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Tracks in the Woods: Identifying and Evaluating Historic Logging Railroad Systems within the Mt. Baker-Snoqualmie National Forest

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TRACKS IN THE WOODS: IDENTIFYING AND EVALUATING HISTORIC LOGGING RAILROAD SYSTEMS WITHIN THE MT. BAKER-SNOQUALMIE NATIONAL FOREST

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ABSTRACT

TRACKS IN THE WOODS: IDENTIFYING AND EVALUATING HISTORIC LOGGING RAILROAD SYSTEMS WITHIN THE MT. BAKER-SNOQUALMIE NATIONAL FOREST

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The Sauk River Lumber Company (SRLC) operated in western Washington's Sauk River valley between 1922 and 1954. Impacts made on the landscape during that time can still be identified. Archival research, oral history interviews and archaeological fieldwork were undertaken to identify and evaluate the many landscape features associated with the SRLC's timber harvest activities.

The systematic identification and documentation of this single company's logging operations and the features that resulted from those operations can be used to assist cultural resource managers facing the same task elsewhere. Maps, diagrams, and photographs are included to provide resource managers with basic tools and methods for the identification of railroad logging features, their probable locations, and the extent and likelihood of linked components. Suggestions are made regarding features' eligibility for listing on the National

Register of Historic Places, both as individual sites and as components of a historic district.

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CHAPTER I

INTRODUCTION

Cultural resource managers working for federal land management agencies such as the Forest Service, Bureau of Land Management, and National Park Service are charged with the careful consideration of present-day impacts on remnants of the past. The National Historic Preservation Act (further reference will be to NHPA) of 1966 established the federal government's policy and programs on historic preservation, including the establishment of the National Register of Historic Places (further reference will be to National Register). To fulfill the responsibilities under Section 106 of the NHPA, resource managers must consider the effects of federally funded projects on historic properties prior to project implementation. Cultural resources, defined by the NHPA as districts, sites, buildings, structures and objects that contain evidence of past human activities, that are located within a project's defined area of potential effect are evaluated for their ability to meet specific National Register eligibility criteria. A cultural resource found eligible for listing on the National Register is called a historic property, and must represent a "significant part of history, architecture, archaeology, engineering, or culture of an area, and it must have the characteristics that make it a good representative of properties associated with" a particular aspect of the past (U.S. Department of Interior, National Park Service 2002,V:1). Groups of concentrated or historically linked properties may be categorized as a district.

To effectively assess whether a single cultural resource or potential district represents a significant part of history, an analytical framework has to be developed. The framework, called a historic context, "involves identifying important historical patterns through the review of known history" (Hardesty and Little 2000:13). A historic context establishes the baseline for evaluation of National Register eligibility. Objects, structures, buildings, sites or districts that represent important aspects of an area's history (called significance) and retain characteristics that make them representative of the time period (called integrity) are considered eligible for listing on the National Register.

District designation requires resource managers to have a thorough understanding of the types and locations of individual historic properties within the district, understand how those properties are related to each other, and how each property is significant within a specific historic context. A National Register eligible district must not only be representative of a significant aspect of local, regional or national history, it must contain numerous historic properties (also called contributing properties), will likely contain nonrepresentative resources or properties (called noncontributing properties), and must be identifiable as a single entity representing a significant part of local, regional or national history (U.S. Department of Interior, National Park Service 2002, IV:3-5).

The Sauk River valley outside of Darrington, Washington offers a unique opportunity to study the significance of individual historic railroad logging remnants, how those remnants are linked within a system, and how those linkages can be used to determine the extent of a historic district. Although the research and analyses presented here are specifically related to the Sauk River Lumber Company, interested resource managers can use the same techniques to assess other western Washington landscapes that have been similarly impacted by historic logging practices. The general historic context dealing with the development of logging in the Pacific Northwest is applicable throughout western Washington. The techniques used to assess the extent of and National Register eligibility of logging-related properties are also broad enough to use elsewhere in the state. The landscape scale analyses techniques used to establish Sauk River Lumber Company district perimeters should be applicable anywhere similar landscape studies are necessary.

The Sauk River Lumber Company

The Sauk River Lumber Company (further reference will be to SRLC) was incorporated in 1922, the result of a successful bid for the very first timber sale offered by the Snoqualmie National Forest's Darrington Ranger District. The timber sale encompassed 20,000 federally owned acres, estimated to have 235 million board feet of timber. An additional 165 million board feet of timber was purchased from private holdings. One month after winning the bid on the Forest

Service timber sale, the SRLC began building a standard gauge logging railroad system designed to transport equipment and personnel into, and timber out of, the Sauk River valley (Figure 1).

Figure 1. Map of Mt. Baker-Snoqualmie National Forest, showing the location of the Sauk River valley and the general vicinity of Sauk River Lumber Company logging operations, 1922-54. Source: U.S. Department of Agriculture Forest Service, Mt. Baker-Snoqualmie National Forest, Mountlake Terrace, WA.

Change within the timber industry during the era of the SRLC was sweeping, encompassing everything from methods of timber extraction to the hiring and housing of personnel. The rate of change accelerated even more rapidly in the wake of newly available post-WWII technologies. The SRLC was usually quick to purchase the latest equipment and incorporate new logging methods that increased the efficiency, and thus the profit margins, of its timber harvest operations. Throughout its 32 years of operation, the SRLC kept its logging railroad as the primary transportation system despite an industry trend in later years towards the less capital intensive use of roads and trucks. By 1954, its available timber reserves exhausted and railroad logging no longer profitable, the SRLC hauled its last load of logs out of the valley.

The Sauk River Lumber Company left an indelible mark on the Sauk River valley landscape during its 32 year presence. Clear-cuts within vast areas of virgin timber were, initially, the most obvious remnants of its occupation. However, the SRLC also built, maintained, and eventually abandoned mainline, secondary and spur railroad grades, switchbacks, inclines, and declines. In its later years, Caterpillar tractors hastily built *Cat tracks* to move downed timber to the SRLC railroad's mainline. Still later, primitive roads were constructed so logging trucks could transport logs from harvest areas to the mainline. Each method of harvest and transportation left a different and distinctive mark on the landscape and different debris in its wake.

The individual workers who moved along this logging system also left behind an enormous amount of debris. From 1923 until the late 1940s, most SRLC loggers were expected to work and live out of mobile logging camps, where company-provided housing was ideally located within 10-30 minutes (by foot or by rail) of the timber harvest area. Today, the remnants of these camps still offer clues about how these men (and occasionally women) lived their lives in the woods. During its 32 years in the Sauk River valley, SRLC workers successively constructed, lived in, and abandoned five large, mobile timber camps. Bunkhouses and other low-order employee homes and workstations were built on flatbed railcars so the entire camp could be easily and inexpensively moved as soon as the immediate area's timber reserves were exhausted. These five camps, all built on Forest Service lands, date in occupation from 1923-25, 1925-29, 1929-36, 1936-42, and 1942-54. The discrete dates of camp use and abandonment offer opportunities to fill existing gaps in the archaeological knowledge base, because, so far, the SRLC is the only railroad logging system known in western Washington to have this sort of well documented temporal stratification associated with its logging camps.

The Research Problem

Today, the federally owned lands clear-cut by the Sauk River Lumber Company 50-80 years ago have begun to recover. The Sauk River valley, which to the casual sightseer looks quite pristine, reveals to the educated observer a dynamic assemblage of historic timber extraction and transportation patterns. These same lands are now being scheduled for selective thinning and probably will be aggressively logged again in approximately 30 years. In accordance with Section 106 of the National Historic Preservation Act, the impacts of these proposed projects on the remnants of the Sauk River Lumber Company will have to be considered prior to project implementation.

Identifying and evaluating the numerous Sauk River Lumber Company logging features scattered across 175,000 acres requires a comprehensive landscape approach. When individual logging-related archaeological sites and features are considered small, integral pieces within a larger landscape or district, the linkages between sites and their relationship to the whole are often revealed. This method of analysis, called a systems approach, can then be used to assess and evaluate important land use patterns and circulation networks as well as the physical components and archaeological sites that exist within the larger landscape.

Landscape analysis using a systems approach requires the resource manager to use tools that are not commonly required for identifying and evaluating individual cultural resources. Landscape scale analysis can be greatly improved by using historical and present day still and aerial photographs, by examining historic maps, and by the meticulous use of primary and secondary source materials.

Research Objectives

One objective of this thesis is to describe and document the distinguishable landscape and logging system features left by the Sauk River Lumber Company during its tenure in the Sauk River valley. The documentation may then be used by resource specialists involved in similar projects elsewhere with some basic strategies for (1) understanding the interplay of various features within a logging railroad system and (2) predicting the existence and probable locations of logging-related resources and the likely components of those resources.

The following four questions are posed in this thesis:

1. How can a landscape overview/systems approach enhance cultural resource management decision-making and policy processes, particularly when dealing with historic timber extraction?

2. Are there identifiable landscape features that can be attributed to particular logging techniques or technologies used during specific time periods?

3. Are the methods of timber harvest and extraction used by the SRLC comparable to those used by the timber extraction industry throughout the Pacific Northwest during the same time period (ca. 1920-50)?

4. Do the five SRLC camp layouts and features change over time? If so, are those changes comparable with those found in other similar logging camps found throughout the Pacific Northwest that were occupied during the same time periods?

The use of historic maps, diagrams, and still and aerial photographs is emphasized to provide resource managers with important tools for identifying specific railroad logging features, and assessing their significance and integrity. These same tools are used to illustrate the extent and likely components of logging-related features associated with the Sauk River Lumber Company.

Using SRLC as a case study, this thesis presents generalities regarding logging railroad camp material remains and landscape impacts, and discusses how those features might be viewed as a part of an entire logging system. This will assist resource managers in moving from a single site viewpoint to a recognition of the potential for interrelated sites, or a single historic district, that might occur within a landscape. These interrelated sites can then be viewed from the perspective of broader regional or national patterns in history, an important step in the analyses associated with determining a site's or district's eligibility for the National Register of Historic Places.

Methodology and Sources

A four-phase research strategy was used to identify and evaluate the impacts that the SRLC had on the Sauk River valley landscape. First, a review of pertinent heritage resource databases, site and archival records, and primary information sources including government documents, maps, articles from the popular press, and historic photographs was undertaken. Secondary information (books and monographs) provided in-depth information about specific aspects of pertinent research questions. The second phase of the research strategy was to interview past employees of the Sauk River Lumber Company. Archaeological investigations conducted during the summer of 1998, and the review of previous archaeological inventories in the area, comprised the third phase of the research approach. Field studies focused on pedestrian survey of two of the four identified Sauk River Lumber camps and extant railroad grade. The information gathered from these different sources was then synthesized to develop the fourth phase of the research strategy, the historical framework or context that relates to the Sauk River Lumber Company. The historic context, a necessary link to the past, can be used to further inform other archaeological fieldwork done in the Sauk River valley.

The development of a comprehensive contextual framework utilizing multiple lines of textual, oral, photographic and cartographic information is a well documented means of effectively informing historic archaeology studies (see, for example, Schuyler 1978). Historic context can be defined as "those patterns or trends in history by which a specific occurrence, property, or site is understood and its meaning (and ultimately its significance) within history or prehistory is made clear" (U.S. Department of Interior, National Park Service 2002, V:1). D. W. Meinig described it in this way:

> To trace sequences of actions—along with the relevant perceptions, thinking, motivations, and tools of the actors—and the resulting

> organization of space and imprint on the land must surely provide a solid basis for understanding. [1995:xvi]

Consideration of the SRLC system through a fully developed local socio-historic context allows the remnants of logging patterns and processes to be analyzed and understood in light of broader regional and national historical patterns. This is an important step in cultural resource management because it is, in part, the ability of those remnants to "represent a significant part of the history, architecture, archaeology, engineering or culture of an area" that qualifies the property for listing on the National Register (U.S. Department of Interior, National Park Service 2002, V:1).

Methodological Realities

The methodology described above reflects the realities of cultural resource management within federal land management agencies. Federal agency archaeologists almost always begin archaeological investigations in response to project proposals developed at the local, regional, or national level.

Examples of projects that would require culture resource review and clearance include developing a recreational hiking trail, designing a timber sale, or installing a new toilet at a campground. These are seemingly simple projects, until the cultural resource manager discovers through review of records and pedestrian survey that the proposed hiking trail follows a section of important railroad grade, that the timber sale's harvest activities will adversely affect an early homesteading site, or that the new toilet is scheduled to be built on a prehistoric site.

Federal legislation and regulations (see Appendix A) dictate that undertakings utilizing Federal funds must first ascertain the project's potential impacts on cultural resources, as well as impacts to soils, wildlife, fish and other resources. The standard procedures used by cultural resource managers to determine if a project may impact cultural resources includes review of readily available historical and ethnographic records, review of local and regional prehistoric and historic site location patterns, and pedestrian survey of the project area. Cultural resource clearance for a project is usually granted when no physical evidence of past use is found within the project area, and when the likelihood of subsurface archaeological deposits being disturbed during the project is considered low.

Most cultural resource managers only initiate more time-consuming processes of investigation when evidence of past use is located, or subsurface features are strongly suspected within a specific project area. Subsurface testing might be undertaken to confirm presence or absence of archaeological components, or to determine site boundaries. Interested people with a history of use in the area might be interviewed. Using the National Register of Historic Places' criteria of evaluation (see Appendix B), the agency archaeologist usually does only enough research to support a conclusion as to whether the site meets those criteria and is therefore eligible for listing on the National Register. Determining that National Register eligible properties are located within a project area can alter or terminate a project, or can delay the project while impact mitigation to the archaeological site occurs.

Throughout the project proposal and evaluative processes, little time is provided to the archaeologist for more than cursory consideration of broader scale patterns of site location, distribution, or connectivity. There is typically limited opportunity for an agency archaeologist to specialize in a particular branch of archaeology or refine a specific research subject. The development of research questions or broader research designs is rarely a part of the federal site evaluation process, simply because there is no time or money available to do the additional research.

In an ideal world, development of the contextual framework for the SRLC archaeological investigations would have preceded actual field investigations. It is likely that the field work and interviews with former SRLC employees would have been driven by a more refined set of research questions had the accompanying framework been developed prior to moving the investigations out into the field.

Study Limitations

Telling the story of the Sauk River Lumber Company would have been easier if company records had been available. Unfortunately, I was unable to locate any of the 32 years' worth of SRLC business records. Information about the areas harvested, the amount of timber hauled, the number of men employed, and the length and costs of railroad grades and truck roads would have been very useful in telling the story of the SRLC. Instead, fragments of the story were pieced together from accounts found in primary and secondary materials, from interviews with former employees, and through careful examination of historic photographs. While the end product may resemble a complete picture, each of these information sources has their own inherent biases in interpreting the truth.

Written documents all carry intrinsic biases. Primary materials (i.e., newspapers and trade publications) often expose the researcher to multiple facets of subtle prejudice. For instance, news stories appearing in the *Arlington Times* between 1920-54 were frequently dramatic and overly optimistic. Trade articles from the same period discussed only successful solutions to logging problems, or new innovations that were of interest to the readership and the publisher. Professional trade publications (i.e., *The Timberman*) and newspapers were also likely to avoid articles that criticized industry leaders, advertisers and patrons, but were very willing to criticize the labor force. For example, *The Timberman* articles written during the 1910s describing timber workers' efforts to organize consistently discredited unions and their supporters. Although other primary materials (i.e., *Camp and Mill News*) seem to have published more worker-oriented material, these publications too were subject to editors' tendencies to protect friends or particular companies or certain types of equipment from avoidable exposure or embarrassment.

Secondary materials are affected by the author's goals, the subject matter, and the editorial processes that go into bringing a book or monograph to production. As with primary materials, authors may intentionally or unintentionally edit out controversial subjects or information that does not support the author's thesis.

In the case of oral history, the memory of an informant is clearly colored by the beliefs, values and prejudices of that person. Interviews conducted for this study were with long-time SRLC or Forest Service employees; most of the SRLC employees had worked their way up through the ranks into positions of relative status within the company, and all were satisfied enough with company policy to stay for many years. Based on the stories of these men and on other logging-related research, long-term employment was not the norm in most logging camps. It is likely that the more transient employees would have very different recollections of the camps and the company.

As discussed above, the contextual document was not completed prior to the SRLC field investigations. The lack of background research and information affected the level, type and length of investigations undertaken in the field.

Previous Research

Archaeologists in the Pacific Northwest have only recently begun to look seriously at early timber extraction and the sites and features left by these early industries. Typically, the realities of federal agency archaeological work have necessitated a piecemeal approach both to archaeological survey, and to the recording and evaluation of sites and features located within a specific project area. Identification of larger systems, with many components, often comes too late, after component sites have been recorded and cleared for destruction as nonrepresentative and not eligible for the National Register of Historic Places.

Pacific Northwest Research

Railroad logging assemblages and sites have been documented on many national forests in the western United States. From the Lincoln National Forest in New Mexico's Sacramento Mountains (see Beidl 1990) to the Shasta-Trinity National Forest in California (see Vaughn 1985), railroad systems were built to extract timber, and the remnants of logging camps, railroad grades and other features located on federal lands have been recorded.

Typically, historic logging camps located on private lands are well known and have been badly looted. Logging-related sites located on federal lands often are less well known and therefore may offer more research potential and information to investigators.

Mt. Baker-Snoqualmie National Forest Research

Within this region, the most comprehensive study to date is the Pratt River Logging Camp Evaluation (Boswell et al. 1990), which does an outstanding job of incorporating several levels of research to elucidate and inform archaeological findings. Oral histories, a comprehensive archival search, and utilization of written public and private documents were used to more fully record and interpret the sites and features located during archaeological survey along the Pratt River.

Sauk River Lumber Company Research

The Forest Archaeologist on the Mt. Baker-Snoqualmie National Forest first recognized the remnants of the SRLC as a system in about 1987. Archaeological investigations within the lands first clear-cut by SRLC have usually been related to small projects, and have been limited to surficial survey and recording of project specific impacts, but attempts to put each small site into the larger context of the SRLC system have been ongoing for some time. Extensive archival study, oral history interviews, and the development of contextual documents have been outside the scope of these previous reports and studies. This thesis represents the first attempt to synthesize the results of the previous investigations into a single document.

Archaeological Site Protection and Location Disclosure

Archaeological and historical site locations are protected from public disclosure by numerous federal laws and statutes (see Appendix A). Both the Archaeological Resource Protection Act of 1979 and the National Historic Preservation Act of 1966 (as amended) contain specific direction and provisions to ensure that information is not disclosed that might put an archaeological or historical site at risk of illegal collection, looting or digging. In the interest of protecting the archaeological sites that are the subject of this thesis, site-specific location information has been omitted, or displayed at a scale that precludes easy identification. Individuals with a substantiated research need may request site-specific information by contacting the author through the Bureau of Land Management, 801 Blue Mountain Road, Challis, ID 83226, or by contacting the Forest Archaeologist at the Mt. Baker-Snoqualmie National Forest Headquarters, 21905 64th Ave West, Mountlake Terrace, WA 98043.

Organization of Study

The first three chapters of this thesis establish the historical context, or the historical framework, which will enable the reader to see how remnant logging features found in the Sauk River valley may be related to important themes in the history of western Washington. A broad regional overview of the history and development of the logging industry in western Washington is developed in Chapter II. Chapter III builds on that general history and presents a more local history of Snohomish County and the Sauk River valley. Chapter IV provides a specific overview of the Sauk River Lumber Company's movements and timber harvest practices in the Sauk River valley during the years 1923 through 1952. This historical framework is provided so that the archaeological sites, objects, structures, and other remnant features of the Sauk River Lumber Company can be viewed and understood in light of events and patterns in local and regional logging history. A clear understanding of that underlying historical framework is essential when developing subsequent arguments for the eligibility of individual historic properties or districts for listing on the National Register of Historic Places.

Having established how the Sauk River Lumber Company relates to important themes in the history of western Washington, a discussion about the types of identifiable features left on the landscape by railroad logging, and how to assess the integrity and significance those features can begin. Chapter V reviews the array of logging railroad equipment and construction methods used during the 1920s through the 1950s, and explains the specific railroad equipment and construction methods used by the SRLC. Historic photographs are used to help resource managers identify landscape features and artifacts or objects that are attributable to specific technologies (research question 2). This information is also used to develop the idea of site interconnectedness (research question 1) and to assess whether the SRLC's methods of timber extraction are similar to those used elsewhere during the same time period (research question 3).

Chapter VI describes the different types of timber harvest equipment and timber harvest methods used during the 1920s through the 1950s. Historic photographs from the SRLC era show timber harvest equipment in use, and illustrate some of the harvest methods used during that time. Identification of specific logging techniques or technologies and the landscape features they left behind (research question 2) can be used to refine the systems approach that will ultimately make cultural resource management decisions about individual site or district National Register eligibility more defensible and straightforward (research question 1).

Chapter VII discusses logging camps, the essential services provided by those camps, and how labor unions influenced camp life during the era of the SRLC. Historic photographs illustrate how the SRLC organized its mobile logging camps, and how SRLC mobile camps compare to other camps of the same era (research question 4). The photographs are also used to predict the locations of and the connections between important camp features (research question 1). In Chapters V, VI and VII, suggestions are made about determining the significance and integrity of the individual features and logging remnants described (research question 1).

Chapter VIII examines how aerial photography can be used to identify clustered remnants of SRLC logging railroad and timber harvest activity. The information extracted from individual aerial photographs is used to determine a historic district boundary (research question 1).

Chapter IX presents conclusions, and addresses each of the research questions posed in Chapter I. The SRLC case studies are reviewed and their ability to exemplify methods and operations used elsewhere by the railroad logging industry is examined. Chapter IX also reiterates the utility of a systems approach in the identification and evaluation of critical elements found within interlinked, multicomponent logging systems. Finally, the association of the SRLC with the development of historic railroad logging in western Washington (NRHP eligibility criterion A) and the ability of the SRLC investigations presented here to provide information not previously available to cultural resource managers (NRHP eligibility criterion D) are summarized.

CHAPTER II

DEVELOPMENT OF THE PACIFIC NORTHWEST LOGGING INDUSTRY

> Other than the creation of cities, possibly the greatest single factor in the evolution of the American landscape has been the clearing of the forests that covered nearly half of the country.
>
> —Michael Williams, *Americans and Their Forests: A Historical Geography*

Introduction

Locating and making knowledgeable decisions about individual logging sites or entire logging systems requires a basic understanding of the historical, political, and cultural conditions that existed prior to and during the formation of that site or system. Studying the political and cultural climates in which timber extraction occurred and logging companies operated gives the investigator a historical framework, or context, that allows a greater ability to recognize and assess the importance of historic logging features. Developing a historical context is also a necessary part of the evaluative process for determining whether objects, structures, buildings, or sites are eligible for listing on the National Register of Historic Places.

The following chapter summarizes major themes in the early development of the timber industry in the Pacific Northwest. This regional context is essential background information that sets the stage for understanding more specific historical information about the Sauk River valley (Chapter III) and the Sauk River Lumber Company (Chapter IV).

The Early Timber Trade

Beginning in the 1820s, timber and spar trees were often carried by fur trading ships on their way to Asian markets. The Hawaiian Islands and South America also provided opportunities for timber-carrying ships to trade replacement masts to needy vessels (Ficken 1987:12).

The British-owned Hudson's Bay Company at Fort Vancouver built the Pacific Northwest's first sawmill in 1828. Hawaii provided the major market for their sawn timber and spar trees, although the islands were not as timber hungry as the company had initially hoped.

At the conclusion of the war of 1812, Great Britain and the United States had agreed to jointly occupy the Oregon Country, including what would eventually be known as Washington State. While the two countries wrangled over the boundary that would divide North America, burgeoning American occupation of the lands around the Columbia River and Willamette Valley areas led the Hudson's Bay Company to move its operations northwards. In 1833, the Hudson's Bay Company built Fort Nisqually, near the present-day city of Olympia, and again sought to diversify its fur-based operations with a sawmill. By 1845, the Hudson's Bay Company was looking northward again, this time to the southern tip of Vancouver Island, where Ft. Victoria was established (Ficken 1987:16-17).

In 1846, with the signing of the treaty establishing the 49th parallel as the line between British and American controlled lands, the United States secured for itself prime shipping access to timber markets in the Pacific and Asia (Schwantes 1989:98-99). The earlier reconnaissance of fur trappers, traders and government surveyors had firmly established the Puget Sound as having the best and safest harbors in the region, and seemingly inexhaustible forests that would make lumbering a profitable venture (Ficken 1987:17-18).

Clearing the Land

> Our Company, and I presume others, have oftentimes been accused . . . of coming to Puget Sound, stealing Government timber, manufacturing it into lumber, and getting rich. Technically that is all true.
>
> —Puget Mill Company manager ca. 1913, quoted by Ficken, *The Forested Land*

The California gold rush pushed the already-developing timber industry in the Puget Sound area into large-scale development. Sizeable influxes of money from San Francisco investors helped spur sawmill construction throughout the early 1850s. Settlers soon discovered that the huge trees impeding their aspirations for cleared farmland could be sold for cash money to local sawmills (Ficken 1987:28).

Sawmills could not keep up with lumber demand by relying on the efforts of small settlement clearing, however. Widespread theft of timber on federal lands was the norm throughout the 1860s and 70s. Sawmill owners routinely harvested lands located near their mill sites, whether they paid for the timber or not. In part, theft occurred because

> the lack of relevant laws for the sale of federal forestland inhibited purchase of timber, but there was actually no need to buy raw material. . . . The mills usually contracted logging out to independent operators, agreeing to purchase logs at a specified rate and to supply towage, boom chains, and oxen. . . . Such arrangements . . . were the norm in the industry until the end of the nineteenth century. [Ficken 1987:32]

Theft was also fostered by timbermen willing to bribe government officials to look the other way. With the local officials firmly in the back pockets of the lumbermen, federally owned timber located along coasts or waterways was harvested without any fear of retribution.

In 1861, United States attorney John McGilvra was sent to the Pacific Northwest to investigate rumors of widespread timber theft from federal lands. McGilvra's initial enthusiasm to prosecute timber-stealing sawmill owners quickly waned under the pressure and persuasion of local politics and generous under-the-table payments. By 1863, McGilvra had devised a virtually harmless plan for collecting trespass fees from those sawmills guilty of timber theft. He set the stumpage fee at fifteen cent per thousand board feet, and relied on mill owners to report the amount of timber they had stolen from the government (Ficken 1987:42-44).

Congress passed two pieces of legislation in the 1860s and 70s that only increased the ability of mill owners and timber speculators to fraudulently acquire timberlands. The Homestead Act of 1862 was ostensibly designed to encourage settlement of unoccupied federally owned lands suitable for agriculture. Settlers could claim 160 acres by "proving up on the land," a process that entailed establishing a year-round residence on the land, investing in improvements such as clearing, fencing, and irrigating, and paying a nominal fee (White 1991:147). The Timber and Stone Act was passed in 1878, and applied only to surveyed federal lands found *unsuitable* for agricultural development. Under the Timber and Stone Act, citizens could purchase up to 160 acres of unimproved land for $2.50 per acre. Not surprisingly, timber speculation companies immediately began to use these laws to procure large stands of merchantable timber by recruiting prospective claimants and encouraging them to go through the motions of "proving up" on a particular piece of ground. Once the claimant's patent application was approved, the company would purchase the property for approximately $100 more than the claimant had paid (Hollenbeck 1987:287-288).

The fraud that defined timber acquisition in the late 1800s was not an anomaly found only in the timber industry. Mining, ranching, and land speculators also worked outside the law to procure the resources necessary for continued economic development and profit. The lack of legal provisions governing acquisition of natural resources, coupled with the government's initial lenience towards theft and fraud, only encouraged resource-dependent industries to find ways to circumvent the few existing laws (White 1991:147-150).

Moving Inland

As merchantable timber receded from easily accessed coastline lands, it became necessary to develop skid roads, with oxen or horses dragging logs to a mill pond storage area, or a river for transportation to a mill site (Figure 2).

Note: This image has been redacted due to copyright concerns.

Figure 2. The transition from teams of horses or oxen to mechanized steam donkeys began in the late 1800s. In this photo, probably taken ca. 1910, the steam donkey (in the background) is pulling logs out of the woods to the skid road. The horses are moving the logs along the skid road, presumably to a log dump. Skids, or logs placed at 90 degrees across the roadbed, can be seen under the team's feet. A water tank on skids, located in the foreground behind the horses, has been pulled into the woods to supply water for the steam donkey. Source: Darius Kinsey Collection, Photo Number 20584, Whatcom County Museum of History and Art, Bellingham, Washington.

In 1881, the invention of the steam donkey, a steam-powered winch, made inland incursions to harvest timber much more efficient. Horses and oxen, which required care and feeding even when they were not working, were eventually replaced by these more efficient but more powerful and dangerous machines. This new efficiency was expensive, and helped widen the gap between those who could capitalize the expense and those who could not (Ficken 1987:70).

When the timber reserves within the range of the steam donkey's short haul capabilities were exhausted, mill owners and timber operators built narrow and standard gauge railroads to transport logs. By 1885, railroads were considered essential Pacific Northwest timber harvest equipment. The steam donkey and locomotive would be indispensable logging equipment for the next 40 or 50 years. Only after World War II would internal combustion vehicles be powerful enough to take over the transportation of large timber from harvest area to mill.

Government Land Grants

To encourage the development of transcontinental railroads, Congress agreed to subsidize railroads by granting them land along proposed westward railroad corridors. Congress believed that, once the railroad was built, lands close to the corridor would become highly desirable to settlers because of the nearby transportation system. Thus both the government and the railroad would gain some income from the increased value of the lands located near the railroad. It was envisioned that railroad companies could quickly recoup their ventured capital by selling surplus lands to interested settlers and speculators (White 1991:146-147). Because land titles were not to be transferred from the federal government to the railroad until the entire route was completed, most railroads raised the capital they needed by selling bonds, or by obtaining bank loans using the federal land grants as collateral (White 1991:247).

