LITTLE NORTH SANTIAM WATERSHED ANALYSIS

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The analysis portion of this document was done in 1997. This is an iterative document and will be updated periodically as new information becomes available. The data in this document was the best available at the time the analysis was completed. Management opportunities for this watershed must be considered in light of the checkerboard land ownership patterns of the BLM administered lands and the legislative mandates of Forest Service and BLM administered lands.

VERSION 1.0
December 1997

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Maps

The following GIS Maps are located in the Appendix at the back of the document.

Executive Summary

The executive summary focuses on key components and findings of the analysis.

Major Findings and Recommendations

Terrestrial

Finding: The Northwest Forest Plan (NFP) allows for regeneration harvest in General Forest Management Area (GFMA) and in Connectivity (CONN) Land Use Allocations on Bureau of Land Management (BLM) lands in the western half of the watershed.

Finding: The amount and quality of older forest habitat are limited in the western half of the Little North Santiam (LNS) watershed. Older forest habitat is most limiting in Kiel Creek sub-watershed (SWB), next is Sinker Creek SWB, then Canyon Creek SWB, and finally Evans Creek SWB.

Recommendation: Implement density management prescriptions in Riparian Reserves, District Designated Reserve (DDR), and Late-Successional Reserve (LSR) to develop and maintain older forest stand characteristics in younger age classes.

Recommendation: Use an interdisciplinary approach to re-evaluate connectivity diversity blocks and the location of the best 25 to 30 percent older forest in and immediately adjacent to the LNS watershed.

Finding: There is a scarcity of standing dead/down coarse woody debris habitat in the western half of the watershed, especially larger material in the early stages of decay.

Recommendation: Implement NFP standards and guidelines for green tree retention for the recruitment and development of standing dead/down coarse woody debris and to contribute to the development of older forest stand characteristics. Protect existing material and leave additional green trees in future harvest units to make up for deficiencies in current conditions.

Finding: The total road density in the lower portion of the watershed is 5+ miles per square mile, which is considered to be high. Road densities are expected to increase in the western half of the watershed.

Recommendation: Close and/or rehabilitate roads to reduce road densities. Highest priorities would be Evans, Sinker, Kiel, and Canyon Creek SWBs in that order.

Special Status and Special Attention Species

Finding: Habitat for certain special status/special attention species associated with older forest habitat and standing dead/down logs is limited in the western half of the watershed.

Recommendation: Protect the best 100 acres of older forest around known spotted owl site centers on federal lands. Coordinate management around known spotted owl sites with adjacent private landowners and the state.

Finding: There is habitat suitable for nesting bald eagles present in the LNS watershed. There are sightings during the nesting season which are suggestive of a potential nest site in the vicinity.

Finding: There are suitable cliffs for nesting peregrine falcons present, particularly in the eastern half of the watershed.

Finding: Suitable habitat is present in the LNS watershed for 4 survey and manage animal species.

Finding: Certain special status/special attention/survey and manage and other plant species of concern have been documented or are highly likely to occur in this watershed.

Recommendation: Survey for priority animal species in the watershed. Special emphasis should be placed on the bald eagles, peregrine falcon, and survey and manage invertebrates.

Finding: Noxious and invasive weeds will continue to be a concern over time because of the increased human use of the watershed, especially in the lower elevations and any travel corridors.

Recommendation: Continue eradication and monitoring for noxious and invasive weeds over time to prevent extensive outbreaks.

Aquatic

Finding: Streamflow in the LNS may be overallocated during periods of lowflow, up to 20 percent of the time.

Recommendation: Study actual water availability during low flow periods. Assess impacts of future water withdrawals on instream flows and aquatic organisms. State agencies such as the Oregon Department of Environmental Quality (DEQ) may be best suited to organizing the task.

Finding: Climatic trends are apparent and can be broken down into three distinct periods. The first period, 1932 through 1944, experienced lower than average precipitation and discharge most years; the second period, 1945 through 1975, received greater than average precipitation and discharge most years; while the third period, 1976 through 1994, was again lower than average for precipitation and discharge.

Recommendation: Consider climatic trends in future studies and projects in the watershed.

Finding: The precipitation/discharge relationship appears to have changed after about 1979. There is a statistically significant difference (P=0.00) between pre and post 1979 precipitation/discharge relationship. Precipitation after 1979 produced less discharge on an annual basis than prior years. The change in precipitation/discharge relationship appears to be climate related.

Recommendation: An in-depth study could be conducted to determine the actual cause if it persists.

Finding: At the end of the lowest recorded discharge period, there was an estimated 21 days of groundwater storage left in the basin before the LNS River became dry. Ground water storage available for streamflow in an average year is estimated to be 50 days at the end of the lowflow period.

Finding: The DEQ has listed the LNS River as having moderate dissolved oxygen, bacteria, and viruses, lowflow, and sediment problems. The LNS River is not in the state's water quality limited stream list (303d Report). However, the North Santiam River (NSR) is listed in the 303d Report as not meeting water temperature criteria downstream from its confluence with the LNS River.

Recommendation: Promote public/private partnerships to study and improve water quality and to identify problem areas (i.e., North Santiam Watershed Forum, joint MOU partnership agreement with U. S. Forest Service (USFS), et al.). Establish limits of acceptable change criteria for water quality in the watershed with the DEQ.

Finding: Water temperature data collected in the LNS River show high summer temperatures in the downstream reaches. Temperatures were above growth threshold for salmon and near the lethal limit during some summer periods. Streams which may be adding significantly to temperature increases include Fawn, Fish, Sinker, Big, Cougar, Moorhouse, Chamberlain, and Wonder creeks.

Recommendation: Expand water temperature sampling network to locate temperature sources. Improve or promote riparian shade on stream segments with open canopies.

Finding: Analysis of water quality data from the City of Salem indicates water quality in the LNS River is statistically better than in the NSR, except for fecal coliforms. Fecal coliforms were significantly higher in the LNS River than the NSR during the summer low flow period. Water quality degrades in a downstream direction from the USFS boundary.

