Executive Summary

Watershed Analysis
for the
Wolf Creek Watershed

Bureau of Land Management
Eugene District

February 1995

Introduction

Watershed analysis is required by the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (ROD) and the *Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (S&Gs). Watershed analysis was recognized as an evolutionary process whereby a system of pilot projects were initiated to test the *Federal Agency Guide for Pilot Watershed Analysis.* During an interim period, FY 94-96, non-pilot watershed analysis would consider following the *FY 1994-96 Watershed Analysis Guidelines* developed by the Watershed Analysis Coordination Team. The Wolf Creek Watershed is not a pilot project and has followed the aforementioned "interim" guidance.

The Wolf Creek Watershed Analysis reflects the ongoing efforts of the Eugene District to manage the resources of this watershed according to the ecosystem-based direction of the President's Forest Plan. It presents the current understanding of the processes and interactions occurring in the Wolf Creek Watershed. The analysis is intended to clarify the interaction among land-use activities, the physical environment, and the biological environment. Additional information is needed for many of the resources, and further analysis of the existing information may be needed to answer new questions. As new information becomes available, this analysis will be revised as needed.

The "interim" guidance allows for initial watershed analysis to focus on predicted management activities, and certain aspects of the analysis may be of less detail than other portions. The Wolf Creek Analysis focuses on the Hydrologic cycle, Aquatic system, Current vegetation condition, Fish stocks-at-risk, Threatened and Endangered Species, and Roosevelt Elk. We also tried to integrate the human interaction within the watershed, believing the human element cannot be extracted in any meaningful way from the physical and biological processes and therefore must be analyzed in context with the physical and biological elements of the watershed.

We intend the document to be used at the Resource Area level by the Resource Area staff. Hence, terminology common in that professional setting has been used. We fully expect the Resource Area staff to utilized the document for planning management activities. We also expect the Resource Area staff to stay within the "scope" of this analysis. The analysis will not balance resource conflicts nor will it answer site specific questions, however it will give the resource manager an understanding of the interactions that could be expected at scales larger than those typically used in the past.

The scope of the analysis has been limited to the Wolf Creek Watershed from the headwaters to where it enters the Siuslaw River system.

Description of the Wolf Creek Watershed

The Wolf Creek watershed is located southwest of Eugene and covers approximately 37,890 acres. The watershed is within the Coast Range Province established by FEMAT and the Regional Ecosystem Office (REO). Wolf Creek lies in both the South Valley and Coast Range Resource Areas of the Eugene District, Bureau of Land Management. The entire watershed is located in Lane county.

Wolf Creek flows westerly approximately 25 miles where it enters the Siuslaw River. The Siuslaw River continues its westerly flow for approximately 40 miles where it empties into the Pacific Ocean at Florence. The headwaters of Wolf Creek are located in gentle to moderate topography with relatively low drainage densities and deep soils. This near Willamette Valley fringe allowed for early human settlement some six to eight thousand years ago. Euro-American settlement began as early as 1846 with settlement in Wolf Creek delayed somewhat as "better" lands were available in the Willamette Valley. By 1896 cash entries were being made in the watershed and homesteads were patented. The extreme western portion of the watershed is typified by topography that is sharply dissected by numerous stream channels that may become extremely steep in the upper reaches. Few settlers ventured into this rugged terrain, subsistence living was marginal, no roads were available and few if any trails provided access.

The watershed has a maritime climate characterized by mild temperatures with prolonged cloudy/overcast periods, wet winters, relatively dry summers, and a long frost free growing season. Winter temperatures average 42 degrees F with the average daily minimum temperature being 35 degrees F; occasional periods of below freezing conditions occur. In summer, the average temperature is 64 degrees F with the average daily maximum being about 76 degrees F. The precipitation ranges from 40 inches at the eastern edge of the watershed to 80 inches at the western edge, with the majority occurring between October and April. Rain is the primary form of precipitation, although snow does occur occasionally.

