Big Creek
Watershed Analysis

Bureau of Land Management

Coos Bay District

Myrtlewood Resource Area

First Iteration: May 1997

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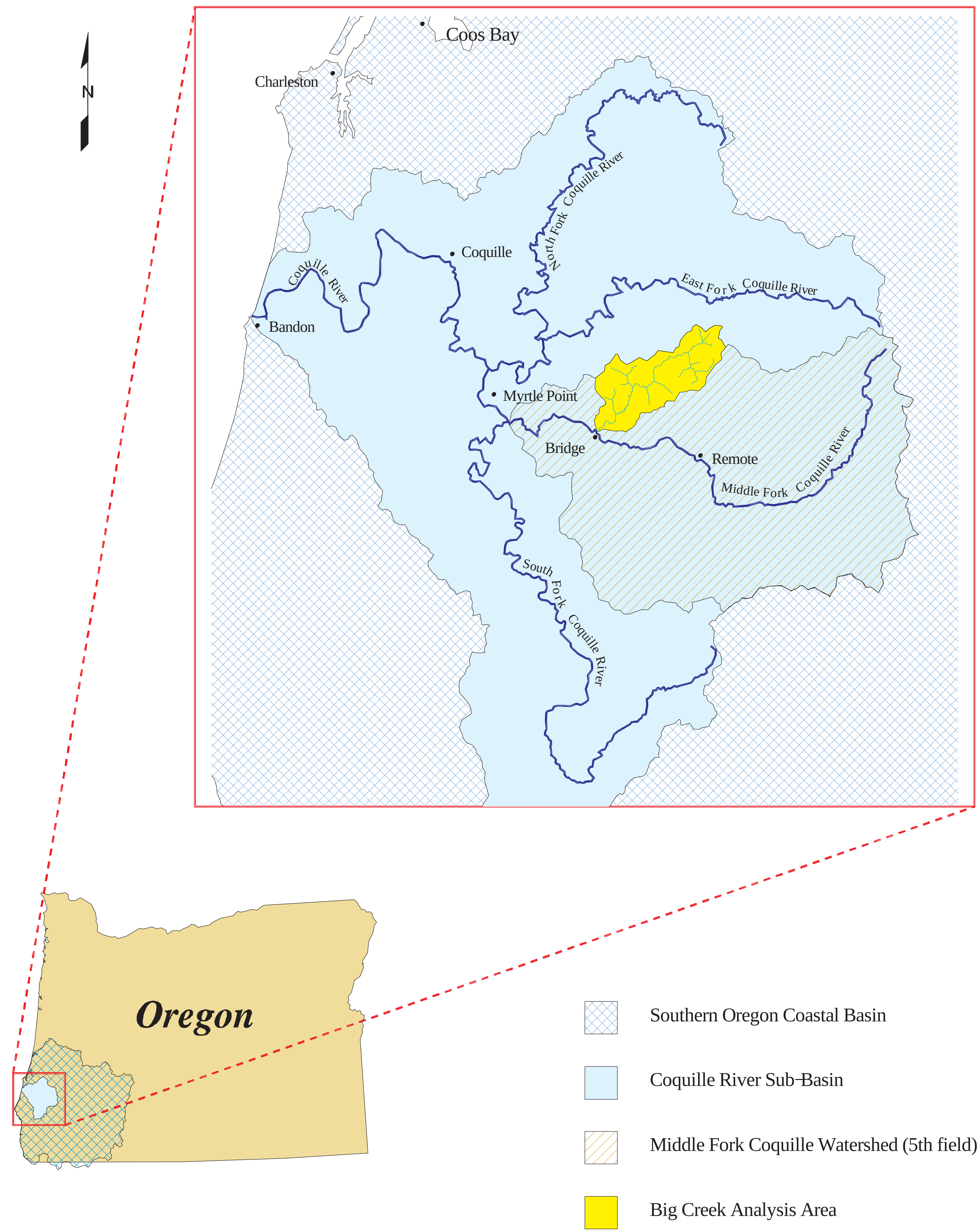
Introduction

This report is a first watershed analysis for the Big Creek subwatershed and is organized within reasonable conformity to the format described in the *Federal Guide for Watershed Analysis Ver. 2.2* (Guide). Prior analysis for this area include the Middle Fork Coquille Watershed Analysis (BLM 1994a). That analysis, however, focused on a general overview of the entire 5^{th} field watershed and was an upgrade from a previous watershed *assessment*.

Watershed analysis is a major component of the ecosystem-based management strategy mapped out in the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (USDI 1994). The stated purpose of watershed analysis is to develop and document a scientifically-based understanding of the ecological structures, functions, processes, and interactions occurring within a watershed, and to identify desired trends, conditions, data gaps, and restoration opportunities. The information, recommendations and data gaps documented in a watershed analysis can be used to help plan land management activities that are appropriate for the analysis area, support the NEPA process, and direct future data collection efforts. Watershed analysis was designed as an iterative process, with reports being revised as additional information becomes available.

The interdisciplinary team members initially convened to identify issues and questions pertinent to the analysis area, then worked independently to write sections covering the analysis questions for their respective fields of expertise. The team reconvened to synthesize the information into a cohesive watershed analysis report.

Figure I–1 Watershed Hierarchy of the Big Creek Analysis Area



I. CHARACTERIZATION of the ANALYSIS AREA

LOCATION

The Big Creek analysis area is composed of the Big Creek subwatershed which lies within the Coquille River system. This subwatershed is one of the ten subwatersheds within the Middle Fork Coquille Analytical (fifth field) Watershed and comprises 8.4% of the Watershed (Figure I-1).

The Coquille River is the largest system in the South Coast River Basin, draining 1058 square miles from the Coast Range and Siskiyou mountains, westward to the Pacific Ocean. The Middle Fork Coquille River is the largest and most eastern with a drainage area of about 305 mi^2 and mainstem length of about 40 miles. The confluence of the Middle Fork Coquille River is with the South Fork Coquille near Myrtle Point, Oregon.

The analysis area is located about 28 miles southeast of Coos Bay, Oregon, near the town of Bridge and is 16,661 acres (26 sq. mi.) in size. (Figure I-2).

Big Creek, which traverses northeasterly through the analysis area is a 5th order stream and has a gentle gradient of less than 0.5 % for over half of its length. Big Creek is 5^{th} order for most of its length with 4th order tributary drainages. Drainage areas in descending order include Big, Brownson, Fall, Bear Pen, Axe, and Jones Creeks (Figure I-3).

OWNERSHIP and LAND USE ALLOCATIONS

Of the 16,661 total acres in the analysis area, the Myrtlewood Resource Area of the Coos Bay District - BLM manages 9,021 acres (54%). The Coquille Tribal Forest comprises 1047 acres (6%) and the remaining is 6,593 acres (40%) is privately owned.