Recommendations: Expand fecal coliform sampling network to locate sources of fecal bacteria.

Reduce sources where possible. For example, provide sanitation facilities in high use dispersed recreation areas in the summer or repair faulty septic systems.

Finding: Water quality may not always meet state standards for fecal coliforms and alkalinity. City of Salem data indicate values above the state standards during some monthly sampling events. Five fecal coliform samples would have to be collected in a month where a reading exceeds the state standard to verify that the standard is not met.

Recommendation: Recommend the City of Salem modify water quality sampling strategy to determine whether state standards are met.

Finding: Storm turbidity sampling indicates Canyon, Sinker, Kiel, Evans, and Fawn creeks have the highest turbidity levels. The creeks are listed in order of severity, with Canyon Creek being the worst.

Recommendation: Determine sources of turbidity in Canyon, Sinker, Kiel, Evans, and Fawn creeks and design enhancement projects to reduce inputs in streams where possible.

Finding: Equivalent clearcut acreage is high in Sinker Creek and moderate in Kiel, Elkhorn, Evans, Canyon, and Battle Axe Creek sub-watersheds.

Finding: Water available for runoff impacts are high in Kiel, Sinker, Canyon, and Evans creeks.

Recommendation: Minimize management actions that would increase the Equivalent Clearcut Acreage (ECA) or Water Available for Runoff (WAR) levels in the **sub-watersheds** with the highest existing impacts. Take future forecasting of ECA and WAR into account when planning long-term timber sale activities. Plan restoration activities in **sub-watersheds** that have the highest ECA and WAR values.

Finding: Anadromous fish populations (winter steelhead and spring chinook) are declining in the LNS watershed.

Recommendation: Implement riparian restoration projects on federal lands including underplanting, manual release, and thinning of existing stands in the Canyon Creek, Evans Creek, Kiel Creek, and Sinker Creek **sub-watersheds.**

Finding: Instream habitat conditions in tributaries in the western half of the watershed are generally poor, with long-term improvement anticipated on federal lands as a result of management under the NFP. Habitat conditions in stream segments on private lands managed in accordance with the Oregon Forest Practices Act are likely to continue to decline. Habitat conditions in streams on federal lands in the eastern half of the watershed are fair to good and will improve under the NFP.

Recommendation: Implement riparian restoration projects on federal lands including underplanting, manual release, thinning of existing stands in the Canyon Creek, Evans Creek, Kiel Creek, and Sinker Creek **sub-watersheds**.

Finding: Large woody debris (LWD) recruitment potential is generally poor in west side tributaries. Improvement is likely on BLM land, whereas decline is likely on private lands. LWD recruitment potential in east side tributaries is generally good and is expected to improve.

Recommendation: Implement road reduction projects on federal lands including road closure, obliteration, and grade restoration in **sub-watersheds** where appropriate. Implement LWD placement projects on federal lands in the lower 0.5 mile of Elkhorn Creek and the lower 0.7 mile of Sinker Creek.

Human Uses

Finding: The LNS watershed is an important place to many people living within and outside the watershed. If populations in the central Willamette Valley continue to rapidly increase, the demand for all of the resources within the watershed will grow along with the potential for conflict associated with that demand.

Finding: There are serious concerns about the potential impacts human activity such as logging, roads, etc., have on water quality. Additional water quality sampling is necessary but often time consuming and expensive. It may not be possible unless landowners and other interested parties in the watershed can work together to develop a comprehensive water quality monitoring and enhancement strategy.

Recommendation: Examine feasibility of developing partnerships with interested parties in a water quality monitoring and enhancement strategy for LNS watershed.

Finding: There are several areas with rural interface concerns in the LNS watershed. The BLM has worked with adjacent landowners to address concerns related to public use of BLM-administered lands; however, more work is still needed.

Finding: In the west half of the watershed, it is assumed that timber harvesting on private industrial forest lands will continue and be visible from the Little North Fork Road and LNS River. Intermixed with these private industrial lands, the BLM has very little control over the scenic quality in the watershed. Special consideration should be given to those BLM lands which have high sensitivity for both rural interface and visual resource concerns.

Recommendation: Many of the same management practices that e used to mitigate potential impacts associated with timber harvest activities would tie-in with rural interface and visual resource concerns. Below is a list of mitigating actions that could be taken depending on the

proposed action and the site specific characteristics.

- Get adjacent landowner input early in planning process for areas with a potential for high sensitivity to better determine areas of concern.

  Early in project planning, consider reducing visual or other disturbance factors in designing the size, shape, and location of the timber harvest units or project. Consider small patch cuts, thinning, or uneven aged management to better maintain forest cover.

- Where possible, utilize green retention trees and Riparian Reserves to buffer the visual impacts from view. Consider leaving additional trees for added buffering where needed.

* Where possible, consider using alternative reforestation site preparation prescriptions to broadcast burning.

Finding: Once the prerequisites of the Opal Creek legislation are met, the east half of the LNS watershed would continue to be predominately natural appearing. Additional timber harvesting would be limited; observable evidence of past management activities related to timber harvest and road building will decrease over time.

Finding: There are opportunities for primitive recreation site and trail development on public lands within and outside of the interim boundaries for Elkhorn Creek National Wild and Scenic River. Where feasible, further blocking up public ownership in this area through land acquisition or exchange with interested private landowners would enhance trail development potential.

Finding: Use levels during the peak use periods during the summer months often exceed the capacity of existing developed recreation facilities. Opinions are mixed concerning the need for expanded recreation facilities. There is potential for expansion of existing recreation facilities and the development of new facilities in watershed. Where possible, the recreation providers in the watershed along with other interested parties need to work together in developing a strategy for managing recreation use and providing recreation facilities and services.

Recommendation: As funding and time allows, look for opportunities for expanding existing developed recreation facilities as well as developing new recreation facilities.

Recommendation: Look for opportunities for increasing public ownership in areas with high recreational and other resource values by working with private landowners that are interested in exchange or acquisition. Enhance public access to the LNS River for trail development potential near Elkhorn Creek.

