CHAPTER 1. CHARACTERIZATION

1.1 PHYSICAL

1.1.1 SIZE AND SETTING

The Trask River watershed is approximately 175 square miles (112,164 acres) in size and is located primarily within Tillamook County, with small portions in Washington and Yamhill counties (Figure 1.1). The Trask River is one of five major rivers in the Tillamook basin (which also includes the Tillamook, Wilson, Kilchis, and Miami rivers) that originate in the northern Oregon Coast Range and drain into Tillamook Bay. For the purposes of this analysis, the Trask watershed is subdivided into eight subwatersheds (6^{th} field watersheds), which will be the basic units for many analyses in this report. Seven of the eight subwatersheds are located in the forested uplands of the Oregon Coast Range; the eighth subwatershed is located in the floodplains of the lower Trask River (Table 1.1). Barney Reservoir in the Middle Fork of the North Fork subwatershed is the primary municipal water supply for the cities of Beaverton, Hillsboro, and Forest Grove.

Table 1. 1. Subwatershed designations.

Subwatershed	Area (mi^2)	Mainstem Length (mi)[a]
East Fork of South Fork of Trask River	29.0	10.5
Elkhorn Creek	17.3	7.6
Lower Trask River	22.5	10.9
Middle Fork of North Fork of Trask River	13.2	7.9
North Fork of North Fork of Trask River	12.6	5.9
North Fork of Trask River	29.2	13.9
South Fork of Trask River	23.3	10.3
Upper Trask River	27.6	14.4
Total	174.7	81.3

[a] Mainstem streams are defined as 5th order and greater

1.1.2 TOPOGRAPHY

The Trask watershed drains a varied landscape, from steep-sloped, highly-dissected headwaters to low-gradient broad floodplains (Plate 1). Long ridges with steep slopes and numerous rock outcrops characterize the upland terrain. Many small, high-gradient streams with deeply incised channels originate from headwalls at higher elevations. The major streams within the watershed flow generally from east to west, from headwaters in the Coast Range to the alluvial fan of the lower Trask River. Watershed elevations range from sea level at the mouth of the Trask River to 3,534 ft at the headwaters of the North Fork of the North Fork of the Trask River. Hembre

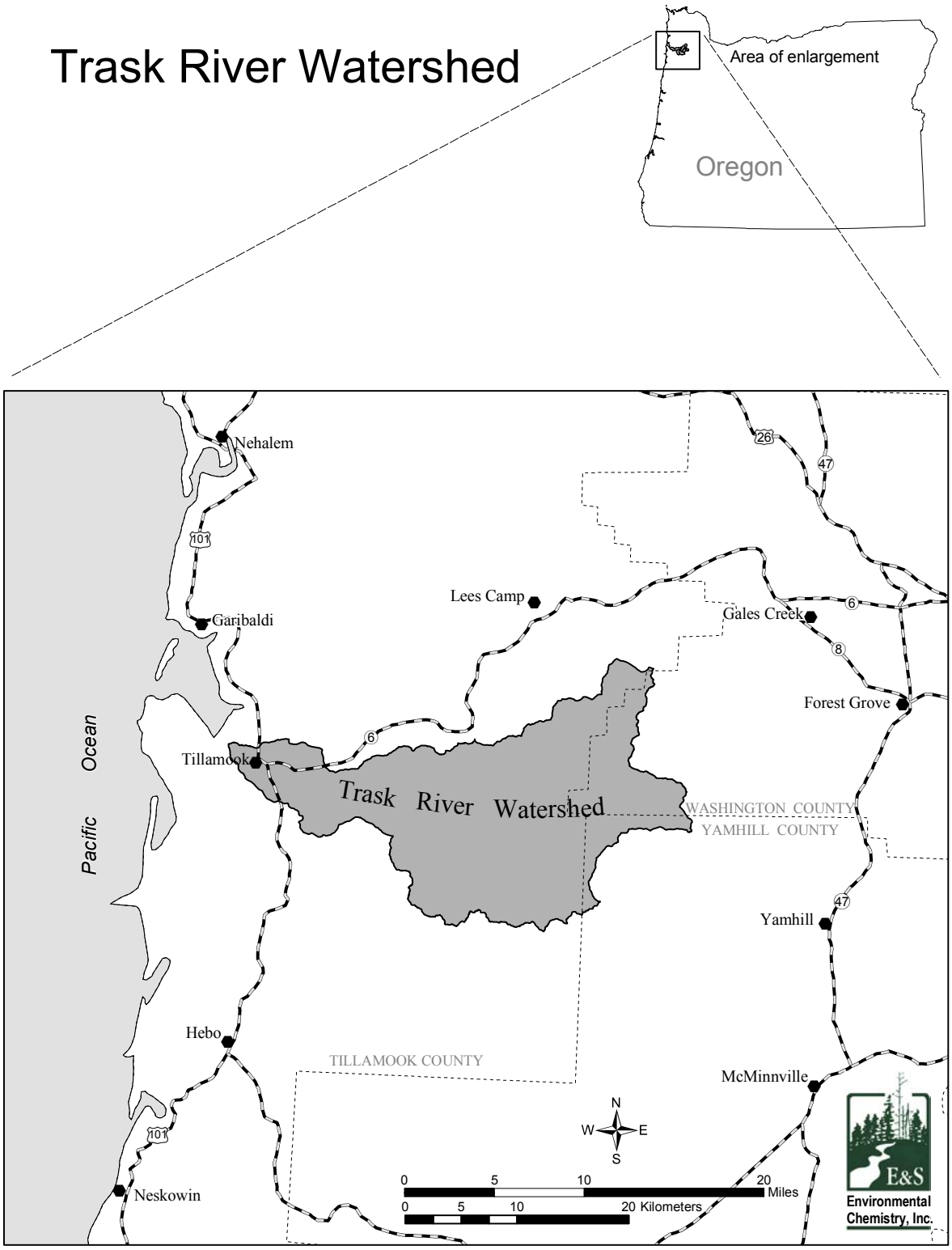

Figure 1. 1. Location of the Trask River watershed**.**

Ridge, Grindstone Ridge, and Blind Cabin Ridge border the upper watershed to the north and east. Grindstone Mountain (3,012 ft), Trask Mountain (3,424 ft), and Edwards Butte (3,170 ft) are prominent high points to the south.