The Northern Pacific Railroad received this type of federal subsidization in 1864, and the intrinsic value of those granted lands was not lost on those who ran the company. Northern Pacific was so intent on maximizing the value of the land given to them by Congress that "engineers tried to lay track through the most heavily timbered areas, so that valuable timberland would be included in the land grant" (Ficken 1987:45).

Rather than quickly selling its 7.7 million Washington Territory acres as Congress had decreed, the Northern Pacific saw this as a golden opportunity to acquire almost two million acres of valuable timber (Ficken 1987:45). Ignoring the Congressional edict that railroad corporations sell the land to the public, and use the funds to build the transportation and telegraph network so necessary to link west and east coasts, the railroads sold millions of acres to timber, mining, and real estate corporations. Millions of acres also were retained by the railroads, and subsidiary corporations were created to manage the land and the timber on it.

However, the owners of the Northern Pacific were well aware that ongoing, indiscriminate timber theft would likely impact their own soon to be acquired lands. Because of their concerns, in 1871 the Northern Pacific began subsidizing the salaries of local government timber theft investigators. Soon afterwards, the government began to intensify its efforts to halt timber theft and corruption. The combined efforts of private corporations and the government meant that, by the end of the 1870s, blatant timber theft had greatly decreased (Ficken 1987:44-47).

The Arrival of Transcontinental Railroads

> The coming of rails to a Pacific Northwest community meant major changes. Their routes functioning as metropolitan corridors, railroads linked the towns and villages of America's hinterland to Wall Street and Capitol Hill. Railroads not only opened the door to a nationwide market for local products—especially for bulky items like wheat and timber—but also increased competition for local merchants and redefined spatial relationships.
>
> —Carlos A. Schwantes, *The Pacific Northwest: An Interpretive History*

Before transcontinental railroads arrived in Puget Sound, the Pacific Northwest's timber fortunes were dependent on port-of-call markets in California, Hawaii, South America and Australia. Other western industries, including mining, commercial agriculture and ranching, needed a cost-effective transportation system to get commodities to market. Development of more diversified regional and national markets could only begin with the arrival of the first railroad (White 1991:246).

After receiving federal land grants in 1864, the Northern Pacific Railroad spent the next 20 years deciding on a route through the Cascades. The route, traveling from the Great Lakes region, over Stampede Pass and into Tacoma, was operational in 1887 and completed in 1888. A Northern Pacific spur line was built to connect Tacoma and Seattle, but dissatisfied Seattleites called it the "orphan road" (Schwantes 1989:196).

In 1893, the arrival of the Great Northern Railroad in Seattle relieved the town of its "orphan" status. Unlike the Northern Pacific, the Great Northern Railroad received neither land grants nor federal loans to push a railroad through the Cascades from Minnesota. The founder of the Great Northern, James H. Hill, was already known as a tight-fisted manager of the Saint Paul-Minneapolis and Manitoba Railroad.

The Great Northern proved to be the most successful railroad in the west, with a low debt load that enabled the line to run at a profit earlier than the over-capitalized Northern Pacific, and greater tonnage capabilities that made it the preferred carrier of commodities both to and from the Pacific Northwest (White 1991:256).

The completion of these two railroad lines and the designation of Tacoma and Seattle as primary terminals continued to shape the Pacific Northwest's economic growth throughout the rest of the 19th, and well in to the 20th centuries.

Establishment of the Forest Reserves

Under pressure from irrigators and farmers to safeguard watersheds from clear-cutting, burning and overgrazing, Congress passed the General Land Law Revision Act in 1891. President Benjamin Harrison used the Act two years later to designate 16 million acres of federal forest reserves from unclaimed federal lands. In Washington State, the Pacific Forest Reserve had 2.25 million acres of the total 16 million acres designated. In 1897, President Grover Cleveland established another 13 forest reserves, adding another 21 million acres to the total, and an additional 8 million acres to the reserves in Washington (White 1991:406-407).

While the general public's response to the withdrawal of these unclaimed lands was predictably angry, many large timber companies quietly supported the forest reserve action. By withdrawing large tracts of land from the public domain, the value of their own private holdings was increased, and competition from smaller companies that had no or few private holdings would quickly be eliminated (Ficken 1987:124).

The Forest Management Act was passed in 1897 to give the government, and specifically the Secretary of the Interior, power to manage the newly designated forest reserves. Congress passed the Sundry Civil Appropriations Act of 1897 to authorize the funding necessary to manage the newly designated forest reserves. Within that same Act, Congress clarified that the purpose of the forest reserves was for watershed protection and timber production. In response to the uproar of the general citizenry over the withdrawal of millions of acres of unclaimed federal land, Congress passed "The Organic Act" of 1897 as an amendment to the Sundry Civil Appropriations Act, which stated that lands primarily valuable for mineral ores and agriculture were to be excluded from forest reserves (McCarthy 1992:184-185).

In 1898, Gifford Pinchot, an American-born and German-trained professional forester, was designated to oversee the Department of Agriculture's new Division of Forestry. By 1905, Pinchot had wielded enough influence to have the forest reserves removed from the Department of Interior and put under his jurisdiction in the Department of Agriculture. In part, this was done to distance the new forest administration from its association with the Government Land Office, which had key members on trial for accepting bribes and approving fraudulent land claims. Pinchot had secured the change in name from "forest reserves" to "national forest" in 1907, to better reflect the philosophy of utilization, not preservation, of the withdrawn lands (Steen 1992:329-330).

Weyerhaeuser Land Acquisition

During the development of the West, one of the most persistent assumptions was that agriculture represented the most socially and financially valuable use of land (White 1991:148). Despite warnings from Puget Sound timber owners that many western Washington lands were suitable only for timber (Ficken 1987:41), promoters envisioned downtrodden urban folk moving back to the land and providing nearby cities with agricultural products. Acres of logged-off lands surrounding major cities were touted as suitable for sustaining a variety of crops, needing only energetic, capable men to turn these rough lands into agricultural utopias. This boosterism took hold in the late 1890s, but began to quickly dim as the economic realities of turning logged-off lands into profitable agricultural land were realized (White 1991:434-437).

In January of 1900, after months of speculation and rumor, the newly formed Weyerhaeuser Timber Company purchased 900,000 acres of timberland from the Northern Pacific Railroad. Frederick Weyerhaeuser, a timber baron who started out in the Great Lakes region, established the company with about 12 other Midwest businessmen. The Weyerhaeuser Timber Company bought surveyed and unsurveyed sections of NP land for $6 per acre. As part of the sale, the Northern Pacific Railroad secured exclusive rights to transport any timber for Weyerhaeuser until 1915 (Ficken 1987:91-95).

The size of the corporation was daunting to others in the Pacific Northwest timber and mill industries. To keep the Weyerhaeuser Timber Company in good favor with its competition, George S. Long, the manager of the company, immediately began to work with smaller mills that were concerned about their log supply. Within three years of the announced Northern Pacific-Weyerhaeuser sale, the Weyerhaeuser Company had sold approximately 19,000 acres of its timber holdings to small mills (Ficken 1987:96-97).

In that same three-year time period, Weyerhaeuser also managed to purchase another 400,000 acres of timberland from a variety of private landholders, including homesteaders. Most of this land was purchased with the intention of solidifying Weyerhaeuser holdings into continuous blocks, rather than the checkerboard pattern inherited from the Northern Pacific Railroad land grant lands (Ficken 1987:97-98).

As daunting as the Weyerhaeuser holdings might have been, many mills were anxious to do business with the new company. Mills that had been marginally profitable were offered for sale to Weyerhaeuser, but Weyerhaeuser management was not interested in entering the timber manufacture business until markets were more stable. Weyerhaeuser eventually purchased a small, out of date waterfront mill in Everett in 1902 (Ficken 1987:99). In 1914, the Weyerhaeuser Timber Company began construction of a second sawmill, also located in Everett. This all-electric sawmill was lauded as the world's largest

(Schwantes 1989:180). With the two Everett sawmills, and that of a subsidiary, the Snoqualmie Falls Lumber Company, "Weyerhaeuser [became] the leading manufacturer of lumber as well as the largest owner of timber" (Ficken 1987:116).

Most large timber companies welcomed Weyerhaeuser's investments in timberlands because timberland values soared as a result of their acquisitions. With a large percentage of Washington's timberland locked up by only a few companies, most owners believed that the timber market would stabilize. Fewer timberland owners meant more effective manipulation of the supply side of the market equation and elimination of the periodic timber gluts that had plagued the timber market since the early 1890s (Ficken 1987:99).

The federal government also welcomed the ownership of a majority of Washington's timberlands by a minority of large corporations. "Regulating a few large . . . timber companies was, after all, easier than regulating scores of small . . . timber companies" (White 1991:409).

The Timbermen Unite

Puget Sound and Grays Harbor lumbermen founded the Pacific Coast Lumber Manufacturers Association in 1901 (Ficken 1987:108). By joining forces, the area's most powerful timberland and mill owners hoped to force the nation's railroads to give them better service and reduced haul rates. The transcontinental railroads had been unable to respond to the lopsided supply and demand of freight cars created by the West Coast timber industry. The East

Coast's increasing demand for West Coast timber was countered by the relatively few consumer goods traveling back to the west, and as a result, there were often shortages of freight cars. Most West Coast timbermen were certain that the railroads were favoring southern timber interests. By banding together, the Pacific Coast Lumber Manufacturers Association was able to successfully lobby the federal government to investigate the freight car shortage (Ficken 1987:109). In 1911, the Pacific Coast Lumber Manufacturers Association merged with other Oregon, Washington and California timber interests into the West Coast Lumberman's Association. Two private trade publications, *The Timberman* and the *West Coast Lumberman*, expanded to include these new areas, and continued to espouse the timber industry's views on politics and issues. The publications also disseminated advice and industry information about different logging companies and their logging methods.

Not surprisingly, soon after forming a coalition, sawmill and timberland owners began flirting around the edges of the Sherman Anti-trust Act. Price fixing was blatant until about 1906, when increasing federal government scrutiny pushed such activity underground (Ficken 1987:108-109). Despite industry attempts to stabilize prices, large debt loads incurred by many sawmills and timber interests necessitated that, despite slowing demand, supply be maintained. As the price of lumber steadily declined between 1907 and 1916, some sawmills actually increased production in an attempt to pay their debts

(Ficken 1987:109-115). Timber markets remained stagnant even after the United States entered into World War I. By 1916, all the existing lumber surpluses had been used, and active timber harvest and millwork resumed (Ficken 1987:138-139).

Disposing of Logged Off Land

By 1911, there were approximately 3 million acres of unimproved logged-off land in western Oregon and Washington. The costs of bringing logged-off land under cultivation were often prohibitively high. "In most instances the costs of the raw stump land plus the cost of clearing it exceeds the value of the land after it is under cultivation. For this reason the bulk of the logged-off land has been permitted to lie unimproved and unused since the timber was removed" (Hunter and Thompson 1911:5). By the 1920s, a more realistic ideal had set in, and the Weyerhaeuser Timber Company advertised "lands worth the time and expense necessary to place them in shape for cultivation" at $10 to $25 per acre, while lands suitable for only grazing were for sale at $3 to $7.50 an acre (Washington Logging News 1922:33). That some of these lands would be only suitable for regenerating timber was an idea slow to develop, but it was a concept that the newly designated Forest Service fostered as it attempted to reforest, plant and seed cut-over lands within the national forest reserves (White 1991:435). Washington legislators eventually authorized a special property tax classification for logged off lands, at a rate of $1 per acre during regrowth, and subjected to a yield tax when the acreage was finally harvested (Ficken 1987:201).

The Threat of Fire

In 1902, 36 people died in the Yacolt Burn, a firestorm that swept up the Lewis River valley. The Weyerhaeuser Timber Company and other large timber holders lost thousands of acres of timber in that and other forest fires burning throughout the northwest. The public quickly demanded political action to prevent future tragedies similar to the Yacolt Burn. Weyerhaeuser management teamed up with the United States Forest Reserves District One leader, William Greeley, to develop a legislative solution (Petersen 1995:3). The Washington state legislators responded in 1903, creating a state fire warden with deputies in each county, and establishing a state system for overseeing the issuance of burning permits. The timber industry created the Washington Forest Fire Association in 1908, and assessed all members one penny per acre of land to support "the employment of seventy-five men to patrol the forests in the 1908 fire season" (Ficken 1987:128). Thus, under the auspices of saving human life and valuable forest and watershed resources, the timber industry was able to manipulate political and public opinion to protect their substantial private investments (Ficken 1987:128).

The first sparks of a forest conservation movement were, in fact, fanned into flames by Pinchot and President Roosevelt at the turn of the century. Dire warnings about an approaching "timber famine" and the decimation of the nation's forests, coupled with the timely outbreak of several severe forest fires, helped garner political and public support for the increased conservation, protection and utilization of the national forests and adjacent private timberlands (Ficken 1987:125-127).

The Strategic Use of Fire

So dense were the virgin forests of western Washington that fire was often the only alternative available to the small homesteader trying to clear his land. A single man could not use an axe to cut down the huge Douglas firs, cedars and spruces that covered much of the land. Instead, an auger was used to drill holes in a tree trunk and live coals were dropped in. The coals were then fanned into flames and the fire left to smolder inside the tree. These fires would be tended for days or even weeks until enough of the tree was consumed to make it relatively easy to chop down (Bunting 1997:81-84). Initially, when fires got away and spread to adjacent lands, it was viewed simply as an unplanned accident, not even worthy of apology or note.

Some of the higher mountain lands that were later assigned to the forest reserves, and eventually the Forest Service, were used for grazing. When sheepherders moved their herds off upper elevation grazing lands in the fall, they would sometimes set fire to the timber adjacent to grazing areas. This expanded the available grazing land for the next year, and increased and encouraged the growth of grasses that sheep could effectively use. This practice also opened up the forest canopy and provided more food for deer and elk.

Later, burning was used to clean up the harvest debris left by timber companies. Burning protected the remaining stands of live timber from uncontrolled fires that could start in logged-off areas where brush, fine fuels, and downed timber had become tinder dry.

October through May was the preferred time of planned burning for timbermen, as higher soil moisture and humidity rates would help prevent fires from escaping containment. If the burned land was to be seeded for subsequent use as pasture, hotter fires were desired so that fuels would burn more completely, and the resulting ash layer could be used as a bed for grass seeding (Hunter and Thompson 1911:6-7).

Labor

The first attempt among mill and timber workers to organize was in 1869, and resulted in the formation of the Knights of Labor. Although workers in western Washington's mills and forests were far better paid than their contemporaries in the Great Lakes region, the Knights of Labor set out to demand better and safer working conditions. Accidents in the mills and the woods were more often than not deadly, and accident rates were extremely high. Timber camps were isolated and living conditions were generally atrocious. By the mid-1880s, the Knights of Labor had focused their rancor on the Chinese laborers working in mills and harvest operations, having decided that it was the cheap Chinese labor that enabled mill owners to continue to ignore labor's demands. Large demonstrations in the streets of Seattle and Tacoma, coupled with the murder of some Chinese coal miners, put enough pressure on several centrally located mills to fire their Chinese employees and hire new white laborers (Ficken 1987:72-73).

Mill owners failed to improve their labor force relations with the firing of foreign laborers. Instead, less than a year later, the Knights of Labor demanded that the standard working day be reduced from twelve to ten hours. The very real threat of strikes and walkouts caused the mill owners to adopt the 10-hour day as if it was their own idea. Soon after this victory, the Knights of Labor dissolved, torn apart by internal dissention (Ficken 1987:75).

Mill owners gained confidence over the next couple of years as several other attempts to organize workers sputtered. The International Shingle Weavers' Union of America organized in 1903, and immediately began demanding better wages. But would-be worker organizers were quickly evicted from the mills. In 1906, the Royal Loggers' Union was founded, and then quickly failed because of financial trouble. Western Washington mill and timber owners were not truly concerned with the prospect of labor successfully organizing until the arrival of the Chicago-based Industrial Workers of the World, also known as the IWW or the "Wobblies" (Ficken 1987:131-134).

Early in 1916, the mill town of Everett received increasing pressure from striking IWW members. Most mills extended out over the water, and the union realized that they could avoid the intervention of local law enforcement by picketing from boats on the bay, which was under federal jurisdiction. Vocal picketers took advantage of high tides to row up to open mill windows and harass the strikebreakers. A prominent Everett mill owner named Neil C. Jamison (who would later incorporate the Sauk River Lumber Company) grew tired of Wobblies rowing up to the windows of his mill and "shout[ing] unrecorded obscenities to the men working inside. This daily chorus finally unnerved Neil Jamison, who acted independently of the other mill owners and hired a dozen thugs to keep the pickets away from his mill" (Clark 1970:180).

Later the same year, a group of 250 IWWs chartered a large boat from Seattle to take them to Everett. The boat was met on the Everett waterfront by an irate group of law enforcement officers and deputies. The clash turned ugly fast, resulting in the deaths of seven, and the arrest of 74 IWW members. Although all union members were later acquitted of charges and released from jail, the increased resolve and power that this incident gave workers throughout the region would plague the mill owners for years (Clark 1970:178-214).

When the U.S. entered World War I in 1917, the war effort offered the timber industry a new opportunity to squelch union misbehavior, and the trade magazines were quick to label all strikers as unpatriotic. The formation of a new organization called the Loyal Legion of Loggers and Lumbermen, or "4Ls," was supposed to foster cooperative work between employee (Loggers) and boss (Lumbermen) in the name of the war effort, and was greeted enthusiastically by employers. The 4Ls was actually the brainchild of Colonel Brice P. Disque, assigned by the President of the United States to resolve the problems with timber production on the west coast. Management's enthusiasm quickly changed to dismay as the Colonel began to urge the timbermen to acquiesce to worker demands for an eight-hour day and workplace improvements (Ficken 1987:146-148).

During a huge AFL Timberworkers union strike in 1917, the IWW encouraged the timberworkers to burn their bedrolls and blankets, symbols of the logger's transient status and of the dreadful conditions that they were forced to live under. The eight-hour day and improvements to living and working conditions were the chief demands made by striking workers. Because of massive walkouts, only about 15 percent of west coast mills were still running one month later (Schwantes 1989:281). By the end of the following month, most mills and timber operations were running again, but the workers continued to plague both mill and timber bosses with work slowdowns and equipment sabotage (Prouty 1973:34, 50).

The mill owners and lumbermen were not pleased with this new worker confidence, and the trade papers of the day reflected that displeasure with articles discussing the base actions of the men they were forced to hire.

> Most of the men nowadays want to do as little as they can and get all the money possible for it without taking any interest at all in the company's business. . . . The class of men today are very different from those who worked in the woods 20 years ago or longer. [Van Orsdel 1917:59]

The fact was, owners of large mills and timber operations had always known about the dangerous working conditions in the mills and the deplorable living conditions in logging camps. They chose to credit the acceptance, even expectation, of these conditions to the unsavory character of the men they employed (Ficken 1987:133). At the Pacific Logging Congress held in Seattle in 1914, the State Commissioner of Health took the timbermen to task, saying

> there is a good deal of basis for the industrial unrest in this section of the country, and every one of you men down in your hearts knows it, and perhaps the greatest of all causes is the very filthy sanitary condition under which some camps are operated. [Kelley 1914:33-34]

Some timber companies got the message, and began to address the issues that were causing so much worker unrest. Most improvements could be viewed, and written off, as making good business sense. In 1915, a Pacific Logging

Congress keynote speaker tried to convince other lumbermen and mill owners in attendance that

> the bedrock on which any scheme of good business management rests, in industries which employ a good deal of labor, is undoubtedly the well-being and proper living conditions of the employees. I do not believe that any other part of one's investment pays better dividends than that spent in keeping the men in a mental and physical condition that will not only enable them to desire to give a good day' work to their employers, but will make them feel like working, with a real interest in their work, instead of looking on it as drudgery to be gotten over with as soon as possible. No one thing will serve to bring this about so well as to let them see that the employer has a real and personal interest in them. [Martin 1915:28]

Into the 1920s

The struggle for economic stabilization following World War I created a financial roller coaster for the timber industry. An unprecedented boom in timber demand occurred in early 1919, only to end unexpectedly 12 months later. By mid-1921, the timber industry was again riding a wave of increasing demand, and this time was sure that, with the election of Republican Warren G. Harding into the Presidency, good times would follow (Ficken 1987:159-163). Timber wages had been cut in half in the earlier downturn, and the unions had lost much of their influence as men returned from the war and looked for work. The Atlantic coast and Japanese markets were growing rapidly, and the new local pulp and paper mills were increasing production. In addition, hemlock, previously considered a trash tree, was now quite valuable as a pulp source because it was ideally suited for the pulp making process (Ficken 1987:172).

The western Washington timber industry leaped back into high production to fill those timber demands.

As the demand for timber products expanded, the transportation problems that had plagued mill owners and timbermen for years began to lessen. The transcontinental railroads could no longer totally control timber shipment, as the many of the ships commandeered for transcontinental shipping during the war returned to their home births. With the re-opening of the Panama Canal to civilian shipping, lumbermen had another, lower-cost shipping option, enabling "mill owners to engage in the rare pleasure of thumbing their noses at the imperious transcontinentals" (Ficken 1987:160-161). The timber industry was riding high, and mill owners jumped to expand their mills and their timber holdings.

Summary and Conclusions

The development of the Pacific Northwest's early timber industry was made possible by improvements and mechanization of the timber harvest and transportation processes. The arrival of two transcontinental railways in the late 1880s and early 1890s expanded the Pacific Northwest's timber markets to the East Coast, and made mill owners' investments in timber land and the equipment necessary to harvest and transport logs more economically feasible.

If lumbermen had failed to invest earlier in the century when timberlands were cheap, they now looked for partners and avenues to gain ownership or access to large tracts of timber. In Everett, a banker joined forces with an established mill owner, to purchase a large tract of private timberland located about 30 miles inland in Snohomish County. A large U.S. Forest Service timber sale would also be offered in the same valley. By 1922, they had incorporated the Sauk River Lumber Company, procured the Forest Service contract, and begun building the railroad that would, for the next 30 years, move timber from the Sauk River valley to the Everett waterfront. The development of the timber industry in Snohomish County, particularly that of the Sauk River Lumber Company, will be described in the next chapter.

Cultural resource managers need to make connections between past land management decisions and how those past decisions manifest themselves physically on the ground today. Congressional legislation passed in the 1800s (i.e., the Homestead Act of 1862, federal land grants made to transcontinental railroads) continues to impact present-day private and federal land management practices generally, and timber harvest practices specifically. These historical influences must be understood in order to determine significance of specific historic properties or districts. Knowledge of these influences helps to correctly evaluate a historic property's or district's ability to reflect specific historical associations, and will ultimately determine whether the property or district is eligible for listing on the National Register.

CHAPTER III

SETTING THE STAGE IN THE SAUK RIVER VALLEY

> History and geography yield some of their greatest insights—insights denied either of them standing alone—when they make common cause and work together. To understand a place, we must know its history; to understand history, we must know the place in which it has occurred.
>
> —William Cronan, Foreword to *The Great Columbia Plain* by D. W. Meinig

Introduction

Refinement of the historic context continues in this chapter with review of the local environmental, political, and cultural conditions that ultimately led to the incorporation of the Sauk River Lumber Company. While some local events, such as the building of the Northern Pacific spur line through the Stillaguamish valley in 1900, are of little consequence at the regional level, they are critical to understanding the development of the timber industry in the local area. This enhancement of the historic context, when combined with specific details about the Sauk River Lumber Company's incorporation, timber harvest methods, and business practices (described in Chapter IV) is necessary to effectively document and evaluate the significance of the objects, sites, buildings, and structures left behind by the SRLC.

"A Rip and a Rush"

The Sauk River valley and the town of Darrington in Snohomish County may have been isolated (Figure 3), but they were no strangers to heavy industry. When the Sauk River Lumber Company was formed in 1922, there was already a 32-year history of mining and timber harvest activity in the area.

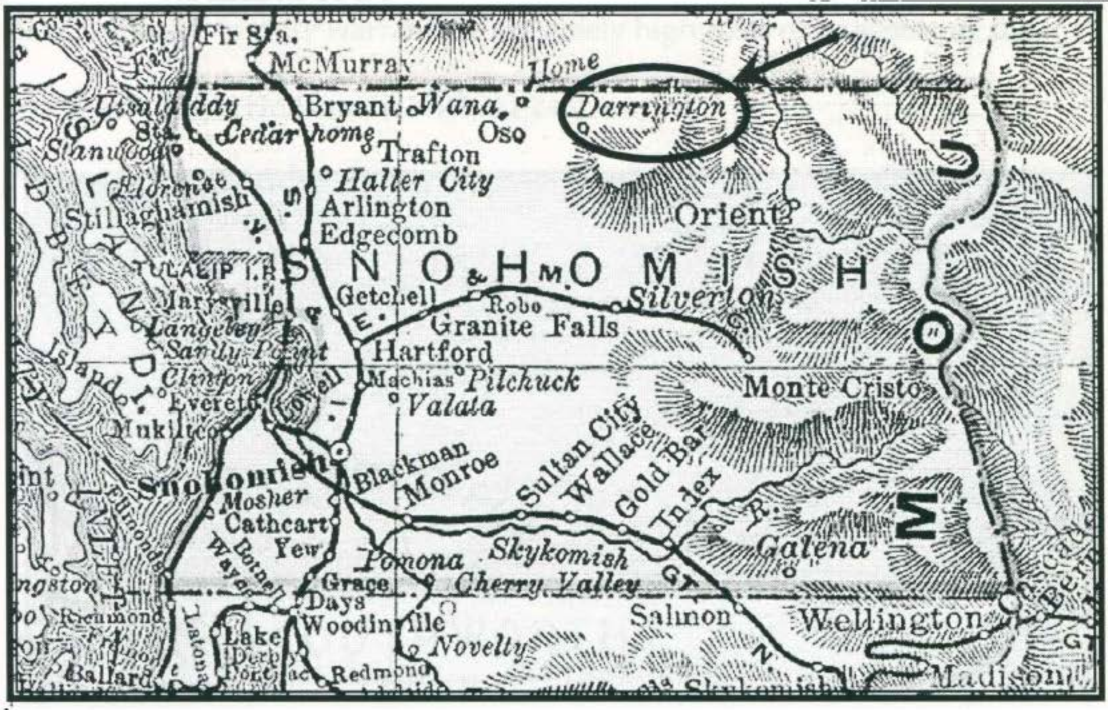

Figure 3. U.S. Atlas map of Snohomish County, published in 1895 by Rand McNally. The Great Northern Railroad travels through the southern part of the county through the towns of Index, Gold Bar and Sultan to terminals in Everett and Seattle. The route of the short-lived Everett-Monte Cristo Railroad travels from Monte Cristo to Hartford. In 1895, Darrington is still isolated in the northern part of the county. Source: The Livingston County Michigan USGenWeb Website Project, 1895 Atlas Project. Electronic document, http://www.livgenmi.com/snohomishWA.htm accessed July 5, 2002.

Mining interests first brought men to the Sauk and Stillaguamish River valleys (Figure 4), and it was mining that was expected to put the town of Darrington on the map (Poehlman 1995:46). "When the [area] does open up, it will be with a rip and a rush, and Snohomish County will see one of the greatest mining excitements ever known since [the California Gold Rush] days of '49" (Rich North Fork 1897:3). Although many mining claims near Darrington were subjected to speculative development, none of the ore bodies were ever extensive or rich enough to truly warrant the extremely high costs of transporting the ore to a mill site (Hollenbeck 1987:241-243).

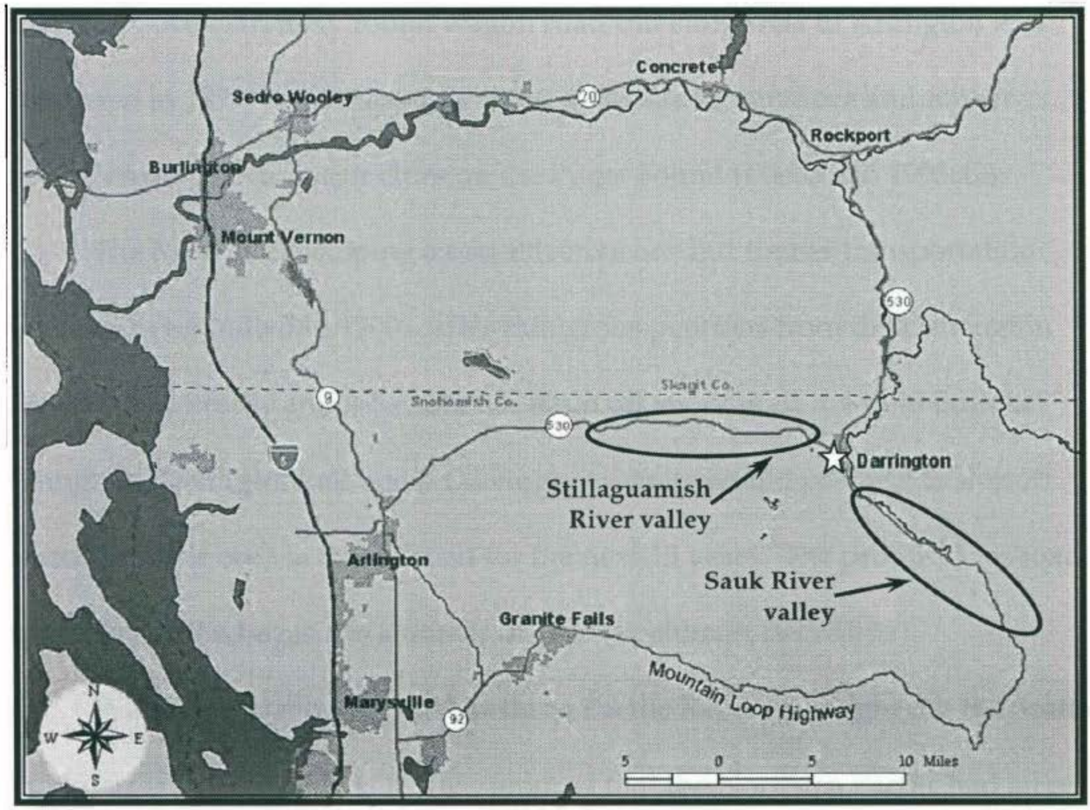

Figure 4. Location of the Stillaguamish and Sauk River valleys in relation to the town of Darrington. Source: Darrington Chamber of Commerce, Map of Snohomish and Skagit Counties. Electronic document, http://www.snohomish.org/communities/index.html, accessed July 13, 2002.

