AN ABSTRACT OF THE THESIS OF

Pamela K. Paullin for the degree of Master of Arts in Interdisciplinary Studies in Anthropology, Anthropology and Geography presented on June 7, 2007.
Title: Boring to the Core: The Archaeology, History, and Dendrochronology of a Railroad Logging Camp, Ladee Flat, Clackamas County, Oregon.

Abstract approved

David R. Brauner

Although the timber industry was the major economic force in the lives of several generations of Oregon families, very little archaeological investigation has been done on the dozens of abandoned logging camps that are scattered throughout the forests of the Pacific Northwest. This project focuses on Camp 1, a 1920s era railroad logging operation in the western Cascade Mountains of Clackamas County, approximately 8 miles southeast of Estacada, Oregon. The study contributes to a growing archaeological railroad logging database in Oregon by locating and documenting the spatial organization of one of these forgotten camps and its associated log transportation system, a railroad incline. Archival research, oral histories, photogrammetry, dendrochronology, and archaeological survey methods generated the data that was used to determine site boundaries, as well as locate and identify the function of activity loci represented by surface features and debris scatters. This study demonstrated that tree ages obtained from tree-ring counts on the trees that had regenerated on the site during a systemic survey of the probable location of the camp, in conjunction with organic artifacts such as springboard cut stumps, and the location of artifact concentrations is an effective method

to establish site boundaries. The dendrochronological study revealed three disturbance events that have affected the current archaeological record found on the site, two forest fires and the construction of a landing strip. Although Camp 1 has experienced significant cultural and natural impacts to the archaeological resources found on the site, this study has demonstrated that heavily disturbed sites still possess information that is useful to answer a variety of research questions regarding the life ways, technological systems, and use of space in temporary logging camps where thousands of people once lived and worked in the forests of the region.

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Boring to the Core: The Archaeology, History, and Dendrochronology of a Railroad Logging Camp, Ladee Flat, Clackamas County, Oregon

by

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A THESIS

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Master of Arts in Interdisciplinary Studies thesis of Pamela K. Paullin
presented on June 7, 2007.

APPROVED:

Major Professor, representing Anthropology

Director of the Interdisciplinary Studies Program

Dean of the Graduate School

I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Pamela K. Paullin, Author

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My biggest supporter was my husband Larry Weaver, who passed away in November 2006, at far too young of an age. He believed in me in his “tough love” sort of way, and encouraged me to complete what I had started. Larry accompanied me out in the woods, and beat the brush in all kinds of weather to help me get the data I needed for this project. He cored most of the trees, helped me lay out the sampling grid, and talked with the old

loggers and town residents whose parents or grandparents worked up on Ladee Flat. I honestly could not have done it without him, and wish that he were here with me to savor the moment. I know he would be proud of our accomplishment.

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DEDICATION

This thesis is dedicated to my husband
Larry Edward Weaver

Boring to the Core: The Archaeology, History, and Dendrochronology of a Railroad Logging Camp, Ladee Flat, Clackamas County, Oregon

CHAPTER 1: INTRODUCTION

A thick blanket of evergreen vegetation currently obscures the archaeological remains of a large-scale railroad logging operation in Oregon that was engaged in timber harvesting activities from 1923 until 1931. A number of burned old-growth snags and springboard-cut stumps scattered about Ladee Flat are silent witnesses to the significant landscape change that resulted from the railroad logging practices of the era, known as high grade logging. Ladee Flat is a 5000-acre plateau located at the confluence of the North Fork of the Clackamas River and the mainstem Clackamas River in Township 4 South, Range 5 East, Willamette Meridian, on the Estacada Ranger District of the Mt. Hood National Forest, Clackamas County, Oregon (Figure 1.1; Figure 1.2).

During the 1920s, three camps were built on Ladee Flat to accommodate the harvest of 500 million board feet of old-growth timber owned by the Union Lumber Company of New Orleans, Louisiana (*The Timbermen* 1923). Logging and railroad equipment was stored and maintained in the shops, sheds, and saw shacks aligned along the axis of the railroad mainline and supply spurs that bisected the camps. Loggers, hoggers (locomotive engineers), flunkies (helpers of any kind), donkey punchers (steam donkey engineers), and their families were housed and fed in simple wood-frame structures that also lined the mainline and spurs. Camp 1, the focus of this study, was built in 1923 by

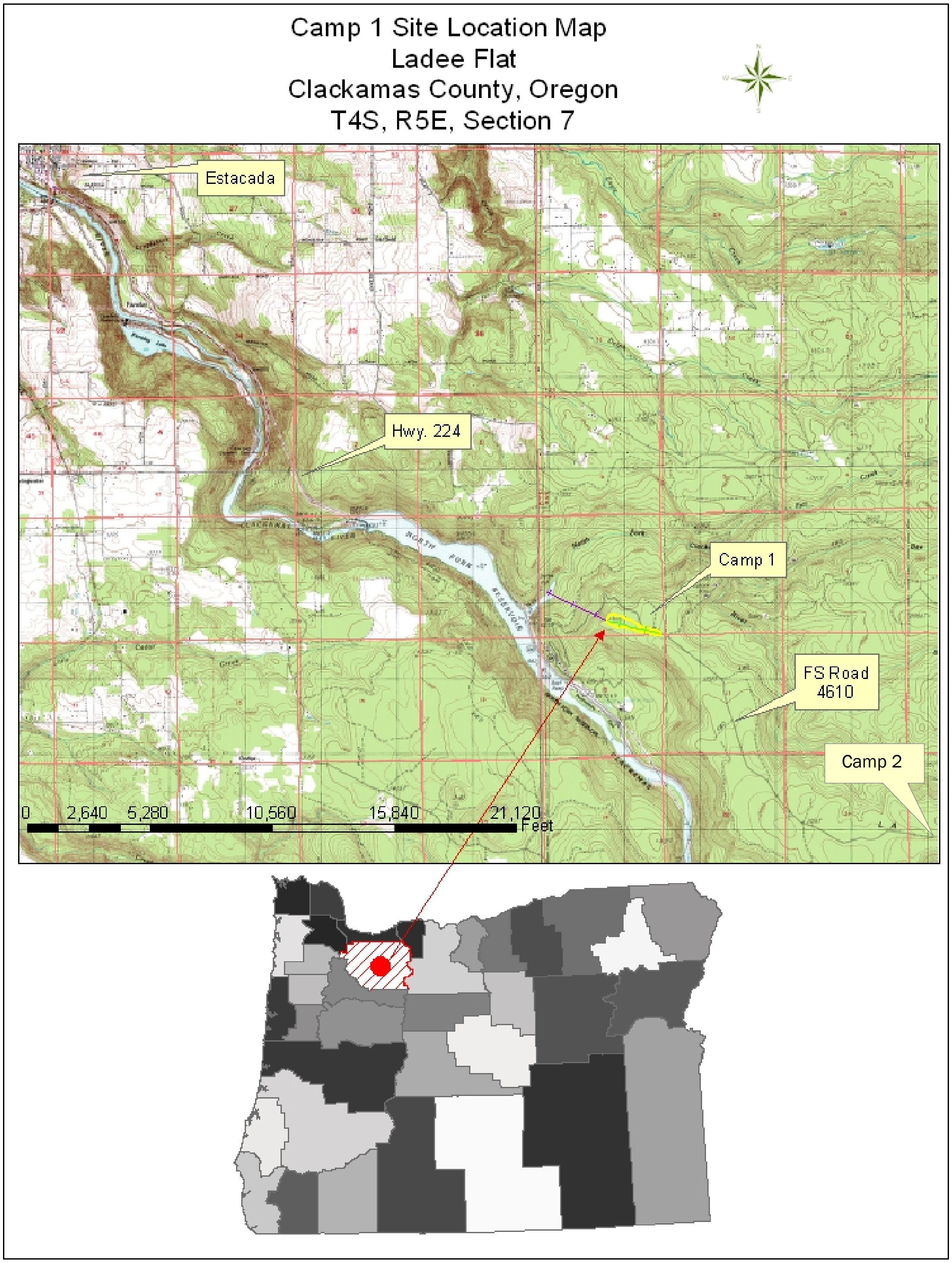


Figure 1.1: Project area map, Bedford Point 7.5' USGS Quadrangle, Clackamas County, Oregon

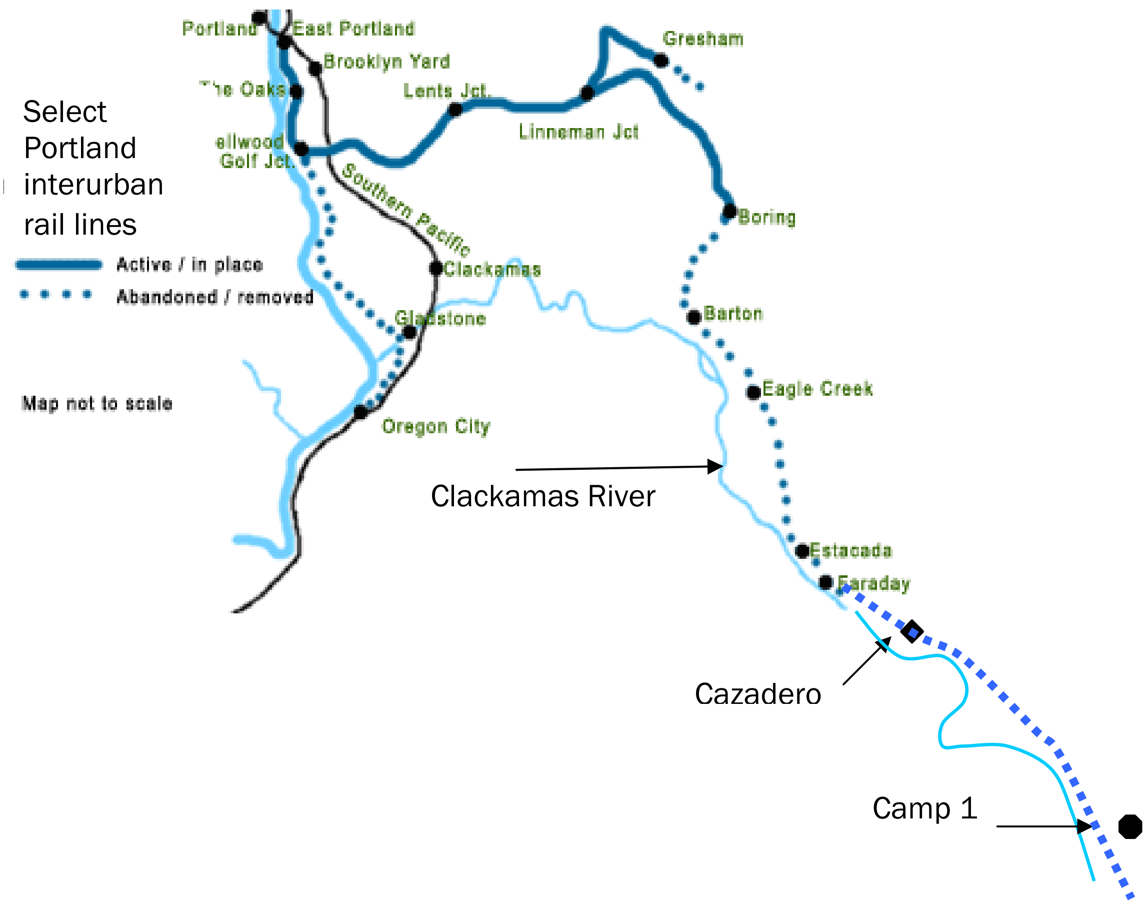


Figure 1.2: Map of Portland interurban rail lines, rivers, and locations mentioned in text.

the Portland based Porter-Carstens Logging Company. Railroad logging required large investments of capital to build track and to purchase and maintain rolling stock, steam donkeys, loaders, and the other specialized equipment that was necessary to move large-diameter logs from the stump to the sawmill. Logging was a labor intensive business prior to the widespread introduction of power equipment into the western woods during the 1940s. Wages were a major expenditure for highball logging outfits that were focused on production, not on the comfort, safety, and health of its workers or the environment (Labbe and Carranco 2001:86). After only two years, Porter-Carstens went bankrupt in 1925. Ladee Logging Company, having logged out its timber holdings near the Nehalem River in the Coast Range of Oregon, took over the railroad logging operation on Ladee Flat in 1926 (*The Timberman* 1926). Logging commenced at an accelerated rate in the spring of 1926, and railroad tracks were laid deeper into the woods by Greek section crews to access the receding timber stands. It was cheaper to build a new camp than to transport the loggers more than six miles out to the timber harvest units, so Ladee Logging built Camp 2 in 1927. Pole Camp, built and operated by a subcontractor to remove pole-sized western redcedar (*Thuja plicata*), was located along the railroad mainline between Camp 1 and Camp 2.

Like dozens of other pre-Depression era logging camps that operated in the Pacific Northwest, the location of Camp 1 has been lost over time. The buildings of Camp 2 were burned in the 1939 Boyer Creek Fire, while Pole Camp was destroyed in the 1929 Ladee Flat Fire. In the 75 years since the last load of logs was lowered down the railroad incline that connected Ladee Flat to a railroad spur located on the north bank of the North Fork River, the remains of all three camps has been masked by evergreen trees and shrubs. The railroad mainline between Camp 1 and 2 has been paved over and converted to a diesel truck logging road and over 20-miles of railroad spur grades have been obliterated by off-road vehicle use.

In logging terminology, the word "camp" is used to describe the entire logging operation, and not just the area where the bunkhouses and dining cars were located that provided food and shelter for the workers. Archaeological investigations at several railroad logging camps in Northern California and Michigan have yielded significant information about the logging industry culture (Vaughn 1985; Rock 1986; Franzen 1992). Considering the importance of the timber industry to generations of Pacific Northwest families, relatively little research beyond documenting abandoned railroad grades has been done on this genre of historical archaeological site, particularly in Oregon (exceptions include Gregory 2001, Horn 1987, and Case 2001). These forgotten logging camps were once home to thousands of men, women, and children, and the archaeological materials they contain have the potential to provide important insights into the lives of the working class people that traditional histories have tended to ignore.

Research questions

The purpose of this thesis is to contribute to a growing Oregon railroad logging camp historical archaeology database by locating and documenting Porter-Carstens' Camp 1, and the unique log transportation system associated with it, which was a counterbalanced, double-tracked railroad incline. Several research questions have been developed to guide this investigation which will require the use of an integrated, multidisciplinary approach employed by many historical archaeologists. Specific research questions include:

- Can the location of Camp 1 be determined from archival records, aerial photographs, oral histories, archaeological features, and artifact scatters?

- What is the current nature of the archaeological record of a logging camp that was purposefully abandoned over 75 years ago?
- Can the spatial organization of Camp 1 and the function of activity areas indicated by the surface features and artifact scatters be determined from a dendrochronological and archaeological surface survey?
- Can an industrial settlement pattern model be developed from archival research, oral histories, photographs, logging textbooks, periodicals, and maps to assist in the interpretation of the data recovered from the surveys?
- Is dendrochronology an effective tool to establish site boundaries in a forested environment where fine-scale age class stand boundary delineations indicating prior disturbances from aerial photo interpretation is not possible? Dendrochronology is widely used to date old buildings and wooden artifacts, but its application as a proxy measure of the spatial boundaries of archaeological sites has not been observed in the review of the literature concerning this topic.
- Can dendrochronology be used to date disturbance events and landscape changes that have affected the nature of the archaeological record found at Camp 1, and provide insight into natural and cultural formation processes that have not been addressed in the historical documentation?
- What is the potential for this purposefully abandoned and heavily impacted railroad logging site to contribute to the development of historical archaeology method and theory?

A variety of methods will be used to address these research questions, including a detailed examination of historical records, field surveys, and analysis of archaeological materials and features. A dendrochronological study of the Douglas-fir (*Pseudotsuga menziesii*) trees that have naturally regenerated on the site is planned to better understand the environmental history and disturbances that have affected the archaeological record at Camp 1. Researchers have used tree-ring dating to construct an event chronology for use in other types of archaeological applications, such as establishing the date juniper trees were cut down to provide support timbers for hard rock mines located in Nevada during the later half of the 19th century (Hattori and Thompson 1987). I will construct a fire history based on the dendrochronological data obtained from Camp 1, as well as other tree-ring histories that have been prepared for the western Cascade Mountains (Weisberg and Swanson 2001 among others) to identify the influence fire has had on the Ladee Flats area and the archaeological record currently found at Camp 1.

Theoretical perspectives

The logging industry can be considered a unique culture. The combination of people, technology, and tradition that characterize logging cultures worldwide can be defined as “a complex whole which includes knowledge, belief, art, morals, law, custom and any other capabilities and habits acquired by man as a member of society” (Tylor 1871:41). The logging camps of the late nineteenth and early twentieth century were microcosms of the general American society. Social issues of the times including class, race, ethnic, and labor conflicts, combined with rapid technological change and the environmental challenges presented by vast old-growth forests of the Pacific Northwest, have left an archaeological record that requires an integrative landscape approach to understand.

Many of the research questions that form the basis for this study are concerned with settlement patterns and environmental change found in an industrial forested landscape. It was necessary to find both an historical and a theoretical framework that could help make sense of how and why industrial events on the local logging frontier took place in the patterned way that they did. A large body of theory has developed around western work camp settlement patterns, including the arrangement of living space that indicate class distinctions based upon marital and occupational status (Brashler 1991; Chapman et al. 2002). Other research domains have focused on labor issues, political reform, and social demographics (McGuire and Reckner 2002; Beaudry 1986; Hardesty 2002). Archaeologists are interested in the impact of these influences on the daily life and living conditions of workers living in the camps, and how these issues are reflected in the archaeological record (Maniery 2002; Gillespie and Farrel 2002; Case 2001). Much of this work has roots in frontier theory, an interpretative model based on the understanding that the intangible social behaviors of capitalism and colonization have resulted in identifiable and repeated patterns in the archaeological record (Lewis 1984).

Many natural and cultural transformation processes have affected the archaeological record found on Ladee Flat. Documenting and interpreting the landscape change resulting from human land-use behaviors, in addition to natural events and processes, is a major focus of my research questions as well. Environmental archaeology, a subset of landscape archaeology, provides a synthetic approach to investigate the complex relationship between nature and culture, and is a useful paradigm to bridge several archeological theoretical perspectives on how humans define, shape, and use space. The past and present forested landscape found on Ladee Flat is an artifact and represents the cultural values and environmental perceptions of the human behaviors that have shaped its appearance over time.

Background research

Preliminary archival and field work on this project began in the winter of 2003 and the rich research opportunities afforded by this historic-era archaeological site were quickly recognized and seized upon as a possible thesis by a topic-hungry historical archaeology graduate student. Camp 1 was operational for a discrete period of time using technology that became obsolete with the introduction of chainsaws, logging trucks, and graveled access roads in the early 1940s. This technical change occurred as the Great Depression drew to a close and logging started up once again in the old-growth forests of the Pacific Northwest.

Articles and photos found in a timber industry trade journal *The Timberman*, document the Shay locomotives, steam donkeys, and hand axe technology that dominated the era. This equipment was used to fall, buck, high lead, load, and transport the Douglas-fir logs out of the forest, down the incline, and onto the electric interurban rail line destined for sawmills in Estacada, Portland, and worldwide lumber markets. I obtained a photo of Camp 1 from the Forest History Collection housed in the archives of the Paterno Library at Penn State University in 2005 (Figure 1.3). The photograph was taken from the top of a water tower overlooking the camp facing the incline. The photo captured part of the built environment, as well as panoramic views of the burned and logged over landscape surrounding the railroad logging operation. These photos document not only the physical environment, but offer insights into the values, beliefs, and ideas shared by members of the logging culture.

Figure 1.3: Camp 1 in 1924 (Penn State University, Paterno Library, Forest History Collection, record group number MGN 103; box 10, folder 33).

I located a 1938 aerial photo of Ladee Flat in the map room at Oregon State University Valley Library (Figure 1.4). The black-and-white photo captured the unmistakable scar left on the landscape by the railroad mainline before portions of it were leveled and filled-in, and an airstrip built on top of it in 1946. Over 70 years later, Douglas-fir trees have yet to entirely reclaim the mainline, incline, and former airstrip because of the damage to the site from soil compaction, contamination from diesel spills and other toxins, and fire. Once the research team (consisting of myself, my late husband Larry Weaver, and our dogs Rufus, Ditto, and dearly departed Henry, augmented by the occasional assistance of my brother Bruce Paullin and his wife Sharon White) had an idea of where to look, the general location of the logging camp was easily discovered.

A closer inspection of the 1938 photo also revealed evidence of structures. Using the technique of photogrammetry to scale for distance and to properly orient the photo to true north, the research team was able to use a hand-held Silva compass and pace to the probable location of one of the buildings. An artifact scatter consisting of triangular metal files, several bunkbed frames, melted glass, and other assorted debris including large boulders was found in what appeared to be an intentionally created pile of rubble pushed together by a bulldozer or other earth moving machinery.

A Douglas-fir tree growing on top of part of the pile was cored using a Swedish increment borer to determine its age. The operational premise behind dendrochronology is that trees produce one set of annual growth rings per year, which vary in size according to the weather patterns and environmental setting the individual tree experiences. The

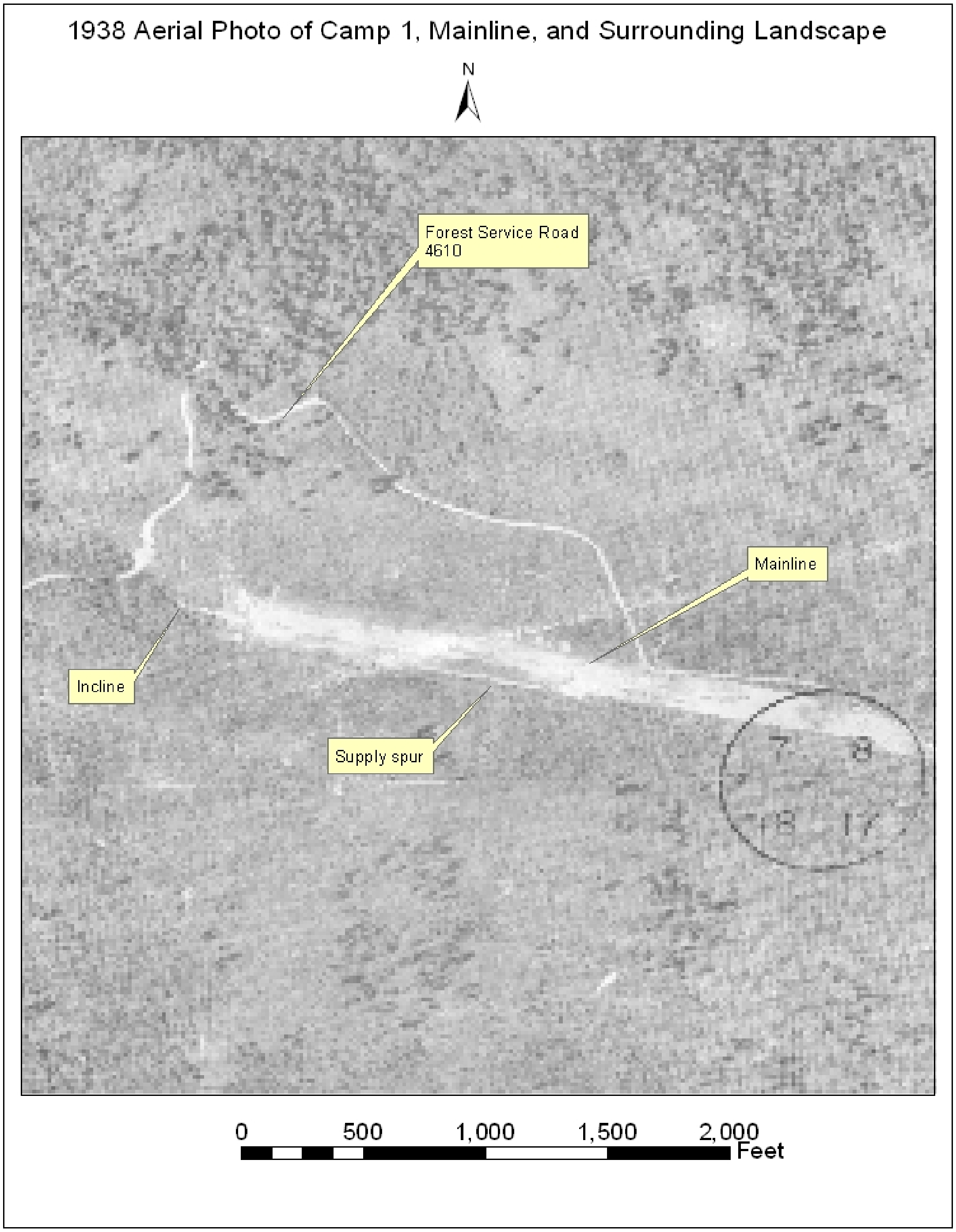


Figure 1.4: 1938 aerial photo of Camp 1 and Ladee Flat (OSU Kerr Library 3rd floor map room)

age of the tree (which is obtained by coring the tree at breast height or four-and-a-half feet and counting the annual growth rings) growing on the tangled pile of rock, metal, and soil was sixty one years old in the fall of 2004. As will be explained in Chapter 8, Table 8.2, an age correction factor of 7 was added to the 61 years which indicated that this particular tree probably germinated on top of the debris pile in the spring of 1936 (obtained by subtracting 68 from 2004). The data suggested that the debris pile was the result of the destruction of one of the buildings associated with the logging camp. Camp 1, although never really lost, had been rediscovered.

To add a truly human side to my research, I was able to locate and transcribe several oral histories that were done in 1967 by a U.S. Forest Service employee, Leroy Layton. Clarence Jubb worked for Ladee Logging beginning sometime in 1926, and his stories of the incline and life in a logging camp are priceless supplements to the documentary record of the era. Another oral history of Hank Boyer, who worked for the Forest Service during the 1920s and grew up in the area, also provided some interesting details on the operation of the incline, cinnabar mining, and forest fires in the upper Clackamas River watershed.

The goal of this thesis to document the railroad logging show (the word "show" is a commonly accepted term for a logging operation) that played on the stage of Ladee Flat for only nine short years before time, vandalism, and managerial indifference result in the total destruction of Camp 1. The following tome is a record of this endeavor.

CHAPTER 2: NATURAL SETTING

The railroad logging era was a relatively short-duration extractive frontier industry based on the prevailing societal assumption that the forests of the United States were commodities to be harvested for profit, and not resources to be conserved (Mzozowski 1999: Cronan 1983). The profitability of any particular logging operation depended upon adaptations of general technological systems to location-specific environmental variables, such topography, available transportation systems, or the size of timber to be cut and transported. An examination of the environmental history of Ladee Flat is necessary to understand the subsequent cultural history of the site.

Because of its inaccessibility, the upper Clackamas River watershed was initially spared from the unsustainable and environmentally damaging logging practices that took place in the Coast Range or along the Columbia River during the 19th and early-20th centuries (Lynch 1973). Although the Clackamas River emerges from the Cascade Mountains only 35 miles southeast of downtown Portland, early settlers and loggers considered the upper drainage too rugged and remote to exploit, particularly since plentiful timber supplies and farmstead sites existed in much more convenient and desirable locations.

Hydrology

The beautiful, clear, free-flowing upper Clackamas River and one of its major tributaries, the North Fork of the Clackamas River, form the western and northern boundaries of Ladee Flat and Camp 1. These nationally designated Wild and Scenic Rivers originate from several sources along the western spine of the Cascades Mountains in the Mt Hood National Forest. The 83-mile long Clackamas River drains 940 square miles of land and has sixteen major tributaries, including the Collowash River, the Oak Grove Fork, Roaring River, Fish Creek, the North Fork, Eagle Creek, and Clear Creek (Student Water Research Project, 2003). The upper Clackamas River travels through a deeply dissected and heavily forested corridor which allows very little floodplain development (Figure 2.1). There are many reaches of rapids, deep pools, fast moving water, and spawning gravels for remnant native salmonid populations. Downstream from Estacada, the lower 24 miles of the river flows through an increasingly populated area, entering the Willamette River in the highly urbanized area of Oregon City and Gladstone (Student Watershed Research Project, 2003).

Geology

Ladee Flat is located in the Southern Cascades physiographic province. This larger region is subdivided into the Western Cascade Province, characterized by very old, highly weathered volcanic mountains that have been tilted and partially covered with younger volcanic peaks which formed in the High Cascades province to the east, such as Mt. Hood or Jefferson (Burtchard and Keeler 1991:11). A series of lava flows, known as the Grande Ronde Basalts, provides the foundation for much of the lower 45-miles of the Clackamas River watershed (Orr and Orr 2000: 6). Approximately 8 million years ago there was a period of andesitic lava flows and geologic uplift in the ancient Western

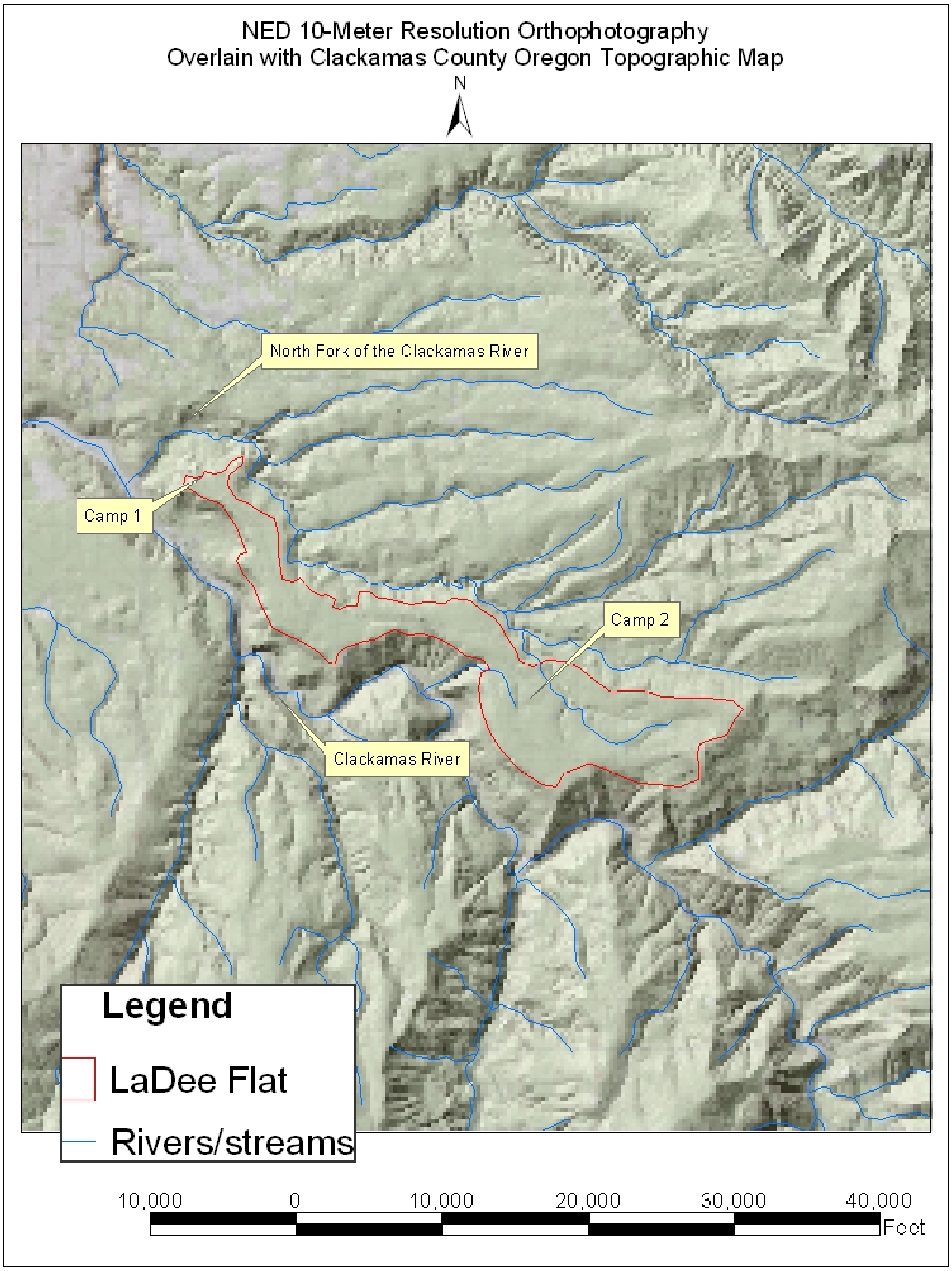


Figure 2.1: USDA-NRCS (Natural Resources Conservation Service) NED 10-meter resolution photo of Camp 1 and Ladee Flat located on a plateau above the Clackamas River illustrating the dissected topography of the western Cascade Mountains.

Cascade Mountains (Orr and Orr 2000:6). This volcanic and tectonic activity resulted in a series of ridgelines separated by deeply dissected and eroded riverine valleys that characterize the landscape today (Orr and Orr 2000: 6). The elevated ridges became an influence on climatic conditions across the region by intercepting the precipitation that once went to the east. The upsurge in moisture levels along the western slopes, in conjunction with the higher peaks found in the High Cascades, allowed the development of the northwest maritime forests. Extensive plateaus formed along the top of the ridges as a result of erosion from the increased precipitation, creating the topography found on Ladee Flat today.

Ladee Flat was later covered with lava that oozed from dozens of volcanic vents and shield volcanoes that emerged in the northern Willamette River valley about 2 million years ago (Baldwin 1976). Known as the Boring volcanoes, they are believed to have been part of the same geologic uplifting processes that resulted in the formation of Mt Hood and many other volcanoes in the High Cascades (Trimble 1963). Most of the forest soils on the ridges above the upper Clackamas River between Estacada and Fish Creek, including those on Ladee Flat, have developed from the ancient Boring lava flows. This parent material is a light gray olivine basalt that has weathered to a depth of 25 feet in some places; the upper 5-15 feet are commonly a reddish brown clay loam (Natural Resources Conservation Service NRCS 1988).

Of particular geologic interest are the pillow basalt formations that occur along the lower North Fork of the Clackamas River and Clackamas River. These formations result in uniformly sized columns of pillow-shaped basalt that appear to have been sculpted into the stone by a master carver. 40 million years ago this portion of Oregon was covered by a shallow sea. The pillow basalt was formed from lava pouring from underwater faults and coming into contact with ocean water and solidifying into these unique formations (Orr and Orr 2000: 7). Most of the blocks are 40 centimeters thick and 80-90 centimeters long, and are a light gray fine-grained material with very small dark gray inclusions. These blocks are suited for foundation material such as corner supports for post and pier construction or prefabricated structures. Judging from the archaeological record, the blocks appear to have been used for that very purpose at Camp 1, as well as crushed up and used for fill between the railroad ties of the mainline that ran through the center of the camp.

Climate

The climate along the western slopes of the Cascade Range has changed many times in the past, resulting in different plant and animal communities. Pollen studies have shown that plant communities are not stable, but have substantially changed in response to fluctuations in the Earth's climate (Sharpe 1996:86). Pollen samples from Battleground Lake in southwest Washington indicate that conditions have ranged from subtropical to a cold arid steppe (Burtchard and Keeler 1991). It does not appear that Ladee Flat was affected by the glaciers that covered most of the High Cascades during the last Ice Age, although glaciers may have covered many of the ridges in the Western Cascades province above 3000 feet in elevation (Burtchard and Keeler 1991:14).

Camp 1 is located at the junction of the North Fork and the mainstem Clackamas River at an elevation of 1,602 feet. The overall climatic regime is Mediterranean, indicating that the region is a virtual desert in the summer, with the majority of rainfall occurring between November and March of any given year. Annual precipitation varies with elevation and aspect in the topographically diverse upper Clackamas River watershed. Weather records from Three Lynx, located at 1,135 feet in elevation between the North Fork and the Oak Grove Fork of the Clackamas River, reveal that that 77% of the annual 67.7 inches of precipitation falls between October and March (Burtchard et al., 1993). Core samples taken from 50-60 year old Douglas-fir trees in the North Fork area reveal yearly weather patterns, including a three year drought in the mid-1980s and another one in the mid to late 1970s.

Vegetation

Franklin and Dyrness (1973) have identified 14 environmental settings or provinces in Oregon, and the associated topography, geology, soils, climate and plant species that contribute to the uniqueness of each vegetative zone. Ladee Flat and Camp 1 are within the Western Cascades Province in the *Tsuga heterophylla* (western hemlock) zone. Franklin and Dyrness note that the mild climate "is extremely favorable for forest development… and many species find their center of distribution and attain maximum development here" (1973: 49). These researchers observe that "few have appreciated how truly unique these forests are among the mesic temperate forests of the world...this includes many features such as composition and productivity" (Franklin and Dyrness 1973: 53). The Natural Resources Conservation Service (NRCS) estimates that a fullystocked stand of 80-year-old Douglas-fir trees growing under the environmental conditions found on Ladee Flat should produce 86,800 board feet per acre (USDA-NRCS 1988). To provide a frame of reference, an average log truck hauls approximately 4,800 board feet. A board foot is a standardized measure, 12-inches long by 12-inches wide by 1-inch thick (Dilworth 1976:11). Coniferous species are usually found growing in stressful environments, so the relatively benign climatic conditions of the Pacific Northwest create an interesting biological anomaly. Ecologists have observed that "one of the most outstanding features of these forests is the nearly total dominance of coniferous species…the ratio of hardwoods to conifers in this region is 1:1,00 based on timber volume" (Franklin and Dyrness1973:53). Although the winters are moist and temperate, conifers are better suited to the dry summer conditions than deciduous trees, which prefer a more constant moisture regiment.

Another feature of the once extensive forests in this zone is their longevity and productivity; the trees continue growing long after other species have stagnated or died. Scientists have hypothesized that the conifers in the PNW were able to survive the last ice age in refugium areas allowing the gene pool to evolve over long periods of time. Many ecologists believe that the mountains of southwestern Oregon provided the necessary environmental conditions that enabled species that prefer temperate conditions to persist and recolonize the landscape as the glaciers retreated and the climate moderated (NRCS 1988). Interestingly, many researchers believe that Douglas-fir (*Pseudotsuga menziesii*) trees are relative newcomers to the region in geologic time, having first arrived 30,000 years ago during an interstitial warming period (Sharpe 1996:86).

Slope, aspect, and elevation determine what and where a suite of plant species will be found on the landscape. Below 3,500 to 4,000 feet in elevation, Douglas-fir, western redcedar, and western hemlock dominate the overstory forest (Franklin and Dyrness 1973). Bigleaf maple (*Acer macrophyllum*) and red alder (*Ulnus rubrus*) are the major deciduous trees found on Ladee Flat. Vine maple (*Acer circinatum*), oceanspray (*Concolor holodiscus*), Indian plum (*Oemieria cerasiformis*), red huckleberry (*Vaccinium parvifolium*), and salal (*Gaultheria shallon*), constitute the majority of the understory shrub vegetation (Pojar and Mackinnon 1994). Western redcedar and western hemlock were important tree species that once grew on Ladee Flat, but fires and logging have eliminated the seed source. The only cedar trees now growing on Ladee Flat were planted by the Forest Service in the 1980s. Western hemlock saplings are slowly regenerating under the Douglas-fir canopy (Appendix A, Table A.2.1).

Soil

Many soil scientists believe that soil contains the sum total of the climatic history of a specific region. Temperature and moisture determine the kinds and amounts of vegetation that populate an ecosystem, and are the active abiotic factors in soil formation processes. The NRCS has identified four climatic zones in Clackamas County that have influenced the formation of soils in the region. Ladee Flat is located in a climatic zone characterized by warm, moist summers and moist, cool winters (NRCS 1988:181).

This climatic regime, along with the general geologic properties and overall stability of the area, has been a key factor in the formation process of Ultisols, which consists of groups of very old soils that share similar physical and chemical properties. These soils

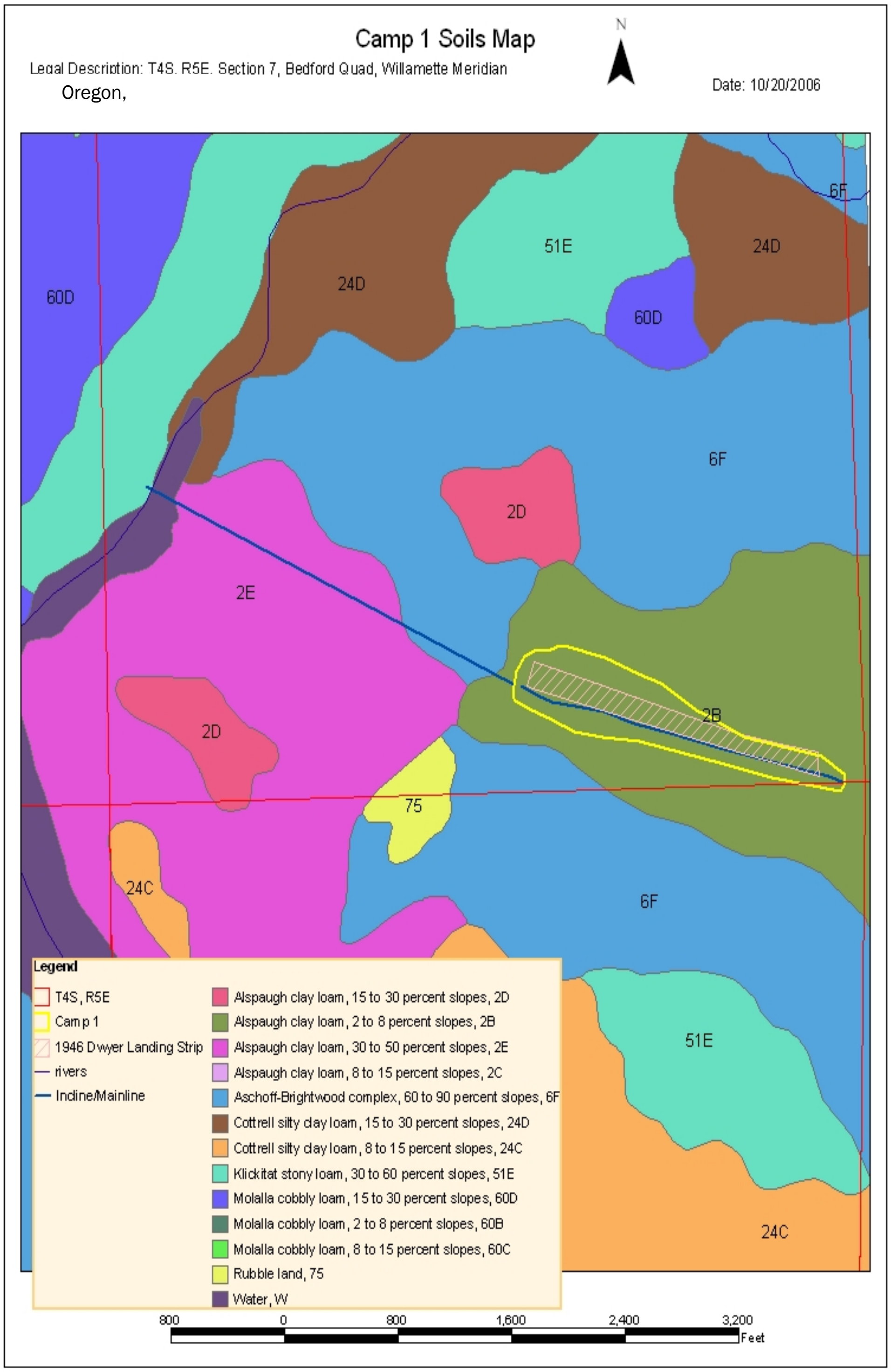


Figure 2.2: Soil map of Ladee Flat and Camp 1 (USDA-NRCS geodata)

usually develop under subtropical conditions, indicating that the soils on top of the North Clackamas River canyon must have formed during a time when the climate was somewhat warmer (Figure 2.2).

The Alspaugh soil series found on Ladee Flat is a local subset of the Ultisols great group soil order and makes up over 14% of Clackamas County soils. It is a deep, well-drained soil found on high terraces and rolling uplands at the edge of mountainous areas from 800 to 1800 feet in elevation (Table 2.1). The soil was formed in alluvium and colluvium derived from andesite and tuff (NRCS 1988: 142). Soil scientists have determined that Alspaugh soils are best suited for timber production, but can be used for pasture, hay, home sites, recreation, and wildlife. The clay soil is subject to compaction if driven over, grazed or plowed when wet.

Table 2.1 Properties of Alspaugh clay loam soil series, USDA-NRCS soil data

Forest Productivity	**Common Trees**	**Site Index**	**Volume of Wood fiber (cu. Ft. ac.)**	**Trees to Manage for**
	Douglas-fir	126	186	Douglas-fir
	Red alder			
Soil Description	**Depth to Bedrock**		**Physical Properties**	**Landscape Position**
	Over 60 inches		Clayey, well-drained, potential for water erosion	Mountains
Soil Texture/Color	**Depth in inches**	**Munsell Color (wet)**	**Texture**	**Rock Fragment 3-10 inches**
	0-14	7.5 YR 3/3 brown	Clay loam	0
	14-43	5 YR 4/4 reddish brown	Clay, cobbly silty clay, clay loam	0-30%
	43-60	5 YR 4/4 reddish brown	Very gravelly clay, very gravelly clay loam	0-30%

Fire history and ecology

Forest fires have been a significant factor in landscape change and on the nature of the archaeological record found at Ladee Flat. Douglas-fir requires sunlight to successfully regenerate. It has evolved as a pioneer tree species in a variety of environments disturbed by fire, landslides, or windstorms where large areas of the canopy have opened up enough to allow sunlight to reach the forest floor. Tree-ring histories have been constructed for several National Forests in the western Cascade Mountains to assist foresters in understanding how fire has influenced the development patterns of Douglas-fir forests (Appendix B, Table B.1.1).

Known as a fire regime, the frequency, extent, and severity of forest fires are influenced by environmental conditions that vary widely across a forested landscape. Factors such as slope, soil moisture, forest composition and fuel loads, in conjunction with the fire regime, have created complex mosaics or patches of age-classes and plant communities when timber stands are examined on a landscape scale (Beaty and Taylor 2001: 955). Fire regime parameters, including the fire return interval and the season and extent of the fires, can be quantified using written fire records and information from dendroecological research. Tree-ring studies provide data on the age of fire scars, radial growth changes in annual tree-rings, and distribution of age-classes from timber stand inventories, and are useful as a forest management tool (Beaty and Taylor 2001: 958).

Continuing interest in Pacific Northwest fire regimes have led to a series of tree-ring fire histories based on data collected from landscape-scale studies. These studies have shown that forest fires increase in frequency, size, and severity along a gradient stretching south from Mt Rainier into Northern California. The regions between these two end points have experienced highly variable fire histories, with fire frequency intervals ranging from 20 years to over 400 years (Morrison and Swanson 1990:2-3). Researchers have discovered that not all forest fires were stand replacing or evenly distributed through time, which has created a complex mosaic of age-classes and structural characteristics in western Oregon forests (Morrison and Swanson 1990:1). Weisberg and Swanson (2001) studied forests just to the south and north of Ladee Flat in order to clarify human and climatic influences on widespread fire patterns over time and at larger spatial scales. They found that most of the old-growth Douglas-fir forests still standing in the Cascade Mountains of Oregon and Washington originated from widespread stand replacing fires that occurred in the years from 1400 to 1650 (Weisberg and Swanson 2001:21). The old-growth trees that were harvested during the 1920s on Ladee Flat regenerated after 1650. Humans were the primary ignition source for the widespread fires that occurred in Oregon forests from the 1850s until 1925. The modern era of forest fire suppression has tempered the impacts that warm summers, low snow accumulations, and human behavior might have had on the frequency, severity, and extent of forest fires since the mid-1920s (Weisberg and Swanson 2001: 21). Figure 2.3 captures the state of the historic vegetation in Clackamas County that foresters encountered in 1914.

In 1933, a survey of Clackamas County and Oregon forestlands by the U.S. Forest Service Experimental Research Station, generated not only timber inventories, but a fire history of the upper Clackamas River watershed (Figure 2.4).

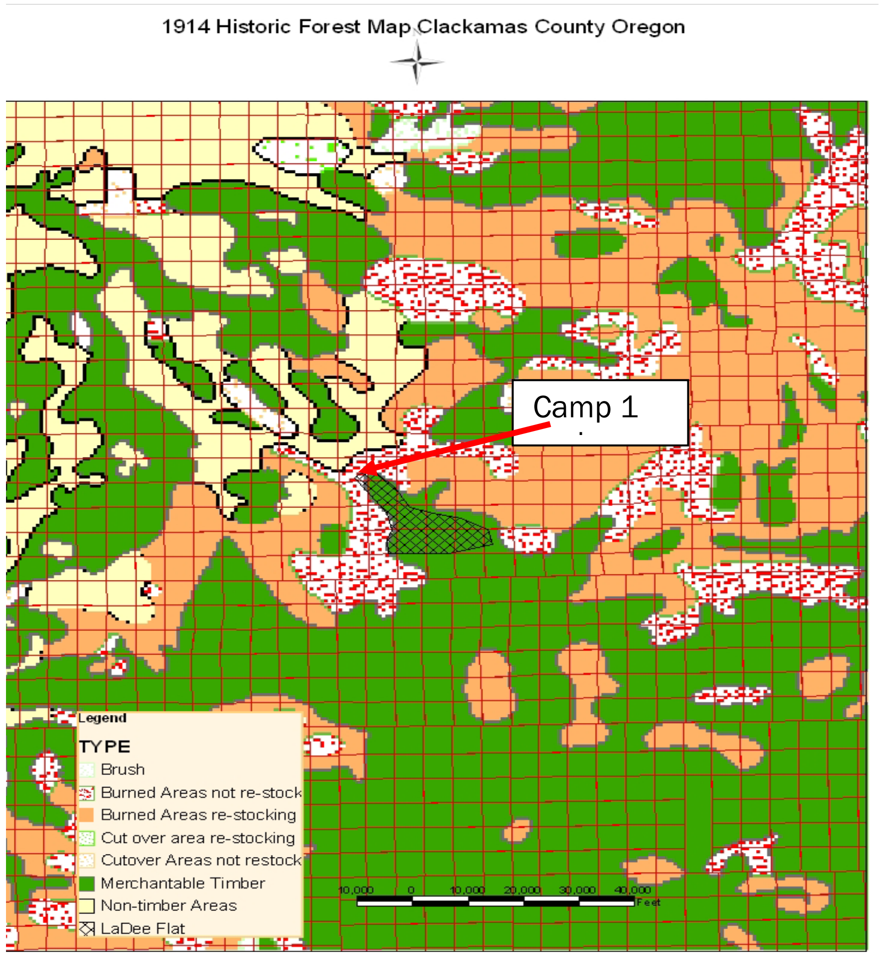


Figure 2.3: 1914 historic vegetation Clackamas County Oregon (Oregon Department of Forestry geodata)

The foresters recorded species type, age class, size class, and stocking class. This dataset continues to provide researchers with useful information to reconstruct the forested landscape as it existed in 1933. Much of the upper Clackamas watershed has been logged or burned several times since the inventory, so it is difficult to establish the boundaries of many of the old burns that were recorded by the stand examiners, especially the North Fork watershed which includes Ladee Flat and Camps 1 and 2.