1.1.3 ECOREGIONS

Ecoregions are areas similar in climate, physiography, geology, natural vegetation, wildlife distribution, and land use that shape and form the function of watersheds. The hierarchical system of defining distinct ecoregions strives to help resource managers and scientists by identifying natural divisions and functional ecological units across the landscape. According to the U.S. Environmental Protection Agency (U.S. EPA) system of ecoregion classification, the Trask watershed includes three ecoregions: Volcanics, Coastal Uplands, and Coastal Lowlands (Table 1.2). The majority of the watershed (86%) lies within the Volcanics ecoregion. This ecoregion is characterized by moderate- to steep-gradient streams and narrow valley floors with moderate to steep hillslopes. Stream densities are higher than those in adjacent areas underlain by sedimentary rock. Erosion rates are high, with a high occurrence of mostly shallow landslides that often result in debris flows. A small portion of the watershed (3%) lies within the Coastal Uplands ecoregion. This ecoregion is characterized by low-gradient, medium to large streams bordered by flat to steep slopes. Steep-gradient small streams in narrow steep-sided valleys are also present. Erosion rates are high and landslides may be either deep-seated in low-gradient areas or shallow in steep headwater channels. The Coastal Lowlands ecoregion is found primarily at the base of the Trask watershed, and comprises the remaining 11% of the area. This ecoregion is characterized by very low gradient, meandering streams, at times under tidal influence, and bordered by mostly flat floodplains. Erosion rates are low and sediment deposition is high due to the low gradient.

1.1.4 GEOLOGY AND GEOMORPHOLOGY

The Coast Range mountains were formed by the collision of a volcanic island chain with the North American continent 50 million years ago. The current geologic structure of the Trask watershed is characterized by uplifted volcanic and sedimentary rock due to subduction of the Juan de Fuca plate under the North American plate. Cycles of slow tectonic uplift have been followed by rapid submergence, resulting in catastrophic earthquakes approximately every 300 to 1,000 years (Komar 1992).

The sedimentary rock consists primarily of layered and interbedded sandstones and mudstones formed in a marine environment prior to uplift (Skaugset et al. 2002). The higher elevations of the Trask watershed are mostly underlain by igneous extrusive and intrusive rock (generally basalt and volcanic breccia) interlaced with siltstone and sandstone. High precipitation levels combined with relatively young geology have resulted in landforms that are very steep in places and highly dissected by streams and rivers. The steep uplands transition to the more gentle foothills of submarine and lower porphyritic basalt geology. At the mouth of the Trask River is

Table 1. 2. Description of U.S. EPA level IV ecoregion classifications in the Trask watershed.

Geology	Topography	Soils	Erosion	Climate	Land Use	Potential Natural Vegetation
1a. Coastal Lowlands						
Alluvial deposits on low terraces or dunes (spits) of wind-blown sand.	Low-gradient streams that often meander widely. Tidal influence. Tidal marshes flow through flat floodplains.	Deep silty clay loams to sand. Peat soil associated with tidal marshes.	Erosion rate low due to the low gradient. Mostly depositional areas.	Wet winters, relatively dry summers and mild temperatures throughout the year. Heavy precipitation during winter months. Mean annual precipitation 60 to 85 inches.	Dairy farms, urban/rural residential development, recreation, pastureland.	Douglas-fir, western hemlock, Sitka spruce, western red cedar, wetland plants, pasture grasses.
1b. Coastal Uplands						
Weak Sandstone.	Low-gradient medium and large streams; few waterfalls exist. Headwater small streams often steep and usually bordered by steep slopes. High stream density.	Mostly deep silt loam.	High erosion rate. Landslides include deep-seated earthflows in lower gradient areas and shallow landslides (often triggering debris slides) in steep headwater channels.	Wet winters, relatively dry summers and mild temperatures. Heavy precipitation. Mean annual precipitation 70 to 125 inches; up to 200 inches in higher elevations.	Forestry, rural residential development, recreation.	Douglas-fir, western hemlock, Sitka spruce, western red cedar, red alder, salmonberry, stink currant.
1d. Volcanics						
Volcanic, including basalt flows, dikes and sills, and concreted basalt materials.	Moderate-gradient medium and large streams; waterfalls may be common. Steep gradient small headwater streams with narrow valleys. Lower stream density than adjacent watersheds underlain by sedimentary rock.	Gravelly silt loam in lower gradient areas to very gravelly loam in steep areas.	High erosion rate. Landslides are usually shallow (often triggering debris slides) in steep headwater channels. Debris slides capable of traveling long distances.	Wet winters, relatively dry summers and mild temperatures throughout the year. Heavy precipitation. Mean annual precipitation 70 to 200 inches.	Forestry, rural residential development, recreation.	Douglas-fir, western hemlock, Sitka spruce, western red cedar, red alder, salmonberry, swordfern, vine maple, stink currant.

an extensive floodplain resulting from thousands of years of fluvial and estuarine deposits (TBNEP 1998a).