All BLM lands are designated according to the categories set forth by the Record of Decision for the Coos Bay District Resource Management Plan (RMP) and the Record of Decision (ROD) for the *Supplemental Environmental Impact Statement on Management of Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (SEIS). The type and amount of each land use allocation is shown in Table I-1 and their respective location is shown on Figure I-4.

Figure I−2 Location Map of the Big Creek Analysis Area

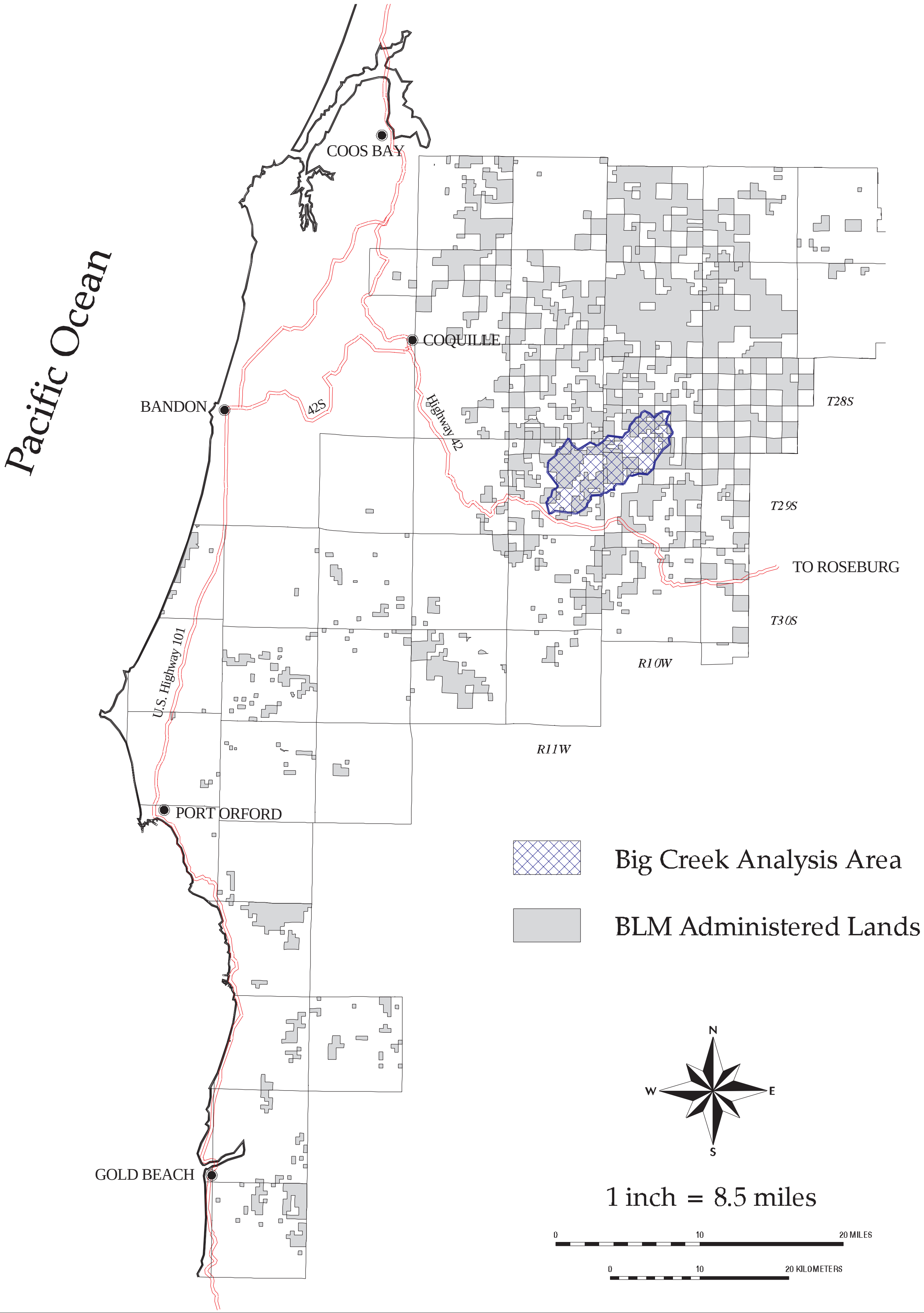


Figure I−3 Drainages within the Big Creek Analysis Area

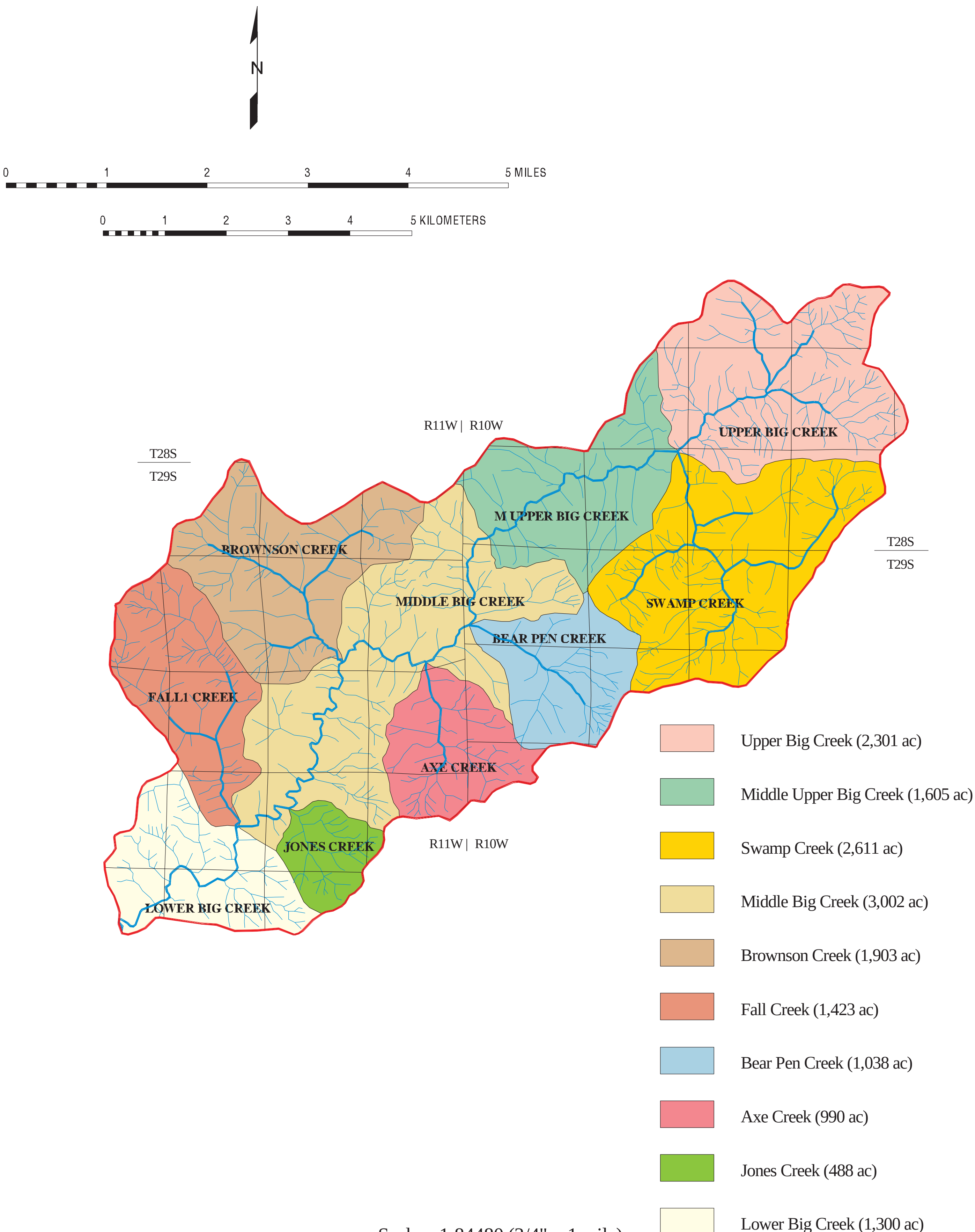


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Figure I−4 Land Use Allocations on Federally Administered Lands