Many timber stands in the North Fork drainage appear to have originated after 1868, which was one of the most destructive fire years in Oregon history (Morris 1934). General Land Office (GLO) surveyors mapped portions of the North Fork watershed in 1869, and remarked that fires had destroyed a large amount of timber. Portions of this drainage burned again in 1883, 1902, 1929, and 1939 including the areas around Camp 1 and Camp 2 (Merle Siedel, personal communication 2003). In 1896, GLO surveyors observed that much of the standing timber in the Roaring River drainage directly to the east of Ladee Flat had been recently destroyed by fire (GLO 1897).

Human activities in the middle and upper elevation forests have been an important factor in the fire history of the western Cascade Mountains. Although the specific role of native people's influence on the fire history of major river valleys in the western Cascades is still being studied, archaeologists have found evidence that early people set low intensity fires in the fall at the beginning of the rainy season to increase beargrass and huckleberry quality and quantities (Weisberg and Swanson 2001; Burtchard and Keeler 1991). The impact of the white settler's use of fire on the old-growth forests was significant. In contrast to native burning practices, fires started by white settlers usually began in the summer and burned hot over large areas for an extended period of time. This fire pattern changed the fire frequency in the upper Clackamas River from several hundred years between stand replacing fires, to a couple of decades in-between the catastrophic fire events.

Studies in fire ecology have demonstrated that it is important for archaeologists working in forested environments to consider the impacts that fire may have had on archaeological features, structure, and artifacts. Variations in intensity of fires, their frequency and spatial extent impact the nature and integrity of archaeological data that remains to be inventoried and analyzed. The challenge facing archaeologists is how to obtain the necessary environmental data to do this. I will demonstrate that tree-ring data is an accurate, efficient and site-specific method of determining the age and extent of fire disturbances to the archeological record of Camp 1.

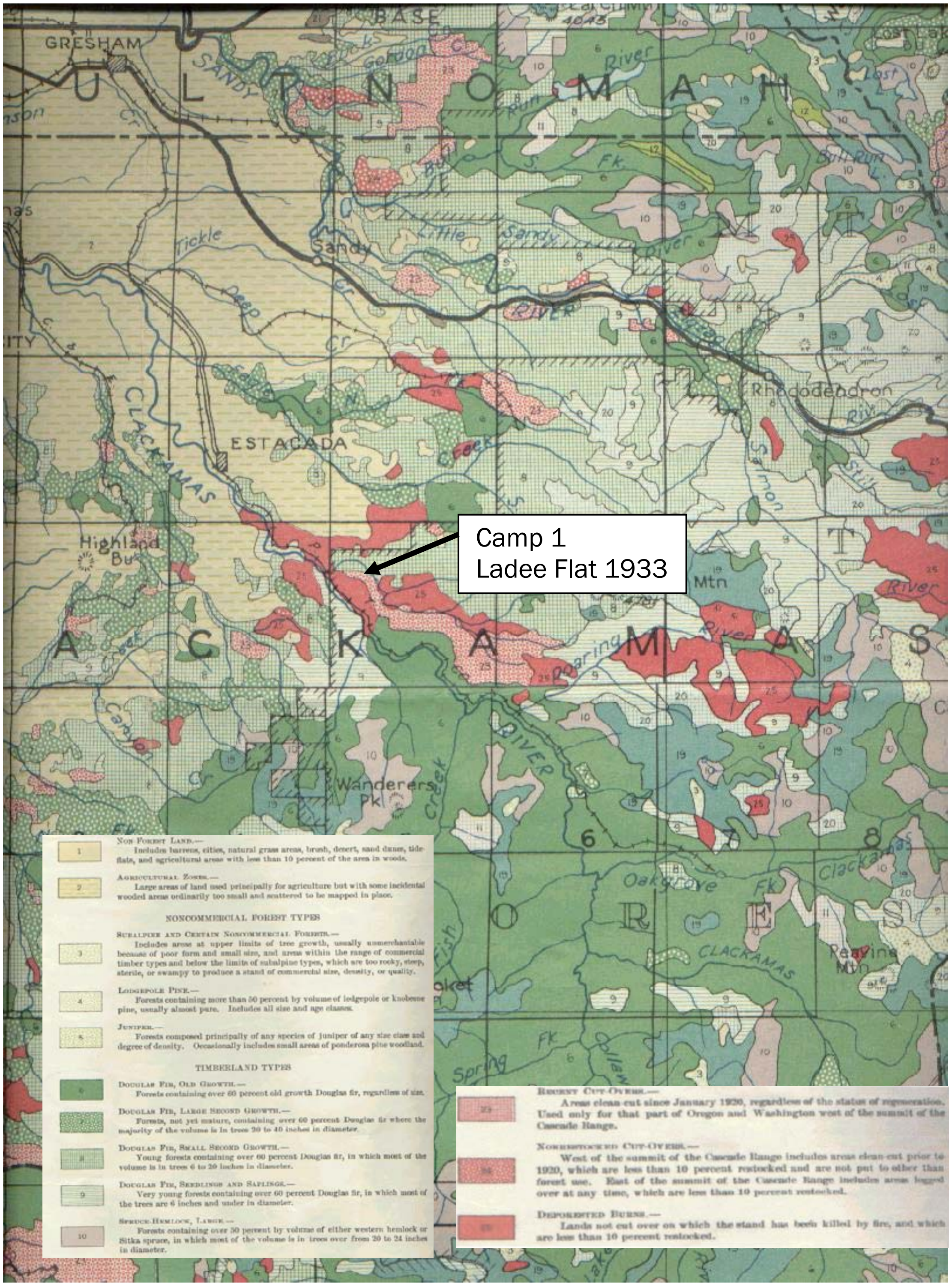


Figure 2.4: Forest inventory map created in 1933 by the US Forest Service showing 1929 Ladee Flat Fire

CHAPTER 3: THEORETICAL PERSPECTIVES

"Theories are the tools that anthropologists use to give meaning to their data" (McGee and Warms 2004:1). The research questions that are formulated to guide archaeological data recovery and analysis are determined by the theoretical perspective of the investigators. A complex historical archaeological site such as Camp 1 requires more than one analytical framework to interpret the archaeological record and use of space, and to understand the relationship between the environmental history of the area and the site formation processes that have occurred. I have chosen to use selected principles from frontier theory, temporary work camp settlement pattern studies, and environmental archaeology as the theoretical perspectives upon which an interpretation of the archaeological record at Camp 1 will be based.

Frontier theory

Frontier theory is an archaeological interpretative framework that originated during the 1980s by archaeologists working in the southeastern United States on colonial era sites. This analytical perspective is based on the assumption that the "form, composition, and organization of frontier colonization reflected adaptations to the new cultural environment created by expansion and migration into new geographic and economic environments" (Lewis 1984: xxiii). Frontier theorists understand that societies are organized along economic lines of subsistence, technology, and exchange, and that this organization has been preserved in the archaeological record of a site.

Recent studies into frontiers are more geographic and economic in nature. Frontiers are thought of as zones, often located next to formal boundaries between settled and unsettled territory. Frontiers can be viewed as "zones of transition stretching from the edge of the state core to the limits of its expansion" (Lewis 1984:10). Although considered an outdated view on the evolution of society by many archaeologists, Lewis maintained that as time passed, the ecological and cultural systems become more adapted and specialized to their evolving environment, resulting in increasing complexity of these systems. Frontier economies, although usually based on a one-way flow of resources out of the peripheral area and back to the core, also involve the unifying factor of shared cultural traditions bound together by a common market network.

Researchers such as Donald Hardesty (1980) have suggested that patterns resulting from the transformation of a frontier into a cultural and political unit contained within the boundaries of the colonizing entity, be interpreted from an ecological perspective. "Research problems should be concerned with identifying documenting, and explaining key processes in this transformation, changes that set these processes in motion, and the impact of the processes on the colonists' social and habitat relations" (Hardesty 1980:69).

Colonization and the development of insular and cosmopolitan frontiers

Archaeologist Kenneth Lewis used material culture studies to explore the nature and effect of frontier processes on the development of New World societies, and the relationship of the material record to the cultural processes that developed and changed over time. The process of colonization is characterized by rapid growth over large areas. The expansion of a cultural landscape is visible in the archaeological record, especially when the spatial distribution and composition of settlements are viewed from a larger temporal and spatial perspective. Lewis applied the frontier theory model to one type of colonization process on a colonial era site in South Carolina. He characterized the frontier environment at the time as "insular', which he defined as the expansion of European colonial powers and agrarian settlers into a frontier setting, intent upon permanently occupying and farming the lands. Lewis believed that this model could be useful in understanding other types of colonization processes, such as the establishment of settlements based solely on the commodification of nature, as the insular frontier expanded to exploit the resources found in the peripheral or cosmopolitan frontier.

Lewis defined cosmopolitan frontiers as areas where specialized resource extraction-based economies resulted in little of the fundamental change that is associated with insular frontiers. Cosmopolitan frontiers are a reflection of the variability inherent in their specific functions such as the transitory nature of the logging industry and the work camps that housed the loggers. As Lewis (1984: 264) explained "cosmopolitan frontiers arise to accommodate specialized extractive economic activities in peripheral areas of the world economy…cosmopolitan frontier change is an adaptation to the economic system in which it plays a major role rather than an adaptation to the economic and social milieu of peripheral areas. As a result of this economic relationship, settlements on a cosmopolitan frontier, despite a variety of environmental conditions, share more characteristics with the colonizing society and with each other, than with agrarian settlements on a neighboring insular frontier". Eventually cosmopolitan frontiers are transformed into insular communities as the workers decide to settle down, usually when the resource is depleted or an economic downturn in distant markets results in layoffs and mill closures. Both types of frontier change have left a unique type of archaeological record in terms of material culture and spatial patterning of sites and activity areas (Lewis 1984: 263).

Lewis identified ranching, trading, exploitative plantation, industrial, military, and transportation systems as cosmopolitan frontiers. All cosmopolitan frontiers are based on the export of marketable commodities to a regional distribution center where the resources can either be processed further or distributed to market outlets. The markets for the product and/or raw materials are external, the money to capitalize the resource extraction ventures are from external sources, the management for the operation comes from elsewhere and usually in the form of capitalists who live externally as well, and the workforce is transient in nature. Because there is a hub or core-state to which the resource extraction satellite communities are connected, there is a degree of standardization in technology, workforce, behavior, management and basic corporate operations that permeates all of the satellite communities. Transportation systems are constructed on a least-cost basis for the sole purpose of providing a means to export the commodity. Colonial frontier settlements are transient and sometimes even portable and periodic abandonment of resource extraction sites occurs as the resources are depleted. A cosmopolitan frontier inevitably changes to one of an insular, agronomy based economy (Davis 1993:25-26). These characteristics of cosmopolitan frontiers impact the archaeological record found in industrial sites and work camps that are scattered throughout the west.

The material culture and settlement patterns of industrial sites on the cosmopolitan frontier reflect the processes of abandonment; the rate and nature of technological change; acculturation of the immigrant ethnic groups who were usually employed as common laborers; nature and pervasiveness of corporate control; the influence of political, social, and economic conditions; growth and change of transportation systems; and the relationship of industrial expansion to market demand. Railroad logging camp structures and equipment were often built on flat cars and moved up to 50 miles to follow the receding timber supplies. Railroad tracks, bridges, and trestles were built for resource extraction using the most economical materials and methods possible, which is reflected in the location, construction techniques, and durability of the structures. A variety of ethnic groups were employed on logging and railroad labor crews and this may have influenced settlement patterns on the industrial frontier landscape.

Lewis found that dispersed resource extraction or industrial sites do not contain large quantities of domestic refuse because workers and their families usually lived and disposed of domestic refuse in a separate location from where they worked. This type of behavior manifested in two types of disposal patterns that is evident in the distribution of artifacts and features found in industrial work camps.

Environmental archeology

Humans are as much a part of the environmental history of North America as climate change and forest fires. The native peoples that lived in North America 12,000 years ago as the glaciers retreated were active agents in the ecosystems that evolved as the continent thawed (Cronon 1983:32). From their first appearance in North America, early European explorers, traders, and colonists set about rearranging the native plant and animal communities to resemble those of their homeland in order to facilitate their survival in unfamiliar conditions. The introduction of non-native plants, animals, pathogens coupled with differing views on resource use began a process of profound changes to the natural environment that continues into the present time. Early settlers viewed North America as a wilderness, and the conversion of forest lands to agricultural fields was considered the highest use of the land. The perception that humans were separate from nature, differed dramatically from Native Americans' traditional viewpoint that humans were part of the ecosystems in which they lived (Cronon 1983:5).

Colonization also includes the capitalistic perception that resources are commodities to be exploited for profit. Capitalism and colonization have played a dominant role in the rise of the modern world and these themes have become a major focus of historical archeological research. Some archaeologists believe that commodification, or the process by which exchange and use values are assigned to things, has been just as influential in shaping western culture and society as capitalism and colonization. Exchange values address what is required to acquire the commodity, while use values captures how useful the object is or will be to the purchaser. Many historical archeological research projects focus on production and exchange of commodities since these are the types of artifacts that are uncovered during excavations (Mrozowski 1999:153-155).

Mrozowki advocated the study of environmental history because it represents one of the most productive research avenues open to historical archaeologists. Through the use archaeological and historical records, archaeologists are able to synthesize environmental data with traditional sources to explore the impact that colonization, capitalism, and commodification of natural resources has had on the environment. Patricia Rubertone (1989:50) explained that natural and built environmental landscapes are "land that has been shaped and modified by human actions and conscious design to provide housing, accommodate the system of production, facilitate communication and transportation, mark social inequalities, and express aesthetics". A landscape is not static; it changes slowly or rapidly depending upon the natural or cultural forces that influence its morphology. Archaeologists are in the unique position to understand how the cultural values that influence these processes are expressed in various forms of material culture, features, and use of space that can be found in the archaeological record (Mrozowski 1999:157).

In addition to information found in historical documents, environmental archaeologists use pollen analyses, soil tests, fire histories, dendrochronology, geomorphic features or other natural datasets as tools useful when interpreting and understanding the landscape-scale processes involved in human land use and natural site transformation processes. Historical photo comparisons reveal environmental change and are valuable when reconstructing past environmental conditions (Swetnam 1999: 1198). These techniques are useful to determine and explain historic trends, in addition to temporal and spatial variations found in the archaeological record.

As Beaudry (1986:41) observed regarding historic land-use studies, there is a "need for an integrated methodology incorporating analytical tools that can provide fine-grained information on earth-moving activities as well as environmental change". Information obtained from natural archives, such as dendrochronology, integrated with documentary records and archaeological methods, provides a powerful set of tools to reconstruct and understand a variety of issues that environmental archaeology is capable of addressing.

Settlement pattern theory

A growing body of archaeological research associated with western work camp settlement patterns and material culture has incorporated many aspects of frontier theory. Archaeologists have expanded upon this base and are exploring new research domains focused on social relations and class distinctions, ethnicity, labor reform movements, corporate control issues, consumer choice and access to national markets, and how these factors influenced the daily life of the thousand of anonymous workers who called these labor camps home (Miss et al.; 2000; Case 2001; Chapman et al. 2003). Some archaeologists contend that the material goods, the structures, and the organization of space on the landscape reflect a social order that can be studied, and from which an archaeologically based social history of the people who did not leave a written record of their life can be reconstructed. Changes in the landscape patterning and the built environment can be linked to larger social, political, and economic influences that lead to transformations in site function, household composition, and socio-economic status (Nassaney et al. 2001).

Settlement pattern studies require an extensive knowledge of the environmental history of the area, as well as any ethnographic or historical documentation that may exist. Archaeologists need to understand the material culture of the site if they intend to define tool kits and activity areas, and answer research questions about who was doing what, and where they were doing it. Material culture has been defined as "the relationship between people and the goods associated with them" (Brauner 2000:1). Material culture is understood by archaeologists to be a physical manifestation of the culturally sculpted "idea" that went into an object's manufacture, distribution, use, and eventual disposal. An artifact is anything made or modified by humans, so a landscape altered by human
activity is as much an archaeological artifact as the rusting pieces of cable, can dumps, and railroad spikes that are scattered about historic railroad logging camps.

Many archaeologists who research temporary work camps in the west use a combination of archival research and archaeological investigations to gather information about the laborers who occupied the camps. Personal, social, and political information pertinent to the work force is not usually present in corporate records or other documentation of the period, so archaeology can provide information about camp life that is not available from other sources.

The influence of gender on the organization of the lumber industry

Deep in the deciduous forests of West Virginia, Janet Brashler (1991) examined the influence that women had in the arrangement of social space in an industrialized landscape, and whether it could be discerned in the archaeological record. She developed an environmental and historical context to explain the transition from family ownership of smaller parcels of property in the region, to one of absentee corporate owners who controlled large blocks of timber lands. As the economic system shifted from subsistence to a wage based economy, the men found themselves living seasonally in logging and mill camps in order to make a living for their families. The construction of railroad logging systems resulted in the development of mill towns, or company communities, which participated in the global consumer network that linked Appalachian hill people with those in Japan.

Brashler used topographic maps to identify probable locations of undocumented temporary logging camps. Field surveys recorded the presence of leveled surfaces where shanty-car shacks were once located. These temporary structures were brought to the site on flatbed rail cars and placed on the pads with a crane. They were picked up and moved as the surrounding area was cut out. Can dumps and dispersed artifacts also indicated that a temporary logging camp was located nearby. Brashler found that the sites varied in size, and that the larger sites contained a distinctive artifact assemblage. Based on the types and location of the material culture encountered at the various sites, Brashler suggested that the smaller shanty-car sites were occupied by all-male work groups, while families lived in the larger, semi-permanent logging communities and mill towns. Her study revealed the role of gender in the organization of the logging industry.

Foodways, ethnicity, and associated material culture studies in Michigan logging camps

Franzen examined the archaeological record in several Michigan logging camps associated with foodways, tableware and other related objects. His goal was to get beyond the generalized historic record associated with railroad logging camps, and establish a more realistic view of the living and working conditions. Franzen's historical research focused on foodways, corporate setting, labor supply and demand, and the ethnic characteristics of the labor force (1992:76).

All of the study sites were located in small, grassy openings in the forest canopy. Franzen (1992:79) believed that soil compaction and destruction of the humus layer were responsible for the lack of regenerating woody vegetation. He found that few structures remained standing in the Pine Era logging camps, but archaeological features like berms were common. Soil had been piled around the bottom of buildings to provide insulation. Other features in the camps included borrow pits, drainage ditches, and depressions from privies and dumps. Artifacts such as tools, building materials, eating utensils, food containers, and bone remnants were also common (Franzen 1992: 74).

The ceramic assemblages at the camps were dominated by undecorated white paste earthenware, also known as ironstone, which would remain white even when chipped (Franzen 1992:86). Most of the fragments had makers' marks from factories in East Liverpool, Ohio or England, and consisted of pieces of plates, cups, and saucers. The occurrence of cut glassware, doll parts, and transfer print china indicated the presence of women and children in the camps. Franzen (1992:92) related that the families of the cook and the foreman often lived in the camps.

The remains of a Finnish sauna were found in several of the camps. These features consisted of rectangular earthen berms that contained heat altered small rocks. Franzen interpretated the material culture found at many of these sites to indicate that they were ethnic specific family work camps. The presence of this type of family work camp led Franzen to draw several conclusions about the rates of cultural change and adaptation that can be elucidated from the archaeological record found in the logging camps. He maintained that family structure was an adaptive unit to an industrial work environment which allowed recent immigrants to transition into the new culture and environment (Franzen 1992:92). Franzen found that many workers retained family and ethnic ties, as well as certain elements of their traditional material culture. He concluded that the archaeological remains of logging camps were an important source of information on the immigrant labor force on the logging frontier.

Keechelus work camp, Washington State

During extensive excavations at Keechelus Dam construction camp in 2000, archaeologists recovered artifacts similar to those found in other western work camps including food and tobacco cans, medicine bottles, ceramic tableware. Based on the spatial distribution and types of artifacts that were recovered in four different living areas, archaeologists were able to conclude that diet, quality of housing, clothing, and presence of luxury goods varied with occupational status (Chapman et al. 2002:35-36). The researchers were unable to detect ethnicity from the archaeological deposits, but found ample evidence of gender differences. The archaeologists believed that the archeological record provided them with information about “personal choices, economic and social status and living conditions of the various classes of workers in the camp between 1912 and 1917: (Chapman et al. 2002:54).

Comparative logging camp settlement patterns

A comparative study of logging camp literature in the Pacific Northwest was performed to provide baseline data to construct a settlement pattern model for Camp 1. This dataset will be combined with oral histories and existing photographs of Camp 1 to develop the model. The model will be used to interpret the archaeological features and artifact scatters that will be encountered during the field survey portion of this project.

The size of the logging camps depended upon the amount of timber to be cut, accessibility to the work site, and the type of transportation systems used. The largest camps were found in the Pacific Northwest in connection with power skidding and railroad operations, and housed up to 300 men (Brown 1934:64). In 1914, W.H. Gibbons (1914:16) provided an example of a stationary camp in a U.S. Forest Service technical publication. The cabins were positioned 50 ft. from the railroad track. Each had three bunks and a woodstove (Gibbons 1914:15). They cost $50 to build, $25 to furnish, and lasted 8 to 10 years. Cabins for 96 men cost $1,800. The cabins consisted of:

- 1 X 12 in. boards set on 6 in. square 17 ft. long runners
- the structure had a 3 ft. gable and rubberoid roofing
- a 30 x 78 in. front door, and two rear 24 X 26 in. sliding windows

Gibbons also reported on a portable logging camp in Oregon which consisted of ten camp cars, each 14 ft. wide and 46 ft. long. These structures were built on 34 ft. long flat cars. The bunk cars were steam-heated, had louvered windows to provide ventilation, two tables, and assorted benches (Gibbons 1914:13). The water supply for the boilers, cookhouse, dynamo car, and other uses came from a 2000 gal. tank. One pumping plant provided water for the camp and for the steam donkeys. There was a generator capable of powering one hundred 110-volt lamps (Gibons 1914:15). The cookcar had sixteen 3 X 3 ft. swinging sash windows, and three front doors. A dish-up table, range, 40-gallon galvanized iron boiler, sink, drain board, portable bread mixer, pastry table, shelving, and hooks for dishes were found inside the cook car (Gibbons 1914:13).

Bryant (1923:71) reported that there usually was one head cook and one or more assistant cooks for the camp. There was also one flunkie or cookie (the cook's helper and waiter/waitress) per 25 men. Modern camps had electric dishwashers, small refrigeration plants, or underground cold storage facilities, and there was one or more cookstoves (Bryant 1923:72). Kitchen utensils were made of iron, tin or graniteware, while tableware was made from graniteware, although heavy china was preferred. The steel cutlery had plain wooden handles. Bryant (1923:74) provided an interesting calculation – based on a 6000-7000 daily caloric intake per worker, the total weight of animal feed and human foodstuffs required to log one million board feet of timber in the Pacific Northwest was 200 tons.

Labor strikes regarding the crowded and unsanitary conditions found in western work camps had resulted in legislation to correct this problem. State regulations in many western work camps were enacted to address water quality issues, proper garbage disposal, adequate bunkhouses ventilation, and other essentials of camp sanitation. In

1919, the Loyal Legion of Loggers adopted sanitary regulations to provide a standard for workers living in temporary camps in the west. The following is a summary of regulations and standards that were in-place during the years that Camp 1 was operational.

- To ensure pure water, camp buildings and latrines should be located away from the water supply, a water fountain should be provided for the workers and common drinking cups prohibited
- Tin cans and other garbage should be burned daily, or treated with kerosene or borax. Tin cans and other garbage should be stored 200 ft. away from camp. Waste water should be carried in closed trenches to a cesspool, or if in open ditches, frequently sprinkled with quicklime
- Fly-proof sleeping, latrines, kitchen, and dining room with wire mesh screens
- Provide adequate space and ventilation for each worker, the bunkhouses should be two feet off of the ground in damp conditions, and none should hold more than 25 men. The floors should be swept daily and oiled every two weeks
- Latrines should be placed on the opposite side of the camp and at least 250 ft. away from the cookhouse, and not less than 150 ft. from the bunkhouses. They should have one seat for eight people, be connected to the rest of the camp with a boardwalk, and have a light over the door. The pit should be eight feet or more deep.
- The bathhouse should be centrally located to the bunkhouses and there should be one shower head per 20 men.

- Each man should have 22-inches of table space in the dining hall
- Tableware will consist of heavy white ceramics and graniteware

Brown (1934:64) reported that structures in logging camps were generally made of #1 or #2 rough-cut tight-knotted lumber; frequently felt or tarpaper was placed between two layers of the boards. When the camps were dismantled, the doors, window frames, and other types of reusable hardware were taken to the new location.

Camp 1 settlement pattern model

Based on the information provided above, I would expect to find the following conditions at Camp 1.

- The cookhouse dump will be located at least 200 ft. away on the other side of the camp
- The latrine will be at least 250 ft. away from the cookhouse, and located on the other side of the camp
- Housing structures were made of rough-cut boards built on 6 X 6 in. sills at least 2 ft. off of the ground, and the doors and windows probably were removed when the camp was abandoned
- The bunkhouses will be no more than 150 ft. from the latrines
- There will be a bathhouse centrally located to the bunkhouses
- A commissary and office structure will be present on the site
- Housing may or may not have been segregated by marital and occupational status or ethnicity

- A well-lit saw filer's shack, several storage and maintenance buildings for the locomotives and logging gear, elevated water tanks, sand shacks, fuel sheds, and structures to protect the lowering donkey and camp power plant are some of the structures that were probably located at Camp 1.
- The camp was aligned along the mainline and began to the east of the lowering donkey. The lowering donkey was located approximately 450 ft. from the head of the incline, and the headworks were approximately 300 ft. away, or 150 ft. from the head of the incline.
- The mainline railroad bed was built atop ballast material, which may have consisted of crushed-up, locally obtained andesitic and basaltic rocks. There were well-defined V-shaped drainage ditches on both sides of grade in front of the camp structures, which were perfect places to collect lost and broken small objects associated with the people who lived in the camp.
- A railroad siding paralleled Camp 1 to the south, and was used to move supplies and empty cars into the camp. There were several storage and shop buildings along this grade
- The camp was heated with woodstoves, so large amounts of firewood would have been required
- All the steel rails, logging equipment, and whatever was of value was moved to a new work location in the Coast Range, so there will not be a great deal of industrial materials remaining

- Camp sanitation requirements at the time would have resulted in only a small amount of domestic primary refuse around the camp, the litter and garbage would have been collected and disposed of in the camp dumps

Figure 3.1 is a visual representation of the settlement pattern model that I have developed for Camp 1 based on the specification listed above. The archaeological and dendrochronological survey of the camp performed during the field survey phase will determine the accuracy of this model, and provide information to increase the accuracy of future Camp 1 reconstructions.

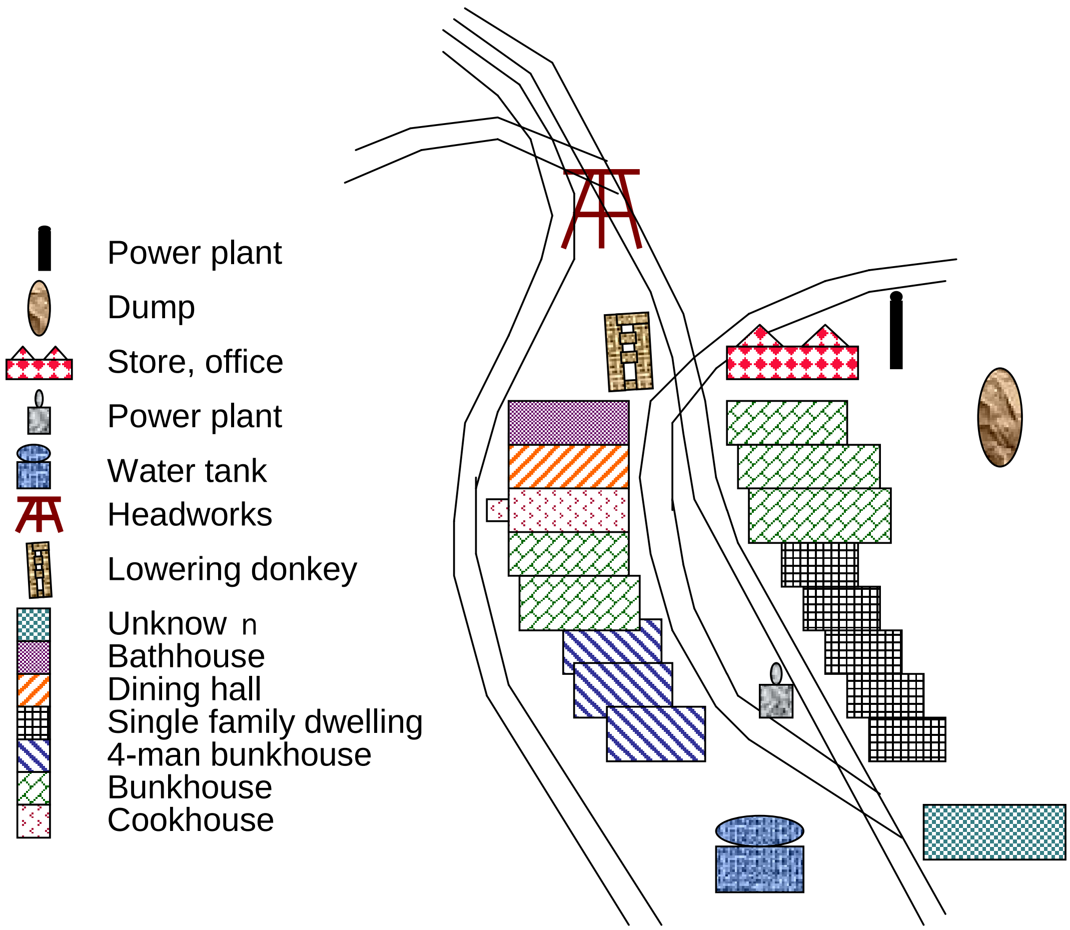


Figure 3.1: Model of Camp 1 settlement pattern based on photos, oral histories, and literature review (not to scale and not oriented to north).

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

The railroad logging that occurred on Ladee Flat during the 1920s, shared characteristics with other logging and labor camps of the era, as well as significant differences. As with most other ephemeral logging operations of the period, corporate records have not been discovered for Union Lumber Company, Porter-Carstens Logging Company or Ladee Logging Company. Although several hundred people lived in the camps on Ladee Flat, it is not known if housing areas were ordered by the marital, ethnic, or occupational distinctions that characterized many other camps of the era (Chapman et al. 2000; Brashler 1991). Only one picture of Camp 1 was discovered during archival research for this project, and it was tucked away in a Forest History collection at Penn State University in State College, Pennsylvania. It would have been a challenge to reconstruct the settlement pattern, and interpret the material culture found at Camp 1, without a multidisciplinary approach that included archaeology, photogrammetry, and dendrochronology. Aerial photographs do not capture the fine-scale variations in age-classes in the Douglas-fir forest that has regenerated on the site. This is important because variations in age-classes are usually related to disturbances in the forest canopy. Dendrochronology can provide insight into the timing and extent of the various natural and cultural disturbances that have influenced the archaeological record at Camp 1.

It was also hypothesized that the site boundaries of Camp 1 could be determined using tree age. Trees growing outside of the camp would be older than those inside the camp. Prior to this study, the site boundaries of Camp 1 were not known to the Mt. Hood National Forest archaeologists and archaeological technicians. The cultural resource managers responsible for Ladee Flat were not sure where the camp was located, but they believed the site did not have integrity because an airstrip had been built over the top of a portion of it in the 1940s (Merle Siedel 2002, pers. comm.). As a result of this management decision, the location of Camp 1 has not been documented, and its eligibility for inclusion on the National Register of Historic Places has not been determined. The site has no protection; the trenches excavated through the old mainline by the Forest Service to keep ATV's out have revealed an incredible assortment of artifacts, unfortunate proof that federal managers have not given proper consideration to the significance of the archaeological resources at Camp 1. Many of the research objectives of this thesis were designed to address this omission, including an exhaustive background literature review, establishing site boundaries, documenting the surface archaeological features and artifacts, and making management recommendations for future actions at Camp 1.

Literature review of work camp archaeology

A comprehensive literature review was conducted for this study, which focused on archaeological investigations and historical records documenting labor camps in the Great Lakes region, Northern California, and the Pacific Northwest. The purpose was to develop an understanding of what types of artifacts, features, structures, and settlement patterns characterized remote work camps in order to interpret the archaeological record that would be discovered and documented at Camp 1.

A great deal of work has been done on logging camps in the Great Lakes area by Gregory Franzen and his associates (Franzen 1992, 1995; Dunham and Farnzen 1997). In one study, researchers excavated four Pine Era logging camps to collect baseline data concerning the organization, function, and lifeways of lumber camps in the region. They found that cookhouses, bunkhouses and blacksmith shops had distinct artifact assemblages associated with each of these activity areas, and that foodways varied by corporate ownership (Dunham and Franzen 1997). In 1992, Franzen investigated the foodways and related material culture items like types of tableware used in the camps and the presence of ethnic markers such as Finnish saunas. He found that the choice of ceramic or enameled tableware used in the camp seemed to be a corporate preference and varied widely across the region (Franzen 1992). Franzen also looked at the relationship between medicine bottles and alcohol consumption in logging camps from the 1880s through the 1940s. He found ample evidence of alcohol use even during Prohibition, and concluded that the medicine bottles revealed the exploitative nature of the logging industry. He believed that in order to relieve job induced stress, workers used alcohol, tobacco, and opiates (Franzen 1995).

Closer to home, excavations at the Keechelus Dam Construction Camp, built by the US Bureau of Reclamation in 1916 in the Yakima Valley of central Washington, revealed that socioeconomic and class divisions existed between the various housing areas that made up the camp. This camp was notable for its progressive housing; electricity, water, sewer, and garbage service that was provided for the residents of the camp. The researchers concluded this was a conscious management decision during a time of labor strikes and reform in the United States, to reduce tensions between poorly paid immigrant workers and the higher status American managers (Chapman et al. 2002).

Shevlin-Hixon railroad logging camps in central Oregon evolved into company towns complete with a post office, school, tavern, and other facilities by the 1930s. Early camps were portable, the structures were built to fit on railcars and designed to be moved to be close to the logging operations in the woods. Residents in the early camps lived in bunkhouses or duplex-type single family structures. Food was stored in cellars and refuse was deposited in slop holes, along the side of the road, or in the camp dump. Cookhouses, dining halls, bathhouses, shops, warehouses, offices, and camp stores were found in the early camps, as well as the later ones (Gregory 2000).

Excavations at the Manley-Moore Lumber Company railroad logging camp just north of the Mt. Rainier National Park boundary in 2000 documented two types of sites. One consisted of two railroad grades that formed a wye, another segment of the grade on the plateau above, and an incline grade. The other site was a camp located at the end of the wye, between the incline and the split grade, and occupied from 1912 to 1914. The archaeologists found evidence that women and children lived in the camp from the artifacts hidden in the duff and moss that covered the site (Miss et al. 2000).

Previous archaeology on Ladee Flat

Various dam licensing and timber harvest projects originating from the U.S. Forest Service and Portland General Electric (PGE) have required Section 106 of the National

Historic Preservation Act compliance surveys. Both entities have conducted or contracted out archaeological resources reconnaissance surveys in partial fulfillment of their responsibility to consider cultural resources during the planning process of a federally funded or licensed undertaking, and to allow the Advisory Council on Historic Properties the opportunity to comment on their recommendations.

Hydroelectric projects

In 1985, a cultural resources identification survey was required by the Federal Energy Regulatory Commission (FERC) when Ott Water Engineers proposed to construct a small hydroelectric project on the North Fork of the Clackamas River. Ott hired a cultural resources management firm to inventory the project area, prepare the reports, and consult with the Oregon SHPO and other interested parties. The cultural resource management firm discovered that there was mixed ownerships along the river, including BLM, Longview Fiber timber land, and US Forest Service property, which added to the complexity of the project.

A review of the literature available at the time revealed that a multi-component site, consisting of a precontact lithic scatter and historic materials, was recorded to the south of the project area. A historic site was associated with the railroad logging industry of the Union Lumber Company in the 1920s was also recorded. A search of the GLO maps of the area revealed this site was near the Indian trail to Warm Springs recorded on the 1897 GLO map (Winthrop and Winthrop 1985:5).

A pedestrian survey of the project area was negative. Heavy vegetation did not allow the surveyors much ground visibility. Although the survey map included with the survey report shows that the area along the river where the incline, trestle, railroad grade and sidings, and engineer houses were located, as well as cinnabar mines, as being surveyed, no mention was made of any historic features or structures that were present in the area.

In 2004, Heritage Research Associates contracted with PGE as part of the relicensing process for the North Fork Dam hydroelectric project. The archaeologists found a precontact site at Promontory Park during a survey in 1997. The site, 35CL00261, is an open lithic scatter on a forested bench above the Clackamas River. Approximately 130 chert flakes were observed, along with a petrified wood flake, an obsidian flake, a green chert core, and a chert biface midsection with a large heat spall potlid scar on one face. The site was revisited in 2000 when 26 shovel probes were used to determine significance and National Register eligibility for the site. 2,072 pieces of lithic debitage was recovered, 98.7% of which was chert. Most of the cultural material was found in the upper 10 centimeters of the soil profile. This supports the obsidian hydration age estimate derived from the single piece of obsidian found at the site which was sourced to Obsidian Cliffs, and found to be only 224 years old. The Late Archaic date for the site corresponds with the poorly developed soil horizons. The small size of the lithic material, lack of cortex, and high concentration of flakes indicates that the site was used for the later stages of tool production.

Timber sale surveys

In 1992, portions of Ladee Flat were surveyed for a planned timber sale. High probability areas were identified from the Mt. Hood Sample Survey Design; these areas were surveyed using meandering transects spaced at 20-meter intervals. Within the study area were four previously recorded sites 665EA13 – Camp 2, Ladee Logging Co.; 665EA14 – Logging trestle, Ladee Logging Co.; 665NA23 (35CL00049); and 665EA23 Elk Springs Archaeological and Historic sites. Two previously recorded sites were located within 1 mile of the project boundary. These sites included 665EA32 - South Fork Waterworks and 665NA33 – South Fork Archaeological site. New sites discovered and recorded as a result of this inventory included 665NA91, 665EA137, 665EA134-A, and 665NA135.

At the time the report was prepared, 80% of the planning area was in 40-65 year old timber, a reflection of the forest fires in 1929 and 1939; although a mosaic of age classes could be found ranging from 2 to 132-year old stands (1860-1990) (Lawson and Carr 1992:2). The surveyors reported that “the second growth stands are a result of several catastrophic fires in the late 1800s to 1939. The 1929 Ladee fire burned all but the northeast corner, which was burned in 1892 and 1902. The 1939 Boyer fire reburned some of the same ground as the 1929 fire. Past logging and repeated fires have removed most residual trees and snags. In 1934 and 1935, standing dead snags were removed along Ladee Flat by the Civilian Conservation Crops (CCC). Tree planting on Ladee Flat began in the early 1930s by the CCC and the Forest Service in order to reforest the burned and logged over landscape (Lawson and Carr 1992:3).

During the course of this survey, the surveyors encountered challenging environmental conditions and eventually gave up on finding lithic scatters. They concentrated instead upon the railroad features; even these became difficult to see as the forest greened up over the course of the field season, and obscured the archaeological materials, sites, and features. In some high probability areas, the surveyors had to examine some of the areas on their hands and knees in order to see the ground surface (Lawson and Carr 1996:5).

Site 665EA13 Camp 2

Camp 2, 665EA13 is located on a flat west of Winslow Creek. The site was re-recorded in 1996, after first being documented by Bill Carr in 1980. In 1980, Carr observed that fire had destroyed almost all the evidence of structures and foundations, but there were surface artifacts such as bottles, ceramics, and rusted tin cans still present. Carr performed an intensive surface survey at this time, and collected many artifacts, including tokens from the interurban line. Table 4.1 is a summary of the artifacts that were present at Camp 2. Evidence of previous disturbances was found in the broken or melted bottles, broken or scorched dishes, and rusted metal containers that littered the site. Five centimeters below the surface some intact bottles were found. The site had been disturbed when Forest Service road 4612 replaced the railroad mainline through Camp 2. The camp burned in the 1939 Boyer Creek fire and some vandalism has occurred in the past to the site. Carr estimated Camp 2 to be 0.8 hectares in size

By 1996, only a few surface artifacts were listed on the Forest Service site form. These included a rusted kerosene can, and a possible trash pit that measured 5 x 7 meters wide and 3 meters deep. The surveyors noted that the heavy vegetation discouraged vandalism of the site, and made surface visibility almost impossible. Log stringers and supports, broken bottles, ceramics, and rusted metal containers indicate the presence of a

Ladee

Logging Company railroad trestle 665EA14 which was built on swampy ground that is now overgrown with alder trees.

Site 665EA12/665NA23/35CL00049

A 1920s era timber faller's cabin was recorded as site 665EA23. The cabin was located adjacent to a precontact/historic era trail, near the only reliable water source in the area. It burned in the 1929 Ladee Flat fire, and all that remains is window glass fragments and rusted pieces of metal. The Native American component to the site included agate and cryptocrystalline silicates debitage along with some broken artifacts.

Site 665NA91

665NA91 is a Native American site adjacent to a small clearing at the origin of Elk Springs that has been recorded. This site is along the trail to Warm Springs and provided reliable water in an otherwise dry part of the forest. This is a sparse lithic scatter in the middle of a Forest Service spur road which was originally disturbed by railroad logging spur construction, and the construction of a truck road in the 1930s, as well as present-day logging. Seven CCS flakes of various colors were discovered, mapped, and drawn (Lawson and Carr 1992:3).

Site 665EA134A

This is a linear site, 5.1 miles long by ¾ miles wide. It consists of a segment of Ladee Logging Company's railroad grade on Mt. Hood National Forest Land. The grade was given the internal Forest Service site number 665EA134A. At the time, Camp 1 and the incline were under BLM ownership, and were not part of the project area (Lawson and Carr 1992:1). In 1934, the CCC removed the railroad ties from the logging operation that was abandoned at the end of 1930, added gravel, and built a truck road over the mainline and some of the spurs (Lawson and Carr 1992:2). Inventoried members of the artifact assemblage included wire rope straps, Humboldt steam yarder valve stem and rocker arm, tongs and a fairlead roller (Lawson and Carr 1992:2). The surveyors described and mapped the railroad mainline and skidroads, features and artifacts they discovered during the survey.

Site 665EA137

This site was the location of the Bedford Point Lookout tower. In 1931, there was a tent and a firefinder, in 1933 the tent was replaced with a cabin and a phone. The structure burned in the 1939 Boyer Fire. A new fire lookout tower was built in 1940 which was demolished in 1966, leaving behind only the concrete tower supports, some stacked rock features, privy and garbage pits, and assorted garbage to mark the site (Lawson and Carr 1992:1-2).

Site 665NA135

This is a dispersed and disturbed lithic scatter with five obsidian and white CCS flakes located across FS road 4610 from Cold Springs. The site is located between two spurs which join to the north and lead into the probable location of the Cedar Pole Camp, which burned in the 1929 Ladee fire (Lawson and Carr 1992:5).

665EA54 "Sponkey Site"

This site was recorded in 1996 as part of the Winslow planning unit and consists of the remains of a steam donkey sled. The two log stringers are 46 ft. long (14.02 meters) by 2 ft. wide (0.6 meters) separated by 11 ft. by 4 ft. cross braces. Mortise and tendon joints were used to attach the braces to the log stringers. The wood braces averaged 7 ft. long by 2 ft. wide. One of the wood braces had been removed and was laying half on and half off of the stringer logs (Lawson and Carr 1992:2). Seven 12 ft. long metal rods were discovered running through the interior of the stringer logs and bolted to the log where they emerged. Railroad spikes and the remnant of a 1½ in. cable were still wrapped around the front of the sled. Corrugated metal roofing was also found. The sled was in fair but deteriorating condition. In 1980, a partial inventory of surface artifacts in Camp 2 was conducted. The results have been abstracted in Table 4.1; the typology was based on Roderick Sprague's 1981 functional classification system for artifacts from historic sites (Sprague 1981).

Historic and aerial photography

The spectacular engineering feat represented by the Porter-Carstens incline was well-documented in the industry journals of the time, including several photographs in the 1925 Willamette Iron and Steel Works catalog. *The Timbermen*, a long-lived trade magazine, documented the first day of operation of the Porter-Carstens incline in the October 1923 edition. Some of the pictures taken by photographers for the magazine ended up in the Forest History collection housed in the archives at Penn State University located at State College, Pennsylvania. These photos were discovered during a search of the finding aid published on the Penn State Library website for this collection in 2004. The archivist was reluctant to share the photos, but was convinced to make copies of eight of the lantern slides displayed in earlier chapters, by promising that the photos would only appear in print as part of this thesis.

Table 4.1: A partial list of artifacts inventoried on the surface of Camp 2 in 1980

Object	**Material**	**Functional classification**
Pot belly stove part	metal	Domestic item – portable heating
Stove part fragment	metal	Domestic item – portable heating
Stove legs	metal	Domestic item – portable heating
Whiskey bottle neck	glass	Personal indulgences - liquor
Mentholatum or cold cream jar	white milk glass	Personal – medical and health
Barrel staves		Commerce/industry - shipping
Kerosene can	metal	Commerce/industry - logging
Tobacco can	metal	Personal indulgences - tobacco
Several medicine bottle necks	glass	Personal – medical and health
Wash basin	metal	Domestic – housewares and appliances-portable waste disposal
Beer bottle necks	glass	Personal indulgences - liquor
8-sided jar bottom	white milk glass	Personal – medical and health
Prince Albert tobacco cans	metal	Personal indulgences - tobacco
Lantern or battery cores		Domestic– housewares and appliances-portable illumination
Lamp shade fragment	White milk glass	Domestic– housewares and appliances-portable illumination
Water pitcher	Metal	Domestic - gustatory
Bed springs	Metal	Domestic
Hack saw blade	Metal	Commerce/industry - logging
Coffee cup fragment	Porcelain	Domestic - gustatory
Aqua paneled medicine bottles	Glass	Personal – medical and health
Well preserved caulk boot	Leather	Personal - footwear
White bowl fragment	Porcelain	Domestic - culinary
Listerine bottle – clear	Glass	Personal – medical and health
Interurban train tokens	Brass	Personal – pastimes and recreation
1917 buffalo nickel	Metal	Personal - treasures
1919 Lincoln penny	Metal	Personal - treasures
Thermos bottle cup	Aluminum	Domestic - gustatory
Two brake shoes	Metal	Commerce/industry - logging
Stove grate	Metal	Domestic item – portable heating
Door lock mechanism	Metal	Architecture – construction - hardware
Waterman's ink bottle - clear	Glass	Personal – pastimes and recreation
Triangular files	Metal	Commerce/industry - logging
Phonograph record fragments	Plastic	Personal – pastimes and recreation

The Timbermen is an incredible primary source of photographs and articles on logging equipment, camps, people and industry trends. Bryant's 1923 college forestry textbook contained photos of camps and machinery. Manufacturing catalogs related to the logging and railroad industry also contained images associated with the equipment that was used on Ladee Flat, such as the Willamette Iron and Steel Works catalog. Other photos were found in railroad logging histories prepared by numerous aficionados such as Edwin Culp and John Labbe.

As mentioned in the introduction, a 1938 aerial photo in the Oregon State Collection was one of the most important documents discovered during the research for this project. The more the photograph is scrutinized, the more possible structures are visible, in addition to the location of the mainline and siding that ran through Camp 1.

Photo-documentation of the landscape changes that have occurred at Camp 1 and along the incline grade have also been compiled using a side-by-side comparison of historic photos with modern-era photos taken at approximately the same location where the original photographer stood. In some instances, the landscape has been so altered that it no longer exists, such as in the photo comparison displayed in Figure 4.1.