Finding: Recreation Opportunity Spectrum (ROS) settings in the greatest demand for Statewide Comprehensive Outdoor Recreation Plan (SCORP) Region 8 are semi-primitive and primitive.

The east half of the LNS watershed offers the greatest potential for meeting these demands. Lands in the west half of the LNS watershed will continue to provide recreational opportunities in the rural and roaded modified settings.

Finding: There is a lack of visitor orientation and interpretive information in the LNS watershed given the level of use that occurs and the educational opportunities the watershed offers. Interpretation in the Opal Creek Scenic Recreation Area (SRA) will be addressed in the management plan. This may help facilitate discussions about needs in the rest of the watershed.

Finding: Public use issues in LNS watershed also relate to vandalism, trespass, unsafe firearm use, illegal dumping, long-term occupancy, and a variety of other issues. If use continues to grow at a faster rate than individual agency resources can manage, cooperative management and projects will become more important.

Recommendation: Clean up all known abandoned vehicle and garbage dump sites on BLM lands. Evaluate the feasibility of increasing BLM law enforcement and other staff patrolling BLM lands. Work with adjacent landowners and interested parties on holding an annual cleanup along Little North Fork Road and the LNS River.

Recommendation: Opportunities should be identified and pursued for increasing cooperation among interested parties on recreation-related issues such as recreation maintenance and development, visitor orientation and interpretive information (including road signing), visitor management, and law enforcement. One potential project already being discussed is constructing a visitor orientation information kiosk (including such things as a map, general use information, and leave-no-trace-use ethics) for the watershed and surrounding areas. Initial partners include BLM, USFS, ODF, North Santiam Economic Development Corporation, and North Santiam Tourism Coalition.

The Opal Creek SRA Management Plan will address many of the recreation issues mentioned above for the eastern portion of the watershed. Where possible, connections and relationships to the western portion of the watershed should be considered and incorporated into the Opal Creek SRA planning process.

CHAPTER 1 - INTRODUCTION

Watershed analysis is ecosystem analysis at the watershed scale. This is one of the principal analysis for implementation of the Aquatic Conservation Strategy (ACS) as described in the *Northwest Forest Plan Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA, USDI 1994) and one of the principle means used to meet ecosystem management objectives identified in the *Salem District Resource Management Plan/Final Environmental Impact Statement (RMP/FEIS)*. The purpose of watershed analysis is to provide a federal agency with a comprehensive and systematic analysis of a landscape to guide planning and management of federal lands and analyze cumulative effects of past, present, and future activities on all lands.

By developing and documenting a scientifically based understanding of the processes and interactions occurring within a watershed, an interdisciplinary team (IDT) will attempt to establish geomorphically and ecologically appropriate Riparian Reserves (RR) and provide a common framework for evaluating and managing the federal land within the landscape. The watershed analysis will serve as a basis for developing site-specific proposals and monitoring and restoration needs for a watershed. Cooperation with other landowners is necessary since the analysis addresses the entire watershed. However, the analysis is designed as a tool for federal agencies. It is not intended, nor will it be used to dictate, influence, or judge management direction of other owners on the management of their lands.

Watershed analysis is an ongoing, dynamic process. It is intended to be revised and updated as conditions, assumptions, or resource plans change and new information becomes available. This document summarizes a large quantity of information and detailed analysis of complex issues and interrelationships. Full reports and any new information will be added to the Little North Santiam Watershed Analysis file maintained in the Cascades Resource Area, Salem District Office.

Watershed analysis is not a decision-making process, but rather a stage-setting process. The results can be used to:

* Assist in developing ecologically sustainable programs to produce water, timber, recreation, and other commodities as well as developing restoration projects.
* Facilitate program and budget development by identifying and setting priorities for social, economic, and ecological needs within and among watersheds.
* Establish a consistent, watershed-wide context for project-level National Environmental Policy Act (NEPA) analysis, management activities evaluation, Endangered Species Act implementation, and water quality issues.

The document is organized based on the *Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis*, August 1995.

A major step in the watershed analysis process is the identification of issues that are relevant to the management of federal lands in the Little North Santiam (LNS) watershed. The issues were used to develop key questions which focus and drive the analysis of particular types and locations of cause-and-effect relationships and discern conditions as they relate to values, uses, and key ecosystems components and processes.

In this watershed analysis, the Issues and Key Questions section (Chapter 3) has been grouped into four areas: terrestrial, special status/special attention species (SSSA), aquatic, and human resources. The terrestrial area analyzes the vegetation, soils, wildlife species and habitat. The SSSA area analyzes plants and wildlife species, both terrestrial and aquatic, designated in the Northwest Forest Plan (NFP) as needing special protection. The aquatic area looks at the hydrology, riparian areas, fisheries, and aquatic habitat. The human resources area encompasses commodity forest products, transportation, and recreation. While there is considerable overlap and interaction among the various ecosystem components and processes in a natural system, these broad categories serve as an organizational aid to facilitate analysis of complex systems.

On a broad scale, much of the future condition of the LNS watershed was decided in the NFP and the Opal Creek legislation. The analysis stratified the watershed into 11 sub-watersheds. These are defined by vegetation cover and geomorphology and have also identified watershed specific opportunities and recommendations designed to achieve the goals of the NFP and the Opal Creek legislation (see Chapter 7, "Major Findings & Management Recommendations").

Executive Summary - Overview of the what and whys of analysis and findings of this particular watershed analysis.

Chapter 1 - Introduction. Focuses on how watershed analysis will be done.

Chapter 2 - Characterization of the Watershed. Identifies dominant processes and/or features of the watershed affecting ecosystem functions or conditions and needing more detailed analysis in subsequent steps.

Chapter 3 - Identification of Issues and Key Questions. Focus the analysis on the key elements of the ecosystem that are most relevant to management questions/ objectives, human values, and resource considerations.

Chapter 4 - Historic Conditions. A historical perspective of the past influences and processes that occurred in this watershed.

Chapter 5 - Current Conditions. What the current condition of the resources of the watershed are, described according to terrestrial, special status species, aquatic, and human uses.