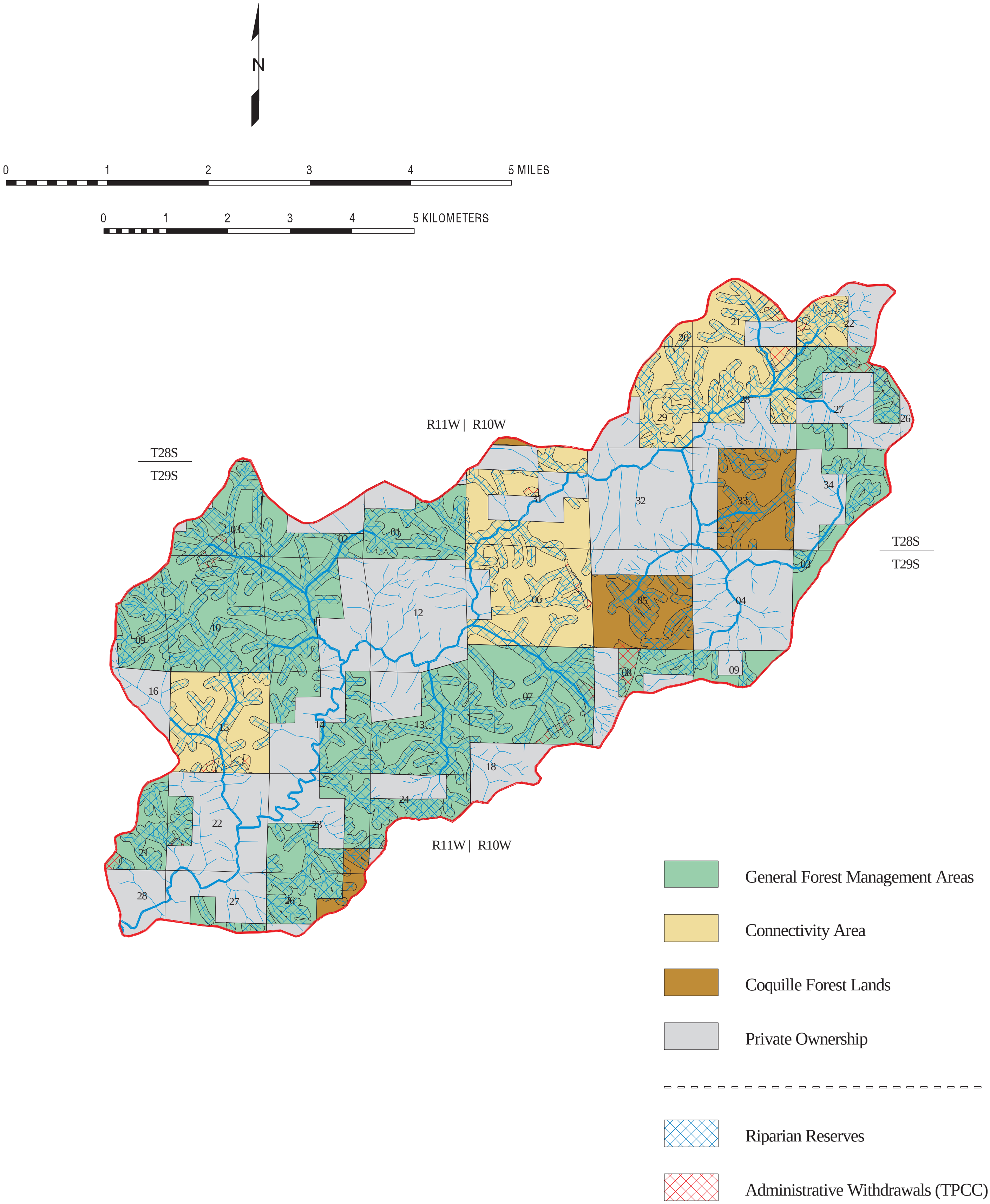

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Table I-1: Ownership and Land Use Allocations in Big Creek Subwatershed

Total Acres	16,661
Private	6,593
Coquille Tribal Forest	1,047
BLM	9,021
GFMA (General Forest Management Areas)	6,034
LSR/MMR (late-Successional Reserves)	0
Connectivity	2,987
Riparian Reserves-all land allocations (estimate)	5,038
Total Reserves[1]	5,275

[1] Includes TPCC withdrawn lands, and Riparian Reserves (GFMA only)

GEOLOGY

The Big Creek analysis area is comprised of formations characteristic of the Coast Range Physiographic and Klamath Mountain Physiographic Provinces (Figure I-5).