Other sources of documentation

Newspaper articles in the Oregonian reported on the damage and chaos from the forest fires that have spread through the area since the 1860s. Articles in trade journals and periodicals were also good sources of background information, as well as specific reports on events at Ladee Flat, such as the fire that destroyed Camp 2 in 1928. Standards such as Schwantes' *History of the Pacific Northwest* and Bryant's logging textbook also provided valuable historical contexts, as did forest history books written by a variety of authors such as Culp and Labbe. A local history prepared by Bill Carr, a U.S. Forest Service technician provided some informative data, but several contradictions exist between his document and other sources on Ladee Flat history. The 1930 U.S. Census, which documented the workers and their families living at Camp 1 and Camp 2 in April 1930, is another very important discovery that was made. Most of the labor camps in the Pacific Northwest were ephemeral and occupied between decadal census years. This has contributed to the undocumented and anonymous nature of the people who lived and worked in the woods. Several important maps also can be found in the Oregon State Map Library including a 1933 map of forest age-classes and species composition in Oregon, which captured the fire history of the state and changing land-use patterns. This map was prepared by US Forest Service foresters. Published timber stand inventory statistics associated with the mapping project are available at the OSU Valley Library as well. The 1869 and 1891 General Land Office maps drawn by Government surveyors were also consulted (Figures 4.2; Figure 4.3). These historic maps recorded Indian trails, structures, and landscape conditions found during the survey of the upper Clackamas River drainage.

Oral history

Many early forest service employees and local loggers were interviewed in 1967 as part of a forest history project by the Estacada Ranger District on the Mt. Hood National Forest. Leroy Layton recorded the oral histories on reel-to-reel tapes, including interviews with Clarence Jubb and Hank Boyer. The tapes were never transcribed and were stored in a warehouse until I struck a bargain with the archaeological technician on the ranger district. She allowed me access to the tapes if I would convert them into a CD format. She would only let me have one tape at a time, so each week I would go to

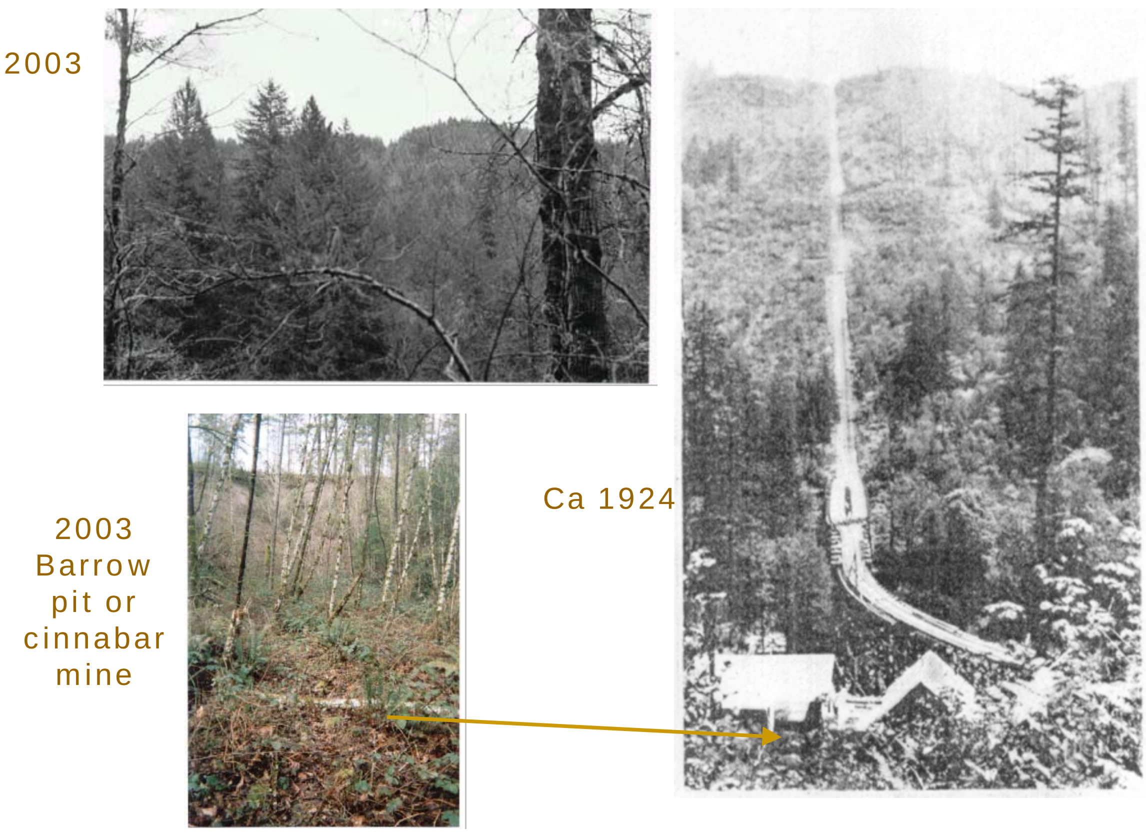


Figure 4.1: Comparison of historic and modern environmental conditions; cinnabar mine has destroyed the location where the original photographer stood in 1923.

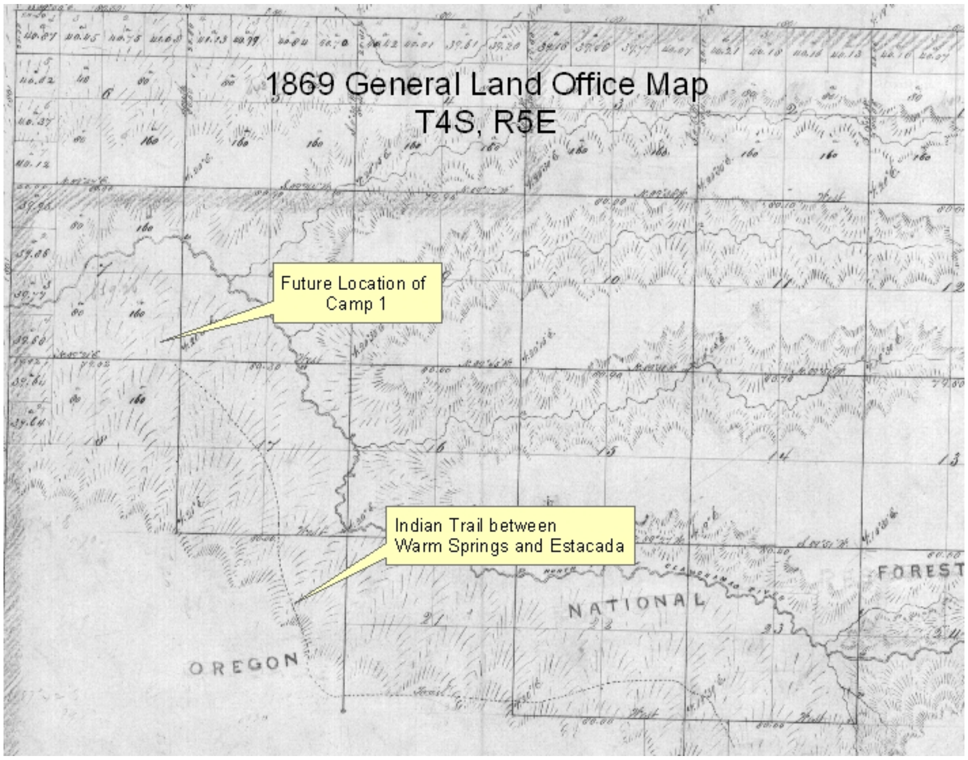


Figure 4.2: 1869 GLO survey map of township 4 south and range 5 east

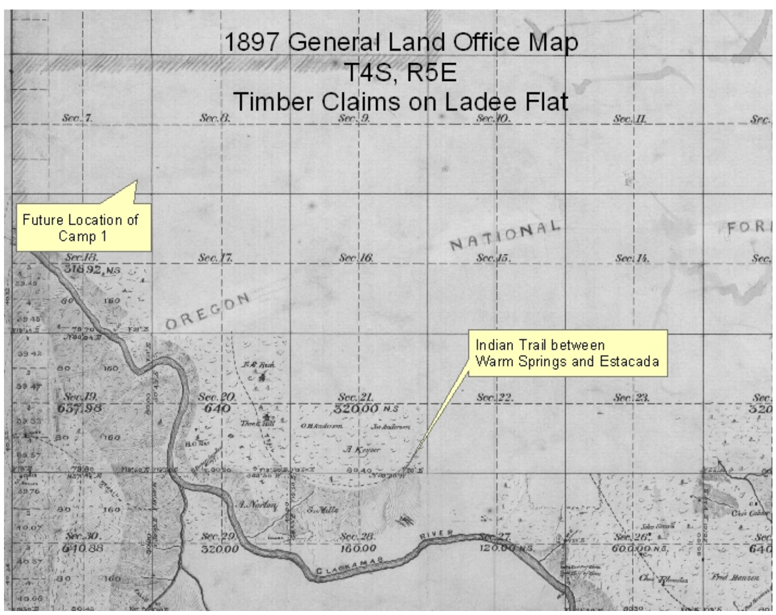


Figure 4.3: 1897 GLO map of township 4 south and range 5 east

the ranger station and trade a completed CD for a reel-to-reel tape. I used equipment from the OSU media center to make the media format conversion.

One of the most important aspects of this thesis is the use of dendrochronology to answer questions about site boundaries, disturbance patterns, landscape change, and human behavior. The following is a discussion that explains the concepts and applications of this versatile analytical tool.

Dendrochronology

For several hundred years, students of the natural sciences have recognized that the annual growth rings of trees reflected the environmental conditions the trees grew under. Leonardo daVinci documented the influence of moisture availability on the size of the annual tree rings, but it was A.E. Douglass that pioneered the principles behind the science of dendrochronology archeologists are familiar with today. Douglass' work in the desert Southwest began in the early years of the 20th century as he searched for long-term proxy environmental records that could be used to reconstruct past environments. Douglass created the techniques that have provided the foundation for hundreds of regional tree-ring chronologies constructed for dozens of tree species around the world (Dean et al. 1992:461).

Dendrochronology is based on the assumption that by overlapping the patterns of tree-ring growth of successively older same-species timber samples from the same geographic area, a master sequence or chronology can be developed against which wooden samples with visible tree-rings of an unknown age can be compared and dated with absolute certainty (Baillie 1982:1). Douglass recognized that the variable widths of annual tree-rings found in samples of ponderosa pine were dependent upon the amount of annual rainfall. Narrow growth rings indicated less available moisture while abundant precipitation produced wider sets of annual rings. Over time, the patterns of tree-ring growth resulted in unique signatures which could be correlated at a regional scale to demonstrate a tree species response to climatic conditions across a landscape. These patterns could also be assigned an absolute date.

If a tree is cut in the winter of 2006 before the start of the growing season, the annual set of growth rings from 2005 would be the closest to the inner bark or cambium of the tree. A tree puts on growth around its perimeter, so the oldest tree-rings are found at the center of the tree. Annual growth rings usually consist of a set of light and dark rings – the porous, lighter band of wood fiber is called earlywood, while latewood is the dense, darker ring formed at the end of the growing season. Baillie states that "by convention the ring pattern of a timber is defined as the successive widths of each of the rings from the pith (center) to the bark…each ring is measured from the start of its spring-wood to the end of its summer-wood" (1982:74). It takes one year for the weather conditions of the previous growing season to become apparent in the annual set of tree growth rings (Figure 6.4).

Subsequent generations of researchers have built upon Douglass' early twentieth century work and have found the bristle-cone pine (*Pinus longaeva*) to be a particularly useful species in reconstructing past environmental conditions through the analysis of tree-rings. Bristle-cone pine is long-lived, resinous, and grows quite slowly in the arid, higher elevations habitats where it is found. This combination of factors has resulted in a relative abundance of well-preserved, tight-ringed ancient raw materials from which an 8,200 year old master chronology has been developed (Baillie 1982:36). This chronology was also critical to the eventual calibration of the radiocarbon time-scale. As radiocarbon dates were compared with the absolute dates obtained from tree-rings, persistent and predictable differences in dates were obtained using the two methods. It was discovered that C14 rates vary with time so the radiocarbon dates have been adjusted to reflect this environmental reality.

Dendrochronology has contributed important date controls for paleoecological studies into past environmental conditions. To the skilled analyst, the structure, density, and chemistry of wood samples can reveal the influence of fires, human settlement patterns, and tsunamis (Luckman 1996:3). The discussion of fire ecology in Chapter 2 of this thesis is another important application of dendrochronology. Researchers are also using worldwide tree-ring databases to identify global events such as a major volcanic eruption or past climate changes.

Douglas-fir and ponderosa pine master chronologies have been developed for a variety of elevation zones for the Cascades Mountains of Oregon and Washington. A cross-correlation statistical study based on several climatic parameters demonstrated that tree growth for the two species at the various sample sites was dependent upon the amounts of moisture available during the growing season. The researchers concluded that:

> Douglas-fir shows a slightly stronger correlation with seasonalized precipitation for the prior year and early summer whereas ponderosa pine correlates most strongly with current year and late (July) summer

> precipitation. Maximum correlations for both species occur with annual precipitation totals. Analysis of earlywood and latewood chronologies indicates that earlywood width is most consistently and strongly correlated with precipitation in the previous summer (July and August), and latewood width is more strongly related to precipitation in the current summer (June and July). The results of these analyses demonstrate considerable potential for reconstructing annual (and (or) summer) precipitation for sites across the region (Watson and Luckman 2002: 1898).

A distinct series of annual growth rings is not always apparent and errors in ring counts can lead to inaccuracies in dating archaeological materials as well as living trees. Droughts or defoliation can affect the vigor of timber stands as the tree responds defensively to hostile conditions by limiting the production of wood fiber as it draws upon stored energy reserves. There might not be a complete set of visible growth rings and a microscope may be necessary to see small changes in the annual cellular patterns. Conversely, a rainy summer in the Mediterranean climate of the Pacific Northwest can result in a third spurt of growth in late summer in some conifer species which creates another type of anomalous ring pattern to puzzle both the forester and the archaeologist.

How do you get a tree core?

Most age and growth samples are obtained from live trees using a hand-powered Swedish increment corer. This tool is a tempered steel tube with a sharpened, helix-threaded end. The device functions as a drill, simultaneously cutting a sample of the wood while pushing it into the hollow center as the borer is twisted into the bole (or trunk) of the tree. A slender piece of concave steel is inserted into the tube and the wooden core is extracted. Traditionally, the sample is taken at breast height or 4½ ft. (Figure 4.4).

In order to obtain an accurate age for the tree, a predetermined number of years must be added to the actual ring count to account for the difference in age from when a tree sprouts from a seed until it reaches 4½ ft. in height, depending upon the environmental conditions or site class where the tree is located. Site class tables derived from site indexes have been developed by the U.S. Department of Agriculture for all the major timber species in the Pacific Northwest and are based on various combinations of soil types and tree heights at 50 or 100-years of age (USDA/NRCS 2006).

Dendroarchaeology

Archaeologists saw the potential of dendrochronology to determine the dates of archaeological sites in the desert southwest and it was in this region that dendroarchaeology developed. Although a selection of dating methods is available to archaeologists, they vary greatly in terms of suitability, accuracy, and cost (Butzer 1977: 164). These chronometric dating techniques range from counting tree rings with an effective dating range of approximately 8,000 years to amino acid racemization using bone and marine shells which can provide dates spanning tens of thousands of years but whose accuracy is questionable. Dendroarchaeology or the use of tree-ring data to establish the dates of archeological materials or features is an accurate, economical, and relatively simple chronometric technique. When suitable raw materials are available, tree-ring counts can provide independent verification of dates given in recorded oral histories or assist in the dating of artifacts recovered from precontact sites.

Figure 4.4: Boring to the core-Larry Weaver drilling a Douglas-fir for age.

The development of master chronologies for the desert Southwest allowed archaeologists to place stone archaeological structures constructed with timbers and the people that built them within the proper sequence of time. The unique pattern of tree rings found in remnant fragments of wood in pueblos was cross-matched with master chronologies and the approximate age of the structure was established (Dean et al. 1996; Dean 1996, 1997).

Eugene Hattori and other archaeologists working in the Cortez Mining District of north central Nevada used tree-ring counts to determine the extent and timing of juniper harvested to provide timbers and fuel for mining operations that occurred in the region

during the 1880s. They were able to correlate distinct periods of Cortez's economic history with tree-ring ages they obtained from stumps and timbers in the region (Hattori and Thompson 1987).

Tree-ring dating was used by the Hugo Neighborhood Association in Josephine County Oregon to determine the ages of trees growing in the trace of old wagon roads and in the adjacent travel corridors of the numerous grades that cross their region (Hugo 2005a; Hugo 2005b). They discovered that a tree growing in the middle of what they believed to be a section of the Applegate Trail predated automobile traffic in the county which began in 1905. The tree had experienced many injuries in its lifetime from being run over by wagons and cars and trampled by livestock. The researchers found that it had taken the tree over thirty years to grow to DBH height, so this figure was used instead of the 7-10 years one normally adds to tree ages obtained at DBH. A tree growing out of the disturbance area was dated at 102 years old, which reinforced their initial findings (Hugo 2005a:7).

Figure 4.5: R10T17 tree core, tree is 57 years old, and sprouted in 1949.

Sampling Methodology

Plant ecologists have successfully used dendrochronology to detect patterns in continuous spatial distributions of vegetation. One of the purposes of this thesis is to collect and analyze data to address a specific set of research objectives. There are several types of statistical sampling methods available to researchers that are useful when collecting and analyzing data. These include the random, systematic and stratified sampling techniques. The choice of sampling method depends upon the purpose for which the sample is needed and the types of variables that will be measured. A systematic sampling method uses samples that are selected in some regular way, such as a grid superimposed over a map of the study area, and the variable sampled where the lines intersect (Dilworth 1976:204). This method is more practical to use than random sampling in certain applications. Systematic sampling works well for measuring spatial variables distributed across a landscape such as stand density, tree age classes or artifact distribution, providing more uniform coverage than random sampling where portions of an area may not be sampled at all (Dilworth 1976:42). For large areas and populations, it is impossible to measure the variables at every point. The purpose of spatial sampling is to economically and accurately provide a description of the spatial distribution of a variable, usually in the form of a map. Sampling points are analyzed by drawing an isoline map with appropriate intervals to portray different categories of information, such as tree age cohorts.

The dendrochronological portion of this study was concerned with the spatial distribution of a variable, specifically tree age, whose value varied from place to place.

The population for this dendrochronological study was the naturally regenerated trees that have reforested the once barren location of Camp 1. Since the identification of the camp boundaries and the size of the site was a major research objective, certain assumptions had to be made regarding the population (how many trees) and sample size (how many trees to core) in order to begin the archaeological survey and dendrochronological sampling procedures.

Determining sample size

Stand stocking information, or how many trees per acre were contained within the probable boundaries of the site, was the first step in the process. The distance between the trees located on the compass (transect) line was necessary to make these calculations. This information was recorded when the archaeological survey transect lines and possible sample trees were measured and flagged for future coring during initial visits to the site in the early winter of 2005. The individual tree and horizontal distance data was analyzed using a zig-zag transect stand inventory procedure developed to assist U.S. Department of Agriculture – Natural Resources Conservation Service (NRCS) planners determine tree stocking levels in a variety of environmental settings. Figure 4.6 is an example of the worksheet; completed worksheets for Camp 1 can be found in Appendix C. Results obtained from the timber stand inventory indicated that the average stocking was 85 trees per acre in the area contained within the potential boundaries of the site. Douglas-fir made up 97% of the stems per acre, with a limited number of younger western hemlock and red alder in the understory. A population of 1,639 trees was present, based on an estimated camp size of 20 acres. This was an unrealistic number of trees to core, and because a systematic sampling method was used, standard random sample statistical methods to determine a valid sample size were not applicable (Dilworth 1976:204). Alternative methods were necessary to obtain an adequate sample size for the dendrochronological study.

Based on the average stocking rate of 85 trees per acre, the average spacing between trees was 20 by 20 ft. (NRCS Timber Stand Improvement Technical Sheet #33). The archaeological and dendrochronological survey transects lines were designed to average 600 feet long; aerial photos had revealed the narrow, linear nature of the site aligned along the grade of the mainline. Each survey line potentially had 30 trees that could be sampled. Assuming that six transect lines 600 ft. long and spaced 200 ft. apart included enough area to cover the entire site, 180 trees would be available for sampling to determine their age. This sampling density provided an 11% sample. In the Pacific Northwest, most timber cruisers use 20% intensity for a very accurate cruise in high-value timber, 10% cruise for moderate accuracy and a 2-5% sample when only general information is needed (Dilworth 1976:207). Based on this information, it was decided that a 5% sample, or a minimum of 82 trees, was an acceptable sample size from which to map tree age isoclines that would be used to determine the boundaries of Camp 1, and to date various disturbances that have influenced the archaeological record of the site.

FOREST INVENTORY WORKSHEET

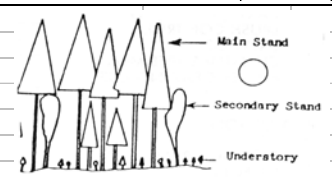
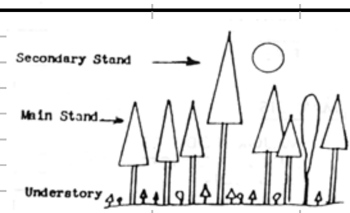
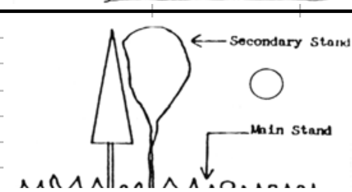
Cooperator:	Camp 1 LaDee Flat	**Conservationist:**		Paullin		**Date:**	4/12/2006
Mgmt Unit/Field Number: Row 6		**Acres:1**		**Tract:**	**Species**	**Base Age**	**Site Index**
County:					Coastal Douglas fir	50	

MAIN STAND - Transect Notes

Species (1-20)	Dist.(ft)	Diam.(in)	Cond.	NOTES
DF-R6T1	76	16.5		south of RP#6
DF-R6T2	35	19.6		
DF-R6T3	30	23		
DF-R6T4	10	24.2		
DF-R6T5	10	30		
DF-R6T6	36	26		
DF-R6T7	20	14.3		
DF-R6T8	13	28.8		
DF-R6T9	33	25		
DF-R6T10	9	26.6		north of RP#6
DF-R6T11	20	13.9		
DF--R6T12	16	19.8		
DF-R6T13	22	16.8		
DF-R6T14	10	21		
DF-R6T15	5	21.6		
DF-R6T16	68	5.8		
DF-R6T17	20	8.3		
DF-R6T18	26	9.3		
DF-T6T19	25	12.8		
DF-T6T20	15	15.1		
Total (20)	499	378.4		
Average of the 20	24.95	18.92		

SUMMARY DATA

Average Spacing (ft)		**25.0**
Average Diameter (in)		**18.9**
D + X Spacing		6
Desired D + X Spacing*		0
No. Trees / Acre		**70**
Desired No. Trees / Acre		122
Excess Trees / Acre		-52
* See Commercial Thinning Table		
Diam. Range	5.8-30.9	
Species (%)		
	WH	5%
	DF	95%
Quality (%)		
Good		
Fair		
Poor		

TYPE OF STAND (Check One)	Species	Extent
	XXXXXXX	XXXXXXXX
	XXXXXXX	XXXXXXXX
	XXXXXXX	XXXXXXXX
	XXXXXXX	XXXXXXXX
	XXXXXXX	XXXXXXXX

Salable or usable products

Other Values and Considerations

Treatment discussed with cooperator

Figure 4.6: Example of USDA-NRCS timber stand zigzag inventory worksheet.

Site discovery hypothesis

To test the validity of using dendrochronology as a site boundary and disturbance dating method, an archaeological reconnaissance was planned in conjunction with a systematic sampling of tree ages in order to define the site boundaries of Camp 1. Photos taken in 1923 reveal that the camp and incline were mostly deforested due to the 1902 Hillockburn fire, and from site preparation activities that cleared the remaining trees and snags in order to build the camp, incline, mainline, and spurs. The working hypothesis behind the data collection procedures used for this type of site discovery method assumed that the trees will first reseed in areas outside the camp boundaries where disturbance was minimalized after the initial logging in 1923 took place. Trees inside the perimeter of the camp should be younger than those that surround it, because they reseeded in after the disturbance from the logging operation ceased in 1930-31. Therefore, up to an eight year age pattern difference between the trees inside the camp and those located outside the boundary should be observed when the tree-ring data was mapped.

Douglas-fir trees do not produce reliable, annual seed crops, and a good seed year depends upon weather conditions in the spring when pollination occurs, insect damage, squirrel cuttings, and other environmental factors. It is not expected that trees will invade a site immediately after it has been abandoned due to the variable nature of seed availability, but it is assumed that the distribution of tree ages across a landscape impacted by the same disturbance regime and experiencing the same seed fall events will be similar.

Surface survey strategies

A preliminary site reconnaissance revealed that cultural material and features were present on at least 10 acres. The survey of Camp 1 was planned as a surface examination only, and would not include any invasive techniques such as shovel probes or duff scraping It takes 10 minutes to core a tree, time must be allocated to obtain a UTM coordinate from GPS units that operate poorly under the forest canopy, and the core must be labeled and safely stored away in a container since they will have to be carried along on the surveyor's route. Mapping and identifying the artifact scatters and features along the transect line is quite labor intensive as well. A 100% survey of the Camp 1 site was just not possible, so a representative sampling strategy was developed. A stratified random sample consisting of transects that ran perpendicular to the old mainline every 200 feet was calculated to provide a sample size of at least 82 trees, and adequately cover and document the archaeological resources that were present at Camp 1.

Layout of sampling grid

The center of the head of the incline would serve as the permanent datum, and secondary datums would be established at the point of intersection of the transect lines with the mainline. A baseline of secondary datums would be established every 100 ft. at an azimuth of 310º aligned with the siding grade, and marked by flagging anchored in the ground with a stick. A 200 ft. nylon tape and hand-held compass would be used to measure the distance and established the line between the secondary datums and GPS coordinates taken for the location.

A hand-held Silva compass and 75 ft. tape would be used to sight in the north/south survey lines to establish the framework of the sampling grid; any living tree that fell directly within the line of sight for that particular bearing would be measured for DBH, and its distance from the previously sampled tree in the transect line recorded (Figure 4.7). The trees would be flagged and numbered; it was decided that only a few would be cored during the preliminary stage of the investigation in order to speed the process up. It was planned that the remainder of the trees would be cored once the initial archaeological and dendrochronological inventories were done. Each transect line was numbered as R2, R4, R6, R8, and R10 and each tree was labeled with a number denoting its position along the line. The first tree south of the R2 datum would be recorded as R2T1; the second tree south of the R6 datum would be R6T2 for example (Figure 4.9). Every sampled tree would be identified in geographic space using the Universal Transverse Mercator (UTM) coordinates obtained from a Magellan handheld GPS unit. All cores should be obtained on the upward side of the tree and at approximately four-and-a-half feet from the ground following professionally accepted standards and guidelines. DBH of each tree would be recorded as well as any other pertinent tree, environmental, or archaeological data on a recording chart (Appendix A).

Adjustments to tree sampling strategy

It was found that the sampling strategy as originally designed provided too large a sample size once a preliminary sampling grid was established at the site. The trees that had regenerated at Camp 1 were not evenly distributed (Figure 4.8). Adjustments were

Figure 4.7: Sighting in the survey line.

necessary in the spacing and tree selection criteria to reduce the number of trees that were sampled. It was also discovered that a decrease of archaeological materials and features coincided with an increase in rotten springboard cut stumps and old duffy logs. Instead of keeping to 600 foot long transects that were originally planned, I decided to vary the length of the transects to the environmental conditions and archaeological features I encountered along the survey route.

Another problem with the grid setup was operator error. I had established the line of secondary datums along a 310º azimuth from the head of the incline, believing that this line would follow the siding grade the whole length of the camp. Unfortunately, a 5º error in the azimuth of the line quickly made it obvious that the secondary datums would not align with the railroad siding as originally planned. Another mathematical factor I did not take into account was the fact that the datum line ran southeast to northwest, while the transect lines were spaced at 200 ft. intervals that ran from north to south. The resulting 50º angle created two legs of a triangle. Instead of a rectangular grid with transects at right angles to the baseline, an angled grid was created with the transect lines spaced at 158 ft. Science is full of surprises.

Archaeological survey

It was anticipated that both industrial and domestic archaeological materials would be found throughout the camp. The intent of the survey was not to identify every artifact and feature at Camp 1; the archaeological investigation was designed to be preliminary in nature. The purpose of the archaeological surface survey was to gather baseline data for future researchers by locating artifact scatters and activity areas, and assign a probable function to these features and artifact concentrations. Interpretations would be based on the artifact assemblages that were readily visible at the site, and on the Camp 1 settlement pattern model that was developed in Chapter 3. All features and artifacts along the survey line would be mapped when the sampling grid was laid out, and when the trees were measured and GPS coordinates taken of their position. Artifacts would not be collected, and the surface of the site would not be disturbed during the inventory process.

It is anticipated that when a map of the distribution of tree ages is overlain with the results of the archaeological survey, a definite correlation between the location of artifacts and features with the ages of trees will be demonstrated and the boundaries of the camp delineated. It is also hypothesized that variations in age classes of the trees that have reforested the site will reveal previous disturbances that have influenced the current archaeological record found at Camp 1. The next step in the process involved the field work phase of the project, which proved to be more time consuming and difficult than planned.

Figure 4.8: Example of irregular tree distribution and overall field conditions.

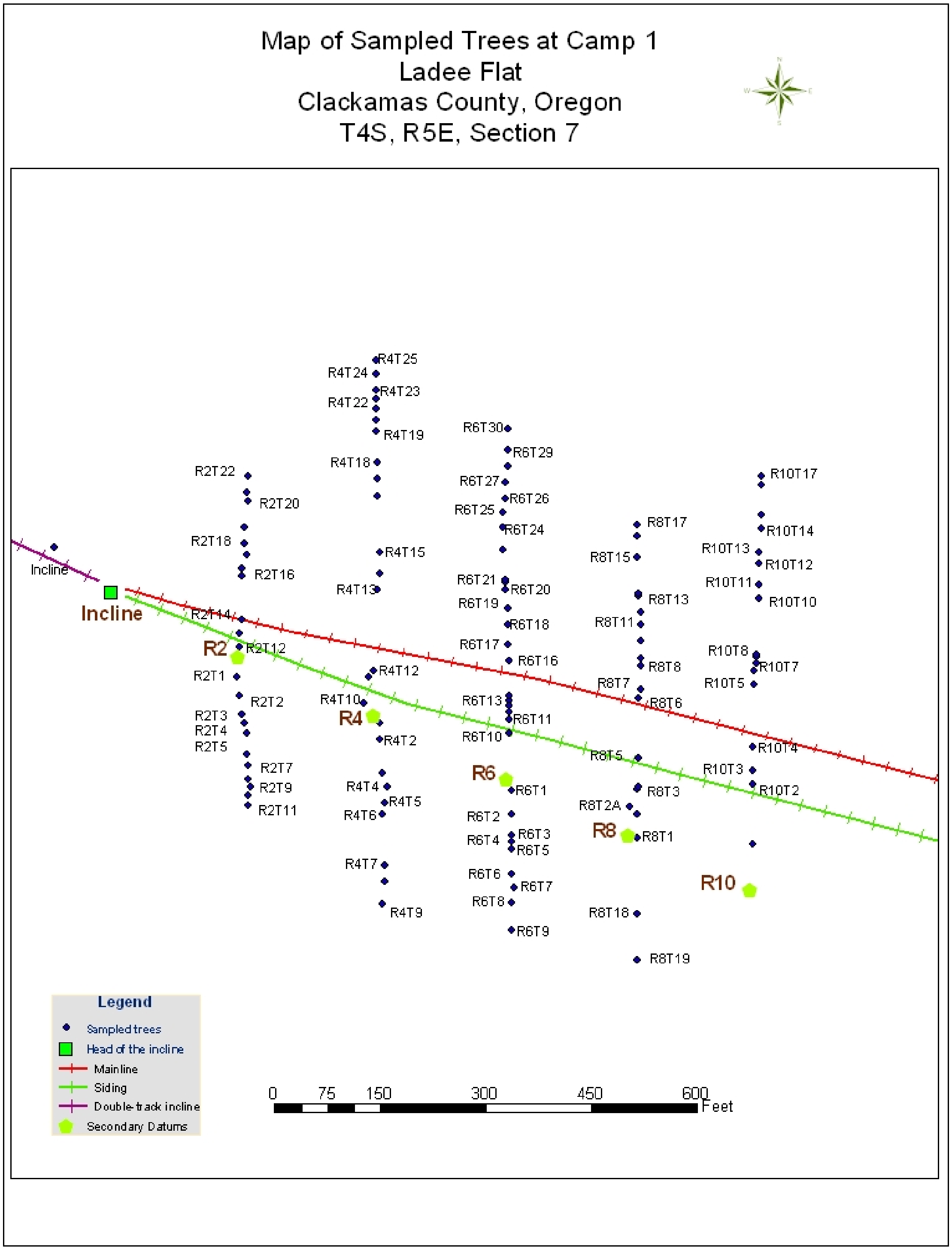


Figure 4.9: Map of sampled trees, railroad grades, and secondary datums at Camp 1.

CHAPTER 5: HISTORIC AND TECHNOLOGICAL SETTING

The history of lumber production is a reflection of the changes in technology, economic systems, population demographics, industrialization, and modes of transportation that have occurred in American society over the past 300 years. There are three basic processes involved in the production of lumber: cutting, transporting, and milling. Wood products include saw logs, pulpwood, shingle bolts, cordwood, crossties, studs, shakes, poles, posts, and pilings.

Settlers in the New England colonies logged the forests surrounding their settlements in the fall season after the crops had been harvested. The colonists used axes to fell the trees and cross-cut saws to cut the logs into manageable sections that could be transported by animals or water to small local water-powered sawmills where they were cut into lumber products that were sold in local markets (Bryant 1923:22).

Similar climatic conditions and terrain were found by lumbermen interested in exploiting the vast white and red pine forests which grew in the Great Lakes area (Bryant 123:29). The logs were pulled by oxen or horses over frozen roads on sleighs to a convenient waterway where they were floated to a downstream mill. As the forests were cut down and timber supplies receded further from navigable streams, lumbermen looked to railroad transportation systems to get the timber from the stump to market. Great Lakes logging historian Carl Bajema (1991:81) believed that “one of the most important technological developments in the history of logging in the nineteenth century involved the use of railroads to transport logs".

Development of railroad logging technology in the Great Lakes region – 1850-1880

The use of steam-powered railroad logging technologies developed independently in the United States in response to increased transportation costs and to overcome climatic and other environmental limitations that were encountered in pursuit of the dwindling timber supplies (Bajema 1991:76). Logging railroads required large capital investments for equipment, labor, and roadbed construction. It was only profitable on large tracts of high-volume saw logs that could be moved efficiently to mills for processing (Adams 1961:9). Once railroads became the dominant mode of log transportation, logging systems changed from selectively cutting the highest volume trees to clearcutting all the standing timber over a large area in order to supply the logs that were necessary to keep the mills operating and turn a profit for the company.

A horse-drawn railroad logging railroad built in 1850 in northern Michigan began the railroad logging era that was to last another 90 years, and result in significant landscape and social changes in this region and beyond (Bajema 1991:77). The oldest documented use of a log hauling steam engine occurred in northern Michigan in 1857 (Bajema 1991:78); while others claim that New York was the location (Adams 1961:9). It has been reported that over 500 logging railroads operated in the conifer and hardwood forests of Michigan during the railroad logging era and each participated in the evolution of railroad logging technology. Bajama (1991:81) explained that "the history of numerous experiments with logging railroads between 1850 and 1877 documents multiple independent inventions whose success depended upon a fortunate combination of technology and economic opportunity". Many early logging railroads were made of wooden rails secured in place with stakes, or wide planks laid end to end to make a tram road. Some operators made rails from hardwood poles flattened on three sides, while others actually used steel rails, though the gauge (distance between the rails) was determined by the preference of each lumberman or what kind of used equipment he had access to (Bajema 1993: 46).

Several Great Lakes lumbermen accrued great wealth and power from their successful business ventures in the pine forests of the north, achieving the status of timber barons during the Gilded Age of America circa 1880-1890. The vast timber stands growing in the north had been harvested at an unsustainable rate and no thought was given to reforesting the stump-littered land. The development of steam powered logging and transportation systems accelerated the depletion of Great Lakes timber inventories and the timber barons looked to the old-growth forests of the west as a new source of raw materials. The availability of a mainline railroad or other common carrier transportation network was essential to move lumber products that originated in peripheral locations such as those found in the Pacific Northwest to an economic core where demand for the product existed.

Oregon and California Railway (O&CRR) – 1868 to 1887

The first railroad in Oregon was a horse drawn portage built in 1846 around the falls at Oregon City (Culp 1987:15). In 1869**,** the Union Pacific and Central Pacific Railroads met in Utah, becoming the first transcontinental railroad system in the United States connecting San Francisco with population centers to the east. Chartered by Congress in 1864 and finally finished in 1884, the Northern Pacific was the second transcontinental railroad to be completed, linking the Pacific Northwest with the markets of the eastern United States. To fund the construction without having to provide a cash subsidy, the government authorized the largest grant of public lands ever. This economic decision resulted in a 40-80 mile linear checkerboard of railroad and public land ownerships stretching along the right-of-way from Minnesota to Oregon that is observable upon the landscape today (Schwantes 1997:173). Once the railroads connected the underpopulated areas of mid-America with both coasts of the United States, the U.S. Census Bureau officially proclaimed the end of the western frontier era. The economic and social isolation once experienced by early Pacific Northwest pioneers was over and residents increasingly were tied to world markets and the boom-and-bust economic cycles that characterized communities dependent upon extractive industries for their financial livelihood.

Meanwhile, the federal government responded to the regional need for transportation systems to connect the transcontinental systems with local networks that could move agricultural and forest products to burgeoning and profitable Californian and Asian markets. In 1866, Congress issued a land grant to the State of Oregon to fund construction of a railroad in the Willamette Valley that would connect with the transcontinental railroad in California (Figure 5.1). The land grant would be awarded to the first railroad that finished 20 miles of track. Two interests rose to the challenge. On the east side of the valley, the Oregon and California Railway (O&CRR), under the leadership of Ben Holladay and backed by East Coast money, outmaneuvered the locally funded Oregon Central Railroad, which was building a railroad down the west side of the valley (Labbe 1980). Ben Holladay, a local entrepreneur known as the Stage Coach King,

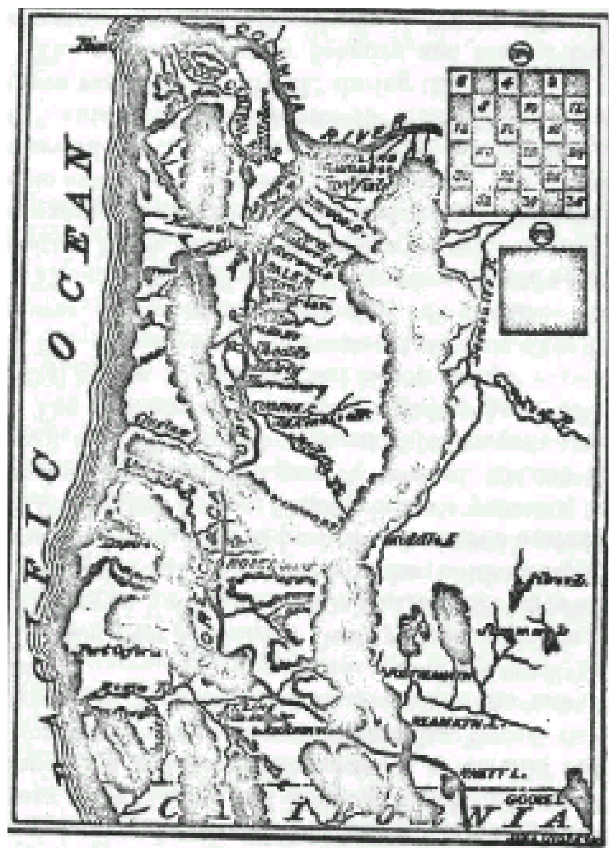


Figure 5.1: Map of Southern Pacific Oregon Railroad Land Grants (European and Oregon Land Company 1872).

had made his fortune in frontier transportation systems. Schwantes (1997:185) claimed that Holladay acquired the rights to the Willamette Valley land grant from the Oregon Legislature through the use of bullying, bribery, and bluster tactics during a particularly corrupt period in Oregon politics.

By 1873, regular service was offered between Portland and Roseburg, but the national economic woes of that year exposed Holladay's financial vulnerability and the unprofitability of the line (Culp 1987:47). By 1876, he had lost the Oregon and California Railroad to Henry Villard, another strong-willed entrepreneur with empire-building tendencies (Schwantes 1997:185). Villard had been sent by German bankers who had invested in the O&CRR to salvage what he could from the financial disaster that resulted from Holladay's free-wheeling business activities. Villard ended up in control of the railroad and the other business ventures once owned by Holladay. He used these assets to create his own industrial empire, which included the 1881 acquisition of the Northern Pacific Railroad (Wollner 1990:2). Villard resumed construction of the O&CRR line in 1881 but like Holladay, had difficulties building the railroad and lost it to the Southern Pacific Company on July 1, 1887 (Culp 1987:47). The Southern Pacific Railroad took over the 5.35 million acre Oregon land grant, becoming one of the largest private landowners in the United States (Schwantes 1997:189). By 1887, railroad service was established between the Pacific Northwest, California, and New Orleans. People flooded west with expectations of finding cheap land and personal wealth in the forests, mines, and ranches of Oregon (European and Oregon Land Company 1872).

Oregon Pacific Railroad 1885-1886

The Oregon Pacific Railroad was designed to link the Oregon Coast and the Willamette Valley with the lucrative mining and ranching regions of eastern Oregon, ultimately joining the Union Pacific Railroad in Idaho (Case 2001:32). Construction began on the railroad between Yaquina Bay and Corvallis; the line was operational by 1885. A route suitable for a railroad grade over the Cascade Mountains had been discovered in 1880. The proposed grade would follow the North Santiam River and the Santiam wagon road to the crest of the Cascade Mountains in eastern Linn County, Oregon.

The Oregon Pacific was founded by Thomas Hogg, an unorthodox railroad man whose construction strategies confounded his contemporaries. Rather than build the railroad from beginning to end in the traditional manner, Hogg chose to begin construction at several locations along the route, perhaps to secure his claim to the Santiam Pass area (Case 2001:34). At one point, 3,000 laborers were working on the railroad, but financial and labor problems finally forced Hogg's hand. The Oregon Pacific Railroad was sold for $100,000 at a Sheriff's auction; the new owner converted the operation to a logging and lumber railroad (Case 2001:37).

Railroad logging in the west 1880 to 1930

Railroad logging was a highly specialized industry with its own unique culture, machinery, and traditions that were not found on common carrier lines like the Union Pacific Railroad. Railroad loggers had outstanding mechanical and problem-solving abilities that enabled them to make technical adjustments to suit the terrain, equipment, and supplies they had on hand to work with (Labbe and Goe 1961:5). Tonsfeldt (1995:5) reported that the majority of industrialized railroad logging occurred in the Pacific Northwest between 1880, when small railroad operations proliferated across the region, and 1930, when the Great Depression signaled the end of the railroad logging era. As in the eastern forests, prior to the application of steam technology to log transportation systems, gravity and water were used as the primary power sources used to transport logs to western mills. After the trees closest in proximity to the water had been harvested, loggers moved inland in search of stumpage to keep the mills supplied. Oxen, horse, and mule teams became the standard mode of log transport by the 1870s (Labbe and Goe 1961: 6).

The history of western logging is the story of mechanization. As early as 1852, sawmills along the California coast used primitive railroads to transport logs to their facilities (Adams 1961:11). Adams (1961:12) reported that the first steam powered logging railroad in the west was built to provide timbers and ties to feed the voracious appetite for wood products generated while building the Union Pacific Railroad. By the 1870s, loggers working in the redwood region of northern California were using steam power to transport the immense logs out of the woods; by the 1880s nearly two dozen railroad logging outfits were harvesting the previously inaccessible redwood stands (Adams 1961: 12).

Dolbeer's steam donkey 1882

The steam engine was introduced into the western forests in the early 1880s and powered an explosion in timber harvest activities. Previously inaccessible timber could be cut and transported to the mill because in 1882 John Dolbeer, a sawmill owner in Eureka, California, adapted a marine rigging system he had seen to create a steam-powered portable engine that revolutionized logging technology. Dolbeer connected a single-cylinder, single-acting steam engine to a vertical boiler and rigged together a series of gears to drive a capstan or vertical revolving cylinder capable of hoisting weight by winding cable around it. Dolbeer mounted his machine on two logs that had their front ends snubbed off and cabled the contraption to some stumps to hold it in place. His woods crew used steel dogs to attach a manila rope to a log, and steam-powered donkey logging was born. This simple machine was the catalyst for the development of new generation of log transportation machinery that could meet the power, speed, and efficiency of steam-powered yarding and skidding systems (Old Time Loggin' 1998:29).

Dolbeer's machine was nicknamed a steam donkey because it was commonly thought that it was not able to generate enough power to be considered a steam horse. He used his steam donkey to unload logs at his mill pond but its versatility was quickly discovered by loggers. As the technology developed, steam donkeys were found to be useful in yarding trees from the stump to the landing and for loading them onto wagons, cars, or big wheels for transportation to the mill (Adams 1961:16). The logger who used the first

Dolbeer steam engine in Washington in 1889 completely mechanized donkey yarding. He replaced the horse that was used to haul the cable back to the woods with a tail block hung at the head of a skid road through which the haul back cable was strung and rigged onto a drum of its own mounted on the steam donkey sled (Old Time Loggin' 1998:32). Increased efficiency led to increased profits which led to increased volumes of timber

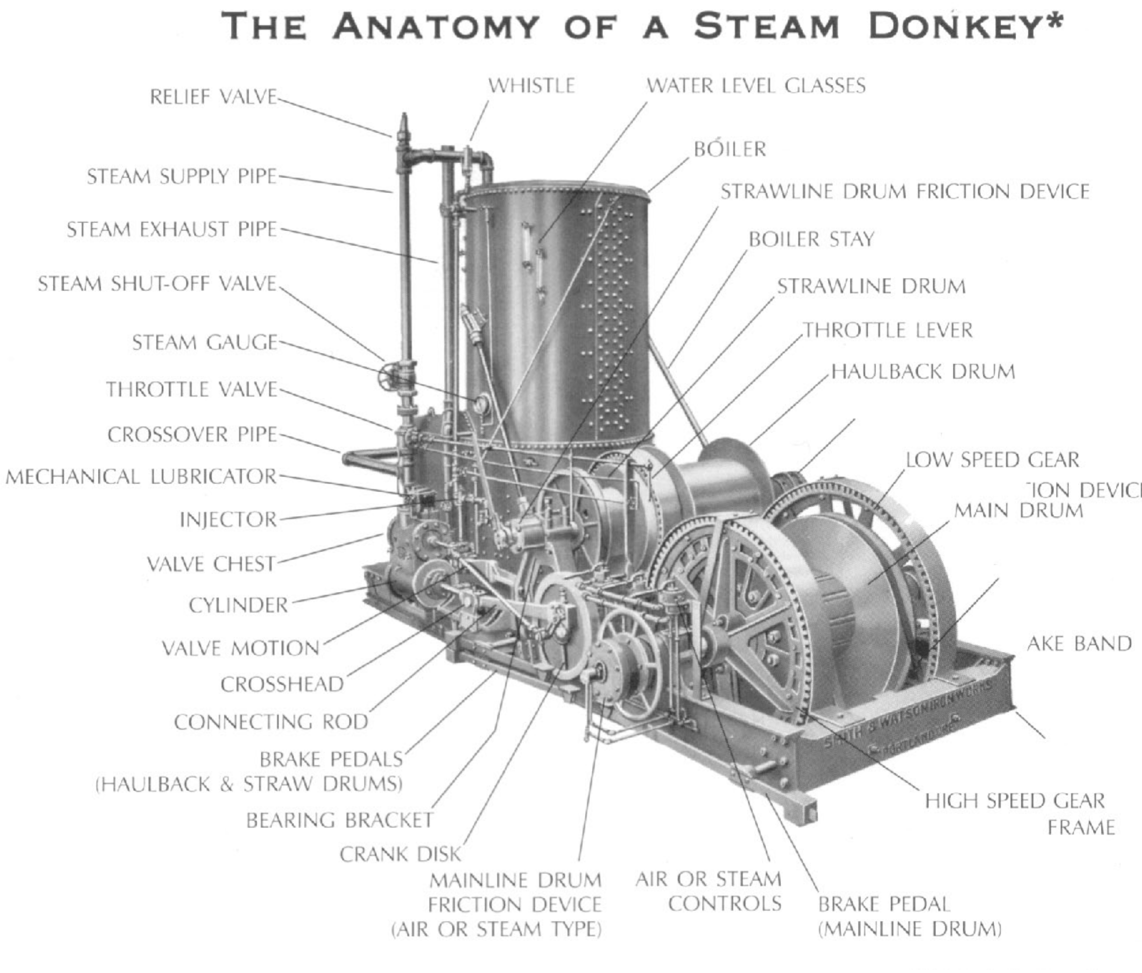


Figure 5.2: Dolbeer's Steam Donkey (Willamette Iron and Steel Works 1925:118)

harvested from western forests. The old-growth forests of the Pacific Northwest were no match for the steam powered logging and log transportation systems that were in operation along the Columbia River and in the Coast Range during the last two decades of the 19th century.