The land ownership pattern is typical for the O & C revested lands, being alternating sections of Federal and private ownership. Approximately 16,688 acres (44%) are managed by BLM and approximately 21,204 acres (56%) are managed by private owners or State of Oregon. Of these 21,204 acres approximately 18,885 acres are managed by International Paper Company.

Historically, the Federal, industrial, and state forest lands were managed primarily for timber production. The Forest Plan, which sets direction for federally managed lands in this area, emphasizes the restoration and maintenance of late-successional forest habitat and aquatic resources. Presently, and for the foreseeable future the management of the industrial and state forests will continue to emphasize timber production. The State Forest Practices Act has been changing of

late and now requires additional protection measures for riparian habitat. Not knowing what the future will bring as far as environmental legislation we have assumed the present condition will continue. Radical changes in environmental philosophy, particularly on private lands, would require us to review this analysis for the assumptions made.

Human uses and values are associated with the watershed in the context of occupation, small agricultural lots, timber harvesting, recreation, other forest product commodities and social values. Most of the current resident's income is derived from sources external to the watershed. Generally speaking people who live in the watershed work elsewhere and people who work (derive income) in the watershed live elsewhere. This paradox has developed since the end of World War II, where people have become more mobile and traveled to where jobs were. Roads were improved to facilitate those transitions. Also as people became better educated they migrated to metropolitan areas for the benefits those areas held.

Another paradox is at play in the watershed concerning traditional values and national values. Traditional values hold that people closest to the land understand the capabilities and limitations of the watershed. National values concerning the survival of species and protection of certain types of ecosystems has lead to competitive behaviors between the two arguments. We are in part attempting to find a solution to that paradox.

Ecological values about forest health and productivity are a key to the plant and animal life diversity within the watershed. Wolf Creek contains high value fish streams, spotted owls, marbled murrelets, and other species that are dependant upon late-successional forest habitats. The long term maintenance and sustainability of biotic diversity and ecosystem health and productivity are important facets in the current quality of life for today's society.

Major Natural Processes at work in the Wolf Creek Watershed

Several natural disturbance processes function at scales larger than the watershed scale and are often difficult to interpret at the watershed scale. Wind, Flood, Landslides and Fire all can operate at scales larger than the watershed. The historical data supports the occurrence and location of these events however, we were not fully able to calculate accurately the effects these events have on the watershed. The Columbus Day storm had catastrophic effects to the timber resource in western Oregon and in Wolf Creek, but what effect did the storm have on hydrologic response, fisheries, big game, we can only guess. Similarly, floods have been monitored for many years documenting the conditions that lead to the flood and the effects were estimated in damage to structures and crops. We now are trying to understand the effects of flooding on the physical and biological processes in the ecosystem as well as the social processes. Understandably, as viewpoints change through time the questions we seek

answers to changes as well. Unfortunately the data we have does not stratify readily to answer the these new questions.

Landslides have been identified as a major contributor of woody debris, small and large boulders, gravel and sediment to stream systems. At least one area was identified in Wolf Creek were a landslide contributed the aforementioned structure to Wolf Creek in 1980. The results of landslides are noticeable and quantifiable. The processes that lead to the landslide are more difficult to assess. We attempted to stratify the watershed based upon slope, soil, depth to bedrock, precipitation, management actions etc. to assess the current conditions and to determine which human caused conditions affect the landslide potential. Past practices of removing vegetation in headwalls and less rigorous road design have been suspected to lead to an acceleration of landslides. However, in the recent past (20 years) improvements in road construction and location and retaining slope stability buffers has reduced the amount of human caused slope failures.

