VEGETATION

Characterization

Array and Landscape Pattern of Plant Communities and Seral Stages - Vegetation mapping work, currently in progress, shows the hemlock series to be the overwhelming dominant plant series in the North Fork Coquille Watershed. Grand fir and tanoak series are present on valley side sites next to the major valleys in the southwest half of the Watershed. Old aerial photos indicate fire prairies existed into the 1940s on some southwest facing ridge tops near the major valleys. A small patch of oak grows on Rock Prairie. The common conifer trees are Douglas-fir, western hemlock and western redcedar. Grand fir is present and locally common in valley side locations. The Watershed is near the northern limit of the range of Port-Orford-cedar. Port-Orford-cedar, when encountered on BLM land in this Watershed, occurs as widely scattered individuals and disjunct small patches. There are no known stands of mature or old-growth Port-Orford-cedar on Federal land in this Watershed. Grand fir, blue blossom ceanothus, Oregon myrtle on upland locations, and to a lesser extent Port-Orford-cedar suggest there was a high fire frequency in those locations where they are found before Euro-American settlement. Vegetation on the valley bottom and valley side hills is highly modified by a long history of human use.

Local Climatic Influences Affecting Vegetation Patterns - The North Fork Coquille Watershed is in an area with a steep climatic gradient for a Coast Range watershed. The watershed has a marine air influenced wide valley, within a few miles of 2,400-foot tall ridges.

The marine air influence is a factor setting the northern extent of tanoak's range at Hudson Ridge in the North Fork Coquille Watershed. Frost/ cold temperatures and summer drought limit the range of tanoak (Atzet *et al.* 1996). Tanoak grows primarily on warm south facing valley side slopes in the North Fork Coquille. The south slopes provide a long warm frost free growing season, and mild winter temperatures. Wide valleys allow for moist marine air, with its associated fog drip and higher humidity, to reach inland and by that moderate the summer drought conditions. The lower elevation of tanoak is limited by cold air pooling in valleys. The upper elevation limit is associated with the increased incidence of frost with increased elevation. Myrtle and big leaf maple are generally found below 1,800 feet, which suggests that cold or snow break may limit the ranges of both these species. Myrtle is found on droughty south to west facing slopes frequented by fire and on riparian sites where the soils are seasonally saturated. Big leaf maple is found on the well-drained benches and lower slopes. Both myrtle and big leaf maple are often components of low elevation stream side stands. Chinkapin and madrone are occasionally found in association with tanoak on warm valley side locations. Periodic disturbance may be necessary to maintain a component of either of these two species in a stand, and both are tolerant of extreme heat and drought (Niemiec et al 1995). Red alder was only rarely found above 1,800 feet, in either an upland or riparian setting before the Watershed area was roaded. The general lack of red alder in the unmanaged forest can be attributed to two factors. First, the snow line is about 1,800 to 2,000 feet. Above that elevation early snows will break the brittle alder branches giving the conifers a competitive advantage. The other factor is red alder is short lived and shade intolerant, which means it will drop out as a component of the forest if stand replacement disturbances are not occurring at intervals less than about 100 years.

The Watershed's east rim is next to Tioga Creek Subwatershed. Tioga Creek is situated well upstream from the ocean and direct marine air influence is greatly restricted by several miles of narrow twisting canyon. This results in Tioga Creek Subwatershed having a somewhat more interior climate than the North Fork Coquille Watershed. A consequence of this is cold air pools in the Tioga Creek Subwatershed over night and spills into the warmer Middle Creek Subwatershed in the morning through a low gap on the ridge where the Middle Creek-Burnt Mount Tie Road is located. Under the right conditions, the cold air flowing between watersheds results in hoar frost forming on the vegetation in the low ridge gap. The cold air drainage also results in a higher incidence of frost and shorter growing season in the riparian zone and lower slope locations than at the midslope locations along the upper main stem of Middle Creek.

The southern most occurrence of devils club in the North Coquille Subwatershed suggesting the climatic conditions favorable to that species cease to occur south of Coos Mountain.

Processes Affecting Landscape Patterns - The most prevalent stand replacement process occurring today is timber harvest and subsequent reforestation. Landscape level vegetation patterns have been altered through fire exclusion, agricultural practices, and logging. Before 1950, logging was concentrated in the west half of the Watershed. That part of the Watershed was closer to utilization centers, has larger streams, which are suitable for log drives, and a topography suitable for railroad logging. The first log drive in the Watershed was in 1898 (Farnell 1979) and in 1907 a railroad for logging on top of Blue Ridge entered the North Fork Coquille Watershed from Daniels Creek (Beckman 1990). Timber harvest began in earnest on the east half of the Watershed in the 1950s following the a major renovation of the Middle Creek Road and construction of the Burnt Mountain Road accessing the area from the west, and the Hatcher Creek Road accessing the Watershed from the east. Up to 1957, logs hauled out of the Watershed over the Hatcher Creek Road were dumped behind the Tioga Splash Dam and floated to town in log drives down the South Fork Coos River. Before Euro-American settlement, the dominant factor affecting overall landscape patterns was fire. Flood (peak flows) and debris flows were the major influences on riparian vegetation patch dynamics (Jones *et al.* 2000).

Table Veg-1: Processes that Influence the Current Vegetation Patterns

Process	Influence on Upland Vegetation:		Influence on Riparian Vegetation:	
	Landscape Patterns (Stand Replacing)	Stand Structure (Stand Modifying)	Riparian Stand Replacing	Riparian Stand Structure (Stand Modifying)
Fire (Lightning & Human Caused)	X	X	X	X
Wind	X	X	X	X
Management (Timber Harvest & Agriculture)	X	X	X	X
Disease (Primarily Root Rot)		X		X
Insects		X		X
Snow break		X		X
Landsliding/ Mass Wasting		X	X	X
Stream Bank Erosion				X
Plant Competition		X		X

For general discussions on processes affecting stand structure and landscape patterns see:

- Franklin and Dyrness (1973), and Hemstrom and Logan (1986) for plant succession.
- Averill *et al.* (1995) for an overview on disturbance.
- Oliver and Larson (1990) for vegetation competition and stand dynamics.
- Agee (1993) for fire as a disturbance process. Especially, fire effects on vegetation (pg. 113-150), fire effects on western hemlock forests (pg. 205-225).
- Agee (1993) pg. 9, Smith (1962) pg. 413-414, 422, & 499, and Oliver and Larson (1990) pg. 100-106 for wind as a disturbance process.

In the Coast Range, many vegetation patterns and the processes that influence those patterns occur at scales larger than a watershed. The following appendices cover those patterns and processes that occur across the Umpqua Resource Area, and by that, allow a greater portion of the space in the Vegetation Chapter to be devoted to North Fork Coquille Watershed specific information and to new information and observations.

- "Appendix: Fire History and Fire Pattern Affects on Stand Development and Landscape Patterns on the Umpqua Resource Area With Emphasis the North Coquille, Middle Creek and Tioga Creek Subwatersheds" provides an analysis and synthesis on how fire affects stand and landscape patterns.
- "Appendix: Vegetation and Disturbance Processes" covers vegetation communities, successional patterns and the disturbance caused by fire, wind, snow, landslides, floods, insects, and disease.
- "Appendix: Managing for Landscape Level Diversity Based on Observed Disturbance and Stand Development Patterns" is a synthesis document on managing landscapes by emulating fire influenced stand and landscape patterns. This appendix duplicates parts of the Fire History and Fire Pattern Appendix.

Current Conditions

Array and Pattern of Vegetation: Current vegetation patterns are a result of past management actions, harvest practices and associated road building, land ownership, fires, human settlements, agriculture and farming. Landsat data displayed on Map Veg-2 and summarized on Table Veg-2 show the cover condition across the Watershed as of the summer of 1993. Early or mid-seral stands occupy most of the private forest land in the Watershed. Approximately 9,358 acres are agricultural and rural residential lands.

Table Veg-2: Forest Classes and Acres Based on Landsat Data from Summer 1993.	agriculture and rural residential	new clearcuts, young plantations, nonforest	conifer stands (all diameters)	hdwds stands <10 in. dbh	hdwds stands 10-19 in. dbh	hdwds stands 20+ in. dbh	mixed stands <10 in. dbh	total
North Coquille Subwatershed	193	5,048	13,789	568	2,748	897	770	24,013
Fairview Subwatershed	2,191	4,628	12,527	237	2,329	596	453	22,961
Middle Creek Subwatershed	813	4,807	20,410	653	3,700	952	1,048	32,381
North Coquille Mouth Subwatershed	6,161	4,113	5,346	256	2,014	782	207	18,879
Total Ac for the North Fork Coquille Watershed	9,358	18,596	52,071	1,715	10,792	3,227	2,477	98,235
Percent of acres in the North Fork Coquille Watershed	9.5%	18.9%	53.0%	1.7%	11.0%	3.3%	2.5%	100.0%

The GIS Forest Operations Inventory (FOI) data set contains stand specific information for all stands managed by the BLM. The FOI is designed to track past and prescribed land treatments, and contains other information that is helpful in setting land treatment priorities. The FOI layer in GIS was last updated in 1997. Map Veg-3 and in Table Veg-3 show FOI forest age class data, organized to match RMP Seral Stages[1]. Appendix: Age Class Distribution presents the acres by age class for each subwatershed. Figure Veg-1 displays the FOI age class data in graph form.