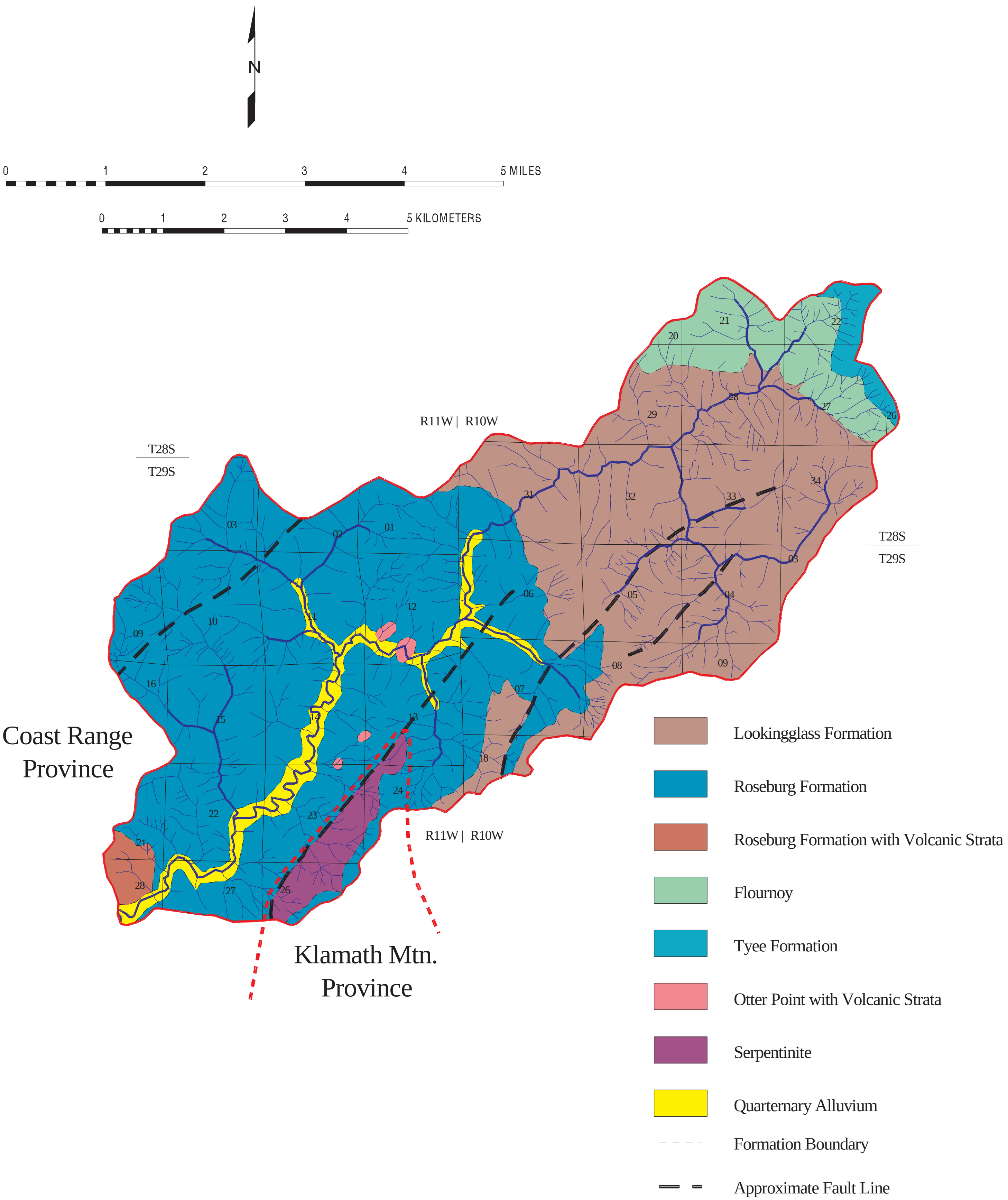
Geologists speculate that between 45 and 60 million years ago the Coast Range Physiographic Province was part of a large, partially enclosed basin called a geosyncline. Vast amounts of submarine basalt flows, breccias, and tufaceous sediments were deposited in this geosyncline during past volcanic activity and subsequent surface erosion during tetonic uplifting. These flows and deep water sediments constitute the Roseburg, Looking glass, Flournoy, and Tyee Formations.

The Klamath Mountain Physiographic Province borders the Coast Range Province on the south and extends into California as far south as San Francisco. It is the most geologically complex province in southwestern Oregon. It is comprised of very old (450 million yrs.) sedimentary and volcanic rocks, locally metamorphosed (altered by heat and pressure), with intrusions of granite and serpentine. The Jones Creek portion of the analysis area is comprised of the Otter Point formation and soils derived from serpentinite parent materials. This isolated portion of the drainage provide a unique character to the Big Creek drainage in regards to sediment type, vegetation characters and landscape stability.

There are six different geologic formations in addition to other deposits and outcroppings within the analysis area. They are from the oldest formation to the youngest: Otter Point, Roseburg, Lookingglass, Flournoy, Tyee Formations and the Quaternary alluvium. The underlying base rock is weakly resistant to erosion.

Four fault lines within the analysis area are predominately found lying in a Northeasterly and Southwesterly direction as are most in southwestern Oregon.

Figure I−5 Geologic Formations and Fault Lines



Scale = 1:84480 (3/4" = 1 mile)

Geologically, the drainage has a steep young portion on the Tyee and Flournoy formations. The Looking glass formation is steep in those areas associated with fault lines or adjacent to other formations due to uplifting or resistance to lifting. The drainage is dominated by the Roseburg and Looking glass formations. These two tertiary aged formations have a higher siltstone and mudstone component in the parent material in addition to being composed of larger bedded materials (Townsend 1977, Beaulieu 1975, Burroughs 1976)

SOILS

According to the Soil Survey of Coos County, OR. (USDA 1989), there are fourteen different soil types on several different slope classes (Figure I-6). These soil types can be grouped together by similar properties to encompass four map units that cover the Big Creek drainage. The Preacher-Bohannon series and Digger-Preacher-Remote series that are deep to moderately deep, moderately steep to very steep, gravelly and loamy soils that formed in colluvium and residuum derived from sedimentary rock. The Serpentano-Digger series that has similar depth, slope steepness, texture, and is derived from metamorphic and sedimentary rock. The last series is the Umpcoos-Rock outcrop-Digger that is more shallow than deep, very steep, gravelly and loamy and formed in colluvium derived from sedimentary rock.

