Chapter 1: Characterization

1.1 Physical

1.1.1 Size and setting

The Middle Tualatin-Rock Creek watershed[1] drains 169 square miles (107,900 acres) in the northern part of the Tualatin River basin (Map 1-1). It includes the Tualatin River and its tributaries between Gales Creek (RM 56.8) and McFee Creek (RM 28.2). Between these two creeks, the Tualatin River meanders for 29 miles through flat to rolling terrain.

The watershed is drained by the mainstem Tualatin River, one fifth-order tributary, Rock Creek, and two fourth-order tributaries; McFee and Beaverton creeks. Rock Creek drains the Tualatin Mountains and the urbanized northern portion of the watershed, while McFee Creek drains the Chehalem Mountains in the southwestern portion of the watershed. Dairy Creek, which joins the Tualatin River at RM 44.73, is considered a separate watershed. Mainstem lengths and their drainage areas are given in Table 1-1. The Tualatin River Watershed Information System (Ecotrust 1998) divides the watershed into 33 subwatersheds (6th field watersheds). These subwatersheds are displayed in Map 1-2.

Table 1-1. Major drainages of the Middle Tualatin-Rock Creek watershed

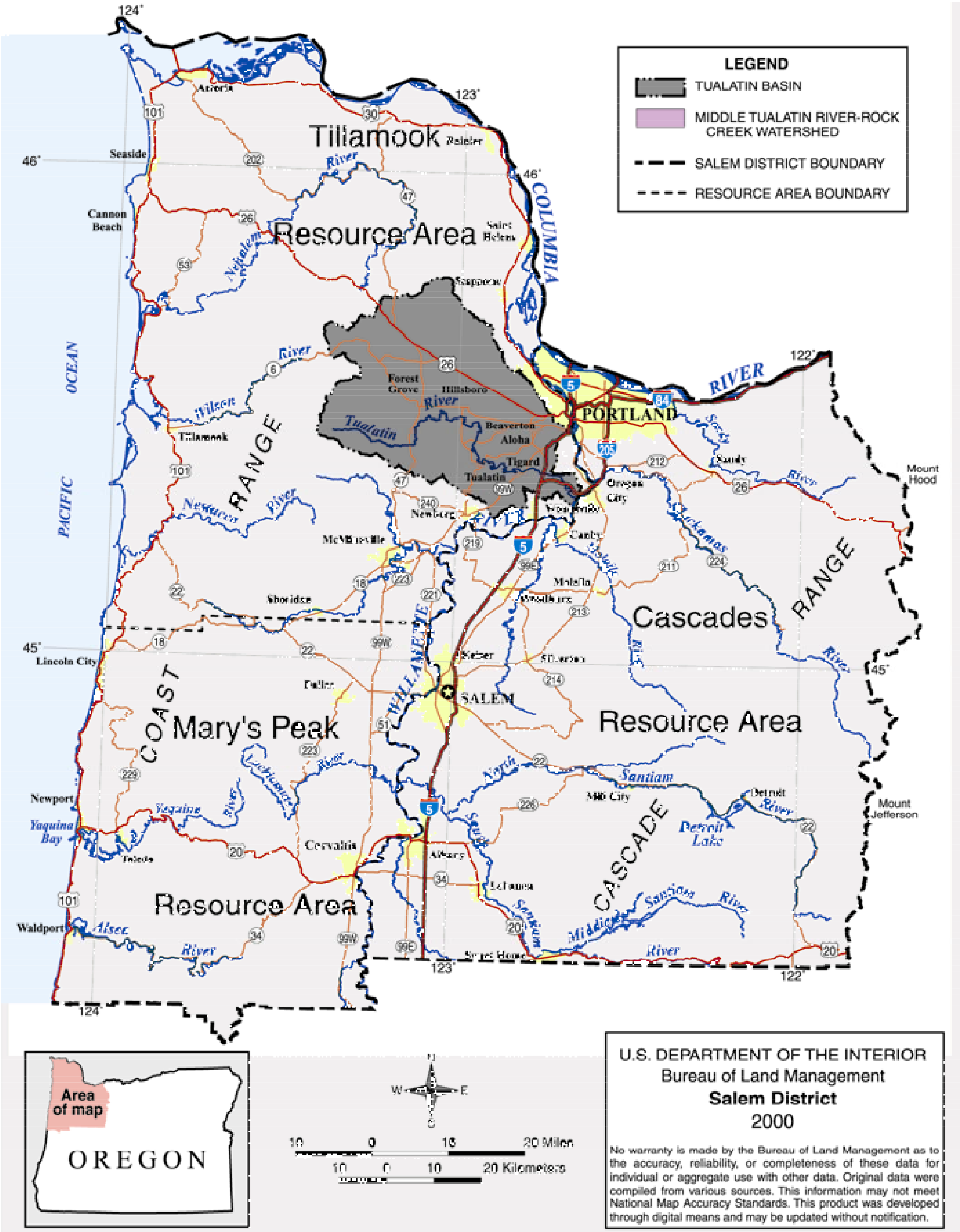
Major stream (RM)	Area (mi^2)[2]	Mainstem length (mi)[3]	Confluence with Tualatin
Tualatin River (total at McFee Creek)	614	53	————
Tualatin River (Rock-Middle Tualatin watershed)	169	29	————
Rock Creek	75.6	19.3	38.1
McFee Creek	24.6	8.9	28.2