Railroad logging in the Pacific Northwest 1880 to 1930

Just as in the Midwestern and Eastern forests, there were several contenders for the distinction of first logging railroad to operate in the Pacific Northwest. Coos Bay, Oregon on the southern Oregon Coast, and Eufala, Washington located on the Columbia River were mentioned as probable locations by Labbe and Goe (1961:16, 56). Schwantes (1997:217) reported that in 1910 every county in Oregon had at least one logging railroad operation working in the woods. An early historian wrote that “by 1907 there were over 1,000 miles of railroads in Washington and northern Oregon, equipped with 323 locomotives and employing nearly 1,000 engines to supply them with logs” (Miss et al. 2000:12). Ralph Bryant (1923:23) stated that the environmental conditions and size of timber that loggers confronted in the forests of the Pacific Northwest had been instrumental in the development of modern power logging systems, and the adaptation of the railroad to logging purposes.

Many Pacific Northwest railroad logging operations acquired second-hand mainline equipment and refitted the cast-offs in the machine shops found in their forest camps, customizing the machinery for the particular environment it operated in (Labbe and Goe 1961: 10: Figure 5.3). As electric interurban lines replaced steam-powered systems,

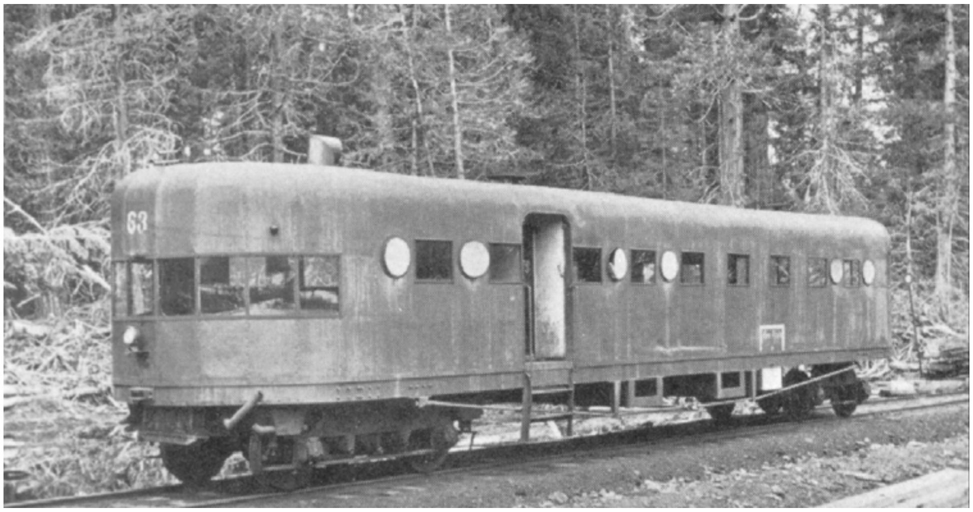


Figure 5.3: An interurban car transformed into a “crummy”, or railcar used to transport loggers (Labbe 1980:100)

the old cars were adapted for use in the woods, adding to the unique assemblage of machinery that characterized Oregon logging camps. Loggers welcomed the enclosed and heated rejects from the city; steam powered “speeders” replaced the open air flat cars that once shuttled them back and forth to work (Labbe and Goe: 1961:61).

Railroad grade construction

Early logging railroad grades were usually designed and built by the woods boss in charge of the logging operations. Using a compass and an experienced eye, he laid out the grade which normally followed stream bottoms until waterfalls or other natural obstructions prevented further upstream construction. When the drainage was logged out, the tracks were pulled up, and the woods boss laid out another railroad grade in the next unit to be logged (Adams 1961:22). Once the accessible timber was depleted in the areas adjacent to the stream courses, railroad grade layout and construction required engineering skills beyond those possessed by the woods boss.

Logging railroad grades, sidings, spurs, trestles, bridges, and wyes were not built to same specifications as those used by the Union or Northern Pacific Railroad. Spur lines were temporary and did not require sophisticated road bed construction. Grades and curvatures were more extreme on spur lines because hauling speeds were lower than those along the mainline (Bryant 1923:289). The scarcity of suitable ballast materials led many section crews to use what they had nearby. Ashes from the steam locomotive, steel rails spiked to logs, or cedar slabs placed under the ties as shims are examples of the expeditious use of materials railroad construction crews employed to build the track (Adams 1961:67). Shifting tracks due to shoddy construction or cheap materials caused innumerable derailments leading to lost loads and lives (Adams 1961:67). Figure 5.4 illustrates the typical cross-section of a railroad grade.

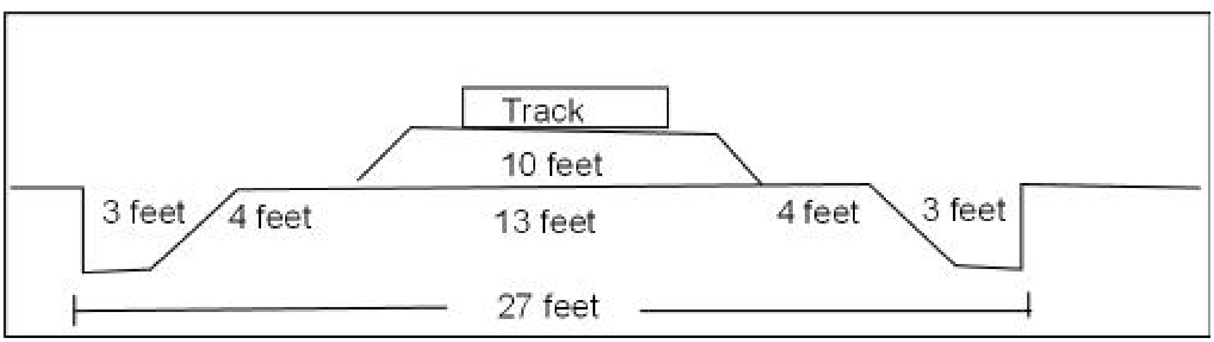


Figure 5.4: Cross-section of a typical railroad grade (drawing by author)

A great deal of variability existed in the industry regarding the spacing of rails, or track gauge. The choice of gauge was an expression of professional judgment, historical precedent, inherited equipment, and experience of the men in charge of designing the railroad logging operation. Pike (1967:161) reported that the standard gauge of 4 feet 8-½ inches between rails was adopted by mainlines in 1886 based on the wheel span of Roman chariots. Several hundred narrow-gauge railroads operated across the west, all with a maximum distance between the rails of three feet. More than half of the narrow-gauge lines in operation prior to World War I were located in the redwood region of California. Advocates of wider gauge railroads applauded the stability afforded by the increased span between rails, while proponents of narrow-gauge operations were interested in the economy (Adams 1961:68),

The average gradient of a mainline railroad is less than 1%, which means that one foot of elevation is gained for every 100 feet of track; many logging railroad grades in the west were built with slopes that exceeded 10%. The use of switchbacks in grade construction to traverse mountainous territory is illustrated by the narrow-gauge Sumpter Valley Railroad which served Blue Mountain communities in Eastern Oregon. The steam-powered locomotive negotiated three-quarters of a circle curves every mile to achieve a 2000 ft. elevation gain in 12 miles (Adams 1961:51).

Wyes are a triangular configuration of track designed to turn the locomotive around. The engine moves forward along one track and is switched to a second track. The locomotive backs up the second track until the engine is switched to a third track from which the locomotive moves forward. Track junctions are not wyes, although some may be located near junctions (Tonsfeldt 1995:18).

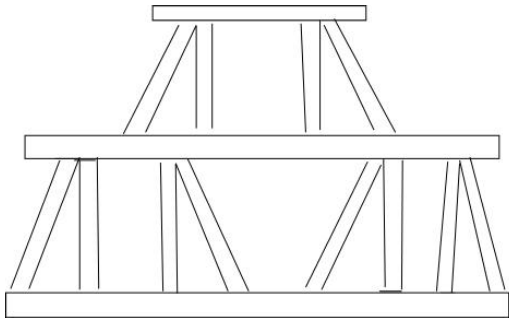
Sidings are tracks laid parallel to the mainline where cars are loaded or parked to allow other railcars to pass. Sidings were found in camps, landings, junction points in the woods, and where the logging railroad met up with the common carrier railroad (Tonsfeldt 1995:18).

Pile and framed trestles were the two types of trestles built in the western woods to cross stream channels, wet areas, and steep slopes (Figure 5.5). Pile trestles were used in marshy areas and stream beds where a suitable surface foundation was not available. A pile driver drove three poles vertically in a row across the grade until stable subsurface conditions were reached. A timber or cap was bolted across the top of the pilings, creating a section of trestle known as a bent. Stringers were bolted on top of the caps, cross-ties were spiked to these timbers and steel rails placed on top (Bryant 1923:313). Pile trestles were more expensive to build than cribbing or framed trestles, and were used on mainlines or roadbeds that were designed to be used for an extended period of time (Tonsfeldt 1995:18).

Each bent in a framed trestle was made of four logs which provided support for the structure. The bents were bolted to a sill which functioned as a foundation; the tops of the logs were covered with a cap and finished with stringers, cross-ties, and rails. Framed trestles were often put together on the ground and pulled into position using a block and tackle and a hoisting machine (Bryant 1923:317-318).

TYPES OF TRESTLES

Framed trestle



Bryant 1923:238

Trestle at bottom of the Porter-Carstens incline (Penn State University, MGN 103, box 5 folder 15)

Pile trestle

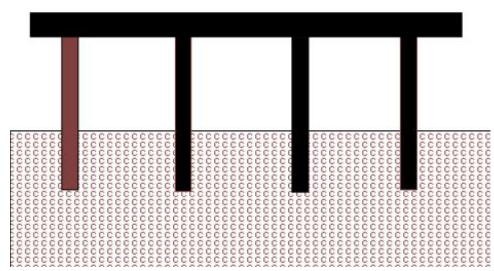


Figure 5.5: Illustrations of a framed and pile trestles.

Crib foundations were used in low or wet areas where the operator did not want to use fill or build a trestle. Logs were piled log cabin style to fill up the depression, and the railroad tracks built over the top. This type of crossing was easy to build, but required large amounts of suitably sized logs.

Tonsfeldt (1995:18) reported that trestles were preferred over bridges, which had a habit of catching fire. Logging engineers recommended that railroad logging operators spend their money on fill materials, as opposed to building a bridge.

Inclines

An alternative to switchbacks, sinuous tracks, trestles, and curvature resistance issues was the use of inclines to transport logs from higher elevation harvest units to mainline railroads in the valley below. An incline consisted of a set of tracks laid against a mountainside on which loaded log cars were lowered by cables powered by a lowering donkey or snubbing engine (Bryant 1923:490; Figure 5.6). Table 5.1 illustrates examples of selected western railroad logging incline systems. There were two types of inclines systems; a one-way system lowered loaded log cars down the grade on a single track, while a double-tracked counterbalance system lowered loaded log cars down the incline as empty cars were pulled up the grade. A turnout was used to connect the two separate tracks at the bottom of the slope. A moveable part known as a switch was located at the point where the two tracks met. There were two types of switches used on a logging railroad, the stub switch where both mainline rails were cut, and the split switch where only one mainline rail was cut. Frogs allowed the flanges of the car wheels to cross

Table 5.1: Examples of West Coast incline railroad logging systems (adapted from Adams 1961; Labbe and Goe 1961)

Operator	**Location**	**Year Built**	**Engineering Specs**
Yeon & Pelton Logging Co.	Rainier, OR	1890s	3,200 feet long; 5-33% grade
Marysville & Northern	Sedro Wooley, WA		60-70% grade
Porter-Carstens	Estacada, OR	1923	45-65% grade
Warnick Lumber Co.	Bellingham, WA	1920s	60-70% grade
Roach Timber Co.	Sutherlin, OR	1916	60-70% grade
Diamond Match Co.	Sandpoint, ID		60-70% grade
Saginaw Timber Co.	Aberdeen, WA		60-70% grade
West Oregon Lumber Co.	Clatskanie, OR	1930	74% grade
Wisconsin Logging & Timber Co.	Coos Bay, OR	1916	2,000 foot long cableway with a maximum grade of 66.5%
Basin Logging Co.		1920	6,800 foot long incline with 65% grade
Hogg-Houghton	Mill City, OR	1920s	65% grade
Wood-Knight Logging Co.	Bellingham, WA	1930	6,600 foot long incline with grade between 20-76%
Yosemite Valley Railroad	Merced River, CA	1912	8,300 foot long incline with a grade of 78%
Bohemia Lumber Co.	Culp Creek, OR	1920s	2.5 mile long gravity railroad

the rail when it entered or exited the switch. Guard rails were placed opposite the frog to hold the wheel flanges in place (Bryant 1923:325).

According to Adams (1961:57), the first logging incline was built in 1852 at the foot of the Sierra Mountains in California. The loaded log cars were lowered down a 1,000 foot long, 45º slope using a rope and pulley contraption. The introduction of wire rope in the 1890s made powered inclines practical. In 1903, John Yeon, a partner in the Yeon Pelton Lumber Company of Rainier, was one of the first loggers in Oregon to

Figure 5.6: Porter-Carstens incline in 1924 (Penn State University MGN 103, box 32, folder 12).

combine an engine with gravity to lower old-growth logs down an old log chute he had converted to an incline (Labbe and Goe 1961: 31). The single-tracked incline was 3200 ft. long and was powered by a steam engine cobbled together from a compressed air rig and a pair of hydraulic cylinders, which used oil as the liquid agency.

The Manley-Moore Lumber Company owned several hundred acres of forestland north of the Mt. Rainier National Park boundary. In 1913, the company built a counterbalanced incline system to avoid 2½ miles of expensive railroad grade construction. The Willamette Iron and Steel Works of Portland, Oregon manufactured the lowering donkey, which was mounted on a concrete foundation once it was moved to the top of the incline. The engine had two sets of gears to control ascending or descending cars and two sets of brakes. One-and-a-half inch cable mounted on a large drum was used to lower loaded log cars down the incline. The lowering donkey was 250 ft. behind the headworks, which was a 26 ft. tall wooden tower with sheaves mounted on the top through which the cables passed. The lift in the cables provided by the headworks ensured that the cables would not get caught in the load as it descended the incline (Miss et al. 2000:20).

The Timberman magazine reported that many logging operators felt that the use of inclines increased their professional status, besides their bottom line, and sought out steep parcels of timber so that they could build these exciting log transportation systems (Adams 1961:59). As if it was a symbol of their masculinity, many railroad logging operators claimed to have the longest, steepest, or highest incline. In the 1920s, the Hogg-Houghton Logging Company of Mill City, Oregon briefly operated the steepest incline in the world. It was located 65% slope (Adams 1961:59). A 61%, 2000 ft. cableway constructed in Washington allowed the logging company to avoid four miles of switchbacks in the grade (Adams 1961: 57). Perhaps the granddaddy of all inclines was built by the Yosemite Valley Railroad in 1912. The incline was 8,300 feet long and had a maximum grade of 78%. Because the grade was so steep, special log cars with bulkheads built on the front to keep the logs from sliding forward were used. A loaded log car weighed 30 tons and it took eight minutes to lower the car (Adams 1961: 58).

Logging railroad locomotives

Many thousands of words have been written about the logging railroad locomotives, the versatile pieces of equipment that made railroad logging possible. Shay, Baldwin, Heisler, Climax, Willamette, and Porter locomotives became the work engines of the western woods. Adams (1961:72) reported that in addition to hauling logs out of the woods, the lokey was used to trail logs along the rails without the use of rail cars, as a yarder to drag logs to the landing, and as a loader.

There were two types of engines used in the forests of the Pacific Northwest, those that were rod-driven and those that were gear-driven. Geared locomotives, such as the Shay and Climax engines, were suitable for steep grades and sharp curves (Figure 5.7). They had a short wheel base which allowed the locomotive to make sharp turns, and the geared engines provided more power than that of a rod-driven engine (Bryant 1923:289). Shay engines had a lopsided appearance due to the configuration of the vertical engine of three cylinders mounted on the right hand side just ahead of the cab. The boiler was set on the left side to compensate for the weight and position of the engine (Labbe and Goe 1961:83). One of the major complaints about a Shay engine was that one side of the track would wear from the unevenly distributed weight of the locomotive (Adams 1961:78). Every Shay locomotive that was built by the Lima Manufacturing Company

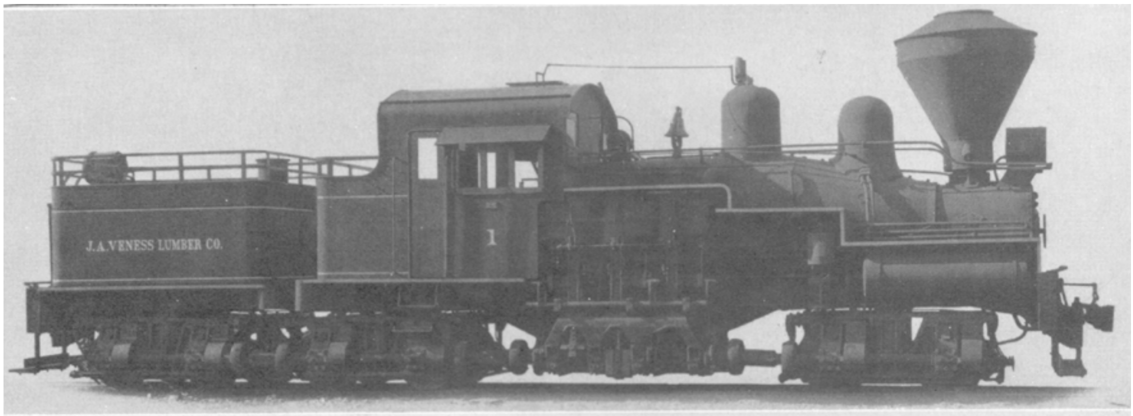


Figure 5.7: Wood-burning gear-driven 67-ton Shay locomotive circa 1920 (Bryant 1923:187)

was a custom creation; very few of the 2,761 engines built between 1880 and 1945 were the same (Labbe and Goe 1961:83).

The patent for the Shay engine expired in 1922, and the Willamette Iron and Steel Works of Portland Oregon immediately began production of an undisguised Shay knock-off (Figure 5.8). According to Adams (1961:78), Willamette made an inferior product and only 33 geared locomotives were manufactured before production ceased in 1929. Geared locomotives proved to be superior for log hauling in the west. Known as rock crushers because their exhaust was four times as fast and loud as that of rod-driven engines, gear-driven locomotives were slow but steady. Because of their more uniform exhaust, gear-driven engines consumed less fuel, were able to attain a speed of 10 to 15 miles an hour in less time than a rod-driven locomotive, and derailed less frequently on rough roadbeds and light rails that characterized most railroad logging operations (Adams 1961:81).

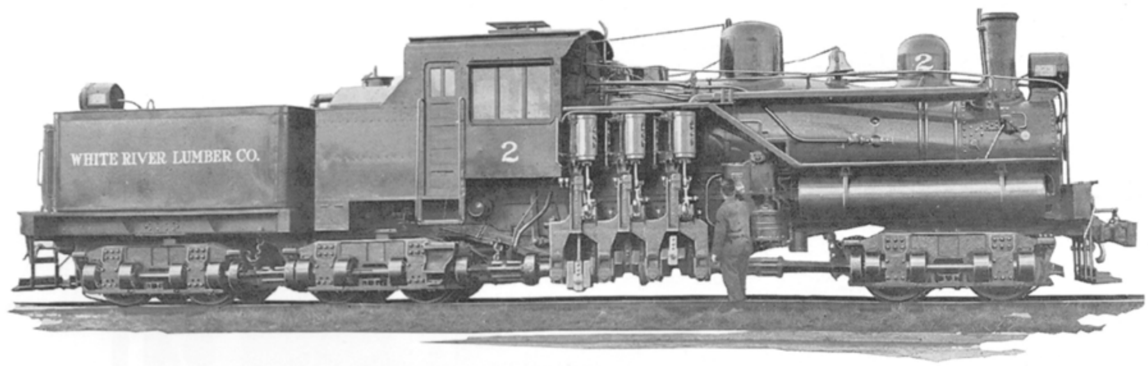


Figure 5.8: Willamette Iron and Steel Works oil-burning gear-driven locomotive (Willamette Iron and Steel Works 1925:82)

Rod-driven locomotives, represented by Baldwin engines, were never able to compete in the western woods against the reliable gear-driven models (Labbe and Goe 1961:112; Figure 5.9). Rod-driven engines had three cylinders horizontally placed below the boiler which drove a line shaft positioned along the right hand side of the frame. Bevel gears and jack shafts transferred the power across the trucks to drive the geared wheels located on the left side of the engine (Labbe and Goe 1961:112).

Railroad locomotive manufacturers continued to make improvements to their products right up to the early 1930s, when the Depression became an economic reality for most railroad logging operations. At the end of the 1930s, when economic conditions began to improve and there was a demand for wood products, railroad logging was no longer economically or environmentally viable. Although a few large timber companies

Figure 5.9: Example of “Shay-type” oil-burning rod-driven engine manufactured by Baldwin (Bryant 1923:188)

continued to use railroads into the 1950s, Peterbilt logging trucks had replaced Shay locomotives in the western woods and the glory days of railroad highball logging were over.

Logging and railroad construction work camps

Donald Hardesty (2002:94) has remarked that work camps have been a part of the human experience for thousands of years. Labor camps were once organized along kinship lines, but industrialization, capitalism, and wage labor have become the organizing forces in the modern world (Hardesty 2002:94). Temporary work camps in the west were usually associated with extractive industries such as logging, mining, ranching, or construction camps (Hardesty 2002:94). An average East Coast logging camp in the 19th century housed 60 French Canadian and European workers. The workers lived in a single-story log structure called a dingle. This structure had a bunkhouse on one end connected to the cookhouse on the other by a covered porch. A stable and a blacksmith shop represented the minimum number of buildings found at logging camps of this era (Bryant 1923:29; Figure 5.10).

Dingles were also found in early Pine Era logging camps in northern Michigan. When the large railroad logging operations began in the 1870s, multi-purpose log structures were replaced with single-function board buildings. As rates of productions increased with technological advances, more laborers were required to maintain the corporate

Figure 5.10: Logging camp in Maine circa 1890. The buildings from left to right are the cook shanty, bunkhouse, blacksmith shop, and stable (Bryant 1923:29)

structure. The camps built during 1890 to 1910 expanded to include warehouses, offices, shops, cookhouses, bunkhouses, stables, and blacksmith shops (Dunham and Franzen 1997:130). Bryant (1923:30) reported that the laborers were mainly Scandinavians and the foremen and railroad engineers were usually native-born Americans.

Western work camps

Labor camps proliferated across the west to provide housing for the large number of workers that were needed to build the railroads, dams, and roads and harvest the old-growth forests. Variables in western labor camp organization included the presence of families and immigrant ethnic groups, amount of corporate control, and whether the project was publicly or privately funded. Adams (1961:51) reported that the quest for profit among logging operators resulted in the employment of immigrant low-wage labor crews. Railroad logging construction gangs included men of Scandinavian descent who had followed the migration of major timber companies to the forests of the west, as well as men from southern Europe, particularly Greek and Italian railroad section crews. The ready availability of cheap, unskilled labor delayed the introduction of labor saving machinery such as bulldozers and diesel-powered log trucks into logging operations into the forests of the Pacific Northwest (Adams 1961:51).

Stacy Case (2001) documented a late 19th century railroad construction camp in the west central Cascade Mountains of Oregon. She found that the Oregon Pacific Railroad employed various ethnic groups in its quest to build a railroad over the Santiam Pass from Albany to Sisters Oregon. She found two stone domed ovens built by the

Mediterranean workers to bake bread in and reminded the reader that although these types of structures are commonly referred to as Chinese ovens, this has not proven to have been the case (Wegars 1991:37-65). A remote camp housing Chinese railroad workers was located 20 miles up the Santiam River from the main camp. Case (2001:142) explained that this type of segregation was common in labor camps in the west.

The Keechelus Dam construction camp was built by the U.S. Bureau of Reclamation to house 500 to 700 workers employed during the years 1912 to 1917. Electricity, plumbing, and telephones were provided within the camp. These services were considered luxuries at this time in the history of rural eastern Washington, as well as western work camps of the era (Chapman et al. 2001:7). Chapman (2001:5) reported that:

> the camp housed workers classified by rank and duties as foremen, mechanics, laborers, office men, flunkeys (a classification for mess hall workers) and teamsters. Separate areas for family quarters were also constructed. A YMCA building and a clubhouse for the office men were set up. Food service structures, a hospital, and a schoolhouse were also built in side the camp. The camp was laid out on a grid with named streets, wood-frame buildings and canvas tent houses. The temporary homes were grouped according to job description.

During the years the camp was in operation, labor-union unrest characterized many western work camps. Workers demanded higher wages, improved working conditions, and job protection as cultural and social changes swept across the increasingly industrialized west. Poor living and working conditions in western labor camps lead to labor strikes and ultimately change, but not without loss of life and property. The 1914

Ludlow Massacre at a tent camp in Colorado, the 1916 Everett and 1919 Centralia Massacres in Washington resulted from violet social upheavals and major labor strikes that characterized this period (Rajala 1989). In response to the labor reform movement, the Keechelus Dam work camp was built by the federal government to meet state health and safety standards, and provide clean and safe housing for the workers.

Oregon logging camps

Jonathon Horn (1987) documented a 1890s logging camp located in the Cascade Mountains southwest of The Dalles, Oregon that began operation in 1884. For 18 years, The Dalles Lumbering Company supplied lumber products to local markets from a sawmill and a series of camps located deep in the forests that flanked Mt. Hood's eastern side (Horn 1987:1). Horn explained that geography determined the location of many logging and mill sites in the Pacific Northwest. The economic success of these operations depended upon the productivity of the methods used to cut and process the timber. The timber could be brought to the mills via railroads, wagons, flumes, or log drives, or the mills could be located near the timber supply and the rough-cut products transported by flume or wagon to planning mills located near a railroad for finishing (Horn 1987:30).

Gravity and water power combined to make flumes an effective mode of wood products transportation. Travelers in the Columbia Gorge during the 1880s noted several flumes leading to sawmills near the river's edge (Horn 1987:10). The lumber manufactured in The Dalles Lumbering Company sawmill was transported directly to the town via an 18 mile log flume considered by some to be a "masterpiece of bridge engineering and trestle work" (Horn 1987:32). The lumber was cut extra long to compensate for the beating it took on its long journey down the wooden flume to the Columbia River (Horn 1987: 51).

The Bridal Veil Lumber Company began operation in the heart of the Columbia Gorge in 1886. A town called Palmer grew up around the mill built to exploit the timber resources found on Larch Mountain 30 miles east of Portland (Woodward 1975:1). By 1900 the company had three Baldwin locomotives and six donkey engines working in the woods producing 75,000 board feet of timber a day (Horn 1987: 10). The town and mill were destroyed by a forest fire in 1902 which killed two young men and forced others to wait out the fire in the mill pond (Woodward 1975:10) The old site of Palmer was abandoned and the Bridal Veil Lumber Company built a new camp and mill with better buildings and equipment at a different location. By 1910, the company was producing 125,000 board feet of lumber a day (Horn 1987:11).

Ron Gregory (2001) documented the railroad logging camps of the Shevlin-Hixon Company that operated in the pine forests of central Oregon from 1916 until 1950. Shevlin-Hixon became one of the largest timber land owners in Oregon having acquired over 215,000 acres of clear-grained, old-growth Ponderosa pine, known as "pumpkins" because of their bright orange bole. Both Shevlin and Hixon were independent timbermen in the Great Lakes area and combined their fortunes and business acumen to build a large-scale sawmilling operation in Bend once their timber holding in the north had been depleted (Gregory 2001:20).

To supply their mill, Shevlin-Hixon built a series of portable camps to house the loggers near to the timber supply. As the trees were cut out in an area, the structures in the camp were moved to a new camp that was constructed in proximity to next timbered tracts that were to be logged. Initially, Shevlin-Hixon used horses and high wheels to transport the logs, but the animals were expensive to keep and this type of log hauling system was only suitable in flat, open country. By 1923, Shevlin-Hixon was using gasoline-powered tractors and Lidgerwood skidders mounted on railcars to haul the logs from the stump to the landing where they were loaded onto rail cars and transported to the mill in Bend (Gregory 2001:24).

Pacific Northwest labor force

One writer of forest history explained in 1948 that:

> The Pacific Northwest was a melting pot of logging culture in the 1890s. The eastern lumbermen bought thousands of acres of virgin timber. They fetched their crews, often whole trainloads of them together with their saws, axes, habits, speech, folkways and snuff, and built them villages in the woods. Thus the Northwest received sealed cargoes of logging/woods culture intact, untainted by contact with either farm or cities (Holbrook 1948:87).

Bryant reported that 60% of the loggers in the Pacific Northwest were native born as opposed to 15% of the loggers in the Great Lakes region. He considered the Scandinavian loggers to be the best woods workers, but no matter the region, the most responsible positions were held by native-born Caucasian men (Bryant 1923:42).

In 1930, the Forest Service estimated that 300,000 of a total population 953,786 people in Oregon depended directly or indirectly on the forest industry for their livelihood (West Coast Lumbermen's Association 1937:22). Gregory documented the people who lived and worked in the Shevlin-Hixon logging camps during the first half of the 20th century. As other researchers have discovered when investigating railroad logging companies, written records exist for some aspects of the operation but not for others, such as the ethnicity of early loggers or day-to-day life in the camps. Based on the oral histories he obtained, Gregory found that there was a group of first and second generation eastern Europeans who apparently were the section crews (railroad construction workers) that lived in the camps. The immigrants from Czechoslovakia, Croatia and Austria "hung together pretty much and had a certain section in camp that they all lived close to each other" (Gregory 2001:37).

Other logging families living in the camps were failed homesteaders who had been drawn to the region during a period of abnormally high rainfall and the accolades of local business interests proclaiming the suitability of central Oregon for homesteading. Once the weather returned to normal and their apple trees died from frost and drought, the former farmers turned to logging for their livelihoods (Gregory 2001:36). Gregory identified a third group of camp residents as experienced woods workers who migrated from the Great Lakes and followed the Shevlin Company to work in the pine forests of Central Oregon. He reported that this was a common practice in the industry, especially when a company was expanding into a frontier area where the skilled labor force required to operate sawmills or a railroad logging operation was not available. These workers included “timber fallers, rigging slingers, saw filers, equipment engineers, and camp clerks” (Gregory 2001:39).

Loggers have been characterized as single men full of wanderlust, but many families could be found in the logging camps of Oregon, such as those operated by the Shevlin-Hixon Company, the Union Lumber Company, and Bridal Veil Lumber Company. Gregory reported that as the glory days of highball railroad logging shifted into high gear in the forests of Central Oregon, schoolhouses, taverns, and recreation buildings were found in most of the larger camps (2001:43). Merv Johnson (1998: 235) reminded his readers that “it was the off-beat characters of the day that we remember, and like to talk about. Those who quietly went about their work and provided for their families didn’t make good copy”. The single men reportedly moved from camp to camp following the big trees, seeking out the best logging camps where good food was plentiful, the bunkhouses were clean, and the wages were high (Johnson 1998:235; Conlin 1979).

Forest ownerships in the Pacific Northwest

Much of the forested lands included in the Northern and Southern Pacific Railroad land grants were sold to private timber companies. Frederick Weyerhaeuser bought 900,000 acres of Northern Pacific land in 1900 from his neighbor in Minnesota James Hill, who happened to be president of the railroad at the time. By 1914 Weyerhaeuser had increased his land holdings to almost two million acres; 75% of the lands were in Washington State (Miles et al. 2000:11). Other Great Lakes lumbermen such as

William W. Mitchell purchased 36,000 acres in the Coast Range of Oregon 1904 with the intent of logging the timber land in the future (Culp 1958:3).

In 1937, the West Coast Lumbermen's Association produced a book of statistics and facts about the lumber industry in the Douglas-fir region. Interestingly, the Association used 1929 as the benchmark year from which to assess market conditions because pre-Depression facts and figures were more representative of economic conditions than those experienced by West Coast lumbermen during the Depression (West Coast Lumbermen's Association 1937). The editors extracted data presented in a 1934 report prepared by the Pacific Northwest Forest Experiment Station. The U.S. Forest Service had inventoried the various land-uses, vegetation types, and forest stand age classes found in Oregon during 1933. The Table 5.2 summarizes some of the key factoids regarding land ownerships in the Pacific Northwest. The Lumbermen's Association reported that "severe competition rules the sale of West Coast lumber. First, competition between West Coast mills and second, with mills of other regions and countries. (In the final analysis), West Coast lumber making and selling is a gamble" (1937:17).

History of the Mt. Hood National Forest

An important part of Pacific Northwest logging and railroad history is the establishment of the national forest system beginning in 1891. A rising environmental ethic and public will geared toward the preservation and protection of America's natural treasures resulted in the creation of the first National Park at Yellowstone in 1874. The

Table 5.2: Ownerships of forestlands in Oregon and Washington in 1934.

	Oregon	Washington	Pacific Northwest
Total land	61,188,480 ac	42, 775,040 ac	103,963,520 ac
Total forest land	25,217,000 ac	21,905,000 ac	50,122,000 ac
Percent of total	46.1	51.2	48.2
Privately-owned forest lands	12,251,000 ac	10,322,000 ac	
National Forest lands	11,238,000 ac	7,523,000 ac	
Other public lands	4,678,000 ac	4,060,000 ac	

destruction of the forests on public land from unregulated logging was a concern as well, especially with the rise of professional foresters and forestry programs such as the one at Yale from which Gifford Pinchot was a graduate. A series of forest reserves were created from public lands in the west between 1891 and 1897. In Oregon, the Cascade Range Forest Reserve was established in 1893 along the length of the Cascade Mountains from the Columbia River south to the California border. In 1908, the Cascade Reserve was split into the Oregon, Cascade, Umpqua, Crater and Deschutes Forests. The Mount Hood National Forest was created from the Cascade Forest in 1924 (Wang et al. 2002:363).

The introduction of transcontinental railroads, railroad logging, and steam powered yarding and skidding engines into the forests of Oregon and Washington occurred during the 1880s. In the 1920s, tractors adapted to ground logging, and diesel-powered log trucks were introduced into the western forests. Gasoline-powered chainsaws followed in the 1930s. These innovations were examples of the technological developments that contributed to the modernization of timber harvest practices in the Pacific Northwest (Davis 1993:29). Improved transportation systems also contributed to the rapid large-scale deforestation of America’s forests. By the late 1890s, legal protection and professional management of public forestland for the long-term welfare of the American people was necessary.

The purpose of the Organic Act of 1897 was to create a system of forest reserves to preserve and protect the forests within the reservation, to protect the water supply, and to furnish a continuous supply of timber for the use of the people of the United States. When the forest reserves were transferred from the Department of the Interior to the Department of Agriculture in 1905, the U.S. Forest Service was created with Gifford Pinchot at the helm. Pinchot penned a mission statement for the fledgling Forest Service directing foresters to efficiently manage the land and its resources in the most productive manner for the permanent good of the people. Resources were to be managed for sustainability and not for the temporary benefit of individuals or companies (Johnson 2003:3).

The sustainability of old-growth forests was the last thing on the mind of most West Coast loggers during the first decades of the 20th century. The West Coast Lumbermen’s Association reported that a survey published by the U.S. Forest Service in 1926 revealed that more than 3 billion board feet of merchantable timber was left in the woods to rot or become fuel for forest fires, or more than 1/6 of the annual cut in 1926. “The primary cause given for such waste was excess stocks of low-grade timber. The amount of waste is related to the extent of over-production and operating losses. The more hard pressed the manufacturer – in recovering operating costs – the more does financial necessity force him to "skim the cream" of his raw material" (West Coast Lumbermen's Association 1937:13). The publication went on to report that the waste was even greater in 1936 than in 1926 because many loggers left large merchantable western hemlock and the smaller Douglas-fir sawlogs behind. As logging progressed into the higher elevations of the Cascade Mountains, the proportion of high-grade, clear-grain lumber decreased which increased the loggers' reluctance to transport low-volume timber to the mill.

E.T. Allen reported in 1923 that 1906-1907 marked the peak in lumbering in the west. Investors in forestland had found themselves on the short-end of a financial bust cycle due to borrowing and speculating on future land values, and were forced to cut their holdings rather than wait for better market conditions (Allen 1923: 235). Most lumbermen of the era did not recognize or receive any financial incentives for reforesting the denuded landscapes and did not want to tie up scarce capital in a long-term and speculative investment that a timber crop represented.

This is not to say that the opinions from a very active conservation movement across the nation as a whole and within the timber industry were not voiced. In 1923, an article in the *American Forestry* magazine reminded readers that "our modern methods of forest slaughter coupled with world-wide means of transport, remove from our forests in a single year as much as the demand in a decade upon German forests…if our forests are to be made to serve us permanently, we must proceed with rapidity to the solution of our forest problems" (Kirkland 1923:205). Kirkland was concerned that the great old-growth forests would become only a memory because the belief that the timber supplies in the Pacific Northwest were inexhaustible was so pervasive. He advocated for sustainable timber practices where resources were continuously available for human use and proposed that a new cultural mind set was in order, as well as new forest management practices (Kirkland 1923:208).

The evolving land-use philosophies of the 1920s concerning sustainable forest practices were not part of the corporate ethic of the Union Lumber Company, a Louisiana-based timber company who had purchased several thousand acres of prime old-growth Douglas-fir in the Clackamas River drainage from the Oregon and California Railroad. The lack of a suitable log transportation network inhibited exploitation of the forest land by the Union Lumber Company until the 1920s. The development of railroad transportation networks in Clackamas County coincided with increased interest in electric power, which was first commercially distributed in 1882 (Wollner 1990:15). Both agents of environmental and social change would soon combine with Great Lakes and Southern lumbermen to leave a lasting footprint on the landscape of east-central Clackamas County.

CHAPTER 6: THE STORY OF PORTER-CARSTENS' CAMP 1

A local electric interurban rail line, not a transcontinental railroad, was responsible for the transformation of the forested landscape in the upper Clackamas River watershed. Street railway service for Portland citizens began in 1872 when horse-drawn cars traveled the tracks around the growing city. A light steam locomotive called a dummy worked the rails in the suburban areas (Mills 1943:82). In June of 1889, an incandescent light bulb in Portland was lit by current generated 13 miles away at a power plant located at the Willamette Falls in Oregon City, over the first long-distance transmission line in America (Mills 1943:83). By November, the first electric railway in Oregon was operational, providing service to the growing east-side and downtown Portland.

An expanding metropolitan Portland population in the 1890s demanded more electricity than the little power plant at Willamette Falls could generate. Locations for possible hydroelectric projects were surveyed and purchased along the upper Clackamas River by the Portland City and Oregon Railway. The area was conveniently located to Portland markets, and possessed the necessary geology required for the construction of several dams. It was common business practice at the turn of the 19th century for electric railroad operators to finance the development of hydroelectric projects to provide power for their lines (Mills 1943:87).

Clackamas River hydroelectric projects and interurban railway construction

The history of interurban rail lines in Oregon is a history of financial struggles, reorganizations, and unrealized dreams. The Oregon Water Power & Railway Company

(OWPRC) was incorporated on June 6, 1902, with financial backing from the Land & Trust Company of Philadelphia. Their mission was to develop the Clackamas River dam sites and provide electric power to the people of Portland (Greissen 1981). This company was formed from several earlier failed interurban lines, including the short-lived Portland City and Oregon Railway (Mills 1943: 86). By August, work was started on the rail line from Portland to Gresham to supply the raw materials and manpower for the construction of at least three hydroelectric generating plants planned for streams in the upper Clackamas River drainage. The construction of the 32 mile standard gauge railroad proceeded quickly, and by January 1903, electric trains were running to the end of line at Gresham (Culp 1987). The trains were then switched to steam-driven locomotives to finish the trip to Cazadero, the site of the first dam and electric power plant on the upper Clackamas River (Figure 6.1; Figure 6.2). Cazadero Dam was a wooden-crib diversion dam built without adequate fish passage facilities (Burtchard et al. 1993; Figure 6.3).

Figure 6.1: End of the line at Cazadero circa 1904 (Labbe 1980:9).

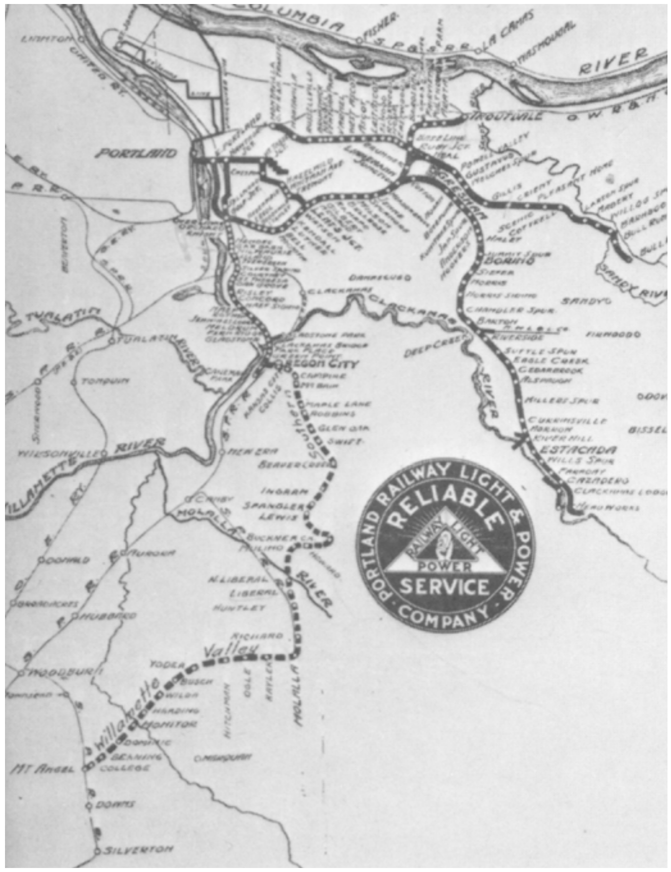


Figure 6.2: 1906 map of the Portland Railway Light & Power Company system, formerly the OWP&RR line (Labbe 1980:123).

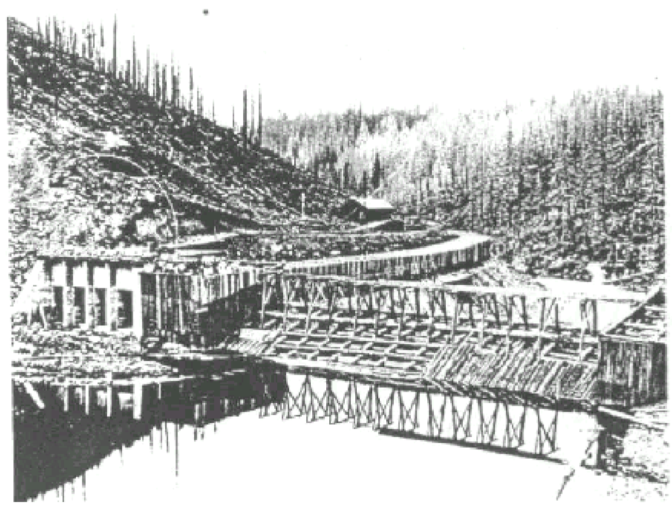


Figure 6.3: Cazadero Dam construction in 1903 surrounded by the 1902 Hillockburn Fire which burned through portions of Ladee Flat (Estacada Middle School student history project 1979).

There were no towns in the area, and the only place to buy supplies was from the country stores located in the rural hamlets of Garfield, Springwater, Viola and Eagle Creek. Housing and services were required for the 600-1000 people that would eventually be employed in dam construction, railroad operation and construction, and logging activities in the upper Clackamas River watershed (Burtchard et al. 1993). In January 1904, a plat for Estacada, where 300 people were already living near the Cazadero site, was filed at Oregon City by the principal parties of the Oregon Water Power and Railway Co (OWPRC), and a new town was born (Wollner 1990).

The OWPRC built the Estacada Hotel beside the railroad tracks in the new town and marketed it to weekend tourists from Portland as a desirable destination for outings, complete with attractive fares and inducements such as large, economical meals and clean rooms (Figure 4.4). 900 people rode the first excursion train to Cazadero

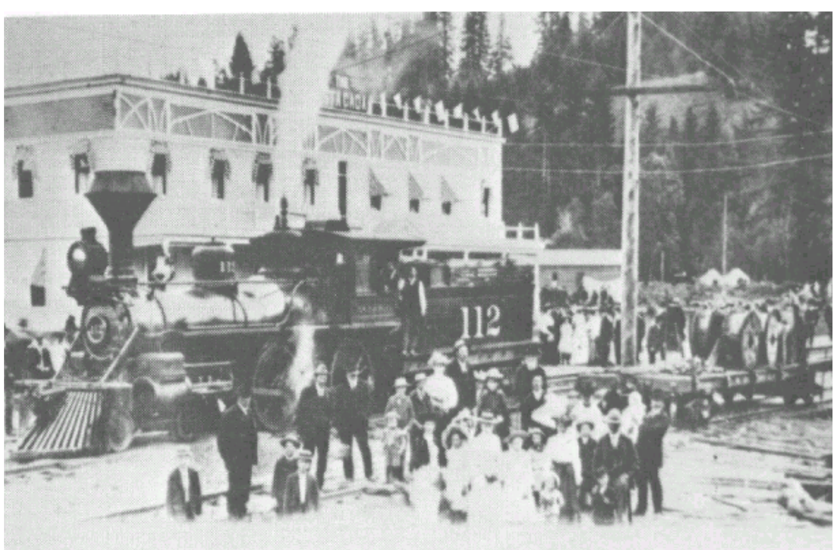


Figure 6.4: Estacada Hotel circa 1906 (Labbe 1980:109).

in October1903 to view the site of the future hydroelectric project (Labbe 1980). Eventually the interurban line to Estacada would be known as the “Trout Route”. Thousands of people visited the area every weekend during the summer to take advantage of the splendid scenery, the parks along the newly constructed reservoir, and the hunting and fishing opportunities in the mountains and streams (Culp 1987).

The railroad promoters also saw the railway as a means to exploit the timber resources of the upper Clackamas River. Natural obstructions on the river and steep terrain had precluded the use of log rafts, which were a common method of getting logs to the mills or to transportation facilities. This goal was soon to be realized when the Portland Railway Light & Power Company purchased the Oak Grove and Three Lynx power sites on the upper Clackamas River in May 1911 from the Southern Pacific Railroad(Wollner 1990:131). In 1920, construction began on the landscape-altering projects that resulted from this purchase (Figure 6.5). One monumental undertaking

Figure 6.5: Logging with the Shay on the upper Clackamas River hydroelectric projects 1920 (Labbe 1980:139).

included an 8 mi. long pipeline that snaked through the old growth forest carrying water from the partially diverted Oak Grove Fork of the Clackamas River. The 6 ft. diameter iron pipe terminated in a 1000 ft. plunge to the Three Lynx power plant located on the Clackamas River below. The logging necessary to clear the railroad right-of-way to the power plant sites continued in the upper Clackamas River canyon through 1924, when the Oak Grove power plant was completed (Burtchard et al. 1993). Overall, 55 million board feet of logs were removed during this stage of the construction project (Wollner 1990).

Oregon and California Railroad land grants

Portions of the Oregon and California Railroad (O&CRR) land grant were located in the upper Clackamas River watershed, including the Ladee Flat area. By 1866, when the Oregon Legislature offered land to fund a Willamette Valley railroad, the properties closest to the Willamette Valley were already claimed, and only the mountainous, unsurveyed timberlands in the western Cascade Mountains still remained in the public domain. The Oregon and California Railroad began selling their Clackamas County timberland in the 1870s to homesteaders, hydroelectric developers, and timber companies like the Union Lumber Company of New Orleans, Louisiana and relocated Minnesota lumbermen A.J. Dwyer (Hurd 2004:12). The land was surveyed and sold in 40 acre parcels; a tract just to the north of Ladee Flat was purchased by a homesteader for $300 in 1883 (Clackamas County Land Deeds 1883). Figure 6.6, a portion of Metskers 1939 map of eastern Clackamas County, displays the mixed land ownerships surrounding the Union Lumber Company land on Ladee Flat. Unfortunately, large portions of the forest

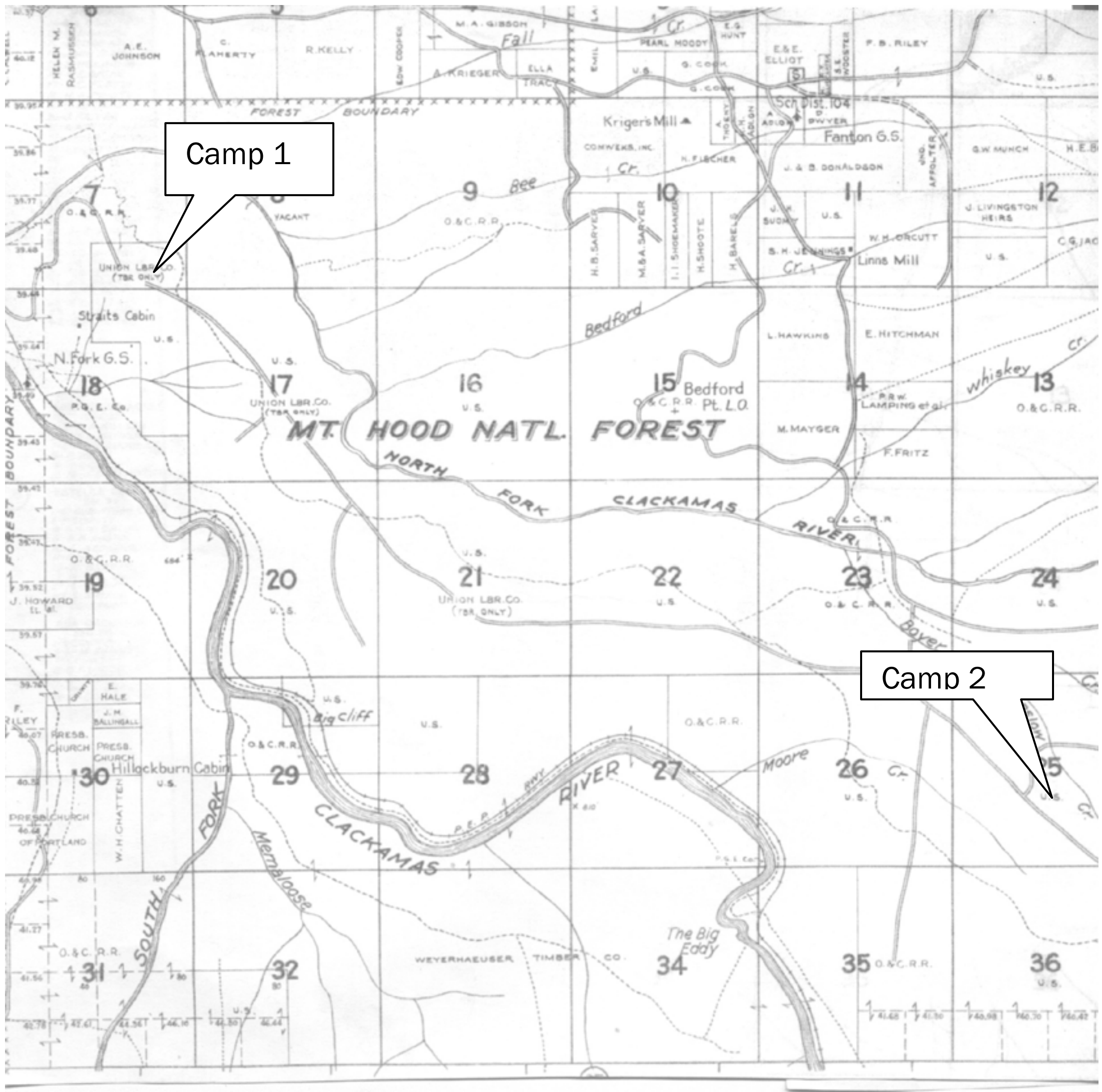


Figure 6.6: Metskers 1939 map of Ladee Flat displaying mixed land ownerships.

land in the upper Clackamas River watershed had been destroyed by forest fires, which had increased in frequency with the arrival of Euro-American settlers into the region during the mid-19th century.