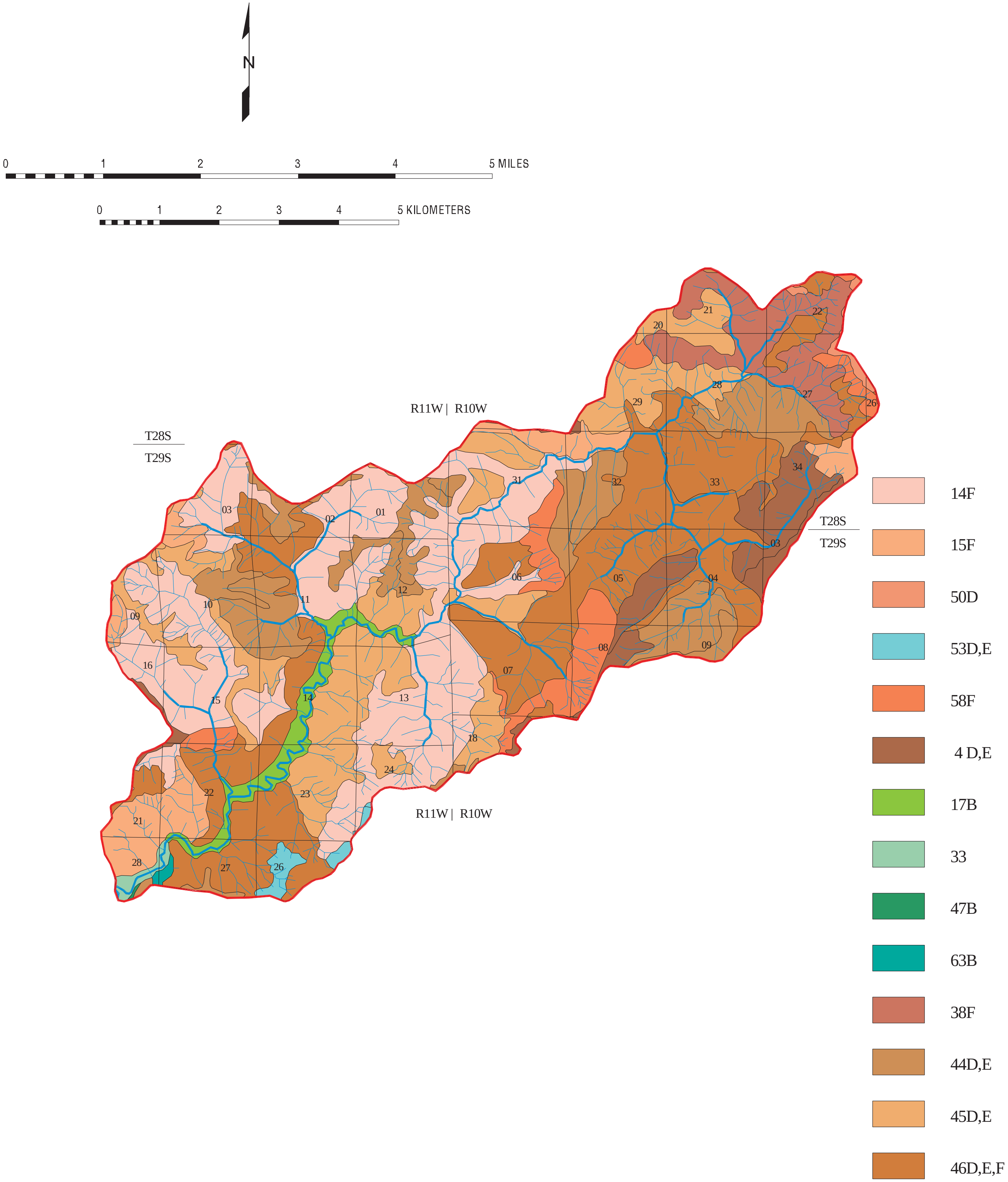
CLIMATE

Annual precipitation occurs mostly as rainfall, ranging from 55 inches in the low elevations and river valleys along the Middle Fork Coquille, to more than 70 inches in the upper areas of Big Creek near 2600 feet (OSU 1993). Precipitation varies strongly with elevation, with greater amounts in the higher portions of the drainage. Aspect and drainage orientation to prevailing winter Southwest winds also influence precipitation amounts. The analysis area seems to occupy a slight rain shadow behind the Siskiyou mountains from the Southwest trending winter storms, thus precipitation is lower than elsewhere in the Coast Range. Cool, moist air masses lifting over the Coast Range can produce snow over 1500-1800' elevations. These are intermittent snow packs, usually persisting on the ground for only a few weeks, and sometimes melting quickly with warm winds and rain. Extra water storage as snow water equivalent can elevate flood waters.

Approximately 90% of the average annual precipitation occurs between October and April, with 50% occurring during November-January. Although heavy rainfall occurs with winter storms, most of the precipitation is low intensity, and commonly occurs as "drizzle". Precipitation during the May through September summer months is only about 10% of the annual average, the dry season precipitation being 7 -8 inches (OSU 1982).

Maximum precipitation periods are responsible for high runoff, including flooding, watershed erosion, slides, and debris torrents - but occur on an infrequent basis. High precipitation with the melt of existing shallow snow packs can worsen flooding. Analysis from area NOAA Cooperative Weather Stations, damaging storms have a return frequency of 5 years or more, and could be expected to have daily precipitation of at least four inches. Cumulative precipitation of 9 inches or more in several days, has been correlated with a higher incidence of landslides and torrents (see Section III.1- Erosion Processes).

Figure I−6 Soils Map of the Big Creek Analysis Area



Scale = 1:84480 (3/4" = 1 mile)

Temperatures are generally quite mild with maximum temperatures seldom exceed the low 90's, nor fall much below freezing. Sustained hourly wind speeds on Signal Tree, a high point, about five miles East of the analysis area have not exceeded 48 mph in the last five years, with a gust speed of 72 mph (does not include the December 1995 storm). The prevailing wind direction is South/Southwest.

