CHAPTER 2 - GENERAL DESCRIPTION OF WOLF CREEK WATERSHED

General Overview

The Wolf Creek watershed is 99 percent forested with 1 percent composed of a variety of other nonforest vegetation types. The nonforested portion consists largely of agricultural/pasture lands, rock quarries, dwellings, and home sites.

The Wolf Creek watershed is a "backwards" watershed in a number of ways. All of the human settlements and development occur in the headwaters of the watershed rather then the usual development pattern where these occur on the lower reaches of a basin. The headwaters of the basin are gentle to moderate slopes with the steep, highly dissected lands occurring towards the lower reaches and confluence with the Siuslaw River. The stream gradient for the entire main stem of Wolf Creek is relatively gentle from headwaters to confluence.

Watershed Location

The Wolf Creek watershed is located southwest of Eugene and covers approximately 37,890 acres (see Figure 1). The watershed is within the Coast Range Province established by FEMAT and the Regional Ecosystem Office (REO). Wolf Creek lies in the South Valley and Coast Range Resource Areas of the Eugene District, Bureau of Land Management.

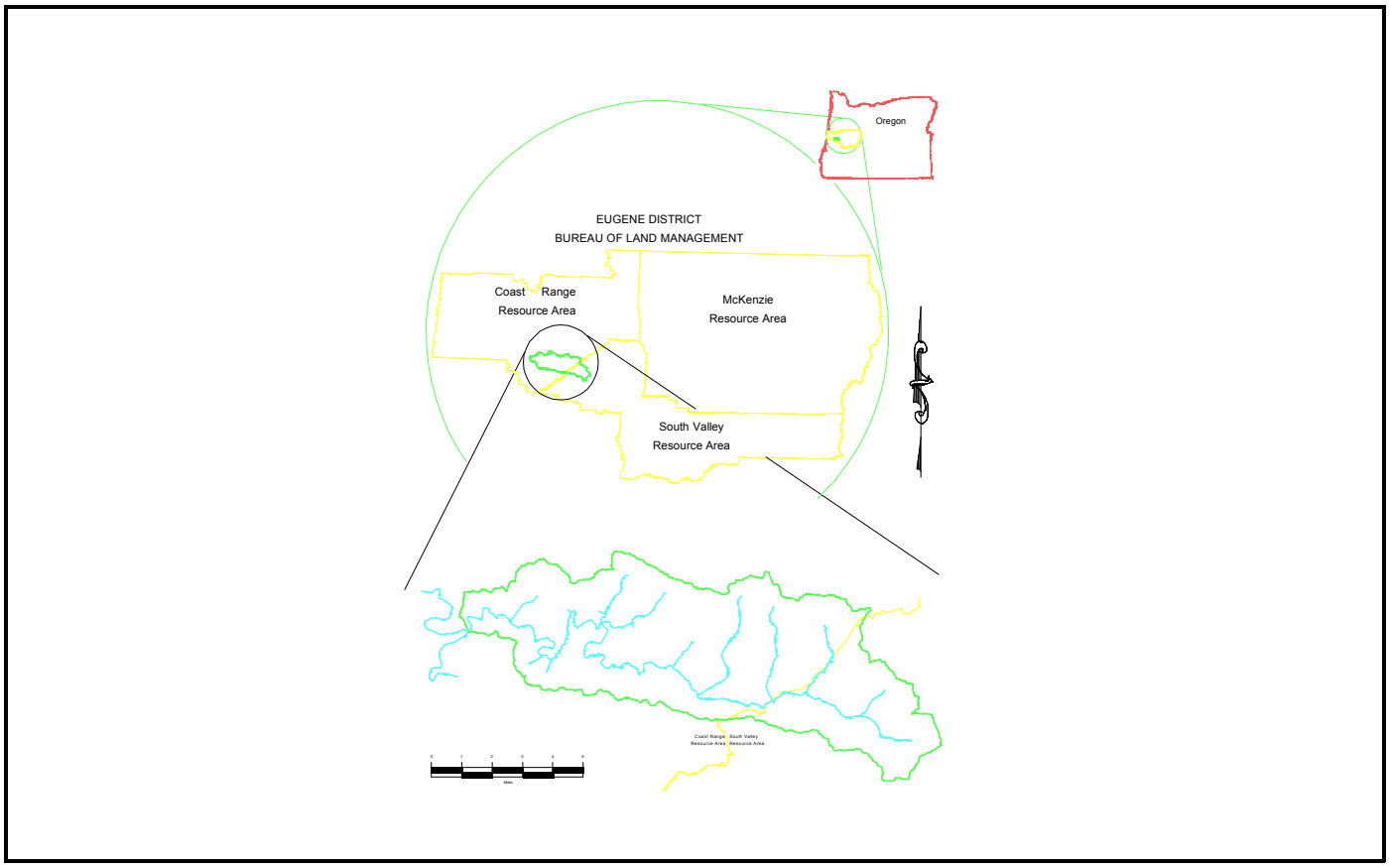

Figure 1: Vicinity Map - Wolf Creek Watershed

Ownership

The BLM ownership totals 16,688 acres and the balance of the land is owned by a variety of owners. Table 2-1 depicts the ownership of the watershed by acres and percentage and Figure 2 is a graphical summary.

Table 2-1 - Wolf Creek Ownership Summary

Landowner	Total Acres	Percent of Watershed
State of Oregon, Dept. of Forestry	900	2.4