1.1.1.1 Topography

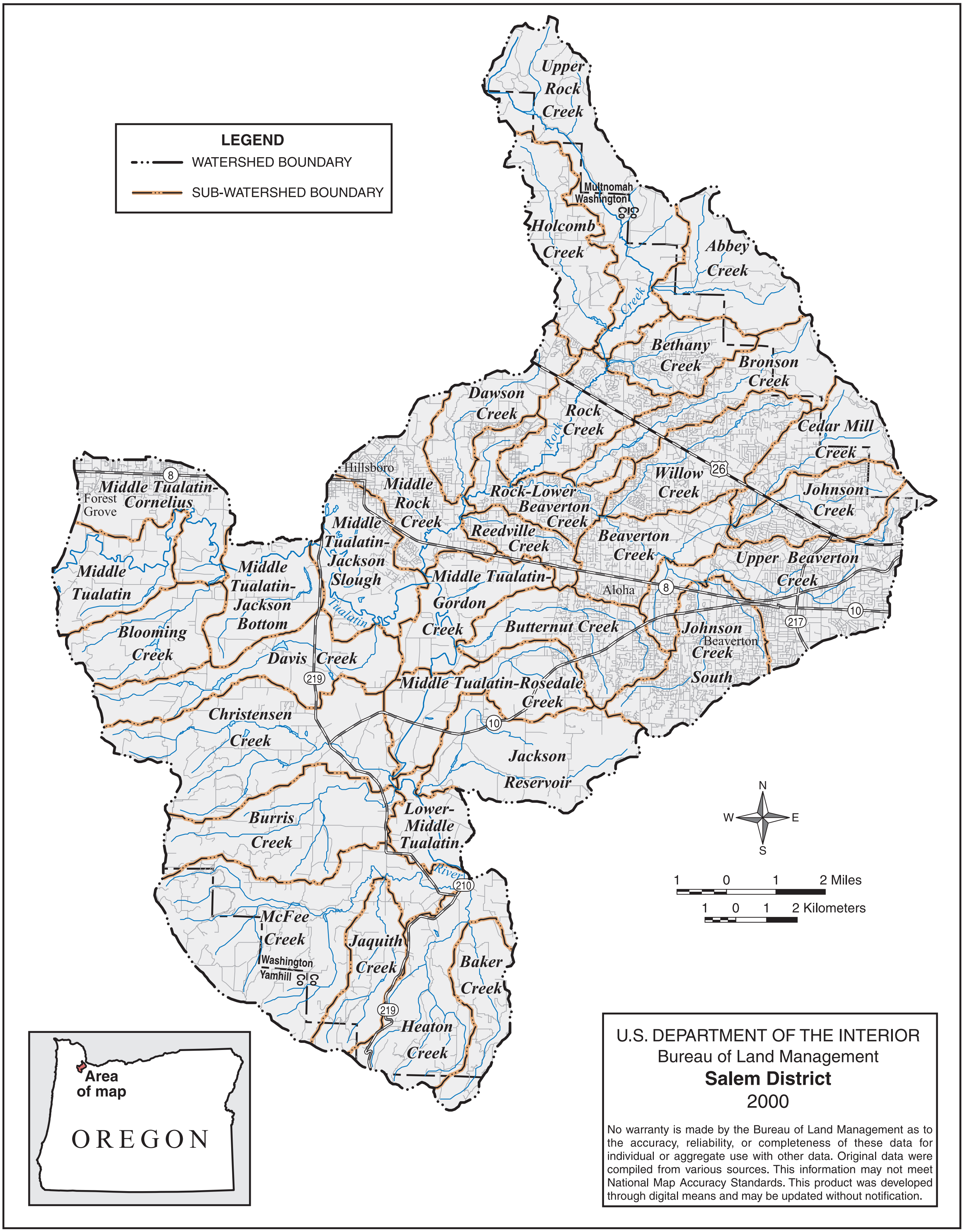
The watershed consists of two ranges of hills separated by the Tualatin Plain (Map 1-3). The Tualatin Mountains are located in the northern portion of the watershed and are drained by Rock Creek. Within the watershed, the Tualatin Mountains rarely exceed 1,000 feet in elevation. The Chehalem Mountains, to the southwest, are drained by McFee, Christensen, and Burris Creeks. This southwestern divide generally exceeds 1,000 feet elevation, and the maximum watershed elevation of 1,633 feet is located at Bald Peak. Both the Tualatin and Chehalem mountain ranges are characterized by extensively dissected terrain. Although stream gradients are locally steep, they seldom exceed 16% for any extended length.

Cooper Mountain, at 721 feet elevation, is the other prominent ridge within the watershed. Although this ridge covers a relatively small area, it gives rise to several streams, including Johnson (South) and Butternut creeks.

Between the Chehalem and Tualatin Mountains, the Tualatin Plain provides an extensive area of flat to rolling terrain. About 60% of watershed area is included in this alluvial plain, where elevation is generally less than 250 feet. Streams within the plain experience little change in elevation, as expressed by stream gradients that are generally much less than 1%. For example, the mean gradient of the Tualatin River in the watershed is 0.024%. Near its confluence with McFee Creek, the Tualatin River has a gradient of 0.009%. Ultimately, the Tualatin River leaves the watershed at the confluence with McFee Creek, at an approximate elevation of 111 feet.



Map 1-1 -- Location of the Middle Tualatin-Rock Creek Watershed.



Map 1-2 -- Middle Tualatin-Rock Creek Watershed and Sub-Watersheds.

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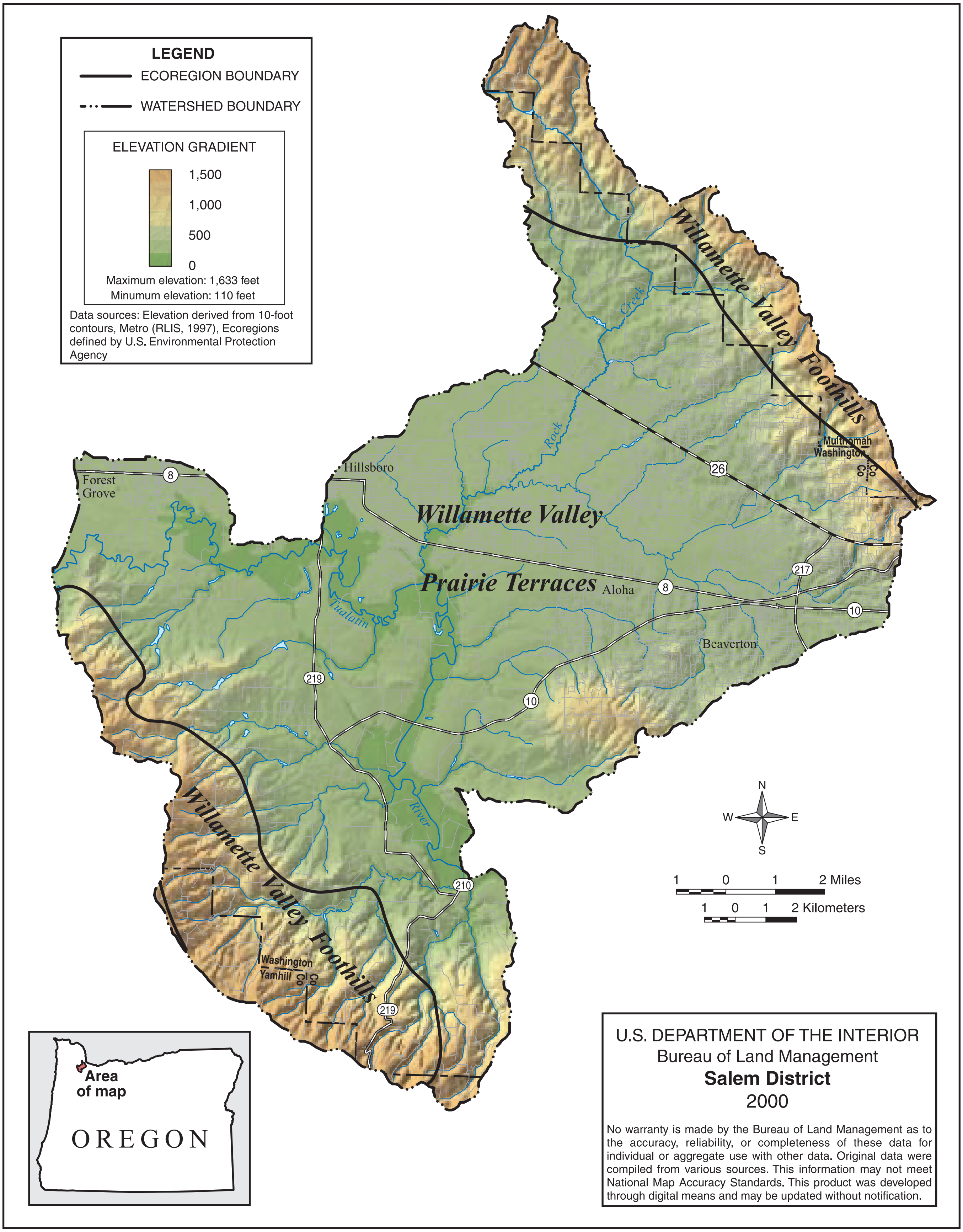

Map 1-3 -- Ecoregions and Terrain Elevation of the Middle Tualatin-Rock Creek Watershed.

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1.1.1.2 Ecoregions

In order to facilitate management, the federal Environmental Protection Agency (EPA) has subdivided the landscape into units based on physical and biotic characteristics. These units, called ecoregions, are designated on a hierarchical scale, with higher level classifications denoting finer divisions of the landscape. At level IV of the EPA classification system, the Middle Tualatin-Rock Creek watershed falls within two ecoregions (Map 1-3). The Tualatin Mountains and the Chehalem Mountains are included in the Valley Foothills ecoregion, while the Tualatin Plain is part of the Prairie Terraces ecoregion. Characteristics of these ecoregions are given in Table 1-2.