A survey party for the Northern Pacific Railroad (further reference will be to Northern Pacific) passed through the Darrington area in 1870 during their search for a viable route through the Cascades (Hollenbeck 1987:218-219). The Northern Pacific ultimately selected a more southerly route that traveled across Stampede Pass and terminated in Tacoma. Darrington was connected to Skagit

County to the north via a wagon road in about 1891, but the shrill demands of Darrington miners and businessmen for an improved transportation system continued. An extremely rough wagon road traveling west to Arlington was completed in 1899, but the locals wanted a rail line to move ore and timber through Arlington to major cities on the Puget Sound (Poehlman 1995:42).

The hope of developing a cost-effective ore and timber transportation system was rekindled in 1900. After numerous petitions from the Darrington citizenry, the Seattle and International Railroad announced it would build an Arlington-Darrington rail line if Darrington miners would promise to ship 75 percent of their ore via the railroad for the next 15 years. The promise was made, and construction began the summer of 1900 (Poehlman 1995:51-52).

Within a few months, the Northern Pacific Railroad bought out the Seattle and International Railroad. It was rumored that the Northern Pacific had large timber holdings up the Sauk River valley that it was wanted to access. When the line was completed in July 1901, one of the first trains brought in sawmill equipment that powered several different Darrington companies over the next 15 years (Poehlman 1995:52-57).

Cedar Mills and Shingle Bolts

The huge cedar trees located along the Sauk River created a natural opportunity for shingle weaving, the manufacture and packaging of shingles and shakes. Cedar trees were cut down, bucked up (cut into manageable lengths), and split into large chunks called "bolts." The bolts were then transported by oxen or horse team to a waterway where they were floated down to a shingle mill (Figure 5).

Note: This image has been redacted due to copyright concerns.

Figure 5. Shingle bolt cutters pose with their products. The horses are hitched to low wooden sleds used to safely transport the bolts over the rough ground from harvest area to the water's edge. Source: Darius Kinsey Collection, Photo Number 10055, Whatcom County Museum of History and Art, Bellingham, Washington.

Downstream mills would recapture the floating bolts, and split them into shakes and shingles. Some mills developed sophisticated mechanisms to collect and hold the bolts as they floated past. Elizabeth Poehlman, author of *Darrington: Mining Town, Timber Town*, interviewed many locals while writing her book. One gentleman named Lawrence "Toby" Freese arrived in Darrington in 1901, when he was five years old (1995:96). Poehlman (1995:59) recorded the following story told to her by Toby, about one of the shingle weavers:

> Kane [owner of the Swastika Mill in Darrington] had visions of great success and wealth in the shingle industry and built what Toby Freese called "an ingenious mill." Kane constructed a box crib 600 or 700 feet long in the middle of the river. At the head of an island there he built a four-log swing boom to guide shingle bolts from upriver into the crib.
>
> One spring Kane employed a large crew of shingle bolt cutters upriver. . . . Against the advice of men who worked for him, he sought to float a huge drive of bolts downriver at one time. According to Freese, "He had so many shingle bolts in the river that he plugged the river up." The men broke up one jam only to create another downstream. When the bolts got downriver, close to the crib and boom, they piled up again, this time ten or twelve feet thick. The river dammed up behind them and then let go like thunder. The drive swept through, taking the boom and crib. "Ten thousand cords of bolts went clear through to the Puget Sound," Freese recalls.

Kane's mill was one of 11 Darrington mills in operation between 1901 and 1910 (Poehlman 1995:59-60).

Years of Uncertainty

In 1907, the United States Lumber Company started logging operations on a large tract of private land just outside of Darrington, using a rod locomotive to get timber into town (Adams 1961:appendix). Several other timber companies were working in the area during that time, also on private lands. The first Darrington Ranger District timber contract (under the Washington National Forest) was issued in 1908 to the Hazel Mill Company, in an area up the Stillaguamish River valley (Poehlman 1995:145). Major price declines in the Douglas fir market between 1907 and 1915 combined with increasing IWW labor demands to keep the timber industry subdued. By 1913, the United States Lumber Company had gone into receivership, having laid only 4 miles of track into the Gold Hill area just outside of Darrington (Adams 1961:appendix).

When war broke out in Europe in 1914, the overseas markets of the Pacific Northwest's timber and mill industries collapsed. At the same time, the United States' timber industry suffered the resurgence of IWW protests and strikes to attain an eight-hour day and improved working conditions.

These demands were pressed for by the workers, and rejected most strongly by the employers in Everett, where a deadly clash between IWW members and local law enforcement occurred on the docks in 1916. The leaders of the IWW and AFL quickly changed tactics, learning that avoidance of overt violence and the use of passive protest could be much more successful. Just before the United States entered the war in 1917, the IWW and the American Federation of Labor timberworkers were "conducting perhaps their most successful strike in the Pacific Northwest lumber industry. Their protest—which included the classic on-the-job slowdown—cut production to 15 percent of normal and drove the industry to its wits' end" (Schwantes 1989:281). In response to increasing labor pressure, the timber industry created the Lumberman's Protective Association and agreed to stand united against labor's demands for an eight-hour day and safe working conditions (Ficken 1987:117, 138-145).

A year of bitter and venomous rhetoric in both trade and labor journals resulted in nothing more than bad feelings. Members of the Lumberman's Protective Association began to implore the federal government to intervene, as "unpatriotic" laborers continued to keep production rates low. Management argued that the eight-hour day would decrease production just when increased production was most needed for the war effort (Ficken 1987:145). The Wilson Administration, interested in resolving the problem, authorized a mediation committee to investigate. The committee findings, presented by Vernon Jensen to the Administration in 1945 (Jensen 1945), determined that most of the problem was the "uncompromising attitude on the part of the employers" (Boswell et al. 1990:33).

The government responded by assigning Colonel Brice Disque of the U.S. Army to resolve the Pacific Northwest's labor problems that were interfering with timber production. The Wilson Administration was particularly concerned because the timber industry had been unable to increase the production of spruce, a lightweight, strong wood determined essential for the United States' airplane production program (Ficken 1987:145-146).

A short time after arriving in Seattle, Disque created two organizations designed to address what he saw as the most pressing needs of the timber industry. The Spruce Production Division was created to address both production and labor issues. The Spruce Division bought timberlands with heavy stands of spruce, built and operated new railroads necessary to access those lands, and constructed a specialized mill in Vancouver, Washington to produce airplane-quality milled timbers (Labbe and Goe 1995:165-169).

The Spruce Production Division was also created to bolster the greatly reduced wartime labor force by bringing loggers who enlisted back into the woods, wearing the uniform of the US Army. The Spruce Division had their own logging camps, but also stationed soldiers in non-military logging camps to help logging companies in need of additional laborers (Labbe and Goe 1995:165).

Disque also created the Loyal Legion of Loggers and Lumbermen, or 4Ls. The 4Ls union was intended as a patriotic option to the more volatile IWW or AF of L, and both laborers (loggers) and management (lumbermen) were encouraged to sign up. Known IWW members were not allowed to join, and all 100,000 of those who became members had to sign a no-strike pledge. Lumbermen and mill owners initially viewed the establishment of these two organizations as a huge victory, but the celebration was short lived. A study done at this time by the army "found that half of the logging camps in the Northwest lacked adequate bunks or showers and that a third were without toilet facilities" (Ficken 1987:132). Improvements that had been the main points of contention between loggers and lumbermen for years, such as access to showers, clean bedding and an eight-hour day, had to be instituted at many of the logging camps before U.S. Army soldiers, part of Disque's Spruce Production

Division, could be stationed in the camps to help cut timber (Schwantes 1989:281).

The start of World War I in 1914 caused the Northwest timber industry to collapse because of shipping problems and the general collapse of European demands for lumber. As the war progressed, demands for wood and timber increased. Wood was necessary for building ships, airplanes, refugee and troop housing, and for constructing and reinforcing trenches. By 1916, the war's progression had created such a demand that production rates for the Washington timber industry were "only slightly below the all-time high" (Ficken 1987:138-139).

In 1916, in response to the growing foreign market demands for timber, several new logging companies moved into the Darrington area. They expected to take advantage of the burgeoning timber market, but also planned to benefit from a more peaceful labor scene. The Sound Timber Company, originally organized by Weyerhaeuser in 1899, and McNeeley and Anderson, both worked private lands in the Stillaguamish River valley. The Dannaher Company began timber harvest activities just north of the Darrington city limits at about the same time (Poehlman 1995:145-146).

The 7 February 1918 issue of the *Arlington Times* reported that Dannaher Camps 1 and 2 were "running full blast, the only trouble now is a shortage of [railroad] cars," and noted that "the Sound Timber Company started work last

Saturday, the bridge across the [Stillaguamish] river being completed. They are employing some 42 soldiers from Vancouver Washington who arrived on Monday" (Darrington 1918:4).

The Spruce Army

By the summer of 1918, the Sound Timber Company had sixty "Spruce Army" soldiers working in the camps (Poehlman 1995:146). At the same time, in a display that was now rare in the Northwest, loggers at the Dannaher Company #2 Camp staged a demonstration, burning their blankets and demanding "the supplying of a full set of bedding by the operators" (Wobblies 1918:1). Mr. Dannaher was known as an IWW supporter, and had, in fact, already promised Colonel Disque that the camp would supply clean bedding for the men with only a small charge for laundering (Poehlman 1995:146).

The quality of the soldiers assigned to the logging camps was apparently highly variable. A prominent timber company owner, R. W. Vinnedge, wrote "I am frank to say that if they [the last ten Spruce Army soldiers to arrive at the camp] could do no more for their country than for the logging business we would certainly have lost the war. . . . The other men were, while new to the business, mighty fine fellows and we feel greatly indebted to them" (Boswell et al. 1990:31).

The Spruce Production Division would ultimately place 27,000 soldiers in Pacific Northwest logging camps to help the industry with labor shortages, and under Colonel Disque's administration, spruce production increased from 198 million board feet in 1917 to 276 million board feet in 1918. But the increase in production was much lower than might have been expected given the amount of federal funding and attention that had been dedicated to the effort. Congressional inquiries into the expenditures of funds ended in 1919 with no evidence of corruption, "but Disque emerged from the episode with a damaged reputation" (Ficken 1987:151).

Peacetime Unease

The sudden end of World War I in November of 1918 left the timber industry reeling. The industry had become dependent on the huge wartime demands for timber, and once again, as at the start of the war, the rapid decline in the market demands caused mills and logging camps to close or greatly slow production. Adding insult to injury, the Spruce Army soldiers that had been working in western Washington logging camps were quickly discharged from their wartime duty stations and returned to civilian life. This caused a labor vacuum in the logging camps that lumbermen feared would be filled with IWW and AFL union members. The timber industry was sure that peacetime demands for lumber could not meet those of the war, and a long economic depression was predicted (Ficken 1987:153-154).

Only half of these prophecies came true. By 1919, the resurgence of the IWW and AFL came on with a vengeance, and several logging camps and mills were closed during the summer by union strikes. Although the 4Ls union remained active, it was more likely the flood of young men, recently discharged from Armed Forces duty and anxious to return to the labor market and the normalcy of peacetime work that led to a quieting on the labor front (Ficken 1987:152-160).

The dire predictions for slow local and national timber market recovery proved to be false. By 1919, the post-war timber market was booming. Prices for Douglas fir skyrocketed in the wake of the war, going from $24.89 per thousand board feet in 1919 to $34.94 per thousand board feet by 1920 (Ficken 1987:153-156). The booming timber market owed some of its success to national demands for lumber that had been on hold during the long war effort. In the midst of this burgeoning market, several logging camps in the Darrington area had to close indefinitely because of railroad car shortages (Logging Camps Closing 1920:5).

As quickly as the timber market boomed in 1919, it collapsed again in 1920. This time, the failing market conditions were caused by "reduced government spending, curtailed foreign trade and depressed farm prices" (Ficken 1987:160). Demand for lumber was further reduced by rising production costs caused by increased railroad freight charges. As stockpiled logs became less and less valuable, most of the mills in Everett closed for the winter (Clark 1970:231).

Everett as a Timber Center

By the mid-1920s, the timber market had recovered from the post World War I economic slump. Near the town of Darrington, the logging camps of Washington Spar and Lumber Company, McNeeley and Anderson, McCaughey and Leatherdale, and Klement and Kennedy were all back in business (Poehlman 1995:147). In Everett, post-war development of pulp and paper manufacturing was now on the rise, and the new mills needed a steady supply of wood. Hemlock, thought to be an inferior tree species for lumber production, was soon was in demand for its superior pulpwood characteristics (Ficken 1987:172). Douglas fir was still the preferred lumber species, and new electric mills, capable of producing more lumber faster with less labor, less waste, and less danger of fire, soon replaced most of the older wooden mills on the waterfront of Everett (Clark 1970:235-236).

In 1922, Everett was responsible for approximately 40 percent of all logs put into Puget Sound. Eight fir lumber mills, with "a combined capacity to process 1,825,000 board feet per eight hour shift, two cedar mills, with a capacity to finish 250,000 feet of cedar daily, and fourteen shingle mills, with a total capacity of producing 4,075,000 cedar shingles in an eight hour shift. A post and pole business, a telephone and telegraph creosoting plant, two box factories, and two sash and door factories" completed the list of Everett mills (Everett 1922:11).

Many of the lumbermen who had successfully weathered the post-WWI economic roller coaster came into the mid-1920s ready to take advantage of the developing pulp and veneer markets. The hard, lean times of the previous five years had thinned the number of mill and timber owners, meaning less competition and more market control for those who had survived (Ficken 1987:172).

The Founding of the Sauk River Lumber Company

In April of 1922, *The Timberman*, a Pacific Northwest timber trade journal published for the well-heeled owners and management personnel of mills and timberlands reported that

> incorporation of the Sauk River Lumber Co. with capital stock at $300,000 was recorded in articles filed the first week in April at Olympia naming Neil C. Jamison, president of the Jamison Mill Co., and A. H. B. Jordan, vice-president of the Everett Pulp and Paper Co., both of Everett, as incorporators. No announcement is made about other stockholders. Acquiring of about 400 million feet of fir, cedar and hemlock in the Sauk River valley to be entered from the end of the Northern Pacific branch at Darrington in this county has been accomplished by the new firm it is stated. Railroad construction work was announced to start some time in April. Cutting is to commence during the summer with a camp not to exceed 150 men. The logs will reach tidewater in Everett and will supply the shingle mill of Mr. Jamison and also will be offered on the open market. The government is offering about 235 million feet of timber in Sauk valley, bids on which are to be opened in Portland June 21. [New Logging Firm 1922:132]

Two of the men involved in the creation of the Sauk River Lumber Company were well known in the nearby Everett community. Neil Jamison was the Everett mill owner who, during the 1916 IWW strikes, grew tired of picketers harassing strikebreakers working in his mill and "hired a dozen thugs to keep the pickets away from his mill" (Clark 1970:180). Jamison's aggressive actions helped provoke the 1916 clash, known as the Everett Massacre, between labor and management that ended in the deaths of several men. Also involved was W. C. Butler, an independently wealthy man, president of both the Everett First National Bank and the Everett Trust and Savings Bank, and was "widely regarded as the meanest son-of-a-bitch in town" (Clark 1970:62-63).

The development of the SRLC holdings received impressive coverage. For the next seven months, articles appeared regularly in the local newspaper called the *Arlington Times*, the trade magazine *The Timberman*, and the logger and laborer newspaper entitled *Camp and Mill News*. In most cases, the verbiage and content of the articles is so similar that they appear to have been taken from a single source, suggesting that some kind of controlled information release was being practiced by the SRLC owners.

By July, these men had leveraged $400,000 towards building their logging railroad. Their initial private timber holdings were reportedly purchased from the bankrupt United States Lumber Company, and they were planning to bid on a Snoqualmie National Forest contract that would add another 235 million board feet to their holdings (Bohn and Petschek 1984:97). By August, the SRLC had about 115 men building the railroad mainline grade out of Darrington up the

Sauk River, and estimated that it would be four or five months before timber cutting could actually begin (What's Doing 1922:15).

The Sauk River Lumber Company also purchased 40 acres outside of Darrington where they intended to build "homes for its employees, desiring to employ men with families insofar as possible" (Sauk Lumber Company 1922:1). Construction was begun on a warehouse, a company office and headquarters located in the town of Darrington near where the SRLC rail would connect with the Northern Pacific's (Sauk Company Lets Contract 1922:1). By September, the *Arlington Times* reported that 30 portable bunkhouses, built on flat cars, would be moved to the first logging campsite near Dubor Creek. Each bunkhouse would be "equipped with bunks [for eight men], a stove, lavatory, and hot and cold water." The camp would also have four dining cars, two kitchens, an office, and a gravity water system and a light plant (Big Logging 1922:1).

The Forest Service Sale

At the same time that the Sauk River Lumber Company was announcing its incorporation and the acquisition of private timberland in the Darrington area in *The Timberman*, the April 6, 1922 edition of the *Arlington Times* ran the following article:

> The District Forester at Portland announces the advertisement of one of the largest blocks of national forest stumpage which has been placed on the market for several years. . . . [The sale] includes 5800 acres on the Sauk River in the Snoqualmie National Forest near Darrington. The total estimated stand is 235 million feet of Douglas fir, cedar, hemlock and

> silver fir, of which 130 million feet is Douglas fir. . . . There is enough private timber in the unit to make a total of about 400 million feet. The watershed also contains large amounts of government stumpage which will be available for future operations. The advertised prices are $2.00 per thousand feet for Douglas fir, $2.75 per million feet for cedar, $.50 per thousand feet for other species. The contact runs until 1933 and provides for periodical readjustments of price. *The placing on the market of this large body of government timber undoubtably has a direct connection with the large logging proposition that has been in process of development for several months, involving a large amount of cruising and engineering work.* The timber involved is understood to be situated in the Sauk River valley above Darrington and including at least a part of the Whitechuck watershed. The timber is considered one of the finest stands in Snohomish County and all of it except a narrow strip along the river is in the forest reserve. The opening up of this timber area will involve the building of about 15 miles of railroad, which will virtually be an extension of the Darrington branch of the Northern Pacific. It is understood that the surveys for the road have been completed. *The interests behind this project, according to people in Darrington who are familiar with same, include the Jamison Company and W.C. Butler of Everett, the later being a well-known banker. These people have acquired the Pendleton [a.k.a. United States Lumber Company] holdings adjacent to the Forest Service timber offered for sale.* [Large Block 1922:2, emphasis added].

Acknowledgement that the SRLC had won the bid for the Forest Service contract was almost tacit. No formal announcement of the contract award appears to have been published. The first reference to the contract award came in an August *Arlington Times* article, in which it was stated that "the company under its contract with the Forest Service must log about 40 million feet of timber yearly, which means the employment of a large crew" (Sauk Company Lets Contract 1922:1). With the rights to 175,000 acres of timber in the Sauk River valley secured, sources told the *Arlington Times* that the SRLC would be in operation for the next 15 to 20 years (Big Lumber 1923:3).

The Most Substantial Construction

Newspaper accounts differed in the cost of the preliminary work necessary to get the Sauk River Lumber Company operational. Whether the amount was the $500,000 reported in the April 1923 edition of the *Camp and Mill News* (What's Doing 1923:13), or the $1,000,000 reported in the 8 February 1923 edition of the *Arlington Times* (Big Lumber 1923:3), the staggering dollar figures emphasized that, by the 1920s, logging companies had to be capitalized by people with deep pockets. Not only did investors need large amounts of cash, they had to be able to wait for returns on their investment until the infrastructure was built and the company began to haul logs. Logging companies, particularly those that were relying on a private railroad for access into timbered areas, required a large amount of money just to get the grade cleared and built, the locomotives and steam donkeys purchased, and the men hired. They also had to have a direct line or a primary rail carrier to shepherd the logs to a mill, and had to have access to enough private or federal timber to justify the considerable outlay of substantial dollars before the first log ever came out of the forest. In the case of the Sauk River Lumber Company, the rail line from Darrington to the timber would be privately owned, but railcars loaded with logs would be transported into Everett via the Northern Pacific line that terminated in Darrington.

If there were any doubts about the 15 to 20 years' worth of harvest that the company was saying they would do in the area, their considerable dollar investment in the first 10 miles of railroad grade, and the logging equipment to be purchased probably laid it to rest. *The Timberman* reported that

> the road is of the most substantial construction; 66-pound rails will be used with two tie plates and rail braces. The equipment will probably consist of one ninety-ton direct connected mail line locomotive, one seventy-ton geared locomotive, four skidders . . . and two yarders. The company will install its own cars some time next year. The company does not anticipate being able to operate more than nine months out of the year owing to weather conditions in the Sauk River valley. The output will be about 250,000 [board] feet per day. [Washington Logging Roads 1922:109]

Investing in Goodwill

Turning an estimated $500,000-$1,000,000 initial investment into 20 years' worth of sustained timber yield seemed like good business in early 1923. Timber prices were good, labor costs were down, and demand for logs was steady.

Perhaps more interesting than the infrastructure investment was the investment that Jamison and his partners were making to get and keep good men as employees. Jamison and his investors were likely influenced by their earlier experiences with the IWW in Everett, and undoubtedly had been carefully scrutinizing the reported successes of other logging companies in establishing more stable workforces. Intent on starting right, several of the earliest articles about the SRLC stated that the SRLC would prefer to employ married men, and had in fact purchased land where high quality housing would be built for those men's families (Sauk Lumber Company 1922:1). It also appears that they made sure that articles emphasizing the quality and amenities of the SRLC's first camp were carried in both trade magazines, *The Timberman* and the *Camp and Mill News*, and in the local newspaper, the *Arlington Times*.

Investing in the health and happiness of one's employees was a relatively new concept in the timber industry, but the idea that married men would make the ideal workforce was about 20 years old when the SRLC began its first subtle recruitment. If the earlier IWW strikes, both walkouts and slowdowns, did nothing more they certainly proved to employers that employees' willingness to work could make or break a company.

In the earliest days of logging camps, transience was the one of the most effective means that loggers had to exert control over an exploitive system. The predictable seasonal shutdowns of logging operations also gave men an opportunity to hunt up other employment. Most railroad logging camps had to curtail logging during summers when fire danger became too high, and sometimes during winters when snow made running the locomotives difficult. If the timber market was simply too slow to warrant harvesting logs, employers often felt free to lay men off or drop wages without warning (Rajala 1989:170-171).

As employers got wise to the ways of discreet employee manipulation, several techniques were used to encourage crew loyalty and help assure the return of good men to a camp. In the days immediately following World War I, some employers offered piecework bonuses, or bonuses for staying with the firm for a prescribed length of time. A large social movement came to the camps in the early 1920s, and included establishing YMCA's on site, providing men with carefully screened reading materials, films, visiting speakers, and other wholesome types of entertainment (Rajala 1989:174).

It was during this time that the *Camp and Mill News* was established by

> the largest coastal logging firms in hopes of blurring class lines between operators and loggers. Firms supported the *Camp and Mill News*, a monthly publication with editorials, stressing the unity of interests between capital and labor, articles concerning the industry, and reports from operations throughout the region on the activities of the loggers. The tone of the magazine was one of hearty good fellowship between bosses and loggers, each contributing to and sharing in the rewards of industrial partnership. [Rajala 1989:175]

During the industry's first struggles to squelch the IWW, several Pacific Logging Congress speakers advised that married men were the answer to the labor problems being experienced in the mills and logging camps throughout the region. By cultivating the married man's desire for stability for his family, they postulated, companies could develop a more reliable and strike-resistant labor force (Rajala 1989:176).

The Sauk River Lumber Company started harvesting timber in February 1923, about eight months after it initially incorporated (Big Lumber 1923:3). Only three months later the *Arlington Times* reported that an IWW strike closed about 30 percent of the logging camps in Snohomish County, and that 40 percent of the workers had walked off the job. Despite the SRLC's emphasis on hiring married men, presumably to create a strike-resistant labor force, the Sauk River Lumber Company was one of the operations shut down by the strike.

The Long Slide

Unfortunately, early 1923 marked the post-war peak of the timber market, and a long slide in demand and prices would herald the coming crash of the Great Depression (White 1991:464). Economic downturns were nothing new to those in the timber industry. It is likely that SRLC stockholders, farsighted enough to purchase timber and timber rights for 20 to 30 years' worth of harvest, were looking at long-term returns. Even so, it must have been daunting for investors when, having just spent over $500,000 in building a state-of-the-art infrastructure, the markets began to slump.

Summary and Conclusions

County and local promoters initially expected mineral extraction to be the most lucrative industry in the eastern reaches of Snohomish County, but it was actually timber extraction that put the town of Darrington on the map. The shake and shingle industries hired loggers to harvest huge cedar trees along the banks of the Stillaguamish and Sauk rivers, split the trees into large bolts, and then float the shingle bolts downriver to the mills. In 1900, a Northern Pacific Railroad spur line was built to connect Darrington to the Puget Sound. The new rail line eliminated the need to use the river as a transportation corridor, and made the commercial harvest of the area's merchantable timber possible.

It was another 22 years before the timber market stabilized enough to make the building of a private logging railroad up the Sauk River valley seem economically feasible. In August of 1922, the Sauk River Lumber Company, with rights to about 175,000 acres of private and Forest Service timber, began building its own railroad up the valley. The company was realizing returns on that capital investment in less than eight months. How the Sauk River Lumber Company moved its camps, harvested its timber, and weathered the economic downturn of the Great Depression, the labor shortages of World War II and the increasing obsolescence of its railroad will be explored in Chapter IV.

Cultural resource managers must make expedient, informed decisions about the objects, sites, structures and buildings that they locate on the ground. To do that, a well-developed historical context for the local area and the region must be available. Determining that a specific property or an entire district is eligible for the National Register requires the resource manager to tie those properties to significant trends, patterns or events in the past in a logical way. Designating an entire district eligible for the National Register requires the additional step of discerning contributing properties from non-contributing properties. Without a thorough understanding of the history of an area, it can be difficult to identify and discriminate between these different properties.

For example, in the Sauk River valley, knowing that shingle bolt cutting was an important industry that pre-dated the Sauk River Lumber Company is crucial. Without that information, springboard-notched cedar stumps located along a crude path leading to the Sauk River's edge likely would be considered contributing elements within a SRLC-associated district. In fact, those features represent a different industry and another time period. Historic photographs can help a resource manager make those distinctions. Figure 5 clearly shows what shingle bolts look like, and the equipment and methods used to transport bolts through the woods to the river's edge. This photograph gives the resource manager a better framework and understanding of how the physical evidence of shingle bolt cutting might manifest itself on the ground.

The local history and information presented in this chapter, when combined with broader state or regional histories (as in Chapter II), gives the cultural resource manager information necessary to make defensible decisions about National Register eligibility of individual objects, sites or buildings. District nominations require that same thorough understanding, but also require the resource manager to be able to recognize sites, buildings, structures, or objects that are linked by association, function, or specific time periods. When contemplating district nomination, local and regional contexts should be further refined by developing specific information pertaining to the event, association, or time period that will ultimately be used to determine the district boundaries.

The contextual information related specifically to the Sauk River Lumber Company is presented in Chapter IV. This final refinement of the historical context provides information necessary to identify and evaluate specific properties that can be linked through their association with the Sauk River Lumber Company during its tenure in the Sauk River valley. This comprehensive historical context will also allow the cultural resource manager to determine the practicality of moving forward with the evaluation of National Register district designation.

CHAPTER IV

OVERVIEW OF SAUK RIVER LUMBER COMPANY OPERATIONS

Introduction

This chapter will discuss specific timber harvest methods and business practices used by the Sauk River Lumber Company during its 32 years in the Sauk River valley. This information, gathered during archival research and interviews with former SRLC and Forest Service employees, can also be used to determine whether SRLC-related logging remnants are eligible for listing on the National Register as individual properties, or whether the SRLC left "a significant concentration, linkage, or continuity of sites, buildings, structures, or objects" that can be identified as a district (U.S. Department of Interior, National Park Service 1997, III:9).

The Sauk River Lumber Company's activities and actions around the valley were well documented in a variety of trade and news publications during the 1920s through the 1950s. Understanding when, why and how the SRLC moved its camps and harvest areas, purchased new equipment, and tried new harvest methods leads to a better understanding of the SRLC's logging system linkages and interconnections. The well-chronicled movements and practices of the SRLC can also be used to determine if the SRLC's methods of timber harvest and extraction are comparable to those used elsewhere in the Pacific Northwest during the same time period. Coping strategies used by all timber companies during timber market downturns and recoveries can be inferred from the more general reports on timber company activities in the region.

The Sauk River Lumber Company

Between 1922 and 1952, the SRLC established a base camp and five different mobile logging camps, all connected by about 24 miles of mainline railroad. Each of the five mobile camps was constructed, used, and abandoned on a well-documented time schedule (Figure 6). This temporal stratification can help clarify the chronology of technological change in the Sauk River Lumber Company's timber harvest and logging railroad strategies.