Other/small private owners	1,417	3.7
International Paper Company	18,885	49.8
BLM	16,688	44.1
Totals	37, 892	100.0

Climate

The watershed has a maritime climate characterized by mild temperatures with prolonged cloudy/overcast periods, wet winters, relatively dry summers, and a long frost free growing season. The temperatures are relatively mild with narrow diurnal fluctuations. Winter temperatures average 42 degrees F. with the average daily minimum temperature being 35 degrees; occasional periods of below freezing conditions occur. In summer the average temperature is 64 degrees F. with the average daily maximum being about 76 degrees F. The precipitation ranges from 40 inches at the eastern edge of the watershed to 80 inches at the western edge, with the majority (75% to 85%) occurring between October and April. Rain is the primary form of precipitation, although snow does occur occasionally.

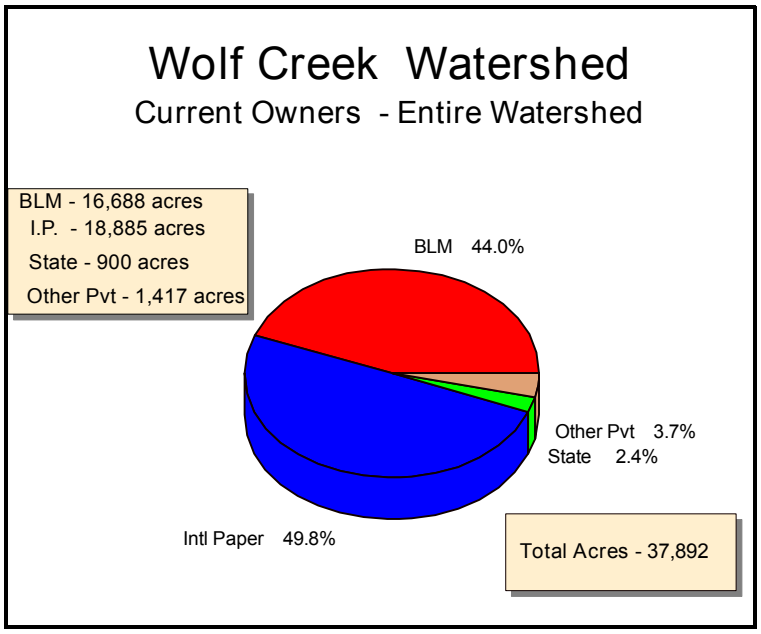

Figure 2: Ownership Summary - Wolf Creek Watershed

The precipitation generally results from low pressure weather systems that approach from the Pacific Ocean on the dominant westerlies. The cold weather patterns that produce snow and/or freezing rain events originate out of the Gulf of Alaska. The summers are characterized by fair, dry weather for extended periods of time produced by high pressure systems that result from the shifting of the storm tracks to the north. A precipitation gradient exists across the watershed from west to east. The western portion of Wolf Creek receives approximately 80 inches of rain while the eastern part receives about half that amount.