1.1.5 SOILS

Upland forest soils in the Trask watershed are predominantly shallow to moderately-deep and well-drained, silt loam soils. Both finely textured silt loam soils, and coarse, gravelly silt loam soils are common. According to the Soil Survey of Tillamook County (USDA 1964), these soils are grouped primarily into the Astoria-Hembre and Hembre-Kilchis-Astoria-Trask associations. The Weyerhaeuser soil survey groups them into the Grindstone, Jewell, and Dovre associations.

The Soil Survey of Tillamook County groups the lowland soils into the Nehalem-Brenner-Coquille association, which are deep, floodplain soils deposited over thousands of years by rivers and streams. They are highly fertile, but require drainage for maximum productivity. Alluvial terrace soils between the bottomland floodplain and the forested upland soils belong to the Quillayute-Knappa-Hebo association. They have high to medium organic content, but are less fertile than the floodplain soils (USDA 1964, TBNEP 1998a). Lowland soils were not mapped in the Weyerhaeuser soil survey.

The USDA Natural Resource Conservation Service (NRCS) is currently preparing an updated soil survey for Tillamook County, which is expected to be completed by 2005. Soil types for the forested uplands are already complete, but are not currently available in a digital format (John Shipman, NRCS, pers. comm., 2003).

1.1.6 EROSION AND SEDIMENT

There are two distinct zones of erosional processes in the Trask watershed: the steep, forested uplands, and the broad, lowland floodplain near the river mouth. The lowland floodplain zone includes the Lower Trask subwatershed, and the lower half of the Upper Trask subwatershed; all other subwatersheds are in the forested upland zone (Plate 1). On the steep slopes and shallow soils of the forested uplands, mass wasting is the dominant erosional process. Mass wasting includes a variety of erosional processes including shallow landslides, rock slides, debris slides, and debris flows in steeper terrain, and earth slides and earth flows on gentler slopes. Under natural conditions, geology, topography, and climate interact to cause landslides. Slope steepness is shown on Plate 2, giving an indication of the location of steep areas that are more prone to landslides.

Streambank erosion is also prevalent in the uplands, most notably in the East Fork of the South Fork and the Elkhorn Creek subwatersheds. Roads and off-highway vehicle (OHV) trails in the upland subwatersheds further increase the potential for erosion. Roads have been identified as the single greatest human-caused source of sediment (ODF 1998), but OHV trails are also believed to be an important contributor to erosion in the Middle Fork of the North Fork subwatershed (Hatton 1997).

Streambank cutting and sheet and rill erosion are the two primary erosional processes in the floodplain zone. Streambank erosion is the more prevalent of the two, and typically occurs in response to selective stratigraphic failure, soil saturation, or sloughing during high flow events.

Land use practices have caused stream channelization and modification of the riparian zone in some areas, thereby altering the natural patterns and rates of streambank erosion.

1.1.7 CLIMATE AND PRECIPITATION

The Trask watershed is exposed to a marine climate that is influenced by proximity to the Pacific Ocean and elevation. Westerly winds predominate and carry moisture and temperature-moderating effects from the ocean, resulting in winters that are moderate and wet, and summers that are cool and dry. Annual precipitation is high and occurs mostly during the winter months (Figure 1.2). The upper reaches of the Trask watershed generally receive from 125 to 200 inches of precipitation per year, while the lower reaches closer to the city of Tillamook receive between 80 and 125 inches. Intense winter storms occur periodically, accompanied by high winds and heavy precipitation. Snow falls at the high elevations during the winter, but often melts quickly with the warm rain that is typical of Pacific winter storms. Air temperatures in the Trask watershed are mild throughout the year with cooler temperatures at higher elevations. Due to the moderating effect of the Pacific Ocean, summer air temperatures in the lower reaches of the watershed may increase significantly only a few miles inland, relative to areas near the ocean. The average maximum temperature over a 30-year period in Tillamook County was 59.2° F (15.1°. C) and the average minimum temperature was 41.6° F (5.4° C). Over the 30 years studied, less than one day per year on average had a temperature over 90° F (32° C). The highest temperature recorded was 102° F (38.9° C; TBNEP 1998a).

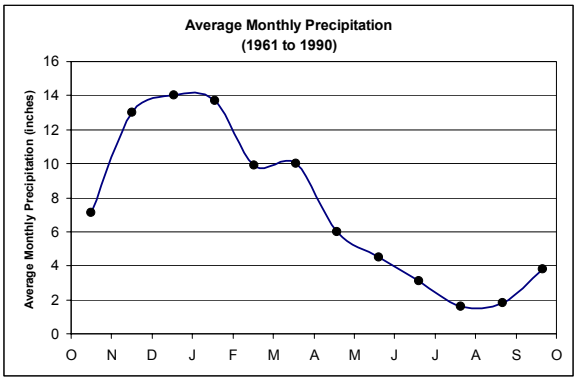

Figure 1. 2. Average monthly precipitation (in inches) near Tillamook.

1.1.8 HYDROLOGY

Streams in the Trask watershed are characteristically “flashy”. They respond very quickly to rainfall by rapidly increasing discharge due to the steep topography, high stream density, and intensity of precipitation. High flows typically occur between November and March and low flows from May to October.

Daily stream flow records have been collected near the mouth of the Trask River since 1930 by the U.S. Geological Survey (USGS). The annual low flow for the Trask River averages approximately 110 cubic feet per second (cfs), and the annual high flow is generally greater than 2,000 cfs. The 7-day average low and high flows with a 10% chance of occurring in any given year are 54 cfs and 8,000 cfs, respectively (Figure 1.3; ODEQ 2001).