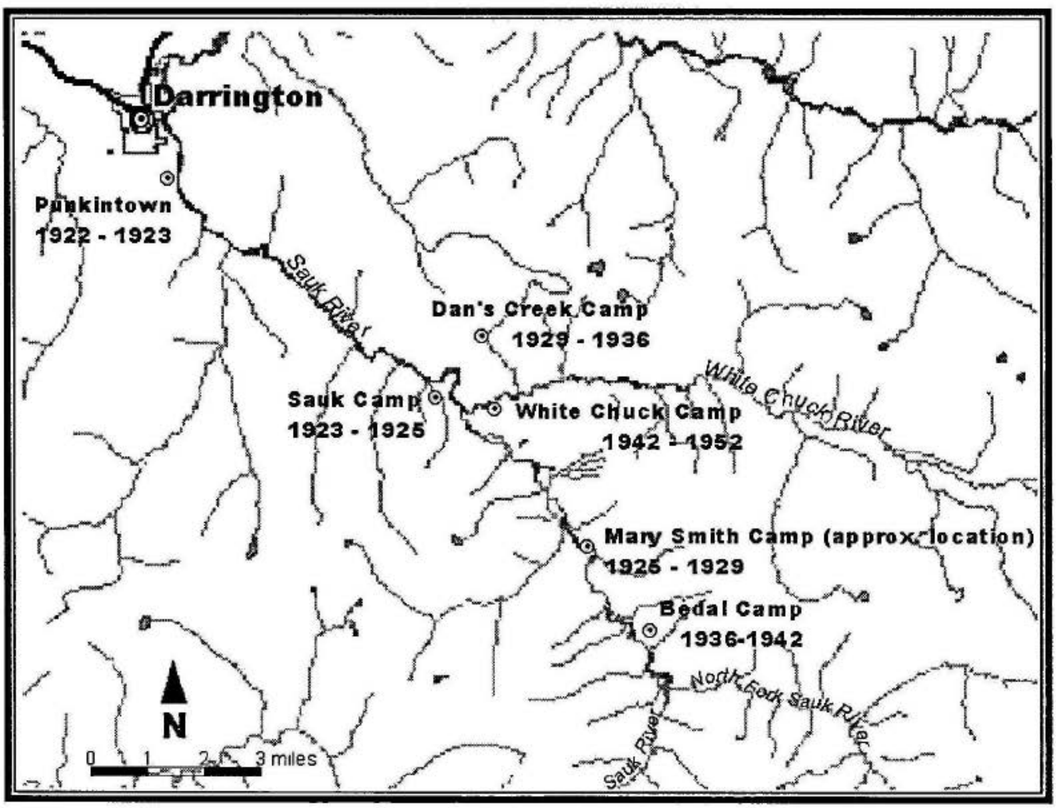

Figure 6. Location of all six of the camps built and occupied by the Sauk River Lumber Company between 1922 and 1952. Map by author.

Operations at Punkintown 1922-23

The first and only permanent camp proposed by the Sauk River Lumber Company was to be built just outside of Darrington, in an area now known as Punkintown. "The company has purchased 40 acres of land adjoining the town site, platting some into 48 lots on which cottages will be erected for employees with family. The houses will be served by a modern water and sewer system" (Big Logging 1922:1). Although an office and warehouse were quickly constructed on the site, neither the homes, nor the water or sewer systems were ever built (Poehlman 1995:147-148).

Punkintown served as the base of operations while men built the mobile bunkhouses that would be their homes in the woods. The cookhouse, the dining cars and the bunkhouses were all built on flat cars so the camp could be easily moved. By April of 1923, enough mainline grade had been completed to move all the newly constructed camp structures out to the SRLC's first logging camp.

Operations at Sauk Camp 1923-25

The new camp was located about 7 miles southeast of Punkintown, near Dubor Creek. Twenty-six portable bunkhouses, each measuring 14 x 40 feet, were moved onto spur rails just of the mainline track that ran down the middle of the camp. In this first camp, the dining cars and the cookhouse were also built to the same 14 x 40 feet specifications. Camp amenities included sewer and water systems, and an electrical system powered by a portable Delco plant. A filing shed and a storehouse were built on skids so they could be easily winched onto flatbed railcars when it came time to move camp (Sauk River Company 1923:3).

Instead of the promised permanent housing in Punkintown, SRLC provided a small gasoline-powered rail motorcar called a speeder or crummy, for the "home-guard" men to commute to and from Sauk Camp. "The speeder left [Darrington] at six each morning and returned between six and midnight each night" (Poehlman 1995:154). The speeder always left the Darrington station behind the locomotive, which would be pulling the empty cars up to the work site. The speeder usually followed the locomotive hauling the day's harvest of logs into town at the end of the day. That way, if the train or one of the cars went off the track, plenty of help was quickly at hand (Ashe 2000: personal communication).

The SRLC did provide its upper echelon with an alternative to bunkhouse living at the camps, beginning with Sauk Camp. Small family homes were built on skids, so they too could be winched onto railcars when it came time to move the camp to a new location. Although not as easy to move as the bunkhouses built on railcars, these homes provided an alternative to commuting for individuals such as the camp supervisor (Ryalls 1998: personal communication).

By 1923, the Sauk Camp crew consisted of approximately 100 men. The company had purchased enough equipment to work two harvest areas simultaneously, and had three locomotives, including one purchased specifically to move logs along the mainline into Darrington (Sauk River Company 1923:3).

The Sauk Camp was dismantled and moved further up the Sauk River to the Mary Smith Camp in 1925. The former site of Sauk Camp was subsequently used as a siding yard and as a staging area for a nearby incline that was built later in the 1920s. Oral informants also state that a SRLC night watchman, a siding yard and a sand house operated in this area from the 1930s until the late 1940s (Ryalls 1998: personal communication; Ashe 2000: personal communication).

The timber market continued its slow decline during the time the Sauk River Lumber Company occupied the Sauk Camp. Timber companies overproduced in an effort to make some money when lumber prices and new housing markets were declining. Despite the expansion of the Weeks Laws allowing timber companies' tax breaks for delaying harvest, the timber industry would continue to struggle with timber oversupply and dropping prices for the next decade.

Operations at Mary Smith Camp 1925-29

The Mary Smith Camp was so called because it was located across the Sauk River from the home of Mary Smith, a Sauk Indian, and her husband, Tommy "Josh" Smith. Mary Smith was a favorite of the SRLC loggers and Forest

Service workers, and frequently rode her horse across the river to catch a ride on the speeder or one of the locomotives. Josh Smith periodically sold tracts of timber on his property to the Sauk River Lumber Company for quick cash (Ryalls 1998: personal communication). Several logging inclines were operated on either side of the river in this area (Bates 1998: personal communication).

Northern Pacific Shipping Rates Increase

The economics of timber and lumber did not improve while Sauk River Lumber Company occupied the Mary Smith Camp. In 1925, the Northern Pacific increased its freight tariff and many logging operations in the Darrington area closed, including the Sauk River Lumber Company. The Logging and Lumber section of the *Arlington Times* reported that

> logging on the Darrington branch of the NP is particularly hard hit by the development as all ship to tidewater over that line, and thus are directly affected by the increased rate. Camps in that district suspending operation are the Sound TC, Andron, and SRLC. . . . Steps have been taken by the state department of public works to enjoin the enforcement of the new log rate. . . . Camps owning their own lines from camp to dumping grounds are not affected, of course, and the new freight rate, if sustained will place them in an especially advantageous position. [New Log Rate 1925:1]

By 1927, the local Northern Pacific agent was reporting that local log shipments were at about 80 percent of normal. In March, the Sauk River Lumber Company was shipping about 45 railroad cars a day, which was, according to the Northern Pacific agent, about normal (Logging Now 1927:1). At the same time the SRLC's logging output was returning to normal, the construction industry was slowing throughout the nation, a portent of the Great Depression. As a result, timber prices continued to fall (White 1991:464).

Operations at Dan's Creek (Black Oak) Camp 1929-36

The Sauk River Lumber Company moved their camp from Mary Smith's to Dan's Creek in 1929, after timber markets had been declining for several years and the Depression was looming. This was the only SRLC camp that was not located in the bottom of the Sauk River valley. The location of this camp is still readily identifiable because of a stand of "ratty old growth" that SRLC chose not to harvest because of its poor quality. The stand is still locatable today (Bryson 1998: personal communication).

The Depression Years

Shortly after the move to Dan's Creek, the tremors of the Great Depression began to be felt throughout the timber industry. The national per capita consumption of lumber dropped from 223 board feet in 1929 to 79 board feet in 1932, and as a result, many sawmills simply shut down. Hemlock, Douglas fir and spruce production fell as much as 60 percent during that same three year time period (Ficken 1987:174, 182-192).

At the same time timber prices were dropping during the early summer of 1929, extremely high fire danger led the Forest Service to restrict logging operations. Adopting what were called "hoot owl hours," logging companies could only harvest timber between 2 a.m. and noon. The higher humidity and cooler temperatures of those hours made it less likely that logging equipment operation would start a fire. Logging was completely suspended during July and August because the fire danger was so high.

In 1930, logging was again suspended during July through October because of the similar high fire risks (Poehlman 1995:159). In mid-October, in a continuation of the economic roller coaster, the Sauk River Lumber Company had to cancel plans to reopen Dan's Creek Camp because of a sudden $2 drop in the price of logs (Logging Off 1930:1). The SRLC, having bought or bid on large tracts of private and Forest Service land with contractually predetermined prices for the logs (also called stumpage fees), was finding that it simply could not turn a profit at the current price scale. Instead, all of the logging interests in the Puget Sound, including the SRLC, prepared for the longest suspension of logging in the history of the industry (Boswell et al. 1990:62-63). Fourteen days later, the *Arlington Times* announced that the SRLC would indeed be returning to work:

> Marking one of the sudden fluctuations to which the logging industry seems to be subject, word comes from Darrington that fallers and buckers were sent into the woods at the Sauk Lumber company camp Wednesday, and that yarding probably will be underway by Monday next. This action followed an announcement a week earlier that the machinery was to be hauled in and the camp put in mothballs until next spring. It is understood that operations will be on a 2 side scale and will continue for at least 8 weeks. This employment will be most welcome to the crew which has been idle since early July. [Work in Woods 1930:1]

Economics in the 1930s

In a November 1930 paper prepared for the Pacific Logging Congress, E. T. Clark, Supervising Engineer for the Sauk River Lumber Company, detailed the method that SRLC used to keep track of the cost of logging railroad construction costs (Clark 1930:35, 38, 42). The costs associated with constructing the railroad, including labor, bridges, additional grading work, culverts, etc. were carefully calculated by the engineer, and then the costs of manning the side was provided by the timekeeper. The equipment and operating costs were added, and then all expenses were totaled. A monthly report was prepared contrasting the costs of extraction with the amount of timber extracted and the market value. The result was a monthly itemized report that detailed whether the company was operating efficiently and at a profit.

As the managers of Sauk River Lumber Company were putting together reports showing their meager profits, the timber industry was instituting an industry-wide ten percent pay cut. W. C. Butler, one of the primary stockholders in the SRLC, wrote to his brother, N. M. Butler, that the "rank and file of the employees understand the situation clearly, and are ready and willing to accept wage reductions" (Ficken 1987:189). Apparently W. C. Butler was misinformed. Demonstrations and wildcat strikes closed mills when wage cuts were announced. The timber industry was running at 35 percent of capacity at the end of 1931, and at 19 percent the following spring. The Loyal Legion of Loggers experienced a brief resurgence in membership and influence at the bargaining table, but soon fell from favor with both workers and timber operators (Ficken 1987:189-190).

In mid-1931, the SRLC got relief from its contractual obligations with the Forest Service. President Hoover authorized the Forest Service to grant time extensions to timber harvest contractors and renegotiate the associated stumpage fees (Ficken 1987:185). These measures, coupled with the establishment of a new tariff on Canadian timber, were greeted enthusiastically by the Pacific Northwest timber industry.

The Best News Darrington has Heard

Despite the reprieve in the federal contract's timber harvest schedule and the renegotiation of Forest Service stumpage rates, the Sauk River Lumber Company did not resume operations until early September, 1932:

> The best news that Darrington has heard for a long time will be the sound of the speeder taking local men to work again next Monday morning, when the SRLC starts logging operations again after a 2 ½ year shutdown. Even a few months' work will be of great benefit to the community. A few men have already gone to work getting things in readiness to start logging. [Sauk Resumes 1932:1]

The Dan's Creek Camp soon closed for the winter, and resumed production in 1933, employing about 125 men (Poehlman 1995:160).

In 1935, the Forest Service increased the pressure on private industry to improve their forestry management techniques. Ideas about conservation, sustained yield, and selective cutting had been around for quite a few years, but had basically been ignored by the timber industry (Ficken 1987:202-203). Selective logging in particular had been theoretical only until the early 1920s, when the Forest Service began to offer special selective cut timber sales in some parts of the nation. To most timber operators, "selective cut" meant leaving the small tress, the unprofitable species of trees, or the difficult to reach trees. Using their own definition rather than the Forest Service's, most timber operators did not see, at least initially, a problem with selective cutting because the smaller, less profitable or difficult to harvest trees cost just as much or more to fall, buck and load as the big profitable trees (Crosby 1928:70).

In 1936, the Forest Service offered the Sauk River Lumber Company an opportunity to selectively cut a 200-acre tract of prime timber located near the Dan's Creek Camp. To accomplish the selective cut, the SRLC had to come up with "an entirely new method of harvesting the timber" (Unusual Selective Logging Project 1936:1).

The new method's formula for extracting the timber included two Caterpillar tractors, grudgingly purchased by the SRLC, and a skyline that took the logs up to the existing railroad (an explanation of the skyline method can be found in Chapter VI) for subsequent transportation in to Darrington. Caterpillar tractors, which in 1936 were still considered impractical and underpowered by most in the logging industry, had been introduced in the eastern Washington in the early 1930s as the "modern" solution to carefully extracting selectively cut logs. Although the method devised by SRLC to extract the timber ultimately proved uneconomical, the SRLC had, through the purchase and successful use of its Caterpillar tractors, entered into a new era of timber harvest techniques.

Shortly after completing the selective cut in 1936, the SRLC abandoned Dan's Creek Camp, and moved its Caterpillars and its bunk cars way up the Sauk River valley to the camp known as Bedal.

Operations at Bedal Camp 1936-43

By the time SRLC moved its logging camp to Bedal, located near the confluence of the North and South Forks of the Sauk River in 1936, there was a good automobile road in place. Cars could travel along the Mountain Loop Highway, from Darrington to Barlow Pass, thanks to the efforts of the Civilian Conservation Corps (further reference will be to CCC) that had been working in the area since 1933 (CCC to Continue 1937:1). The SRLC, unwilling or perhaps unable to abandon their expensive railroad investment, continued to use its locomotives, rather than trucks, to transport logs into Darrington.

Developing Caterpillar Logging

The experiment in Caterpillar logging that SRLC undertook while at Dan's Creek was adopted as a standard logging practice at Bedal. During the experimental selective cut, the SRLC was able to avoid building an $18,000 bridge by using the Caterpillars and a skyline to extract large logs (Unusual Selective Logging Project 1936:1, 10).

The SRLC was able to use an expanded fleet of Caterpillars to adopt that same "bridge avoidance" technique while logging in the Bedal area. While logging on the west side of the South Fork of the Sauk River, Caterpillars dragged harvested logs across the river, where the logs were stacked and loaded onto railcars for delivery to Darrington.

World War II Begins

The onset of the political crises in Europe and the war between Japan and China effectively shut down foreign exports of timber in 1937. The pulp industry was the sole moneymaker in the market, mainly because specially processed pulp, used to create rayon fabric, was in high demand. "These [pulp] plants benefited from the rapid expansion of the Japanese rayon industry during the 1930s and from the dependence of that industry on imported pulp" (Ficken 1987:216). Ironically, part of the demand was attributable to the increasing production of Japanese military uniforms, which were made from rayon.

In 1939, United States' lumbermen responded to the beginning of World War II with outrage over the lost and disrupted foreign timber markets. Concerned with the impacts that a war would have with timber demand world wide, spokesmen for the timber industry urged the United States to stay out of the fray. The popular timbermen's press took the stance that "United States' participation [in the war] would necessitate the termination of normal civilian business activity and therefore be 'a national catastrophe'" (Ficken 1987:223).

Even before December 7, 1941, the Roosevelt Administration was gearing up for national defense. Mills and logging camps were operating at full capacity by the time the United States entered the war, and "three-fifths of production was directed toward the defense effort" (Ficken 1987:224). Timber demands ranged from milled lumber to wood cellulose needed for explosives. Other wood products, such as nitroglycerine, turpentine, and rosin were essential for the war effort. A 1940 Forest Service report estimated that it would take three trees to outfit each American soldier (Steen 1991:246-247).

Operations at White Chuck Camp 1943-52

Although automobiles were able to reach the SRLC's Bedal Camp by 1936 via the CCC-built Mountain Loop Highway, it wasn't until 1943 that the company began the transition to truck logging.

When the SRLC was moving from Bedal to White Chuck Camp, it was also building truck roads to go back into the area that had been selectively logged in 1936. Many of the trees in that 200-acre plot of "exceptionally fine timber including fir, hemlock and cedar" had blown down (Unusual Selective Logging Project 1936:1), and the Sauk River Lumber Company, equipped with a full force of Caterpillars and trucks, and inexpensive to build truck roads, was able to go in and clear-cut that area (Ashe 2000: personal communication).

The End of an Era

By 1944, only 17 percent of wage earners in the state of Washington were employed in the timber industry, a significant change from the 46 percent who were employed by logging and mill operations in 1939. The rapid influx of manufacturing-based industry into the Pacific Northwest changed the industrial and political dynamics of the area forever. Never again would the timber industry dominate the economic scheme of the region (Ficken 1987:223-225).

The Sauk River Lumber Company continued to work out of the White Chuck Camp until 1952, when it moved its offices to Darrington for a final two years in the Sauk River valley. In 1954, Simpson Logging Company bought out the SRLC and moved the more modern equipment to Skykomish. Some SRLC workers moved with Simpson, but many chose to stay in Darrington (Ryalls 1998: personal communication).

Summary and Conclusions

When the CCC finished that first rough road from Darrington to Barlow Pass in the early 1930s, it was the beginning of the end for the Sauk River Lumber Company. For almost 20 years, the company had owned the only transportation system capable of hauling logs out of the Sauk River valley, and that monopoly allowed them access to private and federal timber reserves that might otherwise have been put out for competitive bid. In the wake of World War II, with the increased strength and capabilities of the internal combustion engine and the relatively inexpensive cost of putting in roads for trucks to travel on, the locomotive, and thus the SRLC logging railroad, became obsolete.

Prior to its demise, however, the Sauk River Lumber Company ran a logging railroad that was efficient and cost effective. The company took care of its employees, invested in high-quality equipment and expected its employees to take good care of it. Details about the railroad logging equipment and construction methods used by lumber companies to get men and equipment in to a harvest area, and carry trees out, are described in the next chapter.

Contextual information related specifically to the Sauk River Lumber Company is the final refinement in the historic context. This detailed framework makes it possible to begin identifying and evaluating the National Register eligibility of specific SRLC-related properties, and identifying the linkages between them for district consideration.

It is clear that advances in logging equipment technology changed how timber harvest areas were accessed and harvested. Understanding the historical timeframes of this change generally, and for the SRLC specifically, can make the identification of changing logging techniques possible, and aid in the development hypotheses about harvest area chronologies. When designing and implementing cultural resource management strategies, it is the ability to connect what is historically known about an area with what is found on and in the ground that leads to effective deliberation about the National Register eligibility of individual sites or districts.

For example, knowing that the SRLC used a fleet of Caterpillars to log the area west of Bedal Camp should impact the survey strategies used for identifying SRLC remnants in that vicinity. The historic information reveals that railroad spur lines were not used to harvest timber on the west side of the river. Instead, Caterpillars dragged logs across the river to the railroad mainline for loading. The astute investigator will now look for road remnants, likely located in shallow parts of the South Fork of the Sauk River, where Caterpillars would have cut into the river banks while crossing the river. Not knowing that the Sauk River Lumber Company adopted this timber harvest strategy in this area could lead to missed or poorly understood sites, objects, or features.

The newspaper articles cited in this chapter clearly show that the SRLC's activities and responses to economic changes were typical of other logging companies also working in the area. In the following chapters, further evidence that the SRLC's methods of timber harvest and extraction were comparable to those of other Pacific Northwest timber companies will be presented.

CHAPTER V

LOGGING RAILROAD EQUIPMENT AND CONSTRUCTION METHODS

Introduction

The previously presented historic context (Chapters II and III), coupled with the SRLC's well-documented chronology of business and timber harvest practices, campsite locations and movements through the valley (Chapter IV), clearly links the SRLC to historic trends in timber extraction. Cultural resource managers with access to this type of detailed historic context can more easily understand how a particular property (or group of properties) relates to a particular time period, and reflects aspects of history that are important or representational, a critical component to evaluating properties for their eligibility for listing on the National Register (U.S. Department of Interior, National Park Service 1997).

For a property to qualify for the National Register, it must also be significant, and have integrity. Significance is defined as the ability of a property to reflect its importance through association, physical characteristics, or yield important information, and integrity is characterized as the ability of a property to illustrate significant aspects of its past (U.S. Department of Interior, National Park Service 2002). National Register Criteria for Evaluation have been developed to assess the integrity and significance of objects, structures, buildings, sites and districts, and can be found in Appendix B.

The use of historic photographs is particularly useful when assessing the integrity of a particular site. National Register eligible properties must retain their integrity through original location, design, setting, materials, workmanship, feeling and association, and historic photographs allow the resource manager to make comparisons between the original structure or site and how the property looks today. Using this technique, the integrity of the property often becomes immediately obvious. An added bonus is that representative historic photographs often reveal associated components that the perceptive investigator can then use to locate additional components on the ground.

No discussion about railroad logging can take place without a basic understanding of the essential equipment required to power the different elements of railroad logging operations, from training logs to town to providing men in camp with hot water for laundry or showers. Powerful locomotives and steam donkeys formed the hub of early logging operations.

The Locomotives

Locomotives were essential to almost every aspect of building, maintaining, and transporting a timber company's products, people and essential supplies. Over the course of operations in the Sauk River valley, the SRLC owned eight locomotives, including a single rod-driven (direct drive) locomotive and seven geared locomotives, ultimately selling or scrapping them all (Table 1). This pattern of engine ownership and exchange was fairly typical

Table 1. Sauk River Lumber Company locomotives, showing length of service (adapted from information in Hubert and McAbee 1996:20).

SRLC Roster Number/ Type of Locomotive		Darrington 1922-23	Sauk Camp 1923-26	Mary Smith Camp 1926-29	Dans Creek Camp 1929-36	Bedal Camp 1936-42	White Chuck Camp 1942-52	Darrington 1952-54
#10 **4-8-0 Brooks direct drive**	Built in 1898 →	Purchased used sometime prior to April 1923 →	→	→	→	Date sold is unknown, but prior to 1946 the #22 Shay (a geared locomotive) took over the mainline		
#12 **42 Ton, 2 truck Shay**	Built in 1910 →	Purchased used sometime prior to April 1923 →	→	→	→	Scrapped by SRLC in November 1939		
#21 **65 Ton, 3 truck Shay**	Built in 1907 →	Purchased used sometime prior to April 1923 →	→	Date sold is unknown. Changed ownership 5 times after SRLC sold. Scrapped in 1936 by a subsequent owner.				
#22 **90 Ton, 3 truck Shay**			Purchased new in June 1925 →	→ *At some point prior to 1946, the #22 Shay began serving the mainline.*	→	→	Date sold is unknown. Changed ownership twice after SRLC sold. Scrapped in 1952 by a subsequent owner.	
#23 **90 Ton, 3 truck Willamette**			Purchased New in March 1926 →	→ *Prior to 1946, the Willamette worked as a woods switcher.*	→	→ *After 1946, the Willamette worked the mainline.*	→	Scrapped by SRLC in the late 1940s – early 1950s
#2 **60 Ton, 2 truck Shay**	Built in 1910 →	→	→	Purchased used in April1928 →	→	Scrapped by SRLC in November 1939		
#Unknown **60 Ton, 2 truck Shay**	Built in 1912 →	→	→	→	→	Purchased used in September 1939	*This engine was assigned to the steel gang for most of its tenure with the SRLC* →	Date sold or scrapped is unknown.
#2 **70 Ton, 3 truck Shay**	Built in 1920 →	→	→	→	→	→	Purchased used in February 1948 →	Date sold or scrapped is unknown.

for railroad logging companies (Beauter 1926:70). An overview of the types of locomotives used generally by Pacific Northwest logging companies and specifically by the SRLC is provided here.

Rod Locomotives

Rod or direct drive locomotives were often employed by logging companies to provide efficient and fast transportation of logs from woods to town along well-built mainline track. The mechanics of rod engines caused rail pressure to increase and decrease with the speed of the engine, creating a "hammer-blow" effect that could damage less than optimally built track (Kittle 1926:68-69). Because mainline track provided the essential artery used to carry long and heavy loads from the woods to town, it behooved logging companies to spend extra money beefing up this part of the system. By using heavier rail, ballasted grade and gradual turns, companies could limit track maintenance, decrease the dangers of high-speed derailments, and use a faster locomotive (Bohn and Petschek 1984:22-23).

The Sauk River Lumber Company was clearly constructing the first eight miles of mainline grade to high standards. Shortly after the SRLC's grade building commenced, *The Timberman* reported that "the road is of the most substantial construction; 66-pound rails will be used with two tie plates and rail braces" (Washington Logging Roads 1922:109).

A Brooks rod engine was purchased by the Sauk River Lumber Company to move the big timber into Darrington along that substantial mainline (Figure 7). In the spring of 1923, the *Arlington Times* reported that the "large direct-connected engine . . . will be used on the [SRLC] mainline as soon as the roadbed is sufficiently perfected" (Sauk River Company 1923:3). This locomotive was purchased used and served the SRLC mainline for a time, but mainline service was eventually taken over by geared engines (Bates 1998: personal communication; Ryalls 1998: personal communication).

Note: This image has been redacted due to copyright concerns.

Figure 7. This Brooks direct-drive locomotive was already 25 years old when it was purchased by the SRLC in 1923. The gentle grade of the Sauk River Lumber Company's mainline allowed for the use of a rod engine, but this engine was soon replaced with newer geared engines. Source: Southern Iron and Equipment Collection, Smithsonian Institution National Museum of American History, Washington, D.C.

Geared Locomotives

Slower moving geared locomotives were commonly used to move timber from harvest area to mainline grade. Geared locomotives could handle steeper grades, rougher track, tighter turns, and had greater holding power on hills. Out in the woods, turning facilities were an unwarranted expense, so geared locomotives were designed to transport heavy loads efficiently both pulling and pushing, whether in reverse or forward gear. Because of this, geared locomotives were usually equipped with couplers, lights and sanders to run in either direction (Donovan 1910:35).

By the early 1920s, three types of geared locomotives had been developed. The Shay, the Climax and the Heisler all shared the ability to safely negotiate steep curves on hastily made rail beds and uneven rail, and were able to haul large loads up steep grades that would have defeated more conventional rod engines (Turner 1990:57).

Shay locomotives. The Shay locomotive was developed by a lumberman in Michigan in about 1880, and by 1882 the Lima Locomotive Works had bought the rights to mass produce these slow moving rugged machines (Bohn and Petschek 1984:21). The distinctive design of the Shay, with its geared drive system and shorter wheelbase, enabled these locomotives to negotiate turns as tight as 100 feet in radius, and grades up to 14 percent (Turner 1990:58). Although not known for their ability to travel quickly, Shay engines were particularly noted for their reliability and ease of repair. The exposed cylinders, located on the right side of the boiler, were connected by universal joints and sliding shafts to a crankshaft which powered a pair of trucks. The already highly tractive power of these trucks was enhanced when water and fuel supplies were carried directly over the powered trucks, as opposed to the fuel and water tenders typically pulled behind rod engines. The exposed engine and drive train of the Shay also made the engines easier to work on and repair in the woods. When hauling heavy loads, the Shay's ability to move slowly was considered an asset, especially when the threat of derailment loomed because of less than ideally built grade or sub-weight rail. Derailment was much safer when the engine or the load came off the track at slow speeds (Kittle 1926:68-69).

Shays were manufactured in many sizes, from small two cylinder two truck models weighing 40-50 tons to large three truck engines weighing upwards of 90 tons (Figure 8).

Note: This image has been redacted due to copyright concerns.

Figure 8. This 90-ton three truck Shay from Lima Locomotive Works was purchased new by SRLC in June 1925. Lima posted the construction number and initials of the purchaser in the upper left-hand corner of each photo. Arrows indicate the location of the trucks. Source: Lima Locomotive Works collection, California State Railroad Museum, Sacramento, California.

The Pacific Coast Shay made its first appearance in 1927. This Lima Locomotive engine was built specifically to meet the demands of West Coast timber harvest with a beefed-up frame, boiler and drive mechanisms. The boiler and firebox were mounted on a separate frame, isolating them from destructive engine vibrations (Turner 1990:63).

The Willamette Iron and Steel Works locomotives. The Willamette Iron and Steel Works moved from building steam ships and steam donkeys (in their simplest form, steam powered winch systems) into the production of geared steam locomotives in the 1920s. After performing major repairs on Shay engines for years, the Willamette Iron and Steel Works was able to identify design flaws of the Shay and build a very similar locomotive that incorporated new technology and improved on the Shay design. The Willamette Iron and Steel Works built only thirty-three locomotives; the Sauk River Lumber Company purchased a new ninety-ton three truck geared Willamette locomotive in 1926 (Bohn and Petschek 1984:100-101) (Figure 9).

After replacing the direct-drive Brooks locomotive and serving on the mainline for a number of years, the Willamette locomotive was scrapped by the SRLC in the 1940s (Hubert and McAbee 1996:20).

Note: This image has been redacted due to copyright concerns.

Figure 9. This 90-ton three truck Willamette geared engine was purchased by SRLC in 1926. This was the 22nd of the 33 engines that came off the Willamette production lines. Source: Darius Kinsey Collection, Photo Number 13468, Whatcom County Museum of History and Art, Bellingham, Washington.