WATERSHED GEOMORPHOLOGY

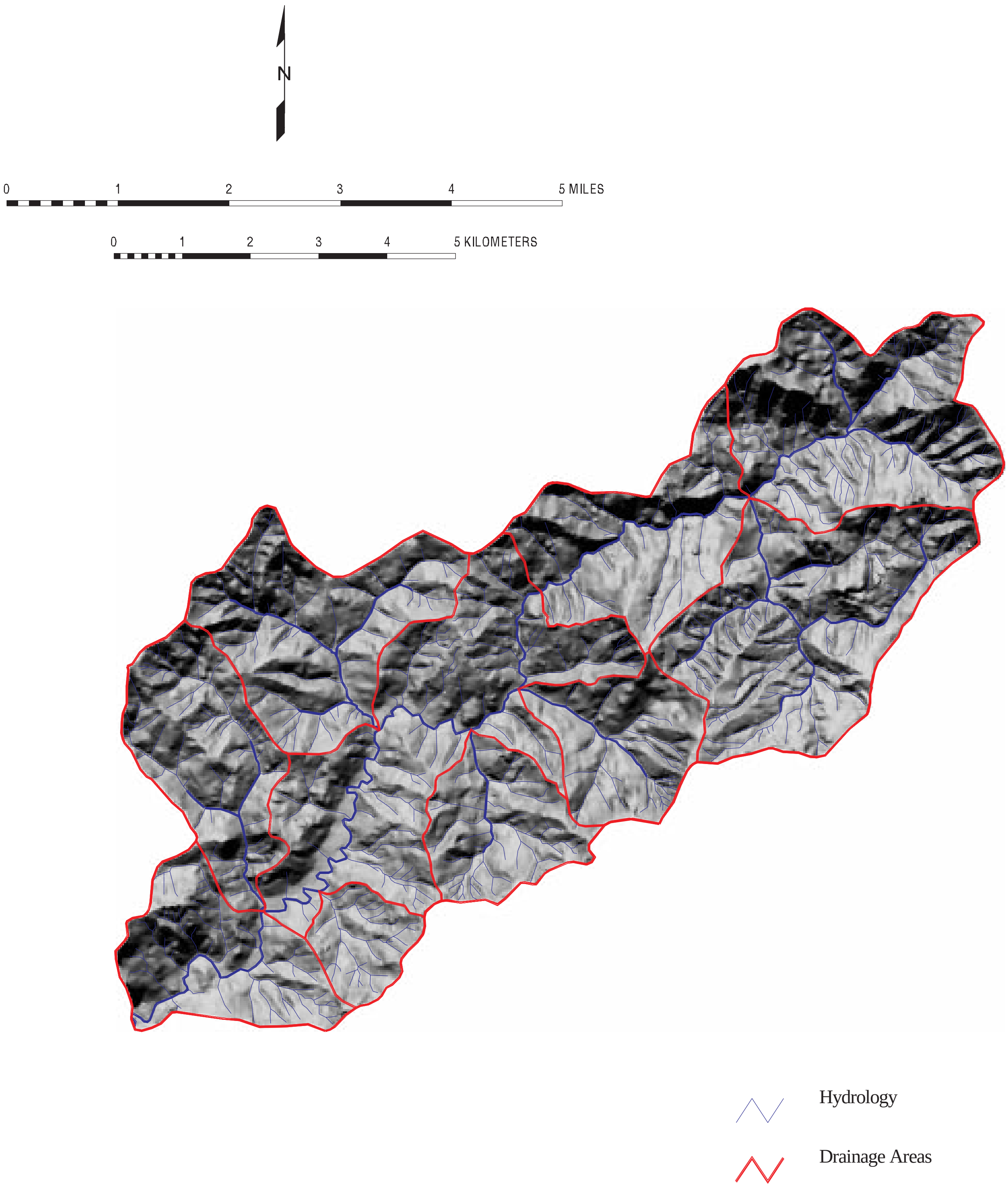
The Coast Range is a northeast-southwest trending anticline, dissected by perpendicular stream systems (Figure I-7). The drainage pattern is dendritic with a high drainage density of more than 7.2 mi/mi^2. About 186 miles of streams are found of which first and second order streams comprise 79% of the total drainage density (Table I-2). These are generally steep headwaters channels draining small catchments. Many of the first order streams and some of the second order streams become intermittent by late summer. The remaining 21% percent of the stream miles are 3^{rd} order or greater have larger drainage areas and are almost always perennial.

Table I-2 Miles of Stream by Stream Order for the Big Creek Analysis Area.

Drainage	Miles of Stream by Stream Order[1]					
	1	2	3	4	5	Total
Lower Big Creek	7.9	3.8	1.4	<0.1	2.4	15.6
Middle Big Creek	17.1	6.3	2.7	<0.1	6.3	32.5
Middle Upper Big Creek	9.0	2.6	0.3	-	2.5	14.4
Swamp Creek	17.9	6.9	4.6	1.4	-	30.8
Upper Big Creek	18.0	6.2	2.7	0.8	1.2	28.9
Brownson Creek	12.9	3.5	2.6	0.9	-	19.9
Fall Creek	10.6	2.5	3.1	0.9	-	17.1
Bear Pen Creek	4.4	2.9	1.1	0.9	-	9.3
Axe Creek	6.5	3.3	0.8	1.2	<0.1	11.9
Jones Creek	3.6	1.4	0.9	0.2	-	6.1
Total (%)	**107.9** 58%	**39.4** 21%	**20.2** 11%	**6.5** 3%	**12.5** 7%	**186.5**
Drainage Density, mi/mi^2	**4.1**	**1.5**	**0.8**	**0.3**	**0.5**	**7.2**

[1] Relative position of streams, where all exterior links are order 1, and preceding downstream, the confluence of two like orders result in existing stream order +1. The junction of two different orders retains the higher order, and the main stream always has the highest order (Strahler 1957).

Figure I−7 ’Hillshade’ Representation of the Topography



(Topography 3−D effect is exaggerated 3x)

Scale = 1:84480 (3/4" = 1 mile)

Big Creek has very low gradient for a coastal stream. Contrarily, the tributary drainages consist of narrow canyons and much steeper channel gradients. Tributary streams drain rugged mountainous land forms, from near sea level to 2600 feet at the northeastern end of Big Creek and generally start below steeply sloping headwalls. Longitudinal profiles of streams are useful to compare morphology between stream reaches or from one stream to another. Bear Pen Creek and Jones Creek have the highest average gradients of 18% and 15.3 % respectively. These are high energy erosional streams with a high capacity to move water and sediment. Brownson, Axe, Fall, and the upper half of Big Creek are moderate to steep gradient streams. These are moderate to high energy erosional streams, with a moderate to high capacity to move water and sediment. However, all streams contain reaches of low gradient, which provide high habitat value. The lower portion of Big Creek is low gradient streams with average gradients of less than 1 %. These are low energy depositional streams.

HYDROLOGY

Forest hydrology is the study of the occurrence, movement, and distribution of water across forested watersheds, and how they are affected by soils, geology, land form, vegetation and climate. The principal driver of hydrology is precipitation as rain of which a high percentage ends up as runoff . Precipitation events interact with the land form, soils, geology, and vegetation. This interaction has an effect on hydrological characteristics such as, floods, frequent discharge, low flow, and distribution of flow.

Except for direct interception into streams, nearly all of the runoff occurs by infiltration into the soils and subsequent subsurface routing to streams due to the low water storage capacity of the shallow and coarse textured soils, and impermeable underlying bedrock that does not readily transmit water. Overland flow is seldom observed in the Coastal forests because infiltration capacities are in excess of 2 inches per hour, which is much higher than the most intense hourly storm likely to occur in this area (4 inches in 6 hours) (NOAA 1973). Surface flow can runoff from compacted sites, such as roads and landings, and can increase quickflow from rainstorms.