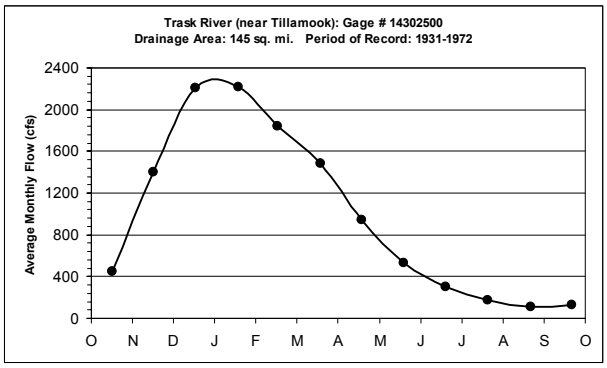

Figure 1. 3. Average monthly discharge near Tillamook.

Flooding frequently occurs in the lower portion of the Trask watershed, and has caused extensive property damage in the City of Tillamook. River flooding occurs most commonly in December and January during periods of heavy rainfall or snowmelt, or a combination of both. River flooding combined with tidal flooding can extend the flood season from November to February. The Trask watershed has a floodplain area of 3,600 acres, 3% of the total watershed area (TBNEP 1998a).

1.1.9 WATER QUALITY

Water quality in the Trask River is highly dependent on location within the watershed. The forested uplands generally have very different water quality issues than the pasturelands and urban areas of the lower reaches. Upland water quality issues revolve around water temperature, mainly in mainstem reaches, and turbidity levels, which increase in response to erosion; in the lowlands, fecal coliform bacteria (FCB), water temperature, and (locally) dissolved oxygen (DO) are issues of greatest concern.

Overall, the Trask River contributes proportionally more water pollution loading (e.g., bacteria, sediment, nitrogen) to Tillamook Bay than any other river in the Tillamook Basin (Sullivan et al. 1998 a,b; 2002). The estimated annual loading of FCB (2,000 to 3,200 x 10^{12} colony forming units (cfu)/year) was higher than the estimated FCB loading rates for the Wilson, Tillamook, Miami, or Kilchis rivers (Sullivan et al. 1998b). Estimated annual loading of total suspended solids (TSS; 185 x 10^6 kg/yr) was second only to the Wilson River (314 x 10^6 kg/yr). Inorganic nitrogen (N) loading was highest for the Trask River (1.1 x 10^6 kg/yr; Sullivan et al. 1998b).

FCB loading has been found to originate from urban, rural residential, and agricultural land use zones, in the lowland portion of the watershed (Sullivan et al. 1998a,b). The upper watershed has not been found to contribute significant amounts of FCB. Most of the inorganic nitrogen, however, originates in the upper, forested portions of the watershed (Sullivan et al. 1998a,b), although concentrations are not particularly high in the Trask River compared with other rivers in western Oregon, ranging from about 0.3 to 1.1 mg N/L.

The federal Clean Water Act requires implementation of Total Maximum Daily Load (TMDL) standards for rivers, lakes and streams identified as water quality limited for “beneficial uses”.

In the Tillamook basin, including the Trask watershed, "beneficial uses" identified by the TMDL include cold water aquatic life, water contact recreation, and shellfish harvesting in the bay. Water temperature is currently listed as being "limited" (as specified in section 303(d) of the Clean Water Act) from river mile 0 to 19.2 (from the mouth to the South Fork tributary junction). In addition, the Trask River has failed to meet standards for FCB and DO (from September 15 to May 31) in past years, and FCB is included in the TMDL. Targeted reductions in FCB concentrations in the lower mainstem Trask River of 94 to 99% overall are indicated by the TMDL (ODEQ 2002).

1.1.10 STREAM CHANNEL

Stream channels were divided into distinct channel habitat type (CHT) segments by the Tillamook Bay National Estuary Project (TBNEP) following Oregon Watershed Enhancement Board (OWEB) guidelines (TBNEP 1998b). Categories are based on geomorphic structure, including stream size, gradient, and side-slope constraint. CHT designations provide a useful summary of physical stream characteristics for determining habitat condition and restoration potential for fish and other aquatic species. The TBNEP estimated the quality of CHTs for supporting salmonid habitat, following the OWEB protocol (WPN 1999), based on Oregon Department of Fish and Wildlife (ODFW) data on pool area, pool frequency, gravel availability, and gravel quality. The MM (moderate gradient, moderately confined) CHT, which occurs only in the East Fork of the South Fork subwatershed, had the best habitat conditions in the Trask watershed. MC (moderate gradient, confined), MV (moderately steep narrow valley), VH (very steep headwater), and MH (moderate gradient headwater) CHTs all had some zones of intermediate habitat quality. Only the SV (steep narrow valley) CHT had uniformly poor habitat conditions. Overall, the East Fork of the South Fork subwatershed and the North Fork subwatershed had the most desirable CHT conditions, whereas the Middle Fork of the North Fork had the least desirable conditions (TBNEP 1998b).

1.2 BIOLOGICAL

1.2.1 VEGETATION CHARACTERISTICS

The vegetation in the Trask watershed has been greatly altered since settlement by Euro-Americans (Plate 3). Prior to settlement, vegetation included a substantial component of late-successional forest, with prairies, swamps, marshes, and tidally-influenced forest in the lowlands (Coulton et al. 1996). The original upland forest was primarily a mixture of western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), Douglas-fir (*Pseudotsuga menziesii*), grand fir (*Abies grandis*), noble fir (*A. procera*), and Sitka spruce (*Picea sitchensis*; TBNEP 1998a, Franklin and Dyrness 1973). Since the 1850s, forests have been cleared and harvested, wetlands drained, and pastures created for dairy cattle. A series of catastrophic fires beginning in the 1930s burned much of the remaining forest (about 200,000 acres in the Wilson and Trask watersheds) and accelerated rates of erosion (TBNEP 1998a).