[1] The FOI data set shows the old-growth stands in the North Coquille Subwatershed and in the Alder Creek Drainage to be greater than 300-years old. These birth dates were assigned in the 1980s. More recent fires history work combined with local knowledge indicates no stands in either the North Coquille Subwatershed or the Alder Creek Drainage have birth dates from before 1735. Fire history work does show stands older than 300-years in the in other parts of the Middle Creek Subwatershed. The FOI data base has not been corrected to reflect this information. However, the FOI birth date information shown in the Vegetation section of this document was edited to reflect our current knowledge.

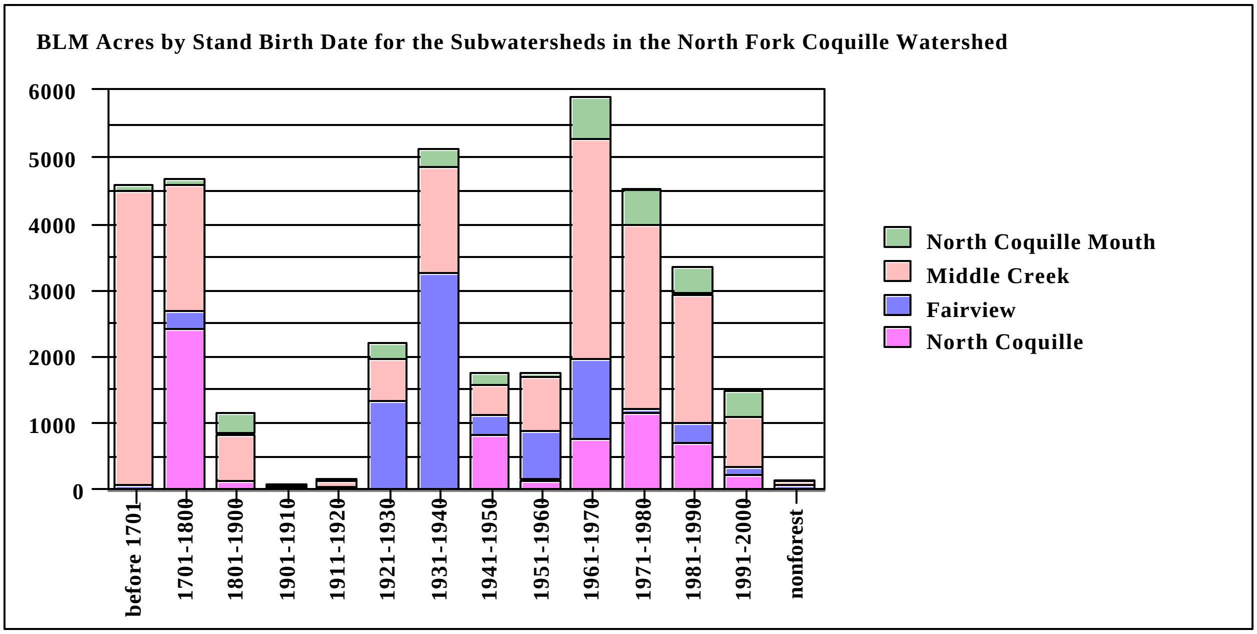

Figure Veg 1

Table Veg-3: BLM FOI Acres by Stand Age for the Subwatersheds in the North Fork Coquille Watershed

Seral Stage	stand age	stand birth date	North Coquille	Middle Creek	Fairview	No. Coquille Mouth	Acres by age class	total acs. by seral stage	% acs.by seral stage
nonforest	N/A	N/A	4	47	63	4	118	N/A	0.3%
Early Seral	0-9	1991-2000	228	751	122	380	1,481		
	10-19	1981-1990	713	1,927	308	421	3,369		
	20-29	1971-1980	1,143	2,724	95	553	4,515	9,365	25%
Mid Seral	30-39	1961-1970	763	3,297	1,219	630	5,909		
	40-49	1951-1960	162	811	728	64	1,765		
	40-59	1941-1950	828	478	292	152	1,750		
	60-69	1931-1940	25	1,591	3,228	283	5,128		
	70-79	1921-1930	0	637	1,328	225	2,189	16,740	45%
Late Seral and Old-Growth	80-89	1911-1920	10	91	35	47	183		
	90-99	1901-1910	20	34	12	11	78		
	100-199	1801-1900	113	719	24	287	1,143		
	200-299	1701-1800	2,426	1,066	262	71	3,825		
	300 +	before 1701	0	5,243	82	72	5,398	10,625	29%
		total acres	6,435	19,415	7,799	3,200	36,848		

Array and Pattern of Riparian Vegetation: The streamside BLM stands were evaluated with respect to their potential to supply large wood to the adjacent streams. Table Veg-4 summarizes these results. Map Veg-4 displays the stand types within 100 feet of streams on BLM land. This evaluation is based on the process described in the DNR large woody debris recruitment potential module (Washington Forest Practice Board 1993). The DNR process involves examining and classifying steamside stands using aerial photos. For this analysis we stratified stream side stands based on current large woody debris recruitment potential using reclassed 1993 Landsat satellite data. We used the DNR protocol's streamside vegetation classification as a basis for reclassing the satellite data. The analysis findings, methods used and the strengths and limits of using Landsat data on GIS are discussed in the Instream CWD Recruitment Potential Appendix. The acres of stream side forest next to 2nd order and smaller streams are overestimated because the "buffer" command used to select data within 100 feet of 2nd order and smaller streams also captured data where the 2nd order and smaller streams were within 100 feet of third order and larger streams.

Fifteen Percent Rule: Stands 80-years old and older constitute 29% of Federal forested land in this 5th Field Watershed. This includes 9,222 acres of stands 200 years old and older, which equals 25% of Federal forested land in the Watershed. Acres by age class are displayed in Table Veg-3. The FOI underestimates nonforest acres in that FOI does not include road right-of-way acres, or all the acres in streams, water holes, or exposed rock.

Port-Orford-cedar: This Watershed is on the north end of the natural range of Port-Orford-cedar (POC). In the northern part of the Watershed, POC grows on upper slopes, ridge tops and south facing benches. POC is found closer to draws on the southern end of the Watershed. Timber cruise data from 1963 to 1994 and POC Root Rot survey data show 20 BLM sections in the Watershed contained POC. This information is summarized in the Appendix Port-Orford Cedar section. POC was most common in and south of the Big Bend Middle Creek area. The Vaughns Creek-Mungers Road area supported a large disjunct POC population. The Watershed no longer contains any known mature or old-growth POC trees on BLM land.

POC is highly susceptible to a fatal fungal root disease caused by *Phytophthora lateralis*. The Port-Orford Cedar Management Guidelines (Betlejewski 1994) includes methods for managing the root disease. This document provides a context for analyzing the site specific impacts and selecting disease management and mitigation measures that may be included in project proposals. The guide presents an array management options, not all which are suitable on all sites. The best disease management approach will depend on the site specific conditions and will benefit from an adaptive management approach. Additional information can be found at the following Internet sites: http://www.fs.fed.us/r6/siskiyou/poc1.htm and http://www.fs.fed.us/database/feis/plants/tree/chalaw/.

Map Veg-1 shows known locations of the *Phytophthora* root rot disease pockets in the Watershed and is based on the examination of the 1997 aerial photographs. Only sites that the photo examiner had a high degree of confidence in, based on his experience in photo interpretation and on his site visits, are shown on this map. Site visits verified all the disease pockets shown on BLM land, and those few sites on private lands directly visible from public roads. The disease sites on BLM land are:

- 1 site in Section 33, T.26S.,R10W., next to the 27-10-4.3 road.
- 5 sites in Section 7, T.29S.,R11W. One of these sites is next to the 29-12-1.1 road.
- An additional known *Phytophthora* root rot disease site, not identified by the disease survey, is next to the 27-10-6.3 road in Sections 7 and 8, T.27S.,R10W.