Geology

Regional Geology - The Coast Range Physiographic Province includes coastal mountains of western Oregon from the Columbia River to the Middle Fork of the Coquille River, and from the continental shelf to the western edge of the Willamette Valley. An important feature in the province is the subduction zone beneath the base of the continental slope where the Farallon plate is sliding under North America. At the end of the Cretaceous period (66 million years ago), the ocean shoreline extended across eastern Washington to Idaho. During this time, the Klamath Mountains projected into Idaho. A chain of volcanic seamounts formed in the ocean and around each volcanic center, and pillow lavas accumulated to form low islands. This volcanic chain collided with the west-bound North American plate and, consequently, the island chain began to subside. A volcanic arc formed east of the block, and thick layers of sediment accumulated in the subsiding basin during the Eocene-Miocene epochs. Due to the large amounts of sand and silt covering the marine faunas, the fossil record of this environment is sparse. Eocene sediments were derived from the Klamath Mountains but the primary source was the Idaho batholith, as new watersheds developed in that area. Finally, large volumes of pyroclastic deposits were also deposited by the ancestral Cascade volcanoes. In the Coos Bay area, sands accumulated in a large delta spreading to the north. Subtropical plants were preserved in the Coaledo Formation swamps, and this formation is now a source of coal.

The northern Coast Range block was submerged during the Oligocene epoch and, as a result of uplift of the block during the Miocene, the ocean retreated to the west. The western North American plate was wrinkled by the subduction occurring with the Juan de Fuca plate. Lava flows from fissures in eastern Oregon reached the coastal area and invaded layers of soft sediments. Once the ocean withdrew to the western edge of the coastal block, the Cenozoic formations were shaped by erosion. Rivers cut through the younger formations exposing the more resistant Oligocene sills and dikes that now comprise nearly all the prominent Coast Range peaks.

During the Pliocene epoch, the Coast Range province was above sea level, representing a time of erosion. The coastline was approximately in the present location.

During the Pleistocene epoch, the Coast Range was uplifted and tilted and, combined with the fluctuation of sea level, terraces were created near Cape Blanco and Cape Arago. Instead of a step-like uplift of the coastline, development of the terraces reflects the eastward tilting of the Coast Range block combined with fluctuating sea levels. More than half the Oregon Coast is bordered by sand. The source of the beach sands is the erosion of sea cliffs, supplemented by material transported by rivers to the coastal estuaries. Winter beaches are stripped of sand during the storms and the sand is redeposited to off-shore submerged bars. During the summer months, the sand is returned to the beaches by a change in the currents.

Structurally, the Coast Range is "a large crustal wrinkle" (Orr 1992). The Northern Coast Range (west of Salem, north into Washington) is an anticlinorium, which is a general arch or anticline. South of this feature to the Klamath Mountains, the Coast Range inverts to a broad basin or syncline including what is called the Tyee Basin. The area has been altered by faulting and the predominant faults follow 3 patterns of alignment: east-west, northeast-southwest, and northwest-southeast. Steeply angled thrust faults are found on the continental slope. Normal faults, nearly vertical or steeply dipping to the east or west, are found in the Coast Range and strike-slip faults such as the Fulmar fault also occur in this province.

Evidence of catastrophic seismic activity during the Holocene epoch was discovered in 1987 and studied since then in buried lowland swamps and bogs along the Oregon Coast. According to Orr et al.,[1] (1992) there are 15 sites between the Coquille River and Seaside where geologic exposures suggest a distinctive pattern of subsidence, buried forests, and bogs with a mud covering. Evidence of large scale earthquakes in the area is further noted in turbidites found off the Oregon coastline. Orr et al. suggests that over 14 of these deposits correlate with subsided coastal swamps.

Local Geology - The Wolf Creek watershed is situated in the northern portion of the Tyee Basin, which is an area in the southern Coast Range underlain by Tertiary-aged rock formations. The Tyee Basin has been, and is being, studied for its potential for producing oil, gas, and coal resources. The description of the local geology of the Wolf Creek

watershed and a map included with this narrative are derived primarily from a report written in 1990 by Alan R. Niem and Wendy A. Niem for the Oregon Department of Geology and Mineral Resources.[2]