The majority of forested uplands in the watershed were re-planted 25 to 45 years ago with Douglas-fir for timber production. Currently, the forest is dominated by closed canopy, even-aged conifer and hardwood stands 25 to 45 years old (ODF 2003a,b). There are pockets of late-successional forest at the northwestern edge of the watershed, and some mixed stands of Douglas-fir and western hemlock are found scattered throughout the forest (ODF 2003a). Throughout the forest, hardwoods tend to dominate the riparian zones, and are mixed with Douglas-fir in the uplands. The lowlands are predominantly occupied by pasture lands, with rural residential and urban areas (Plate 3).

Riparian vegetation distribution and condition varies with land use throughout the watershed. The tidal mainstem of the Trask River has poor riparian conditions. Riparian trees are largely absent, and vegetation is comprised primarily of blackberries and non-native grasses. Riparian zones in agricultural areas are discontinuous and comprised of brush and young hardwoods. In forested areas, riparian vegetation is continuous and comprised of dense mature and young hardwoods. The upper watershed riparian areas contain a mixture of mature mixed conifer and hardwood stands and young dense hardwoods. Stream shade is not adequate in some reaches, especially throughout the lower and middle mainstem reaches of the Trask River, and summer mainstem temperatures often exceed state standards (TBNEP 1998b).

There are three main forest health concerns in the Trask watershed, the most prevalent of which is Swiss needle cast (SNC; *Phaeocryptus gaumanni*), a fungal infection affecting Douglas-fir. Approximately 40% of the state lands in the Tillamook District of the Trask watershed show symptoms of SNC. Plans for near-term timber harvest are largely concerned with reducing the impacts of SNC (ODF 2003a). The second largest forest health consideration is the vigor of trees planted from off-site seed stock. The third is *Phellinus weirii*, a root rot that is affecting between 5 and 10% of the forest in the Tillamook District (ODF 2003a).

Management of rare plants in the Trask watershed varies depending on land ownership. Rare plant designations on Bureau of Land Management (BLM) lands are managed under the policy guidelines of the Special Status Species program. The BLM has surveyed over 2400 acres in the Trask watershed (primarily in the Elkhorn Creek subwatershed) for Survey and Manage plant species and found none. One Survey and Manage lichen species, *Peltigera pacifica* is known to occur immediately adjacent to the Trask watershed and almost certainly occurs with the Trask watershed (Andy Pampush, BLM, pers. comm., 2003).

Based on reviews of the Oregon Natural Heritage Program's (ONHP) database of plant locations, consultations with the Oregon Department of Agriculture Rare Plant Program, and the Oregon Department of Forestry's (ODF) own work in the basin, Endangered, Threatened, Candidate, and Special Concern plant species on ODF land in the Trask watershed have been identified. See listing of species and additional information regarding rare plants on both BLM and ODF land in Section 3.2.3.4.

1.2.2 FISH AND WILDLIFE HABITAT

1.2.2.1 Aquatic

Anadromous salmonid fish species occurring in the Trask watershed include spring and fall chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), chum salmon (*O. keta*), summer and winter steelhead (*O. mykiss*), and sea-run cutthroat trout (*O. clarkii;* Table 3.17). Resident cutthroat trout also occupy most of the streams. Resident brook lamprey (western brook [*Lampetra richardsonii*] and/or Pacific brook [*L. pacifica*]) likely occur in the watershed but are not well-documented.

Coho is federally listed as Threatened under the Endangered Species Act. Chum salmon is listed as Threatened under the State of Oregon's Endangered Species Act; Pacific and river lamprey and coastal cutthroat are State Species of Concern. Steelhead is designated as a candidate for listing within this evolutionarily significant unit (ESU), but is not currently listed. The Oregon Coast ESU is one of 19 ESUs of salmon and steelhead that have had critical habitat designations withdrawn as of April 30, 2002. The National Oceanographic and Atmospheric Administration (NOAA) fisheries division is currently in the process of re-issuing critical habitat designations for these species.

The Magnuson-Stevens Act governs the conservation and management of ocean fishing and establishes exclusive U.S. management authority over all coho and chinook salmon (species of commercial interest) throughout their migratory range except when in a foreign nation's waters. The Pacific Fishery Management Council (off the coast of the continental United States), and the Pacific Salmon Commission (off the coast of Canada and Alaska) are the agencies responsible for managing anadromous fish species during the period of their life cycle spent in the ocean. Salmonid species in the Trask watershed most likely to be affected by regulatory actions are coho, chum, and chinook salmon, due to existing marine fisheries for these species. Steelhead and cutthroat trout are rarely caught in marine waters. A habitat conservation plan (HCP) for listed species and Species of Concern is currently under development for western Oregon state forests, and is expected to be completed in approximately two years. Interim policies for Threatened and Endangered (T&E) Species are included in the Interim State Forests Salmon Protection Policy Implementation Plan (IP), which is expected to be completed in 2003.

Key habitat for at-risk species such as coho, chinook, chum, steelhead, cutthroat trout, and Pacific lamprey is found within the Trask watershed. Core areas of coho habitat are located in the North Fork, South Fork, and East Fork subwatersheds. Elkhorn Creek is designated by the BLM as a Tier 1 Key Watershed that contributes directly to conservation of at-risk anadromous salmonids and resident fish species (BLM 1995).

