Past and Present Conditions

Soils

In the past, prior to European settlement, the soils in the basin were being built up by weathering, vegetational and animal processes. The vegetational communities covering the landscape at that time will be considered natural and unimpaired with regard to the soil building processes for comparison purposes. Soil structure with respect to the processes affecting soil aeration would have been in balance or unimpeded. The state of compaction within the soil at that time may have been limited both in scope and scale.

Since the arrival of European settlers the landscape has been altered by removal of vegetation of one form (large trees) and replaced by another (grasses, brush and small trees). The processes that build soil and cycle nutrients and water changed in the basin as a result of human influence on the landscape. The removal of forest products compacted the soil resource and the grazing of the resulting grasslands added to that level of compaction. The removal of vegetation allowed the process of erosion to be accelerated over that which would have occurred in the forested state.

Erosional processes in the past have been largely surface and gully erosion, earth flow, followed by slumping or landsliding. In this basin, there is evidence that soil creep or earth flow is the dominant process of mass movement and has been occurring for a long time.

The clays of the dominant soil types in the basin are classified as silty clays and are the major source of sediment within the stream network of the lower watershed. They have a high susceptibility to erosion and are added to the system quickly after a major storm event. Once in the stream network, the sediment remains in suspension until the stream velocity reduces sufficiently to allow the sediment to settle out. Past land clearing activities, especially pasture development, allowed the soil to be exposed to the weathering elements, yielding more sediment than under the forested or vegetated condition that exists today.

Past removal of timber resources did not adequately protect the soil from compaction. During the review of aerial photos spanning the 1943 through 1992 period of time, it was evident that on the lower grade slopes (those less than 40%) harvesting with track or wheeled vehicles was prominent. Minimizing compaction during log transport was not a consideration. Prior to the development of a transportation system in the watershed, the use of cable systems did not provide for suspension of logs. Most logs were dragged over the ground, sometimes for long distances, using the same skid trails repeatedly. The use of these systems compacted the soil in those areas where multiple passes of logs occurred.

A major soil resource impacted in the past was the organic matter component on the soil surface. The function and physical placement of organic matter on the land surface ultimately defines the soil productivity. Fire has impacted a majority of the watershed, and thus reduced the woody debris and organic matter concentrations in the basin. Fire occurrences in the Baker, Rowland

and Salmon drainages have been extensive enough to reduce the amount of organic matter. See Fire and Disturbance section for a full discussion. The 1932 and 1936 fires were stand replacing fires, and may have been intense enough to consume all the organic matter and volitize nitrogen from the soil. The organic matter component within the watershed has also been reduced by activities that compact the land surface such as harvesting or grazing.

Grazing within the watershed eliminated a major source of organic matter additions to the soil. The annual production of grasses would have provided a considerable accumulation of organic matter to the soil in the last 60 to 70 years in localized areas (meadows). Burning to encourage grasses to grow and reduce encroachment of conifers does not appear to have been a standard practice. Repeated agricultural burning has been largely confined to a five section area within the watershed, based on agricultural burning permits from 1985 to 1994. The watershed appears to have a natural ability to produce grasslands after disturbances and thus may have only needed occasional burning to produce forage for grazing.

EROSION

The Lower South Fork Coquille River basin is largely covered (52% of the total area) with the Etelka, Remote and Whobrey soil types (see Figure 3). Water tables at depths between 24 and 36 inches are created between the months of December and March on these soils. The soil types of 18E, 19F, 21D and 22E dominate this basin, except near the southern portion of the watershed in the Salmon Creek compartment (see Figures 3, 8, and 9). This accumulation of water between soil types (or between the soil and the underlying parent material) creates a slippage plane at saturation point. If the plane is steepend to a point above which the weight of the soil and water can remain stable, a landslide or mass movement of soil results. Soil creep is the major mass movement process in the basin. No inventory of the moving area is available at this time. Since this process can not be readily identified from aerial photos, but requires ground truthing - a data gap exists for this process.

Figure 8. Soil types within Tier 1 Watershed by compartments and entire watershed

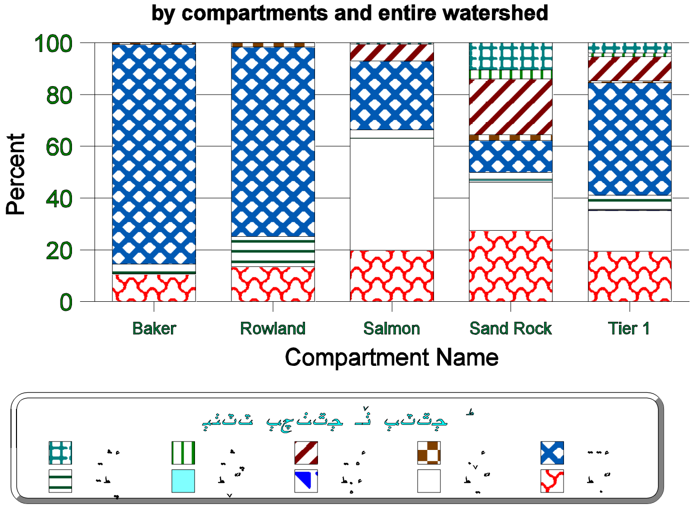
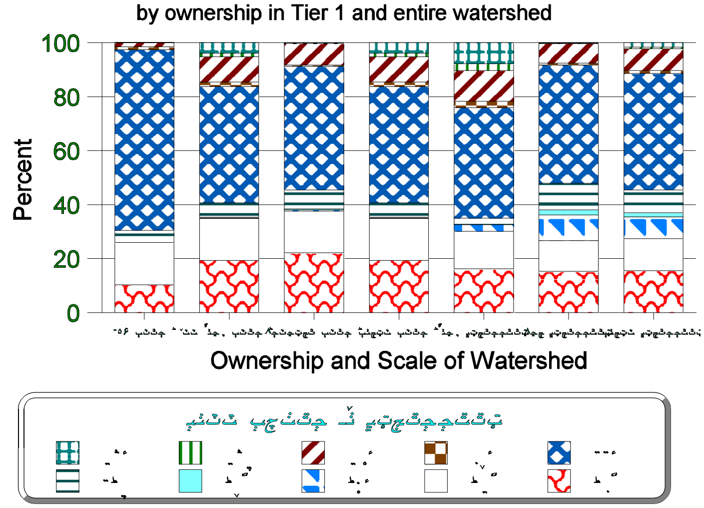


Figure 9. Soil types in the Lower S. F. Coquille Watershed by ownership in Tier 1 and entire watershed



The Salmon Creek drainage is composed of soils that are very rocky and steep. The 14F and 15F soil series contain the Digger, Umpcoos, and rock outcrop types within the watershed. These soils are subject to sudden, rapid and large, persistent landslides that deliver a sandy type of sediment mixed with larger rocks to the stream network. Table 3 presents the number of slides by decade and particular soil type for the Rowland-Baker-Salmon Key Watershed. Table 4 points out the large number of slides in the 1950 decade, most of which occurred in the Salmon Creek drainage.

Table 3. Landslides within the Tier 1 Watershed by decade and soil type.

Soil Type	Decades					Total
	1950	1960	1970	1980	1990+	# (%)
14F	29	0	1	0	2	32 (16)
15F	21	2	0	0	0	23 (12)
19F	0	2	0	0	0	2 (1)
21D	8	5	0	0	0	13 (6)
22E	46	6	7	4	8	71 (36)
25	1	0	0	0	0	1 ( )
49 E,F	1	0	0	0	1	2 (1)
50 D,E	16	0	0	0	0	16 (8)
65	9	0	0	0	0	9 (4)
Total # (%)	161 (81)	14 (7)	8 (4)	4 (2)	11 (6)	199 (100)

A landsliding rate was determined for the Key Watershed for the decades from 1950 to 1990. A total of 199 slides were identified. The results are presented in Tables 3 through 5. The landslide rate depends on the type of slide identified and the decade in which it occurred. The bulk of the landslides in the Key Watershed were identified from the 1955 aerial photographs. Eighty one percent of the slides occurred by that decade, with the remaining nineteen percent occurring in the remaining three decades. The majority of the occurances (54%) were the shallow rapid type landslide during the 1950's. During the 1960 - 1990's, that rate decreased to 15% of the total. The other types that were identified were debris flows, large persistent deep-seated failures, and sidecast. Again, the 1950 decade produced the largest number of these events, with a drastic decline in the remaining three decades.

Table 4. Landslide types in the Tier 1 Watershed by decade.

Decade	Shallow Rapid	Debris Flow	Large Persistent Deep-Seated Failure	Side Cast	Sediment Delivered to Stream Channel
1950	108	13	31	9	130
1960	11	3	1	0	13
1970	7	1	0	0	5
1980	4	0	0	0	3
1990+	8	2	1	0	4
Total # (%)	138 (69)	19 (10)	33 (16)	9 (5)	155 (78)

Natural slides accounted for 76% of the total slides identified (see Table 6); 69% of these slides occurred in the 1950's. Land management activities such as sidecasting, road building, yarding and skidding accounted for the remaining 24% of the total landslides. Since the 1950's, only 12% of the total number of landslides can be attributed to management activities. However, it should be noted that the photo coverage of the Key Watershed was incomplete, and the most notable area for sliding in the 1950s (Salmon Creek) was not available for analysis in the later decades. Over all, there does not appear to be a problem with landslides in the Rowland and Baker Creek drainages. In the absence complete photographic coverage of the Salmon Creek drainage, the extent to which landsliding is a reoccurring event, and thus a concern, has not been fully evaluated.

The types and rates of landsliding within the entire Lower South Fork Coquille Watershed are probably similar to those of the Key Watershed. The soil types are similar, with the exception of soil types 18E and 19F. These two soil types are found more often in the larger watershed and are more prone to failure due to their slope. Thus, a slightly higher rate could be expected in the larger watershed.

Table 4 presents the number of slides that delivered sediment to the stream. In the 1950 decade, large quantities of sediment were added to the streams as a result of the identified slides. Nearly a ten-fold reduction occurred in the 1960's. In the 1970-1990 decades, the same number of slides delivered sediment, but it was over a 22 year span of time. Therefore, not only were the total number of slides reduced, but the sediment delivery was reduced as well.

Table 5. Landslide events by land use association and hazard classification.

Soil Hazard Class	Soil Types Defining Rating	Portion of Basin Acres (%)	Number of Events (% Total)	Land Use				
				Natural	Side Cast	Yarding	Skidding	Road
High	15F	3481 (14.5)	23 (11)	17	0	4	1	1
High-Mod	14F, 21D 19F, 22E	15,224 (63.2)	148 (74)	109	8	19	3	9
Moderate	49E, 49F	531 (2.2)	2 (1)	2	0	0	0	0
Mod-Low	50E	2,102 (8.8)	14 (7)	12	1	0	0	1
Low	50D, 25 65	722 (3)	12 (6)	11	0	0	0	1
Totals		91.7	199 (100)	151	9	23	4	12

Table 6. Landslide Event by Land Use Association and Decade.

Decade	Number of Events/ Decade (% Total)	Land Use				
		Natural	Side Cast	Yarding	Skidding	Road
1950	161 (81)	138	4	10	4	5
1960	15 (7)	6	4	3	0	2
1970	8 (4)	2	1	2	0	3
1980	4 (2)	1	0	2	0	1
1990+	11 (6)	4	0	6	0	1
Total (%)	***199 (100)***	***151 (76)***	***9 (4)***	***23 (12)***	***4 (2)***	***12 (6)***

SEDIMENTATION

Turbidity sampling data during the winter of 1994-95 in the Rowland and Baker Creek drainages is presented in Figures 10a and 10b. The turbidity of these streams appears to be caused by the suspension of clay particles within the water column (personal observation). No testing or sampling for suspended sediment was associated with the collection of turbidity samples. The

Dement, Rowland and Baker Creek drainages are extensively covered with Etelka, Whobrey, and Remote soils and influence the water quality of the Lower South Fork Coquille River directly. These soils have apparently always produced high amounts of silty clay to the stream network and may affect the fish habitat and water quality accordingly. Adequate filtration of sediment carried in surface runoff can be accomplished by 25 to 75-foot (depending on slope) strips of vegetation in key locations, such as riparian buffer areas or road-side ditches adjacent to stream crossing culverts.

Some of the fine sediment in these streams is small enough that it does not readily settle out. The turbulent nature of the streams allows particles to be suspended with little increase in stream velocity. Thus, once a major storm event fills the system with sediment it takes a drastic reduction in velocity to allow the stream to clear. This happened toward the end of April or May in 1995, when constant input from precipitation stopped for a week or more. It may also occur during the winter if rainfall stops for a week or more. Overall, Rowland and Baker Creeks are high in natural sediment load and stay in that condition in the winter. Baker and Rowland Creeks respond similarly to precipitation. However, high turbidities in Baker Creek recover more slowly than in Rowland Creek. Notice the trend of turbidity in Figure 10a resembles that of the 3-day rainfall event presented in Figure 11. Turbidity appears to be under the influence of the amount of rainfall received in a 3-day period.

Figure 10a. Turbidity of Rowland Creek

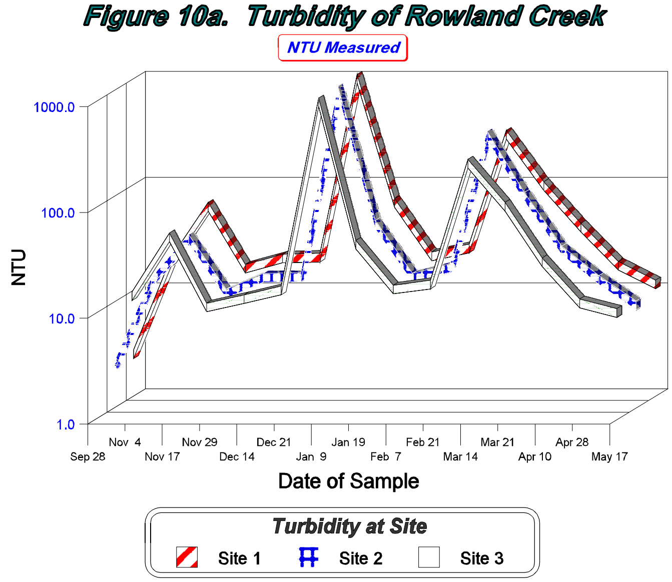


Figure 11. Rowland Rainfall Amounts

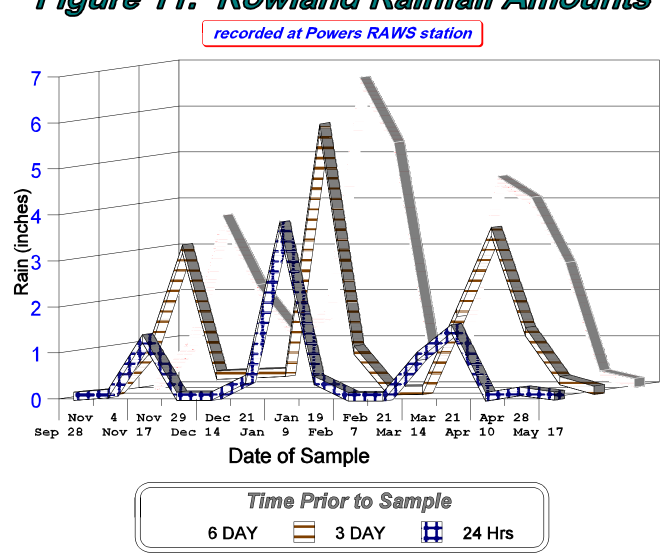
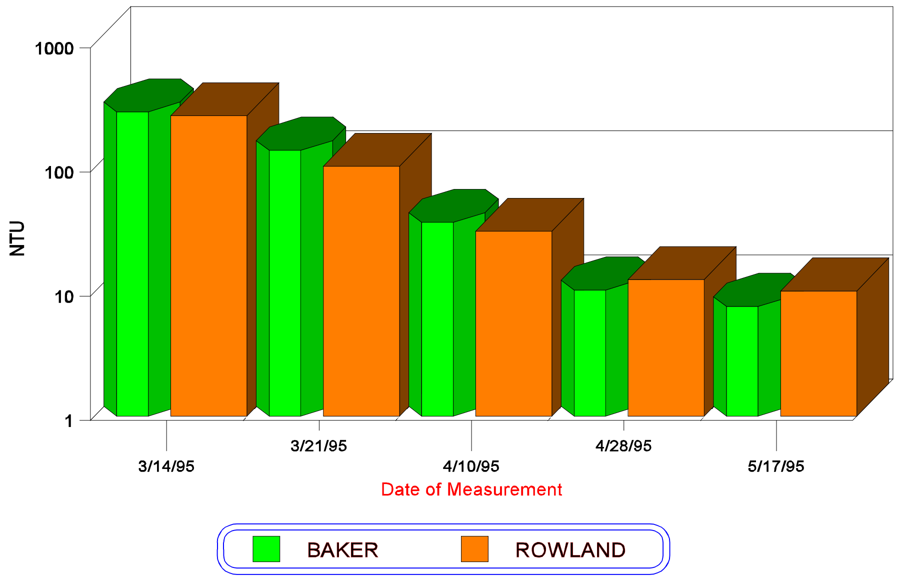


Figure 10b. Comparison of turbidities in Rowland and Baker Creeeks.



SOIL PRODUCTIVITY

Soil productivity is a combination of the nutrient status, biological functions, and interactions with plants growing in the soil. Soil productivity is tied to site index in the District Resource Management Plan (RMP), Appendix X. At this time, site index is our best measure for site productivity. It is limited in scope in that it relates tree height, at 50 or 100 years of age, as the measure of site productivity. Basing productivity on this measure is narrow in scope, because while all soils have some inherent level of productivity, all may not grow trees. Within the Lower South Fork Coquille Watershed, the site indexes for the predominant soil types range from a high class 2 to a low class 5. The average index for the watershed is mid class 2 or mid class 3. This level of productivity is capable of producing high volumes of timber in short rotations.

The nutrient base of the soil is heavily influenced by the type of disturbance that occurs on the surface. Compaction limits water infiltration and soil aeration processes, microbial activity, and root growth of plants. Burning or harvest (including salvage) can deplete the nutrient capital from the soil, or retard those processes that cycle the nutrient base. The combined nature of these activities in a short span of time (less than 80 years) may have lowered the site index in certain areas. Silvicultural activities that manage the resulting plantations may be able to overcome any impact to the soil resources (by fertilizing), but no inventory of the replacement stands has been conducted to date to reevaluate the site indexes.

COMPACTION

The level of compaction of the soil influences the ability of the soil surface to infiltrate water to the groundwater table. A high level of compaction allows more surface runoff to occur, and may result in higher peakflows in the streams. This watershed is naturally prone to perched high water tables in the winter months. Increasing the runoff to localized areas (such as road drainages) results in water infiltrating into an already saturated subsoil. This will increase the likelihood of road prism failure, and is reflected in the high rate of culvert failures in the recent years.

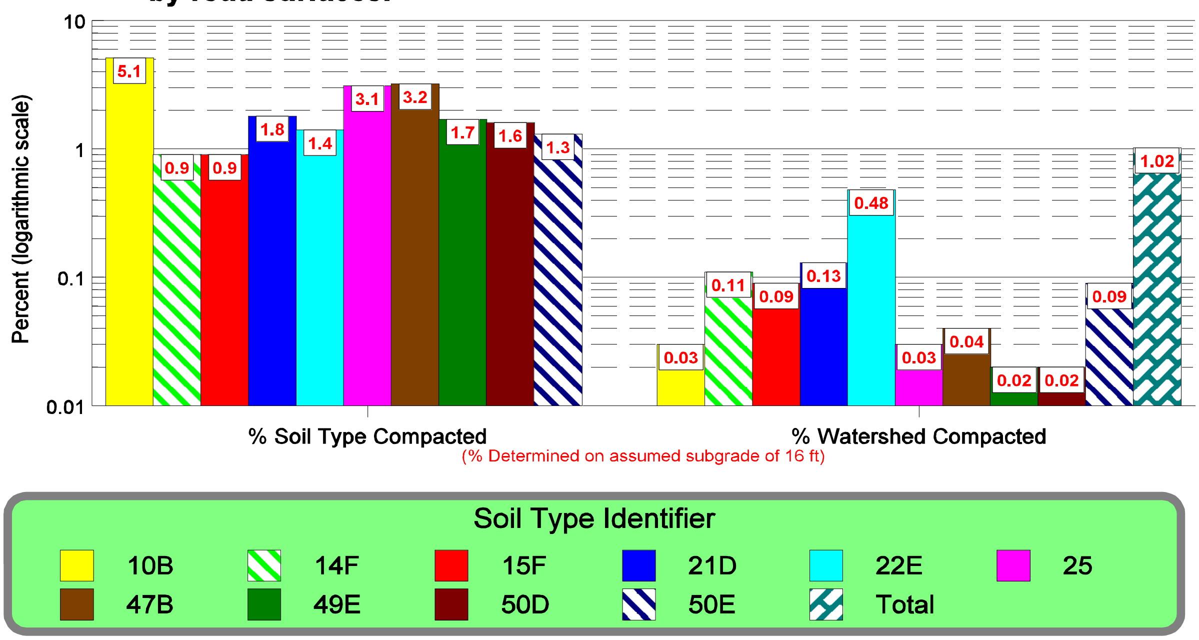
Within the Key Watershed, the transportation system is undergoing a large number of culvert failures. The major roads in this area were constructed or rebuilt between 1960 and 1970. The culverts placed in the subgrade at that time were not backfilled with suitable materials or techniques. A casual inventory suggests that culvert placement and alignment within the subgrade was often done without regard for the original stream channel orientation. It is possible that since installation the land has exerted forces on the pipes and moved them within the subgrade causing misalignment. Additionally, many of these culverts have been in place past their thirty-year design life. As a result, many culverts are deformed and have reduced capacities. They are also rusted through or undermined causing erosion within the subgrade around the pipe. Subsurface drainage was not provided during installation and many of the culverts are failing downhill due to earthflow movement. Within the remainder of the Lower South Fork Coquille Watershed, culvert failures are less common. Maintenance is provided by the county and other private land holders, and may keep culverts in better repair. Therefore, road-associated slides and culvert repairs are not required as frequently as in the Key Watershed. This may also be due to the relatively low gradient slopes in the lower portion of the watershed, where the hillsides are not poised for movement under saturated conditions, as they seem to be in the Key Watershed.