Forest fires in eastern Clackamas County

1868 was one of the most destructive fire years in Oregon history. By mid-August much of the Pacific Northwest was on fire. So much smoke was generated from the fires that ships could not navigate the Columbia River, and the people of Portland were not able to see the sun for two weeks (Morris 1934:326). Much of eastern Clackamas County has been logged or burned several times since 1868, making it difficult to establish the boundaries of the old burns, but many timber stands up the North Fork of the Clackamas River drainage appear to have originated during this time (Morris 1934:332). Other fires in 1883 may have created the vast expanse of noble fir (*Abies procera*) and Douglas-fir forests that were inventoried by U.S. Forest Service employees in 1933 in the upper North Fork of the Clackamas River watershed (US Forest Service 1934).

Attitudes towards fire prevention were casual before 1910. An article in the September 13, 1902 *Oregonian,* a year in which forest fires raged across the state, including portions of the land the Union Lumber Company would purchase, captured changing attitudes towards forest fires and the destruction to life and property that resulted. The anonymous author wrote:

> Fire has been a most efficient assistant to the farmer in clearing his land of refuse, timber, stumps, roots, and brush. Without the employment of that agency it would have been impractical to put under the plow vast areas of fertile lands in the Willamette Valley and in the foothills of the Cascade and Coast Range mountains…. People must learn that when they set fires, on their own land but under conditions which permit the fire to extend to the lands of another, they violate the criminal laws and are liable to punishment (*Oregonian*, Sept. 13, 1902:5).

Much of the timberland that burned in the upper Clackamas River watershed during the great fires of the 19th and early-20th century was part of the Southern Pacific and Oregon and California Railroad land grants. The Hillockburn fire of 1902 was a particularly destructive and frightening event to the people living on the farms in the foothills of eastern Clackamas County because they were forced to flee from the flames racing through the logging slash and grain stubble that covered the area. Photos taken in 1903 during the construction of the new hydroelectric power plant on the upper Clackamas River at Cazadero, clearly show the burned forest surrounding the dam (Figure 6.3).

Clarence Jubb, a long-time logger and resident of the Estacada area, reported in a 1967 interview that their neighbor Mr. Mars told him that he had taken three or four people from Oregon City up to the South Fork of the Clackamas River to hunt. The men got wet and set a snag on fire to dry out. After they had left, the east winds picked up and started a forest fire that burned much of eastern Clackamas County, including the location of the dam at Cazadero, several farms, and millions of board feet of timber. Clarence's mother related that she took the food they had in the cellar down to the garden where they buried it for safekeeping (Jubb 1967). Morris reported that nearly every farmer in the Dodge/Springwater area had been burned out (1934:336).

The fire started across the Clackamas River from Ladee Flat and burned through understory of the 200-year-old stands of Douglas-fir that were growing there. The fire on the plateau was a low intensity burn, destroying only the shrub component and not the overstory trees. Clarence Jubb related that:

> My main job was timber falling. From the time you got to the top of the hill at North Fork where the incline was 'til you broke over the hill down into Roaring River, it was the nicest stand of timber that anyone could ever imagine; it was all clean, practically clean underneath, and nice smooth timber (Jubb 1967)

Union Lumber Company

In 1910 the Union Lumber Company, headquartered out of New Orleans, purchased 250 acres of old-growth timber in parcels scattered in the Cascade Mountain foothills southeast of the newly founded town of Estacada. Access was poor, but a wagon road had been built up the Clackamas River from Cazadero to the North Fork of the Clackamas River in 1903 after the disastrous Hillockburn Fire in 1902. This road connected with a trail system that followed old Indian trails to huckleberry and beargrass fields in the higher elevations, and salmon and cedar bark resource gathering areas along the Clackamas River (Burtchard et al. 1993: 29).

In 1916, the Chamberlin-Ferris Act returned nearly 3 million acres of the former Oregon and California Railroad land to the federal government. The land was to be sold at reasonable prices as quickly as buyers could be found. By 1921, the Union Lumber Company had purchased nearly 4,700 acres of former O&CRR lands located on a plateau at the junction of the North Fork of the Clackamas River and the mainstem, approximately 7 miles east of Cazadero where the terminus of the Portland Railway, Light and Power Company was located. Other timber companies joined in the land rush once word was out that the Portland Railway, Light & Power Company planned to extend its tracks from Cazadero up the previously inaccessible Clackamas River canyon for another 20 miles to the site of the Three Lynx hydroelectric project. A reliable log transportation system was all that was lacking to exploit the largest volume of standing prime old-growth timber that remained in relatively close proximity to Portland.

The Union Lumber Company decided not to wait for the power company to build the mainline railroad upriver, and in a joint business venture, helped fund the extension of the tracks from Cazadero 5 miles southeast to mouth of the North Fork of the Clackamas River in 1921 (Burtchard et al. 1993:29). A construction contract was awarded in 1922 to a Portland railroad contractor (*The Timberman* 1922:30). Union Lumber Company officials had hoped to build their mainline up the North Fork canyon to access their timber holdings on the flat 900 ft. above. Unfortunately a 50 ft. high waterfall blocked the route and the logging engineers were left to explore alternate options to move the logs from the plateau to the mainline below.

Bert Porter and Claus Carstens

The conifer forests of Clatsop and Columbia Counties, Oregon were some of the most productive in the world. A mainline railroad was established between Portland and Astoria in 1898, opening up the Nehalem Valley and Coast Range for logging. Dozens of timber companies operated in the region, including several railroad logging operations. In 1916, the Columbia and Nehalem Railroad completed their line which began at Kerry on the Columbia River and ran south towards the Nehalem Valley. At the peak of the boom times the Kerry Line, as it came to be known, was providing service to 10 large railroad logging camps (Labbe and Goe 1961:197).

One of the largest woods operations on the Kerry Line was Bear Creek Logging Company. Bert Porter became its president in 1921, but most of the timber had already been cut when he assumed control of the company. The equipment was sold and the corporation was dissolved in 1922. Porter bounced back and formed a partnership with Claus Carstens and Portland attorney James G. Wilson, creating the Porter-Carstens Logging Company (Carr 1991). They built a camp and a 5 mile long spur from the Kerry Line to access 30 million board feet of timber they had purchased near Sunnyside, but as a sign of the deadly efficiency of railroad logging operations, the timber was cut out in less than six months. *The Timbermen* reported in 1923 that "logging in close proximity to the Columbia River is rapidly becoming a thing of the past and log hauls of 75 miles or more to sawmills or log dumps will soon be a common occurrence" (October 1923:54). The editors attributed this state of affairs to the evolution in logging methods that had occurred during 40 years of logging along the river which had resulted in the exhaustion of the timber supplies. As a consequence of timber depletions in the Coast Range, logging operators looked towards the relatively intact forests of eastern Clackamas County for a new source of raw materials.

The Porter-Carstens incline

In April 1923, Porter-Carstens signed a contract with Union Lumber Company to log an estimated 500 million board feet of timber in eastern Clackamas County (The Timberman May 1923:48). The problem of getting the old-growth logs down the mountain was solved by the construction of an incline system. *The Timbermen* (1923:84) reported in November 1923 that the double-tracked counter-balanced incline, designed by logging engineer A.E. Glover, was approximately 2,800 feet in length and averaged a 45% grade. The counterbalanced system allowed loaded log cars to be lowered, while pulling up tank cars full of water, oil, and disconnected trucks used to haul logs. The closest water supply for Camp 1, which was built in the summer of 1923, was from the North Fork River 900 feet below. A load of loads made the trip down the incline in 3½ minutes (Figure 6.7).

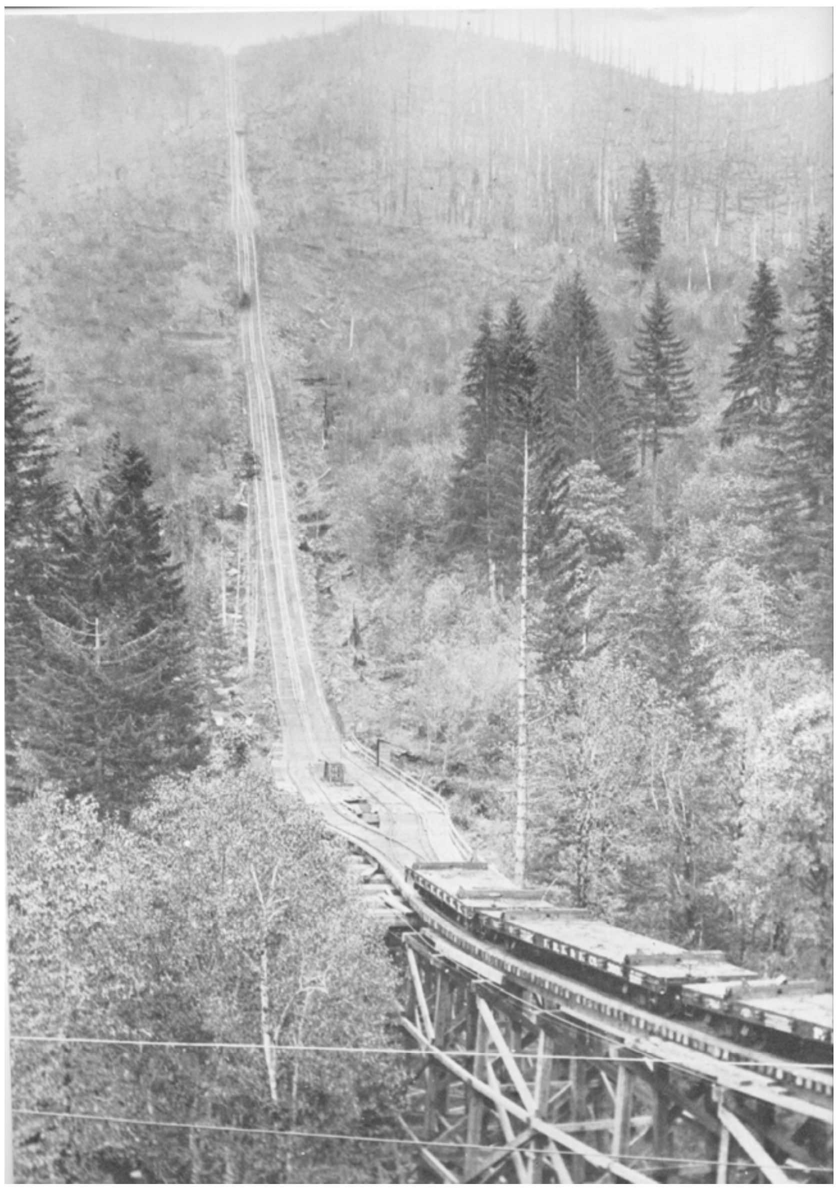
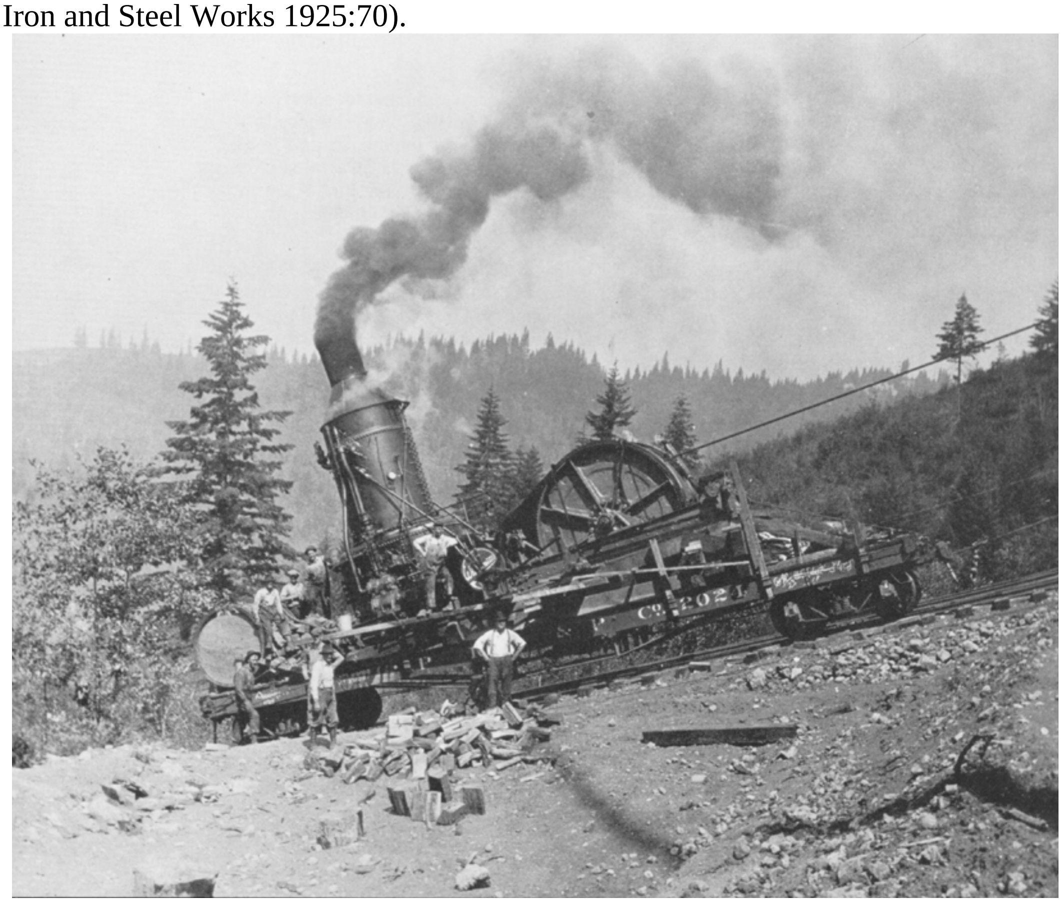


Figure 6.7: Porter-Carstens incline circa 1924 (Penn State University, MGN103, Box 32, folder 31).

The Willamette Iron and Steel Works of Portland, Oregon manufactured the lowering donkey that was responsible for the success of the operation. The engine had a 9 ft. diameter brake drum, and two 13 in. pistons with 14 in. strokes powered the engine (Carr 1991). A 6 ft. diameter gypsy drum around which 1½ inch wire rope was wrapped was used to lower the loaded cars. The engine was equipped with a reversing valve gear so that it could operate in either direction (WISW 1925:71). Willamette recommended that the lowering engine be mounted in concrete to reduce vibrations and eliminate strains due

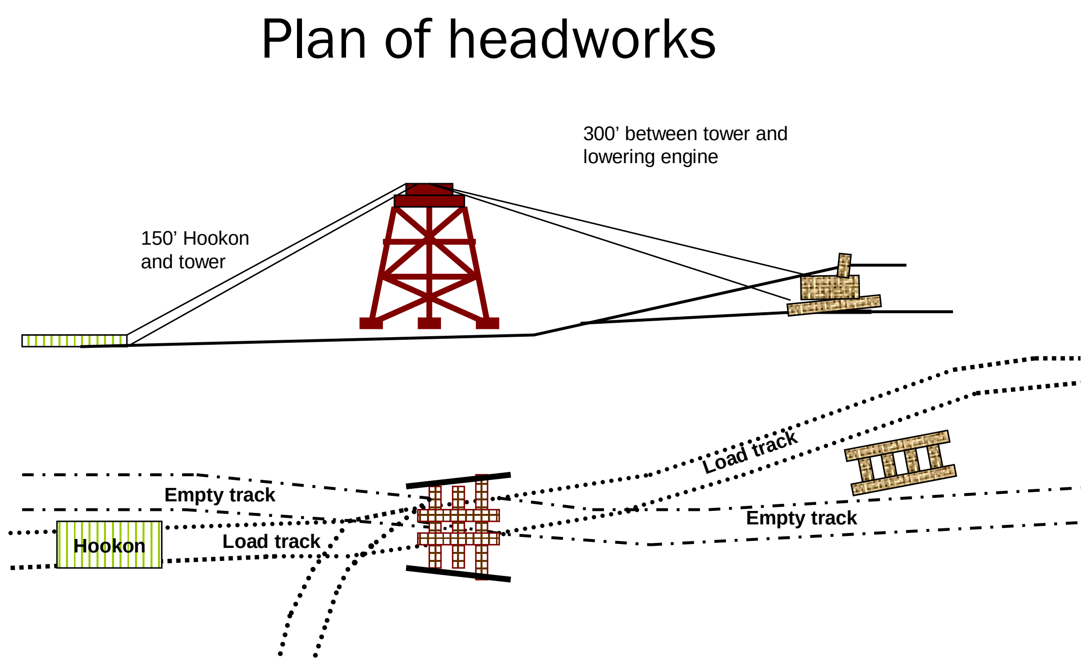
Figure 6.8: Lowering donkey on the steep pull up the incline to Camp 1 (Willamette Iron and Steel Works 1925:70).



to a poor mounting on a traditional log donkey sled. Carr reported that "the lowering engine was set up about 550 feet beyond the top of the incline, between the double set of railroad tracks. Located in front of the engine, at a distance of 200 ft., were the 24 ft. high headworks" (Carr1991; Figure 6.10). In the 1925 Willamette Iron and Steel Works catalog, the editors explained that all the hoisting or lowering engines manufactured in their plant were equipped with brakes cooled by a flow of water against the band. One brake was operated by compound hand levers from a quadrant and the other controlled by compressed air. The catalog featured the Porter-Carstens lowering donkey and reported that lowering engines are sometimes shipped to the customer already mounted on a railcar so that it could haul itself up the incline under its own power (WISW 1925:70-71; Figure 6.8).

A railroad spur was built up the north side of the North Fork from the Portland Railway, Light & Power Company mainline which connected to a trestle built across the North Fork River at the bottom of the incline. Houses for the engineers and brakemen who operated the Shay switching engine at the lower end of the incline grade were located above a railroad wye used for switching loads. This configuration of track allowed the Shay to move loaded log cars around to form a log train, which it pushed out to the Portland Railway, Light & Power Company's mainline at the west end of the spur.

The Timbermen documented the day the massive lowering donkey was brought out to the Porter-Carstens operation with numerous spectacular photographs (November 1923:84). Hank Boyer, local resident and early Forest Service employee remembered that the engine pulled itself up the steep slope under its own power, while smaller



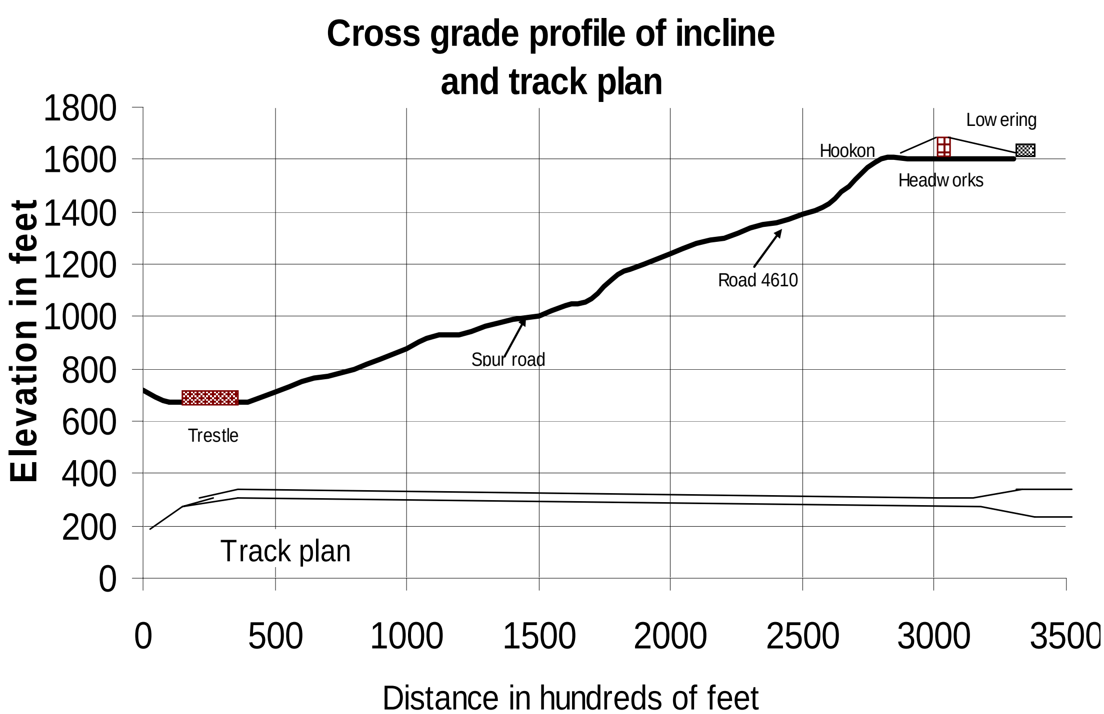


Figure 6.9: Plan of headworks, incline, and plan view of incline railroad tracks at Camp 1 (adapted from Miss et al. 2000).

donkeys already up on top assisted (Boyd 1967; Figure 6.8). A short mainline was constructed into the timber, and a camp was built on the burned-over flat at the head of the incline to house the loggers. Operation of the incline officially commenced when the first loaded log car was lowered down the incline on September 21, 1923.

Clarence Jubb was quite familiar with the incline. He remembered that:

> the incline was 3500 feet, and it was a 65% grade, and it was quite a thrill to ride it especially coming down when you rode down on a couple loads of logs (Figure 6.10). When them old lines would tighten up and the bark would fly off and one thing or another and you would look right straight down there for 3,500 feet and wonder if you were going to stop or go down like it did one Thanksgiving morning when they had a little ice and a little frost on the brakes of the lowering donkey and they let over a couple of cars and away they went. They couldn't hold it, and the line was wrapped about 5 or 6 wraps around a big spool and the spool was concave so that the line kept sliding into the middle and then there was water pouring on this spool to keep it from getting hot. And as one car would go down it would bring up three or four sets of empty trucks and right in the center it was a double track with automatic switches. When one car went down it would close the switches so that the trucks coming up would go that way and then when they would go out of the switch why it would open it so that the other car would go down, it was an automatic thing there.
>
> Anyway, this morning the brakes wouldn't hold and away she went down the hill and across the North Fork Bridge and piled up into that bank over there. And drove those pilings into the hill so tight that they had to buck them off, drove them in so tight they couldn't drag them out, they was drove in there. The trucks that was coming up the hill came up with such speed that up at the top was an A-frame that the lines ran up over and the cars went underneath. They would lower the cars down with the Shay until they would go under this A-frame and then they would block them there and put the lines on them to lower them down the hill so that the

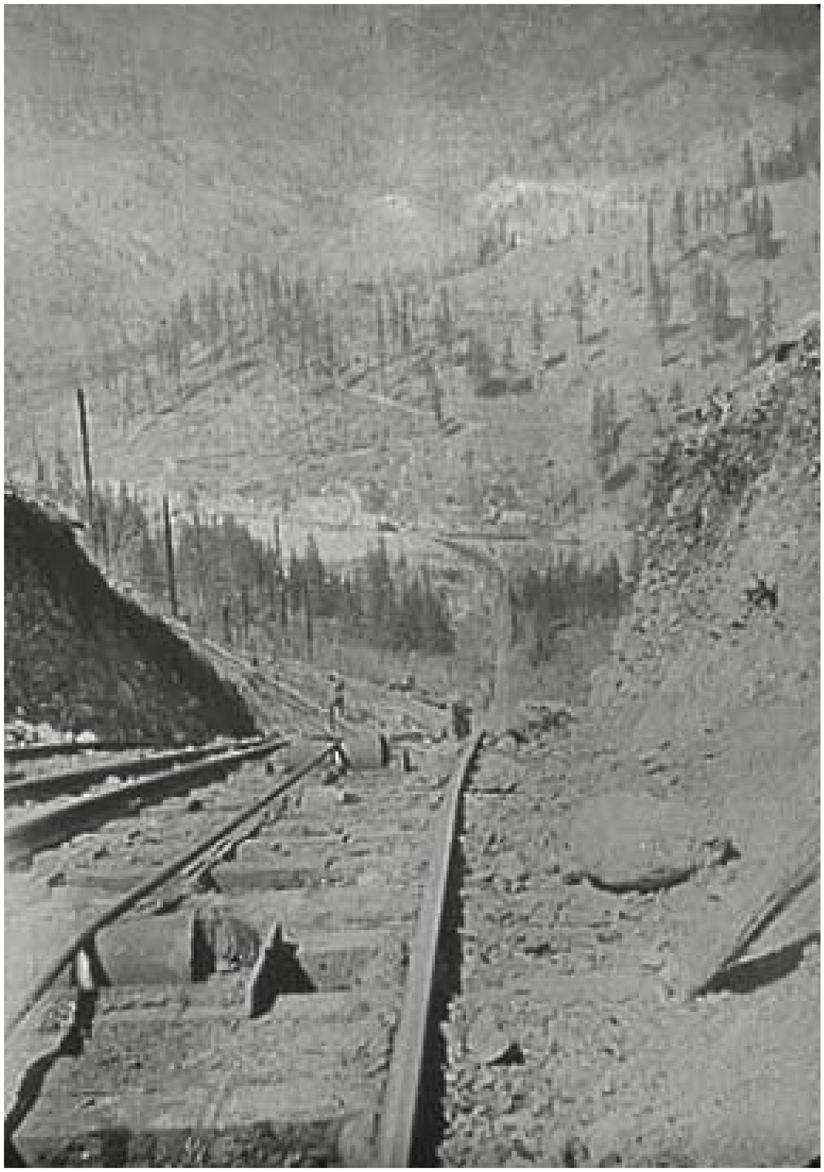


Figure 6.10: Looking down the Porter-Carstens incline in 1924 (Penn State University, group number MGN 103, box 32, folder 11).

> lines from the lowering donkey went up over this A-frame and then down over the incline. The cars that were coming up the hill that morning came up with such speed that they jumped over this 40-foot A-frame and flew back 300 feet and knocked the top off of the lowering donkey. Just wrecked the thing completely (Jubb 1967).

Runaways on inclines were rare but spectacular, as illustrated by Clarence Jubb's story. Special lowering donkey engines spooled enough wire rope on a drum to haul cars and equipment from the bottom of the incline to the top. The donkeys had a brake system designed to handle the heavy loads (Labbe and Goe 1961:123). A huge shoe with a continuous brake pad surrounded the drum. A foot pedal applied the brake (Hurd 2004:85).

The logs from the Porter-Carstens operation supplied several mills in the Estacada and Portland area, besides providing cordwood for local residents in the days when most homes were heated by wood. The Dwyer sawmill in southeast Portland, conveniently located along the Portland Light, Railway & Power Company's track, began to buy logs in 1924 (Hurd 2004:85). Much of the timber from the Ladee operation ended up in a log dump near Oaks Amusement Park in southeast Portland where it was taken to the Inman-Poulson mill for conversion into lumber products (Carr 1991). Carr reported that by the first part of May 1925, Porter-Carstens had three sides in operation, with almost 150 people living at Camp 1 (Carr 1991). A side is defined as "a logging unit, including all men and equipment, operating around a single landing" (Labbe and Carranco 2001: 169).

Although not documented in the coverage that the incline received, it appears that Porter-Carstens used the Sessoms incline system. A 1924 photo of Camp 1 shows a block car, as well as a loaded log car, waiting on the mainline that ran down the center of the camp (Figure 6.11). Block cars were used to provide additional "purchase" or a more

Figure 6.11: View of the mainline, block car and structures at Camp 1 in 1924 (Penn State Library MGN 103, box 10, folder 33).

secure grip on the loaded log cars descending the incline. Two large pieces of plate metal were cut into a triangular form with large-diameter sheaves welded on each leg of the triangle and mounted on a railcar (WISW 1925:73). A line from the lowering engine was passed through this huge block and then attached to an anchor on the other side of the track. Railroad cars loaded with logs were coupled to the block car which was then lowered down the incline (Labbe and Curranco 2001:164).

Rolling stock

Locomotives were expensive assets that were traded, rebuilt after a crash, sold at a bankruptcy auction, sold for scrap during difficult financial times, or eventually become

Table 6.1 Shay engines owned by Porter-Carstens Logging Company adapted from Shay Manufacturing records

Serial Number	Owner	Location
3227	Porter Carstens Logging Co	#4, Estacada Oregon
2490	Porter Carstens Logging Co	Estacada, OR
3179	Porter Carstens Logging Co	Kerry OR

History of Shay locomotive #2490

- #2490 was built for Western Cooperage Co. #2 located at Olney, Oregon
- At an unknown date, the engine was transferred to Astoria Southern Railway Co. located at Astoria Oregon and became their #2
- 1/1922 #2490 was sold to Porter Carstens Logging Co. at Estacada Oregon
- At an unknown date #2490 was sold to Clark County Timber Co. at Yacolt Washington
- 5/1928 #2490 was sold from Western Loggers Machinery Co. (dealer) located in Portland Oregon to Oregon-American Lumber Co. located in Vernonia Oregon
- 1953 liquidation of #2490 from Long-Bell Lumber Co. #102, Vernonia Oregon
- 11/1956 merger with International Paper Co.
- 1958 International Paper Co. donated #2490 to the City of Vernonia, Oregon (www.shaylocomotives.com, accessed 1-7-07)

an attraction at a logging museum, such as Shay #2490 has experienced. Table 6.1 documents the life history of the three engines used by Porter-Carstens on Ladee Flat. Shay kept meticulous records on thousands of engines manufactured at its plant in Lima Ohio.

Camp 1

Unlike many railroad logging camps, Camp 1 was not designed to be a portable camp where the structures could be moved on flatcars. An early photo of Camp 1, displayed in figure 6.11, provides a glimpse of the layout at Camp 1 and some of the equipment that was used in the camp and logging operations. The houses were built on-site using frame construction with board and batten siding. They appear to have been placed on logs or on large basalt rock foundations. The size and floor plan of the structures varied, depending on the side of the track they were built. The housing on the north side had only one window per side, while the houses across the track had two. This could indicate that the multi-window structures were small bunkhouses that housed four people. In 1919, the Loyal Legion of Loggers advocated for work camp housing standards, including one window per man in communal housing situations, in addition to 500 cubic feet of air space (Bryant 1923:75).

The shape of the stack of the steam engine, housed in structure located between the tracks in the foreground of figure 6.11, indicates the engine was oil-powered. This was probably the power plant for the camp; Carr reported that Camp 1 had electricity to the cookhouse, dining hall, and bathhouse, but did not mention if the bunkhouses had this convenience (1991). Hank Suter reported in 1979 that the camp did not have a radio when he worked at Camp 1 and that everyone was too tired to listen to one at night anyway (Carr 1991). Carr also noted that there were usually two cooks and one baker at Camp 1. The loggers made their own lunches from melted butter set out in gallon cans – the butter was spread on the fresh-baked bread with a paintbrush and topped with ham and cheese. Apples and oranges were available, as were desert items. Pigs were kept in the camp and fed the garbage from the cookhouse (Carr 1991).

When pigs flew

Even though classic high ball railroad logging was occurring on the North Fork, the atmosphere at the corporate office of Porter-Carstens in Portland was more subdued.

Increased labor costs, combined with decreased demand and falling lumber prices, caused many of the local mills to close. In July of 1925 Porter-Carstens was forced to file bankruptcy. Officials with the Union Lumber Company arrived in Portland to explore options to protect their investment and get the timber harvesting operations started again with another logging contractor. Camp 1 and all the machinery set idle above the North Fork, awaiting their eventual disposition by the bankruptcy court. Clarence Jubb recalled that:

> Well these two old guys were left up there when Porter-Carstens went broke, why the bank in Portland kept them out there as watchmen and they had 40 pigs and a cow. They kept them for as long as the feed lasted and this George Morgan, the fellow that was the boss of the outfit; he called up the bank and asked them what they wanted to do. And they asked him if he had any way of getting those pigs down off there and he said well there is a boxcar up here we might be able to load them into that and send them down. They said well you do that, do you have any body up there who knows how to run that lowering donkey? He had a man there who was supposed to be a mechanic, and engine man and one thing or another the fellow said well he didn't know anything about the lowering donkey but I can run the Shay. So they loaded the pigs and the cow into the car and they got 3,500 feet of line and pulled it up the railroad track and hooked the Shay on one end of it and the boxcar on the other and they figured when they loosened the brakes on the boxcar the weight of it would pull the line and start over the hill and a fellow could hold it with the Shay. It was so far that he couldn't see the man down at the boxcar and he started to back up and the boxcar wouldn't start so Morgan run and got a car mover and he started to work on the car and he got it started. In the meantime they backed the Shay over the line and cut it in two and by golly when he got it started it went down the first incline, and when it hit that little flat that was there at the bottom of the first steep incline, why it just took to the air when it went there and went sailing out there and took the top out of big dead snag that stood alongside the track and landed in a heap. There was only one pig out of the whole outfit that was alive. Mr. Armstrong came up and told them they had to bury those pigs. So they figured that was gonna take a pretty good size hole. They had a box of powder so they figured they'd get this box of powder and blow out a hole. So Morgan said well you take the powder down and blow out the hole and I'll cook dinner and then we'll go down and throw the pigs in it and try to cover them up. So the guy took the powder and went down and he dug under the end of the old boxcar the pigs was in and put the box of powder

> under there and it went off and it blew the boxcar and the pigs all over the side hill. Mr. Armstrong came up again and he said by gosh you fellows have got to bury every one of them. He had them running around there for two weeks with shovels burying pigs; he had a heck of a time. So that was the end of the livestock up at the Porter-Carstens site (Jubb 1967).

The Timbermen informed their readers in June 1926 that Ladee Logging Company of Portland had entered into a contract with the Union Lumber Company to log their timber in Clackamas County. The reporter also stated that the engineers were engaged in surveying a new four mile long route to circumvent the use of the incline. Under the management of C.M. Christensen, plans called for three sides to be in operation by early September, and it was expected that 25 million board feet of timber would be produced a year (June 1926:229).

Ladee Logging Company

Carl M. Christenson was another logger who had operated along the Kerry Line in the Nehalem Valley. In 1918, Christenson and his partners John Bailey and C.B. Buchanan formed the Ladee Log Company. They built a camp at Birkenfeld in Columbia County, Oregon to log their timber holdings (Carr 1991). Like the other operators in the area, he looked east for timber to fuel his logging company once the supplies on the Coast Range were gone. Christenson surveyed the remaining standing timber on the North Fork and agreed to log it for the Union Lumber Company. Just as in 1923, the engineers discovered that it was not possible to build a railroad up the North Fork of the Clackamas River. The old incline grade was repaired and placed back into operation. Carr also reported that a small sawmill operated by Porter-Carstens near Camp 1 was also rebuilt (1991). Photographs from the period show the mountainside where the incline was located was deforested as a result of the 1902 fire (Figure 6.7). A few remaining old-growth sentinels not killed by the fire dotted the hillside and standing and fallen snags littered the landscape.

By the summer of 1927, 130 men were living at Camp 1, and two sides were in operation producing 200,000 board feet of timber a day. Clarence Jubb remembered that the logs were bucked into 92 ft. lengths, or if the logs were very large, into 4,000 board foot lengths (1967). Most of the trees averaged 40 in. on the stump and the buckers would cut two logs from each tree. There was also a lot of rot in the trees according to Jubb. He reported that it was all high lead logging which required sophisticated rigging systems hung from spar trees powered by steam donkeys. Jubb remembered one instance when the slack was pulled out of the cables that had been strung through a second growth stand, at least 5 acres of standing timber was knocked down (1967).

Jubb also reported on the rate of production at Ladee Flat.

> The falling crew there was about nine to twelve sets of fallers working there all the time. We tried to average about forty to forty five thousand a day falling and bucking, we were doing our own bucking each two fellows, we figured if we could fall forty to forty five thousand and buck it a day and we were making good wages (Jubb 1967).

Carr stated that the mainline and spurs were built from 60 pound rail, some of which was salvaged from the earlier Porter-Carsters operation. There were two geared, oil-fired locomotives working Ladee Flat hauling logs to the incline, a 60-ton two-truck Shay and a 63-ton Heisler. Eight donkeys were used to yard and load logs. Other equipment included a locomotive crane, two steam shovels, two railroad flat cars, a railcar modified for moving steam donkeys, one oil tank car, and two gasoline powered speeders (1991). Portland Railway, Light & Power Company supplied Ladee Logging Company with disconnect trucks and extra flat cars. Camp 1 had a small commissary and a generator that supplied lights and electricity to the camp.

Camp 2

Camp 2 was built approximately six miles east of Camp 1 in 1927. Economic reality dictated that it was cheaper to build a new camp than to move 150 workers six miles each way to work and back. Pole Camp was located between Camps 1 and 2 near Cold Springs. Local loggers Johnston and Davis subcontracted to Ladee Logging to remove pole-sized cedar in advance of the logging operations (Carr 1991). By the spring of 1928, Ladee was shipping at least 30 log cars a day, the majority going to the Dwyer mill in southeast Portland.

The tremendous amount of slash and logging debris generated from the logging operation was not treated, but left lying in the woods, creating an enormous fire hazard. In some places the slash was 10 ft. deep, a condition which concerned Clarence Vanderjack, Ladee Logging Company’s logging superintendent. The Forest Service also recognized a potential problem when District Ranger Armstrong and assistant Thomas Carter visited the operation in the spring of 1928. Carr reported that as a precaution, cigarettes were no longer sold at the store at Camp 1 and loggers were

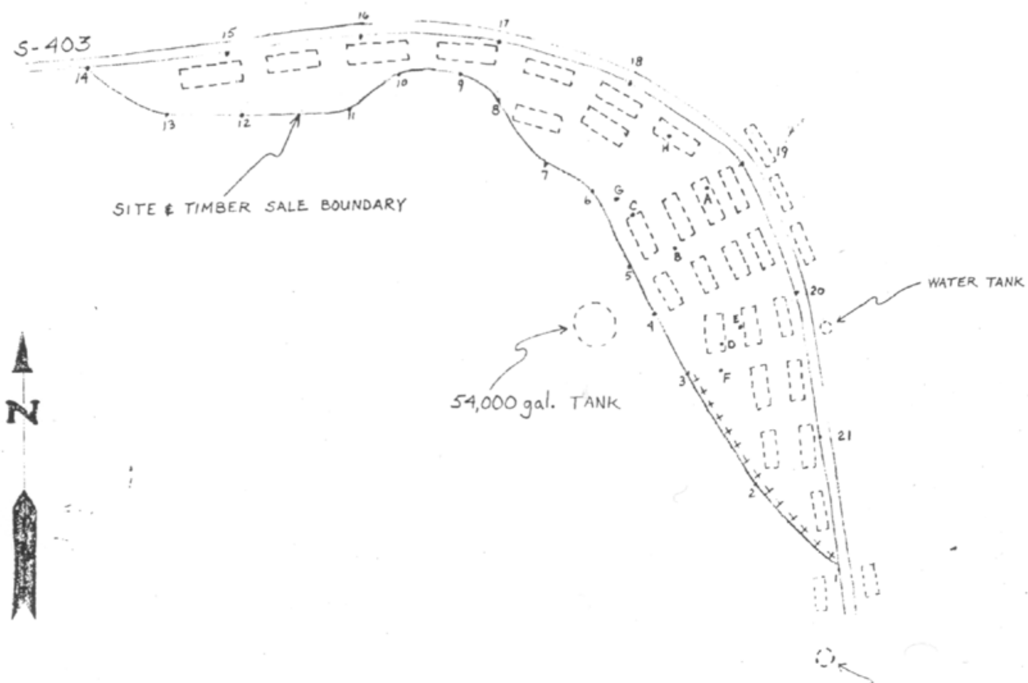


Figure 6.12 Ladee Logging Company's Camp 2 built in 1927 (Lawson and Carr 1981).

prohibited from smoking in the woods. Fire watchmen were hired and each camp had a campfire warden to monitor warming fires and other open flames. Water hoses were laid around the yarding and loading operations to further safeguard against a forest fire (Carr 1991).

Thanksgiving fireworks

Thanksgiving Day, November 29, 1928 was a memorable day for Camp 2 resident Clarence Jubb. He recalled that:

> we had a rather open fall and we were logging right up until after Thanksgiving. There was a guy that got chilblains on his feet and somebody told him that if he'd wash his feet in kerosene that it would cure the chilblains. So we were sitting around the camp and it was dark and he decided that he would get a can and get a can of kerosene. So he got a five gallon can and he went down to the oil house.

> And they just brought in two flat car loads of gas drums full of gas for the gas donkeys and they had spotted them there near the oil house. So he went down to the oil house to get his can of gasoline, or his can of kerosene, and he didn't have a flashlight, no light around there, so he found a piece of newspaper and he rolled it up and made hisself a torch and went in there and instead of turning on the gas, or on the kerosene, he turned on the barrel of gasoline and away she went. We were all laying in the bunkhouses and the first thing we knew everybody began to holler and we took off and run outside to see what was going on and the whole camp was afire and them old gas drums would get hot and the bottoms would blow off and they would just shoot up into the air like sky rockets and sprayed fire all over the camp and burned the camp up and everything but the kitchen and the office building but all of the bunkhouses burned and all of our clothes and stuff burned up that we had up there (Jubb 1967).

Carr reported that no one was killed in the fire, and Camp 2 was quickly rebuilt with lumber sent up from the sawmill near Camp 1. The camp was expanded to make room for the expected increase in laborers that was projected for 1929 (*The Timberman* December 1928).

1929 Ladee Flat fire

By the summer of 1929, Ladee had three sides in operation and almost 300 men working in the woods. It had been a dry summer and the mountains of slash on Ladee Flat were cooked from the summer sun. A spark from a brake shoe on one of the locomotives started a fire about noon on September11 one mile southeast of Camp 2. Clarence Jubb recalled that:

> we had been working a hoot owl shift and we were just coming in from work when we got the call that they had a fire up at side 2. So we never stopped for dinner or anything, the filer had our tools loaded and they just shoved us right on up to the fire. When we got there we found the fire was between the two railroad tracks. One had been the old side two track and the other was the new side two track and there was a three cornered piece of ground in there that was afire - I'd say about three acres when we got to it. And we started in falling snags and they had a pump in the creek there and they had two tank cars shoved in there. They were oil tanks that they were using for fire protection and they were full of water.

> They had that shoved in there and they had the locomotive was pumping water with their steam pumps and then they had gas pumps in the creek that was also pumping water. And we had the snags pretty well down, we only had one or two left and we saw smoke over on the side one track, and they had a crew out there cutting national timber, National Forest timber. They had a forester out there with them, supervising the cutting. He stayed right out on the job there all the time. So when they were coming in and he saw this smoke, he got excited and instead of coming around to investigate, he stopped the train and got his crew off and started a backfire along the side one track. I can' remember what the chap's name was but when we looked up and seen the smoke over there all coming up for about a half mile along the side one tracks why naturally we wondered what in the dickens had happened over there. So they jerked everybody off the fire that we were working on and we ran over there to try to stop that and we found this crew and started in falling snags and we worked there the rest of the day and all night. We had just got into camp in the morning and had a cup of coffee and some breakfast when we got word that the fire had crossed, that we had left up on the side 2 track, had crossed and was going down toward Boyer Creek. So they shoved us right back up on Boyer Creek and we started to put in a fire trail and we had about half a mile or so of trail built when the east winds come up and then everybody was lucky to get out (Jubb 1967).

Three yarding donkeys had burned on the first day of the fire. Superintendent Vanderjack had been caught in the fire and had the hair burned from his head. As Jubb recalled, by Friday the 13th, the fire was completely out of control and had expanded from 1,000 acres to 3,000 acres. East winds pushed the fire towards Estacada and away from Camp 2, where the loggers had been engaged in the battle of their lives to keep the camp from being burned, and the 35 people, including three women and two children, from being killed in the flames. Jubb remembered that:

> While we were in the camp working there, trying to save the camp, why the deer and stuff was running right into camp right among us. We were out there with buckets and everything that would put out a spark trying to keep that camp from burning, because we figured that if that camped burned, why we were just sunk, we couldn't get out and we didn't have anyplace to run (Jubb 1967).

The fire burned through a trestle on the mainline and cut off Camp 2 from the world. The fire continued to rage and grow in size, and crossed the North Fork River and burned through the Garfield area. A Forest Service work camp was destroyed, as well as the construction equipment for the first truck road on the Estacada Ranger District that was being built along the ridges to the north of Ladee Flat.

Carr reported that 20,000 acres of land burned, while Jubb claimed that the total was more like 30,000 to 40,000 acres. No matter the size of the fire, 10 farms had been destroyed, along with numerous barns, the Log LaBarre Hotel, the Garfield schoolhouse and miles of railroad track and logging equipment on Ladee Flat. Jubb reported that the fire burned so hot in places that the rail had curled like bacon. He also stated that Camp 1 was not burned in the fire, but Carr reported that the only thing left standing in Camp 1 was the bathhouse. (1991).

Clarence recalled working on the fire mop-up crew on Ladee Flat. Ranger Armstrong was in charge of the clean-up activities and

> he put me to working with a bunch of winos that he had brought in from Burnside Street. And I had those boys for several days, mopping up and putting out fires and digging fire trail, and what have ya. When the job was finished and he paid me off why I got paid off at about 3 or 3 ½ a day, I don't remember just what the wages were, it wasn't very much. But the timber fallers that I worked with, and my partner, and everybody that got to work they got to fall snags and they paid by the foot, I think it was 8 cents a square foot for falling snags. They were making 25 to 30 dollars a day and I was out there working for 3 ½. When the job was finished why Mr. Armstrong said well, he was sorry but maybe something would happen some day he could repay me (Jubb 1967).

Before all the smokes had been put out, crews were back at work rebuilding the trestle and track that had burned in the fire. *The Timberman* reported that Ladee Logging was shipping logs down the incline by October 10 and that “several million feet of decked logs, several donkeys, five bridges and trestles, one camp and the ties from several miles of railroad had burned” (October 1929:202). Although most of the forest land on Ladee Flat had burned, the severity of the fire differed across the landscape. The fire burned hot in some areas and skipped others, leaving pockets of unburned merchantable timber amidst the devastation.

Logging continued into 1930. The U.S. decadal census of 1930 recorded the specifics of over 100 residents of Camp 1 and Camp 2, one of the few instances where the demographics of a logging camp are known. A thorough discussion of this very important document can be found in Chapter 8.

Union Lumber Company received a one-two knockout punch the fall of 1929. Before the ashes had cooled, the bottom had fallen out of the stock market, signaling an end to the highball logging era that occurred during the first three decades of the 20th century. On top of this problem were the lawsuits from the fire on Ladee Flat. Jubb reported that during the winter of 1930, the loggers spent a great deal of time hanging around the courthouse in Portland waiting to testify in court. Jubb claimed that it was an inexperienced Forest Service employee who had started an unnecessary back fire that was the cause of the bigger blaze that had destroyed so much timber and property. The Forest Service did not accept responsibility, and eventually the Union Lumber Company was forced to cede their 4,500 acres of cut and burned over land to the Mt. Hood National Forest in payment for the federal timber that had been lost in the fire. The farmers in Garfield and the owner of Log LaBarre hotel received nothing for their losses.

By early fall, Ladee Logging Company had cut all the merchantable timber still standing on Ladee Flat and began the process of dismantling the operation. The company had purchased several million board feet of timber on the Kerry Line and the steam donkeys, locomotives, and other assorted equipment was lowered down the incline and moved to the new camp in the Coast Range. Crews salvaged over 30 miles of rail for reuse and whatever else that might be of value at the new camp. Finally the lowering donkey crept over the edge and down the incline, and the railroad logging era on Ladee Flat was over. Carr reported that the rails on the incline were pulled and the timbers on the trestle that crossed the North Fork were cut, causing the trestle to collapse into the river (1991). In November 1931, the Union Lumber Company closed the doors on its Portland office and withdrew from the lumber business in Oregon (*The Timberman,* December 1931:130).