Stratigraphy - Three geologic units are exposed in outcrops, roadside excavations, and stream deposits in the Wolf Creek watershed. Alluvium of Holocene and Pleistocene age is deposited along Wolf Creek and Panther Creek, as shown on Map 1.[3] The alluvium consists of flood plain and stream channel sediments of clay, silt, sand, and gravel. The predominate rock formation of the watershed is the Siuslaw member of the Flournoy Formation, which was deposited during the early to middle Eocene epoch. This rock unit consists of 4,000 to 5,000 feet of very thick bedded sandstone with minor sequences of thinly-bedded siltstone and fine grained graded sandstone beds. Some sandstone beds contain numerous groove, flute, and load casts, and the siltstone contains bathyal (deep sea environment) microfossils. The Siuslaw member of the Flournoy Formation is thought to be a lateral turbidite facies of the formation. The sediments were deposited by a highly turbid and relatively dense current, which moved along the bottom slope of the basin. The third geologic unit exposed in the Wolf Creek watershed consists of intrusive rocks, predominately basaltic in composition. These rocks are believed to be younger in age than the Flournoy Formation and are probably related to western Cascade volcanism, which occurred during the late Eocene and Oligocene epochs. As shown on Map 1, a large area adjacent to Wolf Creek in T. 19 S., R. 6 W., W.M., Sections 7, 8, 9, 16, 17, 18, is underlain by this formation. Within in this area, basaltic rock has been quarried from at least 4 locations. Elsewhere in the watershed, small feeder dikes and sills of basaltic rock have been identified, but are not as large in size as this intrusive body. Those smaller deposits are located on several of the ridgetops, as can be seen on Map 1.

Structure - The sandstones and siltstones of the Flournoy Formation within the watershed are gently dipping in various directions. Aerial photo interpretation, and the measured attitudes (strike and dip) from field work by Niem and Niem (1990), inferred that there are four faults in the Wolf Creek drainage (see Map 1). Three of the faults, trending generally northeast, correspond to Grenshaw Creek, Eames Creek, and Swamp Creek. To the west, another fault trends generally to the northwest, and its location is placed based on geologic interpretation of the nearby attitudes measured from rock exposures. This pattern of northeast and northwest trending faults is typical of the region.

A cross section (in the Niem and Niem report) near the western edge of the watershed illustrates the near horizontal bedding of the Flournoy Formation and a fault along Fawn Creek, just south of the watershed boundary. The Flournoy Formation in this area is presumed to be approximately 2,000 feet thick. The Flournoy Formation is underlain by a thick deposit of basinal mudstones and pillow basalts of the Roseburg Formation, presumed to be nearly horizontal in this part of the Coast Range.

Geomorphology

Aerial photo interpretation and subsequent field investigation revealed six general geomorphic surfaces in the Wolf Creek watershed (see Figure 3). Table 2-2 gives the acreages and percentages for these surfaces. Each surface will be discussed below.

Table 2-2 - Summary of Geomorphic Units Within Wolf Creek

Geomorphic Unit	Acres	Percent of Watershed
Unit 1	7,877	21
Unit 2	15,500	41
Unit 3	9,996	26
Unit 4	102	<1
Unit 5	2,887	8
Unit 6	1,530	4

Geomorphic Unit #1 is the eastern-most surface of the watershed and consists of gentle to moderate topography with relatively low drainage densities and deep soils. This surface occupies 7,877 acres (21%) of the watershed and is underlain by the Flournoy Formation. It seems to be dominated by the more easily weatherable siltstone and fine sandstone sequence of that formation. The more massive and competent, coarser grained sandstone sequence was infrequently detected in road cuts in this area. Landslide evidence is very infrequent in this eastern-most surface; it appears that landslide contribution to the stream system is minimal to nonexistent. Most of the erosion and subsequent sediment to the stream system is composed of fine (sand, silt, clay) sized material. In general, the soils in this area are older, better developed, and more stable than soils in the remainder of Wolf Creek watershed.