Table Veg-4: Acres by Streamside Stand Types on BLM lands and Current Risk of Nonattainment of CWD to the Streams

Location	Stand type	Size class and density within 100-feet of streams (excludes nonforest) Risk rating of nonattainment of CWD: (L) = low; (M) = medium; (H) = high							
		stands < 10-inch ave. dbh			stands 10 to 19-inch ave. dbh		stands > 19-inch ave. dbh		totals
		Sparse: 5 to 65% crown closure	Dense: 75 to 95% crown closure	All densities 5 to 95% crown closure	Sparse: 5 to 65% crown closure	Dense: 75 to 95% crown closure	Sparse: 5 to 65% crown closure	Dense: 75 to 95% crown closure	
ac. next to 2nd order & smaller streams	conifer	913 (H)	891 (M)		0 (M)	1,470 (L)	1,023 (M)	752 (L)	5,048
	hardwood			153 (H)	0 (H)	1,174 (M)	0 (H)	310 (M)	1,637
	mixed			301 (H)	0 (H)	0 (L)	0 (M)	0 (L)	301
	NF & young plantations								929
	subtotal	913	891	454	0	2,644	1,023	1,061	7,915
ac. next to 3rd order & larger streams	conifer	141 (H)	100 (M)		0 (M)	107 (L)	272 (M)	97 (L)	716
	hardwood			22 (H)	0 (H)	585 (M)	0 (H)	135 (M)	742
	mixed			24 (H)	0 (H)	0 (L)	0 (M)	0 (L)	24
	NF & young plantations								242
	subtotal	141	100	46	0	692	272	232	1,725
total acres next to all streams	conifer	1,054	991		0 (M)	1,577 (L)	1,295 (M)	848 (L)	5,764
	hardwood			175	0 (H)	1,759 (M)	0 (H)	445 (M)	2,380
	mixed			325	0 (H)	0 (L)	0 (M)	0 (L)	325
	NF & young plantations								1,496
	total	1,054	991	500	0	3,335	1,295	1,293	9,964

Reference Conditions

Nineteenth Century Vegetation Descriptions -

Burton's Prairie, the Fairview area:

> *...the best agricultural lands, also originally forested with an immense growth of timber, being formed by the alluvium deposited during unknown ages by the stream along whose sources they are located. The tree commonly in local parlance denominated "Myrtle" is in such situations the characteristic growth, but is usually found in sylvan companionship with maple, elder, ash etc. Where fir occupy lands sufficiently level for cultivation, the soil often proves to be of excellent quality when cleared...* (Dodge 1898,pp. 169)

East Fork Coquille, which is the adjacent watershed to the North Fork Coquille:

> *The soil in the bottoms along these streams is the same famous alluvial quality that distinguishes the main Coquille Valley and produces lofty and thrifty ash, myrtle, alder, and maple... The hills and mountains are famed for a heavy growth of fir of the first quality, and after the timber and brush are removed the lands are noted for their excellent qualities to produce grass...* (Dodge 1898,pp. 172)

The Mast Farm on the North Fork Coquille, 1872-73:

> *They were soon settled snugly in a board shanty, twelve by fourteen, which was surrounded by towering fir timber on the north and east and on the south by a stretch of ten acres of black logs which had been cut down in the early summer and burned over in the fall. All through the long winter they toiled in those black logs, cutting, rolling, burning and grubbing, day in and day out and often till 10 o'clock at night, so that when the June roses blushed and nodded in the sun that ten acres was nourishing as fine a crop of grain and grass as ever grew.* (Dodge 1898,pp. 407)

General description from the survey notes for the interior of T.26S.,R.10W, Will. Mer., Oregon:

> *This Township is very broken and mountainous. Its formation is similar to the adjacent Townships, sedimentary sand stone and is cut up by deep canyons and high precipitous cliffs and ridges. The soil is sandy and shallow of inferior rate except along the margin of the larger streams where it is deep and rich and*

capable of producing good crops of hay, grain, fruit, and vegtables when cleared of timber and brush.

There is quite an amount of good fir timber in the southern part and also some good cedar. The timber in the northern portion is mostly second growth and of no commercial value. It is covered with a dense undergrowth of the various kinds of vines and brush indigenous to that region which with the old fallen timber and steep uneven character of the surface rendered the survey lines over it extremely slow and difficult.

The Township is well watered by springs, brooks, creeks and rivers. The water is clear, cold, and pure. Coos River flows through the extreme South eastern and northeastern parts.

North River rises in the eastern part of the Township and flows sinuously through the northern portion. (Lackland 1898b).

General description from the survey notes for the interior lines in T.26S.,R.11W, Will. Mer., Oregon:

This Township contains some narrow bottoms along North River of good 2nd rate soil. Capable of producing crops. The Balance of the Township is hilly broken and mountainous and in many places very rough and rocky soils 3rd and 4th rate. The whole Township is densely covered with forests fir, cedar, hemlock, maple, myrtle, shittim, and alder timber; except a few patches that have been cleared along North River by the settlers. There are 5 settlers in the Township. The value consists in the timber. (Hall 1884).

General description from the survey notes for a portion of T.26S., R.12W., Will. Mer., Oregon:

The quality of the soil in this Township is usually 3rd rate excepting in the bottoms near the streams which is 1st rate, The southern and eastern part of the Township from about a line diagonally across from S.E. corner of Sec. 1 to S.W. corner Sec. 19 is green timber and will eventually be valuable; The balance of the Township has been burnt by fire making the timber of little or no value[2].

Timber on the high lands is Fir, Hemlock, Cedar, Spruce, Chittumwood and Dogwood; also Maple, Myrtle, Ash, and Alder on the bottom lands.

The "Blue Ridge" running north and south through the South-eastern part of the Township is covered with valuable timber; and from indications rich deposits of iron ore are abundant in this ridge. Water is abundant and good. (Flint; Williams, 1872).

General description from the survey notes for the interior of T.27S., R.10W., Will. Mer., Oregon:

This Township lies near the summit on the western slope of the Coast Range Mountains. Its surface is exceedingly rough and broken. Its presents a tangled mass of high, sharp mountain ridges, deep rugged canyons and irregular precipitous bluff and cliffs. The formation is principally sedimentary sandstone and it has been worn into its present rugged condition by the attrition of ages. The soil, save that in the narrow valleys along the larger streams which is deep, strong and fertile, is sandy and shallow. There are some groves of good timber consisting of fir, hemlock and cedar, with some maple and myrtle, in different parts of the township, but the greater portion of the forest is of an inferior quality or much injured by fire.

Owing to the warm and humid climate of the region vegetation grows luxuriantly, and with vines and shrubbery over the whole area wherever the absence of shelving rocks or butting craggs will permit seeds to germinate and roots to penetrate.

It is abundantly watered by springs, brooks, creeks, and rivers. In fact it includes the source of several considerable streams. Coos River flows through the extreme northeastern portion of it and the East Fork of Brummit Creek through southeastern portion. The water of all springs and streams is clear as crystal and cold and pure.

This and adjacent townships are a favorite haunt of elk and were it not for their extreme ruggedness would doubtless be frequented by sportsmen. (Lackland 1898c).

General description from the survey notes for the west portion of T.27S., R.11W., Will. Mer., Oregon:

The land in the bottoms along the three largest streams in this Township is good for farming purposes, but require a great deal of labor for its clearing of timber.

The hills in the south half are low and not much broken, while in the northwestern part of the west half, the land is mountainous and rugged.

The fir timber on most of the land is of a late growth, the timber generally being not more that eighteen inches in diameter, but they are very tall and symmetrical.

The whole of the land surveyed in this Township is covered with a thick growth of underbrush of various kinds from the vine maple in the bottoms to the mountain laurel. (Cathcart, 1892b).

General description from the survey notes for the interior of T.27S., R.12W., Will. Mer., Oregon:

The quality of the land is this Township is generally 3rd rate soil being almost entirely a dense forest of timber, the timber is good and will eventually be valuable. The soil in the vicinity of the streams is first rate.

[2] The timber was likely burned by the Coos Bay Fire in 1868.

Indications of coal are manifest in the south and western part of the Township. (Flint, 1872).

General description from the survey notes for the interior of T.28S.,R.12.W., Will. Mer., Oregon:

The general quality of the land in this Township is 2nd rate except along the bottoms of the Coquille River; which is rich sandy loam. The Coquille River which runs through the Township is navigable for steam boats as far as the west boundary of section 12, as soon as a few drifts of logs are cleared out. The water for the greater portion of the year varies from 8 to 12 feet deep.