1.1.1.3 Geomorphology

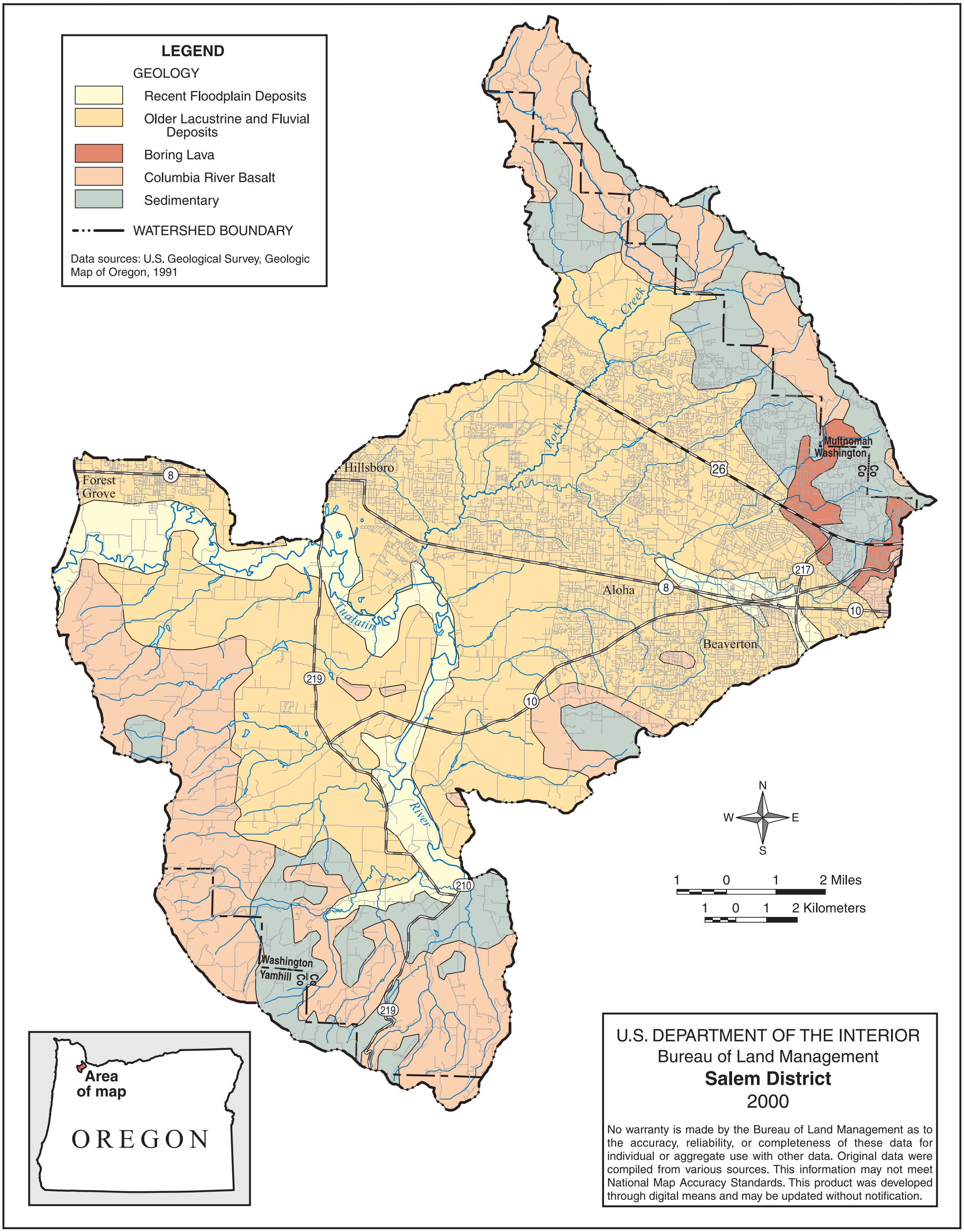
Tectonic folding and subsequent alluvial deposition characterize the geological structure of the watershed. Terrestrial lava flows overlaid sedimentary formations east of the Coast Range. Subsequent folding of this area resulted in formation of anticlinal ridges such as the Tualatin Mountains, Chehalem Mountains, and Cooper Mountain, as well as a synclinal trough, which became the Tualatin Plain. Subsequently, alluvial silts and clays settled in the plain. Additionally, sites of impeded drainage accumulated organic matter (Orr et al. 1992, Wilson 1997, Schlicker 1967).

Lithology varies within the watershed (Map 1-4). In the mountains, Columbia River basalt is interspersed with sedimentary formations. Aeolian silts often overlie the ridgetops. In the foothills, streams begin to develop alluvial floodplains. Generally, these floodplains are not of substantial width, although a portion of Beaverton Creek upstream of Cedar Mill Creek has a floodplain averaging 2,500 feet in width. The lower portion of McFee Creek has a floodplain averaging about 1,500 feet in width. Floodplains are somewhat wider in the Tualatin Plain, where width along the Tualatin River averages about 3,400 feet[4].

In the Tualatin Plain, these recent alluvial floodplains are surrounded by thick beds of older alluvium, which are largely the result of Pleistocene flooding. The Missoula floods resulted as massive lakes in the Rocky Mountain province burst through their glacial dams. Release of impounded lake waters resulted in a flood wave that immersed the Tualatin Valley to an elevation of roughly 250 feet. The initial flood waves carried gravel, sand, silt and clay, much of which was deposited in the Tualatin Valley. Much of this water remained in the valley for a substantial period of time, forming Lake Allison. Subsequently, this lake deposited lacustrine silt/clay throughout the Tualatin Valley. Many of these deposits have low permeability, resulting in poorly drained conditions in many parts of the basin (Orr et al. 1992, Hart and Newcomb 1965).

Table 1-2. Characteristics of EPA Level IV ecoregions in the Middle Tualatin-Rock Creek watershed. (Adapted from Pater et al. 1998, SCS 1982.)

Level IV ecoregion	Elevation	Physiography	Lithology	Soil Orders	Common soil series	Potential natural vegetation	Land use	Climate
3c. Prairie Terraces	110-260 feet	Nearly level to undulating fluvial terraces with sluggish, sinuous streams and rivers. Historically, seasonal wetlands and ponds were common. Many streams now channelized.	Pleistocene lacustrine and fluvial sedimentary deposits.	Alfisols, Mollisols, Inceptisols	Aloha, Woodburn, Cornelius, Kinton, Chehalis	Prairies interspersed with oak and conifer forest. In riparian locations, Oregon ash, black poplar.	Agriculture and urban. Also rural residential development and some forested riparian zones.	Mesic/Xeric
3d. Valley Foothills	260-1630 feet	Rolling to steep foothills with medium gradient, straight to sinuous streams.	Miocene andesitic basalt and marine sandstone.	Alfisols, Inceptisols	Laurelwood, Cascade	On drier sites: Oregon white oak. On moist sites, western redcedar and Douglas-fir.	Rural residential development, pastureland, coniferous and deciduous forests, forestry, vineyards, Christmas tree farms, orchards.	Mesic/Xeric



Map 1-4 -- Geology of the Middle Tualatin-Rock Creek Watershed.

