate Service. http://www.ocs.oregonstate.edu/county_climate/Sherman_files/Sherman.html.

Taylor, Ronald J., 1992, *Sagebrush Country a Wildflower Sanctuary*, Mounntain Press Publishing Co., Missoula, MT, 211p.

United States Census Bureau. http://www.quickfacts.gov/qfd/states/41/41055.html.

USDA. 1992. Sherman County Soil Survey.

USFS. 1996. Mt. Hood National Forest. West Fork of Hood River Watershed Analysis. Mt. Hood-Parkdale, Oregon.

USGS. 2006. United States Geological Survey. *Peak Streamflow for Grass Valley Canyon*. http://nwis.waterdata.usgs.gov/nwis/peak/?site_no=14048020.

Watershed Professionals Network. 1999. *Oregon Watershed Assessment Manual.* Prepared for the Governor's Watershed Enhancement Board. Salem, OR.