Another major process at work in the watershed is wildfire. Wildfire has played a minor role as a change agent for the last 70 years largely due to aggressive wildfire control efforts. Conversely the lack of natural fire events has been suspected to be causing forest health problems in the Pacific Northwest. There are strong relationships between biotic communities and past fire regimes which we are able to briefly describe. Several studies we found estimated natural fire events in the Oregon coast range had 150-350 year return intervals. Our evidence indicated the last significant fire occurred in the watershed between 1850 and 1890. There has also been growing concern over the intensity of the wildfires in recent years. Some believe the intensity of the fires has increased in part due to the suppression of wildfire for the past seven decades. We cannot know now how the natural fire scenario will play out in Wolf Creek however, we can say that wildfire has an ecological role in the watershed. Balancing the role of fire in the ecosystem against the negative social aspects is a tremendous challenge but one worth engaging.

Present condition of the Aquatic ecosystem

Downstream beneficial uses for Wolf Creek are primarily fishing, salmonid fish rearing, recreation and domestic use. Water flow and water quality have been altered by management activities however, those alterations have been difficult to quantify. Research has shown removal of vegetation affects the timing of water flow through the watershed, with peak flows being higher than normal and base flows being lower than normal. Some of the causes are reduced evapotranspiration, more efficient water routing, reduced riparian vegetation effects and soil compaction. Review of aerial photos from the 1950s and 1990s shows changes in the stream channel morphologies from streams with structures (logs and woody debris), gravel bars, flood plains and islands to streams with fewer of the above. On the ground inspection confirmed what we saw in the photography, few of the larger

creeks have adequate hydrologic functioning channels or riparian areas. These streams have been downcut to bedrock with the exception of the upper portion of Wolf Creek which has maintained proper functioning conditions due to logging debris and beaver activity. Downcutting of the stream channels can cause the riparian areas to drain. The flood plains become detached from the stream and higher flow levels are required to flood the floodplains. Inundation frequencies tend to be less often on streams with entrenched stream beds. The biological effect of lowering flood frequencies is beyond this watershed analysis iteration but would be well worth pursuing in research.

Wolf Creek watershed contains ten major streams that are tributaries to Wolf Creek itself. Stream channels in the basin were once dominated by large woody material which, together with beaver dams, created extensive reaches of pools and slow flowing water. As a result of activities in the basin, most of the woody structure in the streams was removed or lost. Harvesting of streamside trees left too few large trees that could fall into the stream channel and replace the stream structure. As a result of this loss, many of the stream channels in the basin have incised into the valley substrate, secondarily confining the channels and reducing the availability and quality of the habitat. Currently the habitat for anadromous fish is considered good in terms of pools. Wolf Creek watershed has an average of 60 percent of the habitat within the watershed as pools. However, the pool width to depth ratio is rated low to moderate for nearly all streams including Wolf Creek. The current conditions of these streams in the watershed indicate that spawning and rearing habitat is a potentially limiting factor to fish colonization and recruitment.

Present condition of the Terrestrial ecosystem

Approximately 10 percent of the BLM administered lands have been surveyed for vascular plants, this amounts to approximately 4 percent of the total watershed. Based on these limited inventories, no Threatened, Endangered or sensitive plant species were found nor has ther been any likely habitat yet identified. Surveys began in 1994 for SEIS Special Attention Species (vascular and non vascular) and no information was available at this writing.

Noxious weeds are present in the watershed and have been associated with management activities particularly road construction. Forest roads act as a conduit for weed invasion in the watershed. Repetitive ground disturbing activities along roads and around private homes are also contributing to maintenance and spread of the noxious weeds. Rock sources and stockpiles often become contaminated by hardy weed species and the weeds are spread by using the contaminated rock sources. Very limited weed surveys have been conducted however, all roads in the watershed were surveyed for weed occurrence and a list of species has been included. The most frequent weed species encountered were Scotch Broom, Tansy Ragwort and St.

John's Wort. We were unable at this time to develop a priority list of species to eradicate because we were not able to determine which species may occupy a critical niche of an endemic species. However, weed control in the Late Successional Reserves will be necessary to maintain native plant communities and should be applicable in other land use allocations as well.