Based on the information extracted from the Transportation Information and Management System (TIMS), there is a one percent (1%) level of compaction within the entire Lower South Fork Coquille watershed due to inventoried and non-inventoried road surfaces. The number of acres of the ten major soil types and the percent of compaction both within the individual soil type and over the entire watershed can be found in Figure 12. Eighty percent of the total land surface is covered by these ten soil types. An assumption of 16 feet for road subgrade width was made for all roads (including cat trails). Since 1960, 19 acres within the Key watershed and 29 acres outside of the Key watershed have been compacted by road construction.

A change in both building technique and subgrade width have taken place since the early 1960's. In the beginning, mainline transportation systems with wide subgrades were developed using crawler tractors as the dominate construction tool. In the 70's and 80's, the subgrade width was reduced, largely because the roads were secondary tributaries or single purpose spur roads. The use of excavators replaced the crawler tractor as the primary construction tool and sidecast was reduced.

The non-inventoried trails, such as those made by ground-based harvesting activities or compaction from the grazing of animals, cannot be determined. Based on decadal photo series, the common harvest technique in the past on most private lands was ground based. These lands have been impacted by this type of activity. Grazing continues along the Lower South Fork Coquille River from the town of Powers to the main stem of the Coquille River, on the lower foothills and flood plains. The extent and recentness of these activities suggests that there is a much higher level of compaction within the entire watershed than indicated by the TIMS data; possibly as much as 10 to 15 percent of the total land base. Land in federal management is at a lower amount of compaction due to the use of cable systems instead of ground based systems during harvest activities. A level of 5 to 6% is expected on harvested areas on these lands. The higher level of compaction is approaching a threshold where the ability of the soil surface to infiltrate water, soil aeration, and the processes of root growth and microbial activity may be adversely affected. In addition, increased runoff and changes in timing (e.g., peak flow increase) may occur.

Figure 12. Percent of the Lower South Fork Coquille Watershed Compacted by road surfaces.



The components that are most vulnerable to impact within the watershed and influence site productivity are: 1) the aeration of the soil and the organic matter layer on the surface; 2) the stability of the land surface, especially under saturated or super-saturated conditions; and 3) the nutrient base of the soil and the nutrient cycling processes.

Currently, an estimated 10-15% of the watershed is in a compacted state, thus limiting many of the soil processes, increasing the rate of runoff and changing the timing and duration of peak flows in the basin. The inherent instability of the soils in the watershed is compounded by road construction and management, which concentrate or store water in the soil on slopes that approach 35 to 40%. The reduction of organic matter from the surface of the soil to the point that large areas are exposed, or replacement of vegetation does not occur within 2-3 growing seasons, will reduce the nutrient base and produce sediment from long term erosion. Additional information on the soils within the analysis area is provided in Appendix 4.

Water Quality/Quantity

FLOW, DISTRIBUTION and USES

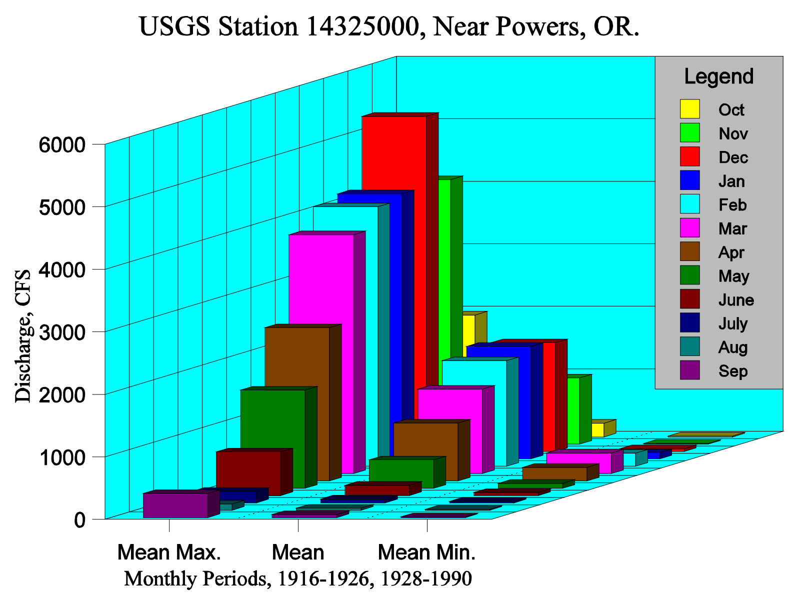
Mean monthly flow for the South Fork Coquille River is shown in Figure 13. Values represented in this graph were calculated by grouping each monthly period of mean daily discharge for the period of record. Monthly maximum and minimum flows can be substantially different from the mean in any month, but usually do not persist over long time periods. Contribution of mean monthly flow to percent of annual runoff is depicted in Table 7.

Table 7. Mean Monthly Contribution of Annual Runoff (Percent)

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2.4	11	19	19	17	14	9.6	4.9	1.7	0.7	0.4	0.5

The following brief history of flood events is presented, and shows where a few significant

Figure 13. South Fork Coquille River mean monthly discharge for the period of record.



events left the channel in a poorer functioning condition:

> During November of 1861, there was a significant rain-on-snow event accompanied by strong, warm, southerly winds, which raised the water in Dement Creek at least eight feet and caused heavy windthrow (Wooldridge 1971).

In February of 1890, a large rain and major flood occurred in southwest Oregon. There are various observations of this event on area coastal streams in the historic literature. The flood magnitude and return interval is unknown. Much slide activity was reported. During heavy rains, a massive slide dammed Salmon Creek, four miles above its confluence with the South Fork Coquille. A high volume of water was impounded to an estimated depth of 75 feet behind the slide deposits, and several days later a dam-break flood occurred. A mass of trees, debris, rocks, mud and water swept down Salmon Creek, into the South Fork Coquille, and all the way to Myrtle Point. This torrent covered a distance of more than 25 miles, and was without a doubt responsible for major channel rearrangement and widening. South Fork Coquille raised 25 feet, and the flood wave attenuated to 12 feet at the confluence with the Middle Fork Coquille (Dodge 1969). The debris torrent delivered enough sediment to the confluence of the South and Middle Forks of the Coquille River to displace the head of tide six miles downstream (Wooldridge 1971). Tremendous mile-long log jams were formed in several different locations on the river with 200-300' lengths of timber (Dodge 1969). This landslide into Salmon Creek, and dam break flood, was probably the single most damaging event ever recorded on Salmon Creek and the South Fork Coquille River. The effects of channel scour, widening and bank failure probably greatly exceeded effects of log drives, the 1964 flood, or other recorded floods. Landslides also entered the South Fork from both sides of the stream from just below Rowland prairie during this event (Wooldridge 1971).

On November 1, 1924, there was a mean daily high flow of 20300 cfs, at the USGS gage near Powers, OR. The return period probability for this flood, based on the record is near 20 years.

On December 26, 1955, there was a mean daily high flow of 18600 cfs, at the USGS gage near Powers, OR. The return period probability for this flood, based on the record is near 10 years. However, a six-day period from December 21-26 had similar high flow.

On December 22, 1964, a maximum discharge of 48900 cfs (from floodmarks) was observed at the USGS gage near Powers, OR. The return period probability for this flood, based on the record is in excess of 100 years. This equals 289 cfs/mi^2, which is close to three times higher than the maximum equivalent area runoff for coastal watersheds to the north, but similar to coastal watersheds arising in the Siskiyous to the south. This was a rain-on-snow event. The flood of 1964 raised the water in Baker Creek up over the top of the large (10' diameter) culvert near its confluence with the South Fork Coquille River (BLM 1995a).

On January 17, 1971, there was a mean daily high flow of 20600 cfs, at the USGS gage near Powers, OR. The return period probability for this flood, based on the record is near 20 years.

On January 15, 1974, there was a mean daily high flow of 22100 cfs, at the USGS gage near

Powers, OR. The return period probability for this flood, based on the record is near 25 years.

Two sources supply water for the city of Powers; Bingham Creek (winter source), and the South Fork Coquille River at Mill Creek (summer source). Water from the South Fork is pumped to a concrete reservoir, and gravity flows to the distribution system. The water receives chlorination treatment. These surface supplies serve about 736 persons through 355 unmetered connections. The city of Powers has water rights for 1.23 cfs on the South Fork, and 1.21 cfs on Bingham Creek (CH2MHill 1993). Additionally, there are 32 permitted or certificated domestic water rights users on the South Fork Coquille and tributaries, with a total consumptive use of 0.16 cfs. Surface water is used for irrigation from 89 sources with a total permitted amount of 26 cfs (OWRD 1994).

For protection of fisheries and aquatic life, ODFW has established instream flow recommendations for the South Fork and many tributaries, including Baker and Salmon Creeks, and filed for water rights with OWRD. Certificates have been issued in some cases, but many remain as pending applications. Some of the certificates require that 15 cfs remain in the South Fork Coquille River for the July to September period. In some drought years, as occurred in 1987, 1991, 1992 and 1994, when the streamflow fell below this amount for protracted periods, additional irrigation and surface withdrawals may need to be curtailed.

LOW FLOW

With decreasing precipitation in the summer, flows become extremely low in the South Fork Coquille. Minimum flow generally comes in mid August-October. Average two year recurrence interval low flow is about 0.06 cfs/mi^2 in mainstem streams, and$<$0.08 cfs/mi^2 for consecutive periods of up to 30 days. Low flows are mostly a result of natural conditions, although they are being exacerbated by poor channel condition, lack of large wood complexity, and out-of-stream uses. Few natural water storage features (lakes and ponds) exist in the watershed.

Significant recorded 7-consecutive-day low-flows occurred between September-October in 1939, 1974, 1987, 1991, 1992 and 1994. The return period for these 7-day low-flows are 20 years or greater. The low flows in 1991, 1992 and 1994 were 100 year events (Wellman et al. 1993). During these periods there were less than 12 cfs in the South Fork Coquille, measured at the USGS gage 14325000, near Powers, Oregon.

Rowland Creek has been observed to go dry in the lower portions (BLM 1984). Although causes have not been fully determined, poor channel condition is suspected to be a factor. Instream and near-stream floodplain water storage is minimal. The stream channel is wide and overfit from past floods. Rowland Creek's base level is lowered and disassociated from its floodplain. In addition, large wood to form pools is scarce, beaver dams are absent, and other storage elements that would detain water appear to be missing.

WATER QUALITY

Pollution sources on the South Fork Coquille include both point and nonpoint source discharges. Point sources come from a discrete source, such as a pipe, and are regulated by DEQ under the National Pollution Discharge Elimination System.

Nonpoint sources of pollution arise from diffuse sources in the watershed, and are much more difficult to assess. Water quality conditions are listed as severe for the South Fork Coquille, from Middle Fork upstream to Salmon Creek, including Dement Creek (DEQ 1988). Turbidity, sediment, erosion, low-flow, and lack of structure are noted as concerns.

The South Fork Coquille has been listed as "water quality limited", from river mile 0-30, in Oregon's 1994 Water Quality Status Assessment (305b) Report. A Total Maximum Daily Load (TMDL) has also been established by DEQ. "Water quality limited" means that treatment techniques are being used, but frequent exceedances of DEQ water quality standards still occur. TMDL is the total amount of pollutant from all sources that can enter a waterbody without exceeding water quality standards. The primary water quality parameter of concern, and the one for which the TMDL was established on the South Fork Coquille, is very low levels of dissolved oxygen during the summer months (DEQ 1994). Fecal coliform also exceeds standards in some river segments below Powers, but as yet has not been designated for a TDML. Additional concerns include temperature, nutrients, and sedimentation.

DISSOLVED OXYGEN

The amount of oxygen dissolved in water can affect water quality and aquatic habitat. The solubility of oxygen in water is inversely proportional to temperature and directly proportional to atmospheric pressure. Most tributary streams are at saturation for their given elevation and temperature, because of stream tumbling and aeration, except for low streamflow periods. Dissolved oxygen levels may be reduced due to microbial decomposition of organic matter, known as biochemical oxygen demand. During late summer/fall, when flows are low, dissolved oxygen may fall below saturation due to the addition and decomposition of leaf litter from riparian forests (Taylor and Adams 1986). No information is available to know if oxygen depletion is a problem in the Rowland-Salmon-Baker Key Watershed, but it is suspected to have short autumn periods where oxygen levels are below saturation.

A point source of pollution is the sewage treatment plant at Powers, Oregon, which discharges into the South Fork Coquille mainstem at river mile 28.3. The average dry weather flow to the river is 0.3 million gallons/day of treated domestic sewage effluent. To limit dissolved oxygen depletion in the river, this facility has been required to meet a standard of 20 mgl of five-day bio-chemical oxygen demand. Applying current technology could reasonably achieve an even lower level of 10 mgl (DEQ 1994).

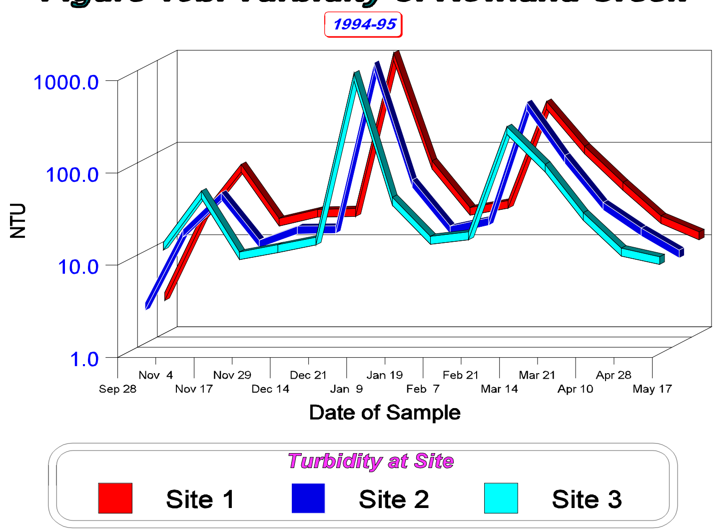
TURBIDITY/SEDIMENT

Turbidity (or water clarity) varies throughout the year in the South Fork Coquille, and is flow dependant. Generally, during fair weather, the river's clarity is excellent. During winter rains, prolonged storms, and rapid melt of shallow snowpacks, the water can be clouded for periods of up to a week or more. High turbidities generally correlate with high sediment loads in the stream. Sources can include erosion from roads, landings and other compacted areas, slides, debris torrents, and stream bank-cutting.

DEQ did a recent source search assessment at 30 different stream locations, identifying sources of turbidity along the South Fork Coquille and tributaries during the winter of 1992-3. An overall ranking and geometric mean were developed from synthesis of sample data. The data generally showed that upper river and tributary streams have lower turbidities than elsewhere, with some exceptions (DEQ 1993). Salmon Creek, near its mouth, ranked sixth with an average winter stormflow turbidity of 7.6 NTU, and Baker Creek, near its mouth, ranked fifteenth at 22.2 NTU. Rowland Creek was not evaluated in this study.

Turbidity grab samples were taken at three sites in Rowland Creek during 1994-1995, and are depicted in Figure 10b. Turbidity ranged from essentially clear (0.1 NTU) during low flows in September to muddy (1000+ NTU) on January 9, 1995 (BLM 1995b).

Figure 10b. Turbidity of Rowland Creek



Turbidity measurements have only been taken in the past few years; evidence of how water clarity may have changed can be found in anecdotal reports. Following are summaries of historical accounts:

Curt Townsend: From 1934 to the 1940's the river stayed clear during storms. There was only the Agness Road and the Pepper Road over Sand Rock Saddle down to Johnson Creek. The rest of the drainages had no roads. Logging and road building increased in the 1940's for the war effort, and continued afterwards. The areas were widely clearcut right down and across the streams. The Forest Service used the same practices with timber sales in the 1960's and 1970's. After the increase in logging and roads, the river started running muddy during high water and lots of debris was in it (USDA 1995).

René Stinson: In the past it has taken up to eight days for the clarity in the stream (South Fork) to return to normal. Today it takes only two or three (USDA 1995).

Recreational mining at various locations in the South Fork Coquille River and tributaries during summer low-flow conditions can cloud the water for short distances downstream. As river gravels are suctioned from the streambed, fine sediments are released and show a plume. DEQ has operating requirements to mitigate potential effects on water quality. Recent water quality problems associated with this type of activity have not been observed in the Salmon-Baker-Rowland Key Watershed.

STREAM TEMPERATURE

Streams in southwestern Oregon are known for their relatively high summertime temperatures, but it is not clear whether this is related to a latitudinal gradient, high solar radiation loads, low flows, or other related factors (Beschta et. al. 1987). Monitoring of stream temperatures during the drought of 1992 did not show a strong correlation between maximum stream temperature and elevation (Oregon Forest Industries Council 1993).

Elevated water temperatures have been noted throughout the South Fork Coquille Watershed. High temperatures are attributed to loss of riparian vegetation and streamside shade, low flows and poor functioning of stream channels.

Recorded miscellaneous maximum water temperatures for the South Fork Coquille and tributaries prior to 1972 are shown in Table 8 (Thompson et. al. 1972).

Table 8. Miscellaneous maximum water temperatures before 1972.

Stream	Location	Temperature (F^0)
South Fork Coquille	River mile 20	76
South Fork Coquille	Above Panther Cr.	77
South Fork Coquille	At Powers.	84
South Fork Coquille	Banner Cr.	74
Dement Cr.	Mouth	79
Salmon Cr.	Mouth	79

Temperature generally increases in a downstream direction on the South Fork Coquille River. Many tributaries provide cooler water that may reduce temperatures in the river immediately downstream by as much as 1 ˚F (Bakke 1993). The summer temperatures in the South Fork are still characteristically high and exceed the State South Coast Basin maximum allowable temperature of 64 ˚F for more than two months in some years. The wide condition of the river, low flows and lack of shade are primary causes. Past road construction and timber harvest, log drives below Powers, and the 1964 flood largely diminished riparian vegetation.

Summer temperatures have been recorded by continuous electronic data recorders since 1993 in about 20 tributaries to the South Fork Coquille below Powers. Cooperators include BLM, USFS, DEQ, and Georgia Pacific. Although data has not been fully evaluated, summary information is shown in Table 9 for selected South Fork Coquille streams.

Table 9. DEQ 1993 temperature monitoring summary for selected South Fork Coquille streams.

Streams	Seasonal Max.	Date	Seasonal Min.	Date	DeltaT	Date	7 Day Max.	7 Day Min.	7 Day Delta T	Days> 64	Seasonal Max. 64
Baker Creek	66.3	08/03/93	40.3	11/08/93	6.7	06/25/93	64.9	60.2	4.7	9	2.4
Dement Creek	75.4	08/03/93	41.4	11/14/93	11.9	06/25/93	72.8	63.8	9	80	11.4
Roland Creek	67.1	08/03/93	51.4	09/20/93	6.5	06/25/93	65.5	61.3	4.2	14	3.1
Salmon Creek	69.1	08/03/93	46.4	11/08/93	7.9	06/25/93	68.2	61.2	7	65	5.1

Definitions:	
Delta T	-Highest value of daily difference between max. and min. for the season
7 Day Max.	-Average value of daily maximuns for the highest consecutive 7 days
7 Day Min.	-Average value of daily minimums for the same 7 days
7 Day Delta T	-Average of the daily difference between max. and min. for the same 7 days
Seasonal Max. 64	-Number of degrees seasonal max. is above 64˚F
Note: Station location is near the confluence with the South Fork Coquille.	