Chapter 6 - Future Condition and Potential Trends. What are the possible future trends of ecosystem processes with implementation of resource management plans and assumptions on private land management? This incorporates the synthesis and interpretation of all available data and information about the watershed.

Chapter 7 - Major Findings and Management Recommendations. Guidelines for ecosystem management within this watershed based on the findings in the analysis.

Chapter 8 - Monitoring, Data Gaps, Limitations. A list of where information gaps were found during the analysis, what information should be collected, and over what time frame.

Appendices. Includes additional reports by specialists, tables, charts, and maps that are not specific to the issues but may provide other useful information as well as information cited in the analysis.

Scoping/Public Input

The issue identification and scoping process took two different approaches. The first approach involved scoping through the IDT within the Cascade Resource Area and with their counterparts at the Detroit Ranger District, Willamette National Forest (NF). The second approach involved sending questionnaires to watershed landowners, local, county, state, federal agencies, and organizations interested in natural resource management. These individuals, agencies, and organizations were encouraged to complete our questionnaire and return it to our office. Continuing public involvement was dependent on returning the questionnaire. In addition, two open houses were held, one in Mill City and one in Salem. (See Appendices for summary of the comments received and copies of the scoping letters and questionnaire.)

Not all issues initially identified were carried through the analysis process. Some issues were deferred due to lack of information. Other issues were not addressed because they were not covered by federal law or jurisdiction.

Management Direction: Federal Land Use Allocation (LUA)

Under the standards and guidelines of the RMP and the ROD of the U.S. Forest Service (USFS),

Willamette NF, there are seven LUAs for federal lands. The LUAs represented within the LNS watershed are General Forest Management Area (GFMA), Connectivity (CONN), Late Successional Reserve (LSR), Wilderness, Wild and Scenic River (WSR) Corridor, and RR. Other special LUAs include Opal Creek Scenic Recreation Area (SRA) (not final), and DDR.

A brief description and number of acres follow. More detailed objectives and management actions/direction for these LUAs are discussed on pages 7 to 22 of the RMP and are within the *Supplemental Environmental Impact Statement/Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (SEIS/ROD).*

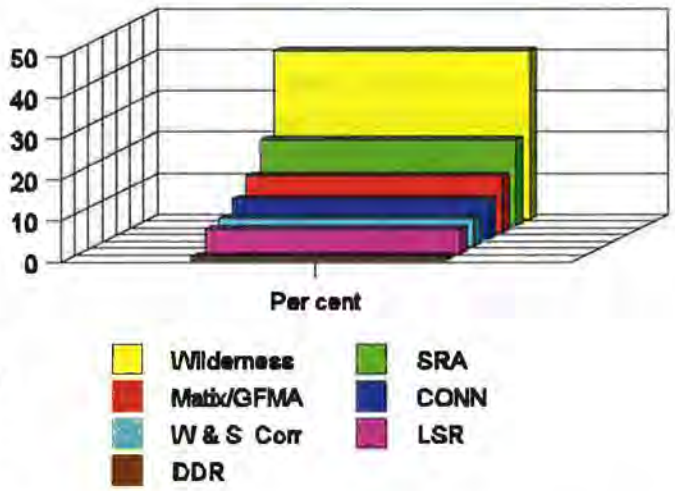
When discussing these LUAs, the inclusion of RR acres sometimes presents a better overall picture of the functions and processes occurring on that particular area of the watershed. The following discussion reflects both riparian acres as a separate allocation and then includes them into the other allocations for a different view.

Within all the LUAs, RR have been identified along all standing and flowing water, intermittent stream channels, and ephemeral ponds and wetlands. Their purpose is to contribute to the attainment of the ACS Objectives as stated in the NFP. The reserves were designed to help maintain and restore riparian structures and functions, benefit fish and riparian-dependent non-fish species, enhance habitat conservation for organisms dependent on the transition zone between uplands and riparian areas, improve travel and dispersal corridors for terrestrial animals and plants, and provide for greater CONN of late-successional forest habitats. The width of the protection buffers varies depending on stream class and site potential. All non-fish bearing streams have a minimum width that is the average height of one site potential tree. All fish bearing streams have a minimum width that is the average height of two site potential trees. Since not all of the streams are mapped, some adjustments will be made as site-specific areas are mapped. For this watershed analysis, site tree height was designated as 220 feet for lands less than 1500-foot elevations, 200 feet for between 1500- and 3000-foot elevations, and 180 feet for all elevations above 3000 feet. RR for all federal lands in LNS account for 20,310 acres or 41.14 percent of federal land.

No recommendations to reduce interim RR widths in any sub-watershed in LNS Watershed will be made as a result of this analysis. Future site-specific analysis may indicate a need to increase reserve widths depending on the analysis team's findings.

Portions of seven sections within the LNS watershed were designated as LSR under the NFP (refer to LUA map). This is a portion of the Opal Creek LSR (RO 209) which totals 3,133 acres. (North Willamette LSR Assessment). Besides these mapped LSRs, there are 10 areas for known spotted owl sites, eight of which are protected. These eight core areas are to be managed as LSRs. Management objectives are to protect and enhance old-growth forest conditions. Total LSR acres outside RR are 1,997 acres. The total with RR are 3,197 acres.

Figure 1. Federal LUA's



Contained within the LNS watershed are portions of CONN blocks identified during the resource management planning process. Outside RR this allocation totals 2,562 acres. According to the Salem District RMP, this allocation allows timber management, but late-successional forests are to be maintained. Intensive management practices are permitted on a 150-year rotation while the remaining 25 to 30 of each block is in older forest condition at any one point of time. Regeneration harvest will retain 12 to 18 green trees per acre.

The remaining federal ownership in the watershed is in a variety of other LUAs. Of these, the GFMA, including 3,556 acres outside RR, are to be managed to produce a sustainable supply of timber and other forest commodities while emphasizing ecosystem management.