The uplands are very broken and heavily timbered with fir, with a dense undergrowth of all kinds of brush vines and briers. The bottom lands are timbered with myrtle maple and ash. Middle Creek in the north eastern and East Coquille Creek in the South East part of the Township are both considerable streams and empty into the Coquille River. There are 29 settlers, located along the bottom lands of the Coquille River in this Township. (Howard; Huffer 1875)

Fire History - The Middle Creek and North Coquille fire history (see appendix), and fire histories prepared for adjacent subwatersheds (USDI 2000a; USDI 2000b), show complexes of stand replacement fires and reburns occurred from 1534 to 1590 and again from 1738 to 1799. The Middle Creek, North Coquille and Tioga Creek fire histories are consolidated in "Appendix B. Fire History, patterns and Stand level Effects in the Hemlock Zone" contained in the South Coast - Northern Klamath LSR Assessment (USDI; USDA 1998). Several stand modifying fires, which locally caused areas of stand replacement, burned from 1845 to 1868 and from 1891 to 1936. Land survey notes show that for at least the late 19th and early 20th centuries, forest fires resulted in areas of dead and fallen trees, and timber scatterings.

The fires from 1534 to 1590 obliterated nearly all the evidence for fires and stand conditions from before 1534. The 1738 to 1789 fires were stand replacement events in the headwaters of the North Fork Coquille and on lands north to Loon Lake, and West Fork Smith River (USDI 1997). The 1738 to 1789 fires resulted in stand replacement in parts of the Middle Creek Subwatershed and stand modification in other areas.

Fires between 1845 and 1855 modified stands throughout the Watershed and resulted in small scale stand replacement on some south to west facing ridge top and valley side locations. Some of the hemlock understory stands in the Watershed regenerated following the 1845 to 1855 fires. The 1845 to 1855 stand modifying fires occurred about the same time as large stand replacement fires on what is now the Siuslaw National Forest (Morris 1934; Teensma *et al.* 1991). Historical references to fire on the north end of Blue Ridge (Flint & Williams 1872; Morris 1934) , and physical evidence of a burn in the East Fork Coquille Watershed (USDI 2000a) suggests that the 1868 Coos Bay Fire may have burned in the western and southern parts of the North Fork Coquille Watershed.

Physical evidence indicates a large low to moderate severity fire burned about1917 to 1919, which modified stands in the Middle Creek Subwatershed allowing understory regeneration. That fire or fires also burned in the subwatersheds lands to the south and east. Fire scars observed in adjacent subwatersheds suggests additional fires between 1890 and 1934. The 1934 Middle Creek Fire burned in the northeast of T.27S.,R10W (Coos Forest Protection Agency [CFPA] files). The 1936 McKinley-Fairview Fire burned in much of T.27S.,R12W. and T.28S.,R12W., and in the southwest of T.27S.,R.11W, and the northwest of T.28S.,R.11W (CFPA files).

The Middle Creek Subwatershed fire history was largely inferred from regeneration patterns observed in that Subwatershed. The fire histories for the North Coquille Subwatershed, Tioga Creek Subwatershed and East Fork Coquille Watershed are based on fire scars supplemented by regeneration patterns. Physical evidence suggests fire was an infrequent visitor to the North Coquille headwaters. However, regeneration patterns in Middle Creek Subwatershed and fire scars in the adjacent Tioga Creek Subwatershed and East Fork Coquille Watershed suggest low to moderate severity fires that modified stands were a common occurrence through most of those areas. A fire of sufficient intensity to leave physical evidence occurred on average every 17 years in the Tioga Creek Subwatershed and every 21 years in the East Fork Coquille Watershed. For several drainages a documentable fire burned on average 50 years or less. See the appendix for additional information on fire history, fire patterns an implications for management.

Early 20th Century Landscape Patterns as Shown by the 1900 and 1914 Vegetation Maps - Map Veg-5, and Table Veg-5 show vegetation patterns based on a 1900[3]. Map Veg-6, and Table Veg-6 show vegetation patterns based on a 1914 source[4]. Maps Veg-7 and Veg-8 provide a larger context by showing vegetation across the Coos Bay District in 1900 and 1914. Map Veg-9 combines the nonforest, cut and burned locations from the 1900 and 1914 maps with the 1993 gross vegetation to aid comparing these three sources to each other. The locations of the different vegetation types on the 1900 and 1914 maps are approximations. Most timberless areas on the 1900 vegetation map and non-timber and cut over areas on the 1914 map are bottom lands and adjacent valley side slopes. Settlers cleared and converted the bottom lands to agricultural in the later half of the 19th century. The valley side slopes were burned by escaped fires, set to clear bottom lands, and intentionally set fires to clear and improve grazing conditions. The proximity of streams, which were suitable for water transport of logs to utilization centers, also means the valley side stands were the first stands to be logged. The timberless area in sections 24, 25 and 26, T.27S., R.12W., on the 1914 map, correspond to Burton Prairie. Cadastral survey notes from 1892 for T.27S., R.11W., document burnt timber on the upper slopes above Little Cherry Creek corresponding to the burnt area not restocking area on the 1914 map (Cathcart 1892a & 1892b)[5]. Fire scars suggest the burnt area above Little Cherry Creek on the 1914 map, and on the south rims of both Park Creek and Vaughns Creek on the 1900 map, date from a fire in or about 1850. The non-timber area on the 1914 map in sections 28, 29, 32, and 33, T.26S.,R.10W. corresponds to the location of Coos Mountain[6].

Table Veg-5: 1900 Vegetation Distribution (From GIS Data)

Vegetation type	Acres
Timberless Area	21,859
10,000 - 25,000 Board Measure* per Acre	52,759
25,000 - 50,000 Board Measure* per Acre	23,365
Burnt	483
Total	98,466

* “Board Measure” is an old term approximately equivalent to a Board Foot.

3 The following is from the metadata for the 1900 vegetation map. Henry Gannet spent two years visiting almost all timbered areas in Oregon. He gathered the data township by township and provided an overall description of the timber status. The actual map was compiled by A. J. Johnson. The work began in 1898 and was finished 1902. The original map was hand drafted and so the scale is uncertain. The dimensions of the original map have changed due to medium shrinkage and expansion. This dimensional distortion is compounded by the photo-enlarging needed to increase the size of the map to make it suitable for digitizing. Some distortion was reduced by rubber-sheeting the map to correct latitude and longitude. The vegetation boundaries of the original map tend to follow township lines. This is likely a reflection of the data being compiled by township. These factors indicate the vegetation breaks shown on the map are approximations. The metadata does not cite the original source for the 1900 vegetation map, however it was likely part of a largeer document titled: *Annual Reports of the Department of Interior, for the Fiscal Year Ended June 30, 1900, Twenty-first Annual Report, U.S. Geological Service.*

4 In 1914, the Oregon State Forester, F. A. Elliott, allocated almost $7,000 to compile and print an Oregon forest type map. In 1954, a night dispatcher, rescued the only known copy of this map from a trash bin. This map was digitized by the State of Oregon and a file made available to the BLM. We did not have access to the metadata at the time this chapter was written. However, the issues of medium stability, and the difficulties of collecting and compiling data for large geographic area documented for the 1900 vegetation map also apply to the 1914 map. Therefore, the vegetation boundaries on the 1914 map also should be treated as approximations.

5 Botany section includes aerial photographs of Little Cherry Creek taken in 1943 and 1990.

6 Botany section includes aerial photographs of the Coos Mountain area taken in 1943 and 1990.

Table Veg-6: 1914 Vegetation Distribution (From GIS Data)

Vegetation type	Acres
Burned Areas Not Re-stocking	1,596
Burned Areas Re-stocking	667
Cut Over Areas Not Re-stocking	5,617
Merchantable Timber	78,701
Non-Timber Areas	11,884
Total	98,465

Landscape Patterns Visible From Coos Mountain Lookout in 1936 - The following images are a 360-degree three panel panorama, called "Osborne photos", was taken from the Coos Mountain Lookout[7] in 1936. These pictures were taken as part of presuppression planning (Arnst 1985). We thank the Coos Forest Protection Agency for allowing us to make copies of these photographs.

[7] The Coos Mountain Fire Lookout was located in the SW NE Sec. 32, T. 27 S., R. 10 W., Will. Mer., Oregon. This is located on the divide between Alder Creek and Honcho Creek of the Middle Creek Subwatershed. The following is a description of the lookout from *Fire Lookouts of Oregon and Washington* (Kresek 1985). The elevation is recorded as 2,241 feet. The first lookout was built sometime during 1936-38. It was a 20 foot high wooden live-in tower. It then appears that in 1957 it was upgraded and replaced with a L-4 model atop a 10 foot creosote treated sawn timber tower. The L-4 model was a 14-by-14 foot frame pre-cut house with gabled shingled roofs and heavy shutters which during the summer were held horizontal above the windows to provide shade. There was no indication if it was a live-in. The lookout was abandoned in 1962 and has since been removed or destroyed.