The stream network expands during storms, especially over several days to weeks, as more of the watershed soils become saturated, and live flow again reappears in low order intermittent channels. By examination of available precipitation and stream flow records, it is estimated that total runoff is about 65% of annual precipitation. The remaining losses include soil recharge, transpiration from the dense vegetation, and evaporation. Steeply inclined drainages, little groundwater storage, and steep stream gradients cause quick hydrograph response and flashy flow after the onset of rain. Stream hydrographs for an individual storm emphasize this short lag time with a steep rising curve, but a more moderate recession.

VEGETATION

Most of the Big Creek analysis area is comprised of the Port-Orford-cedar (*Chaemacyparis lawsoniana*) variant of the western hemlock (*Tsuga heterophylla*) zone (Franklin and Dryness 1973). An isolated area of White oak (*Quercus garryana)* woodland is found on BLM lands adjacent to the southern property line of Sec. 15, T.29 S., R.11 W.

Approximately 74% of the vegetation has been altered through logging or agricultural practices. These lands were generally reforested and are presently covered with Douglas-fir stands 60 years old or less and are of varying density. Furthermore, it is estimated that 99% of private lands have been harvested since the 1940s.

GIS data, describing forest age class, size, and density (Forest Operations Inventory, FOI), is available for BLM and Coquille Tribal lands. While age class information for older stands (>80 years or so) is often inaccurate and one age class may often encompass stands of varying ages and densities, FOI offers the best available picture of forest condition. FOI information for young stands, particularly those < 40 years old, is far more accurate. Data on private lands is interpreted from aerial photography and is less accurate. Forest age class are summarized in Table I-3 and their locations are mapped on Figure I-8.

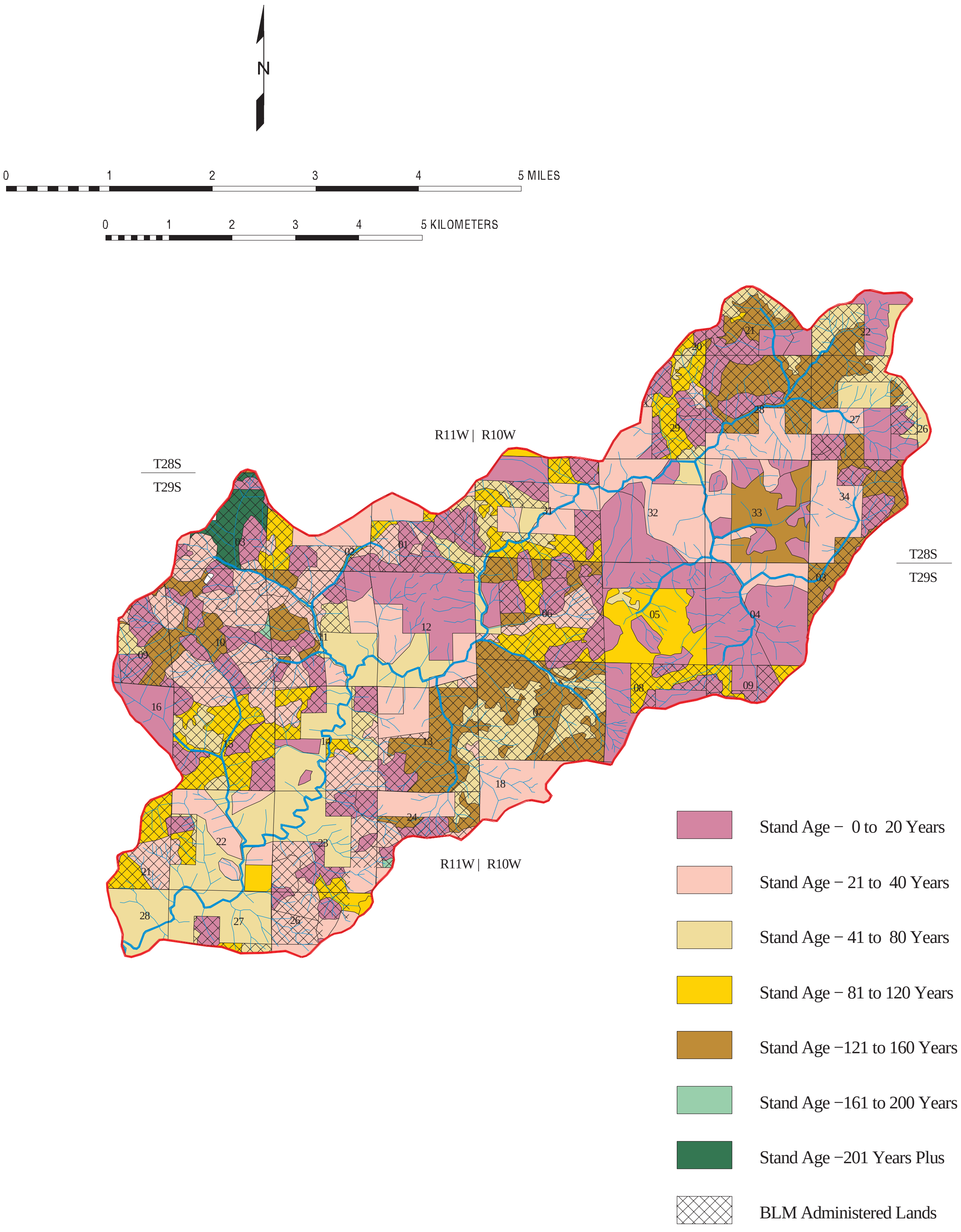
Table I-3. Age Class Distribution

	BLM Ownership (9,021 ac)		Coquille Forest (1,047 ac)		Private Ownership (6,593 ac)		TOTAL (16,661 ac)
Forest Age Class	Acres	% of BLM	Acres	% of CTF	Acres	% of PVT	% of Total
0 - 20	2447	27 %	308	29 %	2245	34 %	30%
21 - 40	1732	19 %	106	10 %	2527	38%	26 %
41 - 80	1183	13 %	16	< 1 %	1779	27 %	18 %
81 - 120	1368	15 %	339	32 %	43	< 1 %	10 %
121 - 160	2101	23 %	278	28 %	-	-	14 %
161 - 200	13	< 1 %	-		-	-	< 1 %
200 +	169	2 %	-		-	-	1 %
Totals	9,021	54 %	1,047	6 %	6,593	40 %	

WATER QUALITY

Big Creek from the mouth to the headwaters was listed on ODEQ's 303(d) list of water quality limited streams with regard to temperature during the summer. Streams are listed on the 303(d) list when monitoring data indicates stream reaches are not meeting State water quality standards. State water quality exceedances for dissolved oxygen for salmonid spawning and incubation during October-April and fecal coliform levels are suspected in the lower Big Creek, but monitoring to confirm this has not been conducted.