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1.1.1.4 Erosion

Erosional processes vary with topographic position and ecoregion. Due to the moist climate, most upland areas within the watershed are highly weathered and covered with a deep, fine-grained, highly erodible soil mantle (USACE 1953). Under natural conditions, a heavy forest cover moderates erosion in these areas. Where human activities lead to clearing and soil disturbance, erosion rates can be quite high.

In the foothill ecoregion, several geologic factors contribute to slope instability. The sedimentary formations are naturally unstable, while the Wanapum/Columbia River basalt readily degrades into highly weathered soils. Additionally, the ridges are typically capped with a heavy, unstable overburden of silt-clay textured soils. These conditions make the mountains susceptible to slumping and sliding, particularly if slopes are oversteepened (Schlicker 1967).

In lower portions of the foothill ecoregion, and in the prairie terrace ecoregion, streambank erosion becomes an important process, as fluvial action erodes the soft alluvium of the banks. In these areas, sheet, rill, and gully erosion are also important, particularly where agricultural activities take place on steep slopes.

1.1.1.5 Climate and Precipitation

The Tualatin subbasin lies in a region of moderate climate. Summers are warm and generally dry, while winters are cool and wet. Temperatures are moderated by the moist climate. In the Tualatin Valley, the freeze-free growing season averages 180 days, and the temperature falls below freezing 65 days out of the year (NRCS 1982). Mountainous regions have shorter growing seasons and greater incidence of freezing temperatures than those experienced in the valley. Weather is often cloudy, but precipitation is generally concentrated in the winter months. This precipitation comes mainly in the form of rain, although minor amounts of snow fall during the winter. Roughly 72% of precipitation occurs between November and March (Figure 1-1)[5]. The highest amounts of precipitation occur in the mountains and decrease with decreasing elevation. Annual precipitation ranges from 55 inches at the headwaters of Rock Creek (T2N, R2W, S22) to 38 inches at Hillsboro (OCS 1998). Precipitation in the Coast Range is generally light with little intensity (OCS 1997). Although the mountain regions experience higher precipitation than the valleys, total amounts and intensity of precipitation are low relative to western portions of the Tualatin subbasin.

1.1.1.6 Hydrology

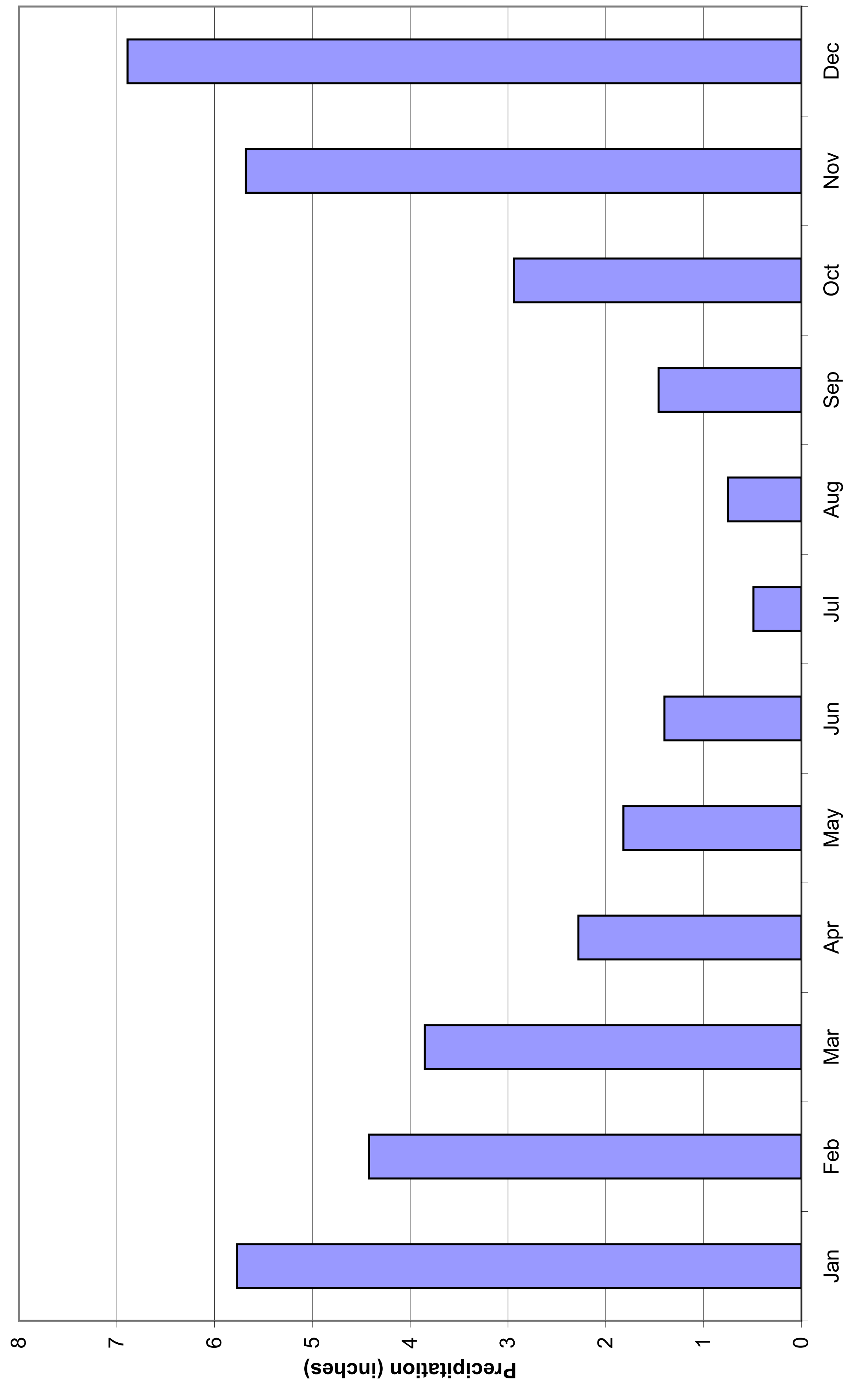
Streams within the Rock Creek-Middle Tualatin watershed are subject to seasonal variations in discharge, with high peaks in winter and very low flows in summer. Rain on Snow (ROS) events are not a major part of the hydrologic regime in the watershed. Prior to flow regulation, the period from November to March accounted for 84% of discharge in the Tualatin River at Farmington[6]. Since construction of Scoggins Dam in 1975, flood retention capability has been enhanced. This has resulted in a reduction of winter peak flows on the Tualatin River. Additionally, the seasonal variability in flows has been reduced, and currently only 76% of flow at Farmington occurs in the November to March period. Notwithstanding the flood control provided by Scoggins Dam and numerous small flood control basins on tributary streams, adjacent floodplains and wetlands continue to be important for attenuation of flood peaks. Additionally, ponding in the lowlands continues to be an important part of the watershed’s hydrology. During wet years, standing water still occupies the Tualatin Plain for substantial parts of the winter.

Long-term hydrologic data for the watershed is limited. The gage on the Tualatin River at Farmington (RM 33.3) provided 18 years of pre-regulation data between the 1941 and 1958 water years, and again was operated by the United States Geologic Survey (USGS) discontinuously between 1973 and 1984. Subsequently, the Oregon Water Resources Department (OWRD) assumed operation of the gage. Currently, OWRD maintains several stream gages in the watershed.

The natural flow characteristics of the Tualatin River have been extensively modified by the Trask River and Tualatin River projects. In summer, water is diverted from the Trask River system at Barney Reservoir. The diverted water augments summer flow in the Tualatin River downstream of RM 78. Henry Hagg Lake has extensively modified the hydrologic regime on the Tualatin River downstream of Dilley (RM 60) by storing water in winter and releasing water in the summer low flow season.