Figure Veg 2

The south to west facing Osborne photograph (180 to 300 degrees azimuth)

degrees above/ below level horizon	degrees azimuth	landscape feature
-3 to -18	212 to 234	Coarse textured, largely north facing stands along Middle Creek with trees dating from the 1500s in protected positions. The upper slopes and more exposed areas are forested with trees dating from the 1700s.
-4 to -7	234 to 300	Fine textured, largely south facing stands in Alder Ck dating from the 1700s.
-1	266 to 285	The logged off top of Blue Ridge

Figure Veg 3

The east to south facing Osborne photograph (60 to 180 degrees azimuth)

degrees above/ below level horizon	degrees azimuth	landscape feature
0 to -3	84 to 121	Land inside the Tioga Creek Subwatershed maintained in an early seral condition by repeated fire. Azimuth 90 degrees looks up Burnt Creek Drainage. From 1534 to 1923, a fire burned on average every 23 years in the Burnt Creek Drainage. One tree in that drainage had 6 fire scars between 1843 to 1942.
-2 to -12	113 to 134	Moore Creek Drainage. Overstory trees dating from the 1500s. Although not visible in the photo, the understory trees date from 1920s to early 1930s. The understory trees regenerated following low to moderate severity burn around 1917 or 1919.
0 to -8	134 to 146	Park Creek Drainage. Overstory trees dating from the 1700s. Understory trees date from 1919 to early 1930s. Open stand condition is a result of fire. The abundant fawn lilies and tiger lilies found along the upper ridges in this drainage are favored by high open shade suggesting that the open stand condition is not new but rather is maintained by disturbance. This drainage is also characterized by frequent debris torrents with long tracks.
0	121 to 150	Ridge top stands that regenerated following ridge top burns and dating from the 1920s and early 1930s
-3 to -10	75 to 96	The 1914 map shows this area to be in a “non-timber” area. The 1914 map also shows “burned” areas suggesting that “non-timber” areas were different from burned areas and were likely the 1914 equivalent of “nonforest”today. A fire lookout was likely sited on Coos Mountain because of the vista afforded by its elevation and non-timber condition. The non-timber condition may have been due to repeated fire. Following fire exclusion, the area slowly filled in with trees. The tree sizes and gaps shown by the Osborne photo suggest tree regeneration was likely retarded by droughty soils and big game browsing.

Figure Veg 4

The north facing Osborne photograph (300 to 60 degrees azimuth)

degrees above/ below level horizon	degrees azimuth	landscape feature
-26 to -2	300 to 2	Alder Creek Drainage is visible behind the foreground trees. The Alder Creek stands regenerated in the 1700s. Fire history work done on near by sites suggests the lower and midslope areas in this drainage may have escape subsequent stand modifying underburns. Ridge top locations likely underburned between 1846 and 1849.
+3 to -17	2 to 31	This is a 3-mile long band of rockland extending north-south from Section 32 to Section 20. This feature is prominent on the 1943 aerial photos. The 1961 type map suggests the patches of trees visible on this feature to date from the 1700s. Tree encroachment since the 1930s has diminished size and reduced the visibility of this feature on unlogged BLM land.
+3 to +7	2 to 31	Regenerated ridge top burn. The 1961 type map shows the stand type to be D3,h= 1890. Fire history work done about 2 miles to the east suggests this site burned about 1846 to 1849. A regeneration lag between 1849 and 1890 is attributable to harsh site conditions, and/or severe big game browse damage, and/or a previously undocumented reburn. The hemlock stand component indicates the stand regenerated under a partial shade condition suggesting the stand initiating burn was a moderate severity event that left an open, shelterwood cut-like stand. The surviving overstory trees likely died during the years following the fire from stress caused by an inability to adapt to the sudden increased exposure.
	39	The original fire lookout on Coos Mountain was a "crow's nest", which is a platform placed in a tree. The rungs are nailed to the tree at azimuth 39 degrees suggests the platform was in this tree.

Activities on Federal Land and From 1924 to 1960

Figure Veg 5 Old abandoned railroad trestle on BLM land in Sec. 11, T.27S.,R.12W. This railroad was used to log the Woodward Creek Drainage under a timber patent. Photo taken April 17, 1952.

Timber Patents Under the General Land Office - Between the revestment of the O&C and CBWR lands and the establishment of the O&C Administration, the General Land Office (GLO) had responsibility for managing Federal lands in this Watershed. The GLO sold timber on these lands through timber patents. Between 1924 and 1937, loggers obtain timber patents on Federal lands on Blue Ridge, Woodward Creek, and valley side sections north of the Coquille-Fairview County Road. These sections were logged and the last of the timber patents terminated by 1940 (Master Title Plates on file at the BLM Oregon State Office). Timber patent contracts made no provision for slash disposal or fire protection. In addition, the governing legislation for the O&C lands, passed in 1916 and 1919, had no provision for sustained management of timber or protection of the capacity of these lands to produce timber. Also the GLO believed that cut over land would be more attractive for sale to private interests desiring land for agricultural purposes. Allegedly the GLO permitted deliberate destruction of trees that were valuable as seed sources when done by settlers in order to meet their legal requirement to improve a homestead (Richardson 1980). In 1933, there was a stock raising homestead entry attempted in Section 3, T.27S.,R12W. that failed by 1939. That section had been logged under an earlier timber patent. The 1936 McKinley-Fairview Fire burned these lands on Blue Ridge south of the lookout, Section 11 in Woodward Creek and the valley side Sections 15 and 27, T.27S.,R.12S. Sustain yield management for timber only became a mandate after the lands were transferred to the O&C Administration in 1937.

Grazing on Federal Lands - Under the O&C Administration, and later the BLM, at least some of the sections logged under timber patents were managed for grazing into the 1950s. Other sections supported naturally seeded conifer stands by the 1950s. The Coos Bay District Office no longer has the grazing lease files from before 1960 so we have little documentation on which sections were grazed or for how long. We also do not know if the BLM lands were regularly burned to improve grazing. However, burning to improve range conditions was an accepted practice (see Figure Veg-6). Captions for 1949 photographs indicate some Federal lands in the Fairview area, logged under the O&C Administration after 1937 were burned and grass seeded for

Figure Veg 6 Original caption: “A view of a typical Fairview grazing area. Looking southwest from NE1/4 NE1/4, Section 24, T.27S., R.12W. This is the type of area which is subjected to repeated burning to get it in shape for grazing.” Picture taken March 3, 1949, by Carroll M. Dubuar.

grazing purposes by local ranchers. See figures Veg-7, Veg-8, and,Veg-9.

Type map data indicate most land logged under timber patents in Woodward Creek and on Blue Ridge in this Watershed were stocked by the 1950s. The exceptions were the western 2/3 of Section 36, T.26S.,R.12W., and the east facing slopes on Steinnon Creek in Section 3, T.27S,R12W., and scattered small patches in Woodward Creek. However, the BLM lands in Sections 13, 15, 23, and 27 were still largely denuded and were being grazed. About 1960, BLM changed its management objective for those sections from range management to timber production, and started a program of brush control and reforestation. Initial attempts to reforest these sections failed due to grazing trespass resulting in sheep browsing a substantial portion of the planted seedlings. BLM was only able to obtain successful regeneration by fencing out livestock. Old type maps on file at the Coos Bay District Office show the location of these fences.

Figure Veg 7 This photograph was taken in 1949 and shows the SE¼, Section 25, T.27S.,R12W. The timber on this site was sold to the Coos Bay Lumber Company in 1938, under patent 022461. The sale terminated in 1940. The original caption read "After logging the stump rancher . . . joyously helped the logger to burn the slash. After the burn it was seeded to grass . . .These areas are excellent examples of areas after logging, burned over by stump ranchers and seeded to grass. . . ." The top center area in this photograph was planted with Port-Orford-cedar by the CCC. The use of the word "patent" for a timber sale was a hold over from the GLO. Under the GLO, timber patents were recorded on the Master Title Plat. However, this timber sale was sold after the O&C Administration was established and "patent 022461" was not recorded on the Master Title Plat.

Figure Veg 8 This photograph, is another view of the area burned and grass seeded in 1940 in Section 25, T27S., R12W. This is a 1949 view a 170 acre grazing lease. A BLM employee at that time attributed the lack of Douglas-fir regeneration to grazing.

Figure Veg 9 This site is in the SW¼NE¼, Section 25, T.27S.,R12W, and is also part of the unit harvested under patent 022461. The BLM employee that took this photograph in 1949 noted this site being on a north slope, and not burned hard, seeded, nor grazed.