Figure I−8 Age Class Distribution



Scale = 1:84480 (3/4" = 1 mile)

SPECIES AND HABITATS

The location of the analysis area, land ownership patterns, and the land use allocations help define the ecological role of the analysis area in the larger landscape. Key ecological functions are: (1) to provide habitat and refugia for aquatic and late-successional species formerly widely distributed in the Middle Fork Coquille system, and (2) to provide population and genetic seeds for future re-colonization through developing connections to other or future habitats. Additional functions for terrestrial species include: (1) facilitating dispersal of wildlife between the LSRs to the north and south of the analysis area; (2) maintaining a forest matrix which retains important habitat features such as snags, down logs, and a complex forest structure conducive to wildlife movements; and (3) providing habitat for early and mid-successional species.

Terrestrial

The analysis area contains numerous ecologically and economically important wildlife species. (Appendix C, Table C-1) contains a list of all vertebrate wildlife species known or suspected to occur. There are 27 wildlife species or species groups of special management concern because they required further site-specific analysis under the regional planning efforts (USDI 1995), or because special local concern existed (Appendix C, Table C-2). These species of concern[1] rely on key habitats or habitat features such as complex forest structure, late-successional forests, snags and down logs, and rocky habitats and are further influenced by the pattern of these habitats on the landscape.

There are approximately 230 vascular plant species representing 70 plant families documented or likely to occur within the analysis area. Of these species, approximately 20% (43 species) are considered exotics, some of which are considered noxious weeds. Bryophytes, lichens, and fungi represent a large percentage of the vegetative diversity. Many of these species, have important ecological roles (such as nutrient cycling, soil stabilization, water retention, etc.) in forested ecosystems while having specific habitat requirements. Species numbers are unknown, but it is estimated that over 500 species probably occur in the analysis area, at least 29 of which are of special management concern and require further site-specific analysis under the regional planning efforts .

Riparian

Riparian areas are among the most heavily used habitats for most wildlife species occurring in the forest lands of western Oregon, because they provide requirements vital to these animals for some aspect of their lives; i.e., food, water and shelter. Brown, et al., (1985) found that of the 414 wildlife species analyzed (in western Oregon and Washington), 359 used riparian or wetland habitats. In addition, several species of concern occur in spring and seep habitats. Riparian areas are sometimes used as travel corridors, and may be used for species dispersal. These areas also provide nesting and perching sites, particularly for those species that use the aquatic invertebrate populations as a prey base.

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[1]The phrase "species of concern" is used to refer to the group of species for which special management concern exists in the analysis area (consistent with the use in WA Guide Ver 2.2) and is not to be confused with the species of concern list maintained by the U.S. Fish and Wildlife Service which is roughly analogous to the former Federal Candidate 2 species list.

The abundance and survival of aquatic organisms is dependent on riparian areas. Inputs from riparian areas provide the foundation for aquatic food webs. Aquatic invertebrates utilize riparian vegetation for mating and oviposition, and fallen riparian vegetation provides cover and habitat for stream fishes and amphibians.

Aquatic

The watershed provides habitat for a variety of native fish species (Table III.6-7) which use Big Creek and its tributaries for all or part of their life cycles. The most widespread species are the Salmonidae (salmon and trout). Other groups present in the watershed include Cottidae (sculpin), Cyprinidae (minnows and dace), Catastomidae (suckers), Petromyzontidae (lamprey), and Gasterosteidae (sticklebacks). Populations of exotic fishes (probably Cyprinids such as *Carassius* and *Gambusia*) may be present in privately-owned ponds, but are not covered in this analysis. The fishes of the Big Creek watershed play an integral role in aquatic and terrestrial food webs in Big Creek as well as help support important commercial and recreational fisheries.

Several species of amphibians use streams in the watershed for all or part of their life cycle. Amphibians, crustaceans and hundreds of other invertebrate species make up most of the biomass in streams in the watershed and are the functional building blocks of the aquatic ecosystem. In addition to providing the major food source which sustains stream fishes, the invertebrates contribute to the maintenance of aquatic and riparian food webs by processing vegetation and leaf litter, increasing the availability of nutrients to other organisms (Christensen 1996, Taylor 1996).

HUMAN USES

The Big Creek area has been the location of both prehistoric and historic cultural activities. The area is adjacent to the Middle fork Coquille which provided an important transportation link between the southern Oregon Coast and Camas Valley. Now, as well as in the past, the focus of human activity tends to concentrate along Big Creek with residences and agricultural uses. Timber production is the predominant use of the lands within the analysis area with dispersed recreation occurring on these lands.

II. ISSUES AND KEY QUESTIONS

ISSUES

Three main issues affecting management have initiated the need for and the focus of the watershed analysis in the Big Creek area. The first issue is to determine the overall condition of the watershed as it relates to; terrestrial plant and animal habitats, the components of the Aquatic Conservation Strategy, and population levels for species of concern.

The second issue is to determine which restoration opportunities could be enacted to improve water quality, aquatic habitat, vegetative communities, or wildlife habitat, or other opportunities. Recommended restoration activities would be brought forth into the 'Jobs-in-the-Woods' program or other funding opportunities and similarly evaluated for viability and environmental impacts (NEPA).

The third issue is to identify potential timber harvest areas within the GFMA land use designation that could contribute to the District's Probable Sale Quantity (PSQ) for fiscal years 1999 and 2000. The Coos Bay Resource Management Plan requires that potential harvest areas be identified through the watershed analysis process. Once identified, these areas are brought forth into the timber sale planning / NEPA process to verify the operational viability and assess the direct, indirect, and cumulative environmental impacts.

KEY QUESTIONS

The Guide recommends development of ‘key questions’ which address the main issues, focus on ecosystem elements as they relate to management actions, promote synthesis/interpretation of information, and are to be answered by the analysis. They are:

1. What immediate opportunities and needs for restoration exist in the analysis area?
2. Where could timber be harvested to help meet the District's commitment to PSQ,
3. What management activities are appropriate within Riparian Reserves and what criteria are appropriate for delineating final Riparian Reserves boundaries for intermittent streams?
4. What is the current condition of Connectivity blocks in and adjacent to the analysis area? How are they fulfilling the objectives of providing; connectivity between Late-Successional Reserves, dispersal/carryover of organisms, and early successional habitat.

ANALYSIS QUESTIONS

In addition, each section contains a series of analysis questions. These were developed by the team and are designed to become progressively more refined in order to answer the key questions. The Guide also contains a series of so called ‘core questions’ to be addressed. Answers to these core questions are contained within the team’s analysis questions or were not found to be relevant to this analysis.