Three groups of special habitats/unique communities were identified within the watershed; rock outcrops and dry rock gardens, ponds and bogs. A total of 250 acres, approximately 0.06 percent of the watershed, are currently identified as special/unique habitats with the majority of these habitats being rock outcrops. The vast majority of the rock outcrops are located along the north western watershed boundary. The dry rock gardens tend to be located in the far eastern part of the basin with Wolf Point being one of the major areas identified. The ponds and bogs are all in the east half of the watershed and are associated with the upper reaches of Wolf Creek or tributaries. The wetland areas in the eastern portion of the watershed are associated with beaver activity.

We stratified the "general" vegetative condition in to 11 classes in order to gain an understanding of the current condition of the vegetation. We would have preferred to use a classification which would have described habitat for various plant and animal species however, we could not find a system which could be consistently interpreted by the various resource interests. Albeit an imperfect stratification, and appears we concentrate on the timber resource, resource specialists can make interpretations about habitat conditions from the classes presented. The 11 classifications we used are: Unclassified, Non-Forest, Hardwoods, Clearcut, Sapling-Pole, Pole-Young, Mature over Young, Old over Young, Mature, Old Forest and Mixed Conifer/Hardwoods. The Wolf Creek watershed is approximately one quarter recently harvested, one quarter in the pole-young stand condition, one quarter in old forest or "uneven" aged stands with structural features trending toward old forest, and one quarter is young forest, hardwood and mixed conifer, and non forested agricultural and pasture lands.

The average patch size in the watershed is 46 acres. The recently harvested areas average 57 acres in size; approximately 25 percent larger than the watershed average. The largest single clearcut patch currently in the watershed is 793 acres. The areas classified as pole-young average 86 acres; about 87 percent greater than the average of Wolf Creek with 1,441 acres being the largest patch currently in the basin. Mature forest areas are scarce, small, isolated remnants scattered throughout the watershed. The largest mature forest patch currently in Wolf Creek basin is 57 acres. The largest single patch of old forest currently is 300 acres in size. The hardwood areas are generally associated with streams and riparian area of 3rd order and larger streams as well as scattered stands in the western half of the watershed. The non forested agricultural and pasture areas are generally located in the eastern half of the watershed; close to the Willamette Valley and are more heavily

developed and populated There are several large rock quarries also classified as non forest.

The mix of vegetation classes between land owners more closely approximates the ownership percentage with the exception of the non forested areas and the old forest. The non forested lands are mostly on non federal lands while 88 percent of the old forest occurs on federal (BLM) lands. We found this to be a major shift of the age class distribution when compared to the 1956 vegetation classification. The younger vegetation classes; clearcut, sapling-pole, and pole-young, are in very similar proportions to that found in the 1956 vegetation distribution. The mature forest class has remained relatively stable between 1956 and 1990, although it is a small percent of the vegetation watershed wide.

Riparian Areas - Riparian Reserves

Riparian reserves are lands adjacent to streams where the riparian dependent resources receive the primary emphasis and specific standards and guidelines from the SEIS Record of Decision. On BLM lands, we used for estimation purposes, the height of a site potential tree of approximately 210 feet. Our goal was to estimate how many acres were included in riparian reserves. We considered fish bearing streams (two site tree buffer), non-fish bearing perennial and intermittent streams plus ponds and bogs (one site tree buffer). For private lands we used the new Forest Practices riparian guidelines and estimated the undisturbed buffer to be approximately 25 feet. We calculated approximately 8,306 acres in Wolf Creek watershed to be within the Interim Riparian Reserves and Forest Practices reserves. This figure represents approximately 13.4 percent of the watershed. We will agree that the data we used can be augmented with intensive field review to verify the locations and presence of streams. We believe there are more intermittent streams which are not in our data bases and the identification of these streams would increase the amount of riparian area.

Attempting to understand riparian condition created problems in itself. We were limited on a data source for nearly all of the streams however, we did have some information about overstory vegetation conditions on 4th order and larger streams. We decided to augment our information with photo interpretation and field review to classify the overstory vegetation condition to answer the question of large wood recruitment. From this classification, 6 percent of the riparian vegetation along main Wolf Creek have been permanently altered and are currently in pasture, residential, or disturbed areas. Almost all of the permanently altered stream-side vegetation occurs in the upper Wolf Creek segment; primarily because this is where the inhabitants are located.