Both unconfined and confined aquifers provide groundwater to the Middle Tualatin-Rock Creek watershed. For the most part, the area lacks large aquifers, although some groundwater units are locally important for municipal and irrigation purposes. The most significant aquifers occur in the Columbia River Basalt. Interspersed sand layers in the Hillsboro area provide important unconfined aquifers (Orr et al. 1992, Hart and Newcomb 1965). Additionally, locally perched water tables occur on clay lenses in the watershed.

Figure 1-1. Hillsboro: Rainfall distribution by month



1.1.1.7 Stream Channel

Stream channels vary with topography within the watershed. Reaches in the foothills are moderately steep. Typical gradients within these reaches range from 3-15%. Gradients exceeding 16% occur over short reaches of headwater streams. These high gradient streams have a substantial capacity to carry sediments, with erosion and sediment transport being dominant fluvial processes. Under high flow conditions, only the larger sediment fractions are deposited. These reaches tend to have a rocky substrate, ranging from gravel to bedrock. However, the characteristics of these streams change when they reach the Tualatin Plain. As gradient decreases, the streams are less able to carry sediments, and finer sediments are deposited on the alluvial plain. Thus, most streams in the Tualatin Plain have substrates dominated by fine sand, silt, and clay.

1.1.1.8 Water Quality

Recently, increased attention has been focused on water quality in the Tualatin River watershed. Legislation, both on the state and federal level has mandated improvements in water quality. For example, the Federal Clean Water Act requires implementation of Total Maximum Daily Load (TMDL) standards for parameters limiting water quality. In 1987, TMDL standards were implemented in the Tualatin subbasin for ammonia nitrogen and phosphorus. More recently, the Tualatin River Subbasin Agricultural Water Quality Management Area Plan (Senate Bill 1010) prohibited certain conditions leading to diminished water quality (OAR 603-095). Implementation of environmental legislation has required monitoring of water quality. Monitoring by the Oregon Department of Environmental Quality (ODEQ), Unified Sewerage Agency (USA), and several other public agencies and private organizations has been conducted at many locations within the watershed.

In response to the requirements of the Federal Clean Water Act, the state of Oregon produced the 303(d) list, which identifies streams with water quality limitations potentially impacting beneficial uses[7] (ODEQ 1998). Twelve streams in the Middle Tualatin-Rock Creek watershed are on the 1998 ODEQ 303(d) list. For details on these streams, see Section 3.1.4.4.

1.1.1.9 Soils

The soils of the Middle Tualatin-Rock Creek watershed are largely influenced by their parent material. In the mountains and foothills, most soils are silty loams from aeolian silts. In the Tualatin Mountains, the dominant soils are Inceptisols of the Cascade series, which form in silty loess and mixed alluvium. Soils in the Chehalem Mountains are typically Alfisols of the Laurelwood series, which form on aeolian silts overlying the Columbia River basalt (NRCS 1982).

Soil in the Tualatin Plain typically consists of fine alluvium in the silt and clay classes. Bottomland soils along the Tualatin River are usually well drained Chehalis silt loams and McBee silty clay loams, with poorly drained Wapato and Cove silty clay loams often occupying nearby backswamps. The terraces that dominate the Tualatin Plain have a greater variety of soils, which range from the poorly drained Aloha soil to well drained Woodburn, Cornelius, Kinton and Quatama soils.

Some soils in the Tualatin Plain are rich in phosphorus. In some cases, high phosphorus levels may indicate accumulation over many years from agricultural use. However, groundwater phosphorus levels in this region are naturally quite high, thus contributing to high soil phosphorus levels (TAC 1997). Similarly, soil phosphorus levels in forested regions of nearby watersheds tend to reflect natural groundwater content (Wolf 1992). Forest soils developed on sedimentary bedrock, in particular, have naturally high phosphorus content (Miller and McMillen 1994).

1.2 Biological

1.2.1 Vegetation characteristics

The vegetation throughout the watershed is highly fragmented, resulting in a mélange of forest, meadow, agricultural, and urban landscapes. The largest contiguous tracts of forest vegetation are found in the Chehalem Mountains and at the highest elevations of the Tualatin Mountains. These stands typically consist of mixed coniferous and deciduous species. Douglas-fir (*Pseudotsuga menziesii*) is typically the dominant conifer in these forests. Associated conifers include western redcedar (*Thuja plicata*). Hardwood stands dominated by red alder (*Alnus rubra*) are common in riparian areas. Red alder is also common on disturbed sites. Bigleaf maple (*Acer macrophyllum*) is typically abundant on canyon walls, and often occurs as a stand component in upland Douglas-fir forests and drier portions of riparian forests. Similar species occur at lower foothill elevations, with Oregon white oak (*Quercus garryana*) becoming more common in drier locations. The alluvial valleys are primarily used for agriculture or are urbanized. Agricultural vegetation varies depending on drainage. Better-drained sites can sustain orchards, while the periodically inundated bottomlands are typically in row crops or pasture. Occasional patches of Douglas-fir and Oregon white oak, along with grasslands, are interspersed with the agricultural areas. A diverse mix of native and exotic species characterizes vegetation within urbanized portions of the watershed.

Riparian zones in the lower reaches of the Middle Tualatin-Rock Creek system are often dominated by Oregon ash (*Fraxinus latifolia*), black poplar (*Populus balsamifera ssp. trichocarpa*) and bigleaf maple. Where riparian tree species do not provide an overstory, the streambanks are often dominated by shrubs such as the native red-osier dogwood (*Cornus stolonifera*) and the introduced invasive Himalayan blackberry (*Rubus discolor*). Within urbanized portions of the watershed, other exotic species increasingly become part of the riparian landscape.

Weed species present problems in many parts of the watershed, particularly in disturbed areas. Prominent invasives include Himalayan blackberry, which is nearly universal along waysides and disturbed portions of streambanks. Reed canarygrass (*Phalaris arundinacea*) is also abundant in moist, disturbed areas in the watershed. Other species of concern include Scotch broom (*Cytisus scoparius*), purple loosestrife (*Lythrum salicaria*) and thistles (*Cirsium sp*).

Several plant species are of special concern under BLM guidelines. Some of these species have a limited range, while others are diminished from their original numbers. Additional discussion of sensitive species is found in sections 1.2.2.1.2 and 3.2.2.1.2.

1.2.2 Species and Habitat

1.2.2.1 Wildlife species

1.2.2.1.1 Aquatic species

Several native salmonid species inhabit the watershed, including steelhead trout (*Oncorhynchus mykiss*) and cutthroat trout (*O. clarki clarki*). Although coho salmon (*O. kisutch*) are not native, they now spawn naturally within the watershed and are considered an important species.

Salmonid habitat in the Middle Tualatin-Rock Creek watershed is more limited than is the case for upstream watersheds. Winter steelhead trout are thought to spawn and rear in Rock Creek above Beaverton Creek, and in McFee Creek downstream of Finnegan Hill Road (ODFW 1999). Additionally, these fish use the Tualatin River for migration. Resident cutthroat trout also utilize these streams, and additionally are distributed in several tributaries of Rock Creek.

Abundance of salmonid species is a matter of concern. Steelhead trout within the Upper Willamette River Evolutionarily Significant Unit (ESU), which includes the Tualatin Basin, have been listed as threatened under the federal Endangered Species Act (ESA). Accessible streams and adjacent riparian areas within the Tualatin subbasin are designated critical habitat for upper Willamette steelhead trout and Chinook salmon. In 1999, the National Marine Fisheries Service (NMFS) determined that coastal cutthroat trout within the Upper Willamette River ESU were not warranted for listing under the ESA. However, the U.S. Fish and Wildlife Service (USFWS) now has authority over cutthroat trout and is currently reviewing their status in the Upper Willamette ESU. These species are also on the ODFW sensitive species lists.