Variations in temperature have been noted, depending on sample locations within each drainage. Temperature data as shown in Table 9 were collected near the mouths of the drainages above their confluence with the South Fork Coquille River. These summer temperatures may not reflect conditions in higher-gradient stream reaches in middle to upper portions of these drainages. For example, stream temperatures were continuously measured at four sites in Baker Creek from June-September 1994 (BLM 1994a). Stream temperatures ranged between 50-63 ˚F, and were cooler at upstream sites. Cooler stream temperatures higher in the drainage may be due to adequate conifer/hardwood stream shade, which limits direct solar heating.

STREAM and CHANNEL CONDITION

The Salmon-Baker-Rowland Key Watershed is in a poor, but recovering watershed condition. Early century downhill yarding of logs to rail sidings, and continued conventional logging and road construction from the 1940's-1980's have left much compaction in the Key Watershed. Increases in streamflow have been documented when compaction exceeds 8% of a watershed (Harr 1976). Compaction in the Key Watershed is approximately 10 - 15% (see Soils section). There is undoubtedly turbidity and sedimentation loading into channels from runoff coming from these compacted areas.

Salmon Creek has a stable bed, moderately stable banks and is well vegetated - but is wide, entrenched and lacks coarse woody debris. Old flood terraces are evident. Grazing occurs in the upper areas of the drainage. This stream appears to be in a fair and improving condition. Stream stability of Baker Creek is fair. The stream flows within a narrow confined channel with stable bed and banks, is well vegetated, but lacks coarse woody debris. There is high level of disturbance from roads and skid trails in this drainage that may be affecting flow regime and stream sedimentation. Rowland Creek stream stability is currently in poor condition. Although the stream is well vegetated with hardwoods and conifers, the channel is overfit and very wide, and has very low coarse organic debris loading. The stream has excessive bankcutting. Furthermore, the channel appears to have lost connectivity with its former floodplain. These field evidences suggest that Rowland Creek has not fully recovered from past episodic flood events; probably the 1964 storm.

Additional information on the hydrology and water quality within the analysis area is presented in Appendix 16.

Aquatic Habitat

The streams in the Lower South Fork Coquille Watershed support resident and anadromous fish, amphibians, and a host of invertebrates through all or part of their varied life histories, and provide migration corridors for anadromous fish to and from this and adjacent watersheds. This watershed's capacity to sustain the indigenous aquatic biota is a function of the condition of its aquatic habitats. Relationships between stream habitat condition and salmonid population density and production are especially well documented (Marcus et al. 1990). The condition of the aquatic habitat also influences water quality, through interactions with numerous physical and biological processes. Furthermore, the Lower South Fork Coquille River and its tributaries are conveyors in the nutrient cycling process between the ocean and the uplands, and provide substrates for primary and secondary production; as such they are crucial to the maintenance of the entire ecosystem. In addition, streams of this watershed can provide drinking water, transportation, recreational opportunities, and add to the aesthetic quality of the landscape when properly managed.

The most recent and comprehensive stream habitat surveys within the Key Watershed were conducted by ODFW in 1992, and included 4.6 miles of mainstem Rowland Creek, 1.6 miles of Baker Creek (plus 0.4 miles of a tributary), and 7.1 miles of mainstem Salmon Creek. The 1992 stream habitat survey data (summarized in Tables 10 through 12) indicates the following:

- There are adequate numbers of pools well dispersed throughout most of the fish-bearing reaches on mainstem Rowland and Baker Creeks. However, there appears to be insufficient numbers of pools in lower Salmon Creek and the Baker Creek tributary. This shortcoming is largely due to the scarcity of large woody debris (which facilitates scour), but heavy sediment loads are also causing pool filling to occur in some areas.

- The stream channel immediately above the Baker Creek culvert is highly agraded.

- There is an overabundance of fine sediments (silt, sand, and organic material) in the mainstem of Baker Creek.

- There is an inadequate amount of large woody debris throughout the Key Watershed.

Taken together, this data indicates that the streams in the Rowland-Baker-Salmon Key Watershed are functioning below their full potential, with respect to over-winter rearing of juvenile salmonids and providing habitat for resident fish, due to a deficiency in large woody debris and complex pool habitats. Furthermore, there is concern with respect to Baker Creek's capacity to successfully incubate salmonid eggs due to a high percentage (18-22%) of fine sediments in spawning areas. Excessive fine sediment delivery to Baker and Rowland Creeks is further evidenced by the extremely high turbidities (approximately 1000 NTU's) measured there during the winter of 1995 (see Water Quality section). It should be noted that the stream survey data cited here is not comprehensive, particularly with respect to Salmon Creek (none of the Salmon Creek tributaries were surveyed). Additional stream survey work is needed for a more complete evaluation (see recommendations).

BLM spawning survey data (provided in Fish Population section) indicate at least two highly productive areas or "hot spots" in the Key Watershed: one on Baker Creek extending upstream 0.25 mile from the large culvert near the confluence with the South Fork Coquille River (which is used by both coho and steelhead), and another on Salmon Creek extending 0.75 mile through the south half of T31S-R12W-23 (which is used primarily by fall chinook). Data reported in Chen (1991) indicates that the unconstrained section of Salmon Creek between the confluences of Waterpipe Creek and Fuzzy Gulch is an important juvenile coho rearing area, and the section of Salmon Creek extending 0.75 mile through the south half of T31S-R12W-23 is an important steelhead rearing area.

The large (10' diameter) culvert near the mouth of Baker Creek was installed in about 1950, when the wooden railroad trestle was replaced with fill material. This culvert presented a barrier to upstream migration of all fish, due to the 10-12' drop at the discharge end (except during extreme high flow events such as the floods of 1964 and 1995, when water from the South Fork Coquille backed up over the top of the outlet of the culvert). At the time the large culvert was installed, a smaller (24") culvert was placed beside it, which discharged into the pool at the base of the fill - below the waterline. During some flows, fish were reportedly able to swim upstream through this smaller culvert (BLM 1995a). However, the smaller culvert has subsequently plugged or been crushed and is no longer functional. Anecdotal accounts (BLM 1995a) indicate that anadromous fish (probably steelhead) utilized Baker Creek prior to the installation of the culvert. During the summer of 1994, Georgia Pacific Corp. modified the large culvert with a fish ladder and baffles. Spawning surveys conducted during the winter of 1994-1995 verified that coho and steelhead were able to successfully migrate through the ladder and culvert and spawn upstream. It should be noted that it became necessary for Georgia Pacific Corp. to close and de-water the ladder in April, 1995, when slope failures in the remaining fill material at the culvert outlet threatened the ladder's structural integrity. Thus, it appears that additional engineering and regular maintenance of the Baker Creek ladder will be required to ensure continued anadromous fish access to Baker Creek.

A 1984 BLM survey of Rowland Creek noted that during summer and fall, the lower two miles of the streambed were dry except for isolated, shallow pools, and described the area as "...a deathtrap to steelhead and coho fry." Similar conditions were noted in the summer and fall of 1994, during visits to BLM water temperature monitoring stations on Rowland Creek. These conditions were reportedly first noted 40-50 years ago, in conjunction with logging in the headwaters of Rowland Creek (BLM 1984). Furthermore, the steep cascade 500' upstream from the mouth of Rowland Creek is a barrier to upstream migration, at least during most flow conditions. There is reason to suspect that rocks deposited in the channel from blasting during construction of the railroad trestle (which sits directly over the cascade) created or compounded this barrier (Shorb 1995). Spawning ground surveys conducted by ODFW and BLM indicate that no coho spawned in Rowland Creek during the 1994/1995 or 1995/1996 seasons. The culvert and aggraded channel at the mouth of the Ash Flat Creek (tributary to Salmon Creek at Powers Ranch) is the only known man-made barrier to upstream fish migration in the Salmon Creek drainage at this time.

Stream survey data on the remainder of the Lower South Fork Coquille watershed is scarce. The lower 0.35 mile of Woodward Creek, and the lower 5.3 miles of Dement Creek were surveyed by ODFW in 1992. An analysis of data from these surveys is presented in Tables 13 and 14, respectively. In summary, the analyses indicate the following:

- There is an insufficient number of pools in lower Woodward Creek. This shortcoming is largely due to the scarcity of large woody debris (which facilitates scour).
- Portions of the Dement Creek stream channel are highly aggraded.
- There is inadequate riparian canopy along the lower portions of Woodward and Dement Creeks.
- There is an inadequate amount of large woody debris throughout the surveyed portions of the Woodward and Dement Creek drainages.

Although not noted in the 1992 survey data, a 1977 BLM habitat survey indicated that the lower portion of Dement Creek was heavily inundated with fine sediments. Erosion control structures, riparian planting, and fencing were implemented in the Dement Creek drainage during the fall and winter of 1995/1996 through the efforts of the Coquille Watershed Association to address this problem.

No recent stream survey data is available for Warner Creek, Rhoda Creek, Yellow Creek, Beaver Creek, Long Tom Creek, Mill Creek, or the Lower South Fork Coquille River; all of which are fish-bearing streams. The Oregon Game Commission conducted stream surveys during the 1940's and 1950's on most of these streams. However, the reports are brief and entirely anecdotal, and as such are not conducive to analysis.

The fish distribution map (Figure 6) was compiled from maps and records obtained from BLM, ODFW (Forsberg 1992), and the Oregon State Forestry Dept. (ODF), and indicates the furthest upstream endpoint noted among the source materials for resident and anadromous fish in each stream. The best information available (stream surveys and maps) indicates that the upstream limits of resident fish habitat shown in Figure 6 are defined by naturally-occurring high-gradient barriers. As indicated in Figure 6, resident fish (especially cutthroat trout) are found in nearly every tributary to the lower South Fork Coquille River. In contrast, anadromous fish are completely excluded from several streams in the Lower South Fork Coquille watershed by natural or man-made barriers. The waterfalls at the mouths of Yellow Creek and Bingham Creek are natural barriers to all upstream fish migration; thus these creeks support only resident fish. The waterfall at the mouth of Mill Creek is also a barrier to all upstream fish migration. However, a comparison of aerial photography from the 1940's to present shows that Mill Creek was diverted near its mouth to construct a mill pond. This diversion resulted in a 30-foot vertical falls at Mill Creek's confluence with the South Fork Coquille River. A 1994 inventory of culverts under County roads in the Lower South Fork Coquille watershed indicated that culverts presented barriers to upstream migration on Long Tom Creek and six unnamed tributaries to the Lower South Fork Coquille River (Figure 14).

Additional information on the condition of the aquatic habitat within the analysis area is provided in Appendix 1.

Table 10. Summary of 1992 stream habitat survey of mainstem **Rowland Creek** using criteria from the Aquatic Habitat Project Benchmarks (ODFW 1994).

Benchmark Criteria	REACH #			
	1	2	3	4
Pool Area (%)	49.6	53.5	46.2	16.6
Pool Frequency (channel widths)	4.7	5.5	4.7	15.8
Residual Pool Depth (m)	0.68	0.62	0.54	0.45
Width-to-depth Ratio	22.0	21.0	13.8	11.0
Silt, Sand & Organic material (% area)	9	10	4	2
Gravel (% area)	30	33	29	31
Shade (reach average %)	81	87	92	91
LWD (pieces/100m)	2.5	4.2	8.2	9.6
LWD (volume/100m)	3.7	3.2	8.1	13.6

Table 11. Summary of 1992 stream habitat survey of mainstem **Salmon Creek** using criteria from the Aquatic Habitat Project Benchmarks (ODFW 1994).

Benchmark Criteria	REACH #		
	1	2	3
Pool Area (%)	5.2	16.5	20.7
Pool Frequency (channel widths)	51.4	20.7	13.8
Residual Pool Depth (m)	1.21	0.70	0.75
Width-to-depth Ratio	23.7	20.0	29.2
Silt, Sand & Organic material (% area)	3	4	5
Gravel (% area)	39	41	34
Shade (reach average %)	75	83	90
LWD (pieces/100m)	1.5	11.0	8.3
LWD (volume/100m)	4.4	14.0	21.4

Good Fair Poor

Table 12. Summary of 1992 stream habitat survey of mainstem **Baker Creek** using criteria from the Aquatic Habitat Project Benchmarks (ODFW 1994).

Benchmark Criteria	REACH #					
	1	**2**	**3**	**4**	**5**	**Trib**
Pool Area (%)	69	56.7	28	28.6	18	4.6
Pool Frequency (channel widths)	4.8	4.5	5.6	9.2	1.8	19.4
Residual Pool Depth (m)	0.88	0.56	0.41	0.67	0.27	0.3
Width-to-depth Ratio	22	78	8.6	22	27	19.7
Silt, Sand & Organic material (% area)	19	18	22	22	13	15
Gravel (% area)	28	18	22	25	29	29
Shade (reach average %)	76	86	93	94	90	86
LWD (pieces/100m)	4.2	11.3	1.2	3.8	9.22	10.5
LWD (volume/100m)	1.9	6.9	2.0	2.5	8.6	5.8

Table 13. Summary of 1992 stream habitat survey of mainstem **Woodward Creek** using criteria from the Aquatic Habitat Project Benchmarks (ODFW 1994).

Benchmark Criteria	REACH #
	1
Pool Area (%)	12.8
Pool Frequency (channel widths)	26
Residual Pool Depth (m)	0.6
Width-to-depth Ratio	23.0
Silt, Sand & Organic material (% area)	10
Gravel (% area)	17
Shade (reach average %)	63
LWD (pieces/100m)	2.1
LWD (volume/100m)	0.7

Good Fair Poor

Table 14. Summary of 1992 stream habitat survey of mainstem **Dement Creek** using criteria from the Aquatic Habitat Project Benchmarks (ODFW 1994).

Benchmark Criteria	REACH #			
	1	**2**	**3**	**4**
Pool Area (%)	60.9	53.4	33.9	38.3
Pool Frequency (channel widths)	4.2	3.8	6.7	7.7
Residual Pool Depth (m)	0.62	0.80	0.72	
Width-to-depth Ratio	26.4	72.8	36	
Silt, Sand & Organic material (% area)	10	9	9	
Gravel (% area)	35	40	45	
Shade (reach average %)	56	68	79	91
LWD (pieces/100m)	6.0	7.3	2.9	3.1
LWD (volume/100m)	1.0	4.4	3.2	1.8

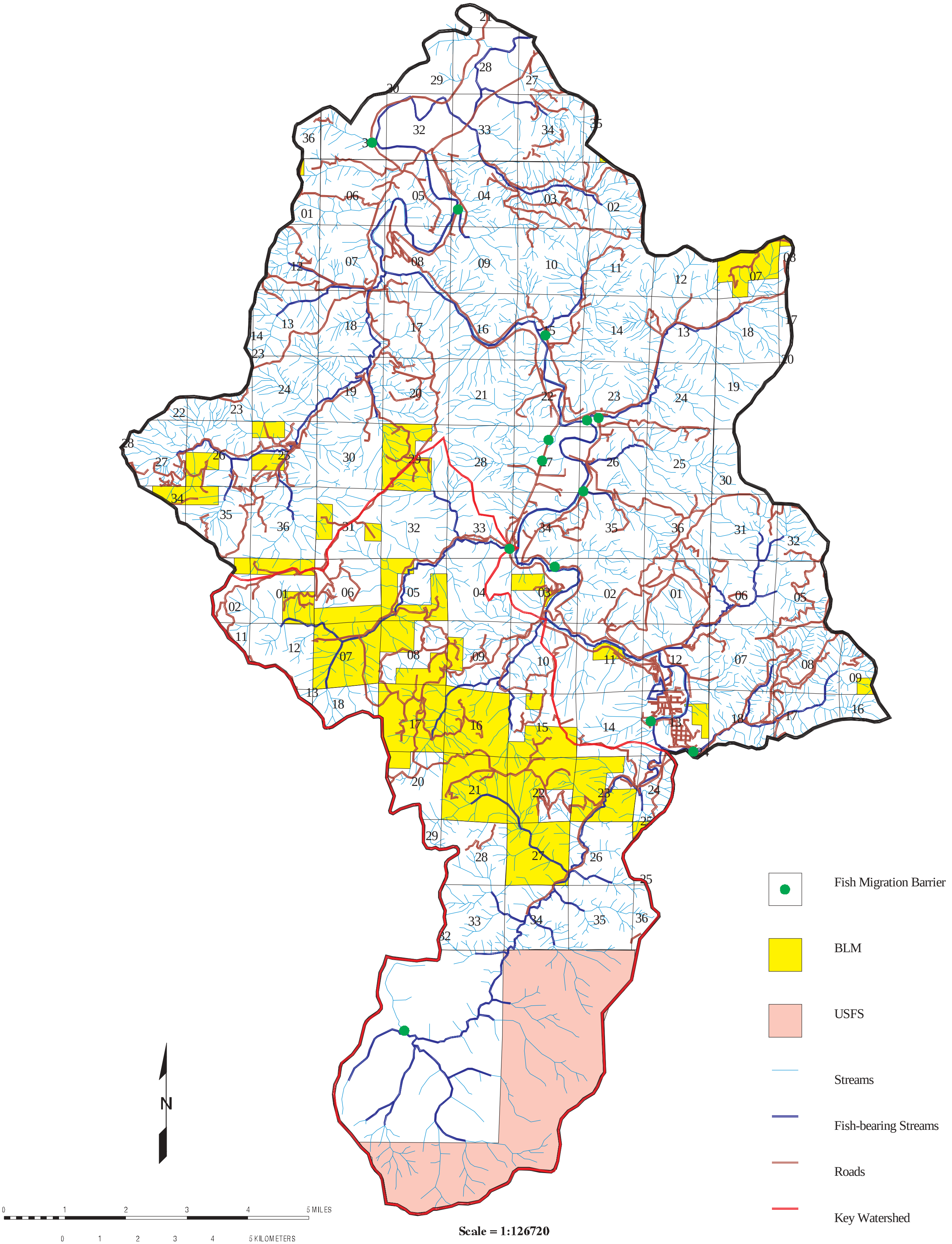
Good Fair Poor

Table 15. ODFW Aquatic Inventory Project Habitat Benchmarks (January 1994)

Benchmark Criteria	RATING	
	Poor	**Good**
Pool Area (%)	<10	>35
Pool Frequency (channel widths)	>20	<8
Residual Pool Depth (m)		
high gradient-small streams	<0.2	>0.5
low gradient-large streams	<0.5	>1.0
Width-to-depth Ratio	>30	<15
Silt, Sand & Organic material (% area)	>15	<5
Gravel (% area)	<15	>35
Shade (reach average %)	<40	>50
LWD (pieces/100m)	<10	>20
LWD (volume/100m)	<20	>30

Figure 14. Barriers to fish migration.

Figure 14. Barriers to fish migration in the Lower South Fork Coquille Watershed.



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Botanical Resources

The basis for much of the ecological process and function of the forest ecosystem is the vegetation of the area. Many conditions within macrohabitats (produced by biotic and abiotic conditions) influence the microhabitats utilized by small vegetative forms. Air quality, water quality, soil conservation, and all biota are dependent in part, or entirely, on the botanical resources. Forests are solar and moisture collectors which affect the function and health of a watershed, cycling massive amounts of water back into the atmosphere. Botanical resources are crucial in the processing and cleaning of water entering the streams in the watershed. Lichens within the forest play a significant role in the nutrient and mineral cycling of the ecosystem (Pike 1978).

Wildlife depends upon the myriad of seral stages and types of forest vegetation for food and shelter. Oak woodlands are an important source of food for many mammals and birds that feast on the fallen acorns. The microhabitats produced by byrophytes provide a home to many arthropods, which are included in the diet of many birds. Vegetation is fundamental to many of the aesthetic, economic, and recreational benefits humans receive from the forest.

THE WESTERN HEMLOCK VEGETATION ZONE

Most of the Lower South Fork Coquille is comprised of the Port-Orford-cedar (Chaemacyparis lawsoniana) variant of the western hemlock zone. Early to late seral forests are dominated by Douglas-fir (*Psuedotsuga menziesii*) and Port-Orford-cedar with an understory of western hemlock, western redcedar (*Thuja plicata*), and grand fir (*Abies grandis*). Hardwoods are infrequent in most of the hemlock zone; but here, at the southern end of the zone, they become more plentiful. Bigleaf maple (*Acer macrophyllum*), tanoak (*Lithocarpus densiflorus*), myrtle (*Umbellularia californica*), and madrone (*Arbutus menziesii*) are common species in this area (Franklin and Dyrness 1988.). The mature forests in T. 31 S., R. 12 W. Sec. 15, 21, 22, 23 and 27 are good reference examples of this forest type. Common plant associations of the western hemlock vegetation zone are shown in Table 16.