Opal Creek Wilderness and Opal Creek Scenic Recreation Area Act of 1996 (The Act)

On September 30, 1996, the U.S. Congress passed The Act. The Act created a process to establish the SRA. The Act also designated Elkhorn Creek as a National WSR.

Establishment of the SRA requires certain conditions to be met within two years of the Act's passage. Most of the private lands in the east half of the watershed are either patented mining claims, many of which are now owned by the Friends of Opal Creek, or timber lands owned by

the Rosboro Timber Company. The Act requires the USFS to acquire the Rosboro lands through exchange and that most of the lands owned by Friends of Opal Creek be donated back to the USFS. The Act also requires that public access be provided around Jawbone Flats. During that two-year period, the USFS interim management policy is to manage those lands identified in the Act consistent with the guidance specified in the Act.

After these prerequisites are met, the Act requires that within one year the USFS is to form an advisory council and complete a management plan for the Opal Creek SRA. The Act also calls for the USFS to work with state and local historic preservation organizations to develop interpretive activities that provide a balanced and factual interpretation of the cultural, ecological, and industrial history of forestry and mining in the Opal Creek SRA.

The legislation also requires the completion of an economic development plan, identifying projects that benefit communities in the vicinity of Opal Creek. Fifteen thousand dollars has been authorized but still require appropriation once the plan is completed.

Table 1: LUAs of Federal Land with/without RR

LUAs	RR	Outside Riparian	Total Acres
LSR	1,200	1,997	3,197
Matix/GFMA	3,124	3,556	6,680
CONN	2,154	2,562	4,716
SRA	3,653	6,699	10,352
Wilderness	8,361	11,857	20,218
Elkhorn Creek WSR Corridor	1,520	1,968	3,488
District Designated Reserve (DDR)	296	419	715
Total	20,308	29,058	49,366

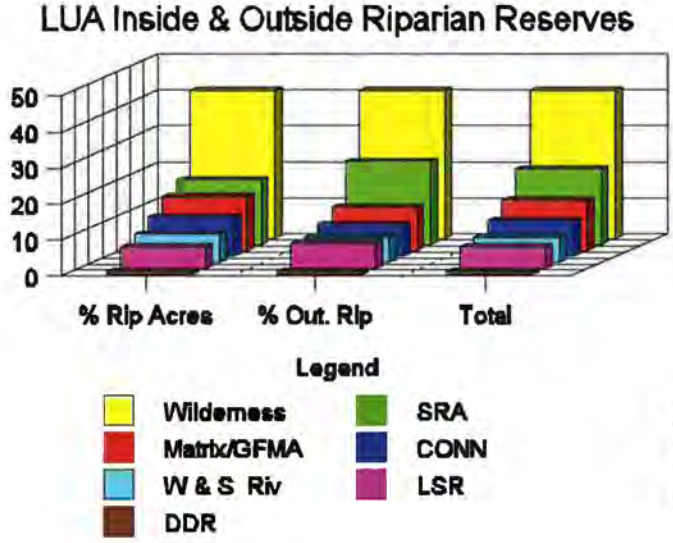


Figure 2. LUAs (Federal lands-RR acres included in each allocation)

CHAPTER 2 - CHARACTERIZATION

The characterization identifies the dominant physical, biological, and human processes or features of the watershed that affect ecosystem functions or conditions. This narrative is intended to give the reader a quick overview of this watershed and these processes and features. A more detailed condition analysis is in the Current Conditions chapter.

The LNS watershed is located in northwest Oregon in Marion County, 30 miles east of Salem. The watershed covers 72,157 acres which includes 36,144 acres of USFS land, 13,222 acres of Bureau of Land Management (BLM) land, with the remainder in state, city, and private ownership. Federal ownership in this watershed is considered major, more than 68 percent. Major industrial landowners also own significant blocks of land within the watershed.

The LNS flows into the NSR which, in turn, flows into the Santiam River, 20 miles to the west near Jefferson. The Santiam River flows into the Willamette River near Albany. The Willamette River Basin (WRB) is part of the Columbia River subregion.

The LNSR watershed includes the LNSR and its tributaries which include (but are not limited to) Opal Creek, Battle Ax Creek, Cedar Creek, Elkhorn Creek, Evans Creek, Fawn Creek, Sinker Creek, Canyon Creek, and Kiel Creek. The northern boundary is the ridge extending from Big/Little Green Mountain to House Mountain northeast to Silver King Mountain and Battle Axe Lookout, while the southern boundary extends past French Creek Ridge, Rocky Top, and Mt. Horeb and follows along No Name Ridge. The watershed is divided into 11 smaller sub-basins which will be used for future cumulative effects analysis and specific project analysis.

To the north is the Abiqua River Basin and its numerous tributaries. To the south and the east is the NSR drainage with its numerous tributaries, small communities, and high rural interface zones.

The LNS watershed (5th field) drains approximately 113 square miles or 72,157 acres of the west slope of the Oregon Cascade Mountains. The watershed is contained within the larger North Santiam watershed which covers 1,800 square miles (4th field). The watershed is located in the WRB, the largest river basin in Oregon, and drains 11,100 square miles. The WRB is part of the Columbia River subregion. A large percentage of the state's population and major cities is located in the WRB, including Portland, Salem, and Eugene. The U.S. Geologic Survey (USGS) has divided the WRB into hydrologic units and assigned each a hydrologic unit code.

The LNS watershed analysis area (WAA) originates at an elevation of 5560 feet at Battle Axe and drops to an elevation of approximately 600 feet at the confluence of the NSR. In the upper elevations, the streams are confined and consist of steep canyons and rocky cliffs. Lower in the watershed, the stream valley widens somewhat, streams are less confined, and the gradients decrease. The USFS manages the upper, mostly forested reaches, while the lower reaches are

managed by the BLM and private landholders. Private lands in the WAA are mostly private timber company lands, with a minor component of small private land holdings and home development scattered along the LNS River.

