Chapter II. Research Methodology

Research for this project was conducted using the “method of multiple hypotheses,” first described by Chamberlin in 1890 (Chamberlin 1965) as: "the effort is to bring up into view every rational explanation of new phenomena, and to develop every tangible hypothesis respecting their cause and history." This method involves approaching a specific research question with all information available from relevant disciplines; making a reasoned answer to the question based on the weight of the gathered evidence; and then posing more specific questions that can then be asked in order to better consider the original hypothesis (see Chapter VIII).

The key premise of this research is to describe forest conditions for the study area as they existed 200 years ago, and to contrast them with current conditions in order to consider if restoration of past conditions would mitigate current risks and problems associated with catastrophic-scale wildfire. Maps and tables created from Geographic Information Systems (GIS) software are the primary formats used to compare spatial and temporal vegetation (“fuel”) distributions during that time span. Figures and text are used to illustrate and describe the earlier landscape, compare it to current conditions, and to further consider persistent vegetation patterns at a finer, more localized scale.

Principal datasets for this project include a literature review (see Chapter IX); archival records, including original General Land Office survey maps and notes (see Appendix A) and historical aerial photographs and fire lookout tower “Osborne” panoramic photographs (see Appendix B); the systematic selection of 25 "Areas of Special Interest," stratified for more specific analysis (see Appendix C); stand reconstruction field work and analysis in order to quantify basic stand development changes from ca. 1800 to the present time (see Appendix D); living memory, including memoirs, interviews, consultations, oral histories and traditional practices (see Appendix E); and a comprehensive set of GPS-referenced field photographs that detail and document current forest conditions, including persistent vegetation patterns and populations (see Appendix F).

Research for this project was conducted in four basic steps: archival research and literature review, predictive field map construction, “ground-truthing” the predictive map (field research), and synthesis. These are not discrete steps in any sense, and usually two or three were being undertaken at the same time throughout the course of this project. This is the general order in which each step was initiated, however, and a similar order as to their relative completion dates. This report represents the most recent synthesis of research findings for this project, for example, and is the final step of the four to be taken in order to complete project contract agreements.

In order to illustrate how data was used to reconstruct and depict past conditions and compare them with current findings, a selection of Abbott Butte area (one of the 25 "areas of special interest") documents and products are used throughout this chapter. The intent is to more clearly demonstrate the process of research and analysis on a step-by-step basis for readers of varying backgrounds, and for purposes of possible replication in other forested areas for which such methods might be useful.

Literature Review

Scientific and gray literatures were researched for this study. Scientific literature, including anthropological and archaeological studies, government reports, and forest science research, focused on disciplines related to studies of people, fire, and forest history specific to Douglas County and the western Cascade Range of Oregon. Gray literature included newspaper and magazine articles, local histories, journals, memoirs, and other published accounts of specific interest to this study. Literature specific to first- and second-person observations, such as ethnographic interviews, diaries, and memoirs, are considered in more detail in the "living memory" section of this chapter.

Archaeology. Scientific studies of precontact and early historical people usually fall under the anthropological headings of ethnography (e.g., Anderson 2005; Lewis 1990) and archaeology. Archaeology is the science of reconstructing the history of people by studying the physical evidence they have left behind. Three basic methods are used in western Oregon: stratigraphic excavation, radiocarbon dating, and topological cross-dating (Aikens 1975: 1). Analysis of artifacts from a site can indicate the types of animals eaten, species of wood used for fuels, approximate size of the local human population, and so on, for a given time and area. The location of specific sites is generally withheld from the public to discourage looting or other damage and, as a result, much of the related literature is also off-limits to researchers. Other problems with archaeological evidence are difficulties in assigning specific dates to artifact assemblages, the limited number and types of artifacts that don't decompose or are otherwise destroyed over time, the limited number of actual sites that have been investigated within and adjacent to the project study area, and the methods by which such sites were selected and analyzed in the first place.