The Sauk River Lumber Company's Locomotives

The SRLC owned eight different locomotives during its 50 years of operation, and all but one of them was geared (Table 2). All of SRLC's locomotives used fuel oil exclusively, as opposed to being wood or coal fired. An *Arlington Times* article explained that "a large storage plant for this fuel has been established at Darrington. Mr. Gilson, [SRLC] manager, states that oil is not only an efficient fuel but also greatly minimizes fire risks" (Sauk River Company 1923:3).

Table 2. Sauk River Lumber Company Locomotive Roster (adapted from Hubert and McAbee 1996:20).

SRLC Locomotive Roster Number	Type of Locomotive	Date Built	Manufacturer's Construction Number	Date Purchased by SRLC	Date Sold or Scrapped
10	4-8-0 Brooks direct drive	August 1898	3011	Purchased used sometime prior to April 1923	Unknown, but at some point a geared engine took over the mainline service.
12	42 Ton, 2 truck Shay	Februar y 1910	2278	Purchased used sometime prior to April 1923	November 1939
21	65 Ton, 3 truck Shay	January 1907	1810	Purchased used sometime prior to April 1923	Scrapped in 1936 by a subsequent owner.
22	90 Ton, 3 truck Shay	June 1925	3282	Purchased new in 1925	Sold at unknown date to Victoria Lumber and Mfg. Co.
23	90 Ton, 3 truck Willamette	March 1926	22	Purchased new in 1926	Scrapped in the 1940s
2	60 Ton, 2 truck Shay	January 1910	2266	April 1928	Scrapped November 1939
Unknown	60 Ton, 2 truck Shay	October 1912	2597	September 1939	Unknown
2	70 Ton, 3 truck Shay	Februar y 1920	3053	February 1948	Unknown

Steam Donkeys

Early steam donkeys (also called donkey engines) hauled, winched or dragged logs down skid roads, replacing the horses and oxen that had previously done that work. Later, steam donkeys supplied the power required to move, load and unload logs, to move heavy construction materials, and to delicately maneuver a spar tree into place. The best description of steam donkeys in supplied by Turner (1990:150):

> In its simplest forms, the donkey engine comprised a small vertical boiler which supplied steam to a single-cylinder steam engine which drove a winch. The early machines often had the spool of the winch mounted vertically (a vertical windlass or capstan). . . . Soon a larger, powered drum, mounted horizontally . . . became standard and this type [of engine] evolved into multi-drum machines.

As steam donkeys became more powerful, they turned into multi-engined machines that ran loaders, yarders and skidders. Steam donkeys supplied the power to operate inclines, and could winch themselves and other equipment to new locations. Depending on the work the donkey would do, it might be mounted on a sled made from large timbers, or affixed to a railroad car.

Building sleds for steam donkey engines was a critical task. Because of the lack of standardization and the ever-increasing size and power of steam engines, sled builders had to be able to calculate stress areas and select the appropriate logs and hardware.

> The sled without a doubt is one of the most important items in donkey sled maintenance. It must be rugged enough to carry the engine over the roughest ground and to afford a firm foundation under all conditions. Instances are on record where donkeys have made journeys of 13 miles under their own power. [Building Sleds 1921:36]

Building a donkey sled required

> two men with good axe and saw skills. . . . We used two logs at least 50 feet in length [and four feet thick]. First, we beveled the ends so the sled could slip over small logs and other bumps encountered in moving the

> heavy, powerful machine. These two logs were placed at the proper distance from each other and tied together with cross-pieces fastened in with iron bolts about two inches in diameter. We mortised all cross members into the logs. All the nuts were counter sunk. The crosspieces were close enough together that extra equipment could be carried on the donkey sled when being moved. Our sled was so solidly put together that a cable attached to one runner could move the entire machine and it would last many years of stress and hard usage. The engine frame was mortised into the sled and bolted down. The fair lead on the front end was likewise fastened. The sled carried three drums for spooling the three cables used in moving the sled. [Brunson 1998:68]

The sled runners were usually selected from prime four to six foot diameter logs. To facilitate moving the donkey onto a railcar, wooden runners were generally limited to the 40-41 foot length of standard railcars. Moving donkeys mounted on longer sleds required connecting two flat cars; the extra length made it difficult to transport the longer machines into areas served by spur lines with tight turns and rough track (Building Sleds 1921:36). In some cases, donkeys winched themselves and other equipment across country, into new logging areas (Figure 10).

It might take three or four weeks to complete a sled and mount the donkey on it. An average 41-foot sled made with six-foot log runners and having standard cross braces and reaches might scale 25,000 board feet. In 1921, the cost of a completed sled was approximately $1000 to $1200, including the logs, hardware, and the labor of three men (Building Sleds 1921:36).

The size of the sled depended on the work the engine would be doing, and was based on the number of drums that were going to be on board. Yarders,

Note: This image has been redacted due to copyright concerns.

Figure 10. This steam donkey is mounted on a wooden sled, and is winching itself to a new work area. Source: Darius Kinsey Collection, Photo Number 10076, Whatcom County Museum of Art and History, Bellingham, Washington.

loaders and skidders were all vital to timber harvest operations, and required steam donkeys for power. Detailed descriptions of yarders, loaders, skidder and other timber harvest equipment can be found in Chapter VI.

Water Supply

A constant water supply was necessary to keep steam equipment running. When harvest occurred in or near the valley bottoms, rivers and creeks could provide easy access to the necessary supply. But as harvest areas and camps moved further up into the more rugged terrain and away from accessible water, problems with water supply needed to be addressed.

If water was nearby, gravity-fed systems were created by positioning a pipe in a flowing water source. Mechanical systems involving head pipes, storage tanks, and pumps were often devised to deal with water needs as logging operations got more sophisticated and demand increased at active cutting areas and in camp (Stamm 1922:39).

For the locomotives, water was collected in elevated tanks that were located alongside the track. The locomotives would pull up beside the tank, pull down a retractable waterspout and fill up with water for the next part of the run. Tanks were located close to a reliable water supply along the mainline routes and in established camps. In many cases, water was placed so that locomotives could "water up" prior to an adverse haul. Although logging engineers tried their best to avoid building increases in grade on the way out of the woods (adverse haul), in many cases the extreme topography of the area did not allow for a downhill grade all the way from woods to terminal. Tanker cars were also used to re-supply locomotives and other steam-driven equipment if there was no nearby water source.

Fuel

All of the Sauk River Lumber Company locomotives, steam donkeys and other equipment ran on fuel oil. Equipment that needed wood or coal could create sparks that would set the woods, or the camp, afire. By 1922, when the Sauk River Lumber Company began to acquire equipment, petroleum was the favored fuel. A storage plant was built in Darrington, and SRLC delivered fuel oil to its camps and equipment via tank cars and barrels.

Making the Grade

Steam donkeys and locomotives were essential to logging operations, and represented large investments of capital. But it was actually railroad construction, the planning and building of grade, the laying of ties and track, and the building of bridges that represented the greatest capital outlay for logging companies (Freydig 1930:46, 48-49). Maintenance of both spur and mainline track was a constant monetary burden. Because logging could not commence until grade was built, the costs of grade building costs could precede the delivery of logs to the mill by months or even years.

Differences in topography, planning methods and equipment led to huge variations in the cost of grade from company to company, and from timber harvest area to timber harvest area. In 1930, one company estimated that building a mile of spur rail line for a logging operation cost a minimum of $3000; adding the cost of ties and rails would elevate that to $8000. Adding in cut and fill, culverts, trestles, bridges, ballasting, or other features would cost even more (Freydig 1930:46).

The variability of railroad grade construction costs and the margin of profit is perhaps best summed up by an exchange between two Pacific Logging

Congress members following a paper on the construction and operation of logging railroads (Surveying 1924:25):

> Mr. Meister: How many million [board] feet of timber per mile of track and bridges do you get?
>
> Mr. Powers: We will probably get 30 or 40 million [board feet] to the mile.
>
> Mr. Meister: We get three.

In some areas, timber was used as fill along railroad grades, because in many cases the timber was considered "cheaper than dirt" (Chunking 1926:51). In areas not requiring fill, timber was often cut into short sections and pushed, pulled, or buried to get it out of the way of the railroad right-of-way.

Culverts needed to be carefully placed and of adequate size to prevent the undermining of fill areas. In areas with exceptionally unstable soils, fills might be anchored using cable tied to stumps, or by driving pilings into the soil to stabilize it. In extreme cases, where soils were particularly prone to sliding, the underlying rock could be drilled and shot, breaking up the bedrock to help alleviate soil movement (Kline 1923:44).

Logging Railroad Construction

> The fitting of railroad lines to the rough topography where most logging is now being done is an entirely more complicated matter. It involves not only securing a line which can be constructed at the least cost but which will at the same time give a low operating cost and also be fitted to the particular logging systems used by the company.
>
> —Russell Mills, Use and Abuse of Logging Railroad Inclines

Logging railroad construction methods depended greatly on the type of locomotive that would be using the grade, the speed at which the locomotive would be operating, the number of months or years that the grade would actually be in use, and the economic parameters set by the timber company. Many of the hard-and-fast engineering rules developed by commercial rail lines regarding minimum curves, rail weight and ballasting were quickly discarded by logging engineers, as the slow moving, extremely heavy loads proved to put entirely different stresses on rail and grade. For example, fast running commercial rail lines were often built with tolerances well below those routinely used to put in a logging rail line. While a 12-degree curve was considered the maximum on a commercial line, curves of 48 degrees were used with no problem on lines for geared locomotives. Third rails were used by logging engineers on curves over 36 degrees to insure the inside wheel flanges stayed on the rail (Clark 1925:51-52).

Ideally, grade needed to be smooth finished, well drained, and completed six to 12 months in advance so that it could settle. Fills needed to be made enough above grade that they would settle at grade level. This was especially true with side hill cut and fill. A well-constructed and well-seasoned grade could often be used without gravel or other ballast for temporary work, such as that of a spur line (Clark 1925:51).

Finding routes that had a consistent and low grade was paramount for railroad engineers laying out rail lines. Laying out a route that required a minimal amount of earth moving or trestle building was equally important. In some cases, low trestlework or cribbing was used instead of earth fill work.

The logging engineer also had to communicate with the logging superintendent about potential problems with harvest units, design water systems and camp power plants, work out skidder settings, lay out incline projects, and assist with new machine purchase decisions (Clark 1930:38).

Fast and furious grade building could end up costing the company much more in long-term maintenance and operations. As early as 1923, railroad logging engineers were saying that 25 foot contour scale topographic maps were essential to plan a new timber harvest area and the railroad grade necessary to access it (Van Orsdel 1923:42-43). Avoiding even one percent of additional grade could save the company a huge amount of money over the life of the grade (Table 3).

Table 3. Cost of hauling 1000 board feet of logs over one mile of average logging railroad grade (adapted from Van Orsdel 1923:43).

Grade	Cost
Level	$0.014
One percent	$0.024
Two percent	$0.031
Three percent	$0.037
Four percent	$0.043
Five percent	$0.051
Six percent	$0.061

Mainline

Almost all railroad logging companies built their permanent main line to higher specifications than those used for branch or spur lines. Because the main line was the main corridor used to carry long and heavy loads from woods to town, heavier rail, ballasted grade, gradual turns and frequent maintenance were necessary to make sure that the track stayed in place and in good shape. Although intense construction and maintenance was terrifically expensive, employing these techniques kept rail creep and movement to a minimum, helping assure that loaded cars did not derail and trains could travel as quickly and safely as possible.

Rail weight is expressed in the rail's weight per foot. Most transcontinental railways use much heavier rail than logging companies did. The Sauk River Lumber Company used 66-pound rail (that is, one foot of rail weighed 66 pounds) on its mainline, with spur lines using 46-56 pound rails (Adams 1961:259).

Good ballast consisted of crushed rock or gravel, and special cars were used to receive and deliver ballast to specific sections of track. Some companies spent considerable time and money in tamping dirt in between rails as ballast, but "the first few rains prove the fallacy of this practice. Dirt will not hold a track" (Kline 1923:43).

The Sauk River Lumber Company initially built about 10 miles of mainline railroad grade to access its timber holdings (New Logging Firm 1922:132), and used a Brooks direct-drive rod locomotive to take their trains of logs from the woods to the Northern Pacific branch in Darrington (Hubert and McAbee 1996:20). The mainline grade was built and maintained to much higher standards than SRLC spur rail lines because of the long term heavy use the grade received, and because the rod locomotive and trains of large logs had much less tolerance for sharp curves and rough track (Kittle 1926:68-69).

Branch and Spur Lines

Branch and spur lines were built to provide men and equipment temporary access into harvest areas. The transitory nature of spur lines meant that less attention was paid to the overall elevation gain and to the costly and time-consuming process of grade hardening or ballasting. Tie spacing could also be increased, provided that the ties were spaced close enough so that cars loaded with logs could be safely carried. The speeds reached on these lines were low, usually a maximum of 13-15 mph, with 9-11 mph preferable (Clark 1925:174), and the geared locomotives, with their high tolerances for steeper grades, rougher trackage and tighter turns were able to maintain those slow speeds more safely and efficiently than any rod-driven locomotive could (Kittle 1926:68).

Building Grade

Steam shovels were used to create railroad grade, regularly working well ahead of the timber fallers (Figure 11).

Note: This image has been redacted due to copyright concerns.

Figure 11. This SRLC-owned Bucyrus shovel is building railroad grade. The wooden mats that the shovel has under its treads and attached to the boom kept the shovel from becoming mired in soft fill and helped compact the grade (Labbe and Carranco 2001:132). Source: Darius Kinsey Collection, Photo Number 14270, Whatcom County Museum of Art and History, Bellingham, Washington.

The shovels were usually mounted on Caterpillar tracks, so they could move independently ahead of the tracklayers, but sometimes they were mounted on flatbed cars and moved to borrow sites, transported via the rail lines. The earth-moving part of the job was seen as the major task of steam shovels, and larger timber companies often felt it much more economical to use the steam shovel only for that task. If that was the case, small steam donkeys, dynamite, and drag lines were used to clear ("chunk out") the proposed railroad grade of rock and standing timber. Smaller companies often had to use their shovels to accomplish both the chunking out and cut and fill tasks, pulling, pushing, hoisting and burying timber to get it out of the way (Chunking 1926:51).

The process of chunking out was usually done with a steam donkey crew, prior to the arrival of the dirt-moving steam shovel:

> There are three real reasons for [having a steam donkey crew chunk out railroad grade]. One reason is it saves time for your shovel; your shovel will get over more ground and more road will be built if the chunking out is done ahead. . . . The second reason is, it saves the [steam shovel] machine itself. Nothing is as hard on the average shovel as the chunking out it does. The operator is more liable to wrench and break booms. And the third reason is he saves timber. My observation has been in the work where the shovel does the chunking out, that the timber is usually cut shorter and frequently is covered up by the fills, due to the fact they can't get the timber out of the way. [Chunking 1926:51]

Burying timber in fill areas was not necessarily an accidental occurrence. In many cases, burying timber was more expedient than bringing in fill dirt from somewhere else. Some companies routinely followed "the policy of burying 80 percent of the logs. We figure that is cheaper than dirt" (Chunking 1926:51).

Two other methods could be utilized to bring fill into grade construction areas. In the first, a borrow source could be located, a railroad grade built to it, track laid, and a steam shovel, engine and ballast cars used to extract and transport the material to the fill area. Moving full ballast cars to the fill site meant that track had to be laid well in advance of actual operation of the line. Most companies resisted these advanced efforts because the outlay of labor and materials prior to actual timber extraction was so uneconomical. In the second method, borrowing occurred from the immediate area alongside the track. A shovel would simply dig out fill from the area alongside the right-of-way and place it in the fill area.

When material needed to be removed from the right-of-way (called a "cut"), costs could be high unless there was a fill area nearby that needed the material. Hauling cut material away could require advanced grade construction and associated labor costs just as fill areas did, with the same negative impacts on the economic bottom line.

Most grade building was done by machine. By 1926, building grade by hand was deemed economical only if the section to be built was short and the steam shovel was otherwise occupied (Hand 1926:52). Logging engineers were responsible for laying out rail lines that were both economical to build and provided efficient transport of men, equipment and timber. Profitable routes minimized the need for bridges and trestlework, minimized the strain on equipment by maintaining even and predictable grades, and tied in efficiently with already-existing spur and mainline routes. Water requirements of equipment also needed to be addressed, and pump systems were devised to deliver that water to working equipment. The quality of the grade and track was often dictated by the amount of timber that was to be extracted and the amount of time the section of grade was expected to be in use. Access routes into small pockets of timber were necessarily built much more expediently than routes that would be expected to provide mainline timber transport for years to come.

Bridges and Trestles

As with other facets of railroad construction, the amount of timber expected to travel across a bridge often determined the complexity and permanence of the span that was eventually built. Inexpensive and expedient bridges could be built with local materials to adequately serve spur lines, but often more permanent structures were constructed on mainline or branch lines. Bridges or trestlework resulted if the proposed railroad route

> crossed a stream, canyon, depression, or swamp too large to be taken care of by a culvert; where fills are too deep or too long or where the earth is not available while trees are. In swampy places the first cost of a pile driven bridge is less than an earth fill. No shooting of stumps [with dynamite was] necessary. Bridges are temporary structures and subject to fire danger during the dry season. [Stamm 1917:52]

The decision to use one bridge construction method over another often depended on required length of the span, the slope, the angle of approach and the soil depth and type. Other factors included the type and amount of timber available for construction, water availability at the site for the steam equipment, and the permanence of the bridge. A combination of bridging methods might also be used, depending on the topography of the area (Baker 1917:52-53).

Cribbed Bridges

Cribbed bridges were used when timbers, especially smaller logs, were almost valueless (Figure 12). This type of bridge could be rapidly constructed with logs from trees located in or near the right-of-way, and were often used on spur lines. There appears to have been no limitation regarding the span lengths that could be constructed using this type of bridge; the only limits were having access to the necessary timber and cheap labor. Usually the builders notched or used cable to hold these bridges together so the timber could be salvaged later when the spur and track were decommissioned (Labbe and Carranco 2001:42).

> The cribbed bridge is not used so much as formerly, partly on account of the increased value of stumpage [logs], partly on account of fire risk, and partly because the head skidder who used to build these for us is hard to find in the modern methods of logging. [O'Hearne 1923:41]

Note: This image has been redacted due to copyright concerns.

Figure 12. A cribbed bridge fills a deep drainage. Source: Darius Kinsey Collection, Photo Number 10708, Whatcom County Museum of Art and History, Bellingham, Washington.

Stringer Bridges

Stringer bridges were the most expedient to build and were only used for short spans. These bridges were commonly used in the 1920s, and were considered very economical (Figure 13).

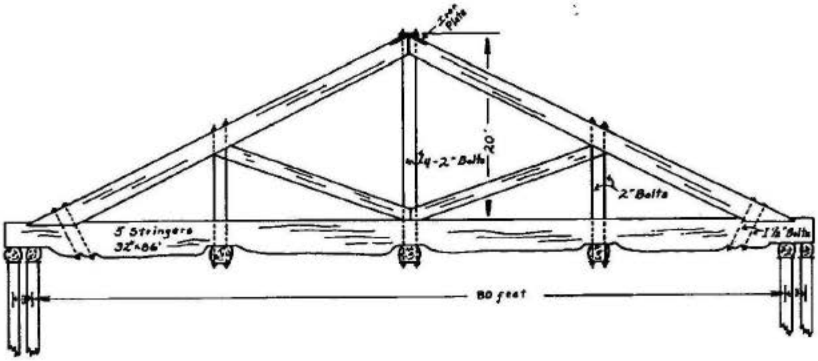

Figure 13. An expedient stringer bridge was designed to provide maximum strength for a minimum of cost. Source: O'Hearne 1923:41.

Stringer bridges required little equipment to construct, other than a steam donkey to move and maneuver the logs. The strength, length and quality of the local timber often allowed engineers to design and build bridges with "spans of up to 60 or 80 feet . . . using practically nothing but large stringers" (O'Hearne 1923:42).

Framed Bent Bridges

Framed bent bridges entailed building the bents on the ground, then hoisting and bracing them. A duplex or three-drum donkey was required to hoist and hold pre-fabricated bents in place while the crew seated the bents in the ground and cross-braced them with other, already standing bents.

Pile Driven Bent Bridges

Pile driven bent bridges were most often used when deep spans were required across rivers or canyons. More engineering and preparation went into the construction of this type of bridge; thus, it was expensive to build and maintain. The pile driver was mounted on a sled large enough to span the length of two bents, while battering in the next (Figure 14). A large steam donkey provided both mobility (via cable winching) and pile-driving power. Pile driven bridges were the most commonly found in a logging railroad system, and the longevity of bridges and trestlework depended on the materials from which they were built:

> Douglas fir piling and timbers are the commonest and the most satisfactory. Cedar is more durable. Cedar piling in the longer lengths are scarce and brash [splinter] badly in driving. Hemlock and silver fir are suitable for short-time bridges. Douglas fir pile bridges have a life of approximately eight to ten years; hemlock and silver fir from four to six years. However, within this span of usefulness any of them require considerable repairing, the amount increasing with the age of the bridge. [Kline 1923:44]

Note: This image has been redacted due to copyright concerns.

Figure 14. Pile drivers were mounted on sleds large enough to spread the weight across two bents and still be in position to drive the third bent. Source: Darius Kinsey Collection, Photo Number 13999, Whatcom County Museum of History and Art, Bellingham, Washington.

Dealing with the inevitable decay of wooden bridge materials was a constant battle. Because bridge pilings were most apt to decay from the ends at the top or bottom, several measures were developed to reinforce weakened pilings. The top of a rotting piling could be cut off and a second timber inserted under the track and on top of the piling; a technique called double capping. Ground line decay was dealt with by cutting off the bottom of the rotted piling and inserting another timber underneath. When enough pilings went bad at ground level, a series of bents and sills were made to replace the pile driven timbers (Kline 1923:44).

Truss Bridges

Truss bridges were more expensive but could handle more and different stresses. At the Sauk River crossing near the confluence with the White Chuck River, the SRLC installed a Howe truss bridge (Figure 15). The extra expense was probably justified because not only did the bridge have to stand up to daily trains of large logs going back and empties returning, but this part of the river was apt to flood. During some of the spring runoffs in the 1940s, logs jammed in the narrow opening spanned by the bridge, and water would actually flow over the bridge (Bryson 1998: personal communication). This is also the bridge that was often referred to by SRLC employees as "the covered bridge" because the SRLC eventually covered the trusses and made a roof with tin sheets to prevent snow from piling up on the tracks (Bryson 1998: personal communication).

Note: This image has been redacted due to copyright concerns.

Figure 15. This Howe truss bridge spanned the Sauk River just above the confluence with the White Chuck River until the 1950s. Source: Darius Kinsey Collection, Photo Number 12446, Whatcom County Museum of History and Art, Bellingham, Washington.

Trestles and Trestlework

In some cases, building railroad grade or bed with earth moving equipment was more expensive and time consuming than building low trestlework. Employing a pile driver was often considered the fastest, and so the most economical, grade building method. By the 1940s, the ability to move dirt quickly with steam shovels and Caterpillars had made low trestlework less economical.

Laying Track

Track laying required a locomotive and track laying crew of about 20. There needed to be a sufficient amount of built and settled grade to permit the crew to move and lay several miles of track at a time (Hand 1926:52).

Smaller machines capable of picking up, moving and laying only about 300 feet of track per day were cobbled together by smaller companies that either could not afford or were not building grade substantial enough to support such a large machine. These smaller machines could operate efficiently with crews of three men (Hand 1926:52).

Maintaining Grade

Maintaining grade involved keeping the line ballasted, so that rail creep, caused by heavily loaded cars moving in only one direction, would not lead to frequent derailments. Although the Shay was considered the ideal engine to move loads along less than ideally built grade, it still placed considerable stress on the rails. One engineer reported that during one month of three daily hauls "the rail under the geared side of the locomotive moved down the hill 34 inches . . . the opposite rail moved 27 inches in the same length of time" (Kline 1923:43).

Branch and spur lines were decommissioned as quickly as they were built. When a harvest area was exhausted the spur line track, and sometimes the ties, would be pulled up and installed on a new spur line.

Summary and Conclusions

Beginning almost 80 years ago, men and equipment began building grade and laying track up the Sauk River valley. By 1922, the first 10 miles of the Sauk River Lumber Company's mainline, the track that would be responsible for transporting men, logs, and empty cars back and forth from woods to town for the next thirty years, was in place. Timber harvest needed to commence quickly to allay the costs of capitalization. Within seven months of laying track, the first train of SRLC logs rolled into Darrington. The equipment and methods used to extract timber from the forests, and the changes and improvements that occurred over time to improve those methods, will be discussed in the next chapter.

The historic context presented in Chapters II through IV have set the stage for timber harvest history in general and activities of the SRLC in the Sauk River valley in particular. Cultural resource managers need to be aware of this context. Specifically, however, resource managers also need to be aware of the requirements of significance (the ability of a property to reflect its historic importance through association, physical characteristics, or information) and integrity (the ability of a property to illustrate significant aspects of the past). Historic photographs can be especially useful in determining the integrity of a site.

This chapter introduces the specific elements that were critical for logging companies to carry out railroad logging operations. The timber trade journals and magazines that provided much of the information presented here show that the SRLC's purchases of specific machinery and particular methods of railroad construction were quite representative of the time period. Locomotive types owned over the history of the company as major capital assets, steam donkeys, provision of water and fuel, and the construction and maintenance of mainline and spur line railroad grade were all reflective of timber industry practices throughout the area. Railroad grade construction was especially important, and involved various methods of cut and fill, and bridge and trestle construction.

In many cases, specific historic photographs illustrate all these elements, and give the resource manger a very precise idea of what different types of grade, bridges, trestles, and locomotive equipment used by the SRLC looked like.

Sauk River Lumber Company grade is still very identifiable on the landscape today. Logging associated objects and parts of locomotive and steam donkeys can still be found in the second-growth forests where SRLC worked. A knowledge of the logging equipment and the mainline and spur line grade construction techniques used assists the resource manager in seeing and properly interpreting these remains.

Additional critical elements that are important for proper interpretation of logging operations in general, and SRLC logging operations in particular, will be presented in Chapter VI (timber harvest equipment and methods) and Chapter VII (railroad logging camp structures and features).

CHAPTER VI

TIMBER HARVEST EQUIPMENT AND METHODS

Introduction

Cultural resource managers need to be aware of critical elements and aspects of railroad logging such as locomotives, steam donkeys, and railroad grade construction; these elements were introduced in Chapter V. Chapter VI continues that theme by discussing timber harvest equipment and methods used to access timber and bring logs to the mainline for loading and transport out of the Sauk River valley.

Chapter VI discusses a variety of methods used to access timber on steep mountainous slopes. The principal timber harvest equipment (steam donkeys, yarders, loaders and skidders) and timber harvest methods are also described in detail. Diagrams and historic photographs are used to illustrate the different methods of timber access and harvest, and the different types of equipment used. As in Chapter V, these illustrations can be used to identify and assess the integrity of different properties found during pedestrian survey. They are also a practical means of recognizing the multi-site interconnections that typified most railroad logging enterprises.

During the thirty years that the Sauk River Lumber Company worked Sauk River valley timber stands, the technologies used to access, harvest and transport logs changed dramatically. Through the years, development of new equipment made timber harvest more efficient, safer, and required few men to run an effective timber operation. The period between 1924-52 saw some of the most dramatic changes in the technology and engineering employed for timber harvest, and the SRLC incorporated many of these different harvest methods into its own operations. These technological adaptations not only altered the way logging was accomplished, but eventually brought about the demise of the logging camp as it had developed around the SRLC's railroad-based logging.

Timber Access

As lands closer to the main population centers were stripped of their timber, the need to develop better methods for removing timber from the mountainous hillsides evolved. From about 1905 through the 1920s, the most economically feasible, but still very expensive, means of extracting timber was to build a logging railroad. Reliable internal combustion vehicles capable of moving huge harvested trees were still years from being developed. Locomotives, steam donkeys, and other industrial equipment were the only way to deal with the problem of getting trees from harvest site to mill.

Building a system substantial enough to carry a locomotive into areas with untapped timber reserves was challenging, but river courses following relatively gentle grades often helped define mainline logging railroad routes. Once the timber in the valley bottoms was harvested, logging engineers had to devise ways to get to the timber located high up on the steep hillsides.

Inclines and Declines

> Inclines were once a great fad in Northwest logging. A logger without one was so ashamed he'd go hunt a steep hill and put an incline on it.
>
> —Walter F. McCulloch, *Woods Words*

As timber reserves were depleted from the most accessible areas, new methods needed to be developed to gain access to timber located in steeper and rougher topography. Several new methods of lowering, raising or hauling logs were developed to deal with steep hills that would have otherwise been prohibitively expensive to harvest. Inclines were engineered to safely lower logs down steep hillsides, and declines hauled logs up steep hillsides. Both were built to deal with timber harvest in topography that was too extreme for railroad access, or when hauls were too long for typical donkey snubbing. Inclines and declines used the same technology and equipment to move logs, workers, and equipment up and down into these otherwise inaccessible areas (Figure 16).

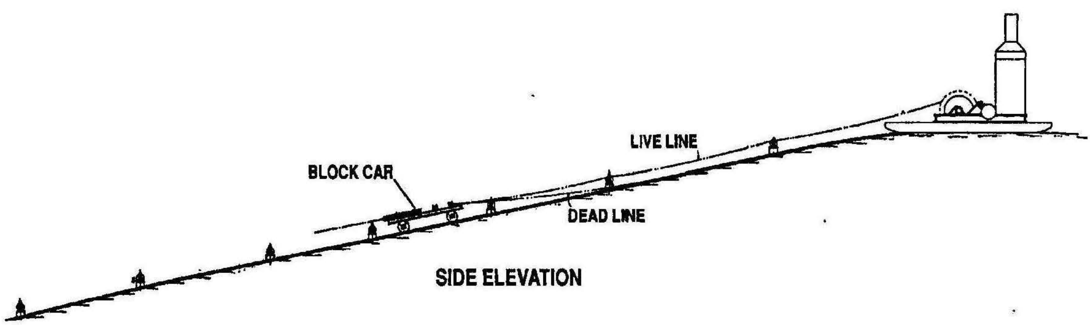

Figure 16. The Sessoms block purchase incline was simple and economical. Source: Illustrated Catalog of the Washington Iron Works 1912.