The Cascade Range, which contributes the majority of drainage area for the Willamette River, extends for over 625 miles from northern California well into British Columbia in Canada. The general physiography of the Cascades is dominated by a string of potentially active volcanic peaks. These relatively recent craggy summits overlie a complex geologic sequence of older volcanic and sedimentary rocks. The overall form of the north-south treading Cascades reflects the line of subduction of the Pacific oceanic plates as they move under the North American continental plate. This plate commotion has modified the Cascades by basin and range faulting to the east and episodic mountain building and volcanism throughout their history and extent. The surface expression of these rock sequences has been altered through time by the numerous rivers that drain the wet western flanks and by intensive periods of mountain glaciation. This area has a complex geologic history that has produced a fairly uniform landscape of U-shaped glaciated valleys with broad outwash filled bottoms that are separated by steep shallow-soiled headlands and sharp rocky ridges.

Concentrations of gold, silver, copper, and lead minerals have been the center for mineral exploration and mining activity since the late 1800s. These concentrations extend from Mt. Hood into the Umpqua NF. They cross the LNS watershed in the north around Nasty Rock and Burnt Mountain and extend southward across the LNS to Phantom Natural Bridge and Dog Tooth Rock. The LNS lies at the heart of one of these concentrations, with extensive gold prospecting activity around the turn of the century. Numerous other areas along mineralized fracture zones occur throughout the landscape, especially in areas such as Gold Creek.

The Willamette Valley at the west end of the watershed supports a limited woodland of Oregon white oak and Douglas-fir, with bigleaf maple, Oregon ash, and red alder in the riparian areas. This area is mainly used for farmlands or small rural homesites. From the edge of this valley bottom land up to approximately 3,000 feet, the western hemlock zone (Franklin and Dyrness 1988) is dominated by Douglas-fir, western hemlock, and western red cedar. Above 3,000 feet, the cooler Pacific silver fir zone is composed of Pacific silver fir, noble fir, Douglas-fir, and western hemlock. Due to its proximity to the Willamette Valley, the extreme west end of the Santiam watershed basin exhibits some ecological characteristics of the Willamette Valley Province. The vast majority of the watershed is typical of the western Oregon Cascades Province. The watershed is rich in older forest habitat. All the water, soil, plants, animals, land, and people within this diverse area make up the watershed ecosystem.

The array and landscape pattern of plant communities and their seral stages are a result of natural processes and human-caused disturbances. Fire is the major short-term natural process. Human-caused disturbances are most commonly logging, fire, agriculture, mining, recreation facilities, and residential development.

Native wildlife species and habitats are typical of the western Oregon Cascades Province. The western portion of the watershed is primarily rural residential and agricultural with a few of the habitats and species typical of the Willamette Valley Province.

There are approximately 690 miles of stream in the WAA. BLM manages lands containing 19 percent of these streams, the USFS 47 percent, state of Oregon 3 percent, and private landowners 31 percent.

Precipitation occurs mostly in the winter. Snow is the dominant precipitation in the upper elevations and rain in the lower elevations. The WAA exhibits high winter flows and low summer flows typical of the Cascade Range drainages. Average discharge over 65 years of record is 751 cfs or 543,900 acre-ft. per year. Maximum measured discharge was 36,000 cfs on December 22, 1964, and the minimum recorded discharge was 13 cfs on August 30, 1961. Snow may supplement spring flows April through June (USGS 1996). This signifies the importance of snow accumulation and melt in the upper elevations in moderating runoff and storing water in the WAA. No major dams or reservoirs exist in the WAA, and most of the summer flow is derived from groundwater.

Significant water quality issues have been identified within the LNS watershed and downstream in the NSR drainage. In the DEQ publication, *1988 Oregon Assessment of Non-Point Sources of Water Pollution* (ODEQ 1988), also known as the 319 report, water quality in the LNS was listed as being moderately impacted (with data). The causes were listed as landslides, erosion, decline in the alluvial water table, animal waste, human waste, and riparian vegetation and bank disturbance. The uses impacted are municipal water supplies and fish and other aquatic organisms. DEQs 303d list and report of water quality limited waterbodies (ODEQ 1996) do not list the LNSR. However, the NSR is listed water quality limited for summer temperatures from the mouth to the LNSR.

Water quality data have been collected by agencies (City of Salem) and other groups and are analyzed later in this document.

Beneficial uses of water in the watershed include irrigation, domestic use, fisheries, aesthetics, power, and miscellaneous other uses resulting in 71 cfs and 41 aft of water rights. The discharge is greater than 70 cfs 80 percent of the time. The remaining 20 percent of the time the stream may be over allocated.

The LNS watershed was designated by FEMAT as a Tier 1 Key Watershed contributing directly to conservation of at-risk anadromous salmonids, bull trout, and resident fish species. Winter steelhead trout and spring chinook salmon are the anadromous fish native to the Willamette River above Willamette Falls. LNS is considered a key production area for the above-mentioned species. Resident populations of rainbow and cutthroat trout are found throughout the watershed. Warm water fish species are found in LNSR, generally in the waters near the town of Mehama.

The LNS watershed is an important place to many people. Along with the inherent biological values, it provides a variety of resources that are utilized by people. These include timber products, municipal water, recreation opportunities, and educational opportunities.

The Willamette Valley has a long history of human habitation. Evidence suggests the Willamette Valley may have had human inhabitants as early as 10,000 years ago. Sites dating to about 8,000 years ago occur along the South Santiam River with artifacts indicative of hunting. At the time of Euro-American exploration and settlement, the Kalapuya Indian groups lived in the Willamette Valley and, along the Santiam and Molalla Rivers, Indians lived on the slopes of the western Cascades. The Kalapuya were known to have burned in the Willamette Valley to maintain habitat for favored plant and game animal species.

American settlers and gold prospectors entered the LNS country in the early 1850s, and some placer mining may have started by about 1853. The first lode claims were filed in 1860. Eventually, hundreds of claims were filed, and a number of mines producing gold, silver, lead, and zinc were in operation. The biggest years of production started about 1915.

Settlement for farming and entry for logging also occurred starting in the 1860s. However, land in this area was valued for mineral and timber resources with permanent agrarian settlement affecting a much smaller portion of the watershed, primarily along the river.