Fire History. Scientific literature related to Indian burning practices and effects has increased in recent years, and this topic is covered in greater detail in Appendix D (Dubrasich 2010). The same pattern holds true for western Oregon catastrophic fire history. With the exception of the "six-year jinx" Tillamook fires from 1933 to 1951, for example, little research attention has been paid to the other "Great Fires" of the Pacific Northwest from the 1700s to the 1980s. Morris (1934) and Pyne (1982) have described these fires, but Morris' article was written nearly 70 years ago, and Pyne's book does little more than paraphrase Morris. Zybach (2003) did comprehensive research on both Indian burning practices and catastrophic wildfire history for the 1491 to 1951 time period, but his focus was limited to the Oregon Coast Range and did not consider the western Cascades. Teensma (1987) and others have done studies of tree ring scarring in attempts to reconstruct Cascadian fire histories, but these methods have proven to be of limited value for detecting landscape-scale practices that occur on a regular basis or wildfires that result in stand replacement events, and unreliable compared to actual documentation of such practices and occurrences.

Forest Sciences. Most of the scientific literature related to forestry that has been found to be useful to this research has been specific to fire history (considered separately), ethnography (also considered separately), or methodology. In this latter category are basic research methods (e.g., Chamberlin 1965; Conedra et al. 2009)), analyses of GLO survey data (e.g., Bourdo 1956; Christy et al. 2008; Powell 2008), and using GIS to display historical forest conditions (e.g., Zybach et al. 1995; Zybach 2003). A limited number of ecological studies were also found to be helpful, particularly when the focus was a specific plant type or species (e.g., Dickman 1978; Minore et al. 1979), or specific to considerations of fire history on stand development over time (e.g., Carloni 2005; Fry and Stephens 2006).

Gray literature. The review of gray (or "popular") literature review included historical studies (e.g., Walling 1884; Carey 1971), newspaper and magazine articles of current events (e.g., Braman 1987; Barnard 2010), and primary documentation, such as memoirs, journals, diaries, and correspondence (e.g., Sperlin 1931; Riddle 1993). For certain time periods and/or events, these forms of literature are the principal data used, owing largely to a lack of other sources. Individual journals kept from 1788 to 1849, for example, are the most complete and detailed records and eyewitness accounts that exist for early western Oregon history. They are important to this research primarily because they demonstrate a total lack of documentation for the study area for this important time period, and because they provide comparative information of value for other locations in the region.

Names on the Landscape. An often overlooked method of learning about a landscape's history is by systematically assembling and considering the names given to landscape features, including rivers, lakes, creeks, peaks, prairies, meadows, ponds, cities, towns, and rock formations (Zybach 2003: 61-63). By this manner, meaning can be added to the history of a landscape, and a better understanding can be gained of the people who lived there, what they valued, and why. An interesting facet of landscape names that exist within (and immediately adjacent to) the study area, is that the vast majority of the names were not given until relatively recent times -- and then date mostly to US Forest Service and other local assignments since 1906 and thereafter. Jackson Creek, for example, was named after a USFS Ranger who formerly worked in the Tiller RD and was subsequently killed by a truck in Washington State; Campbell Falls was named after another local USFS employee killed during WW II in 1944 (McArthur 1982: 117, 391), and most other names are of a similar source and/or vintage.

One result of this recent history in the naming of local landmarks is that hardly any names -- if any -- date to the time of this research, about 200 years ago, and therefore offer few clues as to the people and conditions that existed during that time. This is different from most other areas of western Oregon, western Washington, and northwest California which were better known and documented by early explorers and journalists in the late 1700s and early 1800s and still retain many of their native American names (or records of those names): such as Shasta, Coquille, Yaquina, Champoeg, Queets, and Skamokawa. By contrast, only a few names in the general study area refer at all to the people who lived there in early historical time, and most of them are not even of local origin. The exception is "Umpqua," which has historical importance, although being recently assigned to such formations as "Chief Umpqua Rock." Takelma Gorge refers to the language spoken by early historical Cow Creek band members and upper Rogue River Latgawans (see Chapter III), and is also of likely recent origin, but the few remaining Indian names are English ("Rogue"), Chinookan ("Skookum"), Iroquoian ("Squaw"), and Cherokee ("Telequa") in origin, and were brought in by white immigrants, rather than having early historical local origins.

Other landscape names have greater bearing on this research. Native animals, for example, are listed by mammals (Bear, Beaver, Buck, Cougar, Coyote, Deer, Elk, Fawn, Mink, Rabbit, and Wolf), birds (Buzzard, Falcon, Hawk, Hummingbird, Raven, and Snowbird), fish (at least six major landmarks, including Fish Lake, Fish Mountain, and Fish Creek, have "fish" in their title), bugs (Grasshopper, Littlemite, and Yellow Jacket), reptiles (Rattlesnake), and amphibians (Toad).