The precursor to the incline was the log chute. Log chutes were most often designed to let logs travel downward via gravity, or with assistance from horses or steam donkeys. Log chutes caused a substantial amount of log breakage, and a more economical method needed to be developed (Cowling 1926:68).

In a 1926 article for *The Timberman*, H. G. Cowling quotes the originator of the logging incline, H. E. Sessoms, as Sessoms described the situation that inspired the development of the block purchase incline in 1913:

> We have about nine square miles of timber that lies on a hill about 1200 feet above our main [railroad] line. To switch back this would tie up such a large amount of steel and necessitate such a long switching that it would be very expensive; whereas if we find some means of taking the cars straight up the hill on, say, a 30 percent grade, and send the loaded cars down over the same grade, it would mean a great saving. [Cowling 1926:40]

Sessoms block purchase inclines used a single track powered by a lowering engine and a block car, usually using 1 ¾ inch wire rope. Just as block and tackles increased the pulling power of the engine, so did block cars exponentially increase the power of the lowering donkey engine. The engine was always placed to the right of the lowering track, and the live lowering line brought from the engine through the block on the lowering car. The live line was then fed back to a deadman (usually a block on a stump) located near the engine on the left side of the track. This arrangement gave the engine the mechanical advantage necessary to move the cars efficiently up and down the hill.

The Sessoms system, with its live (connected to the steam donkey winch) and dead (static) line rollers, was initially used on straight-line inclines and declines, but was soon found to be most effective for maneuvering railroad cars around curves (Figure 17).

Note: This image has been redacted due to copyright concerns.

Figure 17. A Sessoms straight-line incline, with the distinctive live and dead rollers on either side of the track, made easier to see by the wire rope traveling alongside the track. Source: Darius Kinsey Collection, Photo Number 10135K, Whatcom County Museum of History and Art, Bellingham, Washington.

Many straight-line single-track inclines did not use this additional roller hardware, using only the block car and a lowering engine to move cars up and down a single track (Figure 18).

Note: This image has been redacted due to copyright concerns.

Figure 18. This straight-line incline belonged to the SRLC. The empty rail cars on the spur track at the bottom of the incline (in the left foreground) will be hauled back up the incline once loaded cars are lowered and uncoupled. Source: Darius Kinsey Collection, Photo Number 13461, Whatcom County Museum of History and Art, Bellingham, Washington.

Counterbalanced inclines used the opposing force of empty cars coming up as full cars were lowered, and so required two tracks. Some counterbalance inclines were designed with single tracks, with only double tracks built in the area where the two sets of cars would actually be passing each other on the side of the hill.

The advantages of inclines (and declines) over switchbacks in the case cited by Sessoms were numerous, and included a cost reduction of approximately one-fifth. Sessoms estimated that the timber accessed by a mile-long incline would usually take about five miles of railroad switchbacks to access.

> You save four miles of grade; you save tying up four miles of steel [track]; and you also save the expense of laying and maintaining this extra four miles of track. You avoid constructing the numerous bridges that go with the switchback system . . . you eliminate one switch engine. . . . Our incline engine consumes an average eight barrels of fuel per day, whereas a switch engine would consume from 20 to 25. [H. W. Sessoms 1922:26-27]

For an incline to be considered economically feasible, there had to be a lot of timber accessible from the top, with extensive logging occurring on the face of the hill, or near the ridge top. Inclines were, therefore, usually associated with a system of railroad grade built up on the top or along the sides of the hill. A switching locomotive would have been sent up the incline to move logs from harvest areas along the grade (log landings) to the top of the incline for lowering. Landing areas would have been outfitted with a spar tree and a yarder or skidder, and would have been placed along and at the ends of the railroad grade to harvest as many trees as possible (Stamm 1927:44, 62). For example, in the case of SRLC, the incline above Sauk Camp allowed entry into a large amount of hillside and ridge top timber that would have otherwise only been accessible via a tremendous system of switchbacks. Railroad grade and a system of landings were built perpendicular to the incline to access adjacent hillside timber.

Declines were subjected to the same economic evaluation as inclines prior to construction. To justify the substantial cost of engineering and construction, there had to be a large amount of high quality timber located in an otherwise inaccessible drainage or side slope below the regular grade. The Sauk River Lumber Company operated at least one decline in the vicinity of Dan's Creek Camp. A drainage in that area still has the name Decline Creek.

Switchbacks

In 1930, Russell Mills, logging engineer for Sauk River Lumber Company, published a paper in *The Timberman* describing the most efficient way to determine if an incline or a series of switchbacks would be more economically feasible. "Use of an incline in its proper place may plug a big hole in logging construction cost or conversely an incline used where one should not be, may open an even greater leak in operating costs" (Mills 1930:52).

In cases where "blocks of timber . . . are isolated by topography or ownership or character of the surrounding stands," Mills believed that an incline was the most cost-effective system. However, when large tracts of timber existed throughout a large unit, Mills suggested it was more economical for several sides to simultaneously harvest the timber as the grade was being constructed up the hill. Mills also emphasized that accurate topographic maps and timber cruise data (information about the types and sizes of the trees in the area) were essential for making this type of comparative cost decision (Mills 1930:52-53).

Timber Harvest Equipment

By the time the Sauk River Lumber Company began extracting timber from the Sauk River valley, the gravity-based systems, such as logging chutes, flumes, and skid roads, had become uneconomical and impractical. Increasingly powerful steam donkeys and locomotives had replaced the horses and oxen so vital to those early logging systems.

The earliest use of steam donkeys was to pull logs along a skid road or simply along the ground, a process called ground yarding. As logging operations pushed further into areas with more extreme topography, ground yarding was quickly replaced by uphill yarding, where a steam donkey would pull logs up to a staging or loading area called a deck. If the logs were loaded from there directly onto a railcar, the loading area was called a "hot deck." If the logs were piled high and then yarded to another loading area, it was called a "cold deck."

The trees being handled were huge, and in the early days, axe and saw-cut stumps could be six or ten feet tall. Yarding under these conditions was frustrating, as trees would tend to catch on stumps or get hung up other trees, or would bury themselves in the ground. The objective was to keep as much of the tree intact as possible.

As logging operations moved into more extreme topography, loggers realized that the mechanical advantage gained by yarding trees uphill, with the leading end of the tree slightly suspended, greatly reduced both breakage and the propensity of the moving tree to hang up on stumps and still standing trees. While breakage was still common, the improvement was quickly acknowledged and new systems began being developed. New equipment had to be developed to power these innovative systems, and soon lowly steam donkeys were being developed into more specialized and powerful equipment such as yarders, loaders and skidders.

Yarders

Yarders were steam donkey engines used in the most conventional manner; they simply dragged logs along the ground from harvest area to a landing. Loggers would take a haul-back cable out to a log, attach the cable to the log and engage the machine, winding up the cable and bringing the log in. Yarders eventually replaced oxen or horses that pulled logs along skid roads to a log landing or dump.

The size of the yarding sled depended on the work the engine would be doing, and was based on the size of the donkey engine and the number of drums on board. Yarders required the smallest sleds of all the timber harvest equipment, and were outfitted with donkey engines used to haul logs from cut area to landing. The sleds had to be large enough to accommodate three powered spools or drums of steel cable.

> Each donkey had three drums on which the cables were wound—the main line, the haulback, and a small line called the "straw line." That last was pulled out into the "layout"—the area to be logged. We then used the straw line to pull out the haulback line, which pulled the main line back to the logs. [Brunson 1998:vii]

By the 1920s, a single yarding crew might consist of six men, including a hooktender (the foreman), an engineer, two choker setters, one unhooker, and a signalman (Turner 1990:153).

Yarders, with their multitude of winches, three cable drums and assorted cables, were able to winch themselves into position. Blocks were attached to the main and haulback lines and the machine would take up the slack, pulling itself uphill or lowering itself down (Figure 19).

In some cases, stumps were used to secure static safety lines while the yarders were being moved. Securing a safety line involved wrapping the safety line several times around a stump located above the yarder, then spiking the line to the stump using a pair of railroad spikes to secure each wrap of the line around the stump (Brunson 1998:69).

Note: This image has been redacted due to copyright concerns.

Figure 19. A yarder lowers itself down a steep hill. The yarder was vital to logging operations, as it was usually responsible for moving logs from the harvest area to the loading deck. Source: Darius Kinsey Collection, Photo Number 10076D, Whatcom County Museum of History and Art, Bellingham, Washington.

The hauling capability of a yarder was determined by more than the size and power of the steam-powered machine. Topographic conditions, and the size and density of the trees also had a direct bearing on what the maximum yarding distance might have been. When timber was less dense, approximately 20-40 thousand board feet per acre, yarding could be done for up to 1200 feet. When the size of the trees increased to 160-200 thousand board feet per acre, yarding distances could be reduced to only 500 feet (Van Orsdel 1914:45).

Loaders

A loader was usually stationed with a yarder at a hot deck, and was responsible for loading logs onto railroad cars or trucks for transportation out of the woods. Areas where loaders worked were some of the most intensively used areas, because of the many different activities that occurred there. Logs were brought in to the "hot deck" by the yarder, and were quickly picked up and transferred onto waiting railroad cars or trucks by the loader.

Loading systems had to provide for the exacting placement of logs onto rail cars or trucks. There were many types of loading booms devised to load logs onto cars, but one of the most commonly depicted in historic photographs is the hayrack boom, also called the McLean boom loader (Figure 20).

Note: This image has been redacted due to copyright concerns.

Figure 20. A hayrack boom attached to a spar tree. Source: Darius Kinsey Collection, Photo Number 10095G, Whatcom County Museum of History and Art, Bellingham, Washington.

Skidders

> A big sled- or rail-mounted donkey that powered a skidder system, which could have three sets of engines if the loading and line-changing engines were mounted on the same unit as the yarding engine. Some of the skidders weighed over 300 tons.
>
> —Labbe and Carranco, *A Logger's Lexicon*

Skidders were the multi-drummed behemoths that combined yarder and loader capacities. Their size and complexity often made them the favorites of photographers (Figure 21).

Note: This image has been redacted due to copyright concerns.

Figure 21. This skidder is mounted on a skidder rail car, especially designed to withstand the heavy weight and vibrations of the machine. These cars had swivel trucks that allowed the machine to be turned 180 degrees under the spar tree, so both sides of a harvest area could be accessed. The remains of the diverging tracks required to turn a skidder, if found in the location of a spar tree, are a tip-off that a skidder was used in that area (Labbe and Carranco 2001:172). Source: Darius Kinsey Collection, Photo Number 13559, Whatcom County Museum of History and Art, Bellingham, Washington.

The skidder eventually evolved into a machine called a tower skidder that not only loaded and yarded, but that had its own metal "spar tree," up to 100 feet tall (Figure 22).

Note: This image has been redacted due to copyright concerns.

Figure 22. A huge Lidgerwood skidder is used for loading and skidding. Lidgerwoods were rigged with either a folding steel tower or a spar tree. Source: Darius Kinsey Collection, Photo Number 10126M, Whatcom County Museum of History and Art, Bellingham, Washington.

Timber Harvest Methods

Ground-Lead Yarding

Ground-lead yarding was one of the first methods of moving logs from one location to another. First used with oxen or horses, ground-lead yarding entailed cabling rows of logs together end to end, and dragging them to their destination. Later, steam donkeys, called road donkeys when used in this capacity, were used to haul logs long distances along skid roads (also called cable roads). This method usually resulted in significant damage to the logs that were being dragged, despite several techniques used to make the log travel more easily. One technique, called "sniping," involved using an axe to bevel or round off the leading edge of a log, thereby preventing it from getting hung up on a road skid or from burying its leading edge in the ground as it was dragged (Labbe and Carranco 2001:76, 182).

In 1914, an article in *The Timberman* stated that 95 percent of western logging camps were still using ground skidding and yarding systems. The reasons given for this mainly dealt with the costs of developing a more sophisticated skyline-type system, which might or might not work in specific topography. Because of equipment limitations, the uphill yarding system was still considered the most economical way to ground-lead yard in 1914 (Van Orsdel 1914:44).

High-Lead Logging

High-lead logging was introduced around 1905, and was an immediate improvement to the ground yarding systems that had previously been used. High-lead logging involved a single spar tree and a cabling system that enabled logs to be hauled by the steam donkey at up to 20 miles per hour to the loading area, or "hot deck" (Figure 23).

Note: This image has been redacted due to copyright concerns.

Figure 23. A basic high-lead system used only one spar tree. The mechanical advantages of being able to "fly" logs over the ground were obviously an improvement over dragging them across the ground. This system allowed loggers to move logs up or down hill, using the height and mechanical advantage of a single spar tree. Source: Young Iron Works Catalog 1952.

Spar trees. The straightest and soundest tree located in the optimum area was usually selected as a spar tree. Potential spar trees were commonly selected during the initial engineering reconnaissance when the rail line spurs and hot deck loading areas were also being planned.

To prepare a spar tree, a high climber would go up the selected tree, checking the soundness of the tree and limbing it as he went. Defects or rot immediately sent the workers in search of another tree. Once the climber had reached the height required for the specific job, he would cut the top off the tree and hang a lightweight "rigger's block." Using the rigger's block, a series of increasingly strong rigging equipment would be hauled to the top and installed (see Figure 23 for a simple diagram of the blocks and wire ropes rigged at the top of a spar tree).

When an intact tree was not available at a landing, a suitable tree would be felled and yarded to the landing. A pad, made of several small logs approximately 10 feet long and snugged together with a length of cable, was made for the tree's butt end to rest on. This prevented the tree from sinking into the ground as it was used. After limbing and topping the tree, the rigging was set, and the tree was lifted into place, secured via a set of guy cables fastened to notched stumps with rail spikes. As many as ten stumps, five to six for top guy lines and three to four for the bottom guys were needed to safely stabilized this type of spar tree (Brunson 1998:75-83).

Skyline Systems

As logs were hauled from further away from the spar tree, mechanical advantage gained by the extra height of the single spar tree was lost. The solution to this was the addition of a second spar tree, or tail-spar tree. This two-spar system was called the skyline system (Turner 1990:154-155). A cable with a carriage would be rigged between the two trees, and the trees would basically be picked up, suspended on the cable, and "flown" to the deck by the steam donkey.

Many different iterations of this system were devised, including some designed to help the yarder or skidder more efficiently unload logs as they reached the landing or deck. The slackline system is one iteration that allowed the donkey operator to put slack in the haulback line, lowering the logs to the ground to be stacked and unhooked (Figure 24).

Note: This image has been redacted due to copyright concerns.

Figure 24. The single slackline system allowed increased mechanical advantage by adding a second spar tree, called a tail-spar or tail tree. Source: Brown 1949.

To make the system work even more efficiently, a second yarder could be put at the tail-spar tree. That donkey could then use the spar tree to pull in logs and stack them for subsequent hauling up to the hot deck. This preliminary stacking area was called a "cold deck" (Turner 1990:155).

Caterpillar Logging

In some cases, it was the introduction of new equipment that led to the development of new timber harvest methods. Caterpillars represent one of the earliest technological advances utilized by the Sauk River Lumber Company to gain access to timber growing in previously inaccessible areas.

Tractors were initially used only to replace the horse component of horse and wagon logging, pulling wagons and sleighs loaded with logs (Jackson 1931:36). The changes and improvements that occurred during World War I turned the Caterpillar into a machine capable of handling rugged Pacific Northwest topography in a way no other piece of equipment could.

The first mention of Caterpillars being used to build logging railroad grade appears in a 1926 trade paper. The Caterpillar worked with a Fresno plow, one man on each, and the two of them cut grade on 40 percent slopes through timber at a savings of 30-50 percent over the usual equipment of steam shovel and crew (Tractors 1926:50).

Caterpillars also proved their value as an inexpensive, easy to operate yarding and skidding machine. By 1931, Caterpillars were being used in some logging operations to get windfalls out of timber units prior to logging the standing green timber. Removing the windfalls prior to harvest reduced the breakage when standing timber was felled, and it was found that the savings in timber breakage more than covered the cost of both Caterpillar and labor costs (Drake 1931:40, 42).

Significant savings were also realized when using Caterpillars to yard lightly timbered areas rather than a skidder. However, the switch to multiple independently operated Caterpillars did require some alterations to standard logging procedures. For example, landings had to be "wider (at least 60 feet wide) and more carefully prepared" to accommodate Cats arriving simultaneously at the landing to drop off their timber loads (Drake 1931:42). Low breakage incurred during yarding, especially with fragile cedar, also made Caterpillars more economical when compared to the faster but more destructive use of high-line or skidder methods.

A drawback of Caterpillar skidding was the wearing out of roads and filling in of the landings, caused by plowing up dirt with the fronts of logs (Drake 1931:46). The creation of tractor-treaded skidding arches, used to elevate one end of the skidded load, came directly out of the old horse wheel technology. When equipped with a skidding arch, Cats could operate faster and at less cost than a standard skidder. Caterpillars were capable of moving loads that scaled anywhere from 2500 board feet to 5000 board feet per trip (Figure 25).

Caterpillars did present some opportunities and challenges that meant changes in standard logging methodology. When making logging roads for Caterpillars, changes in grade really made no difference in efficacy, but sharp

Note: This image has been redacted due to copyright concerns.

Figure 25. Sauk River Lumber Company was using Caterpillars equipped with skidding arches by the time this photo was taken in 1940. Source: Darius Kinsey Collection, Photo Number 14926, Whatcom County Museum of History and Art, Bellingham, Washington.

turns required one of the Caterpillar's tracks to stop while the other continued to make the turn. Sharp turns caused losses in speed and power that were difficult to recoup on steep grades. Because of this, the average 14 foot width of the Caterpillar hauling road was increased to accommodate extra wide turns that kept both tracks turning, thus eliminating loss of power and speed (Drake 1931:42, 44).

These machines also required more aggressive maintenance than most logging equipment. One company built a tractor repair shop on skids so that it could be moved around to different landings where the Cats were working. Routine greasing and maintenance was done at night so no loss of work would occur. The estimated life of one of these Cats, used 240 days per year, was about five years in 1931 (Drake 1931:40).

Interestingly, most timber operations referred to a logging operation using Caterpillars as a "half-side." References to running one and one-half sides would be saying that one of the sides was using only Caterpillars to yard.

The SRLC initially purchased two Caterpillars to use experimentally on a Forest Service selective cut in 1936. Cat roads were built to eliminate the costs of bridge building into an area in Dan's Creek where 35 percent side slopes had previously precluded timber harvest (Unusual Selective Logging Project 1936:9-11). When the SRLC moved south to Bedal Camp, they expanded their fleet of Cats, and used them to yard harvested logs across the river to a loading area, thereby eliminating the need to build a bridge across the North Fork Sauk River.

Truck Logging

Although articles were appearing as early as 1921 in *The Timberman* about the feasibility of trucks for logging (Harwood 1921:126), internal combustion engines, suspension systems and rubber tires would not truly be capable of handling the huge trees located in the Sauk River valley for another 20 years.

By the early 1940s, trucks were reliable enough to be a feasible component in logging operations. Trucks were capable of handling roads with much higher grades and much sharper turns than even the most limber of geared locomotives.

Trucks were used extensively to transport harvested logs to the reload area at White Chuck Camp (1940-54), where logs were transferred onto rail cars and taken to Darrington via the Sauk River Lumber Company mainline (Figure 26).

Note: This image has been redacted due to copyright concerns.

Figure 26. A logging reload area featuring a donkey offloading logs from a truck and loading the logs onto waiting rail cars. Source: Darius Kinsey Collection, Photo Number 10120B, Whatcom County Museum of History and Art, Bellingham, Washington.

Truck roads can be distinguished from railroad grade by their steeper grades, sharper turning radii, and lack of the extensive cut and fill indicative of railroad grade. Truck roadbeds also tend to be much narrower than beds created even for spur rail lines.

By the time the Sauk River Lumber Company moved to White Chuck Camp in 1942, they were using trucks to go out into the woods and retrieve timber from logging decks. The locomotives and the mainline railroad were still used to deliver the harvested logs into Darrington.

The advent of truck roads and easy access into the woods also began the demise of the logging camp. With inexpensive and relatively fast transportation available from Darrington to the work site at White Chuck Camp, many (if not all) of the loggers chose to live in town and commute to their work site. In 1944 aerial photographs, the White Chuck Camp appears to be fully intact, with a full complement of bunkhouses, a mess hall, and small single-family dwellings. By 1949, aerial photographs show that all the bunkhouses have been removed, and only the firehouse and engine servicing buildings remain.

Summary and Conclusions

By the time the SRLC had built the mainline grade from Darrington to the first Sauk Camp, they had also purchased the necessary locomotives and steam donkeys, built a warehouse and mobile camp components, and hired enough men to start logging within the Sauk River corridor. As shown in Chapter V, these activities have been captured in historic photographs. Many remnants of these activities can still be found in the area along the Sauk River.

However, the river valley is surrounded by steep, timbered slopes. The SRLC utilized a number of ingenious methods, most developed elsewhere and adopted by the SRLC, to access the timber on these slopes and bring them to spur lines and eventually to the mainline for transport to town. Just as we saw in Chapter V, these well known methods were also captured in historic photographs, and left enduring marks on the landscape that the resource manager can identify and interpret.

In some particularly inaccessible areas, getting to the timber via a system of switchbacks was not possible because of cost and construction time. Inclines allowed direct access to timber on steep hills, and permitted empty flatcars to be moved up the slope, loaded, and returned to the rail line below. Figures 17 and 18 clearly show how timber could be accessed in this way, and how incline technology can leave a substantial mark on the landscape. Several types of inclines were developed, but were not always practical or economically feasible. Switchbacks, or a complex system of switchbacks, were sometimes preferred. It seems clear that an effective composite of techniques, rather than reliance on one, characterized logging by the SRLC as well as other logging operations.

Timber harvest equipment and methods also varied. Steam donkeys were used to move, skid and yard logs, and load them onto flatcars. Special types of steam donkeys evolved to serve as yarders, and were paired with loaders at loading areas. Skidders combined both yarder and loader capabilities.

Timber harvest methods also involved a variety of systems. Some methods used complex rigging systems and spar trees aimed at moving logs uphill or downhill quickly to loading areas, while others used Caterpillars delivering individual logs to a loading deck.

The previous chapter examined the usefulness of historical photographs for identifying key elements of still-existing logging railroad features found during pedestrian survey. This chapter has discussed the methods used to harvest timber, and also used historic photographs to provide cultural resource managers with a tool for identifying and assessing the integrity and significance of those located features. For example, the scars left by inclines and switchbacks are still there on the landscape. On some hills, old snags still stand as testimony to their use as spar trees used to move logs to loading areas. Interspersed with the signs of railroad logging, there are unmistakable signs of Caterpillar roads and roads built for trucks. The informed cultural resource manager can differentiate between these different transportation networks by observing and understanding the important differences in width, grade, turning radii, and cut and fill.

Moving logs from harvest area to mill site took a complex network of linked elements, each designed to do a specific task. Being able to identify key elements in that linked network, elements such as railroad logging grades (main and spur) and timber harvest areas with components such as spar trees or old loading decks, gives the cultural resource manager valuable insight into how the logging system worked, where other associated features are likely located, and what those other features will probably look like. The timber harvest and railroad logging systems used by the SRLC are very typical of other logging companies that operated during the same era. The model provided by the SRLC gives interested cultural resource managers tools and techniques to use when investigating other historic logging systems in the Pacific Northwest. The final key element in railroad logging systems, the logging camp, will be discussed in Chapter VII.

CHAPTER VII

RAILROAD LOGGING CAMP STRUCTURES AND FEATURES

Introduction

Chapters V and VI have described two of the three major elements that characterize logging railroad systems. The first element includes mainline and spur line grade construction, and equipment such as specialized locomotives, steam donkeys and rolling stock. The second deals with primary methods of accessing and harvesting timber. The third major element that typifies logging railroad systems, logging camps and their associated structures and features, will be discussed here.

Logging camp structures are well depicted in historic photographs, as are their relationships to other features and structures within camps. Knowledge of how these camps were typically organized (e.g., bunkhouses located off mainline grade near dining halls and cookhouses, administrative buildings and upper-echelon housing grouped away from bunkhouses, industrial and mechanical buildings built along mainline grade) provides the cultural resource manager with information about what to look for, and where to look for it, while in the woods. Although the railroad logging industry elsewhere utilized both semi-permanent and mobile logging camps, the SRLC relied exclusively on mobile camps. Expected features, components and linkages between components for both types of logging camps are described.

Logging Camp Layout

Logging camps typically represented a substantial financial investment of the timber company, and the location of camps often reflected safety precautions designed to protect that investment.

By the 1920s, most camps and camp layouts were carefully designed and located by engineers or timber supervisors. Several papers given at annual Pacific Logging Congresses held in the 1920s emphasized the cost effectiveness of good camp design, and pointed out essential elements of a well planned logging camp (see, for example, Dunn 1925:54, 58).

When assessing a potential camp site, some of the important environmental elements taken into consideration included access to an adequate water supply, whether the site had good drainage for septic and sewer systems, and ideally, what kind of topographic relief the site had. Ideally, camps were located on flat ground in a location convenient to the timber harvest area. That way, employees did not spend an inordinate amount of time traveling to and from the logging operation (called "the show").

During the layout design of a camp, special attention was also paid to minimizing fire risk by separating high-risk buildings, such as fuel oil caches, kitchens and electric plants, from residential areas.

Camp living quarters also were laid out based on hierarchical standing within the timber company. Bachelor loggers usually shared bunkhouses designed to hold anywhere from four to 20 other men, while the superintendent, engineers, and other upper-echelon men had small portable single family homes. Married men either had separate housing, stayed in the bunk during the week and traveled home on the weekends, or, if commuting via car or rail was an option, traveled back and forth to and from their home in town on a daily basis.

Logging Camp Buildings

Almost all logging camps needed the same basic set of buildings to provide essential services. Necessary domestic structures included housing for loggers and for company supervisory staff, a cookhouse and dining hall, refrigerated food storage and food lockers, a laundry, lighting and/or heating plant, domestic water supply pump house, and shower and toilet facilities (if not provided in each bunkhouse). A blacksmith shop, filing shed, engine house, fuel shed, and office/commissary were structures associated with the industrial aspects of the operation.

Domestic Buildings

Housing

Housing was the most obvious need at a logging camp. Bunkhouse lodging was usually offered to single men, while married men, supervisors and men in management positions were provided with single-family portable dwellings, or commuted to their homes in town on a daily basis. Early camps tended to combine work and living spaces under one roof. In 1915, the bunks of engineers, cooks, and timekeepers were routinely located inside their respective work areas. Thus, kitchen staff might have a bunkroom located off the dining room or kitchen (Martin 1915:28-30). Later, the cook and his helpers, the locomotive engineers, and the engineers, surveyors and scalers were usually provided with group housing separate from the loggers' bunkhouses.

Bunkhouses. The earliest description of movable bunk cars, built on flat cars, described housing 16 men in double bunks in a 14 x 46 foot bunkhouse (Wastell 1910:31-32). The mobile bunkhouse quickly was adopted by many Pacific Northwest logging camps because of the ease of moving camps from one harvest area to another, and the economy associated with having to build a bunkhouse only once.

The Sauk River Lumber Company's camps followed most of the recommendations of the day for construction, but were more generous in their square footage per man than many other lumber camps. Eight men were set up with single berths in a 14 x 40 foot bunkhouse. The bunkhouses were built on flat cars, and included rows of windows on either side of the roof's peak (clerestory windows) that could be opened to provide good ventilation and, open or closed, increased the amount of light inside the building. The SRLC equipped each bunkhouse with a toilet, sink and shower, and hot and cold running water.

As the SRLC moved the bunkhouses from camp to camp, the camp layout never deviated from arranging the bunkhouses along two parallel tracks. The bunkhouses, apparently used from 1923 through about 1948, were never significantly modified, except when the original wood stoves were replaced by steam heat (Bates 1998: personal communication).

Walter Bates, timekeeper for the Sauk River Lumber Company at Dan's Creek, Bedal, and White Chuck camps, provided a diagram of the inside of the SRLC's camp bunkhouses (Figure 27).

Note: This image has been redacted due to copyright concerns.

Figure 27. The Sauk River Lumber Company bunked only eight men per 14 x 40 foot bunkhouse. Source: Hubert and McAbee 1996:12.

Single-family dwellings. A Pacific Logging Congress paper delivered in 1921 described how its portable single-family houses were constructed to withstand the stresses of being lifted onto a car for moving:

> Our houses for families are 14 feet by 22 feet with two rooms, and are built so as to be easily moved, having 8 x 8 inch end sills and 4 x 4 inch

> lengthwise, spaced two feet apart. These sills serve as floor joists. We use eight foot studding and a timber 4 x 4 inches for a ridgepole, which the rafters center on. At each end of the 4 x 4 is placed an iron with a groove in it for the crotch line of the hoisting machine to rest in, when raising the house from the ground to car, or vice versa.
>
> This moving is usually done by a locomotive crane, with crotch lines which are hooked under the center of each end sill, the crotch lines resting in the slotted irons in the peak, thus holding the building practically level when picked up, without regard as to how the weight inside the house is distributed. The 4 x 4 inch timber, running through the peak has sufficient strength to stand the pressure from the crotch lines and prevents any damage to the roof. [Meister 1921:28]

Cookhouses and Dining Halls

It was usual to have the cookhouse centrally located within the camp. A 1915 camp cookhouse was considered "modern in every respect" because it was equipped with a triple range with exhaust hood, two rolling service tables, a bread raising closet, and a hot water tank. The cooks working in this kitchen fed a total of 170 men who ate in two separate dining rooms located on each end of the kitchen (Martin 1915:28-30).