<u>Changes in Forest Management Practices from 1937 to the 1960s</u> - Under the O&C Administration, and its successor agency the BLM, reforestion became part of managing the Federal timberlands in the Watershed. During the 1930s and 1940s, the O&C Administration, and later the BLM, required purchasers to leave enough seed trees to insure reforestation of timber sale units. The timber sale layout practices at that time involved identifying inclusions of immature trees inside timbersale boundaries and reserving those patches from harvest, designating nonmerchantable and cull trees for seed trees, and

selecting the logging method. They also designated roadside and streamside reservations[8] for aesthetic purposes (Anon. 1945). Timber was often sold in large tracts, sometimes as large as entire section (John F. Lanz, BLM retired).

Figure Veg 10 Contract I-6g-798 or 810 purchased Coos Bay Lumber Company. The site is in Section 19, T.27S., R.12W. The photo shows logging slash before burning and was taken in either 1943 or 1944. A similarly logged area in Section 17, T.27S., R.12W. was recently commercial thinned. Few of the seed trees were still standing at the time of the thinning. However, the surviving seed trees and snags were retained during the thinning because of their value for structural diversity and habitat.

Figure Veg 11 A second photograph of the timber sale tract shown in the previous figure.

In 1939 the McKinley Nursery began as an experimental proposition that operated on a year to year basis to supply seedlings to plant the previously cut over and burned O&C lands with no surviving seed source. During 1943, the Civilian Public Service[9] erected barracks and administrative buildings on the Nursery site. By 1945 the plans were to produce 2,000,000 seedlings, mostly Douglas-fir and Port-Orford-cedar[10], a year (Anon. 1945). However, the nursery program foundered. The nursery site was leased in 1946 to the Coos County Youth Association and the Elk's Club for use as a youth camp (Coos Bay District files).

About 1950, the seed tree method was replaced by the silvicultural clearcutting as the preferred timber harvest and reforestation system. Integral to this change was a shift from large tract timber sales to generally limiting timber sale units to 40 acres and less[11]. Aerial seeding, and planting supplemented by natural seeding from unit side trees became the preferred regeneration methods. Road building patterns also changed about this time. Loggers in the 1940s and before used a low density network of truck roads and rail lines. In place of spur roads, they forwarded logs using logging donkeys and system of swing trees. That combined with very large units meant the miles of road per square mile were lower than what became common in later years. After the 1940s, the increased use of tractors and skidders when logging gentle ground resulted in high cat trail densities on those sites. The shift from spar trees to mobile steel tower yarders also necessitated higher road densities because the drum capacity of early yarders limited

8 The 1950 aerial photos show a leave strip next to the Coos Bay Wagon Road and Bay Creek in Section 29, T.27S.,R11W. that may have been one of these reserves.

9 The Civilian Public Service was an agency similar to the Civilian Conservation Service that provided a nonmilitary service alternative for conscientious objectors during World War II.

10 1951 photographs in the District collection document Port-Orford-cedar being planted under contract in Section 7, T.28S.,R11W., and in Section 19, T.27S.,R.11W. A caption for another photograph documents Port-Orford-cedar planting in SE¼. Section 25, T.27S.,R12W. In 1942/43 the 160 acres surrounding the nursery received "blister rust control." This indicates white pines or sugar pines were among the species grown at the nursery.

11 The caption for a 1950 photograph, in the District collection, makes reference to "staggered setting", which is a stand regeneration method using natural seeding and small clearcut units.

yarding distances to less than 800 feet.

Insect Kill and Blowdown - The most important windstorms in terms damage to the forest, which occurred since the establishment of a District office in Coos Bay were in December 1951, October 1962 and November 1975 (USDI 1978). In addition, considerable timber was blown down in Coos County during the winter of 1949-1950 (Wright; Lauterback 1958). The effects of the 1949-1950 storms on BLM lands are not documented.

Figure Veg 12 The windstorm of December 4, 1951 blew down extensive areas of standing timber scattered throughout Coos County and Western Douglas County. This photo was taken in Sec. 1, T.28S., R.12W. and shows the extent of one bad windfall area. Photo taken by: E. J. Petersen on March, 1951

We have little information on mortality patterns in the North Fork Coquille Watershed, due to natural agents other than fire, before 1949. However, an analysis of Weyerhaeuser's 1945-46 inventory data does indicate the pre-logging mortality patterns (Wright; Lauterback 1958) that may be applicable. In 1946, Douglas-fir with birth dates in the mid-1700s comprised 92% of the standing volume on the Millicoma Tree Farm. This is comparable to the stands in the northeast part of the North Fork Coquille Watershed. The inventory showed the average gross growth to be 282 board feet per acre, average mortality of 244 board feet per acre giving a net growth of 38 board feet per acre per year. Analysis of the inventory data indicated that heavy mortality had been occurring for decades. Tabulation of the causes of mortality for the 50-years before the inventory indicated insects contributing to 70% of the total volume killed. Wind break caused 12% of the volume loss, and fire killed 7%. Suppression, drought, disease and unknown causes together killing 11%. Wright and Lauterbach considered their estimated times and causes of death for several decades old mortality to be little better than guesses but they believed estimates for more recent mortality to be reasonably good. Extensive killing by bark beetles continued until 1949. Insect caused mortality then declined to practically none by 1950. The 1949-1950 blow down provided conditions favoring the build up of tremendous bark beetle populations by spring 1951. Great numbers of bark beetle killed trees were evident by the end of the 1951. Lack of road access impeded sanitation/ salvage efforts. The December 1951 blowdown provided new material for the bark beetles resulting in even greater populations in 1951 and 1952. The bark beetle populations began to decline in 1953 (Wright; Lauterback 1958). We do not have mortality figures for the North Fork Coquille Watershed, however, the total mortality from wind and bark beetles on the near by Millicoma Tree Farm from 1950 to 1954 was 6,100 board feet per acre (Wright; Lauterback 1958).

The 1961 type maps (drawn from 1959 aerial photography) show very few patches of bug kill in the more accessible western part of the North Fork Coquille Watershed. However, few roads accessed T.27S., R,10W. or T.26S.,R10W. in the eastern parts of the Watershed in 1951. The 1961 type map shows those less accessible areas peppered with bug kill patches. The bug kill patches generally ran 1.5 to 3 acres with a few larger and several smaller. T.26S.,R10W. had 7.4 bug kill patches per square mile, and T.27S.,R10W. had 1.8 per square mile. The bark beetle outbreak, following the 1962 blowdown, was not as extensive as the 1951-52 epidemic and the insect killed patches typically smaller than a dozen trees (USDI 1978; Lance Finnegan per. com.). This is attributed to rapid aggressive salvage efforts facilitated by good road access. The 1975 blowdown was rapidly salvaged and consequently there was little insect kill (Lance Finnegan per. com.)

The 1975 blowdown hit the Middle Creek Subwatershed harder than any place else on the District. This resulted in the 25 million board foot Old Man's Road Salvage Sale, the 17 million board foot Fishladder Salvage Sale, and in smaller salvage efforts in Vaughns Creek. See the vegetation and disturbance process appendix for additional information on these particular storms. That appendix also discusses blowdown and insect damage with respect to stand development patterns.

Synthesis and Interpretation

Fire and Landscape Patterns - The major valleys, valley side forests, and to a lesser extent the rest of the land inside the North Fork Coquille Watershed, were human influenced landscapes long before Euro-American settlement. The assemblage of plants that make up the Douglas-fir dominated forest, as we know it, came together for the first time about 6,000 years ago (Brubaker 1991). The earliest radiocarbon dates for human activity on the Oregon Coast are from before 8,000-years Before Present. Therefore, human use of this Watershed, and consequently influence over stand structural characteristics and landscape patterns may predate the arrival of the plant assemblage we know as the old-growth Douglas-fir forest. The Indians of the temperate forest on the Washington and Northwest California coast, and by extension on the Oregon Coast, burned the grass on small "prairies," ridge tops and along grass fringes of rivers so to maintain preferred plants and attract game. Lewis (1990) concluded that the timber was not intentionally underburned by the Coastal Indians and when the understory did burn, it was the result of either lightning fire or escape prescribed burn. However, LaLande and Pullen (1999) found ethnologic interviews indicating that both the Coquille and Coos Indians intentionally underburned some stands. Lightning is infrequent in the coastal forest and moist fuels limit lightning caused ignitions (Arno 1983). Barrett and Arno (1982) observed that the lower elevations, close to valleys where Indians resided, had higher fire frequencies than more remote mountainous areas where lightning was likely the primary ignition source. Fire history data indicate that fires, sufficiently intense so as to leave evidence of their occurrence, burned with return rates of 50-years or less in several drainages in this and in adjacent watersheds (see Appendix sections on fire patterns and fire histories). Much of this data were collected on BLM lands close to Brewster Valley, the main valley in the North Fork Coquille and East Fork Coquille Watersheds, and upslope from the valley floors on Middle Creek, Cherry Creek and from the valley on Tioga Creek between the West Fork Tioga Creek and Burnt Creek. Drainages with substantially longer fire return rates are located some distance from broad valleys. These drainages are Little North Fork Coquille and Upper North Fork Coquille in the North Fork Coquille Watershed and the Upper Tioga Creek in the Tioga Creek Subwatershed.