The vegetation classes expected to produce large wood to the system are the old growth, old hardwood, and mature forest types. These classes total 26.4 percent of the main stem Wolf Creek riparian vegetation. The remaining 67 percent of

the main stem has some form of younger vegetation and are currently not able to supply the structural materials of sufficient size to the aquatic system. Lower Wolf Creek contains all of the old growth, 70 percent of the old hardwood type, and none of the mature type. Middle Wolf Creek contains the remaining 30 percent of the old hardwood type, and no mature or old growth forest types; and upper Wolf Creek contains one stretch of mature forest and none of the other structurally important forest types.

The SEIS established the interim riparian reserves to be used as guidance until watershed analysis was completed and appropriate reserves were designated. Our team believed we needed to know substantially more about the SEIS survey and manage species, overall riparian processes and functions before establishing some final form of riparian reserve standard. We believe there are situations where the local resource specialist should have the opportunity to deviate from the interim guidance depending upon the situation. Several examples have come up where the interim reserves may not protect a resource and we believe the resource specialist should be recommending additional protection. Conversely there are situations where riparian reserve boundaries would extend over a ridge into another drainage and would not benefit the primary riparian drainage and could be adjusted to meet local conditions. We want to strongly urge the local specialist to use caution when reducing the riparian reserve below the interim guidance. The riparian reserves serve purposes which we do not fully understand and in fact serve as connectivity corridors for species who's movement across the landscape can be extremely slow, eg lichens and fungi.

As previously stated we estimated the height of the site potential tree used to establish the riparian reserves at 210 feet. The site potential tree height can vary by site productivity. For efficient field application the resource specialist should be able to use a variable distance within the range of 200 feet to 225 feet, with an overall goal of an average of 210 feet. Variance outside this range would need to be justified in the NEPA document.

Future Conditions

This chapter is yet to be completed. We are presently developing the framework for the chapter and are looking at developing methodologies for "growing" the current condition vegetation polygons. Our hypothesis is that as the vegetation in the LSRs continues to age, 100 years or more, that a disparity will occur between the Federal lands and the Private lands. We expect to see vegetation on the Federal lands continuing to get older while the vegetation on Private lands would not exceed 60 years of age. We wonder if there are species niches which might be limiting if little vegetation in the LSR was between 60-110 years of age. We also would like to see graphically how the LSR would look given what we know now projected some 100 years in the future. We feel this chapter will give us some insights about the spatial arrangement of vegetation in the watershed and point out opportunities for designed disturbances.

Opportunities for Management

Erosion and sediment control: Although not seen as a significant problem, road related erosion could be reduced by renovation, gating or surfacing. Utilizing best management practices in the location and design of new roads will continue to be one of the best alternatives to controlling sediment. Hillslope erosion can be minimized by using best management practices and maintaining the surface litter.

Hydrology/channel morphology: The addition of channel structures to slow the flow of water and reduce the tendency for downcutting were seen as the primary opportunities for improving channel morphology. Long term improvement would include planting and thinning coniferous species along stream courses through-out the watershed to speed up the natural input of structure. Due to low stream gradients in the watershed structure movement from upstream to downstream is dependent upon large stream flows. Opportunities would be to provide natural structure along all stream courses rather than rely on storm events to move the material from the uplands to the stream.

Fisheries/Riparian: Man made stream structures of wood and boulders as well as gravels holds the most promise for the short-term. Improving the quality of fish habitat by increasing the pool width to depth ratio, increasing the number of pools, adding structure, shade, slowing the flow of water, reconnecting the flood zone and maintaining a viable beaver population are but a few options. Replacing road culverts which block fish passage can increase the amount of available habitat. Planting trees which could provide stream structure faster than Douglas-fir may be appropriate, eg. Cottonwood. Providing shade to cool the water is deemed a critical need through-out much of the watershed.