Sauk River Lumber Company's first camp utilized a kitchen with two dining cars attached to either end, and all five structures were built on flatcar frames. By 1928, after the camp was moved to Mary Smith's, the rolling kitchen had apparently been replaced by a large centrally located kitchen and food locker. This large structure appears in subsequent photographs of all the camps used between 1928 and 1944, implying that it could be dismantled and rebuilt each time the camp was moved.

Food lockers and storage. Logically, these buildings or cellar-type structures would have been located close to the cookhouse, and easily accessible for storage when deliveries from the railway arrived. A 1916 Pacific Logging Congress paper described a meat room as having "a built-in, screened, cold air closet installed for cold cooked meats, etc. It also has screened ventilators" (Martin 1916:36).

Lighting and Heating Plants

Lighting and heating plants were usually built on skids or sleds "so that [they] can be set to one side away from the main buildings. This feature will lessen the fire risk considerably" (Camp Cars 1918:39).

Supplying electric lights and power to the camps was a necessary luxury, and one that was considered cost-effective when associated with the running of a small refrigerating plant designed to minimize food spoilage. Kerosene-fueled generators with air-cooled engines were popular, and when used with storage batteries, could supply a camp with 24 hour electricity at minimal cost (Electric Lights 1923:28).

One camp described their lighting system housing as a "32-volt storage battery Delco lighting system is installed in a separate building. The direct connected gas engine and generator is mounted on a concrete foundation. The exhaust noise is practically eliminated by an underground chamber or muffler" (Dunn 1925:58).

Pump Houses and Water Supplies

A dependable supply of good quality water was necessary in camp for laundry, food preparation and general hygiene. Water systems within camps might be gravity fed or pump assisted. Water storage tanks were built into many systems to supplement water demand during the day, and to provide logging camps with water in the evenings after the pump had been shut off (Stamm 1922:39).

Several men who worked at the White Chuck Camp in the 1940s remember the water storage tank that was placed on top of a large 14 foot tall boulder in the middle of the camp. The storage tank provided gravity-fed water to the bunkhouses and the kitchen even after the pumps were turned off for the night (Bates 1998: personal communication; Ryalls 1998: personal communication; Ashe 1999: personal communication). The boulder and the water tank are visible in the 1944 aerial photographs of White Chuck Camp.

Shower and Toilet Facilities

When running water and toilet facilities were not located in each bunkhouse and home, centrally located showers and toilet facilities were usually provided. In 1925, the use of this central location was still fairly common.

At the 1915 Pacific Logging Congress, a company spokesman depicted a centrally located toilet at a mobile logging camp as being "as well built as the rest of the camp, and has screened ventilators and covered seats so arranged that they close automatically. It is electrically lighted the same as the rest of the camp." The same camp's centrally located showers were described as being "equipped with six shower baths and a dressing room. The company furnishes the soap" (Martin 1915:28-30).

Washington State mandated periodic inspections of logging and other industrial camps in 1914. Most camps dating to the mid-1910s and later, whether permanent or rolling, were equipped with sewer and septic systems utilizing wire wrapped wooden or concrete pipe, and water pipe systems utilizing galvanized pipe.

Industrial Buildings

Filing Sheds

The filing shed, because it was so important that saw filers have good light, was built with skylights and was usually oriented to take advantage of good northern light (Figure 28). It was also discovered that the filing shed was best located far from the men's quarters to eliminate accidents between saw-carrying men and those who were hurrying to their quarters. Most filing sheds also had a place to store saws and axes to be sharpened as well as tools ready to be picked up (Dunn 1925:58).

A 1916 Pacific Logging Congress paper described the filing shed as having "three windows on each side and three in the end besides the skylight and two

Note: This image has been redacted due to copyright concerns.

Figure 28. An early filing shed, with plenty of windows and skylights designed to allow the saw sharpeners good light for their task. Source: Darius Kinsey Collection, Photo Number 3588, Whatcom County Museum of History and Art, Bellingham, Washington.

ventilating transoms. The two end windows of the groups of three open by sliding into the wall, the middle one raises" (Martin 1916:36).

Fuel Sheds

Fuel sheds were usually built on sleds and kept away from the domestic part of the camp to reduce the risk of fire, and to make it possible to move fuels quickly out of the way if an in-camp fire, or a forest fire, threatened the camp.

Fuel storage was built in an area where a fire would not immediately pose a threat to any structures (Camp Cars 1918:39).

The fuel shed was

> located as close to the commissary building as is consistent with the fire hazard, so the office man may easily keep a check on the oils issued. Fuel oil is used in the locomotives and donkeys and comes in by tank car, which is unloaded by gravity to a stationary tank. From this tank it is drawn as needed, also by gravity, to the locomotive tanks and a small tank car which supplies the donkeys in the woods. [Dunn 1925:58]

Photographs taken of the SRLC's camps often show railroad tanker cars parked in or near the bunkhouses; the only time fuel oil barrels are seen is in a ca. 1923 Sauk Camp photograph. This rolling stock may have provided mobile fuel delivery to the camp as well as to equipment out in the woods.

Offices and Commissaries

Commissaries provided camp bound employees with a way to purchase anything from tobacco to boots to raingear. Employees could purchase goods with cash or company-extended credit. Often, the commissary was combined with the timber office, where the train locations were tracked, employee wage records were kept, and general company bookkeeping occurred.

Walter Bates was the timekeeper and commissary manager at the Sauk River Lumber Company for about 15 years, starting at Dan's Creek Camp and staying on through the closure of White Chuck Camp in 1952. Men could come into the commissary and buy tobacco, boots or clothing, and take a draw on their next paycheck (Bates 1998: personal communication). His office also included a lavatory and a bunk (Figure 29).

Note: This image has been redacted due to copyright concerns.

Figure 29. The "caulk shop," or commissary, at White Chuck Camp of SRLC, ca. 1945. The caulk shop had the same dimensions (14 x 40 feet) as the mobile bunkhouses, and was also built on a railroad car so it could be easily moved from one camp to another. Source: Hubert and McAbee 1996:12.

The Mobile Camp

At the 1915 Pacific Logging Conference, a logging engineer presented the advantages of mobile camps over the old shack-type camps. Although the initial construction costs were greater, mobile camps were considered a better investment over the five- to twenty-year life of the camp because (1) the camp could be quickly moved in case of fire; (2) mobile camps presented an improvement over the old shack camps that cost nearly as much to tear down and rebuild as they did to simply abandon; (3) mobile camps, with their better living conditions, were believed to be attract a better class of men even if wages were a bit lower, and; (4) moving a mobile camp caused little disruption to company workers. "We moved Camp No. 3 this spring; yarded 249 M [thousand board feet] the day before moving, 269 M [thousand board feet] the day we moved, and 257 M [thousand board feet] the day following the move" (Martin 1915:28-30).

Mobile logging camps with extra amenities for the employees were not a new idea when the Sauk River Lumber Company began to construct their first camp. In 1918, *The Timberman* carried an article regarding a British Columbia logging company that had constructed a camp considered state-of-the-art:

> Each bunk car contains a toilet, a shower bath and sink, supplied with hot and cold water. It will be unnecessary for the men to leave the bunk house as is usual in camps where they have a central bath house. This should be appreciated by the men, especially in the rainy season. The bunk cars are also equipped with a clothes hanger and a locker for each man. [Camp Cars 1918:39]

Sauk River Lumber Company Mobile Logging Camps

Sauk Camp 1923-25

An April 26, 1923 *Arlington Times* article described the Sauk River Lumber Company's first working mobile logging camp this way:

> The Sauk RLC, is now operating 2 sides [harvest crews] and plans to expand to 4 sides within a short time. The portable camp will be moved from Darrington 8 miles to Dubor Creek, where it will be located in a natural forest area instead of cutover land as is the usual custom. The portable camp, with buildings of uniform size 14' x 40', include 26 houses including a cookhouse and dining rooms. These will be arranged in two rows of 13 houses each with a street between. Each will be connected with a water system and a sewer and will be electrically lighted by use of a large Delco system. Each bunkhouse will accommodate 8 men. The cookhouse can accommodate 125 men, and the range is operated with low grade fuel oil which can be lighted instantly by turning a valve. Other buildings on skids are a filing room, a storehouse and other buildings for

> similar purposes. The company operates three locomotives, two geared and a large direct-connected engine which will be used on the mainline as soon as the roadbed is sufficiently perfected. These as well as the donkey engines use fuel oil exclusively. . . . The company has a large storehouse in Darrington where an extensive stock of groceries, camp and railroad supplies of all kinds are housed. The plumbing and sheet metal shop is presided over by Harry Dunn. When the operation is developed to its ultimate capacity the company will have in its employment a crew of 225-250 men. [Sauk River Company 1923:3]

Although this camp was described as being " located in a natural forest area instead of cutover land as is the usual custom" (Sauk River Company 1923:3), the camp area was certainly cutover by the time it was photographed in ca. 1923 (Figure 30).

Note: This image has been redacted due to copyright concerns.

Figure 30. This ca. 1923 photo is captioned "Sauk R.L.Co., Darrington." Topographic features identify this as the first Sauk River Lumber Company camp, called Sauk Camp. Dubor Creek runs right to left across the right foreground, and White Chuck Mountain is on the left background. Source: Darius Kinsey Collection, Photo Number 13449, Whatcom County Museum of History and Art, Bellingham, Washington.

Careful examination of the two Darius Kinsey photos (Figures 30 and 31), taken of Sauk Camp reveals interesting features. Both photos are taken from similar aspects, looking southeast over the camp. In the first photo, undated but easily recognizable as pre-dating the 1924 photo, the bunk cars and the camp have a shiny, brand-new look. In both photographs there are 26 cars set up in two rows of 13 houses each. The seventh car from the left, in the row closest to the viewer, has several large stovepipes emerging from the roof, indicating that this is the kitchen. A laundry line filled with drying aprons directly behind that building adds additional weight to that supposition. The two cars to the left and

Note: This image has been redacted due to copyright concerns.

Figure 31. "Sauk River Lumber Co., Modern Logging Camp in Washington, 1924." Source: Darius Kinsey Collection, Photo Number 10147K, Whatcom County Museum of History and Art, Bellingham, Washington.

to the right of the kitchen car are more closely spaced than the bunk cars. These cars are connected to each other and to the kitchen with small covered porches. These are the dining cars, located so that there are two attached dining cars on each side of the kitchen. The dining cars and the kitchen have slightly different window configurations than the bunk cars, and three of the four dining cars have awnings or shutters on the windows visible in the photograph.

Two rather temporary looking buildings are located behind the kitchen in the ca. 1923 photo. By 1924, these buildings are gone. They may have been temporary food storage buildings, replaced later by refrigeration, or by another more permanent building built on the other side of the camp.

The ca. 1923 photograph shows the locomotive water tower at the far right side of the photo, which was presumably fed by a pipe from Dubor Creek. A locomotive is also visible in the far right of the photograph.

The 1924 photo shows some refinement of the camp, but no men are posed in the foreground. The angle of this photo does not show the water tower, but the higher aspect shows the other rows of buildings in the camp in more detail.

Past the two rows of bunkhouses, there is a row of buildings that likely represents the blacksmith, filing shed, machine shop and caulk shop. These buildings would have been built on skids, so that they could still be moved with the rest of the camp when it came time to relocate.

The filing shed, where men took saws and axes to be sharpened after their shifts, is one of the most easily identifiable buildings in a logging camp. Saw filers needed good natural light to do their work, and the large skylights in the roof of one of the buildings in the middle of the photograph indicate that this is the filing shed. Work areas such as filing sheds, blacksmith shops, and machine shops were located away from the living quarters so men were not walking around camp with sharpened saws and axes, or other types of potentially dangerous equipment (Ryalls 1998: personal communication; Rygmyr 1998: personal communication).

The 1924 photo also shows the addition of at least two and possibly three small homes on the far right end of the camp, separated from the bunkhouses and the main camp. According to oral informants, these were homes provided for the camp foreman and supervisor (Bates 1998: personal communication; Ryalls 1998: personal communication). These small houses would have been built on skids so they could be moved with the rest of the camp.

The two tanker cars on the left side of the 1924 photograph were probably used to move the fuel oil for camp and for logging equipment, replacing the barrels located in about the same place in the 1923 photograph. The ballast car (marked "S Ry & T Co") located in the same area indicates that railroad grade work was ongoing, and that the grade was being built to specifications substantial enough to require additional ballast. The S Ry & T Co on the ballast car could have referred to either the Sultan Railway and Timber Company or the Standard Railway and Timber Company. Both companies were owned by Joseph Irving and cut timber in the Stillaguamish valley. All of Irving's rail cars were marked with the same generic initials, making the switching of cars between the operations and deceptive bookkeeping possible (Rygmyr 2002: personal communication). The ballast car in this photo was probably purchased from Irving's Sultan operation.

The building in the 1924 photograph that stands where the shack and oil barrels were located in 1923 might have been the Camp Office (Bates 1998: personal communication).

Mary Smith Camp 1925-29

Several photos of the Mary Smith Camp still exist, but the actual campsite has yet to be relocated on the ground. Darius Kinsey took two photographs from Sauk River Lumber Company railroad grade located on or near the Smith property, across the Sauk River from Mary Smith Camp, and another from inside the camp. The probable location of the camp can be determined from the photographs' aspect and background topography, and from the location of the river in the foreground (Figures 32 and 33).

The scale of these first two photos make good identification of the buildings difficult, but careful examination reveals that there are only 20 bunkhouse cars and four dining cars in this camp, as opposed to the 21

Note: This image has been redacted due to copyright concerns.

Figure 32. This 1928 photograph is captioned "Pugh Mountain (7150 feet) S.R.L.C. Darrington WA" and shows the location of the Mary Smith Camp. The camp can be seen in the lower left-hand corner of the photo, and the Sauk River can be seen running right to left through the midground. The photo was taken looking west. Source: Darius Kinsey Collection, Photo Number 10149B, Whatcom County Museum of History and Art, Bellingham, Washington.

bunkhouses, 4 dining cars, and the kitchen car used at Sauk Camp. The unique clerestory windows (rows of windows located at the peak of the roof that let in additional light and could be opened to allow cross ventilation) allow for the ready identification of the bunkhouse buildings and the four dining cars, even at this scale. There are also three or four small family-sized dwellings clustered together outside the general camp area to the southwest, along the mainline.

Note: This image has been redacted due to copyright concerns.

Figure 33. In this photograph, the Mary Smith Camp can be seen on the left-hand side of the midground. The caption reads "S.R.L.C. Darrington, Red Mountain 6930 feet, Bedal Peak, 6500 feet, Sloan Peak, 7790 feet." The Sauk River is running right to left. Photo was taken looking SW. Source: Darius Kinsey Collection, Photo Number 10149C, Whatcom County Museum of History and Art, Bellingham, Washington.

A better view is provided by an in-camp photograph taken by Kinsey, presumably from the elevated aspect of the water tank located at the far southern end of the camp. These three Kinsey photographs have the same year (1928) and sequential photo numbers scribed into the captions (149B, 149C, and 149E, respectively), making it easy to surmise they were taken on the same day (Figures 32, 33, and 34).

Note: This image has been redacted due to copyright concerns.

Figure 34. An in-camp Kinsey photograph of the Mary Smith Camp, labeled "S.R.L.C. 1928." Photo was taken looking NW. Source: Darius Kinsey Collection, Photo Number 10149E, Whatcom County Museum of History and Art, Bellingham, Washington.

In this photograph (Figure 34), there are several buildings that appear to be built in place, not built on rail cars, as are the bunkhouses and dining cars. A large building, obviously not portable, is located in the central camp area. This is very likely the kitchen and food locker building that replaced the small portable kitchen used at Sauk Camp. The bunkhouse-like cars closely associated with the kitchen are probably the same dining cars used at Sauk Camp. Other buildings in the right foreground also appear to be non-portable. This does not mean the buildings could not be moved, rather that they would have been built on skids so they could be easily loaded onto a rail car, or were constructed so they could be easily taken apart and reassembled at a new location.

Dan's Creek Camp 1929-36

The Dan's Creek Camp was made up of 19 of the now-familiar bunkhouses, the four dining cars, and a multitude of other buildings, some probably skidded onto rail cars and brought from the Mary Smith Camp. The easily identified filing shed, with its skylights, is located in the lower right corner of the photograph (Figure 35).

Note: This image has been redacted due to copyright concerns.

Figure 35. This 1936 Darius Kinsey photograph depicts Sauk River Lumber Company's Dan's Creek Camp, also known as Black Oak Camp. Photo taken looking to the SW; the still-standing timber marks Gold Hill. Source: Darius Kinsey Collection, Photo Number 10149Z, Whatcom County Museum of History and Art, Bellingham, Washington.

In this photograph (Figure 35), it is obvious that buildings are again clustered by function. At Mary Smith Camp, some grouping could be observed, such as the single-family dwellings being off by themselves. Here at Dan's Creek, the single-family dwellings (which may have been designed to provide housing only for the scaler and the camp supervisor, not necessarily for their families) are again off to themselves along the mainline as they were at the Mary Smith Camp. The bunkhouses are grouped together, and the large kitchen and food locker buildings are clustered together with the four dining cars. The more industrial parts of the camp, such as the filing shed, the blacksmith's shop, and machine shop are all located along the mainline outside the residential area. Presumably the water tank is somewhere in that same area, out of the photo.

Further examination of this photo reveals several other details. There are two fuel cars, and two large ballast cars parked on railroad spurs in the industrial end of the camp. A large pile of split and stacked wood is in the foreground on the right. Because all SRLC logging equipment used fuel oil, this wood may have been used for small wood stoves in some of the buildings when a little extra heat was needed.

Bedal Camp 1936-43

In a 1937 photograph of the camp, we can see that the buildings in Bedal Camp are again grouped by function. There are 18 bunkhouses located behind the kitchen, and the four portable dining cars are located in front of the kitchen, making up the main residential area. The kitchen and food locker, a large, readily identifiable building, appears to be the same size and shape as the kitchen and food locker building seen in the photos of Dan's Creek and Mary Smith camps. This suggests that this important building was designed to be easily dismantled, transported, and reassembled at each new camp (Figure 36).

Note: This image has been redacted due to copyright concerns.

Figure 36. The Bedal Camp of the Sauk River Lumber Company in 1937. Source: Darius Kinsey Collection, Photo Number 10155D, Whatcom County Museum of History and Art, Bellingham, Washington.

Examination of the left-hand side of the photograph's midground shows a group of parked cars. With the new CCC road constructed, clearly some men were choosing to drive out to the camp from homes located near Darrington.

The filing shed, with its skylights, is in the left side foreground of the photo, and the machine, blacksmith and engine shops are grouped nearby. In the background behind the rows of bunkhouses, two or three residential homes, presumably for the camp supervisor, scaler, and other similar upper echelon employees, are visible. As with all the previous camps, these homes are separated from the residential bunkhouse area by a short distance, but are still within easy walking distance to the main railroad grade and to the cookhouse.

White Chuck Camp 1943-52

No professional black and white photographs of the White Chuck Camp were located during archival research associated with this thesis. Darius Kinsey died in 1945, and it seems that no other professional photographer took an interest in photographing one of the last logging railroads after Kinsey's passing.

In the case of White Chuck Camp, information about camp construction and physical arrangement was been obtained through interviews with former SRLC and Forest Service employees, and confirmed and refined using 1944 and 1949 aerial photographs.

White Chuck Camp initially had a building distribution pattern similar to Bedal Camp, but automobile access soon impacted the need for camp bunkhouses. By the 1940s, most men were commuting daily to work at White Chuck Camp via the Mountain Loop Highway; only six bunkhouses are visible in 1944 aerial photograph. Single-family dwellings for the camp boss, the bull cook, the engine and speeder operators, and truck drivers were all located on the other side of the mainline and truck road to the southeast. The filing shed, blacksmith shop, and fuel oil tanks are all grouped together on or close to the railroad mainline (Figure 37).

Note: This image has been redacted due to copyright concerns.

Figure 37. The ca. 1944 layout of the White Chuck Camp, derived from aerial photographs and confirmed using oral informants. Source: Hubert and McAbee 1996:10.

Most of the buildings and structures that can be seen in 1944 aerial photographs, including the kitchen, two dining hall cars, all six of the bunkhouses, the camp water supply and the power plants are gone in 1949 aerial photographs. Clearly, the SRLC was winding down its operations.

Other Camp Features

Camp Livestock

A 1916 Pacific Logging Congress paper proclaimed that "a good and profitable way to dispose of the garbage, waste food and swill, is to feed it to pigs, whose pens should be 200 yards from the camp" (Shields 1916:35).

Camp pigs were considered a necessity in 1916, but "no well-managed cookhouse will fatten these pigs with the waste from the kitchen" (Should the Cook House 1917:60). Pigs were kept to clean up refuse, but more importantly, to supply fresh pork for the kitchen.

Pigs were kept at the Dan's Creek and Bedal camps by the Sauk River Lumber Company for both those reasons; it was also hoped keeping pigs would help curtail local black bear visits to the camp and garbage dumps. Black bears, considered big pests by most camp managers, were usually too shy to approach the actual camp, preferring to visit the dumps instead. At Bedal Camp, the bears were unusually bold and began breaking into the pigpens and eating the pigs. By the time the company moved to White Chuck Camp in 1942, pigs were no longer part of the camp plan (Bates 1998: personal communication; Ashe 1999: personal communication).

Camp Hygiene

In 1914, the State Commissioner of Health, Dr. Kelley, addressed the Pacific Logging Congress with these words: "In [Washington] state, the most important aspect of industrial hygiene is that of camp sanitation. The greatest industrial camp problem in the United States is in our state" (Kelley 1914:32). Dr. Kelley went on to urge the employers to provide each camp with a pure water supply, an effective waste disposal system for urine, excreta, manure and garbage, provide fly prevention and fly-proofing of buildings, make adequate ventilation and washing facilities available, and properly locate the logging camp in a well drained area.

Several outbreaks of typhus had been reported throughout Washington State during the previous year, and inadequate sewage disposal at nearby logging camps was the primary culprit. Dr. Kelley was at the 1914 Pacific Logging Congress to emphasize that regulations regarding camp sanitation were already in place, and additional legislation regarding camp cleanliness had been proposed:

> That hereafter contractors and all other persons who may establish an industrial camp or camps, for the purpose of logging or any like industry, or for the purpose of constructing any road, railroad or irrigation canal, or other work requiring the maintenance of camps for men engaged in such work, or any other temporary or permanent industrial camps of whatsoever nature, shall report to the state commissioner of health concerning the location of such camp or camps, and shall arrange such camp or camps in a manner approved by the State Commissioner of Health so as to maintain good sanitary conditions. [Kelley 1914:33]

The Forest Service also included the following clause in all of its timber sale contracts beginning in 1914:

> The ground in the vicinity of logging camps, mills, stables and other structures will be kept in a clean, sanitary condition and rubbish will be removed and burned and buried. When camps are moved from one location to another, all debris will be burned or otherwise disposed of as the forest officer in charge shall direct. [Cecil 1914:47]

Can Dumps

Tin cans, refuse and garbage from a camp's kitchen were most often disposed of by burying or burning. "Waste material [that cannot be fed to pigs] should be burned or dumped at a distance from the camp. . . . Tin cans and garbage of like nature should be taken out of the camp as they breed flies" (Shields 1916:35).

Summary and Conclusions

The previous chapters have described the various system components, logging railroad construction and equipment, timber harvest methods and equipment, and domestic and industrial facilities, necessary to operate a logging railroad. With the construction and operation of each of these components, men and steam equipment left visible indicators on the landscape that are still discernable today.

Logging camp structures and features constitute the third major set of elements that the cultural resource manager should be cognizant of when providing on-site assessments of logging railroads. The two other major elements, the construction and use of railroad grade and the methods of timber harvest, have been described in Chapters V and VI, respectively.

Logging camp design and construction contributed directly to the cost effectiveness of logging operations. Camp design and location impacted the ability of loggers and equipment to move quickly and efficiently between harvest areas and camp. When locating logging camps, proximity to the timber harvest area was the primary criterion, with a nearby water supply and relatively flat topography coming in second and third.

Logging camp buildings and structures supported a number of different activities. Buildings and structures provided living quarters and eating areas for the crew, protection for lighting and heating plants, defined space for administrative functions, and supported activities such as saw sharpening and fuel oil distribution. Historic photographs can often be used to identify where buildings and structures, built to meet the specifications the activity required, are located on the landscape. Knowledge about the types of buildings and structures that were constructed to support different camp functions and activities can assist the cultural resource manager in identifying specific activity areas within a logging camp. On a larger scale, the ability to identify large functional areas (such as a logging camp), and link it to other related properties is key to evaluating the National Register eligibility of a district.

One way of illustrating this is to discuss the Mary Smith Camp, the only one of the five SRLC mobile logging camps that has not been located on the ground. Historic photographs show conclusively that it was an existing camp, with a full range of functions and activity areas. In other SRLC camps, extensive grade remnants, wooden pipes for plumbing and sewer systems, discarded caulk boots, and large kitchen dumps of cans, bottles and refuse all help locate the logging camp sites. Nevertheless, Mary Smith Camp has not yet been found. It is possible that the highly dynamic Sauk River has destroyed all or part of the camp's remnant features. Careful analyses of historic photographs, especially the background topography and the nearby course of the Sauk River, should help pinpoint where the camp is, or should be. Subsequent pedestrian survey could determine what, if anything, remains of the Mary Smith Camp. The camp's eligibility for the National Register would depend on whether the site has retained the essential physical features necessary to still convey its historic identity (U.S. Department of Interior, National Park Service 2002, VIII:5-11).

CHAPTER VIII

IDENTIFYING A SAUK RIVER LOGGING RAILROAD DISTRICT

Introduction

Once the present-day investigator is able to identify key elements that define historic railroad logging systems (as described in Chapters V, VI, and VII), identification of district boundaries is greatly simplified. Historic still and aerial photographs, combined with maps, diagrams, information from former SRLC and Forest Service employees, and the results of on-the-ground survey can be combined to identify a number of the key elements and establish their linkages within a specific geographic boundary. Other linkages and associated key element locations can then be predicted, and ground truthing can occur with a high level of confidence.

Historic Still and Aerial Photography

Many of the still photographs taken by Darius Kinsey of the SRLC operations can be used to establish general provenance. Kinsey often incorporated recognizable geographic features into the photographic backgrounds, greatly simplifying the task of locating sites on the ground today.

The use of aerial photography offers the cultural resource manager an opportunity to rise above the trees to view large logging systems at a scale that renders the system and its components much more comprehensible (Avery and Berlin 1992:227). Key elements within a logging railroad system such as railroad grade, harvest areas and campsites can sometimes be identified through differences in vegetation type, plant height and density.

Several 1944 and 1949 vertical aerial photographs of the Sauk River corridor were filed in the Darrington Ranger District office. Careful examination of these early aerials photos, taken while the SRLC was still in operation allows the researcher to tentatively identify other possible SRLC timber harvest areas, railroad features, and grade locations.

Historic Maps

Although most of the Sauk River Lumber Company records have been lost, several different types of SRLC maps were located during archival research work.

Timber harvest maps made by University of Washington School of Forestry students show the level of detail that good timber engineers were expected to use when preparing a map for a new logging operation. The timber harvest maps developed for the SRLC were usually drawn with 20 foot contour intervals, and included careful observations about the types and quantities of timber available. In some cases, these maps also depicted past timber harvest areas, rights of way, truck roads, cat roads, and Forest Service campground locations. The Forest Service also made maps of the timber sale areas, usually at 100 foot contour intervals.

Identifying a SRLC District

Figure 38 depicts the proposed boundary of the Sauk River Lumber Company historic district. Historic photographs, aerial photographs, historic maps, and the results of recent archaeological survey were compiled to produce this geographic boundary.

Historic photographs were examined to decipher and extract details about the locations of SRLC logging operations. Areas with distinctive landscape features such as inclines and log loading areas are included within the boundary. Areas where second-growth timber can be clearly delineated from stands of old growth timber (depicting SRLC timber harvest areas), were located using the 1944 and 1949 aerial photographs. Those areas were sometimes used to determine the perimeter of the historic district.

The few existing historic maps and diagrams created by SRLC engineers provided details about specific activity areas and site locations, and often showed the locations of nearby main, branch and spur railroad grade. The results from recent pedestrian survey associated with various Section 106 investigations, in which small segments of railroad grade and associated features were identified, supplied the final component used to develop this specific geographic boundary.