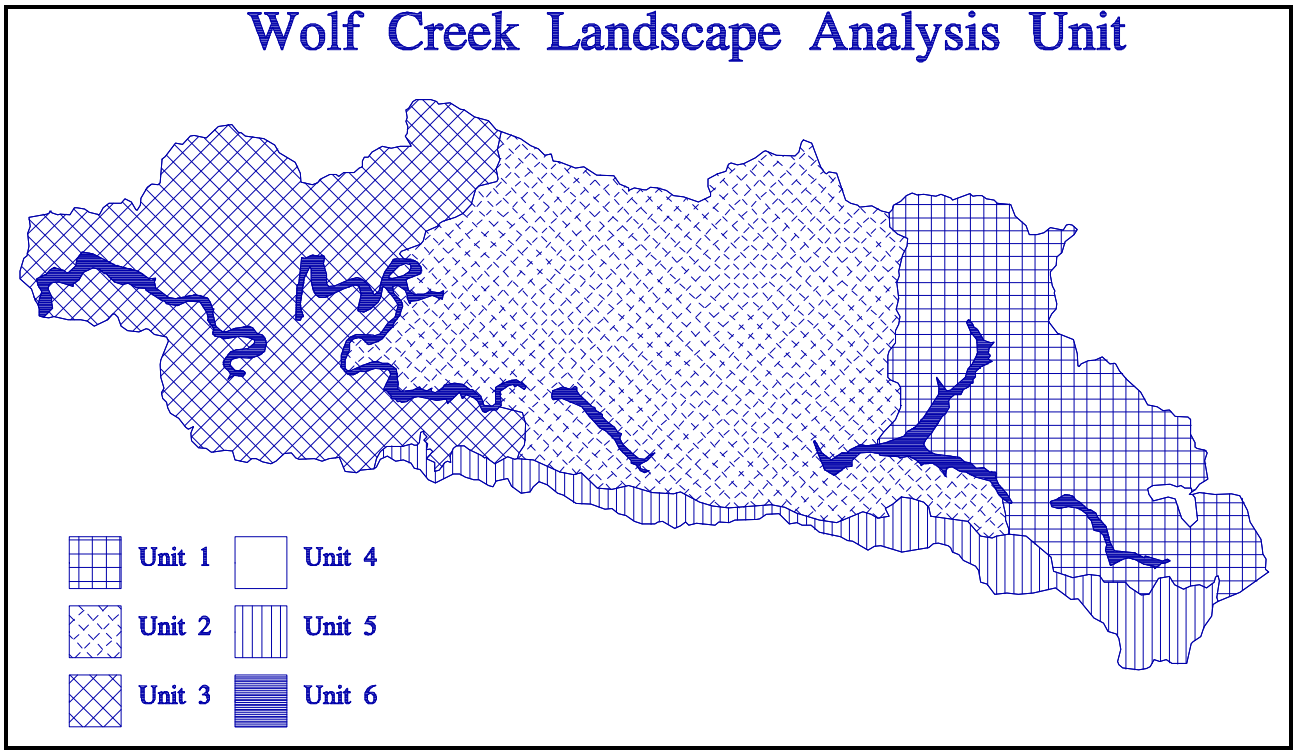

Figure 3: Map of the Geomorphic Units - Wolf Creek Watershed

Geomorphic Unit #2 occupies 15,500 acres (41%) of watershed in the central part of Wolf Creek watershed and is a transition area from the relative stable eastern third (Geomorphic Unit #1) of the watershed to the landslide dominated topography of the western third (Geomorphic Unit #3). This unit is characterized by moderate slope gradients (steeper than those in Unit #1 but gentler than those in Unit #3), and the bedrock is fractured and weathered such that there is a gradual transition from the soil into the bedrock. The more massive, coarser grained sandstone sequence of the Flournoy Formation is characteristic of the bedrock found in this unit. Based on aerial photo interpretation, landslide occurrence is infrequent in this unit, and contribution of landslide material to the stream system is minimal. The most unstable parts are the steep, concave slopes at the heads of drainages.

Geomorphic Unit #3 is in the western third of the watershed and covers 9,996 acres (26%) of watershed. This area is underlain by competent, massive sandstone with an abrupt transition to the overlying shallow to moderately deep soils. Sharp ridges with steep, uniform sideslopes from the ridgetop to the valley bottom characterize this area. The landscape is sharply dissected by numerous stream channels that may become extremely steep in the upper reaches. Translation landslides (debris torrents) appear to be a dominant factor in shaping the landscape and contributing sediment (both coarse and fine) to the stream system.

Geomorphic Unit #4 is located in T. 19 S., R. 5 W., Sections 17 and 18 and covers 102 acres (<1%) of watershed. This area has a higher elevation (300-400 feet) than the surrounding topography of Geomorphic Unit #1. This unit appears as an elevated "island" surrounded by lower elevation ridges. A basaltic intrusion was found in the southeast and the central (ridgetop) portions of this unit. This intrusion is more resistant to weathering, and probably is the reason this area has higher elevations than its surroundings.