Many native non-salmonid species are present in streams within the watershed, including sculpin, lamprey, dace, coarsescale sucker, and redside shiner (SRI 1990). Additionally, the mainstem Tualatin River and several tributaries provide habitat for non-native warm water species, including smallmouth bass, largemouth bass, bluegill, and bullhead.

1.2.2.1.2 Economically important and ecologically sensitive species

The upper portions of the foothill subwatersheds, as well as isolated portions of other subwatersheds, potentially provide habitat for diverse animal species. Some of these species attract extra attention due to biological, recreational, and economic factors. These include species with limited population, habitat, or poorly understood life history, as well as game species.

The Northwest Forest Plan (NFP) directed federal agencies to devote special management attention to certain plant and animal species on federal lands[8]. These included species listed as Endangered or Threatened under the Endangered Species Act (ESA), as well as those species identified as Survey and Manage (S&M) species. Additional species are considered sensitive under state or BLM guidelines.

A large number of the Special Attention Species are on the Survey and Manage list in the NFP. Of the over 1000 species whose viability was assessed through the federal Scientific Analysis Team and Forest Ecosystem Management Assessment Team (FEMAT) efforts, it was determined that slightly more than 400 of those species would benefit from extra management provisions. Thus, the Survey and Manage standards and guidelines were developed and adopted as part of the NFP to reduce the possibility of loss of population viability of those species of concern through the implementation of federal actions.

There are four components to the Survey and Manage standards and guidelines and each species is assigned to one or more of the component categories. The component categories are:

1. *Manage known sites.*
2. *Survey prior to ground disturbing activities.*
3. *Extensive surveys.*
4. *General regional surveys.*

However, there is a new Record of Decision signed on January 12, 2001 by the Secretary of Interior and Secretary of Agriculture that supercedes the Survey and Manage guidelines from the original Northwest Forest Plan (USDA and USDI 2001).

There was also additional mitigation for species known as protection buffer. The new Record of Decision plan moves Protection Buffer Species into the Survey and Manage category.

1.2.2.1.3 Introduced species

Numerous plant and animal species have been introduced to the watershed, both intentionally and unintentionally. These species have had profound impacts upon biological diversity within the watershed. For example, growth of bullfrog (*Rana catesbiana*) populations has been accompanied by a decrease in native amphibian populations throughout the Western U.S. In urban environments, the common housecat has had a severe impact upon native songbird populations.

These species sometimes interfere with human activities, as well. Nutria, for example, are an agricultural pest because they eat crops and burrow into irrigation ditches (PSU 2000). These same characteristics complicate riparian revegetation efforts.

1.2.2.2 Habitat

1.2.2.2.1 Aquatic Habitat

The suitability of aquatic habitat for sensitive cold water species is quite limited. In summer, high temperatures limit the ability of most stream reaches to provide suitable rearing habitat for salmonids. Habitat diversity is also limited in many reaches.

Riparian degradation has contributed to a declining quality of aquatic habitats in the valleys. Loss of large trees has resulted in a reduced supply of large woody debris to streams, thus causing a loss in habitat diversity. Consequently, the stream’s ability to form pools has been diminished, resulting in a reduction of the number and size of pools. Additionally, reductions in riparian canopy have led to increased summer water temperatures. The weedy shrub species, such as Himalayan blackberry, that have replaced the native riparian forest canopy in many sites are unable to provide adequate stream shading.

In the foothills ecoregion, salmonid habitat improves. Many stream reaches have cobble-gravel substrates, thus increasing the potential for successful spawning and rearing. The riparian canopy, however, is impaired in many of these reaches, and high summer water temperatures are a major concern here, as well as in valley reaches.

1.2.2.2.2 Wildlife Habitat (terrestrial)

Wildlife habitat has changed along with changes in the vegetation of the basin. Urbanization in the northern portion of the watershed and agriculture to the south have reduced the total amount of natural vegetation. The remaining natural vegetation in the Middle Tualatin-Rock Creek watershed is predominantly in early and mid-successional seral stages, and structurally quite fragmented. The patchiness of the current landscape is favorable to production of species that prefer “edge” habitat and those that are tolerant of human activity.

The amount and quality of riparian habitat has declined in many parts of the watershed. The ability of riparian stands to provide large woody debris has been reduced, resulting in a reduction of the amount of down wood and snags within the riparian zones. Many of the large trees that formerly surrounded streams have been cleared, resulting in reduced canopy and increased summer temperatures. This has negatively altered the habitat types available to species, especially those that benefit from cool, humid sites, such as amphibians.

1.2.2.2.3 Special Habitats

Certain habitat types in the watershed have special significance through their rarity in Oregon and their importance to sensitive species. One such habitat type is forest with late-successional characteristics[9]. This habitat type is especially rare in the Middle Tualatin-Rock Creek watershed.

Wetlands are another important habitat type. In the mountains and foothills, wetlands include small ponds built by beavers or through landslide processes. Additionally, numerous impoundments exist that potentially provide wetland values. Two large wetlands, Fernhill and Jackson Bottom, are located in the Tualatin Plain. These two wetland areas are supplemented by floodplain wetlands adjacent to the Tualatin River. Although these wetland areas have been heavily used for agriculture, they have the potential to provide important habitat for a number of aquatic, amphibian, and avian species.

Certain structures provide habitat for bat roosting and hibernation. These include snags, decadent trees, and caves. Additionally bats use structures formed by humans, such as mines and abandoned bridges and buildings. The Northwest Forest Plan (NFP) provides for bat survey and protection on federal lands (NFP C-43).

1.3 Social

1.3.1 Population

Population within the Middle Tualatin-Rock Creek watershed is concentrated in the urbanized northeastern portion of the watershed (Map 1-5). Incorporated cities wholly or partially within the watershed (with estimated 1999 population) include Hillsboro (69,670), Beaverton (68,010), Forest Grove (16,275), and Cornelius (8,490) (PSU 2000 b). The growth of the Portland metropolitan area and increasing employment in high technology have contributed to rapid population growth within the watershed. To accommodate this growth in an orderly fashion, an urban growth boundary (UGB) has been designated. If the present urban growth boundary remains constant, most future development will take place as infill in currently urbanized areas.