Several salmonid species are stocked in the Trask watershed, including fall and spring chinook, coho, and rainbow trout (*Oncorhynchus mykiss*). Winter and summer steelhead, cutthroat trout, and largemouth bass (*Micropterus salmoides*) were formerly stocked. The current population of summer steelhead found in the Trask watershed consists entirely of hatchery strays from the Wilson River (Keith Braun, ODFW, pers. comm., 2003). Although details of their life history and habitat requirements differ substantially, all of these salmonid species depend upon the streams of the Trask watershed and Tillamook Bay for migration, spawning, and rearing.

Degradation of habitat and declines in fish populations have been attributed to several natural and human-caused events. High rates of erosion and sedimentation following a series of catastrophic wildfires in the Tillamook State Forest beginning in the 1930s were detrimental to fish populations (Coulton et al., 1996). Sedimentation continues largely due to road-related mass wasting and road surface runoff in the uplands and bank erosion in the lowlands (TBNEP 1998a). Extensive channel modifications, including dredging, diking, streambank armoring, and removal of large wood, have resulted in channelization of lowland reaches of the Trask River. Passage barriers have been introduced, for example the dam at Barney Reservoir and the hatchery weir on Gold Creek. Road culverts block fish passage at some locations. The disconnection of the river channel from surrounding floodplains and wetlands eliminates the exchange of nutrients and sediment that would occur naturally, and destroys important spawning and juvenile fish rearing habitat (Coulton et al., 1996).

Other native fish species present in the Trask watershed include various species of sculpin (*Cottus* sp.) and stickleback (*Gasterosteus* sp.). Adult sturgeon (*Acipenser* sp.) are occasionally found in the tidewaters of the Trask River (Keith Braun, ODFW, pers. comm., 2003). In addition, other aquatic species such as salamanders, frogs, and turtles occur in the Trask watershed. Several additional Species of Concern may be found in the watershed, including northern red-legged frog (*Rana aurora aurora*), Columbia torrent salamander (*Rhyacotriton kezeri*), and tailed frog (*Ascaphus truei*; Table 1.3).

1.2.2.2 Terrestrial

Threatened and Endangered bird species include the northern spotted owl (*Strix occidentalis caurina*), marbled murrelet (*Brachyramphus marmoratus*), and bald eagle (*Haliaeetus leucocephalus*). In the Tillamook District of ODF, there is a northern spotted owl cluster that includes portions of the Trask watershed. The cluster contains a single female owl and includes high quality habitat for the recovery and dispersal of the species. In the vicinity of the ODF owl cluster is a BLM Reserve Pair Area (RPA) that includes two owl sites and encompasses approximately 8,000 acres that includes the lower Trask River. This area contains several late-successional stands that provide high quality potential habitat for spotted owls, marbled murrelets and bald eagles. The dramatic reduction in old-growth forest as a result of the Tillamook Burn and past logging have been associated with a reduction in the populations of wildlife species that prefer late-successional forest, including the northern spotted owl.

There are 3,700 acres of marbled murrelet management area in the Tillamook District of ODF. However, there are no known nesting areas for marbled murrelets or bald eagles in the Trask watershed. These species may utilize the watershed area for other purposes. Currently, T&E species on ODF lands are managed according to interim policies until the completion of the Western Oregon State Forests HCP, which is expected to be completed by 2005. Wildlife species of concern that may have suitable habitat within the Trask watershed are listed in Table 1.3.

Table 1. 3. Wildlife species of concern with breeding and/or foraging habitat within the Trask watershed (ONHP 2001).

Species	Federal Status	ODFW Status	ONHP Heritage Rank
Bald eagle	Threatened	Threatened	Rare, threatened, and uncommon throughout Oregon
Marbled murrelet	Threatened	Threatened	Imperiled in Oregon
Northern spotted owl	Threatened	Threatened	Rare, threatened, and uncommon throughout Oregon
American peregrine falcon	--	Endangered	Critically imperiled in Oregon
Aleutian Canada goose	--	Endangered	Imperiled in Oregon
Dusky Canada goose	--	--	Imperiled in Oregon
Band-tailed pigeon	Species of Concern	--	Not rare, apparently secure in Oregon
Mountain quail	Species of Concern	Undetermined Status	Not rare, apparently secure in Oregon
Harlequin duck	Species of Concern	Undetermined Status	Imperiled in Oregon
Little willow flycatcher	--	Vulnerable	Unknown
Lewis' woodpecker	Species of Concern	Critical	Rare, threatened, and uncommon throughout Oregon
Pileated woodpecker	--	Critical	Not rare, apparently secure in Oregon
Purple martin	Species of Concern	Critical	Rare, threatened, and uncommon throughout Oregon
Western bluebird	--	Vulnerable	Not rare, apparently secure in Oregon
Northern red-legged frog	Species of Concern	Undetermined Status	Rare, threatened, and uncommon throughout Oregon
Tailed frog	Species of Concern	Vulnerable	Rare, threatened, and uncommon throughout Oregon
Columbia torrent salamander	--	Critical	Rare, threatened, and uncommon throughout Oregon
Clouded salamander	--	Undetermined Status	Rare, threatened, and uncommon throughout Oregon
White-footed vole	Species of Concern	Undetermined Status	Rare, threatened, and uncommon throughout Oregon
Red tree vole	Species of Concern	--	Rare, threatened, and uncommon throughout Oregon
Pacific western big-eared bat	Species of Concern	Critical	Imperiled in Oregon
Silver-haired bat	Species of Concern	Undetermined Status	Not rare, apparently secure in Oregon
Long-eared myotis (bat)	Species of Concern	Undetermined Status	Rare, threatened, and uncommon throughout Oregon
Fringed myotis (bat)	Species of Concern	Vulnerable	Imperiled in Oregon
Long-legged myotis (bat)	Species of Concern	Undetermined Status	Rare, threatened, and uncommon throughout Oregon
Yuma myotis (bat)	Species of Concern	--	Rare, threatened, and uncommon throughout Oregon
American marten	--	Vulnerable	Rare, threatened, and uncommon throughout Oregon
Pacific fisher	Species of Concern	Critical	Imperiled in Oregon
Oregon megomphix (snail)	--	--	Rare, threatened, and uncommon throughout Oregon
Marsh damsel bug	--	--	Imperiled in Oregon
Mulsant's water treader	--	--	Imperiled in Oregon
Evening fieldslug	--	--	Critically imperiled in Oregon