The evidence for the purposeful use of fire by American Indians to manipulate ecosystems has been difficult to document. By the time ethnographers recorded information from native informants about their manipulation of Coast Range Forests, many changes had already taken place. A decline of native populations was caused by a lack of resistance to diseases that were introduced from Europe. In addition, warfare (with old enemies and new immigrants), introduction of new technologies (firearms and iron), changes in economy (to fur trading and sheep grazing), treaties (restricting and removing Indians from traditional lands), and in some cases extinction caused cultural disruption resulting in the cessation of cultural land use practices and loss of traditional knowledge about those practices (Williams 1994). LaLande and Pullen (1999) searched ethnologic interviews with elderly individuals, including informants from the Coos and Coquille, that recalled native traditions in southwest Oregon. These interviews provided an informative, though incomplete, record of the methods and purposes of anthropogenic fire:

- *The Coquille used fire to drive deer into rope snares: "put [snare] on deer trail – put stick maybe two feet high – deer go – step there – rope goes over neck."*
- *The open, park-like forests that resulted from Indian-set fires were another long-term goal. Coquille men "burned brush out of the hunting places . . . every so often." Coos Hunters, who considered such areas "the loveliest of the country," set fire "in the mountains to clear away the brush and jungles and so make hunting*

easier." This created a "fine and beautiful open country . . . where deer [could] be seen at a distance"; the men set these favorite mountain locales afire annually, at the end of the fall hunt.

- *The Coquille burned the hazel patches "every 5 years - in August"; this produced "a big slope of nice hazel nuts." . . . they "had lots of hazel nuts [, e]very year [men] burn it over . . . got baskets and baskets full."*
- The Coquille Indians used fire to burn the stickers off of "Indian oats," another name for tar weed, before harvesting the seed. They also used fire to improve berry patches. Although the informant was not specific as to what kind of berry, it was most likely huckleberry.

LaLande and Pullen (1999) and other they authors cite in their paper surmised that Indians burning was not indiscriminate. The Indians had a knowledgeable about how to use fire to obtained and maintain conditions on the landscape. Their practices included frequent light fires, set a different times of the year, to obtain a more diversified environment. This repeated light burning also had the added benefit of lowering the risk of high intensity fire.

The cadastral survey notes covering the eastern portion of the Fairview area describe much of the area occupied with a "scattering of timber" (Chapman 1875). Boyd Peterson, the District Cadastral Surveyor interpreted "scattering" to mean widely spaced individual and clumps of trees. Samuel W. Lackland (1898) who did the original survey of Township 27 South, Range 10 West, Will. Mer., in 1896, also used the term "scattering" in his field notes in conjunction with partly burned timber and in a context consistent with Boyd Peterson's interpretation[12]. The mature and old growth trees in the timber scatterings survived because previous disturbances have left them spaced out or "scattered," which reduced crown continuity among the trees and that had reduced the risk of crown fire spread. Some trees survived fires because they were in topographically protected moist sites. Others survived on more exposed sites in part because fire was frequent enough to prevent the accumulation of continuous fuels. Low to moderate severity fires returned frequent enough to prevent the development of a conifer understory that was tall enough to be able to carry a ground fire into the crowns of the mature trees. Fires were not so frequent as to exclude brush[13]. In fact, the fires may have favored those brush and hardwood species that can aggressively resprout following a burn over conifers that must reproduce by seed. The presence of broadleaf species mixed with the conifers may reduce fire intensity allowing a mixed conifer-hardwood stand to survive a burn where as a pure conifer stand would be destroyed[14]. The "scattering of timber" character and many common shrubs and hardwoods in the valley side areas may have been favored by occasional escape fires initially set to maintain prairies, fire yards, and fire corridors. However, the evidence is circumstantial.

Burton Prairie was the largest opening in the analysis area at the time of Euro-American settlement. People familiar with the productivity of the agricultural soils in Coos County have observed that the soils in the Fairview area are less productive and less responsive to soil improvement treatments than similar soils closer to Coquille (personal communication Paul Heikkela and Ed Peterson). The lower productivity of the soils may be the result of constant use including repeated burning over thousands of years. However this is a purely speculative comment.

Aerial photos taken in 1943 show what may be remnant prairies on southwest facing upper slopes or ridges in and around the Fairview and North Coquille Mouth Subwatersheds. The notes from the cadastral survey confirm that the southwest facing ridge top opening in the SW 1/4, Section 14,

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[12] "Ascend from cor. through partly burned timber.... Dead and scattering live timber on S. 2 chains" (Lackland 1898, pgs. 13-15).

[13] In the survey summary Chapman (1875, pg 44) states "The whole of the land surveyed in this township is covered with a thick growth of underbrush of various kinds from the vine maple in the bottoms to the mountain laurel and bushy huckleberry of the high land."

[14] Personal communication with Bill Emmingham, Oregon State University Extension Silviculturist, concerning his observations following the Silver Fire on the Siskiyou National Forest.

T.27S.,R12W. dates back to at least 1872[15]. These ridge top openings have since disappeared through a combination of aggressive reforestation, natural seeding, and exclusion of fire and livestock.

Fire history data in and around this Watershed (see appendix) and retrospective analysis of landscape patterns on the Central Coast Range (Ripple *et al.* 2000) indicate the prelogging mature/ old-growth dominated landscapes had early/ midseral components. The locations of these early and mid seral components followed a pattern. In the prelogged landscape, the amount of hardwoods decreased with distance from streams and the amount of seedling/sapling/pole and young conifer increased.

- The greater the distance from streams the lower the site moisture and thus the greater probability that a fire will carry and will be of sufficient intensity to locally cause stand replacement. The generally warmer drier upper slopes are more favorable for successful conifer establishment than for alders.
- Landslides are dominant disturbance process in and immediately adjacent to draws. Alders are more competitive on the more moist sites on the lower slopes and where landslides have exposed nitrogen poor subsoil.

Our most detailed snapshot of what the prelogged landscape looked like are the 1943 and 1950 aerial photos. The 1:12,000 scale 1950 photos show vegetation patterns at the first and second order draw scale. However, the 1:40,000 scale 1943 photos are much better at showing landscape patterns, and showing how fire, as a disturbance process, operates a scales that are often larger than a watershed.

Disappearing and Lost Habitats : The late 19th, early 20th century descriptions and cadastral survey notes show the wide bottom lands along the lower North Fork Coquille occupied by myrtle-fir forests. Current observations, historic descriptions, and information on similar land in the South Fork Coos Watershed suggests poorly drained areas on the flood plains and low terraces supported Oregon ash and/or willow, and on at least one site camas. Old photos show fire prairies on southwest facing ridge tops close to the main valleys. The cadastral survey notes also show timber scatterings, and areas with fire killed snags and fallen trees in this Watershed. All these habitats are now uncommon to almost nonexistent.

Old aerial photos showed extensive rockland areas on Coos Mountain, and on the south facing slopes above Little Cherry Creek (see Botany Section). Old photos also show smaller rockland areas elsewhere in the eastern part of the Watershed. Fire exclusion is allowing forest encroachment and nutrient recruitment on these sites. This is to the detriment of the dry prairie plant species dependent on full sunlight and tolerate of nutrient poor condition. The changing conditions favor invasion by the more common forest associated plant species that are more competitive under shady, less nutrient limiting conditions (Wedin 1992).

Fire history data suggest low to moderate severity fires to be a common phenomenon that resulted conditions favoring understory stand regeneration in most of the Watershed. Protected mid and lower slope areas in the Upper North Coquille and the Little North Fork Coquille Subwatersheds appear to be the exceptions. Fire as a natural or prehistoric aboriginal disturbance process is now restricted by fire control efforts. Prescribed use of fire is limited to site preparation. This all but eliminates a major factor responsible for multistory multi-age stands, large snag recruitment, large down log recruitment, and fire maintained natural openings.