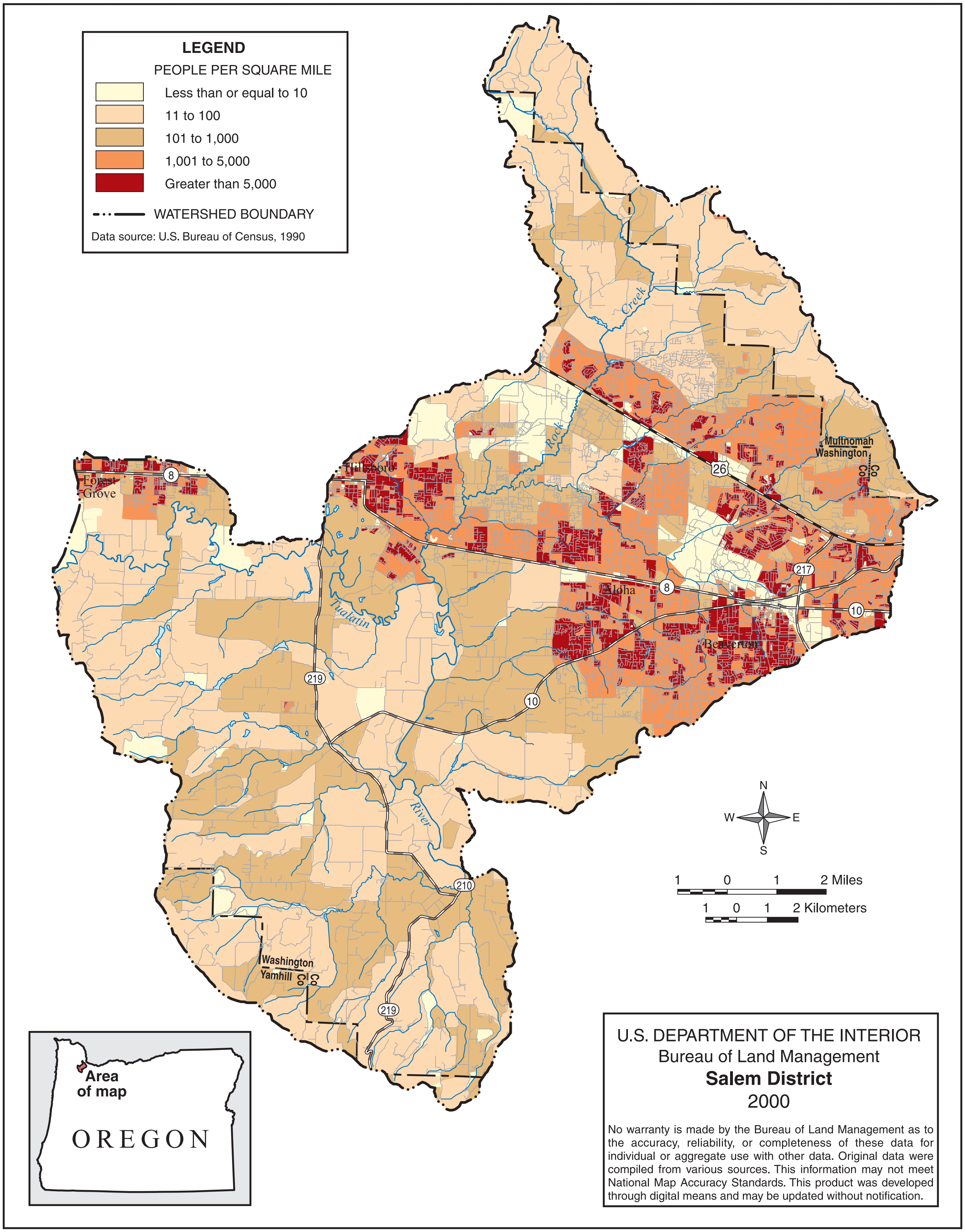
Although urban development is restricted in the southwestern half of the watershed, rural residential development has taken place. Much of this development has been centered in the Chehalem Mountains. Although rural residential activities occur at population densities lower than those in urban areas, there are a number of pressures that this type of growth places upon resources.

1.3.2 Ownership

Land in the Middle Tualatin-Rock Creek watershed is almost entirely privately owned (Map 1-6). More than ninety percent of the watershed is in private ownership. Unlike the watersheds to the north and west, industrial forestland is a very minor component of the total land base: only 1,005 acres (0.9%) is industrial timberland.[10]

Most public lands lie within the Urban Growth Boundary (UGB) and are administered by various municipal authorities. This includes some 3,530 acres of parklands and schools. Between them, the Tualatin Valley Parks and Recreation District, the City of Hillsboro, the Unified Sewerage Agency (USA), and Metro administer 2,940 acres (83%) of this total.

Outside of the UGB, the Bureau of Land Management (BLM) administers most of the public land within the watershed (exclusive of public roads). In total, 243 acres (0.2%) of watershed lands are managed by BLM. These lands are distributed in three small parcels, two in the McFee Creek subwatershed, and one parcel in the Upper Rock Creek subwatershed. Federal statutes direct the BLM to manage these lands for sustained yield forestry in a manner consistent with federal environmental objectives.



Map 1-5 -- Population Density (1990) of the Middle Tualatin-Rock Creek Watershed.

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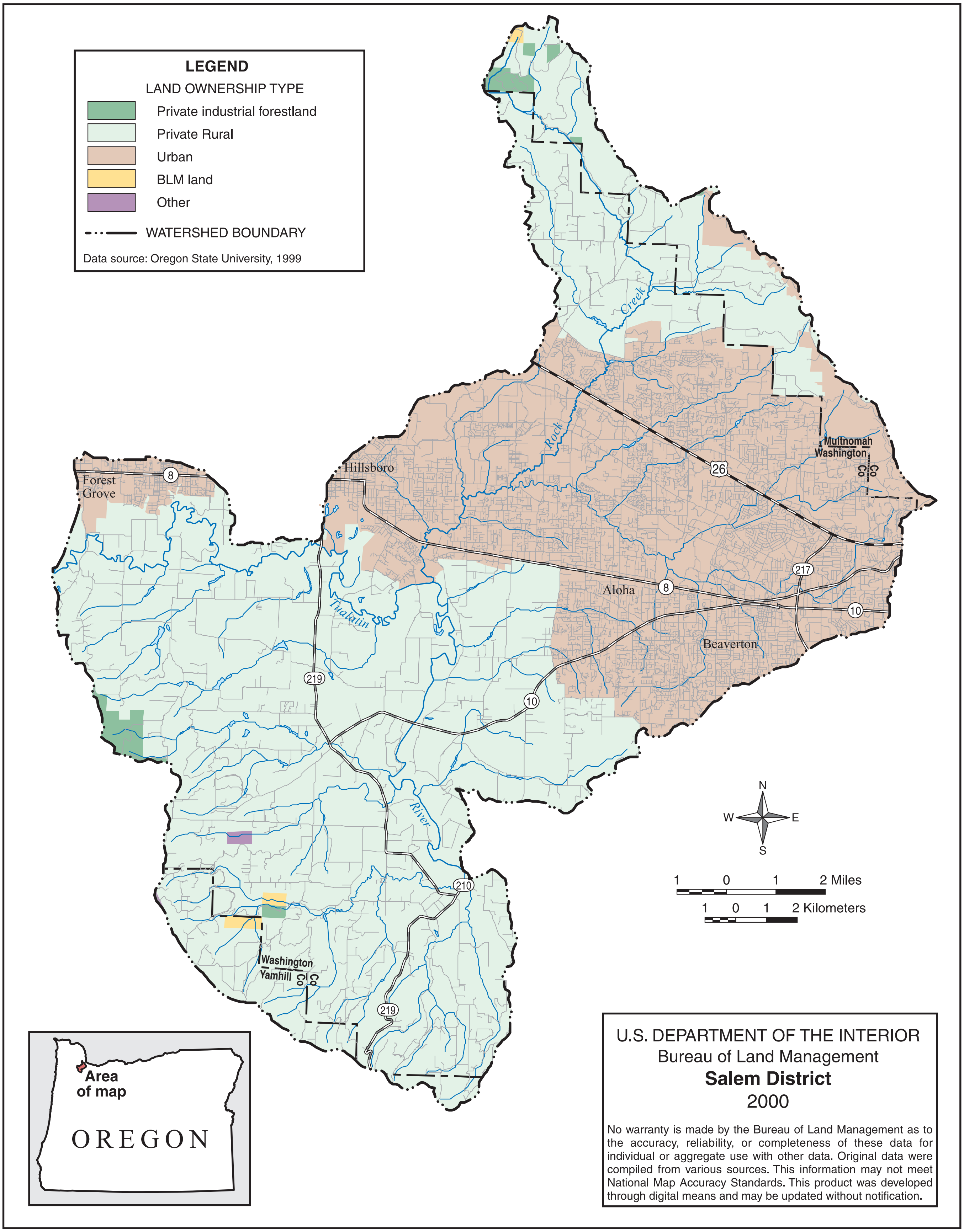

Map 1-6 -- Major Land Ownership in the Middle Tualatin-Rock Creek Watershed.