End of an era

The supply of logs from the Ladee operation was sorely missed by Portland mills. Dwyer Lumber Company began to cut timber under the name of Clackamas Logging Company in 1931 to supply their sawmill in southeast Portland (Hurd 2004:85). Although Dwyer was shipping quantities of logs from their holdings in Clackamas County on the interurban line, it was not enough to keep the railway financially solvent. Seven hundred automobiles were licensed in Oregon in 1908; by 1930 there a quarter million cars providing stiff competition to the interurban lines (Mills 1945:122). Buses had attracted riders because of their novelty, and gasoline freight trucks were taking the lucrative light freight business away from the trains. Passenger service was eliminated between Boring and Cazadero on November 26, 1932 and beyond Gresham in 1934 (Mills 1945:130).

Silence settled over Ladee Flat. Many of the structures were still standing as the forest started to reclaim Camp 1 and Camp 2. Dead burned snags covered the plateau and only a few Douglas-fir remained as seed trees for the next generation of forest that would cover the landscape. The Civilian Conservation Corp (CCC) built a truck road up to Ladee Flat in 1934, cutting through the middle of the steepest part of the incline. Once on top of the ridge, the workers intercepted the mainline about 2,000 feet east of its terminus at the old incline grade, leaving the section of the mainline through Camp 1 undisturbed. The CCC workers graded the easterly trending mainline roadbed flat and graveled it, creating one of the first all-weather roads on the Mt. Hood National Forest (Lawson and Carr 1992:2). The CCC workers also set to work falling the thousands of ghostly snags and replanting the cutover, burned landscape. They may have burned some of the structures at Camp 1 and Camp 2. The Daughters of the American Revolution contributed to the reforestation efforts in 1936, replanting several acres of burned-over land near Camp 2. Hurd (2004:97) reported that the Portland Railway, Light & Power Company pulled up the tracks that ran from Estacada up the Clackamas River to the deep woods hydroelectric projects in 1937, and the Forest Service soon converted the roadbed for truck and automobile use.

In September 1939, another fire on Ladee Flat reburned much of the area damaged by the 1929 fire. Aerial photos show that the Boyer Creek Fire started to the east near Camp 2, and spread in a westerly direction towards Camp 1. Lawson and Carr (1992:2) reported that what remained of Camp 2 after Ladee Logging pulled out was destroyed by the fire, but did not comment on the fate of Camp 1.

Demand for lumber products during World War II sparked interest in resurrecting the interurban line to Cazadero. Crews were dispatched to cut out the tree saplings that had taken over the grade between Boring and Estacada. The idea fizzled in light of financial difficulties, and the plan was scrapped (Mills 1945:133).

Dwyer Lumber Company remained financially solvent during the Depression but suffered a catastrophe of another kind. In May of 1939 the Dwyer operation was responsible for the second of the Tillamook Burns. Miraculously the wind changed just before their camp burned, but all of their timber was lost to the flames. They packed up what equipment remained and moved the operation back to Clackamas County (Hurd 2004: 97). The US Forest Service opened the upper Clackamas River watershed to logging in 1942, and built a truck road over the top of the old railroad grade to the hydroelectric projects at Three Lynx and Timothy Lake. Dwyer purchased the first timber sale in the upper Clackamas River watershed that same year, and built a camp at Fish Creek to provide a base of operations to log the large volume sale.

The Dwyer family became interested in flying at the close of World War II. They enjoyed the excitement, as well as the convenience, when visiting their remote logging operations in the Cascade Mountains. Hurd reported that the Dwyer's built an airstrip next to their mill in southeast Portland in the fall of 1945. While flying to their camp at Fish Creek, the abandoned mainline at Ladee Flat caught their attention. In 1946, with the blessings of the Forest Service, the Dwyer's built an airstrip over the top of Camp 1 and the mainline that ran through it. The landing strip was 2,300 feet long and was grubbed for an intermediate landing. The dirt runway was designated as an emergency landing field by the U.S. Forest Service (Hurd 2004:114).

The Dwyers also built a 2400-foot long airstrip above their camp on Fish Creek. It was hard packed and covered with gravel. The airstrips were open to the public and used by the Forest Service to provide faster access for fire fighting activities (Hurd 2004:172). Hurd reported an incident on Ladee Flat where a pilot tried to land his aircraft, only to get tangled up in 28-inch high weeds that were growing on the airstrip. The plane tipped over and the pilot had to be transported to the hospital in an ambulance with a broken leg. Unaware of what had happened, another pilot attempted to land and also got caught in the brush, tipped over and ran into the first plane. This pilot was also injured. The crashes drew a crowd of onlookers, including logging crews driving by in their crummies (Hurd 2004: 170).

Camp 1 today

The airstrip was minimally maintained until the late 1960s when the U.S. Forest Service instituted industrial logging in the upper Clackamas watershed. Hundreds of miles of all-weather roads were constructed throughout the Mt. Hood National Forest, eliminating the need for emergency landing strips as part of the forest's fire suppression infrastructure. The old airstrip is still relatively open, but the forest continues to encroach on the grade (Figure 6.13). The area attracts people engaged in a wide-range of recreational pursuits, some quite incompatible with archaeological site protection. Recently, people shooting each other with balls of paint have found the trenches built by the Forest Service to keep ATV's off of the mainline/airstrip to be particularly effective hiding locations. Many archaeological materials were buried when the airstrip was built, and are presently eroding out of the sidewalls at an alarming rate. The next chapters of this thesis are devoted to documenting the current conditions of the camp and to provide a baseline dataset for future researchers.

Figure 6.13: View of Camp 1 and mainline from FS Road 4610 in 2006.

CHAPTER 7: FIELD ARCHAEOLOGY

Winter is one of the better seasons to survey for archaeological materials in western Oregon, although no time of year is optimal due to challenges presented by Pacific Northwest vegetation. Salal, mosses, and sword fern effectively obscure the area 3 ft. above the ground surface, limiting visibility to less than 5% (Kramer et al. 1997:1). Archaeologists working in western Oregon forests have developed several strategies to deal with the challenges presented by the environmental conditions. One technique is to scrape the duff and examine the mineral soil for cultural materials at specified intervals along transect lines that have been located in high probability areas (Kramer et al. 1997:8). The survey areas are defined based on topography, characteristics of known site locations, and personal experience. Many times, a post-disturbance resurvey of the same pre-disturbance area reveals archaeological sites that were overlooked in the original survey (Kramer et al. 1997:8).

It was not possible to use a GPS unit exclusively to lay out the survey grid and assign a UTM coordinate to the archaeological materials and trees that were sampled at Camp 1. GPS units are widely used to collect spatial data in forested environments, but their usefulness is affected by several variables including canopy cover, type of GPS receiver that is used, satellite signal availability, time of day, and topography (Kiser et al. 2005:138). Camp 1 is heavily forested and located on the edge of an extremely steep canyon, which interfered with satellite signal availability. Oregon State University forest engineering professor Jim Kiser looked at the cost effectiveness versus efficiency of three techniques used to determine land area in a study comparing digital and traditional measurement technologies (Kiser et al. 2005:239). The baseline was established with a total station survey grade GPS unit. The forest mensuration methods included the traditional string box, compass, and clinometer technique; the second method used an electronic distance and bearing-measurement instrument; and third a hand-held GPS unit. Kiser found that a compass and string box or tape compared favorably with the $40,000 total station unit for precision and accuracy of measurements in a forested environment (Kiser et al. 2005:142).

The core survey crew consisted of my husband, Larry Weaver, and our two dogs Rufus and Ditto, and me. My brother Bruce Paullin, his wife Sharon White, and their dog Iris assisted us several times, taking pictures, coring trees, and helping out with the grid layout. We began to lay out the survey grid at Camp 1 on February 11, 2006. The site datum was established at the centerline of the excavation for the incline. The datum was flagged and a UTM coordinate obtained using a Magellan hand-held GPS unit. We worked on the site March 4, 17, 25, April 1, 9, 16, 22, 29, May 24, and July 18, 2006.

Incline

Although falling trees and erosion have altered the original incline grade, the head of the incline is quite evident (Figure 7.4). The excavation is 26 ft. wide and 15 ft. deep at the top of the slope (see figure 7.5).

Figure 7.1: Boring to the core-Bruce Paullin demonstrates his technique.

Figure 7.2: The author extracting a tree core from the increment borer.

Figure 7.3: Sharon White and Larry Weaver standing near RP#2.

Figure 7:4: Head of the incline in April 2006.

A Douglas-fir tree growing on the slopes of the cutbank was cored and its annual growth rings counted to date the 52-year-old tree. The 500 ft. segment of the incline between Camp 1 and Forest Service Road 4610 descends the hill on a 65% grade. Cinnabar mining activities in the 1940s created a bowl in the hillside destroying the last 200 ft. of the incline just before the grade crossed FS Road 4610 heading down the slope towards the North Fork River. A collapsed structure is located just west of where the truck road was excavated through the incline by the Civilian Conservation Corp (CCC); Merle Siedel, archaeological technician for the Estacada Ranger District, claimed that it was a water shack for the incline (2003 pers. comm.). East of the shack, along the southern side of FS Road 4610, is a stone retaining wall structure built to shore up the hillside where the road cut through the incline grade. The stonework was probably built by the CCC crews who constructed the truck road to Ladee Flat in 1934.

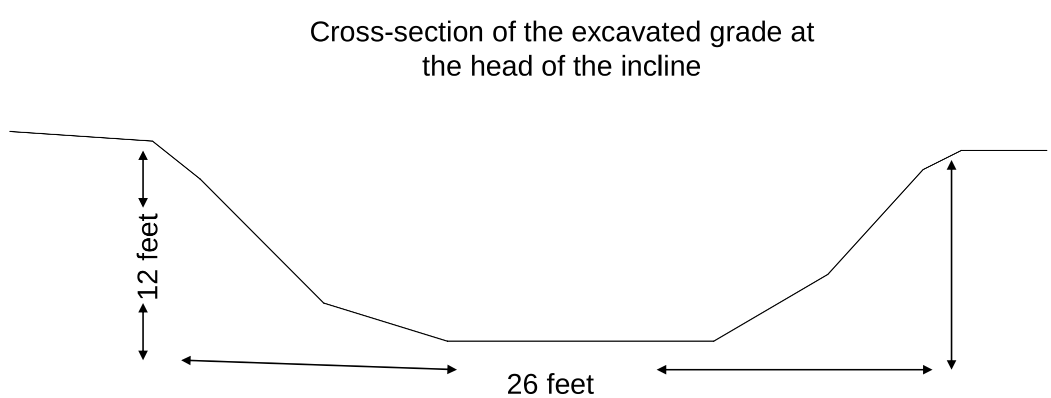


Figure 7.5: Cross-section of the head of the incline.

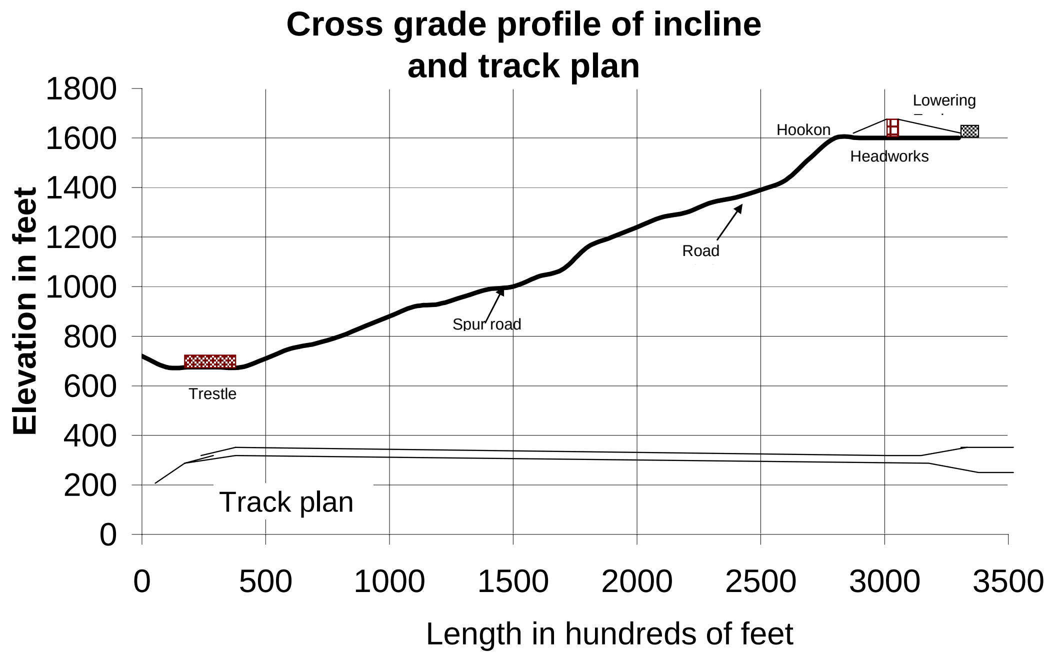


Figure 7.6: Cross-section and track plan of the Porter-Carstens incline.

It was decided that a low-tech forest survey approach to document the historic resources located at Camp 1, as well as obtain the necessary tree-ring data and geographic coordinates, would be adequate to address the research questions designed to guide this project. There was a heavy reliance on a hand-held compass, a diameter tape (D- tape), and a 75 ft. Spencer loggers tape. Trees were measured for their diameter at breast height along the transect lines and the archaeological resources mapped. I made the decision to sample trees and document cultural materials beginning with row 2, which was 200 ft. southwest of the head of the incline. Trees were assigned an identifying number based on the row and position

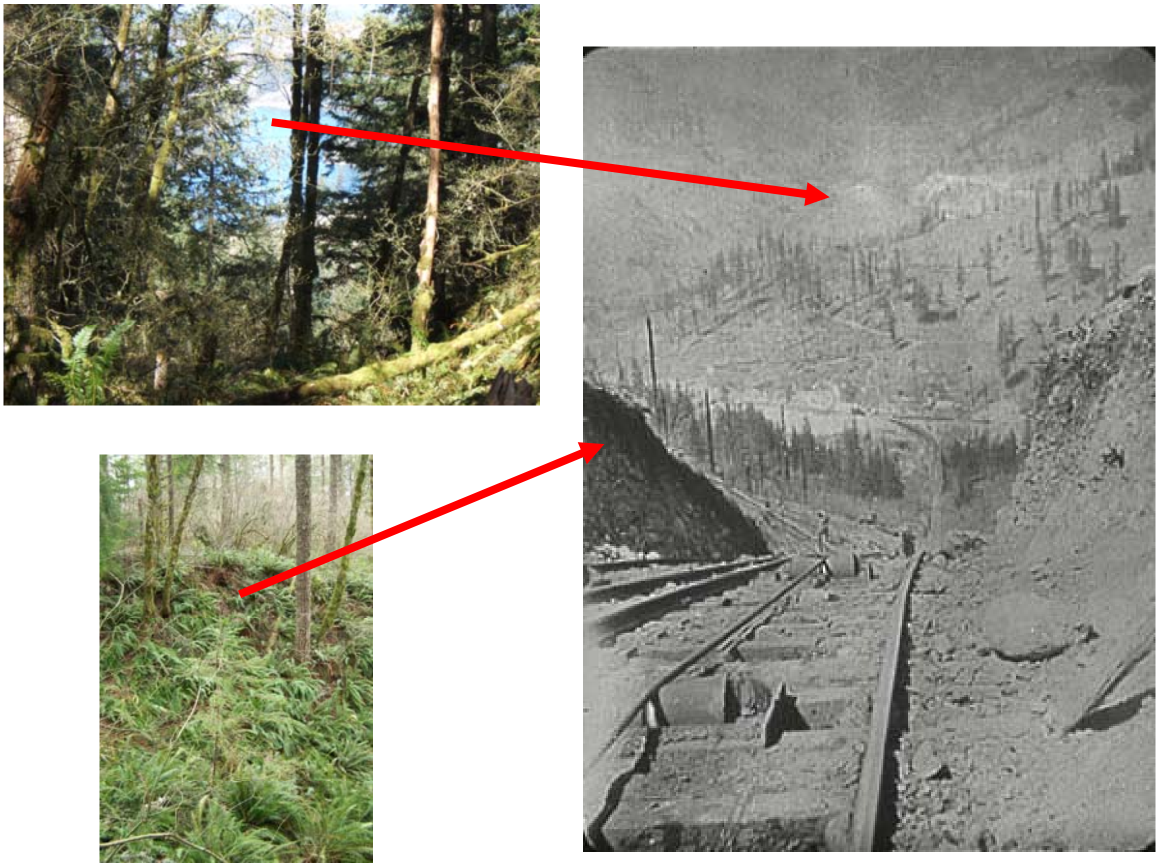


Figure 7.7: The incline in 2006 and 1923 (Penn State University).

on the line. Tree R4T2 was located in row 2 and was the second tree along the transect line. The cores from the sample trees were placed into paper storage tubes; each tree's identifier number was written on the outside of the paper sheathe with a permanent marker. The storage sheaves were placed into a plastic tool box to protect them from being damaged as they were carried from tree to tree. The majority of tree cores were not counted in the field in order to reduce dating errors.

A hand held magnifying glass and a good light source back at the lab were useful tools for accurately counting the annual growth rings.

Row 2 - 552 ft. long – 26 trees measured – 16 trees cored

Row 2 would have intersected the mainline near where the headworks were located, as well as the siding spur that paralleled the camp to the south. RP#2, the secondary datum for row 2, was located in a grassy opening just south of an earthen berm, in the roadbed of the siding. I suspect that soil compaction and industrial wastes have inhibited the establishment of Douglas-fir and other woody vegetation in this area. Various tracks and switches associated with the operation of the incline would have been located here, and this area would have experienced the most concentrated industrial use of the site.

A steel rail block was found at the base of a Douglas-fir tree 110 ft. to the south of the incline. Descending loaded log cars and ascending tank cars and empty disconnect log trucks would have been switched around on a wye that connected to the empty and load tracks that were located in the vicinity. Nearby, hidden in the moss, was a large fragment of a pressed clear glass and a white milk glass jar. Another earthern berm made up of duffy rotten logs was found 25 ft. south of the siding berm near RP#2. Although no evidence was obtained from a visual examination of the feature to support this claim, it is possible that the rotten logs are remnants of the headworks pushed out of the way when the airstrip was constructed in 1946. The trees in the roadbed at this location regenerated soon after the airstrip was built.

Some of the oldest trees in Camp 1 were found 75-140 ft. south of the siding grade (R2T4, T5, and T7). These trees established soon after the camp was abandoned between 1933 and 1937. Industrial artifacts were discovered during the northern segment of the row 2 transect as it crossed a large clearing where a great deal of activity would have occurred from 1923-1931. A pile of broken asbestos bricks was located 160 ft. northeast of the head of the incline, along the edge of a railroad grade (probably a branch of the wye configuration) to the north of the transect line. A 12 X 8 X 2 in. thick steel plate from a piece of equipment was found in the mainline (Figure 7.4). The trees in this 200 ft. segment originated after maintenance activities on the airstrip had ceased in the 1970s. The series of trees in the next 150 ft. segment originated soon after the airstrip was constructed, while the last tree in the row established shortly after the camp was abandoned. No cultural materials were observed along this portion of the survey line.

Figure 7.8: Steel plate found in the middle of the mainline.

Row 4 – 770 ft. long – 26 trees measured – 18 trees cored

Row 4 was established 400 ft. from the head of the incline at an azimuth of 310º. R4T1, 37 ft. south of RP#4, was too large to core – the diameter at breast height (DBH) was 41.5 inches - so a nearby tree was substituted (R4T1A). The bottom of an oil can was found near a galvanized wash bucket at the base of the mound R4T1 was growing upon. This feature appears to be made of organic material such as a sawdust pile of some kind that provided the tree with ample nutrients. A fire brick was located on top of the mound next to the bole of the tree. The substitute tree was growing next to what appeared to be a rotting donkey sled strewn about an excavated area 50 ft. in diameter and 2 ft. deep (Figure 7.9). 1¼-inch cable was buried under portions of the sled and in the duff surrounding the rotting logs, and 1 in. cable was intermingled with the logs and the larger wire rope. Approximately 100 ft. south of RP#4 was another tree too large to reach the center when it was cored, with a DBH of 37.3 in. The tree was at least 61 years old. Burned springboard cut stumps and rotten snags that had been purposefully cut littered the forest floor 238 ft. south of RP#4. The cliffs above the Clackamas River were 300 ft. south of RP#4. Trees in this area were not affected by airstrip construction and regenerated in the early 1940s.

The northern portion of the row 4 transect line immediately crossed a 3 ft. deep excavated grade that was approximately 22 ft. wide. This was the siding that ran to the south of the camp. The trees in the next 200 ft. regenerated after

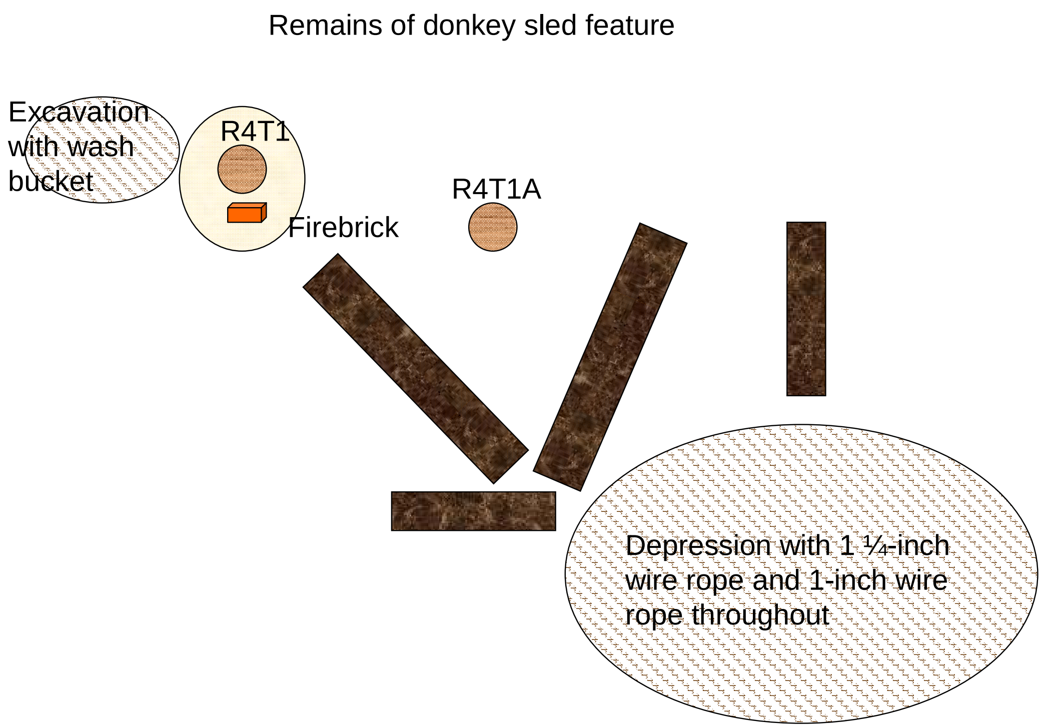


Figure 7.9: Sketch of donkey sled feature (not to scale and not orientated to north).

maintenance activities on the strip ceased in the late 1950s. A segment of the wye recorded in row 2 was encountered on the transect line in row 4, approximately 300 ft. north of RP#4. Large burnt springboard cut stumps were observed 430 ft.north of RP#4.

Row 6 – 711 ft. long – 30 trees measured – 25 trees cored

Tree stocking was very light on the southern portion of the transect line; RP#6 was located in a vine-maple patch that was over 20 ft. high and was almost 150 ft. wide. Large springboard cut stumps were encountered 150 ft. south of RP#6.

One of the oldest trees sampled at Camp 1, R6T6, was located 200 ft. south of RP#6. A few old-growth trees survived the fires and logging that occurred on Ladee Flat. One of these behemoths was located at the southern terminus of row 6 on the edge of the Clackamas River canyon. The tree had a 59.6 in. diameter breast height (DBH) with deep scars on the upward side of the tree; apparently it had been used to hang rigging from during the salvage logging that went on after the 1929 and 1939 forest fires. A 63.9 in. DBH snag was located adjacent to the live Douglas-fir. These trees can be seen on the 1938 aerial photograph of Camp 1.

Immediately to the north of RP#6 was a twisted pile of metal. Upon further examination, a blunt end dinner knife, a grate, and a slotted ladle were found in what appeared to be the rusting remnants of a stove or preparation table (Figure 7.9). Trees growing in this area regenerated after maintenance activities had been curtailed on the airstrip sometime in the late 1950s and early 1960s, and this debris pile may have originated when the cookhouse was pushed over and out of the way of the airstrip. The excavated 22 ft. wide siding grade was located 50 ft. north of RP#6. The transect line crossed a portion of the mainline that appears to have been an area of the airstrip where more intensive brush management practices have taken place over the years. Vegetation clearing related to the landing strip took place over an area 200 ft. wide in this area of the camp.

Another berm was encountered 250 ft. north of RP#6. Just north of the berm was a dump full of countless rusting gallon sanitary cans of an unknown depth,

Figure 7.10: Grate, slotted spoon, blunt end knife.

broken white restaurant ware, and an assortment of broken bottles. The dump measured 71 ft. long and up to 35 ft. wide in some locations. A large pit was located in the western portion of the dump, but it was unclear whether this was a looters hole or served another function. The dump was not investigated in detail. A cursory surface examination took place to find bottles or ceramics that could be used to establish a date for the feature. An intensive investigation was beyond the scope of this project and walking in the dump damaged the delicate cans. A tree growing just north of the dump was too large to reach the center when it was cored, but it was at least 60 years old. Large, burned old-growth stumps were situated to the west, east and northeast of the transect line approximately 150 ft. north of the dump and 405 ft. north of RP#6.

Figure 7.11: The dump.

Row 8 – 642 ft. long – 20 trees measured – 11 trees cored

The excavated siding grade continued in a southeasterly direction, while the line of secondary datums at the 310º azimuth had traveled well south of the probable boundaries of Camp 1. RP#8 was 83 ft. south of the excavated siding grade, the trees in the area became younger the further north the transect line ran. This age-class of trees represented brush clearing activities on the landing strip in the 1960s. North of the excavated siding grade 200 ft. was the debris pile that was originally encountered during the preliminary surveys in 2004 (Figure 7.11). Four triangular files, the metal frames of at least three

Figure 7.12: The debris pile with files, melted glass, iron water pipe and unidentified metal object.

beds, a water pipe, and a broken piece of gear wheel were artifacts observed on the surface of the pile. Nearby was a smashed lunch bucket. The tree growing adjacent to the pile was cored and found to be 67 year old; this tree began to grow in 1936. This indicates that the debris pile was created after the camp was abandoned, but before the 1939 disturbance and the construction of the Dwyer airstrip. Housing structures were probably located in this area of the camp, so the debris pile may represent the remains of one of those buildings. 385 ft. north of RP#8 was an excavated hole of an undetermined origin; springboard cut stumps were found 50 ft. to the north. The vine maple thicket growing south of RP#8 made surveying dangerous, if not impossible. South of RP#8 at a distance of 33 ft., was a large depression 6-ft. deep by 10-ft. in diameter, possibly a latrine, dump, or cellar. Only two trees were sampled south of RP#8, the vine maple thicket was just too miserable to survey through.

Row 10 – 577 ft. long – 17 trees measured – 13 trees cored

Row 10 was the last row to be surveyed, and only the northern portion was mapped and inventoried because of the vine maple issue. The original azimuth of 310º did not accurately follow the siding grade, and led farther south than planned. This error in trajectory placed RP#10 well to the south of the probable site boundaries of Camp 1, approximately 150 ft. south of the siding grade. At a distance of 240 ft. north of the excavated siding grade, on the northern side of the original mainline, was a leveled pad where a large structure was probably located. The pad was 65 ft. long and at least 20 ft. wide, airstrip construction obliterated the southern boundary of the feature. Trees in this area regenerated in the early 1960s and this section of the survey transect would have been subjected to the same intensity of brush management activities that occurred along length of the landing strip as row 8 had experienced. Thirty ft. to the north of the site was another berm that appeared to be a continuation of the linear feature observed in row 8 and row 6. Concrete remnants were scattered in the moss 300-ft. north of the excavated siding \

Figure 7.13: Camp 1 and the mainline in 2006 (top photo) and 1923 (bottom photo).

grade. Several of the trees at the end of row 10 regenerated after the camp was abandoned between 1937 and 1939.

The trench

As archaeologists have discovered, sometimes it takes a ground disturbance to gain access to the buried archaeological record. In an attempt to control off-road vehicle use down the old landing strip and mainline on Ladee Flat, a series of 5 ft. deep and 4 ft. wide trenches were excavated throughout the eastern portion of Camp 1 by the US Forest Service several years ago (Figure 7.14). One of these trenches

Figure 7.14: The trench.

bisected the mainline 1,200 ft. southeast of the head of the incline and intersected another branch of the trench that paralleled the mainline for over 100 ft.. Cable was observed protruding out of the sidewalls of the northwest trending trench at depths of 2 ft. and more. Evidence of local basalts that may have been crushed and used in the railroad bed construction was also visible in the sidewall profile.

Vitrified soil, charcoal, burnt cut lumber and an incredible exposed soil profile revealed that an extremely hot fire had occurred here; a structure had obviously been burned and possibly other camp abandonment refuse as well (Figure 7.15).

Figure 7.15: Sidewall profile of trench showing evidence of a hot fire.

Protruding out the north wall was the largest splitting maul we have ever seen (Figure 7.16). The sidewalls of the trench were collapsing, revealing a wealth of subsurface archaeological features and artifacts. A leather boot heel, pieces of colored bottle glass, a portion of a restaurant ware mug, a piece of unmelted clear pressed glass, and a railroad spike were found eroding out of the western sidewall adjacent to the burn pile. Some type of large gear assembly is visible, but the sidewall erosion has not occurred to an extent that would allow identification of the artifact, which was obviously industrial in nature.

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Figure 7.16: Wood splitting maul eroding out of sidewall of trench.

Other features

The ground surface has been heavily modified by large earth-moving equipment in the 500 ft. unsurveyed section of Camp 1 between the trenches described above and the point where the mainline/landing strip intersects FS Road 4610. Although it is difficult to determine how the various mounds and depressions originated and what their intended purpose was, one feature is an obvious remnant of industrial activities at Camp 1. On the south side of the old mainline and east of the housing area is a 26 by 21-ft. excavation 2 ½ ft. deep. There is a large berm along the southern border of the feature that may have been the result of landing strip construction. Although its purpose is not known, a large water tank may have been located here. The 1938 photo portrays the shadow of a round structure with square buildings on both sides of it.

Field notes for this project have been formatted into tabular form and can be found in Appendix A. Figures 7.17 and 7.18 are maps that were generated from the data that was collected during the archaeological survey.

Road and ditch construction, as well as the construction of the airstrip in 1946, have taken their toll on the archaeological record at Camp 1. This does not mean that the site is void of information that could be used to gain an understanding of how the workers lived, how the space was organized, the corporate structure, and other areas of human behavior that archaeological methods can address. The following chapter is a discussion of the results of the archaeological field survey, and what the results of the dendrochronological study revealed.

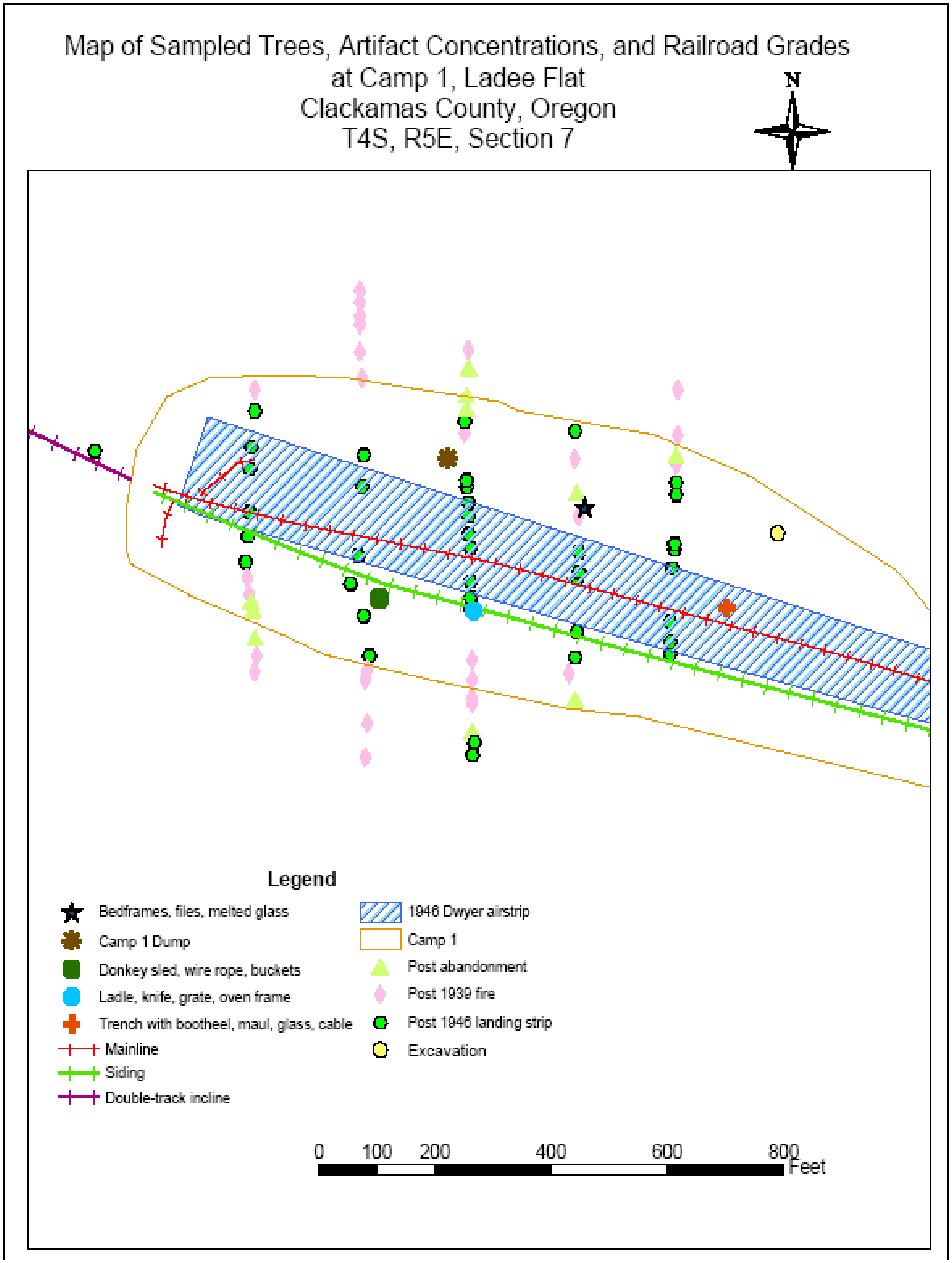


Figure 7.17: Map of sampled trees, artifact concentrations, and railroad grades.

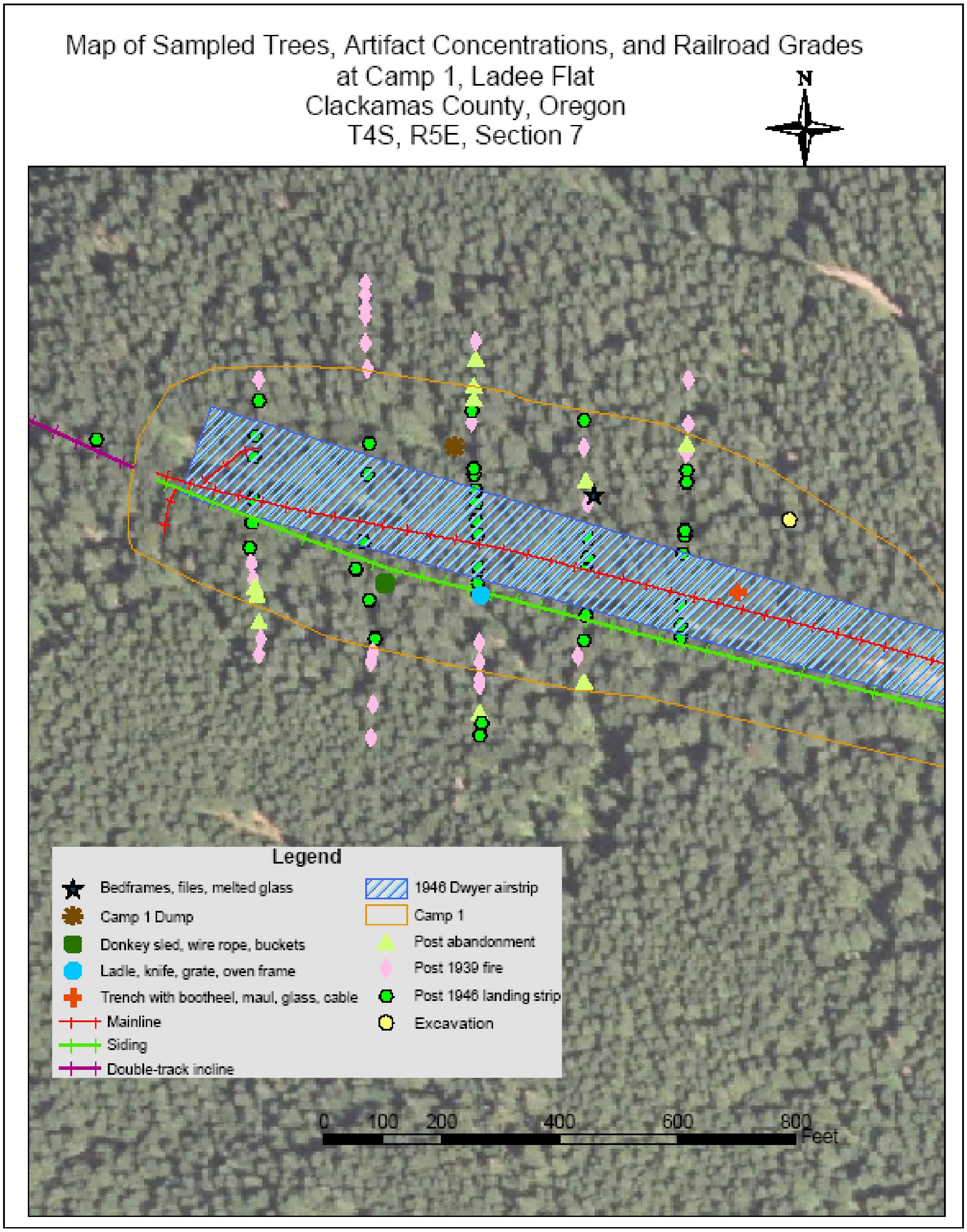


Figure 7.18: Orthophoto of Camp 1 with overlay of site datums, tree numbers, artifact concentrations and camp boundary.

CHAPTER 8: DISCUSSION AND CONCLUSION

A significant amount of archival, dendrochronological, and archeological data was collected for this project. The demographic information contained in the 1930 U.S. decadal census, combined with the recollections of Clarence Jubb, has provided an interesting glimpse of some of the people who lived at Camp 1. Archival materials, maps, and historic aerial photographs were the source of data from which a settlement pattern model was built to interpret the features, railroad grades, artifacts, and landscape disturbances that constitute the archeological record found at Camp 1. An analysis of the dendrochronological dataset obtained from Camp 1 clarified the oral testimonies and archaeological record, in addition to providing insights into the timing of disturbance events and the impact that industrial logging operations have had on the health and vigor of the regenerating timber stands.

1930 decadal census

It is not possible to know who lived at Camp 1 and Camp 2 prior to the 1929 fire and subsequent reduction in the workforce and logging operations. On April 28 and 29, 1930, 112 people living in a "logging camp" were enumerated in the census (Appendix D). The logging camp was located in Clackamas County, Garfield Precinct #37, on the Mt. Hood Reserve. The enumerator did not specify whether the people were living in Camp 1 or Camp 2, but an analysis of the raw data found on the census forms provides an insight into who was living where in late April 1930. Census workers organize their routes systematically; the first people encountered in the logging camp, and recorded on the census forms, would have been living at Camp 1 since that was the entrance point to the Ladee Flat area. The census was conducted on a Friday and a Saturday, so it is possible that many workers who lived at the camp during the week went home for the weekend. The camp superintendent, Clarence Vanderjack, was enumerated with his family in their home in Estacada. Clarence Jubb returned to his farm and family in the Dodge area every weekend as well, and was enumerated at his home in the Dodge Precinct. The 1930 census does not list everyone who was working on Ladee Flat, but it does capture a valuable dataset for researchers to analyze and ponder.

Occupants of Camp 1 and Camp 2

Bookkeeper John Ramage and his wife Stella lived in proximity to one of the cooks at Camp 1, Arthur Santmyer and his wife Ivy. Kitchen help was supplied by Addie Johnson, who was the wife of another cook, Lexus Johnson. Lexus was born in Minnesota; his parents were both born in Sweden. The third cook found at Camp 1 was Joe Pearce, a single man from Georgia, but it is possible his usual home and duty station was at Camp 2. Peggy Sears, a single 19-year-old woman born in Washington State to Finnish parents, worked as a waitress in the dining hall. Two brakemen were enumerated at Camp 1 which could indicate that one locomotive was switching at the head of the incline, and another engine was running loaded log trucks into Camp 1 from the woods. Brakeman Frank Campbell and his wife Daisy were both born in Michigan, as were their parents. Logger Arthur Bergland was enumerated at Camp 1, while his wife and children were counted at Camp 2. All seven of the children lived at Camp 2; they were too young to attend school and no mention is made in oral or archival records whether Ladee

Logging and Union Lumber Company made provisions for their education at the camp. Paul Runey, his wife, and three children called Camp 2 home for several years. Clarence Jubb worked with Runey and recalled that he was the head hooktender (Jubb 1967). A hooktender was the foreman of a yarding crew on a logging side (Labbe and Carranco 201:89).

Although they were not enumerated in the census, Clarence Jubb recalled several of the men he logged with. White Hope was mentioned as a high climber by Jubb, as was Jack Martin. According to Jubb, Roughhouse Dixon would challenge any newcomer to the camp to a fight:

> Roughhouse Dixon, he just lived right up to his name. His main aim in life was to whip any man that came into camp and if he couldn't whip 'em why he wanted them canned. He was one of the hooktenders, but he took some awful beatings (Jubb 1967).

Greek workers in western work camps

A Greek railroad construction, or section crew, probably living at Camp 1 was enumerated by the census taker. Many of these men were single and had been in the United States for over 20 years. There were many reasons that young Greek males immigrated in the early years of the 20th century. Doulis (1977:7) reported that there was a long-standing Greek tradition to provide a house dowry for the sisters in a family, including a parcel of land. Doulis explained that during the 1870s, French wine producers convinced Greek farmers to grow currants as a substitute for some grape varieties that had been destroyed by a virus. The Greek farmers mortgaged their farms in order to convert to currant production. Within a few years demand fell, and the farmers

were left with a worthless crop. Strong family bonds required that the young males in the family find work elsewhere and send home money to help out (Doulis 1977:8).

Papanikolas (1981:6) reported that many of the young men who immigrated to the United States were 19-years-old, the age they would have been conscripted into the Greek Army had they remained in their villages. This coincided with a period of rapid industrialization in America that required cheap labor to build the railroads, dams, mines and harvest the timber. Papanikolas (1981:7) claimed that industrialists sent recruiters to the rural areas of Greece looking for workers to import into the United States in order to fill labor shortages that were occurring in the western work camps.

The men lived in somewhat squalid, crowded conditions. Papanikolas (1979:189) explained that the men preferred to live and cook together to save money. Greeks were amongst the lowest paid workers and on many projects lived in “foreigners’ camps” while US citizens lived in the “white men’s camp”. Greek railroad crews were provided one car for eating, sleeping, and cooking, while American workers had a separate car for each activity (Papanikolas 1979:190). Greek workers were brought in as strike breakers during the labor struggles in the early part of the 20th century, creating deep resentment towards Greek workers by non-migrant laborers who struggled for better working conditions and higher wages (Saloutos 1980:85). Papanikolas (1979:215) summarized the Greek immigrant experience as a symbiotic relationship between the forces of industrialization, capitalism, and the workers. The wages the laborers received allowed many of the men to marry, to have families, and assimilate into American society.

Camp 1 and Camp 2 demographic statistics

- 112 people lived in the camps
- Seven children lived at Camp 2
- ten married women lived at the camps
- 85% of the camp population was male
- 55% of the work force was single
- 56% of the male workers were between 21-40 years of age
- 28% of the camp population was married, but their spouse did not necessarily live in the camp
- 8% of the work force was divorced
- 3% of the work force was widowed
- 12% of the camp population was Greek
- 6% of the camp population was Swedish
- 2% of the camp population was Canadian
- 5% of the camp population was from eastern European countries
- 19% of the camp population was first generation U.S. citizens
- 51% of the camp population was second generation or more U.S. citizens

A copy of the 1930 census for Ladee Flat is located in Appendix D.

Results of dendrochronological survey

A total of 118 trees were measured for their diameter at breast height (DBH) and assigned a UTM coordinate. Eighty-five trees were cored for age; annual growth rings were successfully counted on 82 trees. As discussed in Chapter 6, the sampling strategy was modified after it was discovered that many more trees were being measured than called for in the research design. Instead of boring every tree on the transect line, a decision was made to choose a representative individual from groups of trees that were located closer than 50 ft. together. Five trees were too large to sample because the increment borer was not long enough to reach the center of the tree, and the age could not be determined on four of the trees because internal rot made extracting an intact core impossible.

Camp 1 fire history

Another research objective was to reconstruct the fire history of Camp 1. Conflicting information existed about whether the 1929 and 1939 forest fires that devastated the Ladee Flat area actually burned through Camp 1. Clarence Jubb stated that Camp 1 did not burn in the 1929 fire, while *The Timberman* reported that a camp had been lost to the blaze, but did not specify which one (October 1929). According to *The Timberman* in the October 1929 issue, a bathhouse was the only structure left standing. There were three camps operating on Ladee Flat at the time of the fire, Camp 1, Camp 2, and the Pole Camp. There is no doubt that the Pole Camp burned in the 1929 fire, while Camp 2 was saved by the loggers who lived there, assuming Clarence Jubb was correct in his recollection of the event. If Camp 1 had burned during the fire, the incline system would have been disabled. The relatively immobile lowering donkey, switching engines and track would have been destroyed or damaged by the fire. It does not seem likely that salvage logging could have begun one month after the fire as *The Timberman* and Clarence Jubb claimed, if the camp had been totally destroyed in the forest fire.

The extent of the 1939 Boyer Creek fire was not well documented, although it appears to have been at least 5,000 acres in size. Camp 2 was destroyed for the second time during this fire event, the first time was the 1928 Thanksgiving Day gas house incident reported by Clarence Jubb and recounted in Chapter 6 of this thesis. It was unclear whether Camp 1 was impacted by the 1939 forest fire; it appeared from the later aerial photos that the Boyer Creek fire had burned to the east of the camp. Table 8.1 is a

Table 8.1: Fire history of Camp 1.

Fire Event	**Burned the area around and in Camp 1?**	**Source of documentation**
1868 fires	Unknown	1933 US Forest Service map
	Unknown	1934 Morris OHS article
1902 fire	Yes	Clarence Jubb 1967
	Yes	1914 historic vegetation map
1929 Ladee Flat fire	Partially destroyed	*The Timberman* Oct. 1929
	No	Clarence Jubb 1967
	Too close to call	1933 US Forest Service map
	At least partially destroyed	2006 dendrochronological and archaeological investigation of Camp 1
1939 Boyer Creek fire	Ambiguous	1945 aerial photo
	Ambiguous	US Forest Service maps
	Yes	2006 dendrochronological and archaeological investigation of Camp 1

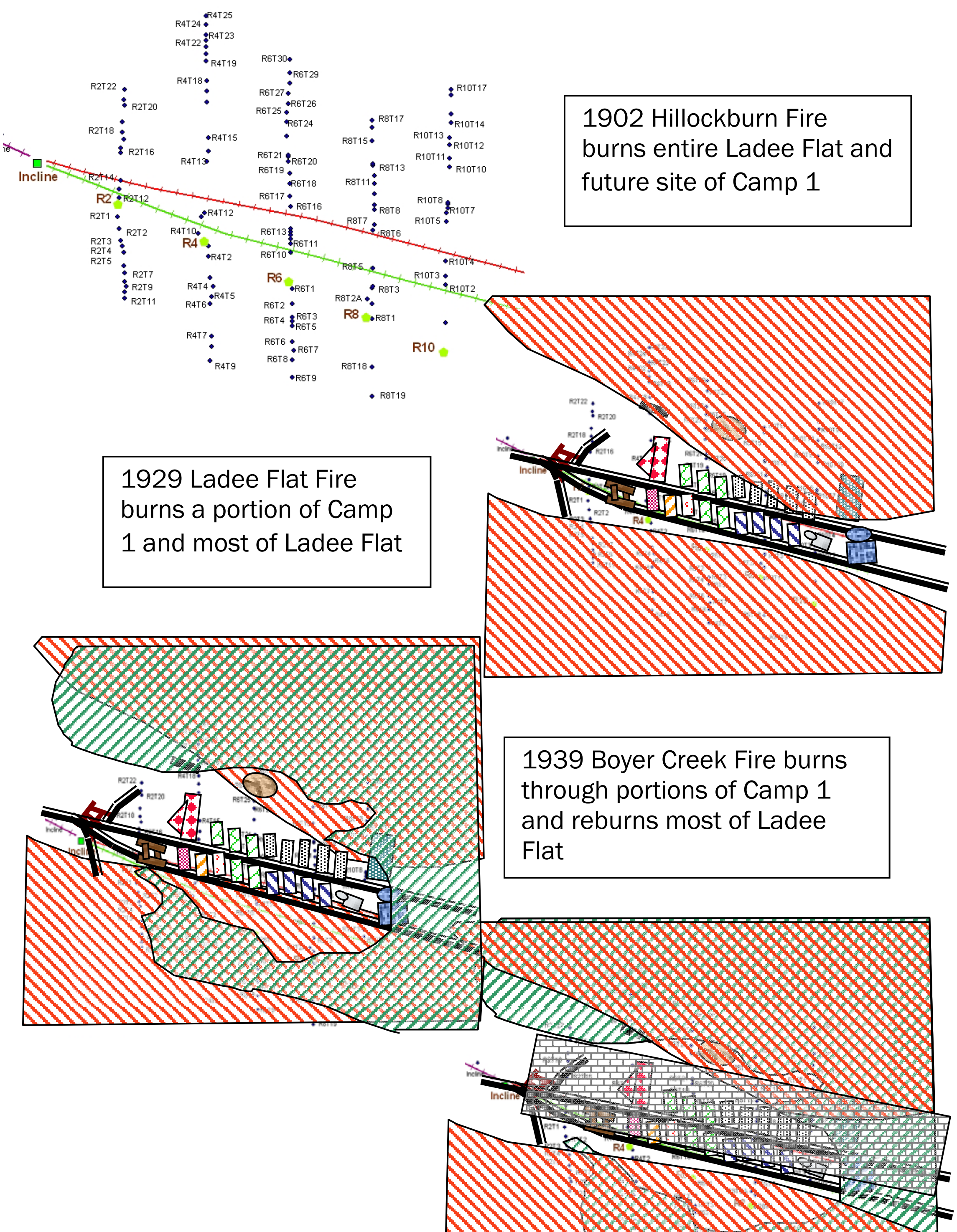
summary of the fire history of Camp 1. Figure 8.1 illustrates the four major disturbances that have impacted the site formation processes and archaeological record at Camp 1 based on the results of the dendrochronological survey. These include the 1902 Hillockburn Fire, the 1929 Ladee Flat Fire, the 1939 Boyer Creek, and the construction of the Dwyer landing strip in 1946.