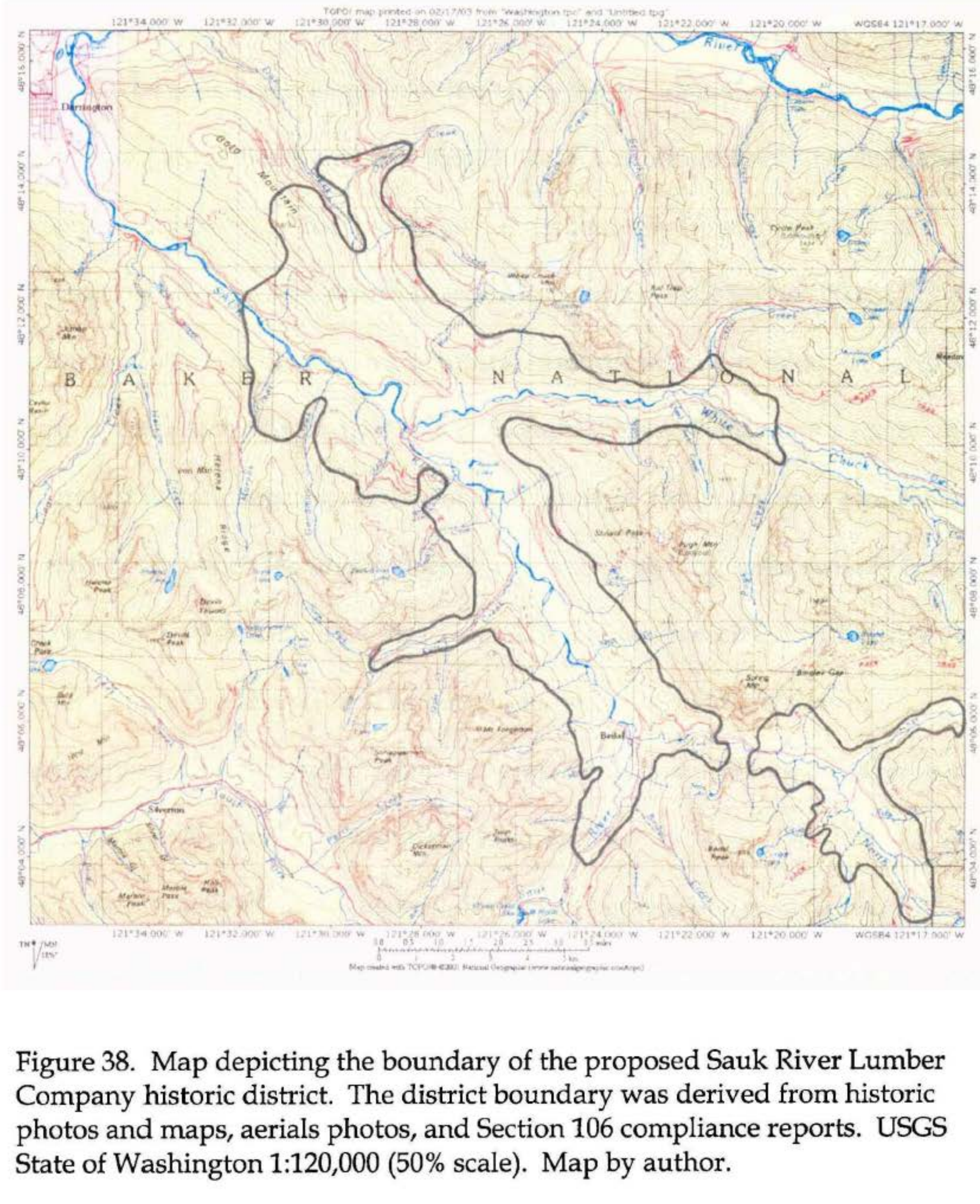

Figure 38. Map depicting the boundary of the proposed Sauk River Lumber Company historic district. The district boundary was derived from historic photos and maps, aerials photos, and Section 106 compliance reports. USGS State of Washington 1:120,000 (50% scale). Map by author.

Summary and Conclusions

To be considered eligible for listing on the National Register, districts must have "a significant concentration, linkage, or continuity of sites, buildings, structures or objects united historically or aesthetically by plan or physical development" (U.S. Department of Interior, National Park Service 2002, IV:3-4). To successfully identify a district, cultural resource managers must have a firm grasp of the historic context, be able to identify the key elements of a fully functional historic logging railroad system, and make the necessary connections or linkages between features and sites. Because these large areas usually contain many objects, sites, buildings, structures and features associated with many time periods and many themes, it is important to find expedient methods of determining a district's geographical boundaries and identifying the significant elements that are located within those boundaries.

Although a district is usually developed because of a geographic concentration of sites linked by a common theme, all the sites within that boundary need not represent that specific theme. For example, there are probably prehistoric sites located near the Sauk River. A prehistoric site, even if it is determined eligible for the National Register and lies within the SRLC district boundary, will not be a site that contributes to the theme of historic logging. Other logging-related sites or features that do represent the district's theme may be determined not eligible for the National Register. For example, railroad grade may lack integrity because of recent road building impacts. Logging-related objects, sites, buildings, structures and features located within a district boundary that do not convey the significance of the district, even if they are representative of the historic logging theme, are considered non-contributing elements. Contributing elements are those sites and features that possess individually distinction (are eligible for the National Register as individual properties), reflect the district's theme, and add to the district's historic character (U.S. Department of Interior, National Park Service 2002, IV:3-5).

Moving from an emphasis on single site assessment to the recognition of interrelated sites within areas logged by the SRLC in the 1920s through the 1940s is essential to identifying contributing and non-contributing elements. Even if district components lack individual distinction, they may, when linked or grouped together, still be able to recognizably convey the importance of historic logging. This aspect of district designation is particularly compelling when dealing with historic railroads. By emphasizing the integrated, systematic nature of logging railroads, the physical linkages that consistently emerge are the systems of railroad grade. Every railroad logging related operation and key element should, by definition, be associated with a segment of railroad grade built to deliver equipment or men to that operation, or to remove men, equipment and logs from it.

Identifying mainline and branch grade can be relatively simple. As described in Chapter V, these types of grade were usually well built to withstand years of use, and are often visible on aerial photographs. In some cases, old SRLC branch spurs have been subsequently turned into roads. In many cases, these branch spurs could be considered contributing elements within a historic logging district, because although they lack individual distinction, they still convey their association with historic logging and they still possess integrity of location, design, setting and feeling, and association.

Spur grade can be much more ephemeral, and may be most easily identified in the Sauk River valley during pedestrian survey. Most of the spur grade on the valley floor is best identified by the thickets of almost impenetrable "dog-hair" hemlock that have grown up along the narrow grade corridors.

District designation occurs when the interconnections of a specifically defined area's features and sites are historically or functionally related. Clearly, the number of identifiable key elements attributable to the SRLC, and the still-identifiable linkages between them, could be developed into a strong statement in support of designating the area a historic district representative of historic railroad logging during the 1920s-40s.

CHAPTER IX

CONCLUSIONS

This thesis has reviewed the activities and methods, over a 32 year span, used by the Sauk River Lumber Company to harvest timber in the Sauk River valley near Darrington, Washington. The logging activities of the SRLC, although interesting in and of themselves, also offer a unique opportunity to develop some generalizations about logging railroads and the remnants left behind by similar logging companies working elsewhere in western Washington during the same time period (1920s-1940s). These generalizations will assist the cultural resource manager in the identification and evaluation of critical elements described in Chapters V, VI, and VII. These same generalizations can help determine the extent and likely components of individual sites and historic districts related to logging railroads, and simplify the process of determining their National Register of Historic Places eligibility.

It is important to recognize, especially when assessing logging railroad activities, that individual components are intrinsically linked by the infrastructure created to support the logging activity itself. Timber growing across a variety of terrain had to be accessed by locomotive and steam donkeys. Because of this, the SRLC's timber harvest areas became interconnected through mainline and spur railroad grade. Special features such as inclines, switchbacks, and trestles represent timber harvest operations' attempts to economically resolve access problems. Logging railroads represent a unified set of activities with individual sites or logging elements that are usually interconnected. Within a National Register eligible district, these linked individual sites or key logging elements would be considered contributing properties.

When assessing areas where logging railroads operated in the past, the resource manager must be particularly attuned to the concept of interlinked, multi-component properties that are representative of a single activity or a specific time in history. Although buildings, for example, may have individual historic significance and integrity, logging railroad related properties may be most effectively evaluated for their National Register significance as a district. Guidelines found in the technical information bulletin on applying the National Register criteria for evaluation state that "a district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development" (U.S. Department of Interior, National Park Service 2002, IV:3-4). In addition, National Register eligible historic districts must also possess a number of other attributes. These are listed below (U.S. Department of Interior, National Park Service 2002, IV:3-5):

1. *Concentration, linkage, and continuity of features* that demonstrate the identity of the district must occur. These features help define the historical and geographical context of the district and the interrelationships between its functionally related parts. In Chapters II through IV, the general historical context within which railroad

logging developed in the Pacific Northwest as well as the specific context of the development of the SRLC in the Sauk River valley was presented. Chapters V through VII demonstrated the interconnections of logging methods and the operations themselves. Logging railroads are an excellent example of an industry whose elements are geographically concentrated, and operationally linked.

2. A district must be *significant*, as well as being an identifiable entity. The remnants of the SRLC that are still found in the woods, including objects, sites, buildings and structures, coupled with still-visible impacts on the landscape, describe a railroad logging company that is representative of logging practices of the time. Photographs depict in detail the main features of the SRLC's historic railroad logging practices, and help determine where specific types of logging activity areas were located. These details are important for local history of the Darrington area, valued by residents whose fathers worked for the SRLC or by residents who value the logging tradition of the community (for example, the athletic teams of the local high school are called "The Loggers"). The combination of sites and photographs also contribute to regional logging history in the Puget Sound area.

3. A historic district is typically, but need not be exclusively, *geographically defined* and discrete. A SRLC district can be partially delineated by the hillsides where what is now second growth timber is growing (areas where the SRLC harvested timber some 55-80 years ago) next to still-standing old growth (areas the SRLC did not harvest). However, the district is also defined by the interconnected features of camps where the crews lived, harvest areas, loading areas, and mainline, branch and spur track that provided the thread that linked all of these features together. The locations of the critical elements (discussed in Chapters V, VI and VII) that needed to be in place to carry out railroad logging also help define the geographical features of the historic district itself.

As is illustrated in Chapters V, VI, and VII, the area harvested by the SRLC meets all the criteria of concentration, linkage, and continuity for National Register eligibility, in part because of the nature of railroad logging itself. Furthermore, the SRLC district is significant, retains integrity, and is geographically defined. As such, it is readily identifiable as a district with local and regional historic significance, and it is clearly eligible for listing on the National Register.

Research Question 1

Such an eligibility determination raises a number of important questions. What are the consequences of such a determination for the cultural resource manager? How will the National Register eligibility of this large area affect cultural resource management decisions and recommendations that are made regarding federally funded projects' effects on historic properties before project implementation? How does the landscape overview/systems approach presented here assist in answering these questions? This last question corresponds with research question 1.

In Chapters V through VII, the SRLC was used as a case study to identify and provide examples of critical system elements in railroad logging. These elements need to be understood by the resource manager in order to have a complete understanding of potentially interlinked elements in a logging railroad system. In the case of the SRLC, most of these elements are exemplified in historic photographs and through interviews with former SRLC and Forest Service employees, rather than through detailed company records.

To summarize, identified critical elements include the construction of mainline, branch and spur railroad grade using established methods of cut and fill, bridge and trestle construction, and the purchase of specialized locomotives, steam donkeys and other logging related equipment (see Chapter V). The SRLC also utilized several well established methods of harvesting, loading, and transporting timber, especially the use of inclines and switchbacks to gain access to timber on remote or inaccessible hillsides. In addition, steam donkeys, yarders, skidders, spar trees and elaborate rigging systems were used in these operations, which also eventually included Caterpillars and trucks, and roads as well as rails (see Chapter VI). The SRLC logging operation also built its own mobile bunkhouses, and periodically moved its logging camp as new harvest areas were developed. Logging camps provided the infrastructure necessary to house and feed crews and supervisory staff, and support important in-camp functions such as tools sharpening, engine and rolling stock maintenance and repair, and administrative and commissary functions. Logging camp structures and features constitute an important set of elements, some very specialized, that supported the logging operations. Because mobile logging camps were specifically designed to leave no buildings behind, it becomes even more essential that the cultural resource manager understand the historic context, can identify the different components that would have been when a mobile camp moved to a new area, and can correctly evaluate them (see Chapter VII).

The locations of logging camps dating from the 1920s through the 1950s are usually well known to local residents, and are relatively easy to confirm because they almost always include large can, bottle and kitchen refuse dumps, and other material remains scattered throughout the area. Inclines, declines, and switchbacks can often be identified with aerial photographs, and trestle locations can sometimes be identified during pedestrian survey, even after the timber bents have been removed or have decomposed completely. Using the combined information from historic photographs, maps, diagrams, oral information and pedestrian survey, even the most ephemeral grade can usually be identified.

Historic photographs have provided a wealth of information about the SRLC's operations specifically, and logging operations generally. However, only those sites that are well known enough to already have general provenance, or those photographs taken at a scale designed to incorporate recognizable geographic features, can be easily located in the field. The clear-cut areas where Darius Kinsey stood in the 1930s and took his striking photographs of logging SRLC operations have all regrown, in most cases with dense, small diameter, "dog-hair" hemlock. In some cases, oral informants familiar with the Sauk River valley were able to use topographic clues from the backgrounds of Kinsey's photographs to make educated guesses about site locations. Familiarity with the concept of interconnectedness of logging sites and features can be used to advantage during pedestrian survey to follow, for example, identified railroad grade to locate unidentified associated sites and features. If the investigator can find railroad grade in the general vicinity, it is usually only a matter of following that grade until an associated camp, reload area, or other area of interest comes into view.

Logging railroads lend themselves to a systems approach through the integrated nature of their associated activities. How does a systems approach to logging railroads—with emphasis on the essential elements of railroad grade, locomotives and rolling stock, methods of harvesting timber, and logging camps—assist the cultural resource manager in fulfilling federally-required consideration of historic properties (Section 106 of the National Historic Preservation Act) during federal project planning? Without a full understanding of the complex interconnectedness of the sites and features found on the landscape, it would be easy for the cultural resource manager to fall prey to a short-sighted approach that could potentially impact the significance and integrity of the individual elements and eventually destroy the integrity of the entire system that had been identified as a district.

Consider, for example, that a highway project or large timber sale was being planned within the historic district boundaries. Under Section 106 of the NHPA, the head of a Federal agency must "take into account the effect of any [federally funded project] on any district, site, building, structure or object that is included in or eligible for inclusion in the National Register." Without the general historical context of Pacific Northwest logging practices, or specific knowledge of the integrated, systemic nature of logging, a resource manager might identify individual sites, features, objects or buildings, without appreciating the potential importance of those properties to the district as a whole. A "piecemealing" effect can occur, in which the overall district importance is lost, and individual properties are evaluated solely on their own merits, without consideration of their contribution to the significance and integrity of the district. On the other hand, a systematic, district-wide approach could greatly expedite the project planning process by identifying alternate routes around or through the district so that no adverse impacts would occur to contributing elements. Similarly, appropriate mitigation of National Register eligible logging properties within the hypothetical timber sale (i.e., recordation, testing, data recovery) may permit new logging to occur without adversely impacting the integrity of the historic district. In either case, proper application of Section 106 guidelines should preserve the historic character of the district.

Although not always practical from a federal resource management perspective because of limited time and funding, the contextual framework presented here allows the remnants of logging patterns and processes to be analyzed and understood in the light of broader historical patterns. The example of the SRLC should assist resource managers in western Washington to move from emphasis on single site assessment to the recognition of the interrelated sites within areas logged during the 1920s through the 1940s. As William Cronan (1995:xi) writes, "to understand a place, we must know its history; to understand history, we must know the place in which it has occurred." Although each logging company has its own explicit history, the background information about the Pacific Northwest's timber industry and SRLC-era logging operations should prove useful to other researchers interested in similar studies. The descriptions of sites, site types, and an inventory of functional activities associated with railroad logging within SRLC's timber harvest areas will increase the systematic identification and evaluation of other similar logging sites in other western Washington areas, or add to those already described.

Research Question 2

Can the analyses of SRLC logging practices also be used to better understand how landscape features can be attributed to particular logging techniques or technologies used during specific time periods, and how they have changed over time? In SRLC's case, many of these logging practices and techniques are illustrated in historic photographs that have been carefully dated. Other logging railroads may not benefit from the talents and interest of a Darius Kinsey. Rough estimates of when photographs were taken (if photographs are available at all) may have to be based on knowledge about the technologies themselves. For example, early logging in an area may be characterized by the predominant use of horse or ox teams and skid roads to move trees out of the woods. Locomotives and rolling stock equipment types can often be identified by type and manufacturer, and approximate dates established from that information.

The most striking example of technological change in SRLC's case concerns the growing use of Caterpillars and trucks in the 1930s and 1940s, respectively. Caterpillars were quickly equipped to do the work of yarders and skidders, and both Caterpillars and trucks were eventually used to transport logs from the harvest area to loading sites. In many logging areas of the Pacific Northwest, trucks quickly replaced rail systems as the primary means of transporting timber from the harvest areas. In the case of SRLC, however, trucks never replaced the locomotive for final transport into town. Nevertheless, there are significant differences to be observed on the landscape that illustrate primary use of locomotives, Caterpillars or trucks. Truck roads could be built with steeper grades, sharper turning radii, and required far less trestling or bridge building than was required for locomotives and large trains of flatcars loaded with immense logs.

Research Question 3

How typical were the methods of timber harvest and extraction used by the SRLC, when compared to those used by other western Washington logging railroads during the same time period (ca. 1920-1950)? This is an important question, because the case studies of the SRLC's methods and operations are presented here as examples of those used elsewhere by the railroad logging industry. The SRLC example allows the identification of critical elements that can be applied to logging railroads elsewhere.

The general summary of the development of logging railroads in western Washington and the Pacific Northwest (see Chapters II through IV) makes it clear that there were similar approaches to harvesting and transporting big trees across the region. The timber extraction industry was highly competitive during the period when the SRLC was active. Technological improvements and development of timber harvesting innovations, especially those that improved production and were cost-effective, were often publicized at the annual Pacific Logging Congress and quickly adopted by rivals. Historic photographs illustrate that there were some highly ingenious technological solutions to the problems encountered when moving big trees out of the woods.

The important difference between the SRLC business practices and those used elsewhere was the refusal of the SRLC to scrap its railroad system. While other companies were using less expensive trucks, and building much less substantial roads for those trucks to travel on, the SRLC hung on to its obsolete rail system to the very end. Whether this was because the company was realizing sizable depreciation write-offs, or simply because their time in the Sauk River valley was almost up is unknown.

It should be very clear, however, that this single disparity does not represent any vast differences in business practices, or technology. Logging railroads usually selected practices to solve a particular problem or to increase the economic bottom line. Slight differences between SRLC and other logging railroads serve primarily to illustrate the range and variation of options available at a particular time in history, and do not negate the SRLC's ability to illustrate and represent essential logging railroad elements.

Research Question 4

A similar answer seems apparent for research question 4, which asks how the five SRLC logging camps changed over time, and whether those changes were comparable with changes found in other logging camps in the Pacific Northwest during the same time periods.

There were two basic approaches to logging camps. The first was reliance on semi-permanent camps with buildings, structures, and features that were constructed to serve as a base of operations for a relatively long time. The second approach, employed by SRLC, used mobile logging camps, with buildings adapted to standard flatcar dimensions (14 x 40 feet), buildings designed to be dismantled and re-assembled easily, or small buildings and structures built on skids so they could be winched onto a flatbed railcar and moved with the rest of the camp. Mobile camps were designed to be moved quickly, without greatly disrupting the business of timber harvest or the lives of the people who lived and worked in them. Photographs of these camps show that dependence on mobility made the camps take on the air of a railroad siding, with lines of bunk cars, dining cars, and other support activities often located near the mainline grade.

As in research question 3, the important focus for the resource manager should be the various functions supported by the logging camps. Familiarity with these functions and the resulting activity areas will assist the resource manager in ensuring that proper identification and evaluation of all objects, features and sites within the camp occurs. For example, a logging camp that is assigned a boundary that does not encompass a can dump is very likely a camp that is not fully recorded. Such an omission may cause the cultural resource manager to fail to record site extent adequately or fail to provide full site assessment, both factors that could negatively influence final decisions regarding National Register eligibility.

Assessing the significance and integrity of a ca. 1930s mobile logging camp requires at least cursory knowledge of what features and sites a ca. 1930s mobile logging camp will likely contain (Chapter VII). The evaluative standard for a mobile logging camp site dating from the 1920s to the 1940s should be very different from that of an earlier, permanent logging camp. Cultural resource managers need to know that the mobile camp site they are investigating had, by definition, a short term occupation, will have few or no building foundations, and was well regulated by Washington State and the Forest Service. Knowledge about regulatory requirements is particularly important, because determination of National Register eligibility includes assessment of integrity. For example, the resource manager not aware that, as early as 1914, Washington State required all logging camps to be equipped with sewer and septics system might be puzzled about the lack of outhouse features within a specific logging camp site. In addition, most logging camp sites on Forest Service lands would have been "cleaned up" at the time the camp was moved:

> The ground in the vicinity of logging camps, mills, stables and other structures ill be kept in a clean, sanitary condition and rubbish will be removed and burned and buried. When camps are moved from one location to another, all debris will be buried or otherwise disposed of as the forest officer in charge shall direct. [Cecil 1914:47]

Understanding that these sites were very likely disturbed when originally vacated makes intact features found within a mobile logging camp all the more important. The well-informed cultural resource manager will develop research designs that take this type of predictable disturbance into consideration, and will be able to deliberate about this type of site influence when assessing the National Register eligibility of a specific logging camp.

Summary

This thesis has described and illustrated many of the distinguishable landscape and logging system features left by the Sauk River Lumber Company during its 32 years of work in the Sauk River valley. This was accomplished by reviewing and extracting information from primary sources of logging information, such as logging trade journals, historic photographs, archival records and maps, and articles from the popular press. Secondary sources, such as books and monographs, provided explicit information about specific types of logging practices. Former SRLC and Forest Service employees were interviewed to gain a more detailed perspective on the business practices of the SRLC. Two of the known SRLC camp sites, various types of railroad grade, and other logging features were investigated using pedestrian survey techniques to gain a better perspective on extant features and site integrity. Finally, this thesis synthesized this information into a single comprehensive historic context for logging in western Washington. This documentation can assist other cultural resource managers involved in similar projects by (1) describing and illustrating the interplay of various features within a logging railroad system and (2) predicting the existence and probable locations of logging-related resources and the likely components of those resources.

No similar discussion of the identification and evaluation of historic logging railroad sites and features has been presented in the literature before. Other management-oriented documents have very thoroughly described existing resources (see, for example, Beidl 1990), but have not clarified aspects of site linkage or employed a systems approach to predict other logging related site locations. Cultural resource managers should be particularly aware of site linkages when dealing with historic logging complexes because numerous critical elements will be locatable using a systems approach. The consideration of large industrial extraction complexes as an entire unit, while not always the most expedient method of investigation, will reduce the incidence of individual sites being overlooked or inadequately recorded.

Numerous contributing elements within the SRLC district are eligible for the National Register as individually distinct archaeological sites. For example, the logging camps of the SRLC are eligible for the National Register under criterion A (properties associated with significant events) and criterion D (ability of a property to yield information). The true significance of these camp sites, however, is in their combined ability to answer important research questions based on comparative data. Systematic excavation at these four well-documented, temporally stratified logging camps could address a number of extant data gaps about this aspect of history. For example, comparative analysis from excavations at each logging camp could yield important information about temporal changes in consumerism and adaptive changes to economic hardships. When each camp is viewed from this larger perspective, as markers of specific time periods (i.e., Dan's Creek Camp as an indicator of logging camp adaptation during the Depression), any disturbance that might have occurred when the site was abandoned by SRLC becomes less important. Development of research questions could include ascertaining whether logging companies did indeed follow the camp clean-up rules stipulated by Washington State and the Forest Service.

Dramatic changes occurred within the timber industry during the three decades of the Sauk River Lumber Company. The amazing shifts in technology, from cross-cut saw to chain saw and logging railroad to truck logging, were only overshadowed by the political and industrial changes experienced in the United States during the same time period. Labor organization, the Great Depression, and WWII redefined national perspectives at the same time they irrevocably altered national and world timber markets. Technological advances made during World War II had an immediate and positive impact on the equipment and techniques used to harvest and haul timber to market. As those changes were adopted and introduced into timber harvest techniques, the logging railroad, a capital intensive system of resource extraction, became obsolete. No longer did large companies with investor backing have to expend large amounts of capital, then wait, sometimes for years, for a return on that investment. By the time the Sauk River Lumber Company was sold and left the valley, logging companies were being started by one or two loggers who had enough money or credit to buy a single Caterpillar, one logging truck and a chain saw.

The uneducated observer might be able to overlook the numerous indicators that the Sauk River valley, with its vast hillsides of green timber and its sparkling river, was once heavily logged, but the impacts that the Sauk River Lumber Company left on the land can still be located. Although some clues are more ephemeral than others, most are recognizable to the well-informed investigator. Developing the ability to identify and evaluate the numerous sites and features associated with timber extraction is an important step to fulfilling the mandate of the National Historic Preservation Act to take into account the effects that a federally proposed project might have on historic properties. Beyond that mandate, there is also an opportunity for cultural resource managers to preserve important aspects of Washington's history, and to acknowledge as significant the industry that, for at least four generations, has defined numerous logging communities throughout our state.

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APPENDICES

APPENDIX A

Federal Laws, Regulations, and Executive Orders Regarding Cultural Resources

Antiquities Act

The Antiquities Act was the first general act to provide a modicum of protection for archeological resources. It protects all historic and prehistoric sites located on Federal lands, and prohibits excavation or destruction of "objects of antiquity" without specific permission (an Antiquities Permit) from the Secretary of the department (or his appointee) with jurisdiction over those lands. The Antiquities Act also authorizes the President to declare areas of public lands as National Monuments (King 1998:271).

National Historic Preservation Act (further reference will be to NHPA) of 1966 (as amended)

Section 106 of the National Historic Preservation Act of 1966 (as amended) requires Federal agencies to consider the effects that any proposed Federal or federally assisted undertaking may have on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. The implementing regulation issued by the Advisory Council on Historic Preservation for Section 106 of the NHPA is 36 CFR 800 (King 1998:270).

Archaeological Resources Protection Act (further reference will be to ARPA)

ARPA was enacted to further reinforce prohibitions on the defacement, damage or unauthorized excavation of 100 year or older archaeological resources located on federal lands. Uniform regulations (Protection of Archaeological Resources, 43 CFR 7) implementing provisions of ARPA have been developed, which in part establish specific procedures for federal land managers to issue permits for authorized excavations on federal lands. ARPA also has provisions for felony level penalties for those convicted of serious violations, and for civil penalties including forfeiture of vehicles and equipment (King 1998:272).

American Indian Religious Freedom Act (further reference will be to AIRFA)

AIRFA, passed in 1978, clarifies U.S. policy regarding the protection of Native Americans' religious freedom. AIRFA establishes that the federal government will respect and protect the right of individual Native Americans (including American Indians, Aleuts, Eskimos and Native Hawaiians) to believe, express, and exercise their traditional religions. Two means of accomplishing this are (1) government to government consultation between federal agencies and federally recognized tribes and (2) the careful consideration of the effects of federally-proposed projects on traditional religious practices prior to project implementation (King 1998:272).

Native American Graves Protection and Repatriation Act (further reference will be to NAGPRA)

NAGPRA, enacted in 1990, requires federal agencies and all museums and repositories receiving federal dollars to take steps to repatriate funerary goods and human remains to tribes that show genetic or cultural affiliation to those objects and remains. This Act also establishes a procedure for Native Americans (including members of Indian Tribes, Native Hawaiian organizations, and Native Alaskan villages and corporations) to request the return of objects and remains from museums and federal agencies. In addition, NAGPRA provides a mandatory 30-day stay on any earthmoving activities that inadvertently cause remains or objects to be discovered (King 1998:273).

National Environmental Policy Act (further reference will be to NEPA)

NEPA was passed into law in 1969, and created the umbrella policy under which all federal cultural and natural resource law and policy is enacted. NEPA requires that, to the extent possible, federal policies, regulations, and laws be interpreted and administered in accordance with the goals set forth in the law. By requiring that all federal agencies analyze and receive public comment on their proposed actions, NEPA attempts to create a systematic, interdisciplinary approach to federal project analyses and decision-making (King 1998:35-37).

Executive Order 13007, "Indian Sacred Sites"

This Executive Order specifically directs federal land managing agencies to accommodate access to, and the ceremonial use of, Indian sacred sites by Indian religious practitioners. It also directs federal agencies to avoid damaging the physical integrity of such sacred sites (King 1998:273).

APPENDIX B

The National Register Criteria for Evaluation

Historic context, historic significance, and historic integrity are the three interrelated concepts on while National Register of Historic Places (NRHP) eligibility is based. A property's significance depends upon its association with an important historic context and upon retaining the integrity of those features necessary to convey its significance (U.S. Department of Interior, National Park Service 2002).

Historic contexts are defined as "...those patterns, themes, or trends in history by which a specific occurrence, property, or site is understood and its meaning (and ultimately its significance) within history is made clear" (U.S. Department of Interior, National Park Service 2002,V:1).). Essentially, the historic context is "the analytical framework within which the property's importance can be understood" (U.S. Department of Interior, National Park Service 2000:14).

Historic significance is defined as "the importance of a property to history, architecture, archaeology, engineering, or culture of a community, state, or the nation" (U.S. Department of Interior, National Park Service 1997, II:2). A property must possess significance under on or more of the four NRHP criteria for evaluation (U.S. Department of Interior, National Park Service 2002, II:2):

1. Criterion A applies to properties associated with events that have made a significant contribution to the broad patterns of the history.

2. Criterion B applies to properties associated with the lives of persons significant in our past.

3. Criterion C applies to properties embodying the distinctive characteristics of a type, period, or method of construction; or representing the work of a master; or possessing high artistic values; or representing a significant and distinguishable entity whose components may lack individual distinction.

4. Criterion D applies to properties that have yielded, or may be likely to yield, information important in prehistory or history.

Historic integrity is defined as "the authenticity of a property's historic identity, evidenced by the survival of physical characteristics that existed during the property's historic period (U.S. Department of Interior, National Park Service

2002, II:3). The NRHP recognizes seven aspects of integrity: location, setting, design, materials, workmanship, feeling and association (U.S. Department of Interior, National Park Service 2002, VIII:1-4):

1. Location is the place where the property was constructed or the place where important historic events occurred.

2. Setting is the physical environment of the property.

3. Design is the combination of elements that create the form, plan, space, structure, and style of the property.

4. Materials are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form the property.

5. Workmanship is the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.

6. Feeling is the property's expression of the historic sense of a particular period of time.

7. Association is the direct link between important historic events or persons and the property; the property must be sufficiently intact to convey this relationship.

These qualities can be present in various combinations and to various degrees; likewise, depending upon the circumstances, some can have more weight than others. However, "to retain historic integrity a property will always possess several, and usually most, of the aspects" (U.S. Department of Interior, National Park Service 2002, VIII:1).