Indigenous large and medium-sized mammals found in the Trask watershed include beaver (*Castor canadensis*), elk (*Cervus elaphus*), deer (*Odocoileus hemionus columbianus*), black bear (*Ursus americanus*), and cougar (*Puma concolor*). However, the dense, young, even-aged forests that now predominate provide limited food for some sensitive species. Thinning and clear-cutting activities have improved forage conditions for deer and elk, and their populations are believed to be increasing. Elk numbers are currently very high within the watershed. Recent forest management policies introduced at both the state and federal levels strive to increase structural and age-class diversity in the future, and increase the distribution of late-successional forest and associated species (ODF 2003a,b).

The Trask watershed contains habitat for four terrestrial wildlife species that are covered by the BLM Survey and Manage provisions, three mollusks and one mammal:

Red tree vole	*Arborimus longicaudus*
Oregon megomphix	*Megomphix hemphilli*
Puget Oregonian	*Cryptomastix devia*
Evening field slug	*Deroceras hesperium*

Two of these species, the Oregon megomphix and the evening field slug, are also designated by the BLM's Special Status Species program as Bureau Sensitive species. Other terrestrial species that are covered by the BLM's Special Status Species program and for which habitat may be found in the Trask drainage include:

Peregrine falcon	*Falco peregrinus anatum*
Common nighthawk	*Chordeiles minor*
Purple martin	*Progne subis*
Columbia torrent salamander	*Rhyacotriton kezeri*

1.3 SOCIAL

1.3.1 POPULATION

The population of the Trask watershed is concentrated almost entirely in and around the City of Tillamook, within the Lower Trask River subwatershed. The remaining population consists of scattered farm residences in the Lower Trask River subwatershed and sparse settlement of the lower and middle reaches of the mainstem Trask River valley. With a population of 24,262 in 2000, Tillamook County grew by 12.5% from 1990 to 2000 (U.S. Census Bureau 2002), a growth rate that is expected to remain steady over the coming years (TBNEP 1998a).

Since 1950, the population of Tillamook County has increased by 30%. The population declined during the 1960s, then rose sharply in the 1970s, generally paralleling changes in the timber industry (Coulton et al. 1996). After remaining steady in the 1980s, the population began to grow again in the 1990s. Recent population growth has been attributed more to quality of life concerns and an influx of retirees than to changes in natural resource industries (Davis and Radtke 1994).

1.3.2 OWNERSHIP

Land ownership in the Trask watershed is divided among private landowners, and local, state, and federal agencies. Over half of the watershed (58%) is owned by the State of Oregon. These lands comprise nearly 65,000 acres that are located in the mid to upper watershed. Private industrial landowners own the next largest portion of the watershed at 21% (24,044 acres), followed by private non-industrial landowners at 12% (13,665 acres). Private industrial lands are concentrated in the forested upper southeast and northeast corners of the watershed, and in the forested regions of the lower watershed. Private non-industrial lands dominate the lower, mostly agricultural part of the watershed, with some small blocks of land along the middle reach of the mainstem of the Trask River. The remaining portions of the watershed are owned by the BLM (8%) and by local government (1%). BLM lands are scattered throughout the middle and upper parts of the watershed. Local government owns Barney Reservoir in the upper watershed and a small block of land in the foothills of the lower watershed.

1.3.3 LAND USE

The vast majority of the Trask watershed is utilized for forest use (91%), with agricultural use as the next largest zoning category at 6%. The remainder of the watershed is a combination of urban use (1%), rural residential use (1%), and other miscellaneous uses (1%; Plate 4).

State forest land in the Trask watershed is managed by ODF according to the Northwest Oregon Forest Management Plan. Under that plan, a forest land management classification system (FLMCS) is being developed as specified in OAR 62-035-0050, and will remain in draft form until the proposed HCP is approved in 2005. The FLMCS places state forests into three broad categories: 1) General Stewardship, 2) Focused Stewardship, and 3) Special Stewardship. The General Stewardship classification is the least restrictive, and specifies management of forest resources using integrated management strategies and techniques. Focused Stewardship lands require supplemental planning, modified management practices, or compliance with legal or contractual requirements above those required on General Stewardship lands. The Special Stewardship classification is the most restrictive, and is required if a legal or contractual constraint precludes integrated management, if forest resources require protection that precludes the integrated management of forest resources, or if lands are committed to a specific use and management activities are limited to those that are compatible with the specific use. Of the Focused Stewardship lands, the majority are classified as Aquatic and Riparian Habitat (85%). Five percent are dedicated to recreation, 4% to visual, and 2% each to deeds restrictions and wildlife habitat.