Geomorphic Unit #5 is the higher elevation ridge to the south of Wolf Creek which forms the southern boundary of the watershed. This ridge system is about 400 feet higher elevation than the surrounding ridges. Occasional igneous intrusions were observed in road cuts along central and eastern portions of this ridge; therefore, it is assumed that this unit is underlain by igneous material. The Flournoy sandstone bedrock overlies these intrusions in most locations. These intrusions are more resistant to weathering and, therefore, probably are the reason this ridge has higher elevations and somewhat steeper slope gradients. It is possible for this geomorphic unit to contribute minimal amounts of larger material (stones, cobbles, boulders) to the stream system but, since the igneous material is exposed seldomly, this amount is minimal. This geomorphic unit, which covers 2,887 acres (8%) of the watershed, is similar in elevation and geology to Geomorphic Unit #4.

Geomorphic Unit #6 consists of terraces and flood plains along Wolf Creek and the larger tributaries. This unit is composed of geologically recent alluvial deposits of unconsolidated sand, silt, and gravel. It occurs on 1,530 acres (4%) of the watershed.

Soils

Relatively high productive soils occur on about 66 percent of the watershed, while relatively low productive soils occupy approximately 6 percent. The high productive soils are typically deep, reddish clay loams/clays with less than 15 percent coarse fragments. The low productive soils are usually shallow to moderately deep, brown loams with greater than 35 percent coarse fragments. The eastern fourth of the Wolf Creek watershed contains soils, predominantly Willakenzie and Bellpine series, with a xeric moisture regime. The western three-fourths of the watershed has soils with an udic moisture regime, with the primary series being Bohannon and Peavine.

The Wolf Creek watershed is located on the eastern edge of the Siuslaw River Basin and, therefore, contains some soils with a xeric moisture regime. This is typical for the watersheds on the eastern edge of the Siuslaw Basin. But as with the Wolf Creek watershed, the larger portion of the Siuslaw River Basin contains soils with an udic moisture regime. When compared to the Siuslaw River Basin, the Wolf Creek watershed has a larger proportion of relatively high productive soils.

Vegetation

The forested plant communities within the watershed are within the Tsuga heterophylla zone as described by Franklin and Dyrness.[4] The major coniferous tree species are Douglas-fir (Pseudotsuga menziesii), western hemlock (Tsuga heterophylla), and western red cedar (Thuja plicata). Hardwood species present include red alder (Alnus rubra), bigleaf maple (Acer macrophyllum), golden Chinkapin (Castanopsis chrysophylla), Pacific madrone (Arbutus menziesii), and dogwood (Cornus nutallii).

The shrub and ground cover species associated with these forested plant communities are varied and plant associations have not yet been developed for the watershed. Common shrub species include vine maple (Acer circinatum), hazel (Corylus cornutta), oceanspray (Holodiscus discolor), salal (Gaultheria shallon), Oregon grape (Berberis nervosa), elderberry (Sambucus spp), willow (Salix spp), and rhododendron (Rhododendron macrophyllum). A variety of ferns, forbs, and other ground cover species are also present within the area. The more common species include sword fern (Polystichum munitum), Senecio (Senecio sylvaticus), etc. Invasive plant species including Scotch broom (Cytisus scoparius), tansy ragwort (Senecio jacobea), and others are spreading throughout the watershed.

Unique vegetation communities or special habitats occur in Wolf Creek. These are generally associated with wetlands; riparian areas; dry, rocky meadows; and rock cliffs. Meadow areas or habitats are reduced because of regrowth following clearing for homesteads and the aggressive reforestation efforts of other landowners within the watershed.

Very little of the area has been surveyed for vascular plants. The acres surveyed have been associated with various management activities (timber sales, silvicultural projects, etc.). These limited surveys have found no threatened, endangered, or special status plant species within the watershed. There is potential habitat for several species within the watershed. No surveys have been completed for lichens, fungi, or bryophytes.

Wildlife

A wide variety of wildlife species live in the watershed. These range from the smallest microscopic species to the largest, Roosevelt elk. Each species has an equally important role in the overall function of the ecosystem.