The mature western hemlock zone forests of the Key Watershed are dominated by Douglas-fir, with an understory of western hemlock, western redcedar, grand fir, and Port-Orford-cedar. The hardwood understory in these forests consists of tanoak, myrtle, and bigleaf maple. Most of this mature forest has a dense layer of sword fern (*Polystichum munitum*), interspersed with brush. Shrubs include salal (*Gaultheria shallon*), salmonberry (*Rubus spectabilis*), gooseberry (*Ribes* sp.), rhododendron (*Rhododendron macrophyllum*), Oregon grape (*Berberis nervosa)*, red huckleberry (*Vaccinium parvifolium*), and evergreen huckleberry (*V. ovatum*). The herbaceous layer includes northern inside-out flower (*Vancouveria hexandra)*, wood sorrel (*Oxalis oregana)*, yerba de selva (*Whipplea modesta)*, and wood violet (*Viola semprevirens*).

Early seral plantations are dominated by Douglas-fir and interspersed with the same tree species components of the mature forest. Shrubs and herbs are also similar. Some young plantations have a significant iris (*Iris* sp.) element which will be suppressed as the canopy closes. Although the early seral species component resembles a mature forest, the size and function of these species differ significantly.

Table 16. Common plant associations for moistuure variants in the western hemlock vegetation zone.

SITE	CONIFERS	HARDWOODS	SHRUBS	HERBS
DRY	Douglas-fir Port-Orford-cedar	tanoak myrtle madrone	oceanspray salal rhododendron Oregon-grape	yerba de selva vanilla leaf
MESIC	Douglas-fir Port-Orford-cedar western hemlock grand fir western redcedar	tanoak myrtle bigleaf maple	sword fern red huckleberry black huckleberry vine maple	wood sorrel starflower
MOIST	Douglas-fir Port-Orford-cedar western hemlock grand fir western redcedar	tanoak myrtle bigleaf maple	sword fern lady fern deer fern maidenhair fern salmonberry	wood sorrel miners lettuce

THE MIXED-EVERGREEN VEGETATION ZONE

The serpentine soils of Johnson Mountain differentiates the vegetation of this area from the rest of the watershed. The mixed evergreen (Pseudotsuga-Sclerophyll) zone generally has an overstory of mixed conifer in the upper lever, and evergreen broad-leaved trees in the lower level. This is a species-rich forest by western standards, with three to five conifers mixed with three to five hardwoods (Agee 1993). The most important trees, which are also the climax species, in this forest zone are Douglas-fir and tanoak. Other broad-leaved trees which may be present include madrone, golden chinquapin *(Castanopsis chrysophylla*), and canyon live oak (*Quercus chrysolepis*) (Franklin and Dyrness 1988). As moisture decreases, the dominant hardwood shifts from tanoak to madrone and canyon live oak, with chinquapin occurring on the cooler sites (Agee 1993). The vegetative communities of the mixed-evergreen zone vary depending upon the substrate on which they grow. The mature forests in T. 32 S., R. 12 W., Sec. 10, on the east side of road # 5560, are good reference examples of this forest type. Common plant associations of the mixed-evergreen vegetation zone are shown in Table 17.

Table 17. Common plant associations for moistuure variants in the mixed-evergreen vegetation zone.

SITE	CONIFERS	HARDWOODS	SHRUBS	HERBS
XERIC	Douglas-fir <50% coverage	tanoak madrone canyon live oak	little wood rose poison oak trailing blackberry	bracken fern
DRY	Douglas-fir Port-Orford-cedar	tanoak madrone canyon live oak chinquapin	canyon live oak Oregon-grape little wood rose poison oak trailing blackberry	yerba de selva vanilla leaf star flower rattlesnake orchid bracken fern
MESIC	Douglas-fir Port-Orford-cedar	Pacific yew vine maple California hazel dogwood	salal Oregon-grape trailing blackberry sword fern	twinflower vanilla leaf

THE OAK WOODLAND VEGETATION TYPE

The analysis area also contains several oak woodlands (prairies) that appear to be oak/Douglas-fir/wild rye type (*Quercus/Psuedotsuga/Elymus*). Large oak woodlands that are/were used for sheep and cattle grazing comprise a considerable portion of the analysis area outside the Key Watershed. The presence of oak trees is a defining factor in determining whether a prairie is naturally occurring, or merely land that has been cleared of forest. About 20% of the land outside the Key Watershed is grazed prairie, not including agricultural land, and 5% of the land within the Key Watershed is grazed prairie.

These oak woodlands and prairies are inhabited by a variety of species that do not occur in forests. Some of these species are brodiaea (*Brodiaea congesta, B. elegans*), Salt and Pepper (*Nemophila menziesii)*, blue-eyed grass (*Sisyrinchium angustifolium),* and clarkia (*Clarkia* spp.). Additionally, a large native prairie in the Rowland Creek drainage (T31S R12W Sec. 6 S1/2 S1/2) contains meadow foam (*Limnanthes douglasii*) and burgundy hound's tongue (*Cynoglossum grande)*, neither of which are common in this area. This prairie is a good reference example of this vegetation type.

Approximately 36 small native oak woodlands, comprising a total of about 120 acres, occur in the Key Watershed. These native prairies (0.5% of the Key Watershed) are thought to contain mostly native species due to their size and remoteness. It is unlikely extensive grazing has occurred on these prairies. Native prairies that are relatively unadulterated by introduced species are absent outside of the Key Watershed.

KNOWN SPECIAL HABITAT AREAS

The oak woodland in the Rowland Creek drainage is the only native prairie in the Key Watershed on BLM land. This prairie is important as refugia for prairie-associated species. There are many large rock outcrops and rock bluffs in the watershed, most of which occur on private land. Several of these rocks are surrounded by grazed prairies. Although the conditions around them may have been altered, it is unlikely that the vegetation inhabiting the rocks have changed much from the condition before disturbance by settlers. Many of the rocks on public land have not been surveyed for special status plants due to the remoteness of their locations. An exception is a large rock outcrop, known locally as Virginia Rock, in T31S, R12W Sec. 11, S1/2 N1/2, along the old Powers Railroad grade. It was surveyed in 1993, and a special status plant was discovered. California sword fern (*Polystichum californicum),* an assessment species, was found growing in a small crevice midway up the rock.

Four ponds were identified on the aerial photos of the watershed. Two ponds are on private property and have not been surveyed. The pond (¼ acre) in T30S, R13W, Sec. 25 SE ¼ NE ¼ looks as if it may have been created for watering livestock. A pond (¼ acre) in T31S, R12W, Sec. 5 SW ¼ SE ¼ appears to be naturally occurring. Both of the ponds on BLM land have been visited. The largest (½ acre) is in the Baker Creek drainage, T31S, R12W Sec. 9 SW ¼ NW ¼. It may have been created by road construction and doesn't appear to have any aquatic vegetation, although some may eventually seed in. A very small pond (100 ft^2) occurs on the edge of a meadow, close to Rowland Creek in T31S, R12W, Sec. 7 SW ¼ NE ¼. An aquatic plant (*Ranunculus aquatilus*) was found growing in this pond.

There are a couple of wet meadows (½ acre each) near the section line between T32S R12W Sec. 9 & 10. There are no known special status plants in these meadows. The largest wet meadow is partially in the National Forest, and partially on private land. The other wet meadow is on private land.

There is a population of Oregon bensonia (*Bensoniella oregana*) on the National Forest in the west half of T32S, R12 W Sec. 15, according to Dave Shea (USFS, Powers Ranger Dist.). This population probably occurs in a wet meadow. Bensonia is a Federal Candidate species (Category 2).

A population of an assessment species, California globe mallow (*Iliamna latibracteata*), exists along the 31-12-17.1 road in Section 17. This has been a known population for many years and doesn't seem to have suffered any ill effects due to the proximity of the road.

Additional information on the botanical diversity of the analysis area is provided in Appendix 3.

PORT-ORFORD-CEDAR ROOT-ROT

Port-Orford-cedar (POC), Chamaecyparis lawsoniana, is an economically and ecologically valuable component of the forests of southwest Oregon and northern California. A fungal root rot, Phytophthora lateralis, was introduced into the northwest in 1923 and was first discovered in southwest Oregon in 1952. This pathogen appears to be 100% fatal to infected trees, no immune trees have yet been identified, although some levels of resistance has been observed (USDA 1994). The pathogen has been unintentionally introduced into uninfested areas and spread to uninfected trees through various means within the watershed. Unchecked, the disease could significantly alter the quantity and distribution of POC. Pacific yew, *Taxus brevifolia*, has also shown susceptibility to the disease and could be similarly affected, although it appears to be more resistant. Further details on POC and P. lateralis can be found in the Port-Orford- Cedar Management Guidelines (POCMG), pages 1-3.

POC is found throughout the watershed from riparian areas to ridge tops on all aspects and elevations. It is a prolific seed producer and disturbed sites often contain abundant numbers of seedlings. It grows well in open sunlight, but tolerates shade and grows, albeit slower, in the shade of other conifers. POC snags are readily used as foraging, resting and nesting sites for cavity-dwelling species. Hollow snags provide shelter for flying squirrels. Charred logs and snags are extremely rot resistant and can persist either standing or down for centuries. In riparian areas, POC's large size and long life provides the same functions as other conifers. It is a component of both the understory and overstory of nearly all mature forests in the watershed. It reaches heights averaging 200 feet and diameters of two-six feet. POC can live in excess of 500 years and, being shade tolerant, is a climax species along with western hemlock (Fowells 1965).

POC brings the highest price per thousand board foot (MBF) of any tree species in the region. It is in high demand by the Japanese, with current appraised stumpage values averaging $700/MBF. Volume per acre varies widely, but in a typical sale in the Baker Creek watershed, POC averaged approximately 4 MBF/acre, or about 6% of the total volume. POC boughs are in demand by the floral-greens industry and many floral arrangements and wreaths contain the feathery-appearing branch tips. Fire-charred POC logs are harvested for arrow manufacturing.

The root rot is known to occur in the watershed; however, no systematic survey has ever been done on BLM land to identify the location or severity of the disease. The most serious pocket of infestation observed on BLM land is located near the center of section 16, T31S-R12W, along the downhill side of road number 31-12-16.0 in the Baker Creek watershed. The disease has killed nearly all the POC on approximately 30 to 40 acres. The trees were large and growing in a stand that is probably 300 years old. The infestation started apparently as a result of the use of contaminated road building equipment during the construction of the road in 1984. This site represents the potential loss that could occur on a wider scale if the disease is not managed properly.

In one study on the Powers Ranger District, POC mortality losses ranged from 14% to 20% along roadsides (Hansen et. al. 1994). The study indicated that although the disease has been spreading in the study area for at least seventeen years, it was still found in close association with roads, streams, wet areas and elk trails near wet areas, and had not significantly spread from tree to tree away from these areas.

During the 1980's and early 1990's, permits for harvesting both boughs and arrow bolts were routinely issued. Currently there is a moratorium on bough permits and some measures are being instituted on other small sales to reduce the chance of P. lateralis introduction.

Additional information on P. lateralis is provided in Appendix 9.

NOXIOUS WEEDS

Noxious weeds are a special class of weeds. They threaten human activities or the native flora or fauna. Noxious weeds have been found to be undesirable, and laws have been enacted pertaining to their elimination (Cheadle 1957). There are several species of weeds recognized as "noxious" by the state of Oregon that should be eliminated or controlled within the watershed:

Tansy ragwort	*(Senecio jacobaeae)*
Gorse	*(Ulex europaeus)*
Scotch broom	*(Cytisus scoparius)*
French broom	*(Cytisus monospessulana)*

Noxious weeds are introduced plant species. They are present largely due to accidental introduction into the ecosystem. They have no endemic natural enemies, and threaten both human activities and the native flora in the ecosystem. Noxious weeds reduce and eliminate desirable vegetation from public lands by competing with native plants for water, sunlight, soil nutrients, and space. Secondary effects of this competition include reduced livestock production and diminished wildlife populations and diversity, due to the presence of less desirable forage (USDI 1987). Noxious weeds also result in less efficient use of public and private lands, and incur costs. Money must be spent to control and eradicate the undesired plants. Land values decrease, and lands infested by noxious weeds cost more to manage. Furthermore, noxious weeds may limit crop choices (USDI 1987).

In its current state, the Lower South Fork Coquille watershed presents a highly favorable condition for the infestation and spread of noxious weeds. Four noxious weed species are known to be present in the watershed: Tansy ragwort, Gorse, Scotch broom, and French broom.

The known distribution of these weeds is as varied as their control. Tansy ragwort was at one time widespread throughout the watershed. Once a biological control program was initiated in

1975 by the Oregon Department of Agriculture, the spread was confined. The status of this plant is "under control", meaning there are plants scattered throughout the watershed, but a natural agent (cinnabar moth) is present to keep the spread of new plants to a minimum.

Gorse is not known to occur on BLM lands in the watershed. The introduction of new plants is a distinct possibility, due to the large amount of traffic using the roads and absense of effective weed control. Some progress in gorse control is being made in nearby watersheds. The gorse seed weevil, *Exapion ulicis*, was introduced into Oregon in 1956 near Bandon, Oregon. It will not reduce existing infestations, but probably is successful in slowing the rate of spread into new areas (Isaacson 1992). The first release of the gorse spider mite, *Tetranychus lintearius*, occured in the fall of 1994 on some coastal sites. In the long term, these efforts may serve to reduce the probability of spreading gorse to new locations.

Scotch and French brooms are a major threat to the watershed at this time. According to ODA information, Scotch broom can be found infesting every township in western Oregon, with the exception of the southernmost counties (Miller 1991). Scotch broom originally came from ballast materials dumped on tidal flats in the Columbia River by the lumber trade. Given the history of lumber trade on the Coquille River, it is obvious why broom species are found throughout the basin. French broom was introduced to Oregon as a garden shrub. As the planting of this species to the interior of the state increased, so did the escapement of the seed produced.

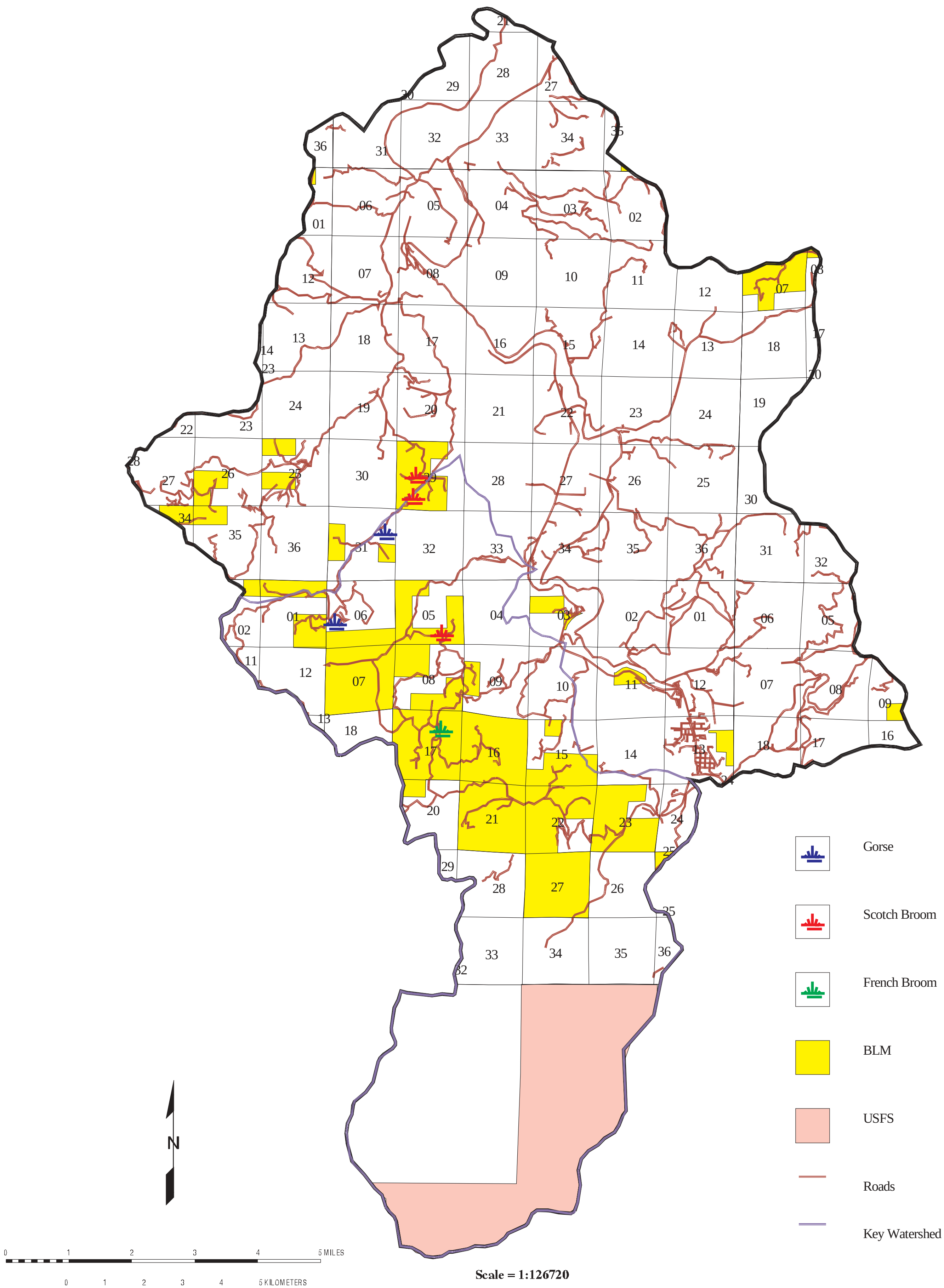
These two broom species are able to colonize disturbed ground, waste areas, roadways, and gravel operations. In the last 50 years, contaminated gravel and road construction activities have contributed to the spread of Scotch broom more than all other factors combined (Miller 1991).

Currently, Oregon only has a good distribution of *Apion* seed weevil for biological control for Scotch broom. This insect only attacks 11-69% of the massive quantities of seed produced by Scotch broom (Miller 1992). *Sitona regensteinensis* is a potential agent that would attack root nodules and reduce brooms' capacity for establishment and growth (Isaacson 1992). It is touted as a reason European broom is so stunted.

In 1991-94, the Myrtlewood Resource Area surveyed and noted locations of brooms and gorse on BLM lands. Five Scotch broom, two French broom, and two gorse locations were found in the analysis area (see Fig. 15). Private lands were not inventoried, but observation of the distribution indicates more extensive infestation of Scotch and French brooms than on BLM lands.

Most locations on BLM land are at landings, along roadsides, in quarries, and some forest plantations. There seems to be a correlation between heavy equipment use and the presence of broom species. Unloading and use of equipment with crawler tracks, especially dozers, appears to provide the seed initially.

Figure 15. Distribution of noxious weeds on public lands in the Lower South Fork Coquille Watershed.



Containment of the spread of these noxious weeds is in doubt at this time. The BLM has developed a Noxious Weed Plan, but funding is inadequate for implementation. No organized effort within the private sector is presently underway. There is an effort by the ODA to start a biological control effort with new insects against Scotch broom in the next several years, depending on funding and level of interest.

Additional information on noxious weeds within the analysis area is provided in Appendix 12.

Riparian Condition

Riparian zone vegetation plays several key roles in the health and functioning of a watershed, including: 1) thermal regulation of surface water through shading and boundary layer effects, 2) control of excessive bank erosion and channel migration through bank stabilization and dissipation of flood energy, 3) trapping mobile large woody debris which, in turn, traps alluvium, 4) providing nesting, roosting and foraging habitat and travel corridors for some animals, 5) nutrient enrichment of aquatic and terrestrial systems from leaf and needle litter, and the supply of large woody debris.

The floodplains and terraces in the Lower South Fork Coquille watershed were historically dominated by mixed stands of myrtle, maple, ash, and widely dispersed cedar. Periodic flooding, caused by heavy rainfall events or water backed up by large debris jams, frequently raised the water level up out of the stream channels, and onto the floodplains. The structural complexity of the floodplains provided excellent overwintering habitat for salmonids and many other animals.

Currently, almost all of the floodplain areas along the lower South Fork Coquille River and its tributaries are owned by private individuals, and all have undergone clearing at some time. Most of this land is being used for grazing, or is covered with shrub thickets. Nearly all large woody debris has been removed, and as a result, the stream channels have become moderately entrenched, so that the floodplains are rarely inundated. This has also resulted in the lowering of the water table in the floodplains.

The upland riparian vegetation community is, in general, associated with higher-gradient, more constrained stream channels, and higher-gradient side slopes. However, within the uplands there are reaches in which the stream gradient is low and in which there are floodplains adjacent to the streams. The earliest available aerial photographs (1939), historical accounts (BLM 1995a), and the few remaining intact stands indicate that the overstory of the upland riparian community was dominated by Port-Orford-cedar, redcedar, hemlock, and Douglas-fir, with a dispersed mixture of hardwoods. The steep slopes were generally dominated by conifers, whereas the floodplains were mostly dominated by hardwoods. The results of 1994 BLM riparian vegetation surveys on Rowland and Baker Creeks are shown in Tables 18 and 19, respectively.

Table 18. Riparian overstory bordering 3rd order and larger streams in the Rowland Creek drainage (shown as % of ownership).