Dendrochronology as a tool to establish site boundaries

One of the research objectives of this study was to investigate whether tree ages could be used to establish site boundaries in a forested environment, in addition to dating disturbance events that had influenced the current archaeological record found at Camp 1. Early on in the study, I realized that none of the trees that had been sampled predated the 1929 Ladee Flat fire, but several trees had regenerated after the camp was abandoned in late 1930. Although the oldest trees at Camp 1 were found near where I would eventually establish the site boundaries of Camp 1, the comparative older tree age dataset outside the camp boundaries that I had hoped to sample had apparently been burned in the 1929 fire.

Dendrochronological evidence has demonstrated that the area around Camp 1 burned in 1929. I believe that the debris pile found along the row 8 transect line may be the remains of a bunkhouse that was destroyed by the fire. The debris was pushed into a pile; the large basalt rocks in the tangled pile may be the foundation stones. A tree growing on the northern edge of the pile regenerated in 1936. It is possible that a Douglas-fir seed source was not available until 1935; Douglas-fir seed years are irregular in nature and most of the trees capable of producing seed had been logged or destroyed in the fire. The two large Douglas-fir trees at the southern end of row #6 probably provided the seed source for most of the trees that regenerated on the Camp 1 site.

The dendrochronological dataset did not exist on Camp 1 to support my hypothesis that tree ages could be used to establish archaeological site boundaries in a forested environment, where older trees would be found growing outside the site boundary and younger trees inside the perimeters of the site. Although a comparative dataset did not exist at Camp 1 to support my original hypothesis, I still believe that dendrochronology is a viable method to establish site boundaries, particularly when used in conjunction with a thorough literature review and archaeological site investigation. This claim has been substantiated through the use of tree ages, the presence of rotten old-growth stumps and



1946 Dwyer
landing strip

Figure 8.1: Visual history of disturbance processes that have impacted Camp 1.

logs, and the location of artifact and feature concentrations that were used to establish the site boundary of Camp 1 (Figure 8.2). Although dendrochronology was not the most appropriate method to establish boundaries in the case of Camp 1, less disturbed environments may provide a better matrix for this type of site boundary delineation to be an effective tool.

Many of the old-growth stumps and rotten logs around the periphery of Camp 1 were burned after they had been cut down. It is unclear whether these stumps would have burned in 1929 or 1939, and all were too duffy to core for an age. Photos reveal that most of the old-growth trees around Camp 1 had been killed in the 1902 fire and those closest to the camp had been fallen for safety reasons (Figure 8.12). Clarence Jubb related that the burned snags were fallen during and shortly after the 1929 fire, and that the CCC crew members fell dead trees on Ladee Flat in 1934. Since the area may have reburned in the 1939 fire, it is possible that the stumps were scorched during that fire event.

I do not believe that the Ladee Flat fire of 1929 destroyed all of Camp 1, but it did burn at least one of the buildings. Further archaeological investigations, including excavated test units, may provide additional understanding of the extent and severity of the 1929 fire. No matter which fire burned the surrounding landscape, the fact remains that fire had been a major disturbance factor influencing the integrity and nature of the archaeological resources found at Camp 1.

Sources of variation in tree ages

Forest ecologists who have used tree-ring dating techniques in the fire ecology studies discussed in Chapter 2 have found that operator error is a factor when assigning tree ages, particularly if the cores are counted in the field. Some trees do not produce an annual growth ring when stressed, or they may be too small to see without a microscope. Researchers have found it useful to classify data using a wider range of values to account for these errors and abnormalities (Weisberg and Swanson 2001:20).

The age of a tree at breast height where the core is obtained is not zero; it has taken a period of years for the seedling to grow to that height depending upon the environmental conditions it has experienced. The forest soils at Camp 1 are classified as site class II, with a site index of 115-134 (NRCS Tech Note 33). These classifications are measures of the growth potential and productivity of the timber, or site quality for a particular soil series (Dilworth 1976:157). Trees on Alspaugh clay loams grow rapidly, by 50 years of age it is expected that they will be 115-134 ft. high (NRCS Tech Note 33). Dilworth reported that the standard range of age corrections for most Douglas-fir is to add 5 to 8 years to the tree age obtained at breast height (1976:156). Accurate tree ages can also be obtained from saplings by counting the number of branch whorls; each set represents one year (Dilworth 1976:156). I used this technique on the saplings found growing at Camp 1 and determined that by age 7 most of the trees had obtained the height of four ft.

five inches. To all breast height tree ages I added a correction factor of seven years (Table 8.2).

Identifying and dating disturbance events

As I began to analyze the tree age dataset, distinct age-classes in the trees became apparent. Douglas-fir regenerates after a disturbance opens up the canopy, providing

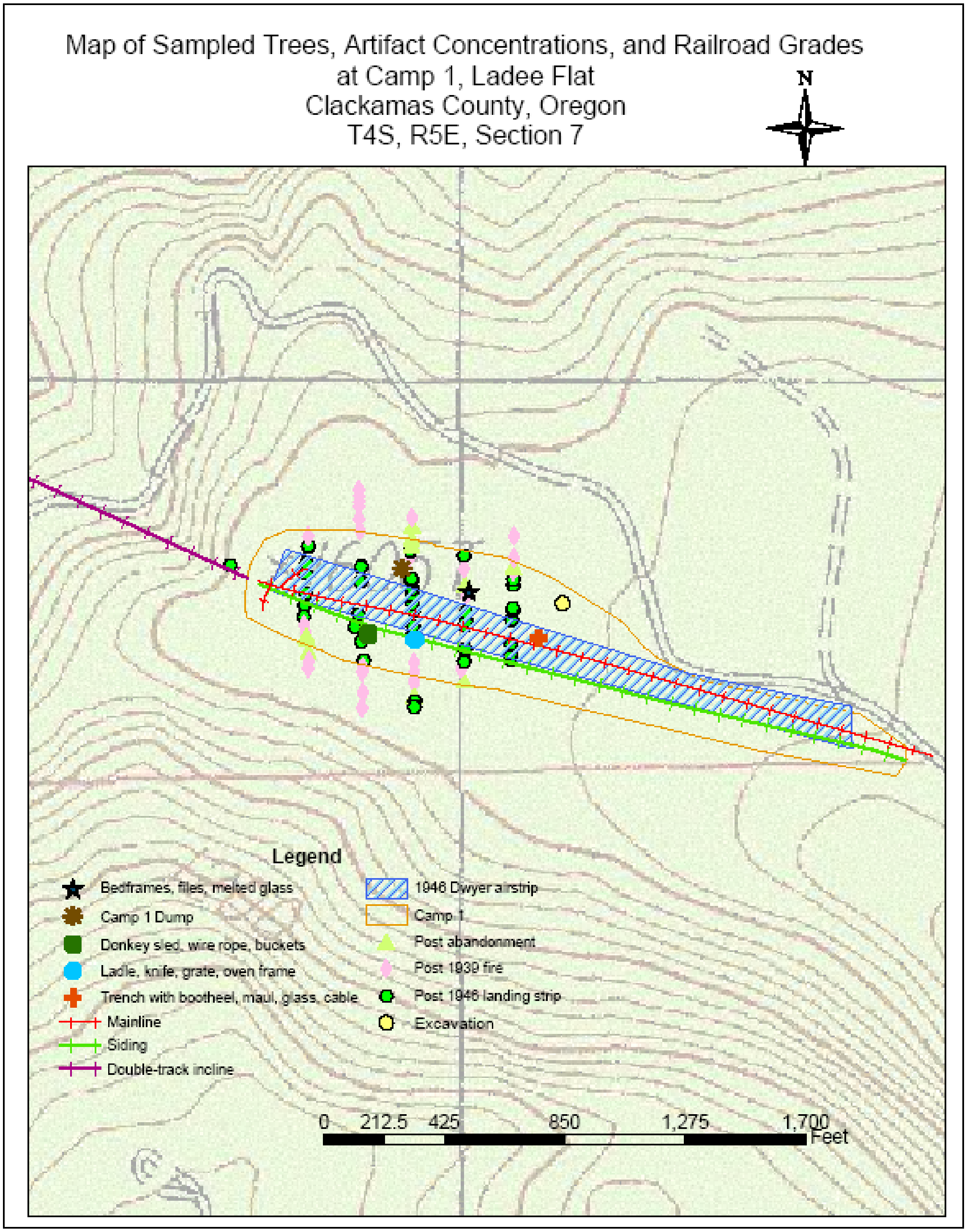


Figure 8.2: Topographic site map of Camp 1.

that a viable seed source is present. Different disturbance events were identified from the various cohorts that had regenerated on Camp 1 in the seven decades since the camp was abandoned. I interpretated clusters of tree ages portrayed in a frequency histogram as representing distinct age-classes of trees that had regenerated after a discrete disturbance event (see Figure 8.3). I prepared an Access database of all the tree data I had collected and imported it into a GIS software program similar to ESRI's ArcView product. I classified the tree age data into three different disturbance events; (1) post camp abandonment; (2) post 1939 Boyer Creek Fire; and (3) post 1946 Dwyer airstrip

Table 8.2: Age class categories correlated to disturbance event

Age at breast height	Correction	Year tree was established	Age of tree	Disturbance event
59 to 66	+7	1932 - 1939	66 - 73	Camp 1 was abandoned by late 1930; some buildings were burned and debris pushed into piles possibly after 1929 fire
52 to 58	+7	1940 - 1946	59 - 65	Regeneration after the 1939 Boyer Creek Fire which burned portions of Camp 1
45 to 51	+7	1947 – 1953	52 - 58	1946 Dwyer landing strip construction fill materials bury portions of the site
35 to 44	+7	1954 - 1963	42 - 51	Landing strip maintenance
25 to 34	+7	1964 - 1973	32 - 41	Landing strip maintenance
24 and younger	+7	1974 - 2005	31 and younger	Sporadic brush clearing; trenches installed to control ATV's

construction. I used the GIS to assist in establishing the site boundaries of Camp 1 by correlating disturbance events, tree ages, and location of cultural materials and features. GIS provides the mechanism for archaeologists to examine the spatial context of features, artifacts, and sites that are spread about the landscape, and observe relationships that might not be apparent without a visual representation (Witcher 2000:13). Disturbance events are summarized in the table 8.2 and a site boundary map generated from the GIS mapping program is displayed in Figure 8.2 and Figure 8.5.

Statistics

Summary statistics of tree ages obtained from the dendrochronological survey of Camp 1 generated from the Statgraphics software program include:

Tree ages obtained = 87	Total trees sampled = 118
Average stocking age = 55.8046	Median stocking age = 58
Standard deviation = 10.1395	
Minimum = 18.0	Maximum = 72.0
Range = 54.0	
Stnd. skewness = -2.88883	Stnd. kurtosis = 1.40822

The frequency of tree ages obtained from ring counts was analyzed using the Statgraphics software as well. The histogram revealed three distinct age-classes present on Camp 1, representing the three major disturbances that have occurred since the 1929 burned all the trees around Camp 1 (Figure 8.3).

1939 Boyer Creek Fire

I discovered that the damage to Camp 1 from the 1939 Boyer Creek fire was spotty once the tree age data were displayed using the GIS mapping software. The fire appeared to jump about the camp and probably assumed the form of a low-intensity ground fire that would have destroyed some but not all of the saplings in its path. A series of trees in row 2, located 200 ft. to the south of the head of the incline, survived the 1939 fire, as did a number of other trees that were sampled, including the tree growing on the bunkhouse debris pile found along the row 8 transect line. Because fuel loads would have been low in and around the camp, there would not have been enough fuels to carry the fire or increase its intensity, enabling patches of trees to survive. Another consideration when attempting to reconstruct the fire disturbance pattern comes from the construction of the 1946 Dwyer landing strip. Grading and filling activities might have influenced the spatial pattern of this older cohort of trees that established after Camp 1 was abandoned in late 1930.

1946 Dwyer landing strip

A spatial analysis of tree ages clearly defined the extent of the disturbance related to the Dwyer airstrip construction. The vegetation in a 150-200 ft. swath was cleared

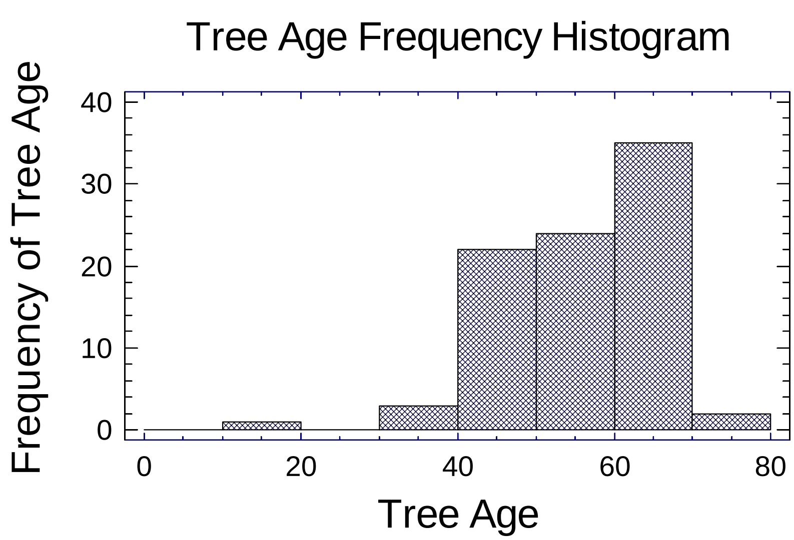


Figure 8.3: Tree age frequency histogram.

down the length of the mainline through Camp as displayed in Figure 8.1 and Figure 8.6. Tree ages also reveal that the clearing for landing strip diminished over time; by the early 1970s active maintenance had ceased beyond invasive species control on Scotch broom (*Cytisus scoparius*) that occurs to this day.

Validity of old maps, oral histories, and news accounts

Although a valuable source of forest stand information, the scale on the 1933 age-class and stocking map prepared by US Forest Service foresters was too coarse to determine the boundaries of the 1929 fire. The 1938 aerial photo of the camp captured a vegetative cover in the area surrounding the mainline, most likely consisting of vine maple and salal (Figure 8.4). Pioneering plant communities would have been

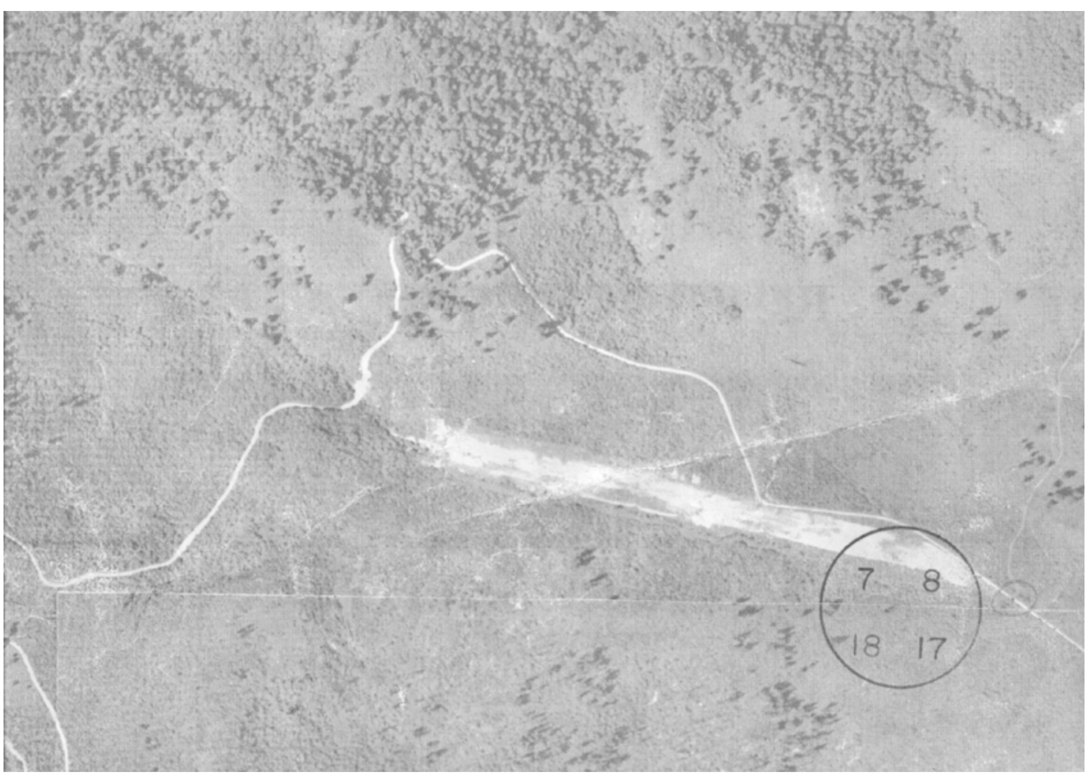


Figure 8.4: 1938 aerial photo of Camp 1, the incline, and the mainline.

well-established eight years after a fire, while the heart of Camp 1 remained free of . vegetation. *The Timberman* reported a camp was lost, it did not say which one; Jubb claimed Camp 1 was not destroyed. Clarence seemed to recall the main events of his live as a timber faller on Ladee Flat, but details such as dates were not his strong point. The truth is somewhere between and further archaeological research, including subsurface testing, would be helpful to clarify the confusion.

Documenting landscape change

Another research objective was to document the landscape changes that have occurred on Ladee Flat as the result of changing land-use practices. The old-growth forests that once were found on Ladee Flat consisted of a variety of coniferous tree species including western redcedar, western hemlock, and Douglas-fir. Today Ladee Flat is a Douglas-fir monoculture. Scattered western hemlocks are beginning to regenerate under the Douglas-fir canopy, but a reliable seed source does not exist for miles, having been extirpated by fire and logging. During the 1920s, Pole Camp was devoted exclusively to harvesting the cedar poles that grew on Ladee Flat. The only western redcedar trees to be currently found between Camp 1 and Camp 2 are those planted by the Forest Service in a timber harvest unit that was clearcut to control root rot.

Although well beyond the scope of this project, a very valuable fine-scale dendrochronological dataset is contained within the cores that were collected from Camp 1. Because the location of the trees has been assigned a geographic coordinate, the relationships between growth rates and soil compaction can be studied, or used to

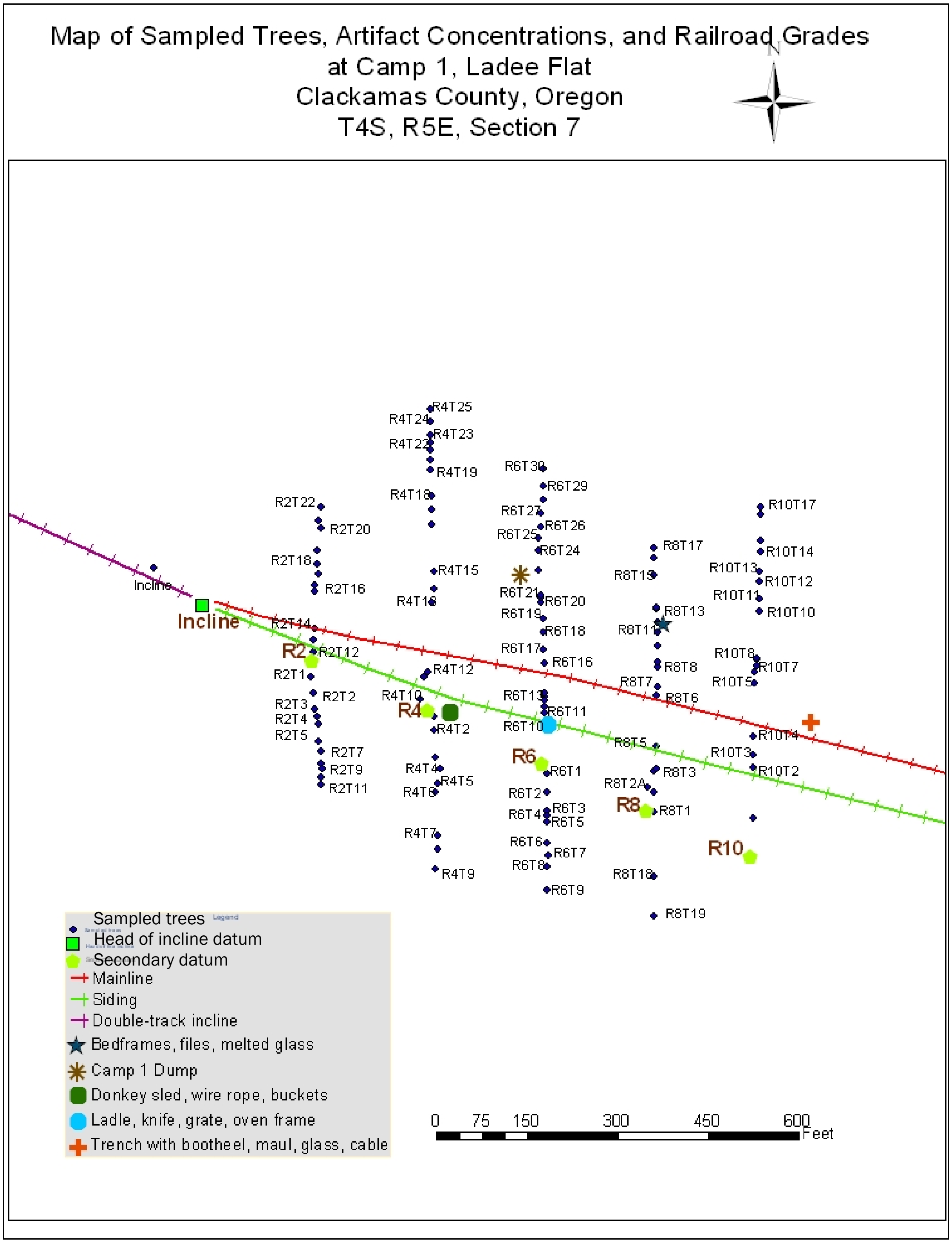


Figure 8.5: Map of sampled trees, artifact concentrations, and datums.

correlate remotely sensed photography to capture very small patches of age-class differences in timber stands that look homogeneous. As fire ecology studies in western Oregon Cascade Mountain forests have demonstrated, the fire return intervals prior to Euro-American settlement in the 1850s would have been several hundred years depending on variables such as landscape position and climate patterns (Weisberg and Swanson 2001; Morrison and Swanson 1990). The dendrochronological study at Camp 1 has documented a fire return interval averaging only 13 years during the first half of the 20th century. Fires have a tendency to erase the traces of earlier fire events, which has contributed to the difficulty interpreting the extent of each of the fires, evidence of the 1902 and 1929 fires is difficult to detect in the areas burned by the 1939 fire.

Site discovery and documentation

The purpose of the archaeological reconnaissance survey was to identify, document, and map surface archaeological features and artifacts, and determine the function of activity areas based on the artifacts that were found in surface concentrations. Many artifacts, concentrations, and features were identified even with the visibility issues discussed in Chapter 6, and the numerous disturbance events that the archaeological resources at Camp 1 had been subjected to.

Several activity areas were defined as a result of this investigation. The rail car block was evidence of the load switching that had occurred near the head of the incline. The excavated railroad siding grade that paralleled the camp is quite obvious on-the-ground but vegetation obscures its traces on current orthophotos (See Figure 8.6). Located at 450 ft. from the head of the incline, the remains of the steam donkey sled, cables, wash tub, piece of fire brick, and large depressions and mound may be associated with the lowering donkey. Just to the east, 600 ft. from the head of the incline, were remains that could be associated with the cookhouse. The dump is several hundred ft. to the north of the cookhouse concentration, which corresponds well with the health and sanitation laws requiring dumps and latrines to be at least 200 ft. away from the camp. Remains of a bunkhouse found 800 ft. from the head of the incline, and those found in the trench at 1,200 ft., are evidence of the housing area that was located here. The maul and other artifacts found buried in the trenches under the fill from airstrip construction speak volumes about the potential this site holds for further subsurface investigations.

Based on a surface examination of the site, the archaeological record at Camp 1 corresponds well with the settlement pattern model presented in Chapter 3 that was constructed from old photos, oral histories, and archaeological studies of other labor camps (Figure 8.7 and Figure 8.8). The camp appears to conform to the norm of other railroad logging camps in the Pacific Northwest. The linear site was aligned along the grade of the mainline and surface cultural materials were not found more than 300 ft. away in either direction of the mainline. This study was successful in documenting Camp 1, and establishing a baseline record for future researchers. The assortment and number of artifacts recorded on the surface of Camp 2 in the early 1980s by Forest Service archaeologists (Table 6.1), is an indication of the possibilities that are buried under the duff and fill at Camp 1. Further archaeological investigations may uncover significant information related to a variety of research domains.

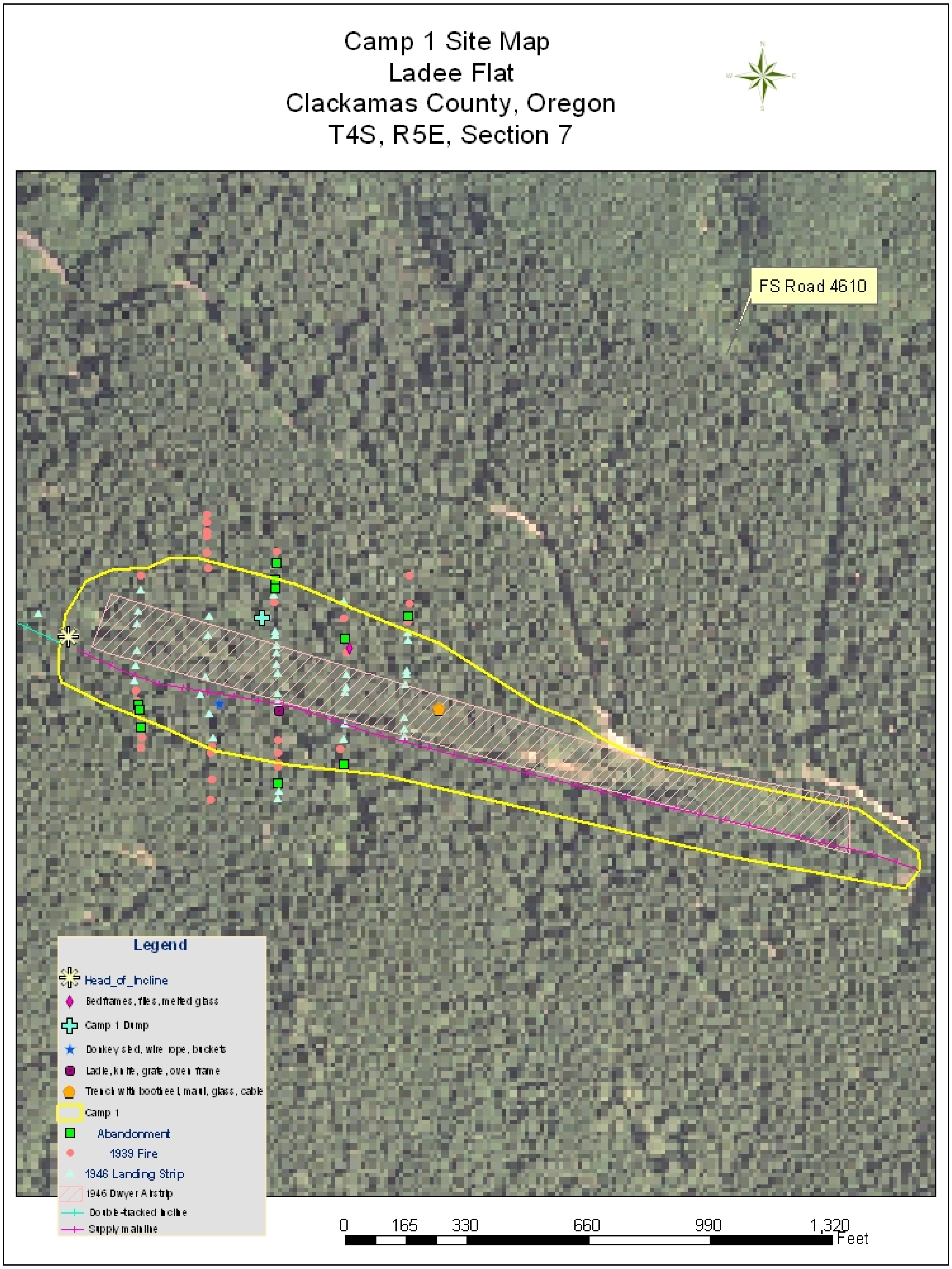


Figure 8.6: Orthophoto of Camp 1 displaying camp boundaries, tree ages, and artifact concentrations.

Camp 1 Reconstruction
Settlement Pattern Model Displayed Over Results of Field Survey

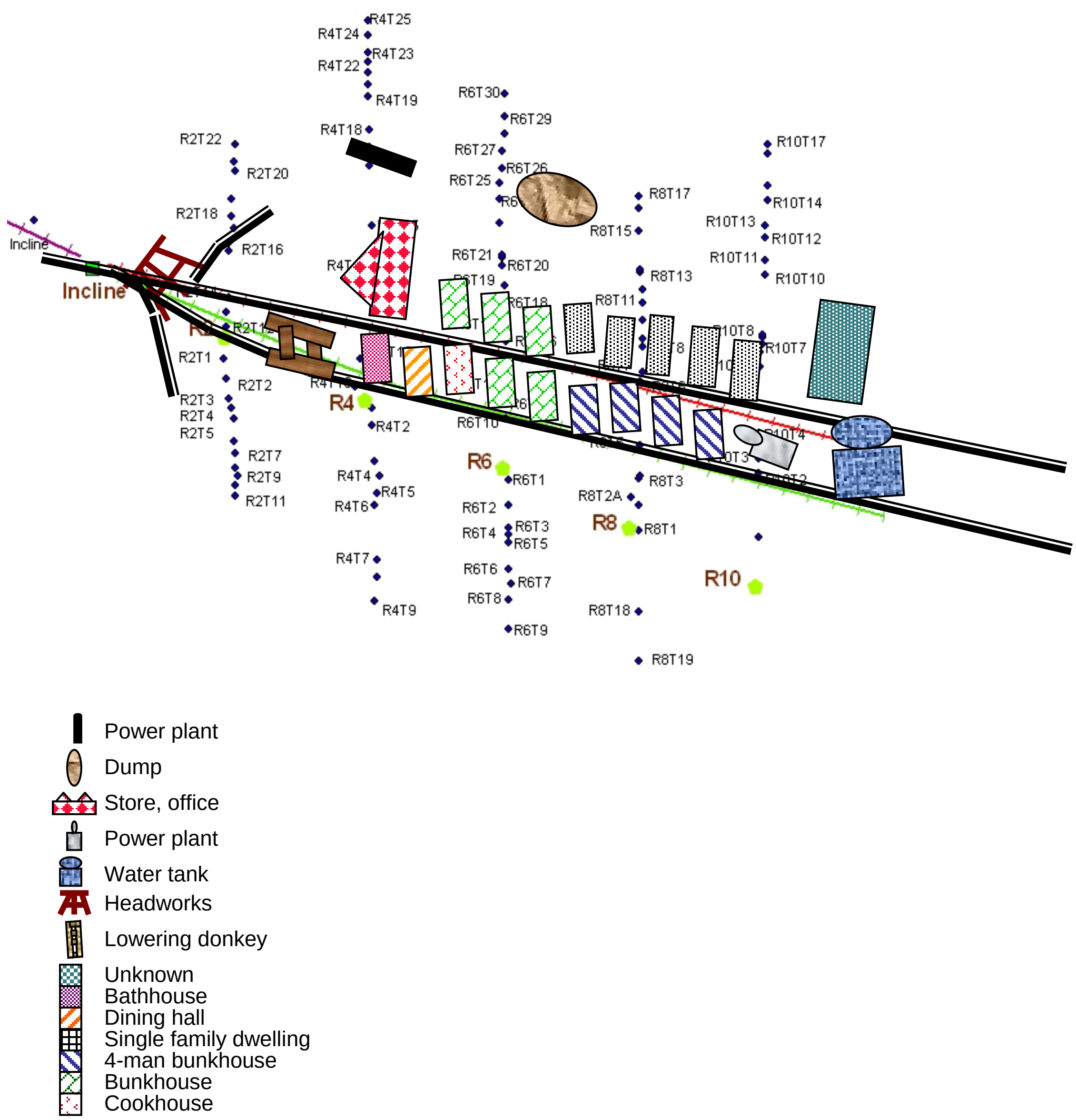


Figure 8.7: Camp 1 reconstruction – settlement pattern model displayed over results of field survey.

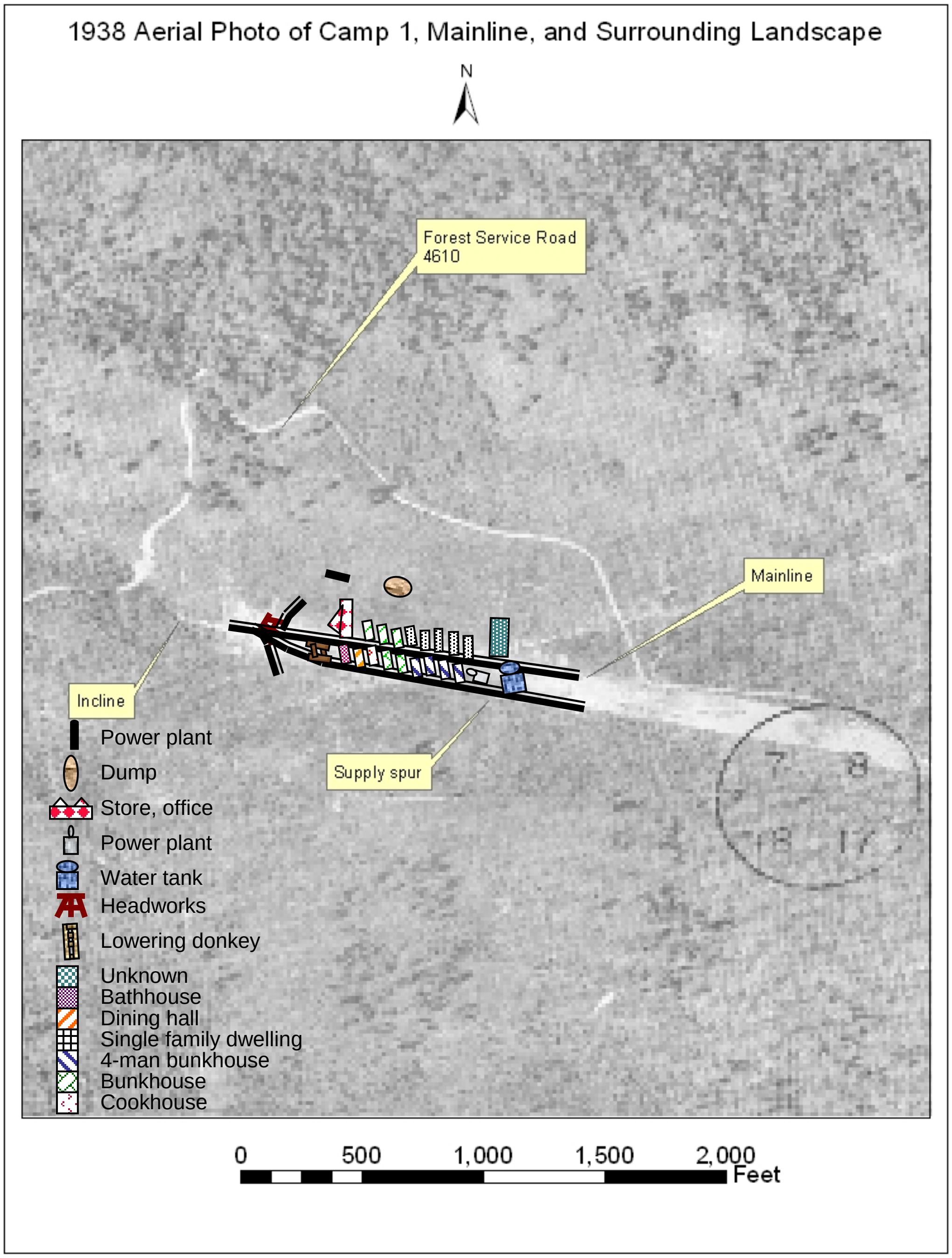


Figure 8.8: Reconstruction of Camp 1 based on settlement pattern model overlaid on 1938 aerial photo.

The site maps clearly display the impact that the landing strip construction has had on the spatial patterning of the archaeological materials found at Camp 1 (Figure 8.6 and Figure 8.7). Linear surface artifact scatters parallel the old mainline where ground disturbance did not occur during the construction of the Dwyer airstrip. Landing strip cut and fill activities not only destroyed portions of the site, but protected it by capping the archaeological materials that were present in low areas of the camp with a layer of fill material.

Cultural and natural transformation processes

Archeological and historic records are created by factors known as formation processes according to Michael Schiffer (1986:7). These processes can originate from natural or cultural factors that create, shape, and affect the archaeological record**.** The spatial patterning of artifacts in the current soil profile does not necessary represent the location where the object was lost, tossed, or broken. Schiffer (1986:10) reminded archaeologists that they cannot interpret human behavior and organization directly from the patterns discovered in the archaeological record because of the various cultural and natural transformations that the artifacts have undergone, and that "formation processes do not just degrade artifacts and deposits but can introduce patterning of their own".

The series of fires that have burned through Camp 1 are examples of natural transformation processes, while the purposeful abandonment of the camps that occurred in late 1930 and the construction of the Dwyer landing strip in 1946 are examples of cultural processes. Historic accounts relate that Ladee Logging Company moved all of its equipment, rails, and whatever the loggers considered of value to their new timber operations on the Kerry Line in the Coast Range.

Schiffer (1986:91) explained that the amount of de facto refuse, or the stuff that has been left behind, depended upon several variables including whether site abandonment was planned or not, what kind of transportation systems were available to move the objects, what time of year the abandonment took place, distance to the next settlement, and several other factors. I expected to find large amounts of industrial and domestic cultural materials because of the magnitude of the activity that took place at Camp 1. Hundreds of people lived and worked in Camp 1 over the eight years it was in operation, and one would expect to discover more evidence of their presence. I did not find a proportionate amount of cultural materials left on the surface of the site. The railroad provided easy transportation of the expensive machinery and steel rails to a new camp. The buildings would have been left behind because they had reached the end of their useful life span and could be cheaply and easily replaced.

Another factor contributing to the paucity of surface archaeological materials is that regular garbage disposal habits were enforced at the camp. It is likely that a camp worker, or flunkie, was responsible for cutting wood for the camp, cleaning the bunkhouses, bathhouses and latrines, and picking up garbage around the camp.

Schiffer noted that many studies on spatial patterning in archaeological sites are flawed because the researchers did not take into account the effects of formation processes on artifact positioning. Schiffer (1986:281) reminded archaeologists that a cluster of artifacts does not necessarily indicate a specialized activity area but could represent refuse disposal patterns and/or other disturbance processes.

Salvaging and other reclamation processes

The camp was abandoned at the onset of the Depression. Difficult economic times would have encouraged local residents to scavenge through the remains of Camp 1 and Camp 2 looking for construction materials or other objects of value. Schiffer observed that this type of behavior was regulated by the law of supply and demand. A demand for scarce materials that were considered refuse by Ladee Logging Company would have definitely existed during the depths of the Great Depression in the rural Estacada area (1986:109). Merle Siedel (2003 pers. comm.) and Hank Boyer (1967) reported that extensive salvage of metal objects that were left behind on Ladee Flat occurred during World War II when scrap iron was more valuable than a rusting steam donkey engine. Schiffer explained that this type of cultural transformation process disturbed the spatial arrangement of artifacts and deposits that were left behind and created new deposition patterns (1986: 101).

Other types of disturbance processes

Plowing, land clearing and leveling, excavations for privies, cellars, and foundations are examples of disturbance processes that modify the ground surface and disturb previously deposited artifacts. The construction of the airstrip altered the spatial context of the artifacts that were pushed around, buried, or incorporated into the fill material.

To illustrate the glass half full analogy, Rubertone explained that researchers have determined that a site that has been filled over is an opportunity to examine the various ways that fill material has been used to transform the landscape, instead of another case of integrity lost (1989:52). Beaudry added that earthmoving activities can reveal changing political, economic, and environmental conditions (1986:41). Viewed in this light, a subsurface archaeological examination under the fill material used to cover over the center of Camp1 should provide researchers with numerous opportunities to address research questions along this line of inquiry.

Artifacts – domestic items – housewares and appliances - gustatory

All of the tableware that was found at Camp 1 belonged to the commercial china group. Known as restaurant ware, café ware, diner china, or institutional china, this type of dinnerware is among some of the highest quality ware produced (Conroy 2003:9). From the 1920s through the 1960s, commercial vitrified china was made primarily of kaolin, feldspar, and quartz. Vitrified china is fired at a higher temperature than earthenwares. The body components fuse together during the first (bisque) firing. The china is then fired at a lower temperature in the second (glaze or gloss) firing. The glazes are formulated to resist scratching, staining, and thermal shock (Conroy 2003:9). The resulting ceramics are non-porous and very durable, even when the glaze is chipped or cracked.

Many pieces of white restaurant ware were observed in the dump (Figure 8.9). Most were broken, and each type of tableware was easily recognizable. Several pieces of the heavy china had clearly visible maker's marks. All of the tableware was manufactured in the United States between the years of 1910-1930. The ceramics were one of the temporally diagnostic groups of artifacts found in the dump, and confirm the finding that this feature is associated with Camp 1. Figure 8.9 are photos of some of the many .pieces of dinnerware found in the dump and Table 8.3 provides information on the some of the tableware observed on the surface of the dump.

Figure 8.9: Examples of china found in the Camp 1 dump

Table 8.3: Characteristics of tableware found on the surface of the Camp 1 dump (Conroy 2003).

Manufacturer	**Location of manufacture**	**Dates of Manufacture**	**Maker's mark present on piece**
Shenango Pottery Company	New Castle, PA	1912-1920's	SHENANGO NEW CASTLE PA CHINA
The Colonial Company	East Liverpool, OH	1903-1929	China Colonial
W.S. George Pottery Company	East Palestine, OH	Circa 1909-circa 1920	Hotel W.S. George 162A
Syracuse China	Syracuse, NY		CHELSEA VITREOUS

Domestic items – housewares and appliances – portable heating

Today, those of us that heat our home with wood we prepare ourselves, can only find second-growth or smaller dimension cordwood. In 1920, a large quantity of the clear-grained old-growth timber harvested from Ladee Flat was cut into cordwood and sold to heat homes in Portland. A close inspection of the photo of Camp 1 shows that all of the housing was heated by woodstoves; smoke can be seen curling from the chimneys. A large pile of firewood is also visible in the center right of the photo. Gasoline-powered woodsplitters had not been invented to split the rounds into manageable pieces, and some loggers found that dynamite was an effective agent. The large splitting maul found eroding out of the trench had a tear-shaped cutout near the distal end (Figure 8.10). Its purpose was a mystery until an old logger in Estacada revealed its secret. He said he had only seen this type of splitting maul in the redwood region of California, and was surprised to find one this far north. A piece of iron fit into the opening and when the maul was driven into the old-growth round, he explained, a hole was left in the wood. The maul was popped out, and some dynamite was stuffed into the hole and ignited, and like magic, the round was split apart! The maul was found in association with 1-inch wire rope. It had been burned in a debris pile; the fire was so hot that the earth surrounding the mall and in the cut-out had vitrified. The presence of the splitting maul, in association with the boot heel, pressed and bottle glass fragments, and heavy, white china cup fragment, confirms that this was the part of the camp where the housing area was located.

Artifacts – Commerce and Industry – Logging

Although the majority of equipment and hardware was moved to a new location when Porter-Carstens abandoned the site in 1930, several portable railroad-related items were

Figure 8.10: Splitting maul used with dynamite

left behind. A railroad spike was found on the bottom of the trench; it had eroded from the sidewall. The spike indicated that the mainline was buried nearby, and its size confirmed that the tracks were standard gauge.

A very unique piece of track hardware was also discovered near the incline (Figure 8.11). A rail block was found near the wye grade that was used for switching loaded log cars and empty disconnect trucks. Loaded log cars were hooked to the block car in this area and prepared for the descent down the incline. The rail block is well-worn on the striking surface where the wheels from the rail cars would have slammed against it and been stopped in its tracks. The numbers 562 were embossed on one side, as well as a cross-hatch design. The rail block would have been spiked into place.

Figure 8.11: Rail block found near the wye at the top of the incline.

How does Camp 1 compare with other Pacific Northwest labor camps?

Although a surface examination of Camp 1 did not reveal any evidence of ethnicity, gender, class, or occupational distinctions found at most other labor camps in the Pacific Northwest, the subsurface archaeological record may be very rich. Cultural materials representing the documented presence of a mix of ethnic groups and women might be discernible in the subsurface excavations, and provide archaeologists with information on rates of acculturation and adaptation to life on the industrial frontier. The use of space, adaptation of available technologies, dependence upon distant, unpredictable markets, and foreign sources of capital that characterized conditions at Camp 1 were also found throughout the industrialized west during the first three decades of the twentieth century. The Depression changed the logging industry forever, and Camp 1 represents the end of a technological, social, and economic era.

Concluding remarks

One of the remaining research questions to be addressed is whether the archaeological record at Camp 1 has the potential to contribute to historical archaeology method and theory. I have documented the presence of surface artifact concentrations that may represent activity areas. I have demonstrated the value of information that can be obtained using a multidisciplinary, integrative approach incorporating dendrochronology, archaeology, and historic records to understand the cultural and natural site formation processes that have influenced the archaeological record found at Camp 1. Although the use of dendrochronology as the sole factor used to determine a site boundary was not totally successful in this particular application, the tree age data was an important supplement to the eventual site boundary determination. The information contained in the 1930 census provides fertile material for future archaeological excavations at Camp 1. I believe that subsurface excavations can contribute substantially to the growing body of research involved with temporary 20th century western work camps regarding gender, ethnicity, and socioeconomic topics.

Camp 1, Camp 2, and the logging landscape found on Ladee Flat have great potential for forest history interpretative tours. Heritage tourism is one way that small towns like Estacada can experience maximum economic benefit from minimal financial investment. Properly interpretated by professionals using appropriate signage, brochures and other media, Camp 1 and the other railroad logging sites on Ladee Flat could be of great interest to many visitors who want to combine forested vistas with the opportunity to learn about early Oregon forest history and logging practices.

Perhaps the most important contribution of this thesis is to dispel the myth that heavily disturbed historical sites have no scientific value to archaeologists. The environmental, historical, and archaeological baseline data that was collected during the course of this project provides ample documentation to support the conclusion that 20th century historic sites written off by cultural resource managers on private and public as having no integrity or significance may be an incorrect determination. The question of whether or not a site is significant is the source of endless debate among various cultural resource managers (Hardesty and Little 2000). In an advanced Section 106 seminar I attended in Portland Oregon in July 2006, Thomas King put the issue to rest with the simple explanation “if the site is significant to someone in the community, then consider the site to be significant enough to at least implement basic site protection measures, whether the site is ever nominated to the National Register of Historic Places or not (King pers. comm. 2006).

Camp 1 and Ladee Flat have a story to tell about the people, environment, economics, technology, and culture of the timber industry in the early 20th century and it is a tale that is definitely worth telling.

Figure 8.12: Camp 1 in 1924.