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1.3.3 Land Use Allocations

1.3.3.1 BLM Allocations

1.3.3.1.1 Adaptive Management Area

BLM parcels within the McFee Creek subwatershed are managed as part of the Northern Coast Adaptive Management Area (AMA). According to the Salem District Record of Decision and Resource Management Plan (ROD/RMP), the general objective of AMA lands is to "encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives." Specific goals related to this objective include "provision of well-distributed late-successional forest, retention of key structural elements of late-successional forests on lands subjected to regeneration harvest, and restoration and protection of riparian zones as well as provision of a stable timber supply". Within the Northern Coast AMA, emphasis is to be on "management for restoration and maintenance of late-successional forest habitat, consistent with marbled murrelet guidelines." Within this AMA, ODF will be "invited to collaborate in development of a comprehensive strategy for conservation of fisheries and other elements of biological diversity."

1.3.3.1.2 General Forest Management Allocations

The parcel in the Rock Creek subwatershed is allocated to the General Forest Management Allocation (GFMA). This is a "Matrix" designation. According to the *Salem District Record of Decision and Resource Management Plan* (ROD/RMP), the objectives of Matrix lands are to produce timber at sustainable levels, provide habitat for a variety of organisms associated with diverse stand types, maintain stand structural diversity, and provide for organism dispersal.

1.3.3.1.3 Riparian Reserve

Riparian Reserves constitute 169 acres, approximately 70% of all BLM lands in the watershed. Riparian Reserves are adjacent to streams, ponds, wetlands, and nearby areas of unstable topography. The extent of these reserves varies based on ecological and geomorphic factors. As a rule of thumb, they extend for a width of two site potential tree heights (usually about 400 feet) from each bank of fish-bearing streams. On other streams, the reserves typically extend for 1 site-potential tree height (about 200 feet) from each stream bank.

In these reserves, the management focus is attainment of Aquatic Conservation Strategy (ACS) objectives through restoration and protection of aquatic and riparian-dependent habitats and communities (Appendix 1). Management activities must be conducted in such a manner so as not to conflict with this primary objective. Many species are dependent upon the habitat provided by Riparian Reserves. Additionally, Riparian Reserves assist in maintenance of the aquatic system by providing shade to regulate stream temperature, contributing woody debris to improve structure and diversity of aquatic habitat, and filtering sediments and nutrients supplied by adjacent upland sources.

1.3.3.1.4 The 15 percent rule

The ROD/RMP in its direction for Matrix lands states, "Retain late-successional forest patches where little late-successional forest persists. This management action/direction will be applied in fifth field watersheds (20 to 200 square miles) in which federal forest lands are currently comprised of 15 percent or less late-successional forest. (The assessment of 15 percent will include all federal land allocations in a watershed.) Within such an area, protect all remaining late-successional forest stands. Protection of these stands could be modified in the future when other portions of a watershed have recovered to the point where they could replace the ecological role of these stands"(ROD/RMP 21-22). Similar rules apply to AMA lands (ROD/RMP 20).

The 15% analysis of the Middle Tualatin-Rock Creek fifth-field watershed shows that 7% of the federal forest acres within the watershed are at least 80 years old. These late-successional forest (LSF) stands, patches and fragments have been mapped and will be deferred from regeneration harvest for approximately 20-30 years, after which a reevaluation of the LSF within the watershed will be made. Additional stands that are located within Riparian Reserves and are currently less than 80 years old have been identified for management to develop LSF habitat characteristics and at some future date to help meet the 15% retention Standard and Guide.

1.3.3.2 Private Zoning

The Middle Tualatin-Rock Creek watershed is in a rapidly urbanizing region of Washington County. In order to restrict urban sprawl and to preserve historical land uses, the Washington County Comprehensive Plan was created. This plan divides the watershed into zones of forestry, agricultural, and urban uses. Under the plan, forestry is to be centered in the Tualatin Mountains, while agriculture will continue to dominate the western portion of the watershed. The Chehalem Mountains will be divided between agriculture, forestry, and rural residential uses. Urban use will be restricted to the northern portion of the watershed

Current zoning regulations provide for 32.1% of the watershed to remain in agricultural use, 14.8% in mixed forestry-agricultural use, and 5.3% in forestry, with 37.9% allocated for urban use and 9.7% in rural residential uses. The vast majority of forest and agricultural lands are zoned for parcels exceeding 10 acres.

1.3.4 Human Uses

1.3.4.1 Forestry

Forestry is a relatively minor land use within the watershed. Industrial forestland only accounts for 1,000 acres within the watershed. BLM manages 240 acres of forested land. Private non-industrial interests own the remaining forested land in the watershed. Management emphasis varies between these entities, but the vast majority of the land has been burned or harvested within the past 80 years.

In addition to timber harvest, forestry entails related support activities, including fertilization, herbicide application, and road construction. Like forestry, these activities are concentrated in the northern portion of the watershed, and the highest road densities on forested lands are found in the Upper Rock Creek and Holcomb Creek subwatersheds.

1.3.4.2 Agriculture

Agriculture has traditionally been the predominant land use in the watershed and continues to be economically important outside the UGB, particularly in the southwestern portion of the watershed. Many of these activities take place on steep foothill lands adjacent to these valleys. In addition to field crops and livestock, nursery crops and Christmas trees are important agricultural commodities produced within the watershed. Agricultural activities that can impact stream water quality include tillage, manure storage, fertilization, pesticide application, and encroachment upon the riparian zone. The USDA Natural Resources Conservation Service (NRCS) and Washington County Soil and Water Conservation District (SWCD) work with agricultural land managers to minimize effects of their operations upon streams.

1.3.4.3 Urban and rural residential

Urban lands are concentrated in the northeastern half of the watershed, in a corridor approximately delineated by Cooper Mountain to the southeast and Bethany Creek to the north. Additional rural residential development is taking place in the Chehalem Mountains. As these subwatersheds develop, pressures on water and land resources increase. This gives rise to potential conflicts with aquatic life, agriculture, and other beneficial uses for these resources. Rural residential growth often brings problems in the form of enhanced erosion and inadequate septic systems. Older rural residential development often is built in floodprone areas near streams.

1.3.4.4 Recreation

Many recreational activities are supported within the watershed. The abundant rural scenery of the southwestern portion of the watershed allows opportunities for bicycling, jogging, and touring along public thoroughfares. Picnicking opportunities are available at Bald Peak State Park. The Springhill and Jackson Bottom wetlands afford opportunities for birding, hiking, and educational activities. Opportunities for these activities elsewhere in rural portions of the watershed are limited by private property considerations. Due to limited extent and poor access, BLM lands in the watershed are not conducive to recreation.

Private commercial farmers in rural portions of the watershed provide recreational harvest opportunities to nearby residents. These include the harvest of fruits and vegetables, as well as seasonally popular commodities such as pumpkins and Christmas trees.

A number of recreational opportunities are present within the urbanized eastern portion of the watershed. The Tualatin Hills Park and Recreation District, USA, Metro, and individual municipalities have acquired open space and parks. This affords opportunities for hiking, birding, and education, as well as providing habitat for wildlife. At developed park sites, opportunities also exist for organized sporting activities.