OWNERSHIP	PASTURE/ MEADOW	CONIFER	HARDWOOD	MIXED
BLM	3	60	23	14
TIMBER COMPANY	16	21	11	52
PRIVATE	19	21	31	29
COMBINED	9	45	23	23

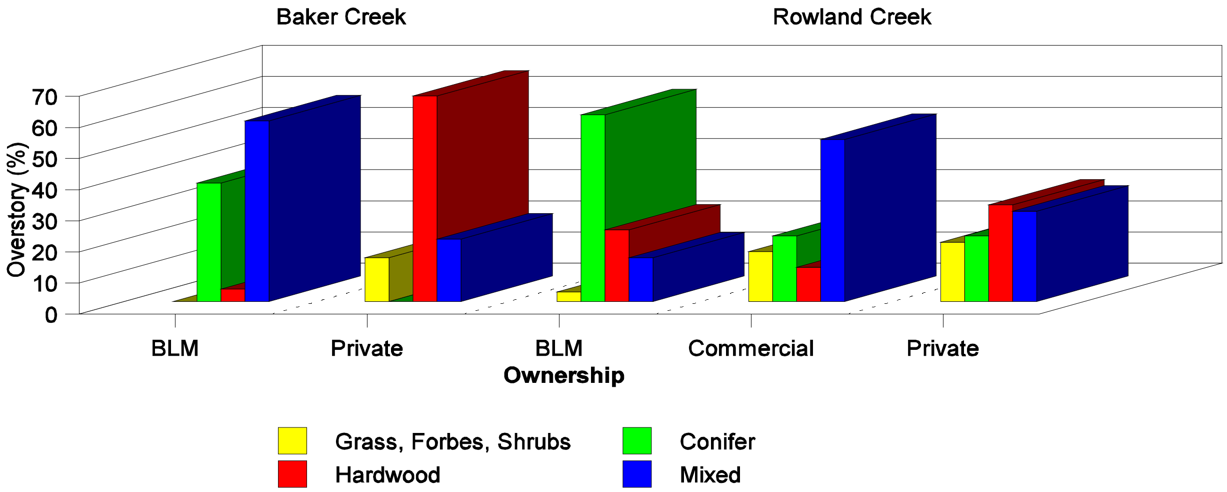
Table 19. Riparian overstory bordering 3rd order and larger streams in the Baker Creek drainage (shown as % of ownership).

OWNERSHIP	UNPLANTED CLEARCUT	CONIFER	HARDWOOD	MIXED
BLM	0	38	4	58
TIMBER COMPANY	14	0	66	20
COMBINED	9	13	45	33

This survey covered approximately 12.7 miles of the 34.4 miles of 3rd order and larger streams in the Rowland and Baker Creek drainages. The area inventoried was comprised of land managed by the BLM (50%), commercial timber company lands (37%), and individually-owned private lands (13%). A 100-foot wide area was inventoried on both sides of the stream. No riparian survey data is available for Salmon Creek or the remainder of the analysis area outside of the Key Watershed. Furthermore, none of the 1992 stream surveys within the analysis area included any riparian information. Therefore, the analysis of current riparian condition in the Lower South Fork Coquille watershed is limited to the Rowland and Baker Creek drainages.

Approximately 31% of all the inventoried riparian areas had an overstory dominated by coniferous trees. Only a small portion of this overstory was mature conifers - all on BLM land. Approximately 9% of the commercial timber company and privately-owned riparian areas had overstories dominated by conifers, versus approximately 54% on BLM land. Approximately 48% of timber company and privately-owned riparian areas were dominated by hardwoods, primarily alder. One quarter to one third of the riparian areas in each of the three ownerships were dominated by mixed conifer/hardwood stands. Pastures and meadows comprised approximately 9% of the riparian areas surveyed. However, it should be noted that some of the pasture land in the Rowland Creek drainage is located on floodplains, which extend well beyond the 100-foot wide area on each side of the stream that was inventoried. Hence, the actual proportion of riparian area presently in a pasture/meadow condition is probably higher than 9%. These results reflect a highly disturbed state.

Figure 16. Composition of riparian overstory on 3rd order and larger streams in the Rowland and Baker Creek drainages.



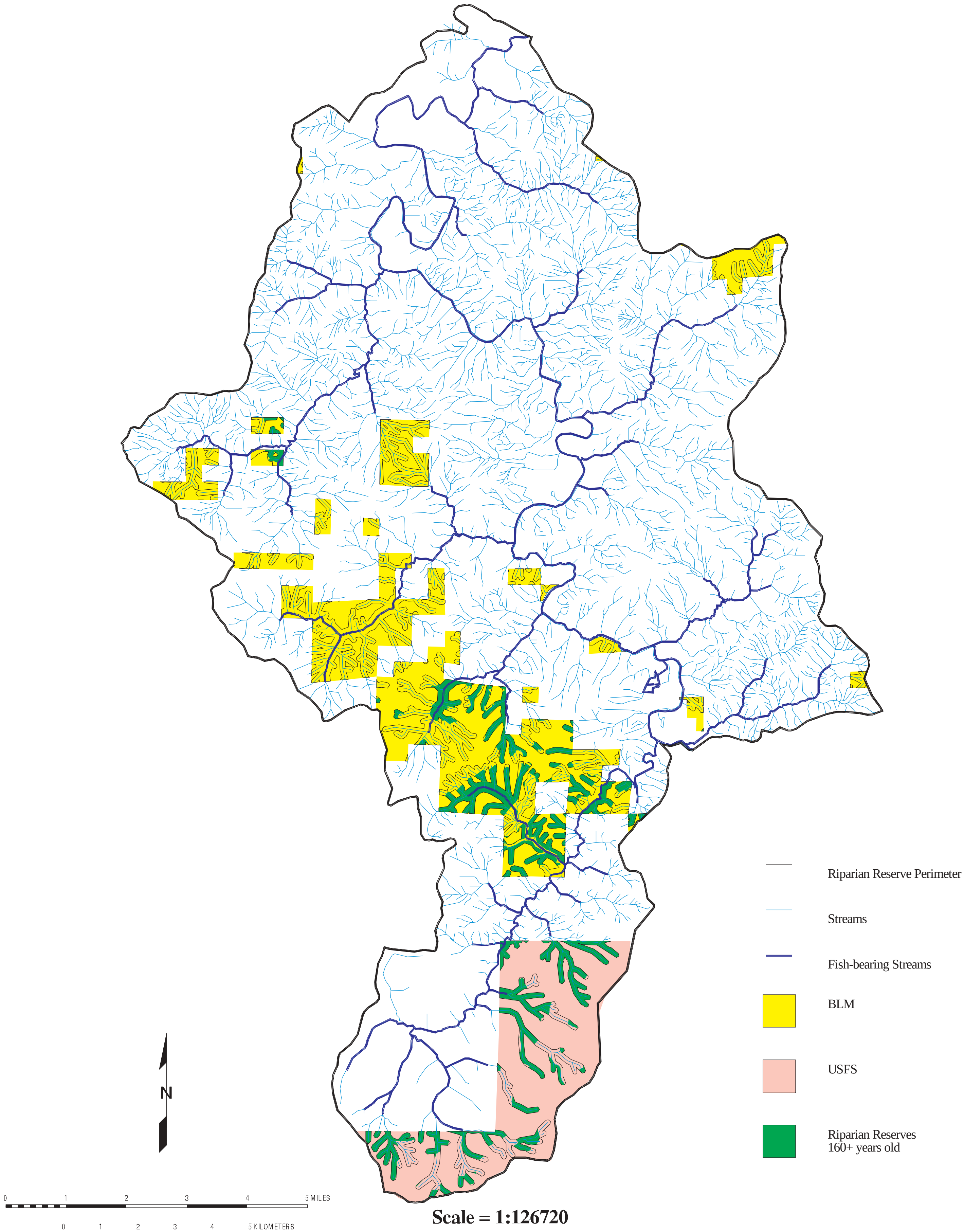
The 1992 aerial photographs indicate that adequate canopy closure exists over most of the fish-bearing reaches in the Rowland-Baker-Salmon Key Watershed, except portions of the lower four miles of Salmon Creek.

Within the assessment area, the removal of parental trees has left insufficient amounts of conifer seed within some hardwood-dominated riparian areas. Even with seed present, conifer reestablishment is impeded because germination and growth are greatly inhibited by the shading effects of alder and salmonberry. The loss of large coniferous trees from the riparian areas also means diminished large woody debris recruitment over the next several centuries. Conifers can live for several hundred years and, once they fall, can take hundreds of years to decay. Red alder stands, on the other hand, are short lived (approximately 70-100 years) and once fallen only provide woody habitat for 10-15 years.

As shown in Figure 17, approximately 35% of all BLM riparian reserves and 68% of all USFS riparian reserves in the Rowland-Baker-Salmon Key Watershed presently meet the desired conditions (specified on page 93). The remainder are of insufficient age, width, and/or lack a conifer component.

Additional information on riparian areas within the analysis area is provided in Appendix 13.

Figure 17. Riparian reserves presently meeting desired conditions on BLM and USFS lands in the Lower South Fork Coquille Watershed.



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Forest Products

Economically and socially important plants and plant communities, as well as their distribution and relative abundance, have been greatly altered since the beginning of large scale product extraction for forest and agricultural products. This has resulted in the imposition of unnatural vegetation patterns on the landscape. This raises questions as to whether the altered plant communities are sustainable, and whether the watershed can continue to provide all the resources and amenities that it did historically.

The Lower South Fork Coquille is a highly commercialized watershed. The extraction of timber is one indicator of that fact. Nearly all private forest land has been logged at least once in the last 100 years or so. The thousands of acres of agricultural land attest to the watershed's capacity to sustain livestock operations.

These forest and agricultural products provide other social values such as employment, contribution to local economic stability, government revenues, and the satisfaction of the aspirations and needs of numerous private and industrial land owners.

The watershed's continued economic value is based on the plant communities the land is able to support. While great changes in vegetation patterns have occurred in the last 100 years or so, plant communities that have replaced the natural ones appear healthy and sustainable. However, other resources may have been adversely affected by the alteration of the plant communities as discussed in the riparian, wildlife and water quality sections.

Forest products produced in the Lower South Fork Coquille watershed include:

> Logs for dimensional lumber, plywood, railroad ties, and chips for wood fibre used in paper manufacturing are the principal commercial products derived from the timber resource. The primary species of trees used in approximate order of importance are Douglas-fir (*Pseudotsuga menziessii*), western hemlock (*Tsuga heterophylla*), grand fir (*Abies grandis*), Port-Orford-cedar (*Chamaecyparis lawsoniana*), western red cedar (*Thuja plicata*), and various hardwoods such as red alder (*Alnus rubra*), big leaf maple (*Acer macrophyllum*), myrtle (*Umbellularia californica*) and tanoak (*Lithocarpus densiflorus*). Small amounts of Pacific yew (*Taxus brevifolia*), Pacific madrone (*Arbutus menziessi*), golden chinkapin (*Castanopis chrysophylla*) are also harvested for various reasons.
>
> Firewood- This is an important commodity both for personal and commercial use. Sources include logging debris left after harvesting, windthrow and hardwoods encroaching on road right-of-ways.
>
> Yew bark- The demand for this product has dropped to essentially zero with the development of a synthetic taxol.
>
> Floral greens- Some species of brush and ferns are picked for the floral industry. They

include evergreen huckleberry (*Vaccinium ovatum*), salal (*Gaultheria shallon*), vine maple (*Acer circinatum*), Pacific rhododendron (*Rhododendron macrophyllum*), dwarf Oregon-grape (*Berberis nervosa*), sword fern (*Polystichum munitum*), and various other species of mosses, ferns and forbs.

Tree boughs- The most popular species is Port-Orford-cedar, which is harvested for floral arrangements and wreaths etc. Smaller amounts of western redcedar and Douglas-fir are also used.

Mushrooms- This watershed is within the range of a number of commercially valuable species of mushrooms including hedgehog (*Hydnum repandum*), chantrelle (*Cantharellus cibarius*), matsutake (*Armillaria ponderosa*), and lobster (*Hypomyces lactifluorum*). Few permits have been issued for the analysis area to date, but increasing value could lead to increased demand. No inventories are available on the abundance of any mushroom species.

Christmas trees- The demand on federal ownership is minimal for this product, since most of the federal lands are far removed from any large population center.

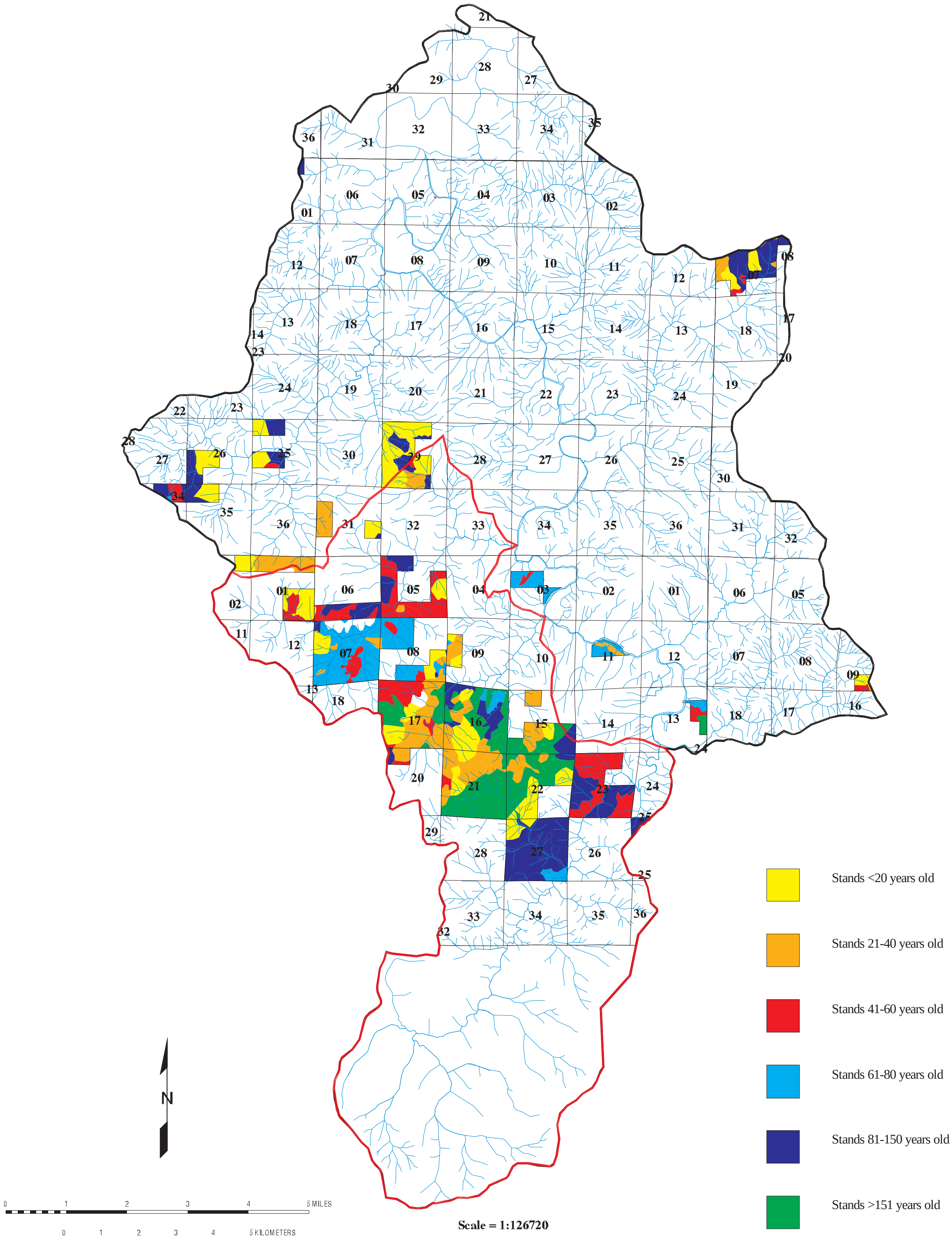
Miscellaneous products- These include posts, poles, arrow bolts, shake bolts and various plants used for landscaping.

The large scale harvesting of timber has been occurring in the watershed for about 100 years. Timber harvest has replaced fire as the major factor shaping forest plant communities. Wildfire and uncontrolled human-caused fires began to be aggressively excluded from forests in the early part of the century, as it was seen as a destroyer of the timber resource. Harvesting has been done primarily by clearcutting, in which large blocks of land were cleared of trees, especially on private land, for agriculture and timber production purposes.

Early in the century, these cleared forest areas were left to be reforested by seed trees, trees in the surrounding forests, or seed stored in the soil on site after logging. This method proved to be unreliable in regenerating new coniferous forests, resulting in large stands of hardwoods and/or brush. In the 1950's and 60's, attempts were made to reforest cutover lands by aerial seeding, primarily with Douglas-fir seed. However, this also proved to be unreliable, and by 1970 nearly all cutover areas were being planted with seedlings. The Oregon Forest Practices Act, first passed in about 1971, also required prompt reforestation of clear-cuts on private land, and contributed to the wide-spread use of planting as the most reliable method.

The tree of choice was Douglas-fir. Thousands of acres were planted with millions of Douglas-fir seedlings from the late 1960's to the present. District records show that stands in Coos Bay were comprised of 60% or more of Douglas-fir. Other species have been maintained through natural seeding and are still abundant in the watershed.

Figure 18. Age classes of BLM-administered forest lands in the Lower South Fork Coquille Watershed.



In addition to agricultural grasslands, there appears to be three broad timber types in the watershed; young forest stands (0-40 years old), second growth forests (41-100 years old), and old growth forests (primarily on federal lands). There is no precise inventory of age classes available to quantify the acres on private lands. Figure 18 shows age classes on BLM lands (Forest Service data not available at this writing).

The timber inventory for BLM lands shows the following volumes:

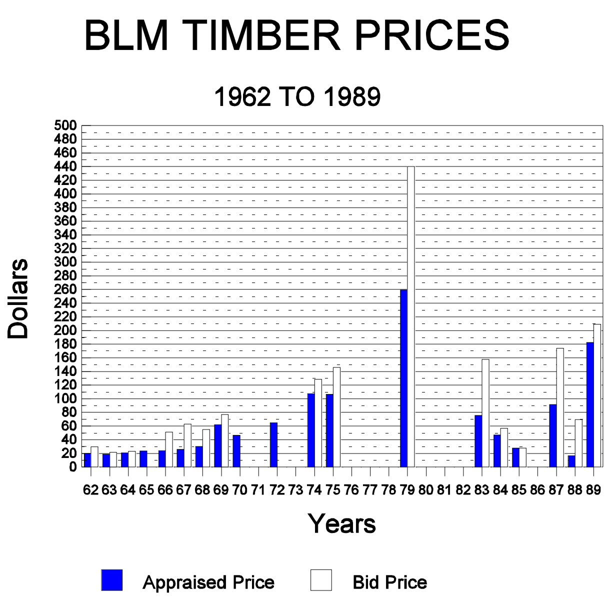
	Gross MBF	Operable MBF*
Entire Watershed	130,817	40,557
Key Watershed	121,048	37,038

*Operable MBF is the volume available for harvest after all lands set aside for uses other than timber production have been withdrawn.

Since 1962 the BLM harvest from the watershed has been approximately 118,325 MBF. There has been no deliberate attempt to maintain a sustainable harvest in this watershed. The sustainable harvest concept was averaged over the entire BLM and Ranger Districts. No reliable estimate can be made about timber volume harvested on private lands, and Forest Service data not available at this writing.

Federal lands will be managed based on the allocations prescribed in the Northwest Forest Plan of 1994. This plan is designed to greatly increase the retention of structural and biological components on all harvest units, and give increased protection to Key Watersheds for old growth dependant species.

Figure 19.



Timber values have risen over the past few years (Figure 19), and are expected to remain relatively high for the forseeable future, due in part to a timber supply shortage. Volume from federal land in the watershed will be greatly reduced because of the reduced land base available for timber production and the retention requirements imposed on the GFMA.

Wildfires will continue to be suppressed, and prescribed fires will probably be further restricted due to smoke management concerns (see Appendix 5). Private industrial forest lands will probably continue to be managed on short rotations of 35 to 60 years. Other privately-owned lands may have varying rotations based on the needs and values of the landowner, and no general prediction can be made. However, if timber prices remain relatively high as expected, individual timber holders will also be tempted to manage their lands on short rotations (see Appendix 10).

All private lands harvested in the future will be subject to the new Oregon Forest Practices Act of 1994, which requires such things as riparian management areas designed to retain large trees near fish-bearing streams, retention of two green trees or snags/acre, two down logs/acre, and a spatial requirement of 300 feet and four years between adjacent clearcuts of no larger than 120 acres. In summary, there will be considerably more structure and large green trees left on all private lands than required under the old Act.

Little information is available on the asthetic, cultural, and/or ecological restoration values of plants. Obviously, people enjoy looking at a landscape containing trees; clearcuts are not a pleasing site to most people. The ecological restoration value of tree species has been recognized and hardwoods and conifers are being used to restore cutover lands and degraded riparian areas (see Riparian section).