Silvicultural treatments: Treatments need to be appropriate to the landuse allocation and comply with the objectives of the Forest Plan and Aquatic Conservation Strategy. Treatments include planting, replanting, animal protection, vegetation management, release, precommercial thinning, commercial thinning/density management, final harvest, fertilization, and noxious weed control.

There are approximately 122 acres over 40 years of age which could be considered for final harvest and approximately 850 acres available for commercial thinning. These areas are located in the General Forest Management Areas (GFMA). There are approximately 1,000 acres of pole-young timber type in the Late Successional Reserves (LSRs) and Marbled Murrelet Reserves (MMRs) which could be manipulated for upland restoration. Additionally, there are approximately 1,800 acres of pole-young stands associated with Riparian Reserves which could be treated to accelerate conifer growth for future down woody debris or stream structure material.

Wildlife Habitat: The highest priority projects would be road management

opportunities. Development of a transportation management plan for BLM and a cooperative agreement between the BLM and other land owners in the watershed should be persued. The current road density in the watershed is approximately 5.6 miles per square mile, which is approximately double the maintenance level for Roosevelt elk. Road closures, gating, and seasonal closures should be coordinated where possible with adjacent landowners.

Creating and maintaining small openings in the forest canopy and seeding with native forage species can increase the effectiveness for big game. The openings need to be located near cover and in forest stands that show little canopy and understory diversity.

Currently there is a snag shortfall in the size category of approximately 15-17 inches in diameter and in the decay classes 4 and 5. Snag creation projects should target this size class, while treatment projects should attempt to reserve these size and decay class snags.

Issues relating to connectivity may be perplexing where riparian reserves vary from the Aquatic Conservation Strategy to those of the State Forest Practices standards. Dispersal of organizms across the landscape via riparian reserves may not be accomplished due to the non-connectedness of Federal lands. Acquisition and exchanges should be looked at to "block up" ownership. Acquisition of special habitats may also be appropriate where the habitat type is not represented on Federal lands.

Data gaps, Inventory, and monitoring needs

We were not able to answer some key questions due to a lack of field data and some questions were answered by applying off site research data. In all cases where field data was lacking professional interpretation and judgement were used to derive the logical answer or outcome. For instance, we attempted to develop a surface erosion model adapted from models developed for agriculture lands. Very little data is available for surface erosion on forest lands and related management practices. We had Wolf Creek stream flow data for the years 1968-1971 however, there is no way to estimate if there have been any changes since then. The only way to relate flow changes to management is to have a continuous record. Disturbance events were equally difficult to assess. There has been limited research on fire history in the Coast Range. Sources of information are very general and broad and tend to be of limited value to a specific watershed. The lack on knowledge of large disturbances, the successional pattern and stand structure which result, limit our understanding of both succession and disturbance as change elements within a watershed. Along with disturbance and succession, we did not have some form of habitat association mapping that would link vegetation composition and structure to habitats for a range of species.

To move beyond the initial phase of watershed analysis eg. after 1996,

inventory for the "survey and manage" species listed in the ROD will need to occur. There were cursory surveys for macroinvertebrates done in the watershed and these surveys discovered 3 species that are listed in Appendix J2 of the FSEIS. Stream improvement projects planned for the near future will need to develop survey protocol and monitoring techniques for survey and manage species. Beyond the initial inventories for a host of data gaps is the need to monitor trends. Long term inventories improve the confidence of predictions and establish the basis for trend analysis.

Project implementation should assume an effectiveness monitoring posture. All projects should establish monitoring criteria to provide a feedback loop to future project development. Monitoring scales need to be flexible, providing for project monitoring, watershed level monitoring, and provincial level monitoring. Partnerships need to be developed between the land management agencies, research scientists, universities and Federal agencies to recognize and integrate their roles within the goal of ecosystem management.