Federal actions in the watershed started with the General Land Office (GLO) surveys. Lower portions of the watershed came under the Oregon and California Railroad lands grant (O&C) and eventually came to the BLM in 1946. Upper portions of the watershed were managed by GLO rangers until 1905, after which management transferred to the new USFS. Roads, trails, and lookouts were built by the Civilian Conservation Corps (CCC) during the 1930s, opening up the country to easier access.

Today, land in the LNS watershed is used primarily for timber production, agriculture, and recreation. Industrial forest production is the predominant private land use in the watershed, and agricultural use is very limited and small in scale. There is a fairly large number of year-round and vacation residences, most of which are adjacent to or near the LNSR. The Elkhorn Valley Golf Course also extends for over a mile along the LNSR.

The majority of USFS-administered lands have had limited harvesting due to political considerations. Presently, all of the lands are in LSR or wilderness designations. By contrast, the BLM administration and private ownerships have had a history of intensive forest management. The USFS-administered lands have a long history of mining, although this has been on a small scale; tunnels and mine tailings are numerous.

Current recreation use is moderate to high compared to other areas in the Santiam River Basin. Several USFS and BLM recreation sites/campgrounds are located along the LNSR throughout the watershed. The Opal Creek sub-basin, on the Willamette NF, is a popular educational and

hiking area. Elkhorn Creek, on both USFS and BLM land, has been designated as a Wild & Scenic River. LNS River is already designated as a State Scenic River.

The recreational experience offered by the LNS watershed is Roaded Natural (RN). This is predominately natural forested environment, with moderate evidence of human modification associated with timber harvest and road construction activities. There are many developed recreation facilities in the watershed. Use of the watershed for dispersed activities is moderate to high. Primary dispersed recreational activities include dispersed hiking and camping, fishing, hunting, target practice, off-road vehicle use, horseback, and mountain bicycle riding.

The proximity of the LNS watershed to many well populated communities in the Willamette Valley makes the watershed a popular recreation area with a high level of repeat visitation. The LNSR and Cedar Creek offer opportunities for swimming, tubing, fishing, and recreational mining. The two developed overnight areas and four developed day-use areas along the river are often above capacity during the peak-use weekends between Memorial Day and Labor Day weekends. There is also a significant amount of dispersed day and overnight use along the river, most of which occurs on USFS lands in the east half of the watershed. The lack of sanitation, water, and trash facilities is a concern in some of these areas.

The trailhead to the Opal Creek drainage receives the highest use in the Detroit Ranger District. It is often visited by individuals seeking opportunities for environmental education about old-growth habitats and a variety of other topics. Access to the rest of the east half of the watershed is limited primarily to trails that feature scenic overlooks of the Cascade mountain range, waterfalls, and geologic formations. Several of the trails also offer opportunities for solitude.

Access to the upland public lands in the west half of the watershed is limited in several areas due to gates on private lands. The public land that is accessible offers opportunities for dispersed camping, hunting, target shooting, and off-highway driving.

The majority of the roads in the watershed are surfaced by rock and passable by the average vehicle. There are also several lesser maintained roads and spur roads that offer more challenging driving experiences. Public vehicle access to public and private industrial landowners in LNS is limited by gates.

The east half of the LNS watershed contains the Opal Creek drainage, an area which has received a significant amount of public interest and media attention over the last several years related to protecting the old growth forest habitat in the drainage. Recent legislation passed by the U.S. Congress provides for the protection of much of the east half of the watershed, provided certain requirements related to land exchanges and transfers are met. The completion of a management plan for the area is also required.

Respondents to a scoping questionnaire indicate that water resources, recreation resources, and the opportunity for experiencing old-growth forest habitat are important values. The need for

balanced resource management including timber harvest was also mentioned.

OWNERSHIP

Table 2. Ownership Acreage and Percentages in LNS Watershed.

OWNER	ACRES	PERCENT OF TOTAL
BLM	13,222	18.3
USFS	36, 144	50.1
STATE	1,869	2.6
PRIVATE - INDUSTRIAL	16,613	23.0
PRIVATE - NON INDUSTRIAL	4,309	6.0
TOTAL	72,157	100.0

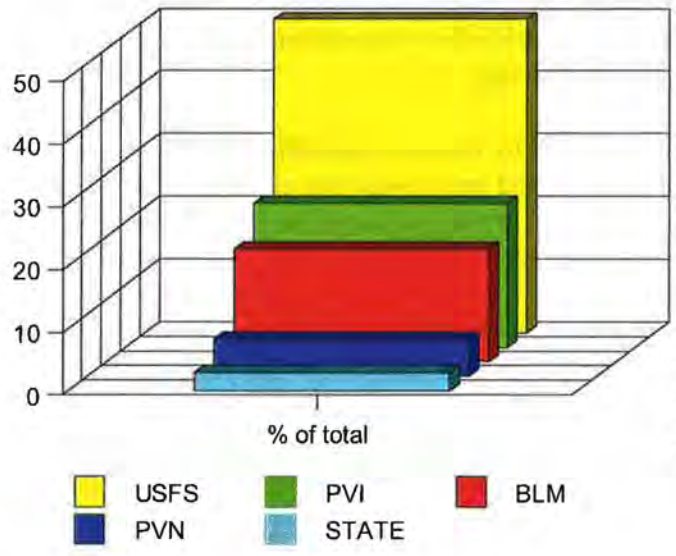


Figure 3. Ownership Percentages in the LNS Watershed

CHAPTER 3 - ISSUES AND KEY QUESTIONS

The watershed analysis team began the process by identifying the following components as significant issues. These issues are addressed by asking key questions. These questions focus the analysis on cause-effect relationships and on conditions as they relate to the ecological processes occurring in the watershed. The questions have been grouped into four categories:

- Terrestrial

- Special Status/Special Attention Species

- Aquatic

- Human

An attempt to answer these questions is made by gathering the information available (Current Condition) or identifying information gaps. Considerable overlap and interaction occur among these ecosystem components. For instance, sedimentation is an erosional process, but it affects the water quality. The grouping into categories was used as an organizational aid for facilitating analysis and promoting easier reading.