The BLM's mandate under the Federal Land Policy and Management Act of 1976 is to manage the public lands for multiple use, while protecting the long-term health of the land (BLM 1995). Management guidance and policy is provided by the Northwest Forest Plan, and implemented by the Salem District Resource Management Plan. The Northwest Forest Plan establishes both Land Use Allocations, and the Aquatic Conservation Strategy (ACS) for land use planning. Land Use Allocations in the Trask include Adaptive Management Areas (AMAs) and Adaptive Management Reserves (AMRs). The management objectives for AMAs are to develop and test new

management approaches integrating ecological and economic health, to restore and maintain late successional forest habitat and riparian zones, and to provide a stable timber supply (BLM 1995). AMAs account for 73% of BLM lands in the Trask watershed. AMRs are managed with particular attention to northern spotted owl and marbled murrelet habitat requirements, and include both the guidelines of AMAs, as well as additional measures to protect Late Seral Reserves. AMRs make up the remaining 27% of BLM land in the Trask watershed. Within the AMR area in the Trask, a RPA has been designated for two spotted owl sites along the northern edge of the Upper Trask subwatershed, requiring specific measures to assist the survival and recovery of this species.

In accordance with the ACS, BLM land in the Trask watershed has been classified as a federal Tier 1 Key Watershed, because it contains high quality habitat for at-risk aquatic species, and is believed to have high potential for restoration. Key Watersheds are given special consideration, and require watershed analysis prior to many management activities. In addition to the Key Watershed status, the ACS establishes Riparian Reserves (RR), which are streamside areas where the primary emphasis of management is concerned with riparian-dependent resources, and special Standards and Guidelines apply. The width of RRs is based on ecological and geomorphic factors, including fish presence and streamflow seasonality. Riparian Reserves overlap with AMAs and AMRs in the riparian zones, and generally the guidelines that provide the most conservative protection are applied.

1.3.4 HUMAN USES

1.3.4.1 Forestry

Forested land, which makes up approximately 91% of the Trask watershed, has supported profitable timber harvest and wood products industries since the 1880s. Forested lands in the Trask watershed were predominantly privately owned until the Tillamook Burn fires, after which the county foreclosed on most of the private commercial forest lands due to delinquent taxes. Subsequently, Tillamook County deeded the land to the State of Oregon. The volume of harvested timber peaked in the 1950s due to salvage logging, exceeding 610 million board feet in 1953 (ODF 1995). Following the salvage logging and replanting of the Tillamook Burn in the 1950s, most timber harvest has come from private and federal land (TBNEP 1998a).

According to the Tillamook District IP, approximately 40% of ODF land in the Trask watershed is showing severe symptoms of SNC infection (ODF 2003a). These stands are the focus of management activity, as directed by the Board of Forestry Intent Statement Number 6, which instructs the Tillamook District to harvest severely affected SNC stands in the next 20 years (ODF 2003a). Between 2003 and 2011, approximately 320 to 455 acres of partial cut and 10,160 to 14,515 acres of clearcut will take place. According to IP estimates, the proportion of the landscape in closed single canopy (CSC) will have been reduced by 2011 from 82% to 53%, and regeneration (REG) structure will have increased from <1% to 26%. Long-term desired future conditions (DFC) are 15% CSC and 10% REG (ODF 2003a).

In the Forest Grove District, the western portion of the Sunday Creek Management Basin drains into the Trask Watershed. Management activities include harvesting of 350 to 700 acres, and

altering the proportion of REG from <1% to 6%. The DFC target is 9% REG. In addition, 5,000 to 6,000 acres may receive fertilization during the planning period (2003 to 2011).

1.3.4.2 Agriculture

Agricultural land makes up approximately 6% of the Trask watershed, and agriculture has contributed to the economy of the Tillamook region since settlement by Euro-Americans. Dairy production began in 1852, immediately following the onset of settlement.

Commercial production of cheese began around 1900, and Tillamook soon developed a reputation as an important producer of cheese on the West Coast. Over the past 50 years, the number of farms has declined as smaller farms have been consolidated into larger commercial farms (Coulton et al. 1996). Dairy products make up 82% of agricultural income in Tillamook County. Small woodlots and cattle and calves constitute 11% and 5% of total agricultural income, respectively (TBNEP 1998a).

1.3.4.3 Urban and Rural Residential

Urban lands within the Trask watershed consist entirely of the city of Tillamook (Plate 4). Over the last several decades, the economic base of Tillamook County has shifted from a heavy reliance on timber, agriculture and fishing to a greater diversity of business and industry. Retail has been the top industry sector in recent years (U.S. Census 1990), likely due to increasing tourism and population growth in the area. Approximately 25% of the jobs in Tillamook County are related to tourism (Southern Oregon Regional Services Institute 1996).

Rural residential lands are scattered across the lower Trask River floodplain, and extend up into the forested watershed along the valley bottom. New homes in Tillamook County are increasingly targeted for upper income individuals who are looking for second or vacation homes near the coast, and these communities have become increasingly popular for retirees and second homeowners.

1.3.4.4 Recreation

The Trask watershed has been a tourist and recreational destination since the turn of the 20th century. Hiking, sport fishing, wildlife viewing, hunting, off road vehicle use, kayaking, mountain biking, horse riding, and picnicking are all popular recreational activities (ODF 2003a,b; Coulton et al. 1996).

Most recreational activity is seasonal, with the majority of activity in the spring, summer and fall. Kayaking is popular in the spring and fall, and picnicking and swimming are common in the summer. Off-highway vehicle use is the most popular year-round activity on the forested land of the Trask watershed (ODF 2003a).