Approximately 280 species of vertebrates (not including fish) can be found within the watershed throughout the year or during their seasonal migration. This approximation includes: 71 species of mammals, 174 species of birds, 14 species of amphibians, and 14 species of reptiles (see Appendix 5). Additionally, many species of invertebrates may occur within the watershed, but no surveys have been conducted to locate and identify these species.

Species of wildlife not included within Appendix 5 are those species that have been extirpated or become extinct from the region including the gray wolf and the Columbia white-tailed deer. Today 27 species of vertebrate wildlife are considered Special Status Species, and have been listed by federal or state agencies as threatened or endangered, or are species of other special concerns (recognized as being rare or vulnerable) (see Table 5-30). Additionally, there are 22 species of invertebrates that potentially occur within the watershed that have been designated as Special Status Species or are species of special concerns.

Hydrology and Streams

Beneficial uses for Wolf Creek are primarily fishing, salmonid fish rearing, and recreation. There are 17 water rights, 7 for domestic use only, (see appendix 7, table 1) at the upper end of the Wolf Creek watershed, primarily on Wolf, Panther, and Swamp creeks. Unlike many other watersheds in the Siuslaw Basin, the upper (eastern) portion of the Wolf Creek watershed has gentler slopes than the lower (western) portion.

Most of the smaller stream channels (see Figure 5) have hydrologic processes that appear to be functioning well. Although segments of these streams exhibit evidence of downcutting, they are still able to reach their flood plains, but less frequently than in the historical past. Few of the larger streams have adequate hydrologic functioning channels or riparian areas. Many segments of these larger streams have been downcut to bedrock.

The lower (western) half of the watershed has more accumulations of cobbles on the stream bottoms when compared to the upper (eastern) half. This is because the soils in the western half are not as deep and contain more gravel/cobbles. Also landslide frequency, which moves the coarser materials into the streams, is greater in the western half.

The average flow per square mile of Wolf Creek is significantly less than for the Siuslaw River due in part to less annual precipitation in the Wolf Creek watershed. Wolf Creek contributes 8 percent of the flow of the Siuslaw Basin at Mapleton. Most sediment is flushed out of Wolf Creek and into the Siuslaw River.

Fisheries

The Wolf Creek watershed has over 60 miles of anadromous fish habitat. It contributes to the fisheries that occur through the Siuslaw Basin. The Siuslaw River historically produced large numbers of chinook and coho salmon; however, these numbers have been drastically reduced as a result of past management practices. As of 1990 numbers

of fish within the Wolf Creek watershed have been estimated at approximately 220 fall chinook, 270 coho, and 120 winter steelhead. The current listing of the native mid-Oregon Coast coho salmon as a threatened species under the Endangered Species Act further indicates the importance of the Wolf Creek watershed for anadromous fish species.

Because of the importance of the watershed to the anadromous fish species and the need for improved habitat conditions, there have been several habitat enhancement projects planned and implemented within the watershed in the last few years.

People

Little evidence of pre-European human use or occupation has been found in the Wolf Creek watershed. Beginning about 1866 and continuing until World War II subsistence farming of varying duration occurred on homesteads established along Wolf Creek and Wolf Creek road. With the economic prosperity generated by the war, many of the watershed's inhabitants moved away to follow employment opportunities in the cities. Following the war, timber harvesting became the primary use of the majority of the watershed while residential use continued along Wolf Creek and Panther Creek roads. These uses have continued to the present, with timber harvesting, residences, and seasonal big game hunting being the major human activities. The watershed is one of the less developed subwatersheds within the Siuslaw Basin and Coast Range Province.

CITATIONS and REFERENCES

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2. Niem, Alan R., and Wendy A. Niem. 1990. "Geology and Oil, Gas, and Coal Resources, Southern Tyee Basin, Southern Coast Range, Oregon." Oregon Department of Geology and Mineral Industries, Open File Report 0-89-3, 19 pages.

3. Baldwin, E.M. 1956. "Geologic Map of the Lower Siuslaw River Area, Oregon". U.S. Geological Survey, Oil and Gas Investigations Map OM 186.

4. Franklin, Jerry F. and C.T. Dyrness. 1973. Natural Vegetation of Oregon and Washington, USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, General Technical Report PNW-8.