Several hundred letters and questionnaires were mailed to residents of the LNSR watershed, natural resource interest groups and individuals, private companies, and community leaders. The responses to the questionnaires as well as those solicited from watershed analysis team members and specialists form the basis for the issues and key questions which will help focus the analysis.

TERRESTRIAL

SOILS

Issues: *Water quality is listed by the Oregon Department of Environmental Quality (DEQ) as being moderately impacted by sediment, low dissolved oxygen, bacteria, and viruses. The potential causes include landslides and erosion. Water quality is one of the key issues in the basin. Erosion, stream channel routing, and riparian condition are all components which contribute to the existing water quality.*

The other main issue is long-term soil productivity. Soil productivity is significantly influenced by the nutrient capital in the soil. The majority of the nutrient capital is in the surface horizon of

the

soil. Erosion or other soil movement would reduce the nutrient capital at that site and reduce the capacity of the site to grow trees.

Key Questions:

- *Where are the major sources of sediment from erosion, landsliding, road runoff, or other management activity located? Where are they likely to occur? What are the processes that affect sediment from erosion, landsliding, road runoff, or other management activity?*

- *What areas have the greatest potential for landslides or erosion?*

- *What are the historical and current conditions and trends of the dominant erosion processes prevalent within the watershed?*

- *What are the natural and human causes of change between the historical and current erosion processes in the watershed? What are the influences and relationships between erosion processes and other ecosystem processes?*

VEGETATION

Issue: *Landscape patterns and processes are necessary for assessing hydrologic condition and wildlife habitat.*

Key Questions:

- *What are the current landscape patterns of plant communities and seral stages in the watershed (riparian and nonriparian)? What disturbance processes caused these patterns (fire, wind, mass wasting, floods)?*

- *What are the current conditions and trends of the prevalent plant communities and seral stages in the watershed (upland, riparian, aquatic)?*

- *What are the historical and landscape pattern of plant communities and seral stages in the watershed (upland, riparian, aquatic)? What processes caused these patterns (fire, wind, mass wasting, flood)?*

- *What are the natural and human causes of change between historical and current vegetative conditions? What are the influences and relationships among other vegetation and seral patterns and other ecosystem processes in the watershed (e.g., hydrologic maturity, channel stability, shade disturbance, species movements, soil and erosion processes)?*

WILDLIFE/BOTANY

Issues:

- *Condition (quality and quantity) and trend of wildlife habitat in the LNS watershed, including late successional/old growth (LS/OG) habitat, seral stage distribution, stand structure, riparian habitat, special habitats and linkages /flows within and surrounding the watershed.*

Key Questions:

- *What are the present seral stage amounts, distribution and vegetation patterns within the watershed? How do current seral stage amounts and distribution, special habitats, and vegetation patterns influence the condition of wildlife habitat?*

- *How will land use objectives and management guidelines of the USFS, BLM, and privately managed lands influence wildlife habitat condition and trend?*

SPECIAL STATUS/SPECIAL ATTENTION SPECIES (SSSA)

Issues: *SSSA species occurrence, habitat condition, and trend.*

Key Questions:

- *Which SSSA (including T&E) wildlife and plant species are known or suspected to occur in the watershed? How do current habitat conditions contribute to habitat for SSSA?*

- *How will land use objectives and management guidelines of the USFS, BLM, State of Oregon, and privately managed lands influence future habitat for SSSA species?*

AQUATIC

Hydrology, Water Quality

Hydrology

Issues:

The DEQ (in the 319 report) lists low flows and flooding as problems in the LNSR. Demands for water are increasing with private water-rights, municipal rights, and fisheries concerns.

Questions:

* *What are the historic or reference flow regimes on the river? What are the current flow regimes, and what is the trend?*

* *How have the management practices affected the rivers flow regime?*

* *What is the status of water availability on the river?*

Water Quality

Issues:

- *Water quality is listed by the DEQ as being moderately impacted by sediment, low dissolved oxygen, bacteria, and viruses. The beneficial uses impacted are a municipal water supply, fish, and other aquatic organisms. Water quality is the key hydrology issue in the basin.. The potential causes are landslides, erosion, a decline in the water table, animal and human waste, and riparian and bank disturbances. Erosion, stream channel routing, and riparian condition are all components which contribute to the existing water quality. Increasing pressure from development, mining, forestry, and recreation has the potential of further affecting water quality.*

Questions:

* *What is the current water quality condition on the river? What is the trend in water quality?*

* *Is the current level of water quality supporting beneficial uses?*

* *How has human development and uses affected water quality on the river?*

* *What opportunities exist for improving water quality through changes in management and*

site specific projects?

* *How have riparian and stream channel conditions affected water quality?*

FISH

Issue: *Declining runs of wild anadromous fish.*

Questions:

- *What is the distribution of anadromous fish, by species?*
- *What stocks of anadromous fish are recognized as "at risk?"?*

Issue: *Resident fish populations.*

Questions:

- *What resident fish exist in the watershed?*

Issue: *Aquatic habitat degradation.*

Questions:

- *What is the general condition of aquatic habitats in the watershed?*
- *Are there restoration opportunities in degraded aquatic habitats? If so, where are they located?*

HUMAN

Issue: *Recreation.*

Key Questions:

- *What is the role of the watershed in providing recreational activities?*
- *What type of access and transportation currently exists and what is needed?*
- *What is the status of roadless areas?*

Issue: *Other human uses.*

Key Questions:

- *What are the major human uses, including tribal uses and treaty rights?*
- *Where do these uses occur within the watershed?*
- *What are the current conditions and trends of the relevant human uses within the watershed?*
- *What are the major historical human uses in the watershed?*
- *What are the causes of change between historical and current human uses?*
- *What are the influences and relationships between human uses and other ecosystem processes in the watershed?*

Not all issues initially identified were carried through the analysis process. Some issues were deferred due to lack of information. Other issues were not addressed because they are not covered by federal law or jurisdiction.