Fisheries

Historically, indigenous fish supported the subsistence-based economy of native Americans, early explorers, and settlers of the Coquille Valley. At the turn of this century, salmon and steelhead supported a tremendous commercial river gill-net fishery, which supplied several canneries along the Coquille River and a sizeable export market. In the more recent past, salmon provided considerable revenues to a large ocean-going commercial fishing fleet. Salmon, steelhead, and trout also generate state revenues from the sale of licenses, tags, and permits. While the commercial fishery has been drastically curtailed in recent years, native fish continue to provide recreation to sport anglers. If properly managed, the populations of anadromous salmonids produced in the analysis area have the potential to support a substantial commercial fishery again in the future.

Native fish also play important roles in the food webs of the watersheds that they occupy, serving as both predator and prey. Anadromous fish, in particular, are key factors in the flow of nutrients and energy between the ocean and the generally oligotrophic systems where they spawn (Brown 1995 and Bilby et al. unpublished).

The majority of the following discussion on life histories and habitat requirements of salmonids was taken from USDA (1995).

SPRING CHINOOK

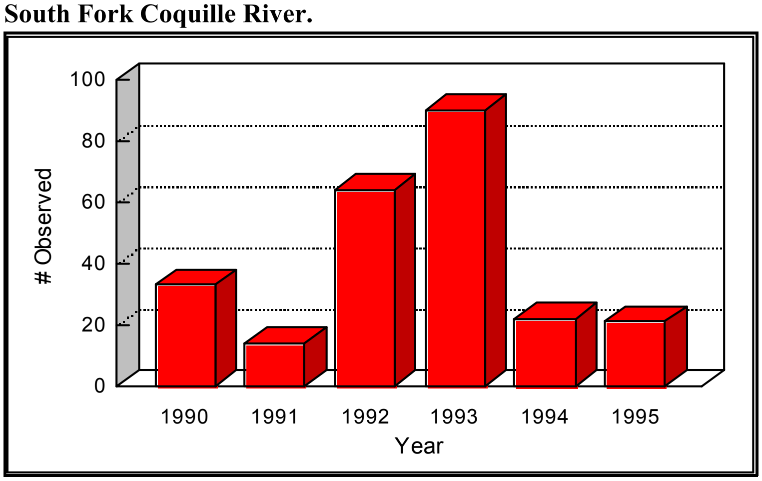
Spring chinook enter the South Fork of the Coquille from June through late August, where they spend the summer maturing in deep pools. Spawning coincides with the onset of the first fall rains. Spring chinook have been observed spawning in the South Fork Coquille

River from the confluence of Rowland Creek upstream to Daphne Grove (upstream of the analysis area). Fry emerge from the redds between February and May, depending on water temperature. The presmolts outmigrate toward the estuary through the summer months and into the fall. They will spend 3 - 5 years in the ocean before returning to their natal streams to spawn. The Coquille River is the only coastal river in Oregon that supports a native run of spring chinook.

Because of their large body size, chinook salmon require greater water depths for upstream migration and holding, compared with other Pacific salmon. The requirement for holding pools is especially critical for spring chinook , which may be in fresh water from 4 to 6 months during summer low-flow conditions prior to spawning (Nickelson et al. 1992). If holding and spawning areas have inadequate cover, spring chinook are vulnerable to disturbance, predation, and harassment over a long time period. Culumnaris, a disease which afflicts salmonids in warm water, has also been known to cause mortality in adult spring chinook. Water temperatures in the South Fork Coquille River in the vicinity of Powers regularly exceed 70˚ F, which is near lethal limits for salmonids. During July of 1994 (a record low-flow year), water temperatures in the South Fork Coquille River exceeded 80˚ F on seven consecutive days at the confluence of Woodward Creek (see Water Quality section).

Historically, spring chinook were never as abundant on the South Fork Coquille River as their fall counterparts, numbering perhaps as high as 2,000 spawners at the turn of this century (ODFW 1993a). Many of the pools which historically held spring chinook through the summer have been filled by sediments, and no longer provide habitat. Furthermore, summer low-flows exacerbated by irrigation withdrawals have rendered adult spring chinook more vulnerable to snagging by poachers. Spring chinook salmon in the South Fork Coquille River are also threatened by genetic impacts, due to hatchery manipulation of their very small population. The annual spawning escapement for Coquille River spring chinook in recent years is believed to be approximately 200 adults, most of which return to the South Fork Coquille River (ODFW 1993a).

Figure 20. Adult spring chinook counted in 3 index pools in the South Fork Coquille River.



ODFW counts adult spring chinook in three index pools in the vicinity of Powers, Oregon each year to monitor escapement; results are shown in Figure 20. The relatively high return in 1993 correlates to a release of 32,450 hatchery smolts in 1990. The spring chinook hatchery smolt program, which was instituted in 1984, was discontinued in 1993, and replaced by a hatchbox program. However, the 1994 return was too low to allow broodstock collection for this program. Hatchery releases have included both Coquille River and Rogue River stocks. Currently, Coquille River spring chinook are depressed (Nickelson et al. 1992), and classified as having a "high risk of extinction" (Nehlsen et. al. 1991).

FALL CHINOOK

Fall chinook enter the South Fork Coquille River during the first significant fall rains, usually between October and December, and initiate spawning shortly after their spring counterparts. Spawning has been observed from Broadbent upstream to Island Campground (upstream of the analysis area). Fry emerge from redds between February and May, depending on water temperature. The presmolts outmigrate toward the estuary through the summer months and into the fall, and typically spend 3 - 5 years in the ocean before returning to spawn.

Fall chinook require deep holding pools to rest in during their upstream migration, but do not penetrate tributary drainages to the extent that coho, steelhead and sea-run cutthroat trout do. Fall chinook do not usually encounter the high water temperatures endured by their spring counterparts, due to their relatively late spawning migration. However, water temperature is an important factor in chinook rearing. As noted earlier, mainstem South Fork Coquille water temperatures are quite high during the summer [rearing] period, which forces most juvenile chinook to move downstream to [cooler] tidewater.

Within the Lower South Fork Coquille watershed, fall chinook are known to spawn in Salmon Creek, Dement Creek, and the mainstem of the South Fork Coquille River. Anecdotal accounts (BLM 1995a & BLM 1984) indicate that some fall chinook spawning also occurs at the mouths of tributaries such as Baker and Rowland Creeks. ODFW uses 0.8 miles of lower Salmon Creek and 1.0 mile (below the confluence of Rowland Creek) of the South Fork Coquille River as index reaches for monitoring fall chinook spawning escapement. This data, presented in Figure 21, indicates that the spawning escapement of fall chinook in Salmon Creek and the South Fork Coquille River has increased over the period of record. Additionally, BLM monitored fall chinook spawning in a 0.75-mile reach on Salmon Creek during the fall of 1994. This data, presented in Figure 22, indicates very high spawning density within the survey reach. However, it should be noted that since the 1960's, most fall chinook spawning has occurred downstream of Powers, Oregon, while spawners upstream of Powers declined (Hamilton and Remington 1962 and USDA 1995).

Hatchery releases of Coquille River and Coos River fall chinook stocks occurred during the time that the hatchery on Lower Land Creek was in operation. The extent to which these releases affected the wild fall chinook population in the Lower South Fork Coquille watershed is not known. Nickelson et al. (1992) listed the status of wild fall chinook in the South Fork Coquille River as “healthy”.

Figure 21. Peak counts from ODFW fall chinook spawning ground surveys. (Discontinuities represent data gaps.)

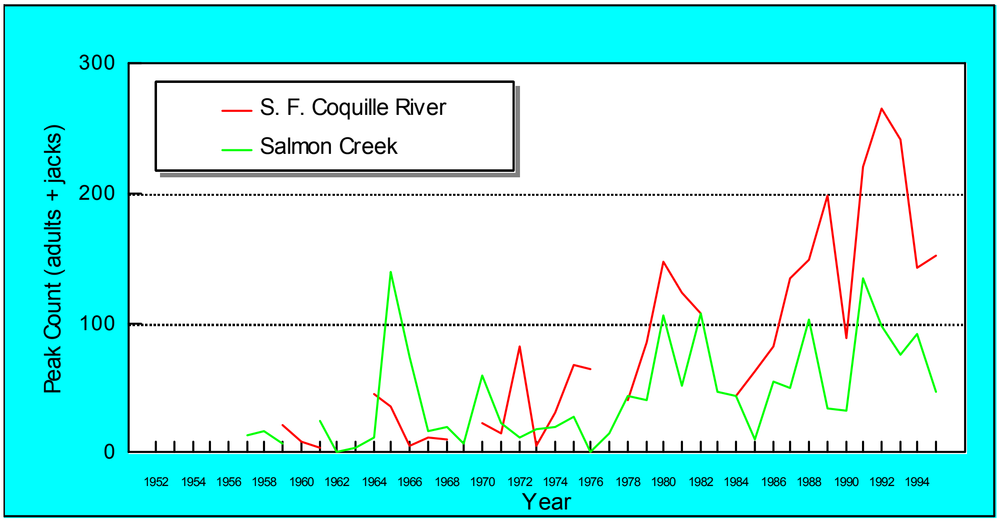
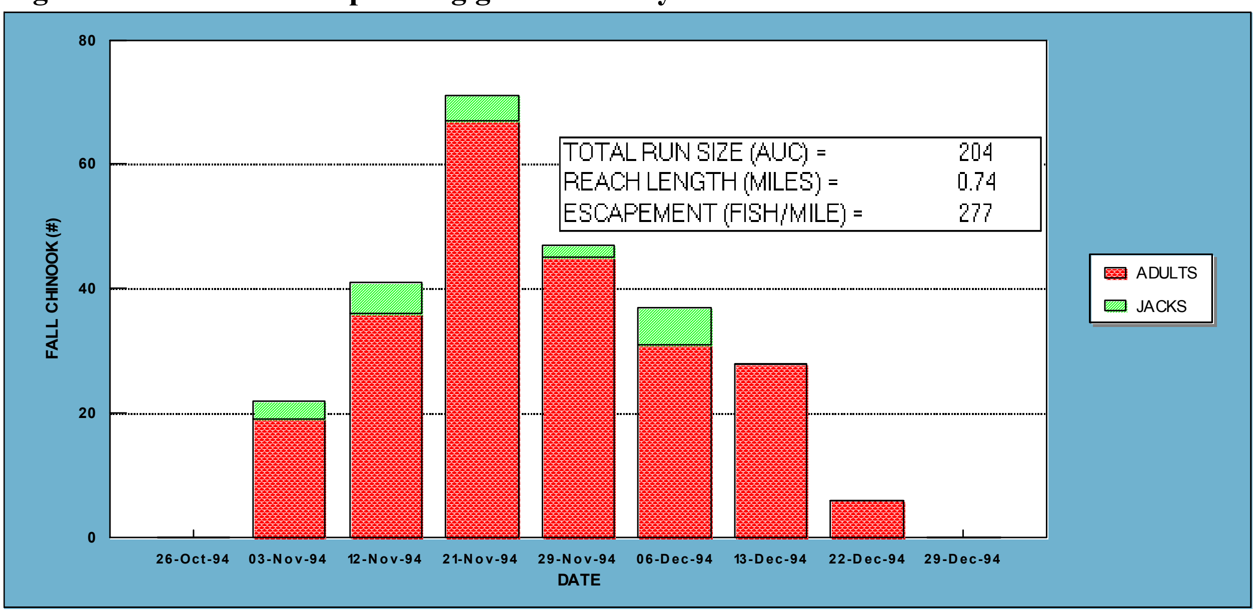


Figure 22. Fall chinook spawning ground surveys on Salmon Creek - 1994.



COHO SALMON

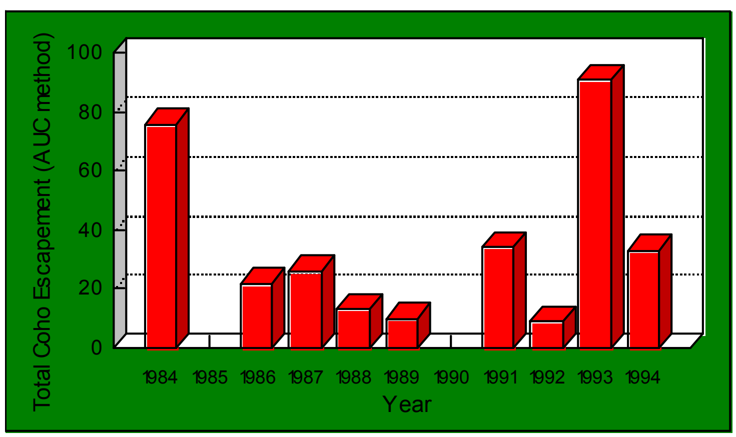
Adult coho migrate into the South Fork Coquille River from September through December, depending on rainfall. Spawning occurs shortly thereafter, primarily in smaller tributary streams. Fry emerge from the redds from January through March, depending on water temperature. Juvenile coho spend one full year in fresh water before outmigrating to sea. During summer months, coho prefer pool habitat associated with cover elements (complex pool habitat), and utilize off-channel alcoves, ponds, beaver dams, and deep pools with complex cover to escape high water velocities during the winter. Large woody debris plays a critical role in over-winter survival of coho (Nickelson et. al. 1992). Coho smolts head downstream toward the estuary approximately one year after emergence, and typically spend 1 - 2 years in the ocean before returning to spawn.

Hatchery coho from Ten-mile, Coos, and Coquille broodstocks have been released into the South Fork Coquille River in the past. USDA (1995) indicates that a hatchery constructed on Lower Land Creek (upstream of analysis area) during the 1930's adversely affected the wild coho population in parts of the South Fork Coquille River, by excluding them from parts of their historic range, diluting the native gene pool, and inducing competition between wild and hatchery juveniles. However, the extent to which this hatchery affected the coho population in the Lower South Fork Coquille watershed is unknown.

In anticipation of the construction of the Baker Creek fish ladder (see Aquatic Habitat section) ODFW released hatchery coho fry into Baker Creek in 1991, 1992, and 1993. The winter of 1994/1995 marked the first confirmed coho spawning run in Baker Creek in approximately 40 years.

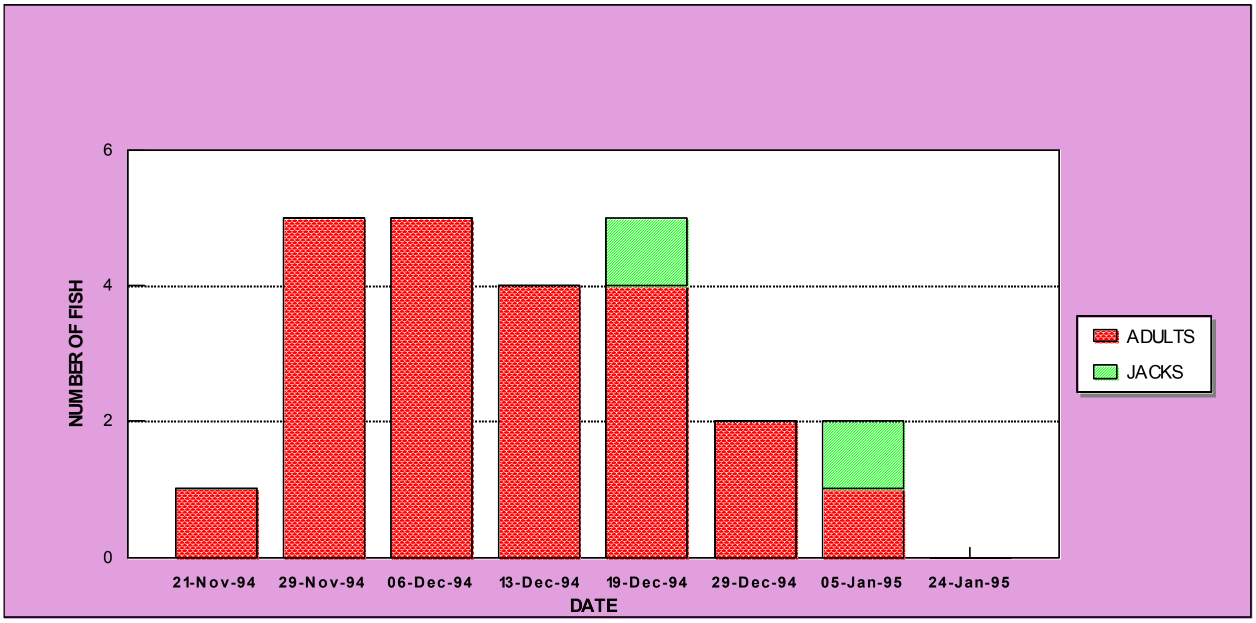
Coho are known to currently utilize the following tributaries in the Lower South Fork Coquille watershed: Warner Creek, Rhoda Creek, Dement Creek, Baker Creek, Woodward Creek, and Salmon Creek. Historically, their range may have also included Long Tom Creek, Rowland Creek, and Mill Creek, but migration barriers now restrict access to these creeks (see Aquatic Habitat section).

Figure 23. Coho salmon escapement for 2-mile ODFW index reach on Salmon Creek.



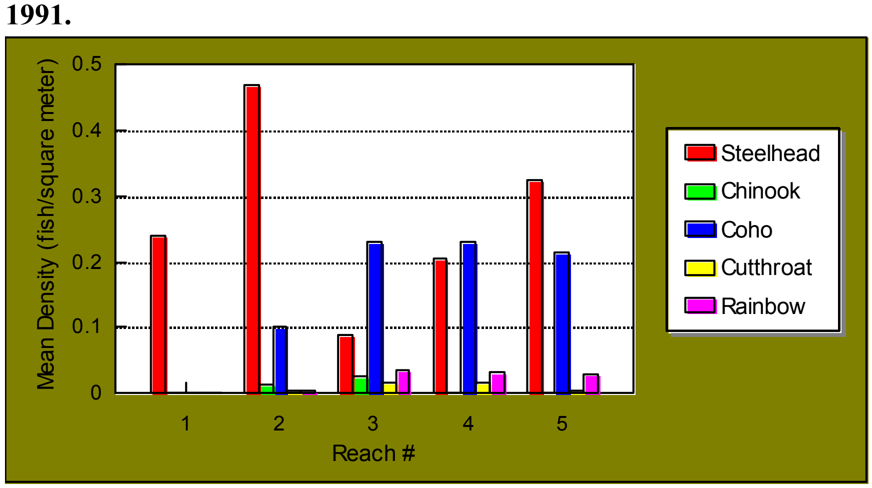
ODFW monitors coho escapement on a two-mile index reach on Salmon Creek. The ODFW data from Salmon Creek, presented in Figure 23, indicates highly variable coho spawning escapement over the period of record. ODFW also conducted spawning ground surveys on Dement Creek and Rowland Creek in 1994. Dement Creek had a spawning escapement of approximately 15 coho/mile; no coho were observed in Rowland Creek. BLM and Georgia-Pacific West, Inc. conducted spawning ground surveys on Baker Creek and Salmon Creek in 1994; this data is presented in Figure 24. In summary, analysis of the aforementioned data indicates that desired coho spawning escapement was not achieved on any surveyed reaches in the Lower South Fork Coquille watershed in 1994. Furthermore, Salmon Creek did not have the desired coho spawning escapement in nine of the last ten years.

Figure 24. Coho spawning ground surveys from Baker Creek - 1994/1995.



Biologists from the Powers Ranger District (USFS) conducted a fish population survey on Salmon Creek in 1991 (Chen 1991). Their data, which is summarized in Figure 25, indicates that the summer seeding level for coho in Salmon Creek was well below the desired 1 parr/m^2 in 1991. Such an under-seeded condition might be attributable to low spawning escapement, low egg to parr survival, or a combination thereof. No other summer seeding level survey data pertaining to the analysis area is available at present.

Figure 25. Juvenile fish population inventory of Salmon Creek - 1991.



Information in USDA (1995) indicates that coho utilization throughout the South Fork Coquille River is down from historic levels, and that no coho have been observed upstream of the Siskiyou National Forest boundary since 1989. Coquille River coho are depressed according to Nickelson et. al. (1992), and categorized at "moderate risk of extinction" by Nehlson et al. (1991). Pacific coast coho salmon (including Coquille River stocks) were petitioned for listing under the Federal Endangered Species Act twice in 1993 (first by Oregon Trout, and later by Pacific Rivers Council), and are presently under review [proposed] by the National Marine Fisheries Service.

The last commercial season for ocean harvest of coho was in 1991; total closures were implemented in 1992-1995. In 1994, sport fishing for coho was closed as well. Between 1986 and 1991, the annual harvest rate on coho averaged 50% of all three-year-olds in the ocean, plus 10% of those that entered fresh water (PFMC 1995). From this information and spawning escapement data presented herein, it appears that the coho population experienced a precipitous decline in the last three years; i.e., if no sport or commercial harvest occurred, there should have been a substantial increase in spawning escapement roughly corresponding to the past harvest rate (50-60%), assuming a relatively stable population. The fact that no such increase occurred indicates that the coho population has recently experienced a dramatic decline.