Problems with defining "natural" conditions without a temporal reference: The old-growth Douglas-fir forest of the Pacific Northwest may be a non-equilibrium ecosystem because the spatial scale of disturbance, specifically fire, in the region (Sprugel 1991). Fire episodes in the region reset very large proportions of the landscape to early seral conditions. Between major fire episodes, long climatic

[15] Similar sites are visible north of Laverne Park, on the Blue Ridge , Morgan Ridge, and Zumwalt area. It may be now difficult to prove that any of these were fire prairies maintained by Indians.

periods favoring stand development over stand replacement maintained skewed a distribution of successional stages. This precluded the attainment of a dynamic balance between disturbance and recovery that could lead to a roughly constant conditions when averaged across the landscape or that could lead to a balance of opposing processes (e.g. gross primary production vs. total respiration, or nutrient input vs. nutrient loss). Sprugel also suggests that vegetation communities, which had evolved in the presence of a consistent pattern of aboriginal burning, were disrupted by the precipitous declines in American Indian populations following exposure to European diseases in the 16th and 17th centuries. Vegetation communities may still be in the process of organizing into new assemblages now that aboriginal burning is no longer a functioning process on the landscape. Aboriginal fire was, for a while in the 19th and early 20th century, replaced by fires set by settlers. However, this was a change in, rather than a continuation of, a disturbance process on the landscape. American Indians set fires to promote a diversity of habitats, especially by increasing edge effect. White settlers set fires to clear land for agriculture and maintain land in a condition suitable for grazing, and by that create more uniformity on the landscape (Williams 1994).

As our knowledge of landscape scale conditions and processes increases, our ability to define what "is natural" becomes more difficult. What is natural must be qualified with when. For example, the North Fork Coquille Watershed in the mid 1500's was a part of a much larger recently burned landscape with few surviving mature or old-growth trees. In the mid 1700's the Watershed had a large contiguous burn area in the eastern part of the North Coquille Drainage and a moderate severity burn over the rest of the Watershed created a mosaic landscape full of edges, contrasts, fire maintained early seral areas, and snags. As a result of the fires in 1700s, and their affect on age class distribution, BLM land in the Watershed supported more acres of 200-year-old+ trees in the 1970s than in the 1870s when settlers were moving into the Watershed. Consequently, picking a single point in time as the reference point for restoration does not take into account catastrophic stand replacement events nor episodic regeneration. A more realistic approach would be to move the forest landscape into the range of natural variation (Kloor 2000). Botkin (no date) In his paper on stability and disturbance in natural ecosystems concluded that a given ecosystem is more likely to persist on the landscape with certain rates of disturbance than with others, and will disappear altogether without perturbation. In a case study using the Boundary Waters Canoe Area, Botkin observed that intentional suppression of fire did not lead to a maintenance of what was found in the presettlement forest. Rather fire was an intrinsic part of the system and removing that intrinsic part was a landscape changing disturbance. Botkin argues that forest do not have a single stable equilibrium and do not recover from disturbance along a deterministic succession path. Instead, ecosystem persistence depends on the recurrence of specific ecosystem states and the occurrence of these states must fall within a certain range of variation.

<u>Snags, CWD, and S&M Species</u>: Sections logged between 1924 and 1940 under timber patent, but not reforested until the 1960s, are potentially deficient in residual vegetation and structural attributes, that provide refuges needed by late-successional forest associated species to survive in early and mid seral stands. This suggests a need to recruit late-successional associated attributes. Survey results for S&M species on these sites may also provide some insight as to which species are late-successional dependent and identify those species that have a tolerance for early seral conditions.

Seed tree cut units prepared and sold from 1937 to about 1950 are likely to have high levels of habitat structure.

<u>Bark Beetles</u>: The frequent fire occurrence in Tioga Creek and Middle Creek in the late 19th and first half of the 20th century may have fostered the high levels of insect caused mortality observed on the Millicoma Tree Farm in the 50-years before 1945 (see appendix sections on disturbance process and fire history). The bark beetle populations likely built up in the fire killed and weakened trees and spread into the unburned stands on the Millicoma Tree Farm, and likely into similar timber types in the North Fork

Coquille Watershed. While avoidance of bark beetle epidemics is attributed to prompt salvage of windthrown timber, fire exclusion since 1950 has also helped to keep bark beetle populations low.

Landslides: Landslides usually affect only small areas at a time but the severity of that disturbance can be very high. Landslides result in the loss of the top soil and organic layer at the point of origin. In extreme cases, all soil is lost down to bedrock. Landslides bury developed soil profiles, where they come to rest, with material that is predominantly subsoil and fractured rock. The loss of the organic layer and top soil to landslides sets back plant succession, and favors pioneer species. Red alder is particularly successful in occupying slide tracks and deposits because of its small winged seed facilitates long distance disbursal, rapid juvenile growth, and ability to fix nitrogen. From the stand point of red alder's regeneration strategy, fresh road cuts and fills provide the same conditions produced by landslides. Landslides that reach creeks can deliver structural material (woody debris, and boulders), gravel, fine sediment, and fine organic matter. The size and species composition of the trees in the headwall areas will affect the size and durability of structural material delivered landslides to fish bearing streams.

The Interrelationship of Riparian Vegetation, Debris Avalanches, Course Woody Debris and Stream Geomorphology: Fires that result in riparian stand replacement are infrequent and also affect large areas outside the riparian zone. Floods and debris flows are more frequent but their effects are limited to the area close to the channels and slide tracks. Riparian trees found on terraces and other sites protected from flooding and debris avalanches tend to be the same age or older than the upland trees (Avina *et.al.* 1996). Trees close to the channel on sites affected by debris avalanches and floods are younger than the upland trees (Avina *et.al.* 1996). Fires and/or debris avalanches in the riparian zone that are severe and/or frequent, can eliminate the local conifer seed source leaving the site to be dominated by shrubs or alders. The higher frequency of disturbance close to the channel, combined with other riparian attributes, creates complex habitats with a high edge to core ratios. With respect to at least songbirds, these more frequently disturbed and younger stands are used by species preferring disturbance initiated habitats (McComb 1996).

The steep narrow “V” shaped 1st and 2nd order draws are source areas for course woody debris and rocky structure collected by debris avalanches and deposited in fish bearing streams. In one study on a Coast Range creek, 60% of the in-stream wood came from debris avalanches (Hibbs 1996). The steepness of the channel, stream junction angles, underlying bedrock, precipitation, degree of debris loading in the head wall and along the creek, and species and age of the trees next to the channel all effect the quantity and quality of course woody debris and rocky structure that enter a fish bearing stream. After a steep 1st or 2nd order draw is “blown out” by a debris avalanche, it may take decades to a century or more before enough material accumulates to precipitate another debris avalanche. The gentle gradient streams that are the recipients of this material typically have many steep tributaries contributing debris avalanches. Therefore, these streams have a higher frequency of disturbance associated with the deposition of debris avalanche material. This higher disturbance frequency is one of several factors that causes 3rd and larger order streams, and some 2nd’s, to have lower conifer basal areas at a given distance from the stream compared with 1st order streams.

Other factors affecting the relative abundance of conifers verses red alders close to streams are the width of the area influenced by the riparian microclimate (generally wider next to larger streams and in more protected areas, narrower on south to west aspects), and availability of a seed source. The relative abundance of a conifer seed source is greater on sites with less frequent disturbance or where the time since the last disturbance is longer than the life expectancy of red alder.

Regulation Changes: Before the 1983 injunction against the use of herbicides on westside BLM land, BLM regulations required 100-foot no-treatment buffers on all streams carrying water at the time units were sprayed. This avoided water contamination but also prevented efforts to control vegetation that competes with conifers along streams inside plantations. The result was that many riparian areas were unintentionally converted from conifer to mixed conifer/hardwood, or red alder, or brush. Effective methods for manually releasing conifer plantations from vegetation competition became commonly understood and applied after 1989 and now allow for reestablishing conifers in riparian areas. (DeBell; Turpin 1989).

The distribution of stand types across the landscape, before fire exclusion and the beginnings of intensive forest management, was strongly influenced by burn patterns and to a lesser extent the occurrence of intense storms. Under intensive forest management, the distribution of stand types was controlled by merchantability, logging feasability, silvicultural practicality, property lines, and management objective for game species. Currently on Federal lands managed in compliance with the Northwest Forest Plan and the Endangered Species Act, the site scale requirements to provide no treatment and light treatment buffers next to suspected and known sites occupied by T&E and S&M species are now major factors affecting stand level structure and composition. These site by site management requirements, work against restoring the premanagement landscape patterns on the Late-Successional and Riparian Reserves.

Recommendations

Data Base Maintenance **-** Correct FOI birth dates for old-growth stands in the North Coquille Subwatershed and Alder Creek Subwatershed. All stands in those areas with an assigned birth date before 1735 more likely have birth dates between 1735 and 1780.

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