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Appendices

Appendix A

Table A.1.1: Results of archaeological field survey

Archaeological Data Collected February 11, 2006

Artifact	Feature	Easting	Northing	Elevation	WPT#	Notes
	Incline grade crossing FS Road 4210	559532	5009030	1529	8	Shed may be the water shack for the incline and stonework may be associated with incline
	Head of the incline	559677	5008976	1642		
Pressed glass clear lamp base		559690	5008961	1644		
	Burn pile with 3-sided metal files, bed frames with springs	559911	5008971	1661	7	
Boot heel, side of white ironstone cup, piece of pressed clear glass, railroad spike	Burn pile in trench excavated by the US Forest Service across the old mainline and perpendicular to it along the eastern side of the grade/airstrip	559974	5008916		1, 2	Found in trench 2.5 feet below the surface
29 cm long iron splitting maul with a 7.5 cm diameter striking surface and a 20 cm neck diameter with a biting edge 12cm wide found 35 cm below the surface sticking out of the eastern side of the N/S trench on the eastern side of the old mainline/runway		559986	5008920		3	Found in association with cement fragments, slag, charcoal – evidence of a hot fire buried 20-35 below the current surface

Archaeological Data Collected March 4, 2006

Artifact	Feature	Easting	Northing	Elevation	WPT#	Notes
Pile of asbestos brick	254º (SW) of incline @ 160 feet Head of incline has grasses, 6-ft high red alder, western hemlock salal, sword fern	559725E	5009010	1546		
Rail car block with the number #562 stamped into it	310º (NW) 82 feet from the head of the incline					

Table A.1.1: Results of archaeological field survey- continued

Archaeological Data Collected March 17, 2006

Artifact	Feature	Easting	Northing	Elevation	WPT#	Notes
Boiler plate with rivet		559736	5008979	1608		Near R2T15

Archaeological Data Collected April 1, 2006

Artifact	Feature	Easting	Northing	Elevation	WPT#	Notes
White porcelain "Shenango" N Carlisle PA China	Dump 71 feet long X 35 feet wide	559849	5008998	1611		Located in dump on row 6 near tree #23

Table A.2.1: Results of dendrochronological field survey

Dendrochronological Data Collected February 11, 2006

Tree #	Landscape position	Easting	Northing	Elevation	DBH age count	Notes
#1 Reference tree	Located in the west side of the excavated grade at the beginning of the incline approx 50 feet down from the top of the flat	559655	5008999	1620	47 1958	25.8" DBH Douglas-fir bole has a sweep that results from growing on a steep eroding slope
R8	Tree growing on debris pile of bedframes, files				62 1943	Drilled below DBH; rot in heartwood

Dendrochronological Data Collected March 4, 17, 25, April 1, 9, 16, 22, 29, May 24, 2006

2nd row transect begins from mainline grid that has been laid out beginning at the head of the incline and tending towards the southeast. Row 1 begins 100 feet @ 120º (SE) from the head of the incline. Row 2 begins 200 feet @ 120º (SE) from the head of the incline.

Tree #	Location/distance to next tree	Easting	Northing	DBH	Total Length of Transect	DBH age count	Notes
	Reference point #2	559734	5008945				
R2T1	5 feet south of station 2 (200 feet on the mainline from the head of the incline)	559734	5008943	22.5	5	48 1957	Unvegetated area with a berm just to the north – core has a black oily center
R2T2	30 south of tree #2 - 33" from mainline)	559735	5008935	22.7	33	52 1953	Sawn-off stumps, duffy/rotten berm to the south; tree has damage at age 7 DBH which makes rings hard to count accurately; core also reveals rot and damage
R2T3	27 feet south of tree #2, 5 feet off of shot	559736	5008927	23.5	60	55 1950	Oregon-grape, salal, vine maple, sword fern, western hemlock understory
R2T4	41 feet south of tree #2-74 feet from mainline)	559737	5008923	26.0	74	62 1943	Some rot
R2T5	20 feet south of tree #4 - 94 feet from mainline)	559738	5008919	22.8	94	65 1940	
R2T6	23 feet south of tree #5 -117 feet from mainline	559738	5008910	23.4	117		WH 2.0, 2.0, 4.1, 5.0, 2.7; alder 4.1
R2T7	14.6 feet south of tree #6 - 131.1 ft from mainline	559739	5008905	22.4	131	62 1943	WH, DF sapling, red huckleberry, salal Oregon grape
R2T8	22 feet from tree #7 – 153 ft azimuth of 180º south of mainline	559739	5008899	19.3	153		WH at 8 ft, 6.4DBH, 3.8DBH, WH at 16ft 4.3DBH

Table A.2.1: Results of dendrochronological field survey - continued

Tree #	Location/distance to next tree	Easting	Northing	DBH	Total Length of Transect	DBH age count	Notes
							1582 elevation
R2T9	25 feet from tree #8 – 161 ft south of mainline RP#2	559740	5008896	25.5	161	57 1948	
R2T10	13.5 feet from tree #9 – 174.6 feet south of mainline RP#2	559739	5008892	13.1	175		
R2T11	11 feet from tree #10 – 186 feet south of mainline RP#2	559739	5008888	26.7	186	58 1947	South end of line
R2T12	42 feet north of R2T1 – on the mainline – 37 feet north of RP#2	559735	5008956	16.5	37	47 1958	Patch of sedge to the east; alder @27' w/DBH of 8.1"
R2T13	20 feet north of #12 – 57 feet north of RP#2	559735	5008962	15.5	57		
R2T14	18 feet north of #13 – 75 feet north of RP#2	559736	5008968	18.4	75	45 1960	Cleared out mainline to the north ramicorn branch
R2T15	63 feet north of #14 – 138 feet north of RP#2	559736	5008987	12.8	138		Crossed cleared out mainline; boiler plate with rivet to the northwest
R2T16	9 feet north of #15 – 147 feet north of RP#2	559736	5008990	17.3	147	37 1968	
R2T17	22 feet north of#16 – 169 feet north of RP#2	559738	5008996	15.0	169		Asbestos bricks to the west and railroad spur grade to the north This tree has internal rot and it was not possible to get an age
R2T18	16 feet north of #17 – 185 feet north of RP#2	559737	5009001	20.5	185	43 1962	
R2T19	23 feet north of #18 – 208 feet north of RP#2	559737	5009008	29.1	208		
R2T20	35 feet north of #19 – 243 feet north of RP#2	559739	5009019	14.7	243	50 1955	
R2T21	15 feet north of #20 – 258 feet north of RP#2	559738	5009023	22.7	258		DF @ 8' with 6.2DBH
R2T22	23 feet north of #21 – 281 feet north of RP#2	559739	5009030	24.7	281	53 1952	Some type of possible structure – mossy flat with stumps sawn low
R2T23	27 feet north of #22 – 303 feet north of RP#2	559740	5009037	22.8	303		
R2T24	26 feet north of #23 – 329 feet north of RP#2	559740	5009045	20.7	329	54 1951	
R2T25	20 feet north of #24 – 349 feet north of RP#2	559741	5009051	22.4	349		
R2T26	17 feet north of #25 – 366 feet north of RP#2	559741	5009056	22.8	366	61 1944	1652 elevation from GPS unit
							Row 2 is 552 feet long

Table A.2.1: Results of dendrochronological field survey - continued

Tree #	Location/distance to next tree	Easting	Northing	DBH	Total Length of Transect	DBH age count	Notes
R4T1	37 feet south of RP#4 – tree is growing on a mound which is possibly an old organic debris pile	559796	5008923	41.5	37	Too large to core	400 feet @300º from head of the incline; in excavated area 20 feet to the west was a galvanized wash bucket, fire brick at base of tree; donkey sled logs to east with 1 1/4 diameter cable and smaller diameter cable; oil can bottom
R4T1A	Substituted for R4T1 growing next to possible old donkey sled					46 1959	
R4T2	26 feet south of tree #1– 63 feet south of RP#4	559796	5008916	23.8	63	38 1967	
R4T3	42 feet south of tree #2 – 105 feet south of RP#4	559797	5008902	37.3	105		Western hemlock 24 feet from R4T2 with 3.0 DBH; tree too large to reach center and is at least 54 years old
R4T4	16 feet south of tree #3 – 121 feet south of RP#4	559799	5008896	23.7	121	46 1959	DF @ 16 feet, milk glass container 1619 elevation
R4T5	44 feet south of tree #3 – 149 feet south of RP #4	559798	5008889	22.5	149	55 1950	
R4T6	60 feet south of tree #3 – 165 feet south of RP#4	559797	5008884	25.4	165	53 1952	
R4T7	73 feet south of tree #6 – 238 feet south of RP#4	559798	5008862	24.5	238	54 1951	Burnt old-growth stumps with snags that had been felled
R4T8	20 feet south of tree #7 – 258 feet south of RP#4	559798	5008855	25.1	258		
R4T9	33 feet south of tree #8 – 291 feet south of RP#4	559797	5008845	19.8	291	56 1949	Large number of burnt springboard cut stumps with snags; located on cliff edge
		559791	5008934				
R4T10 north	17 feet north of RP#4	559789	5008932	19.0	17	40 1965	1642 elevation 3 foot deep excavated spur/mainline grade between T10 and T11 western hemlock @ 13 feet 2.0 DBH
R4T11	38 feet north of tree #10 – 55 feet north of RP#4	559791	5008943	21.6	55		
R4T12	11 feet north of tree #11 – 66 feet north of RP#4	559793	5008946	12.1	66	36 1969	
R4T13	89 feet north of tree #12 – 155 feet north of RP#4	559795	5008981	25.1	155	40 1965	1654 elevation; cleared mainline begins 107 feet from RP#4 and is 36 feet wide; 1 ¼ diameter cable at 115 feet from RP#4 – rot in center
R4T14	23 feet north of tree #13 – 178 feet north of RP#4	559796	5008988	27.2	178		

Table A.2.1: Results of dendrochronological field survey - continued

Tree #	Location/distance to next tree	Easting	Northing	DBH	Total Length of Transect	DBH age count	Notes
R4T15	29 feet north of tree #14 – 207 feet north of RP#4	559796	5008997	22.7	207	39 1966	
R4T16	74 feet north of tree #15 - 281 feet north of RP#4	559795	5009021	34.8	281		Hemlock @64 feet 3.5 DBH
R4T17	23 feet north of tree #16 – 304 feet north of RP#4	559795	5009029	30.8	304		Skid road due west running N to S
R4T18	21 feet north of tree #17 – 325 feet north of RP#4	559795	5009036	28.6	325	58 1947	Hemlock sapling right behind T18
R4T19	39 feet north of Tree #18 – 364 feet north of RP#4	559794	5009049	24.0	364	55 1950	
R4T20	17 feet north of tree #19 – 383 feet north of RP#4	559794	5009054	21.1	383		
R4T21	16 feet north of tree #20 – 399 feet north of RP#4	559794	5009059	24.4	399		
R4T22	14 feet north of tree #21 – 413 feet north of RP#4	559794	5009063	23.8	413	58 1947	
R4T23	24 feet north of tree #22 – 437 feet north of RP#4	559794	5009067	28.2	437	52 1953	W, N, E large burnt springboard stumps
R4T24	22 feet north of tree #23 – 459 feet north of RP#4	559794	5009074	30.0	459	53 1952	Two large stumps 8 feet W
R4T25	20 feet north of tree #24 – 479 feet north of RP#4	559794	5009080	27.8	479	58 1947	1606 elevation Large stumps just north
							Row 4 is 770 feet long
R6T1	76 feet south of RP#6 – 76 feet	559853	5008894	16.5	76	57 1948	Very brushy with vine maple
R6T2	35 feet south of tree #1 – 111 feet south of RP#6	559853	5008884	19.6	111	56 1949	Very brushy with vine maple
R6T3	30 feet south of tree #2 – 141 feet south of RP#6	559853	5008875	23.0	141	53 1952	Vine maple
R6T4	10 feet south of tree #3 – 151 feet south of RP#6	559853	5008872	24.2	151	58 1947	Large burned stump to west
R6T5	10 feet south of tree #4 - `161 feet south of RP#6	559853	5008869	30.9	161		Large burned stump to east Too large for increment borer age is at least 53 years
R6T6	36 feet south of tree #5 – 197 feet south of RP#6	559853	5008858	26.0	197	64 1941	

Table A.2.1: Results of dendrochronological field survey – continued

Tree #	Location/distance to next tree	Easting	Northing	DBH	Total Length of Transect	DBH age count	Notes
R6T7	20 feet south of tree #6 – 217 feet south of RP#6	559854	5008852	14.3	217	47 1955	
R6T8	13 feet south of tree #7 – 240 feet south of RP#6	559853	5005546	28.8	240	48 1957	
R6T9	33 feet south of tree #8 – 273 feet south of RP#6	559853	5008834	25.0	273	55 1950	1631 elevation 51 feet north of R6T9 is a 63.9 DBH old growth DF snag, and a 59.6 DBH live DF
RP#6		589852	5008916				
R6T10	9 feet north of RP#6	559852	5008919	26.6	9	42 1963	Knife, grate, debris pile 10 feet to the east
R6T11	20 feet north of tree #10 – 29 feet north of RP #6	559852	5008925	13.6	29	36 1969	
R6T12	16 feet north of tree #11 – 45 feet north of RP#6	559852	5008928	19.8	45		Excavated grade 3 feet to the north; 4 feet DF no top 8.9 DBH
R6T13	22 feet north of tree #12 – 67 feet north of RP#6	559852	5008933	16.8	67	42 1963	Growing in excavated grade; some clear oily rot
R6T14	10 feet north of tree #13 – 77 feet north of RP#6	559852	5008935	21.0	77		
R6T15	5 feet north of tree #14 – 82 feet north of RP#6	559852	5008931	21.6	82		
R6T16	68 feet north of tree #15 – 150 feet north of RP#6	559852	5008950	5.8	150	11 1994	1608 Tree growing in cleared out mainline – new clearing begins at 29 feet from tree #15; alder @29 feet; hemlock @53 feet
R6T17	20 feet north of tree #16 – 170 feet north of RP#6	559851	5008957	8.3	170	29 1976	Growing on edge of mainline the tree is a double bole; mossy flat area to the east possible building site
R6T18	26 feet north of tree #17 – 196 feet north of RP#6	559851	5008966	9.3	196	37 1968	Some rot in center
R6T19	25 feet north of tree #18 – 221 feet north of RP#6	559851	5008973	12.8	221	37 1968	
R6T20	14 feet north of tree #19 – 235 feet north of RP#6	559850	5008981	15.1	235	35 1970	Rot in center 3 years

Table A.2.1: Results of dendrochronological field survey – continued

Tree #	Location/distance to next tree	Easting	Northing	DBH	Total Length of Transect	DBH age count	Notes
R6T21	3 feet north of tree #20 – 238 feet north of RP#6	559850	5008984	17.3	238	37 1968	Some rot in center
R6T22	7 feet north of tree #21 – 245 feet north of RP#6	559850	5008985	20.7	245		3 foot high berm due north; this tree has serious rot and other damage making an exact age count difficult- 49 years @ DBH, 1956
R6T23	53 feet north of tree #22 – 267 feet north of RP#6	559849	5008998	27.1	267		Berm 12 feet north of tree #23; north end of dump 25 feet north of tree #23; dump is 71 feet by 35 feet with a pit @36 feet; utm is at north end of dump; 47 years @DBH, 1958 tree is growing phenomenally and core did not reach the center
R6T24	30 feet north of tree #23 – 297 feet north of RP#6	559849	5009008	29.4	297	58 1947	Dump 20 feet to the west; this tree has experienced good growth its entire life
R6T25	17 feet north of tree #24 – 314 feet north of RP#6	559849	5009014	11.3	314	48 1957	
R6T26	19 feet north of tree #25 – 333 feet north of RP #6	559850	5009020	14.9	333	59 1946	
R6T27	21 feet north of tree #26 – 359 feet north of RP #6	559850	5009027	28.1	359	61 1944	
R6T28	23 feet north of tree #27 – 381 feet north or RP#6	559851	5009034	23.0	381		
R6T29	24 feet north of tree #28 – 405 feet north of RP#6	559851	5009041	19.0	405	61 1944	Large burned stumps to the W, E, and NE
R6T30	33 feet north of tree #29 – 438 feet north of RP#6	559851	5009050	23.8	438	58 1947	Hemlock in front of tree
							Row 6 is 711 feet long
RP#8		559907	5008867				
R8T1	23 feet north of RP#8	559907	5008874	29.3	23	60 1945	Oily rot
R8T2	32 feet north of tree #1 – 55 feet north of RP#8	559907	5008884	31.5	55		Too large to drill
R8T2A	10 feet east of R8T2	559904	5008887	21.5	53	56 1949	Clear wet-looking rot
R8T3	29 feet north of tree #2 – 84 feet north of RP#8	559907	5008895	11.5	84	46 1959	Excavated grade 1 foot to the north of tree #3; some rot

Table A.2.1: Results of dendrochronological field survey – continued

Tree #	Location/distance to next tree	Easting	Northing	DBH	Total Length of Transect	DBH age count	Notes
R8T4	4 feet north of tree #2 – 88 feet north of RP#8	559908	5008896	8.3	88		No top
R8T5	42 feet north of tree #4 – 130 feet north of RP#8	559908	5008908	17.5	130	37 1968	2.0 DBH Hemlock 37 feet north of R8T4; DF3.0 DB 3 feet R8T5; DF 3.0 DBH 4 feet R8T5; rot
R8T6	85 feet north of tree #5 – 215 feet north of RP#8	559908	5008934	21.7	215	35 1970	1649 elevation Mainline at 14 feet north of RP#8; opening at 37 feet; DF @33 feet/3"DBH; lots of salal
R8T7	18 feet north of tree #6 – 224 north of RP#8	559909	5008938	9.0	224	30 1975	Slight variation in grid – moved line 18 feet to the east – this tree is on the north side of the mainline
R8T8	35 feet north of tree #7 – 259 feet north of RP #8	559909	5008948	21.6	259	40 1965	130 feet between R8T8 and R10T7;
R8T9	10 feet north of tree #8 – 269 feet north of RP#8	559909	5008951	14.9	269		
R8T11	33 feet north of tree #10 – 331 feet north of RP #8	559909	5008966	25.8	331	55 1950	1618 elevation
R8T12	22 feet north of tree #11 – 353 feet north of RP#8	559909	5008971	22.4	353		
R8T13	25 feet north of tree #12 – 378 feet north of RP #8	559908	5008978	22.2	378	60 1945	
R8T14	6 feet north of tree #13 – 384 feet north of RP #8	559908	5008979	18.7	384		Excavated hole – maybe a burn pile?
R8T15	54 feet north of tree #14 – 438 feet north of RP#8	559907	5008995	25.2	438	58 1947	Edge of camp – large burned springboard stump
R8T16	23 feet north of tree #15 – 461 feet north of RP#8	559907	5009004	25.7	461		
R8T17	28 feet north of tree #16 – 489 feet north of RP#8	559907	5009009	21.1	489	47 1958	1634 elevation Large stump 60 feet to the east
	Going south from RP#8						
R8T18 (-1)	85 feet south of RP #8	559907	5008841	33.1	85		33 feet south of RP #8 is a large hole 6 feet deep by 10 feet in diameter – possibly an outhouse hole
R8T19 (-2)	68 feet south of RP #8 – 153 south of RP #8	559907	5008821	32.5	153		Too much vine maple made it too hard
							Line 8 is 642 feet long
R10T1	49 feet north of RP #10	559957	5008871	20.2	49		1626 elevation
R10T2	85 feet north of #1 – 134 feet north of RP #10	559957	5008897	21.5	134		Excavated grade 8 feet to the north
R10T3	21 feet north of #2 – 155 feet north of RP #10	559957	5008903	12.9	155		

Table A.2.1: Results of dendrochronological field survey – continued

Tree #	Location/distance to next tree	Easting	Northing	DBH	Total Length of Transect	DBH age count	Notes
R10T4	32 feet north of #3 – 187 feet north of RP #10	559957	5008913	20.8	187		Growing in old mainline
R10T5	90 feet north of #4 – 277 feet north of RP #10	559958	5008940	21.4	277		Cleared mainline begins 15 feet north of T#4 and ends 75 feet north of T4 (60 feet wide); large building site; tree is east of old truck fender
R10T6	22 feet north of #5 – 299 feet north of RP#10	559958	5008946	15.4	299		
R10T7	7 feet north of #6 – 306 feet north of RP#10	559959	5008949	14.2	306		Surface has been leveled and appears to be a building site – 65 feet long
R10T8	7 feet north of #7 – 313 feet north of RP #10	559959	5008952	7.7	313		
R10T9	5 feet north of #8 – 318 feet north of RP #10	559959	5008953	14.0	318		Off north edge of excavated "pad" Berm 28 feet to the north
R10T10	80 feet north of #9 – 398 feet north of RP #10	559960	5008977	13.4	398		
R10R11	19 feet north of #10 – 417 feet north of RP #10	559960	5008983	20.0	417		Concrete remnants scattered in the duff
R10T12	33 feet north of #11 – 450 feet north of RP#10	559960	5008992	25.4	450		Low burned stumps
R10T13	19 feet north of #12 – 469 feet north of RP #10	559960	5008997	18.8	469		
R10T14	32 feet north of #13 – 501 feet north of RP #10	559961	5009007	23.4	501		
R10T15	20 feet north of #14 – 521 feet north of RP #10	559961	5009013	24.2	521		
R10T16	43 feet north of #15 – 564 feet north of RP #10	559961	5009026	18.1	564		
R10T17	13 feet north of #16 – 577 feet north of RP #10	559961	5009030	24.7	577		1631 elevation

Appendix B

Table B.1.1: Fire history studies extracted from Morrison and Swanson 1990 (p. 2-3); Taylor and Skinner 1998.

Author Year	**Location**	**Fire Frequency**	**Severity**	**Methodology Plant Community**
Hemstrom and Franklin 1982	Rainier National Park Western Cascades	450 years for the years from 1200-1850	Infrequent, widespread, stand replacing fires	Stand age data obtained from increment bore samples
Hitchcock and Cronquist 1973	North of Mt. Saint Helens	One fire every 40-50 years during the first 150 years of stand development and a fire every 125 to 150 years afterwards	Large stand replacing fires and relatively frequent low-severity fires	Douglas-fir
Means 1981	Central western Cascades Range	103 years in dry sites; 144 plots in Western hemlock zone		Dry coniferous forests, western hemlock zone
Stewart 1984	Central Western Cascades Range	15 fires over 750 years	Variable severity and extent created a mosaic of age-classes	Western hemlock-Pacific silver fir zone
Atzet 1988	Klamath Mountains near Ashland Oregon	Fire frequency ranging from 15 to 50 years	Severity was variable, some areas burned hot and other areas did not burn at all	
Morrison and Swanson 1990	Western Oregon Cascade Range – Cook Quentin study area	Steeper more dissected topography, lower elevation study area had 95-year fire rotation	Low to moderate severity resulting in patches on a landscape scale	Tree-ring records observed on road right-of-ways and stumps in clearcuts; cores taken on trees when stumps were not available

Table B.1.1: Fire history studies extracted from Morrison and Swanson 1990 (p. 2-3); Taylor and Skinner 1998-continued.

Author Year	**Location**	**Fire Frequency**	**Severity**	**Methodology Plant Community**
Morrison and Swanson 1990	Western Oregon Cascade Range – Deer study area	Higher elevation, cooler, moister, gentler topography study area had 149 year fire rotation	Predominately stand replacing fires	Tree-ring records observed on road right-of-ways and stumps in clearcuts; cores taken on trees when stumps were not available
Taylor and Skinner 1998	Klamath Mountains, Northern California	Fire return intervals on south slopes was 8 years, west facing slopes 13 years, east facing slopes 16.5 years, and northern slopes 15 years; Fire rotation intervals varied by century from 15.5 years during the presettlement years 1627-1849 to 25.5 during the fire suppression era 1905-1992	Upper slopes, ridgetops, south and west facing slopes had more severe fires, multi-aged stands resulting from frequent low to moderate severity fires	

Appendix C

Table C.1.1: Forest Inventory Worksheet, Camp 1, Row 2

FOREST INVENTORY WORKSHEET

Cooperator:	Camp 1 LaDee Flat	**Conservationist:**	Paullin		**Date:**	4/12/2006
Mgmt Unit/Field Number: Row 6		**Acres:1**	**Tract:**	**Species**	**Base Age**	**Site Index**
County:				Coastal Douglas fir	50	

MAIN STAND - Transect Notes

Species (1-20)	Dist.(ft)	Diam.(in)	Cond.	NOTES
DF-R2T1	5	22.5		
DF-R2T2	30	22.7	oily rot	
DF-R2T3	27	23.5		
DF-R2T4	14	26		
DF-R2T5	20	22.8		
DF-R2T6	23	23		
DF-R2T7	15	22.4		
DF-R2T8	22	19.3		
DF-R2T9	25	25.5		
DF-R2T10	13	13.1		
DF-R2T11	11	26.7		
DF-R2T12	42	16.5		
DF-R2T13	20	15.5		
DF-R2T14	18	18.4		
DF-R2T15	63	12.8		
DF-R2T16	9	17.3		
DF-R2T17	22	15		
DF-R2T18	16	20.6		
DF-T2T19	23	29.1		
DF-T2T20	35	14.7		
Total (20)	453	407.4		
Average of the 20	22.65	20.37		

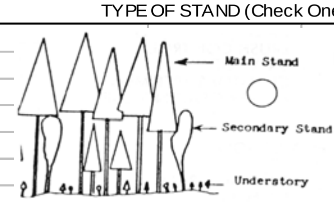
SUMMARY DATA

Average Spacing (ft)	**22.7**	
Average Diameter (in)	**20.4**	
D + X Spacing	2	
Desired D + X Spacing*	0	
No. Trees / Acre	**85**	
Desired No. Trees / Acre	105	
Excess Trees / Acre	-20	
* See Commercial Thinning Table		
Diam. Range	5.8-30.9	
Species (%)		
	WH	5%
	DF	95%
Quality (%)		
Good		
Fair		
Poor		

Salable or usable products

Other Values and Considerations

Treatment discussed with cooperator

TYPE OF STAND (Check One)	Species	Extent
	XXXXXXX	XXXXXXXX
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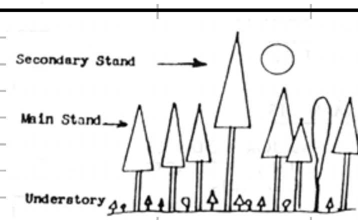	XXXXXXX	XXXXXXXX
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Table C.1.2: Forest Inventory Worksheet, Camp 1, Rows 2, 4, and 6

FOREST INVENTORY WORKSHEET

Cooperator:	Camp 1 LaDee Flat	**Conservationist:**	Paullin	**Date:**	4/12/200
Mgmt Unit/Field Number: Row 2/4/6		**Acres:1**	**Tract:**	**Species**	**Base Age** / **Site Inde**
County:				Coastal Douglas fir	50

MAIN STAND - Transect Notes

Species (1-20)	Dist.(ft)	Diam.(in)	Cond.	NOTES
DF-R6T21	3	17.3		
DF-R6T22	7	20.7		
DF-R6T23	53	27.1		
DF-R6T24	30	29.4		
DF-R6T25	17	11.3		
DF-R6T26	19	14.9		
DF-R6T27	21	28.1		
DF-R6T28	23	23		
DF-R6T29	24	19		
DF-R6T30	33	23.8		
DF-R4T19	39	24		
DF-R4T20	17	21.1		
DF-R4T21	16	24.4		
DF-RrT22	14	23.8		
DF-R4T23	24	28.2		
DF-R4T24	22	30		
DF-R4T25	20	27.7		
DF-R2T24	26	20.7		
DF-T2T25	20	22.4		
DF-T2T26	17	22.8		
Total (20)	445	459.7		
Average of the 20	22.25	22.985		

SUMMARY DATA

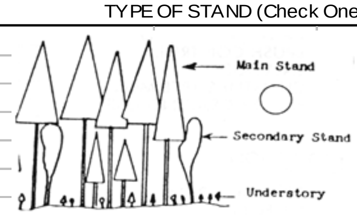
Average Spacing (ft)		**22.3**
Average Diameter (in)		**23.0**
D + X Spacing		-1
Desired D + X Spacing*		0
No. Trees / Acre		**88**
Desired No. Trees / Acre		82
Excess Trees / Acre		6
* See Commercial Thinning Table		
Diam. Range	5.8-30.9	
Species (%)		
	WH	5%
	DF	95%
Quality (%)		
Good		
Fair		
Poor		

Salable or usable products

Other Values and Considerations

Treatment discussed with cooperator

TYPE OF STAND (Check One)

	Species	Extent
	XXXXXXX	XXXXXXX
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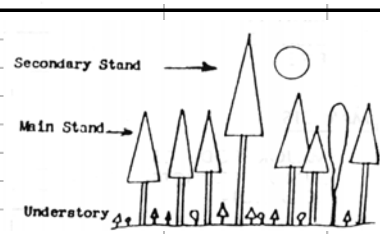
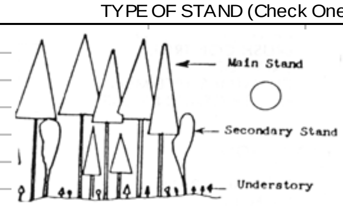
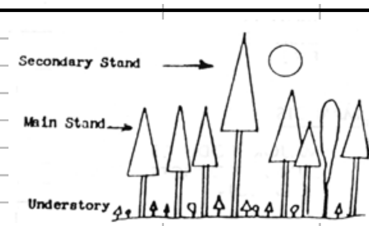
	XXXXXXX	XXXXXXX
	XXXXXXX	XXXXXXX

Table C.1.3: Forest Inventory Worksheet, Camp 1, Rows 2, 4, and 6

			FOREST INVENTORY WORKSHEET					
Cooperator:	Camp 1 LaDee Flat		**Conservationist:**		Paullin		**Date:**	4/12/2006
Mgmt Unit/Field Number: Row 6			**Acres:1**		**Tract:**	**Species**	**Base Age**	**Site Index**
County:						Coastal Douglas fir	50	
MAIN STAND - Transect Notes								
Species (1-20)	**Dist.(ft)**	**Diam.(in)**	**Cond.**	**NOTES**				
DF-R6T1	76	16.5		south of RP#6		**SUMMARY DATA**		
DF-R6T2	35	19.6				**Average Spacing (ft)**		**25.0**
DF-R6T3	30	23				**Average Diameter (in)**		**18.9**
DF-R6T4	10	24.2				D + X Spacing		6
DF-R6T5	10	30				Desired D + X Spacing*		0
DF-R6T6	36	26				**No. Trees / Acre**		**70**
DF-R6T7	20	14.3				Desired No. Trees / Acre		122
DF-R6T8	13	28.8				Excess Trees / Acre		-52
DF-R6T9	33	25				* See Commercial Thinning Table		
DF-R6T10	9	26.6		north of RP#6		Diam. Range	5.8-30.9	
DF-R6T11	20	13.9						
DF--R6T12	16	19.8				Species (%)		
DF-R6T13	22	16.8					WH	5%
DF-R6T14	10	21					DF	95%
DF-R6T15	5	21.6						
DF-R6T16	68	5.8						
DF-R6T17	20	8.3				Quality (%)		
DF-R6T18	26	9.3				Good		
DF-T6T19	25	12.8				Fair		
DF-T6T20	15	15.1				Poor		
Total (20)	499	378.4		TYPE OF STAND (Check One)			Species	Extent
Average of the 20	24.95	18.92					XXXXXXX	XXXXXXXX
Salable or usable products							XXXXXXX	XXXXXXXX
Other Values and Considerations								
							XXXXXXX	XXXXXXXX
Treatment discussed with cooperator							XXXXXXX	XXXXXXXX





Appendix D

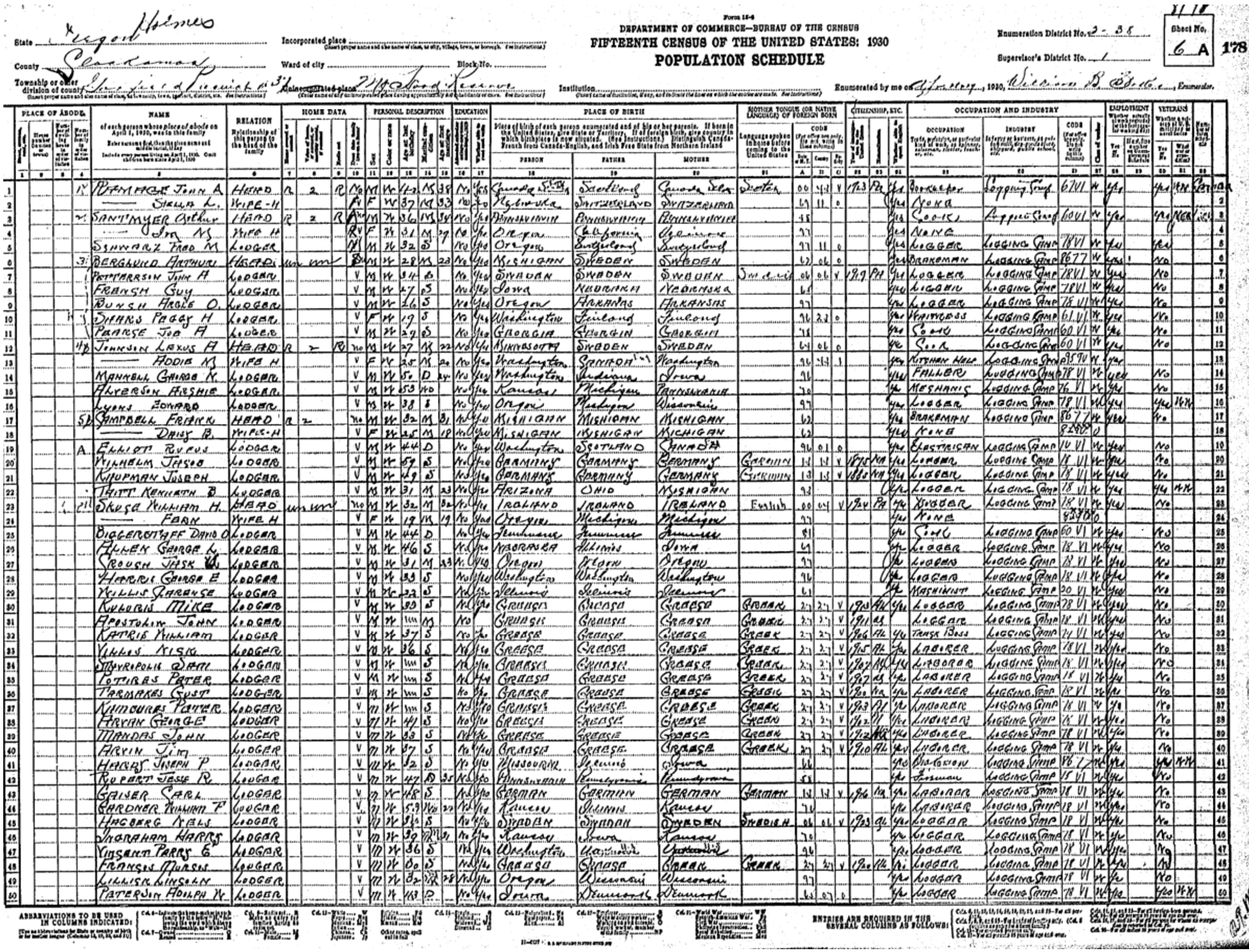
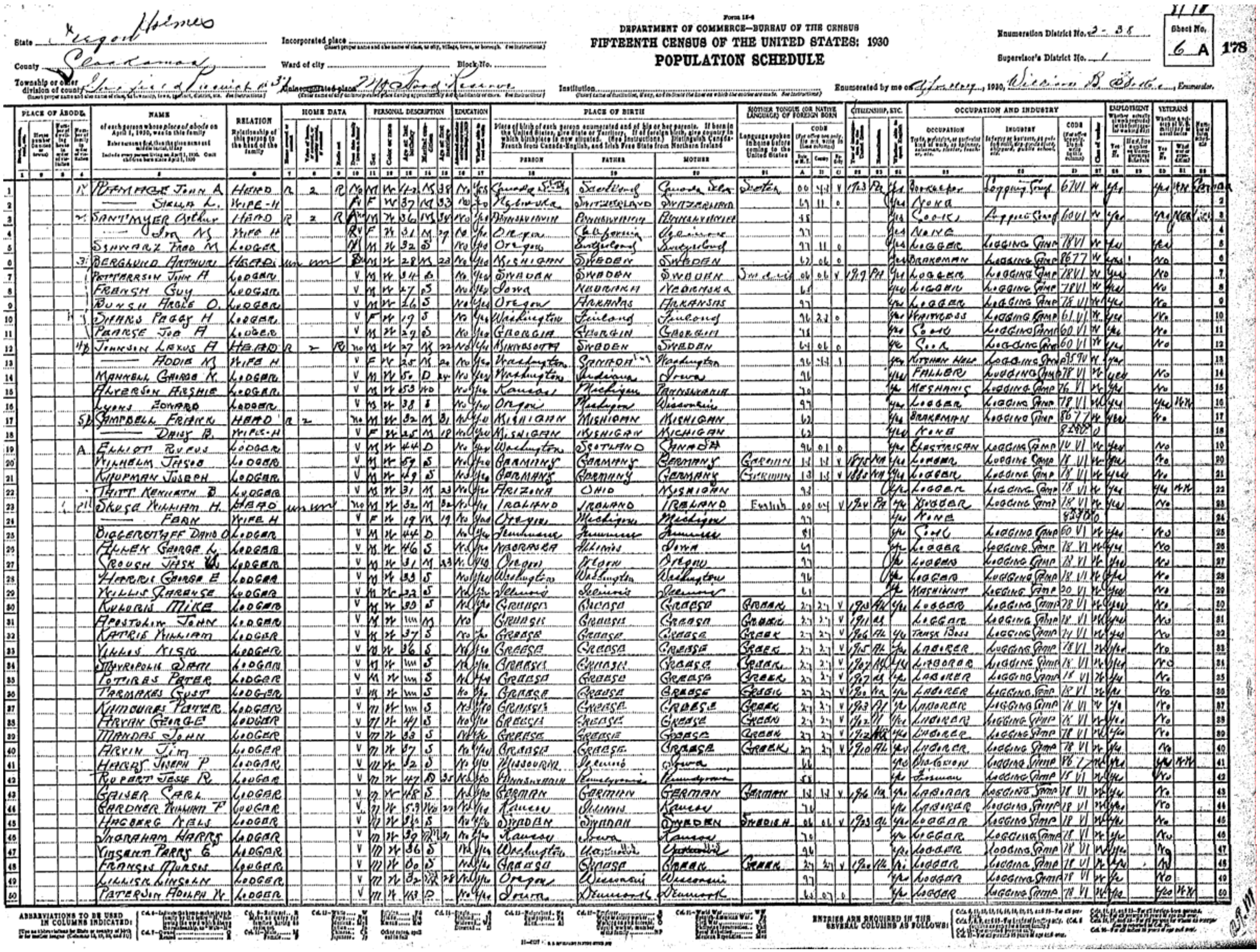

DEPARTMENT OF COMMERCE—BUREAU OF THE CENSUS
FIFTEENTH CENSUS OF THE UNITED STATES: 1930
POPULATION SCHEDULE

Figure D.1.1: Image of actual 1930 census taken at Camp 1 and Camp 2.

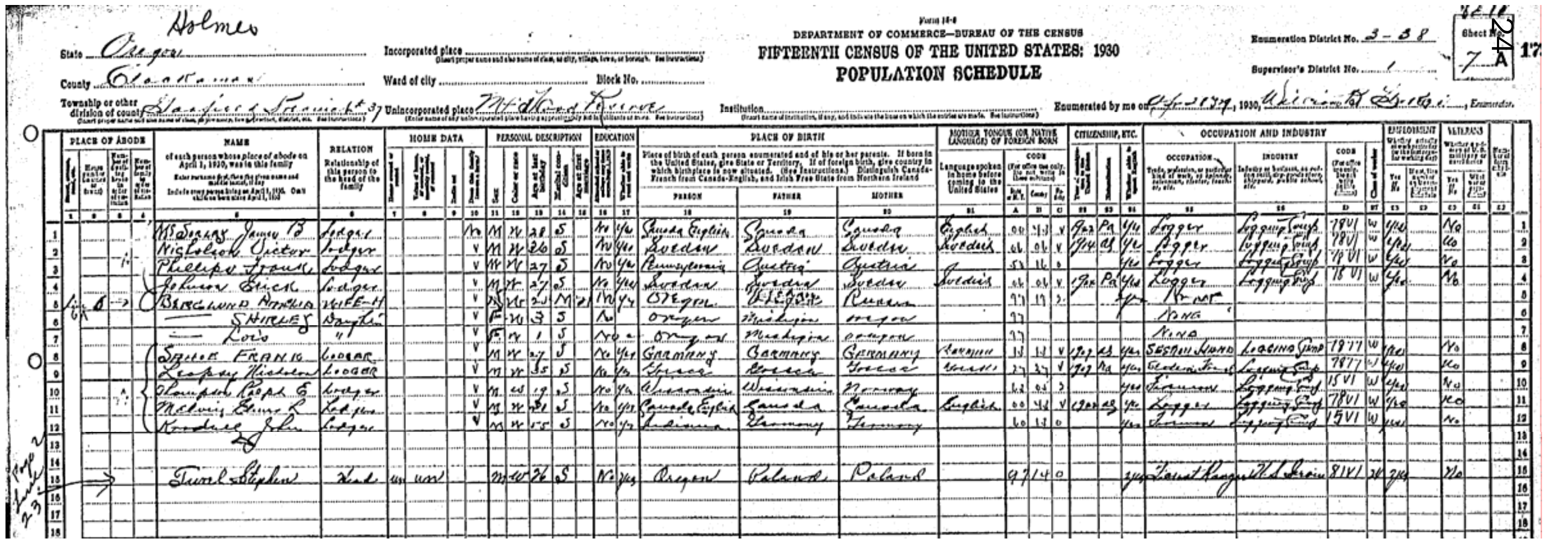


DEPARTMENT OF COMMERCE—BUREAU OF THE CENSUS
FIFTEENTH CENSUS OF THE UNITED STATES: 1930
POPULATION SCHEDULE

State: Oregon. County: Clackamas. Enumeration District No. 3-38. Supervisor's District No. 1. Sheet No. 6 A. 178. Unincorporated place: Mt Hood Reserve.

Line	Name	Relation	Sex	Color or race	Age	Marital condition	Birthplace (person)	Birthplace (father)	Birthplace (mother)	Occupation	Industry
1	Ramage John A	Head	M	W	42	M	Canada Scotch	Scotland	Canada Scotch	Bookkeeper	Logging Camp
2	— Stella L.	Wife-H	F	W	37	M	Nebraska	Switzerland	Switzerland	None	
3	Santmyer Arthur	Head	M	W	36	M	Pennsylvania	Pennsylvania	Pennsylvania	Cook	Logging Camp
4	— Ira N.	Wife H	F	W	31	M	Oregon	California	Oregon	None	
5	Schwarz Fred M	Lodger	M	W	32	S	Oregon	Switzerland	Switzerland	Logger	Logging Camp
6	Berglund Arthur	Head	M	W	28	M	Michigan	Sweden	Sweden	Brakeman	Logging Camp
7	Petterson John A	Lodger	M	W	34	S	Sweden	Sweden	Sweden	Logger	Logging Camp
8	French Guy	Lodger	M	W	27	S	Iowa	Nebraska	Nebraska	Logger	Logging Camp
9	Bunch Archie O.	Lodger	M	W	26	S	Oregon	Arkansas	Arkansas	Logger	Logging Camp
10	Shanks Peggy H	Lodger	F	W	19	S	Washington	Finland	Finland	Waitress	Logging Camp
11	Pearce Joe A	Lodger	M	W	29	S	Georgia	Georgia	Georgia	Cook	Logging Camp
12	Johnson Lexus A	Head	M	W	27	M	Minnesota	Sweden	Sweden	Cook	Logging Camp
13	— Addie M	Wife H	F	W	25	M	Washington	Sweden	Washington	Kitchen Help	Logging Camp
14	Mannell George K.	Lodger	M	W	50	D	Washington	Indiana	Iowa	Faller	Logging Camp
15	Alverson Archie	Lodger	M	W	53	Wd	Kansas	Michigan	Pennsylvania	Mechanic	Logging Camp
16	Lyons Edward	Lodger	M	W	38	S	Oregon	Michigan	Wisconsin	Logger	Logging Camp
17	Campbell Frank	Head	M	W	32	M	Michigan	Michigan	Michigan	Brakeman	Logging Camp
18	— Daisy B.	Wife-H	F	W	25	M	Michigan	Michigan	Michigan	None	
19	Elliot Rufus	Lodger	M	W	44	D	Washington	Scotland	Canada	Electrician	Logging Camp
20	Wilhelm Jacob	Lodger	M	W	57	S	Germany	Germany	Germany	Logger	Logging Camp
21	Kaufman Joseph	Lodger	M	W	49	S	Germany	Germany	Germany	Logger	Logging Camp
22	Thitt Kenneth B	Lodger	M	W	31	M	Arizona	Ohio	Michigan	Logger	Logging Camp
23	Skuse William H.	Head	M	W	32	M	Ireland	Ireland	Ireland	Rigger	Logging Camp
24	— Fern	Wife H	F	W	19	M	Oregon	Michigan	Michigan	None	
25	Biggerstaff David O	Lodger	M	W	44	D	Tennessee	Tennessee	Tennessee	Cook	Logging Camp
26	Allen George L	Lodger	M	W	46	S	Nebraska	Illinois	Iowa	Logger	Logging Camp
27	Crouch Jack W.	Lodger	M	W	31	M	Oregon	Oregon	Oregon	Logger	Logging Camp
28	Harris George E	Lodger	M	W	33	S	Washington	Washington	Washington	Logger	Logging Camp
29	Willis Clarence	Lodger	M	W	32	S	Illinois	Illinois	Illinois	Machinist	Logging Camp
30	Kukuris Mike	Lodger	M	W	30	S	Greece	Greece	Greece	Logger	Logging Camp
31	Apostolin John	Lodger	M	W	un	M	Greece	Greece	Greece	Logger	Logging Camp
32	Katris William	Lodger	M	W	37	S	Greece	Greece	Greece	Track Boss	Logging Camp
33	Villis Kisk	Lodger	M	W	36	S	Greece	Greece	Greece	Laborer	Logging Camp
34	Stavropolis Sam	Lodger	M	W	un	S	Greece	Greece	Greece	Laborer	Logging Camp
35	Potiras Peter	Lodger	M	W	un	S	Greece	Greece	Greece	Laborer	Logging Camp
36	Tarmakes Gust	Lodger	M	W	un	S	Greece	Greece	Greece	Laborer	Logging Camp
37	Kumoures Peter	Lodger	M	W	un	S	Greece	Greece	Greece	Laborer	Logging Camp
38	Arvan George	Lodger	M	W	41	S	Greece	Greece	Greece	Laborer	Logging Camp
39	Mandas John	Lodger	M	W	33	S	Greece	Greece	Greece	Laborer	Logging Camp
40	Arvin Jim	Lodger	M	W	37	S	Greece	Greece	Greece	Laborer	Logging Camp
41	Harris Joseph P	Lodger	M	W	52	S	Missouri	Illinois	Iowa	Blacksmith	Logging Camp
42	Rupert Jesse R.	Lodger	M	W	47	D	Pennsylvania	Pennsylvania	Pennsylvania	Fireman	Logging Camp
43	Gaiser Carl	Lodger	M	W	48	S	Germany	Germany	Germany	Laborer	Logging Camp
44	Gardner William F	Lodger	M	W	59	Wd	Kansas	Illinois	Kansas	Laborer	Logging Camp
45	Hagberg Nels	Lodger	M	W	34	S	Sweden	Sweden	Sweden	Logger	Logging Camp
46	Ingraham Harris	Lodger	M	W	39	M	Kansas	Iowa	Kansas	Logger	Logging Camp
47	Vincent Parry E	Lodger	M	W	36	S	Washington	Unknown	Unknown	Logger	Logging Camp
48	Francis Marcus	Lodger	M	W	60	S	Greece	Greece	Greece	Logger	Logging Camp
49	Lillick Lincoln	Lodger	M	W	52	Wd	Oregon	Wisconsin	Wisconsin	Logger	Logging Camp
50	Paterson Adolph N	Lodger	M	W	63	D	Iowa	Denmark	Denmark	Logger	Logging Camp

Figure D.1.2: Image of actual 1930 census taken at Camp 1 and Camp 2-



Line	Name	Relation	Sex	Color or race	Age	Marital condition	Birthplace (person)	Birthplace (father)	Birthplace (mother)	Occupation	Industry
1	McSorley James B	Lodger	M	W	28	S	Canada English	Canada	Canada	Logger	Logging Camp
2	Nicholson Victor	Lodger	M	W	26	S	Sweden	Sweden	Sweden	Logger	Logging Camp
3	Phillips Frank	Lodger	M	W	27	S	Pennsylvania	Austria	Austria	Logger	Logging Camp
4	Johnson Erick	Lodger	M	W	27	S	Sweden	Sweden	Sweden	Logger	Logging Camp
5	Berglund Amelia	Wife-H	F	W	[illegible]	M	Oregon	Oregon	Russia	[illegible]	
6	Shirley	Daughter	F	W	3	S	Oregon	Michigan	Oregon	None	
7	Lois	"	F	W	1	S	Oregon	Michigan	Oregon	None	
8	Sauer Frank	Lodger	M	W	27	S	Germany	Germany	Germany	Section Hand	Logging Camp
9	[illegible] Nicholas	Lodger	M	W	35	S	Greece	Greece	Greece	[illegible]	Logging Camp
10	Thompson Ralph E	Lodger	M	W	19	S	Wisconsin	Wisconsin	Norway	Fireman	Logging Camp
11	Melvin Elmer L	Lodger	M	W	31	S	Canada English	Canada	Canada	Logger	Logging Camp
12	Knudsen John	Lodger	M	W	[illegible]	S	Indiana	Germany	Germany	Fireman	Logging Camp
15	[illegible] Stephen	Head	M	W	76	S	Oregon	Poland	Poland	Forest Ranger	[illegible]

Figure D.1.3: Image of actual 1930 census taken at Camp 1 and Camp 2-continued