STEELHEAD (WINTER)

Winter Steelhead enter the South Fork Coquille River from November through April. Sexual maturation occurs during their upstream migration, and spawning occurs between December and May. Steelhead fry emerge in late spring, and tend to occupy stream margins at first. Summer rearing takes place in moderate velocity areas within pools, glides, and riffles (Nickelson et. al. 1992). During the winter, juvenile steelhead disperse into a wide variety of refuge habitats, including complex pools, side channels, eddies, and low-order tributaries. Juvenile steelhead spend from 1 - 4 years in fresh water before outmigrating to sea, and then 1 - 4 years in the ocean before returning to spawn. Steelhead that spend two years in fresh water and two years in the ocean predominate the spawning population in the Coquille River (ODFW 1992). Unlike coho and chinook, steelhead are capable of spawning more than once. Approximately one-third of the Coquille River steelhead run is comprised of repeat spawners. Repeat spawners are predominantly female, due to higher post-spawning mortality among males (Busby et. al. 1994).

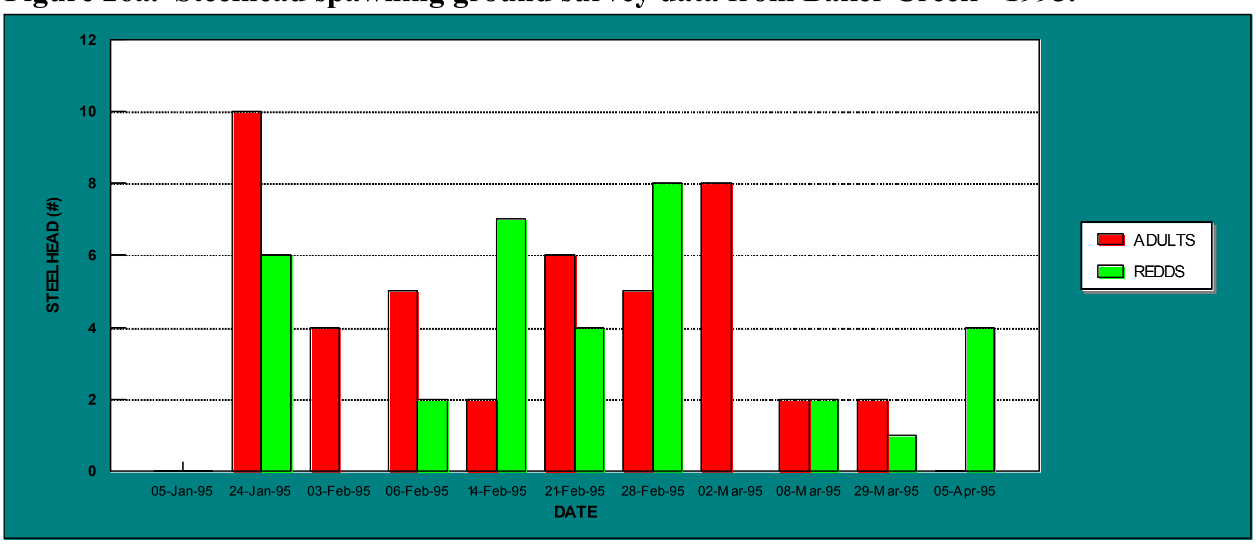
Steelhead are known to currently utilize the following tributaries in the Lower South Fork Coquille watershed: Warner Creek, Rhoda Creek, Dement Creek, Baker Creek, Woodward Creek, and Salmon Creek. Steelhead are also known to utilize Rowland Creek, but the cascade near the confluence with the South Fork Coquille River is a barrier during at least some flow conditions. Historically, their range may have also included Long Tom Creek and Mill Creek, but migration barriers now restrict access to these creeks (see Aquatic Habitat section).

The South Fork Coquille River has historically supported an abundance of winter steelhead. However, this steelhead population has been heavily influenced by hatchery introductions. The first introductions of hatchery steelhead (Coos River stock) took place in 1948. Between 1968 and 1985, imported Alsea River broodstock was used. In 1985, ODFW began releasing steelhead from Coquille broodstock only. In 1990, a program was begun to reduce mixing between wild and hatchery steelhead stocks, and ODFW began using exclusively South Fork Coquille River broodstock for hatchery production. Hatchery smolts are now acclimated in Beaver Creek for 3 weeks prior to release. The percentage of hatchery steelhead in the South Fork Coquille River spawning returns has declined from 83% in the 1980's, to 68% in the 1993/1994 season (ODFW 1995).

In anticipation of the construction of the Baker Creek fish ladder (see Aquatic Habitat section) ODFW released hatchery steelhead fry into Baker Creek in 1985, 1986, 1992, and 1993. The winter of 1994/1995 marked the first confirmed steelhead spawning run in Baker Creek in approximately 40 years.

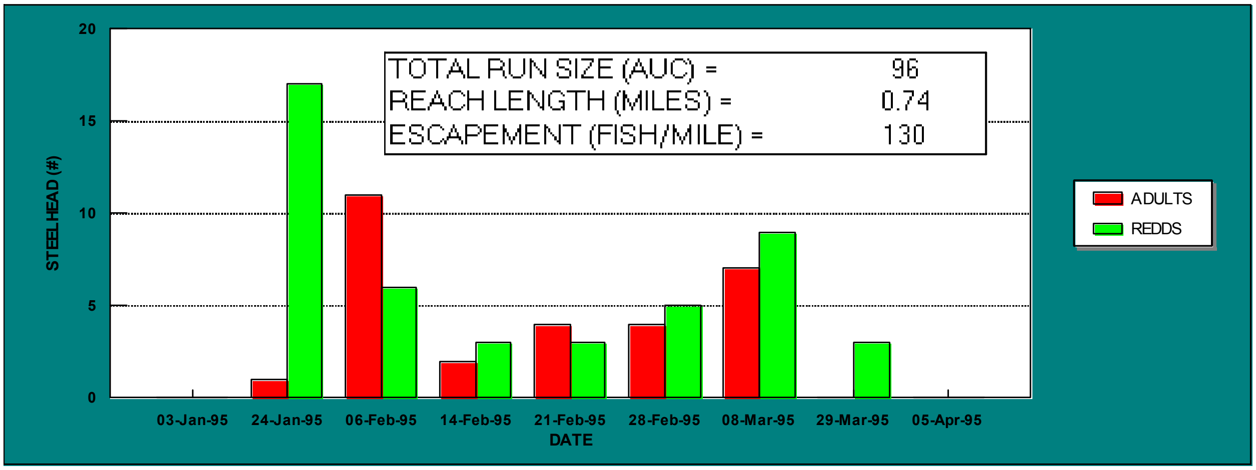
During the winter of 1994/1995, BLM and Georgia-Pacific West, Inc. conducted steelhead spawning ground surveys on Baker Creek and Salmon Creek. This data is presented in Figures 26a and 26b. No other steelhead spawning data from the Lower South Fork Coquille watershed is available at this time.

Figure 26a. Steelhead spawning ground survey data from Baker Creek - 1995.



Fish population survey data from Chen (1991), which is summarized in Figure 25, indicates that the summer loading density of 0+ and 1+ steelhead in Salmon Creek was variable, although generally low, among the six reaches surveyed in 1991. No other summer seeding level survey data pertaining to the analysis area is available at present.

Figure 26b. Steelhead spawning ground survey data from Salmon Creek - 1995.



The population of winter steelhead in the South Fork Coquille River is listed as "healthy" in Nickelson et al. (1992), and at a "low probability of extinction" in Nehlson et al. (1991). However, coastal steelhead (including Coquille River stocks) were petitioned for listing under the Endangered Species Act by the Oregon Natural Resources Council in 1994.

CUTTHROAT TROUT

Sea-run cutthroat trout enter the South Fork Coquille River from June through October. Spawning occurs from December to May. Fry emerge from redds from March to June. Juveniles spend from 1 - 4 years in fresh water before migrating to the ocean. Adults typically spend less than one year in the ocean before returning to spawn. As with steelhead, sea-run cutthroat trout may spawn more than once in their lifetime.

Sea-run cutthroat trout tend to spawn in many first and second order streams. This selection of small tributaries for spawning and early rearing may help reduce the competitive interactions between cutthroat, steelhead, and coho (Nickelson et al. 1992). Culvert design on smaller tributaries may be limiting sea-run cutthroat access within the Lower South Fork Coquille watershed. During the winter, juvenile cutthroat trout use low-velocity pools and side channels with complex cover created by large woody debris (Trotter 1989). Both sea-run and resident cutthroat trout appear to be highly vulnerable to logging activities (Behnke 1992).

Little historical information is available regarding sea-run cutthroat trout populations in the Lower South Fork Coquille watershed. However, anecdotal accounts suggest that their numbers have declined since the 1940's (BLM 1995a). Hatchery introductions of sea-run cutthroat trout began in the 1950's, and continued until 1985. Initial hatchery releases consisted of Coquille River stock, while those occurring between 1975 and 1985 were comprised of Alsea River stock. The impacts of these hatchery releases on the wild sea-run cutthroat trout population in the Lower South Fork Coquille watershed is unknown (ODFW 1993a).

Nehlsen et al. (1991) reported Coquille River stocks of sea-run cutthroat trout to be "at risk" of extinction as a result of habitat degradation, over fishing, and other factors. The National Marine Fisheries Service is presently conducting comprehensive status reviews on coho and chinook salmon, steelhead, and sea-run cutthroat trout. These reviews are scheduled to be completed by early 1996, and should provide additional insight on the current condition of these species, including populations within the Coquille River basin.

Resident rainbow and cutthroat trout (found above barriers to anadromous fish passage) spawn in first and second order streams in early spring when water temperatures start to rise. Fry emerge from redds during late spring. Some first and second order streams are important rearing areas and winter refugia for resident trout (Frissell 1992, Trotter 1995). Thus, access to small tributaries is an important factor affecting the viability of resident trout populations. At one or two tears of age, trout tend to seek out larger streams and establish a territory. Resident rainbow and cutthroat trout reach sexual maturity at three or four years of age.

Hatchery introductions of rainbow and cutthroat trout occurred from the 1950's through the mid-1980's. The extent to which these releases affected the wild trout population in the Lower South Fork Coquille watershed is not known, but genetic studies currently being conducted by ODFW may provide some answers.

Cutthroat trout densities appear to be directly related to the amount of available cover (Wesche 1974). Thus, it may be inferred from the habitat simplification noted in the Aquatic Habitat section that the resident cutthroat trout population in the Lower South Fork Coquille watershed is depressed. However, no historical trout population data from the analysis area is available to empirically verify this conclusion.

PACIFIC LAMPREY

Pacific lamprey are anadromous, and like Pacific salmon die shortly after spawning. Spawning occurs in the Lower South Fork Coquille watershed in April and May. Unlike juvenile salmonids, Pacific lamprey ammocetes spend up to seven years in fresh water before migrating to the ocean. Due to this protracted freshwater development, Pacific lamprey are an important indicator species in evaluating the health of the fluvial systems they inhabit. However, Pacific lamprey have received relatively little attention from fisheries managers, so the status of the Coquille River stocks are unknown. Increased predation on anadromous salmonids may be partially attributable to the decreased availability of Pacific lamprey, a preferred prey item for marine pinnipeds (Parker et al. 1995).

Adult Pacific Lamprey were observed in Salmon Creek in 1995 and are known to use the lower South Fork Coquille River as a migration corridor, but beyond this their distribution within the analysis area is not documented. No empirical data is available from which to assess Pacific lamprey populations in the Lower South Fork Coquille watershed. However, anecdotal information in BLM (1995a) and USDI (1995) suggests that the numbers of spawning Pacific lamprey are well below historic levels in at least some tributaries.

No data is available from which to assess the status or distribution of speckled dace, stickleback, largescale sucker or sculpin populations in the Lower South Fork Coquille watershed. Additional information on fish populations within the analysis area is provided in Appendix 6.

Wildlife Populations and Habitat Conditions

Wildlife are valued for recreation activities and aesthetics. The human benefits from wildlife include the harvest of game, fur, recreational wildlife watching, artistic and other commodity values. Both game and non-game species, provide ecological functions of seed/spore dispersal, nitrogen cycling, and links to the spacial and temporal condition of the forest. Flying squirrels and many small birds connect the canopy of the forest with the forest floor, providing a critical ecological link within the forest. Big game species, many furbearers, and rodents are generally mobile and move horizontally through the forest. These vertical and horizontal links provide connections to all habitats within the forest.

The ecological role of birds is described in the FEMAT, FSEIS and associated documents for the old growth related species. The early and mid seral conditions for this watershed provide habitats for different species of birds. These birds function ecologically by significantly contributing to nutrient dynamics and seed distribution in the watershed, thereby establishing the foundation for future function in later seral stages.

Small mammals distribute seeds and spores, plant some seeds, forage on crop-damaging and other insects, and assist in soil aeration and mixing. Historically, small mammals provided furs, created instream structure and established wetland and related habitats which supported a wide variety of fish and wildlife resources useful to humans.

Where Special Status species exist, there is the potential for the remaining populations to recover (given sufficient time and habitat) to a level where they may be removed from the threatened or endangered species list. The specific values of these species have not been expressed in monetary or other terms relevant to standard human values. These species often fill unique functional positions in the forest ecosystem, some of which are not fully understood at present. Known beneficial uses of some of these species include nutrient cycling, aesthetic values, and stability of a late seral forest condition. Some species may also hold keys to medical or other knowledge useful to humankind.

HABITAT

Before the presence of a European-based society, fire, rain, wind, and to a lesser extent insects and disease, were key natural processes which formed the structure of the forest. Today, disturbances are somewhat more wide-spread, because humans impose greater amounts of habitat alteration, and are doing this alteration more frequently on the same sites. This creates a long-term, early seral condition on the landscape. This affect is seen on agricultural, pasture, and short-rotation timber lands.

Modern forest management on private lands often utilize chemical herbicide application. On all timber producing lands, there is a general trend of increasing numbers and miles of roads, human-caused changes in fire frequency and intensity, and planting a single species of conifer trees for reforestation. The practice of falling "hazardous" snags is changing, but was frequently used in recent years. Some previously forested lands have been converted to open grassland for livestock pasturing in the last 130 years; however, this trend has started to reverse in the past decade. These practices have altered forage sources for species like the band-tailed pigeon, increased the disturbance affects of motor vehicle traffic, increased access for harvest of game animals, and altered the vegetative pattern, proportions and character of the forest. These practices have also accelerated the rate of habitat change in and adjacent to the forest, and some wildlife species are unable to adapt at the same rate. Certain areas of the Lower South Fork Coquille analysis area fit the descriptions prepared in the FSEIS. However, much of this analysis area is not currently in late-successional condition, and it is not proposed to be in the future. Therefore, many of the wildlife resource values for this watershed have not been adequately analyzed, and a local description of the resources is needed.

This watershed was exposed to large scale logging operations in the early 1900's, as described in the Aquatic Habitat section of this watershed analysis, resulting in rapid changes to forest environments. Since that time, some of the area has developed in somewhat of a predictable ecological sequence, provided human activities did not further alter the rate or occurrence of succession. This ecological development should provide a variety of structure within the forest complex, adding to habitat diversity. However, without a habitat inventory, the number and types of habitats cannot be quantified. Habitat locations and distributions across the landscape have also not been clearly defined beyond the general and regional natural history and maps, although a few spot checks and "grab" samples have provided some specific information.

Cavity structure in the forest directly affects the productivity of some bird and mammal populations. Fire and disease are important factors in creating snags for cavity production. There have been no inventories of cavity structures in the analysis area, but it is assumed that private timber production lands, agricultural lands, public or private forested lands harvested within the last 50 years, roads and road prisms, ponds, streams, and old forest stands adjacent to harvest units, contain few or no snags. The remaining forested lands have been subject to salvage, theft, and windthrow influenced by adjacent disturbances. This leaves precious few areas where snags could persist. There is the possibility of cavities in living trees, but the probability of this in highly-managed, Douglas fir forests is low. Thus, although no inventory has been conducted, it appears that there are few structures with cavities available.

Relative differences between habitat qualities in 1943 and 1992 were observed from aerial photographs. Both sets of photos show general vegetative patterns, and also show clearly the areas and amounts of human development. It appears that in 1943 there were substantial timber harvest activities in the Key Watershed. At that time, the northern and western portions of the watershed were not well developed or heavily disturbed. In the 1992 photos there is a similar estimate, but the harvested areas are 50 years older in the Key Watershed, and there is substantially more disturbance in the Dement and Eckley Creek drainages. This suggests a high level of vegetative and habitat fragmentation, and persistence of an unusually high rate of disturbance, unlike any which occurred prior to the influences of European settlers. The fragmentation of contiguous late seral habitat is far greater in 1992 than in 1943. It is estimated that overall this watershed generally favors early to mid successional wildlife species. These species tolerate smaller units of contiguous habitats, or thrive with high levels of "edge" (Hansen and Urban 1989). This condition favors the wildlife species which are habitat generalists and discourages or excludes species which are habitat specialists. The rate of habitat destruction often can exceed the rate of desired habitat development. The current rate of habitat change is not well understood, because some of it occurs on private lands and fluctuates with market conditions.

The aerial photograph interpretation process was non-quantitative, yielded an "above-canopy" perspective only, and should be further supported through a more intensive on-the-ground inventory. Resource decisions based on this information should be made with caution.

It is felt that the Forest Operations Inventory (FOI) for the District is inadequate to describe vegetative communities or wildlife habitats. In order to more accurately describe habitats, a polygon map showing plant communities by seral stage was produced from 1992 aerial photographs. The vegetation map is not included in this Watershed Analysis because it was not produced in the Geographic Information System (GIS). A copy of the map is available in the permanent file of this analysis. This map was **only** produced for the key watershed portion of the analysis area. Seral stages were determined by the Coos Bay District RMP and vegetative communities were established using Appendix 8 of Brown (1985). The “None Determined” communities (containing 701 acres, 9 %), have no seral description because there are not reliable methods to categorize these sites. Other communities were estimated by the following seral stages:

		Approximate Acres	Approximate % of Total Key Watershed
Early Seral	(ES)	269	4
Mid Seral	(MS)	1597	22
Late Seral	(LS)	3041	43
Mature	(MA)	1542	22
Old Growth	(OG)	677	10

This information suggests that the Key Watershed provides a very large amount of late seral to old growth habitats, but it should be understood that late seral habitats are defined in the RMP as between 40 and 100 years old. Age is only one factor in determining whether late seral condition is functioning within an ecosystem. Other factors may include, the presence or absence of structures (snags) which may have been influenced by human activities, lichen development affected by management or temporal/spacial factors, or other physical or biological affects on the community. This means that the functional late seral condition may not have true representation in this table, and a false impression may be reached if this table is the only data used to evaluate habitats for late seral condition species. This table **should only** be used to evaluate the very general conditions of the Key Watershed.

Within these seral stages there are eight communities identified. Names of these and total acres for all seral stages are:

		Approximate Acres	Approximate % of Total Key Watershed
Grass Forb	(GF)	677	9 %
Red Alder	(RA)	921	12 %
Conifer/Hardwood	(CH)	1834	23 %
Temperate Coniferous	(TC)	2467	32 %
Deciduous Hardwood	(DH)	1152	15 %
Evergreen Hardwood	(EH)	752	10 %
Hardwood	(HW)	2	0 %
Non-Resource	(NR)	22	0 %

Acreages and acreage percentages for communities and seral stages are shown in Table 20.

Table 20. Acreages and Percentages of Communities and Seral Stages.

Seral Stage	Habitat	Acres	% Total Acres	% of this Seral Stage
None Determined	GF (Grass/Forb)	667	8.64 %	96.57 %
	HW (Hardwood)	2	0.02 %	0.29 %
	NR (Non-resource)	22.0	0.28 %	3.14 %
Totals		701	8.9% of all Seral Stages	
Early Seral	CH (Conifer Hardwood)	2	0.02 %	0.74 %
	EH (Evergreen Hardwood)	24	0.3 %	8.92 %
	RA (Red Alder)	3	0.03 %	1.12 %
	TC (Temperate Conifer)	240	3.07 %	89.22 %
Totals		269	3.43% of all Seral Stages	
Mid Seral	CH	438	5.59 %	27.43 %
	DH (Deciduous Hardwood)	203	2.59 %	12.71 %
	EH	68	0.86 %	4.26 %
	RA	31	0.39 %	1.94 %
	TC	857	10.95 %	53.66 %
Totals		1597	20.4% of all Seral Stages	
Late Seral	CH	345	4.4%	11.34%
	DH (Decidious Hardwood)	949	12.12%	31.21%
	EH (Evergreen Hardwood)	660	8.43%	21.17%
	RA	887	11.33%	29.17%
	TC	200	2.55%	6.58%
Totals		3041	38.85% of all Seral Stages	
Mature Seral	CH		8.07 %	40.99 %
	TC	910	11.62 %	59.01 %
Totals		1542	19.7% of all Seral Stages	
Old Growth	CH	417	5.32 %	61.6 %
	TC	260	3.32 %	38.4 %
Totals		677	8.64% of all Seral Stages	

This table shows that the majority of the public land in the Key Watershed is in the mid, late and mature seral conditions, but there is a very low percentage in the old growth condition, particularly in comparison with historic abundance (Teensma et. al. 1991). The mid seral is defined by forests 15 to 40 years old, late seral as 40 to 100 years, mature as from the culmination of mean annual increment to 200 years, and old growth as 200 years and older (USDI 1994a). Table 20 indicates that there is a potential concern about the number of acres in non-classified seral (including grass-forb, and rock quarries) early seral, and old growth seral conditions. It is **cautioned** that this table only represents the Key Watershed and a similar analysis of these conditions should be completed for the entire analysis area to determine the conditions on a larger scale. Within the entire watershed, there seems to be an abundance of early seral habitats provided by recently harvested forest lands and grazing lands. There also seems to be enough quarries to satisfy this unique habitat condition. However, it is recommended that the spacial arrangement of all early seral habitats be analyzed relative to the development of old growth habitats. The above information on **only** the Key Watershed suggests that it is probably not providing the types and amounts of habitats needed to support all the objectives of a Key Watershed, and that specific management is needed to modify the seral conditions in certain areas (i.e. old growth areas).

The habitats of the watershed are becoming more fragmented and diverse, but each habitat unit is also increasingly smaller in size. This trend is expected to produce habitats suitable to "generalist" species, who's populations increase with habitat disturbance, and is expected not to produce habitats for species which require mature to late-successional characteristics. On public lands, the habitat trends are estimated to be currently static within the Key Watershed, with the potential for this trend to slightly decline with the implementation of the District harvest plan under the Northwest Forest Plan. This is a difficult evaluation because the LSR is already providing good habitats for old growth related species. The connectivity block is not providing the maximum potential habitat for these species, because much of the area was recently harvested (within the last 20-30 years). The connectivity area has the potential to provide upward trends for habitat production for many of these species in the next 100 to 200 years. Currently, there are habitats for old growth related species in the matrix portion of the Rowland Creek drainage . The matrix lands and private lands are not likely to produce late seral habitats. These lands are expected to produce habitats of 60 to 80 years old or less. The loss of any of the old growth habitat would mean a reduction in trend for old growth related species until the habitats in the LSR and connectivity areas can replace that habitat. For more details refer to the Coos Bay District and the Northwest Forest Plan - FSEIS ROD (USDI 1994a and USDI 1994b).

BIRDS

Nationwide there is concern for the declining numbers of neotropical migratory birds (Terbough 1989, Line 1993, Peterjohn and Sauer 1993). This concern often stems from the alterations to habitats as described in the FEMAT, FSEIS, and associated documents. The current population conditions of these species within the Lower South Fork Coquille analysis area are not inventoried or monitored to any recognized standard. Habitats for these species are also not inventoried or monitored to any recognized standard. As described in general terms in the FSEIS, FEMAT and associated documents, these animals require a variety of upland and wetland habitats to provide nesting, hiding cover, and foraging sites within the watershed. Vegetative diversity and health is one key to providing habitat to reverse downward trends in the populations. It is said that the population numbers and species richness is lower in the western United States than in the east for the neotropical migrants. This suggests that the western species are more vulnerable to poor habitat conditions than other species, which have been monitored closely and have been shown to be declining (Terbough 1989). It is estimated that 25% of the breeding bird communities occur in mature and older vegetation habitat conditions. For those species which require cavity structures, habitat conditions are probably well below what is needed to maintain minimum viable populations. There are no snag inventories to describe habitat conditions on public land for these species. Public lands, in general, are probably in better habitat condition for cavity nesters than private lands. However, the public lands are expected to be well below the target (USDI 1994a) of providing sufficient habitat to maintain 40% cavity nester population levels. Few, if any, snags were left in harvest units in recent years, and the few green trees left on harvest units since the late 1980's have not been converted to snags. Fire generally creates snags , but fire suppression efforts have reduced the frequency of fires in recent history, and snag falling contracts to reduce fire and safety hazards in forest stands were implemented during the early to mid part of this century.

Riparian areas provide some of the most valuable habitats for many of the neotropical migrants. These habitats often are not the only ones used by these species on a daily basis. Therefore, good linkages to other habitats are essential to support the full life-needs of these species.

A greater portion of the watershed is associated with grass/shrub dominated habits today than in 1943. Shrub habitats are preferred by species which are habitat generalists, such as sparrows, towhees, and certain warblers. It is estimated that less than 40% of the neotropical migratory bird species will be associated with early successional habitats (Morrison & Meslow 1983). Although total bird numbers are generally nearly equal in shrub dominated habitats when compared to those in older forests, species diversity is lower and comprised primarily of those species using brush and ground-use strategies (Morrison & Meslow 1983), rather than canopy strategies. Results from breeding bird surveys in the Upper South Fork Coquille watershed, show that songbird populations along that route appear to be healthy (Shea 1995a). However, it has been shown that bird surveys along roadways are biased toward species which are tolerant of vehicle activity and noise (Salathe′ 1991).

Numerous game-bird species occur within the watershed. Band-tailed Pigeons *(Columba fasciata)* occur, but are depressed in this watershed as they are regionally (ODFW 1993b). The reasons for this depressed condition are not completely understood, but there is evidence that herbicide and pesticide use, reduced forage and mineral sites, reduced nesting habitat in the United States and increased pressure from agricultural interests and hunting on the winter ranges all may be affecting populations . California Quail (*Callipepla californica*) and Mountain Quail (*Oreotyx pictus*) both appear to have fair to good population levels. Blue Grouse *(Dendragapus obscurus)* occur mostly on the ridges and Ruffed Grouse *(Bonasa umbellus)* mostly occur in the drainages. Both of these species are in a depressed period of their natural population dynamics, but are generally considered at healthy population levels. There are several populations of introduced Wild Turkey *(Meleagris gallopavo)*, which primarily occur on private lands. There has been much discussion about the possibility of Wild Turkeys adversely affecting the native grouse population. However, the present understanding is that while individual game bird populations are density dependant, they are not interdependent on other game bird species (Toman 1995). Wild Turkeys may have other indirect affects on other species, which are currently not detected or monitored.

Waterfowl occur throughout the watershed, using private ponds, beaver impoundments (see section on Beaver) and open streams. It is believed these populations are in relatively good condition, despite active management to reduce beaver pond development on many private lands. It is common to observe species such as Mallard (Anas platyrhynchos), Wood Duck (Aix sponsa), and Common Merganser (Mergus merganser) among others.

Other notable species of birds which have documented occupance include the hawks and owls. Associated with this group of hawks are: Northern Goshawk *(Accipiter gentilis)*, Osprey *(Pandion haliaetus)*, Coopers Hawk *(Accipiter cooperii)*, Sharp-shinned Hawk *(Accipiter striatus)*, American Kestrel *(Falco sparverius)*, Peregrine Falcon *(Falco peregrinus)*, Red-tailed Hawk *(Buteo jamaicensis)* , Bald Eagle *(Haliaeetus leucocephalus),* and Golden Eagle *(Aquila chrysaetos).* One species of raptor which is apparently expanding its range by following the development of pasture lands along the coastal regions is the White-Tailed or Black-Shouldered Kite *(Elanus caeruleus*). Owls include: Barn Owl *(Tyto alba)*, Great Horned Owl *(Bubo virginianus)*, Northern Spotted Owl *(Strix occidentalis)*, Western Screech Owl *(Otus kennicottii)*, Flammulated Owl *(Otus flammeolus)*, Northern Pygmy Owl *(Glaucidium gnoma)*, and Northern Saw-whet Owl (*Aegolius acadicus*). Barred Owls are also expanding their range into this watershed as a result of increased fragmentation of forest habitats and increased development of "edge" habitats.

There are five species of swallows within the watershed, and several species of warblers including the Wilson's (*Wilsonia pusilla*), Orange-crowned (*Vermiora celata*), Yellow-rumped (Dendroica coronata), and the MacGillivray's (Oporornis tolmiei), as well as the Yellow-breasted Chat (*Icteria virens*). Allen's (*Selasphorus sasin*) and Rufous (*Selasphorus rufus*) Hummingbirds are often found near flower gardens on private property as are Lesser (*Carduelis psaltria*) and American Goldfinches (*Carduelis tristis*). The Downy (*Picoides pubescens*), Hairy *(Picoides villosus*), Pileated (*Dryocopus pileatus*) and other woodpeckers are also found in the watershed (Cape Arago Audubon Soc. 1995). Several of these are special status species of local significance, and need further analysis for future decisions on the management of this watershed.

HERPTILES

Reptiles and amphibians, collectively called herptiles, are unique because of their required habitats, secretive nature in the forest, and for some amphibians, their split aquatic/terrestrial life histories. These animals play a significant ecological role in forest communities, and they are often indicators of ecological health in these systems, because of their vulnerability when habitats are altered or eliminated. Generally, none of these species are very mobile and do not re-inhabit extirpated sites quickly. Herptiles need certain conditions in both the riparian and upland habitats to survive. Amphibians often forage and breed in the streams or the adjacent high-moisture micro-habitats within the riparian areas. Many amphibians also migrate from these breeding sites and use riparian habitats to disperse. This dispersal is not exclusively conducted in the riparian habitats, but reaches out into the uplands in apparently random patterns (Applegarth 1992). Some species of amphibians use upland habitats for major portions of their life functions, and rely on course woody material of specific dimension, or rocks of certain characteristics, in order to survive. Amphibians must keep their skins moist from their environment in order to breath. In many cases, logs act as water storage facilities and are the only habitat wet enough (during the dryer seasons) to allow amphibians to survive. Coarse woody debris and moist talus are crucial habitat for several species of salamander (Bury et.al. 1991, Corn and Bury 1991a). Management of a land base can affect the production of prey for these species. It has been recorded that burning for site preparation after logging left conditions unsuitable for herptile prey base 15 years post burn (Langenstein 1993). One species, the Del Norte salamander *(Plethodon elongatus*), is endemic to a small area in the Pacific Northwest, and probably reaches its northern range limit within the South Fork Coquille Watershed.

Reptiles often use dryer sites across the landscape and will frequently use rocks, talus and/or down logs as habitat sites. These animals often forage on invertebrates which become available because of specific habitat conditions. These animals also provide a prey base for many larger species like mammalian predators and raptors.

Preliminary results of a June 1994 herptile survey in the Lower South Fork Coquille watershed revealed 11 species of herptiles within the watershed. Of these 11 species, four are categorized as special status species: the Red-legged Frog, S. Torrent Salamander, Foothills Yellow-legged Frog, and the W. Pond Turtle (Wright & White 1995).

There are only general statewide range maps and general natural histories of species to describe habitat areas for these species. There have been no intensive inventories conducted by BLM for herptiles, so detailed information is not available. Spot checks and random “grab” sampling has confirmed that there is a variety of herptiles in the watershed; however there is a poor understanding of their population densities, distributions and trends. According to literature, there should be approximately 15 species of amphibians (14 native, 1 exotic) and 14 (all native) species of reptiles occupying the habitats within the watershed (Nussbaum et. al. 1983 and Webb & Shea 1990a). During the 1995 field season, extensive surveys were conducted (Wright & White 1995) for herptiles in proposed FY 1991 sold-unawarded timber sales in the Eckley Creek area and in portions of the Key Watershed. These very general surveys took approximately 20 hours of survey time. Results show that the proposed "Ugly Eckley" timber sale, contained: (9) specimens of Ensatina (*Ensatina eschscholtzi*), (4) Clouded (*Aneides ferreus*), (3) Western Red-backed (*Plethedon vehiculum*), and (1) Dunn's salamanders (*Plethedon dunni*), (2) Northern Alligator lizards (*Elgaria coerulea*), (1) Northwestern Garter snake (*Thamnophis ordinoides*), (3) Pacific Tree frog (*Hyla regilla*), and (3) Red-legged frogs (*Rana aurora*) and many egg masses. Both riparian and upland habitats were surveyed. This information shows that only 40% of the expected amphibians and 14% of the expected reptile diversity was observed in the area. Random observations of herptile habitat during a variety of field exams, shows that Tailed Frogs (*Ascaphus truei*), Southern Torrent salamander (*Rhycatriton variagatus*), Foothills Yellow-legged frog (*Rana boylei*), and Gopher snake (*Pituophis melanoleucus*) also occur in the watershed. Western Pond turtle (*Clemmys marmorata*) are known to occur in the Powers pond. Additional information may be available in the near future from an ODFW and USFS cooperative effort to inventory herptiles in the South Fork Coquille, and from Georgia Pacific Corporation biologists also conducting inventories within the analysis area (VanDyke 1995 and Roberts 1995).

Bullfrogs (*Rana catesbeiana*) have been observed in several locations within the South Fork Coquille watershed (VanDyke 1995). This species has been documented on USFS lands and along the river, so it is likely to occur on private and BLM administered lands. This is significant because this exotic species preys heavily on native birds, fish and herptiles, including special status species.

There is little information from which to evaluate trends for most herptiles. Several species have been identified as special status species (see Special Status Species section), suggesting that these populations could be declining. There is general concern that many amphibian populations may be declining (Wake & Morowitz 1990). This is a data gap which could be filled through intensive local inventory and monitoring.

MAMMALS

A survey of the literature indicates that the Lower South Fork Coquille Watershed is within the historic (Maser et. al. 1981) or present (Webb & Shea 1990b) ranges of 66 species of mammals. The results of the survey are shown in appendix Table 2-1. This table indicates that there are fewer mammalian species presently occupying the analysis area than probably occurred historically (prior to European cultural influences). While some species have been extirpated, several exotic mammals have been introduced into the area. The observed changes in mammalian species ranges are related to environmental changes which favor habitat generalists, as noted above.

There have been no specific inventories on mammalian populations. The current monitoring for mammals includes aerial and spotlight counts by ODFW, recognition of complaints for depredation or damage by ODFW, a short-term extensive bat survey by BLM (summer and fall

1995), and incidental observations by BLM, landowners, ODFW and U.S. Forest Service. Trends for most of the mammals are not known due to the lack of inventory and monitoring data. It is suspected that late seral related species are decreasing substantially, that early and mid seral related species are stable or increasing in trends as a result of habitat alteration from human developments. The population trends are very likely to follow the habitat trends within the watershed. Habitat loss is a major problem, particularly with later forest condition habitats.

The big game species occurring in the Lower South Fork Coquille watershed include Roosevelt elk, black-tailed deer, black bear and mountain lion. All of these species are somewhat adaptable to human development, and may thrive in its presence. In the past few years there have been increased reports of mountain lion and bear sightings in southwestern Oregon, and big game harvests have been very favorable. This suggests that habitats for these species are doing well, although there is only general data (Toman 1995 and VanDyke 1995) for the watershed. Increased management is under way for the big game populations in the watershed. Roosevelt elk and Black-tailed deer have caused fence, pasture and tree damage at several locations on private lands. This has prompted changes in harvest seasons for both species. Within the ODFW Sixes hunt unit (approximately south of highway 42 and west of the Powers Highway), there is an effort to reduce both elk and deer populations on private lands and a desire (by ODFW) to increase populations on public lands. This desire is not supported by the final RMP for Coos Bay District. Specifically, there have been emergency hunts in the unit for elk in the areas of Powers Ranch/Salmon Creek, and for deer in the Dement, Catching and Baker Creek drainages on private lands during 1994 and 1995. In all, elk populations are increasing in both the Powers and Sixes big game units, while deer populations show a slight decline in the Powers unit and an increase in the Sixes unit (Toman 1995).

Mountain lions are tightly controlled by the private land owners because of livestock depredation problems. Black bear densities in the Sixes unit are high, and have caused significant damage to trees. Georgia Pacific Corp. is conducting “bear control” efforts in Baker Creek, where foraging and denning opportunities seem to be favorable at this time. Bear populations and densities seem to be lower in the Powers unit, where there are fewer damage complaints. Private landowners believe that hounding and poaching activities are still practiced on black bear in this area. Black Bear and Mountain Lion populations are increasing (Toman 1995), which may also be a response to the livestock conditions, the rising deer populations, and other factors.

There are at least two exotic species of mammals in the watershed. There is a small population of feral pigs (last estimate =11 animals) on private lands, approximately 4 miles up Dement Creek, near the community of Broadbent. These lands are not close to public lands and pose no immediate threat to the public. There is also a population of Fallow deer which is not considered to be feral but domestic. These animals are believed to be contained within fenced private lands (Toman 1995).

Beavers are an example of a “keystone” species which affect many other species through habitat development. Beaver fall trees and store limbs of shrubs and trees in streams, providing habitat for many vertebrate and invertebrate aquatic species. They also pool water, creating aquatic habitats that expand shorelines, promoting habitats for avian species. Pooling water also creates watering sites for large mammals and supports wetland vegetation for many small mammals. Beaver are a major forage for carnivores in the ecosystem. Trapping of beaver occurred at relatively low levels in early settlement years, and beaver seemed to be easily displaced from their traditional numbers (Root 1995).

Beaver still occur in the watershed, but use bank burrows along streams more commonly than developing dam complexes. Several factors may have contributed to this. In addition to early market trapping, beaver are considered a nuisance by many agricultural operators (Toman 1995), and are shot or trapped by the government animal damage control agent or private land owners to limit the amount of flooding of agriculture land. Additionally, the upper portions of many streams have been de-stabilized by past logging activities, rendering some areas less suitable to beaver complex development. Once these sites are broken down, it often takes substantial amounts of time and the proper vegetative condition to reestablish beaver complexes. Beaver are persistent in the watershed, but their complex developments have not fared as well. Fisheries monitoring has provided some data on public lands, but little quantified data has been assembled for the entire watershed. There is no recognized management plan for beaver other than to eliminate animals from problem areas.

River Otter have been observed at the bridge across the South Fork Coquille River near Baker Creek (Root 1995). This species is considered common along the South Fork Coquille River and throughout the Powers Ranger District (Shea 1995b). There has been no monitoring program on these species other than anecdotal comments from fisheries biologists in the Lower South Fork Coquille Watershed.

There are up to ten species of bats occurring within the watershed, some of which are on the Forest Plan - ROD “survey and manage” list (Maser et.al. 1981). A level 1 survey is currently being implemented to examine if there are high activity areas of bats along one road corridor within the Key Watershed. These animals have not been inventoried or monitored in this watershed in the past, and a substantial data gap exists. There are two abandoned tunnels on private lands within the watershed. A large rock formation (Virginia Rock) also contains suitable habitat for a small population of bats. California Myotis has been observed along the river and has been killed by house cats (Shea 1995b).

Bobcat and their tracks are regularly seen within the analysis area (Root 1995), including the Key Watershed. There are minor efforts to manage this species through Animal Damage Control, and fur trapping does take some (Toman 1995). Little is known about this species in the Lower South Fork Cooquille watershed, but they are considered to be common in the Powers Ranger District (Shea 1995b).

Remote station photographic surveys have been conducted within the Key Watershed, primarily to survey for American Marten or Fisher (BLM 1994b). Neither of these species were photographed during the surveys, so it is believed there is little chance that they still occur in the watershed with any regularity. Camera surveys suggested a high occurrence of opossum, striped and spotted skunks, coyote, raccoon and black bear.

Red Tree voles (special status, ROD C-3) have not been surveyed by BLM, but should regularly occur in some of the forest habitat areas of the watershed. Older forests are expected to contain more dense populations than young forests (Corn and Bury 1991b).

Little is known about the White tree vole, except it tends to occur in red alder sites. There have been no surveys for this species.

SPECIAL STATUS SPECIES

The species composition in the Key Watershed is probably about the same today as it was in 1943. However, changes in the relative abundance of each species have probably occurred with canopy and understory development. It is highly unlikely that the present relative abundance of species in the Key Watershed represents the historic condition, because the proportion of late successional habitat has been diminished. The expected species ratios in the remainder of the watershed are probably similar to that of early times when substantial agricultural/grazing development on private land occurred in the area. In most of the analysis area, there is increased fragmentation and maintenance of earlier seral conditions. Species adaptable to disturbances and early to mid-seral habitats are likely to be increasing, while those needing the older habitats are probably decreasing. Thus, habitat alteration may be creating a problem for some species dependant on late seral conditions. These concerns have been recognized by many public and private land managers, and as a result local watershed associations, the State Forest Practices Act, and the Northwest Forest Plan are changing forest management.

For special status species which use other than just old growth habitats (ie. Del Norte salamander, American marten etc.) trends are probably going to fluctuate slightly , but will generally remain static within the Key Watershed. In the remainder of the watershed, there is the potential for long-term and persistent disturbances. This suggests that there will be an downward trend for special status species on these sites.

Additional information on birds, herptiles, mammals, special status species and their habitats is provided in Appendices 2, 8, 11, and 15, respectively.