Of greater value are names assigned to persistent patterns or species of native plants. Surprisingly, due to its near omnipresence within the study area, only one name recognizes Douglas-fir ("Red Fir Creek"), cedar or true fir species aren't designated anywhere, "pine" only shows up twice, and comparatively rare ash, alder, and hemlock have important – but very localized – uses. More telling are the names Bunchgrass, Camas (Camas Creek is a major drainage to the north of French Junction), Huckleberry

(Huckleberry Lake and Huckleberry Gap are well-known for their historical and cultural significance), and Serviceberry. An unusual name is "Buckeye," which is used for a major creek drainage, a lake, and a large historical burn, but seemingly refers to the eastern horse chestnut tree, which doesn't exist in the study area. Nothing could be found on the background of this name, but it is possible that it was mistakenly assigned to Chinquapin trees, which have a similar spiny nut casings to horse chestnuts, and were an important local food source for native families and wildlife, and are common in the area. Persistent landscape-scale plant pattern names that offer significant interpretive value include Balds (two examples), Burns (three, including "Burnt Creek"), Glades (three), Meadows (six), and Prairies (thirteen). Nearly all of these latter names refer to plant assemblages and conditions that were human in origin and maintenance, and have persisted since earliest historical times (see Chapter IV and Appendix D).

Living Memory

Living memories are the documented eyewitness accounts and personal experiences and recollections of individuals who have lived in or visited a particular environment, experienced or participated in a noteworthy event, or have personally known others with these types of experiences. Living memory can be captured in personal journals, diaries or memoirs, via scheduled or opportunistic interviews, through recordings, informal conversations, or formal consultations. News reports, autobiographies, published journals and diaries, oral histories, and ethnographic interviews are standardized methods of documenting living memories so that information can be more widely shared or distributed. Local and regional histories, biographies, academic studies, and radio, video, and film documentaries often draw directly from these resources to develop more detailed information or insightful opinions regarding the topics they deal with.

Living memory is the general basis for oral histories, oral traditions, structured interviews (including many ethnographies), focus groups, conversations, and consultations. It is the one type of information that can be derived from dialogue with living experts and other observers (Berg 1998; e.g., Jackson 2010, Appendix E, Figure 2.01). Living memory was a primary source of data used for this study and was a critical element for interpreting, corroborating, and/or locating other sources of data. Living memory was also the most useful type of information for triangulation tests of reliability and/or validity (Hoffman 1996), in that several different knowledgeable individuals could be queried easily at any given point in time via direct meeting, email, or telephone regarding particular details, sources of information, data interpretations, and/or personal observations.

	
Susan Nonta Thomason, ca. 1870.	Chuck Jackson, July 14, 2010.

Figure 2.01 Life-long Drew, Oregon residents Susan Nonta and great-grandson Chuck Jackson.

The terms “oral histories” and “oral traditions” are often used interchangeably, despite their quite different meanings. This division has resulted partly from the differing purposes and intents of each practice, and because of differences in scientific criteria. Oral traditions tend to preserve and communicate cultural information, principally through spoken words, songs, games, and gestures, whereas oral histories explicitly attempt to preserve and communicate historical data via recorded interviews and the written transcriptions of those interviews (Zybach 1999: 29-34). Figure 2.01, for example, shows Chuck Jackson in his home in Drew, Oregon while he is participating in an oral history interview on July 14, 2010; it also shows Chuck’s great-grandmother, Susan Nonta Thomason, who was born in “a rockshelter, near Drew,” and provided Chuck with a certain amount of information regarding her own life, experiences, observations, and values via the oral traditions that were passed down through their family from her generation to his.

Oral histories are tape recorded and transcribed interviews with individuals that document living memory (see Appendix E). Sitton, Mehaffy, and Davis (1983) define oral histories as “recollections and reminiscences of living people about their past.” According to Dunaway (1996), oral histories commonly include relevant materials such as tables of contents, indexes, photographs, maps, texts, and other documents to complement interview transcriptions. An oral history, in addition to being a final product of historical research, “differs from other sources of information in that it is also a method; it requires an active collaboration between the historian who collects the information and the narrator” (Schvaneveldt et al. 1993). In oral history research, practitioners often use “triangulation” to establish the credibility of informants, and the reliability of their information (Hoffman 1996; Zybach 1999): if three (or more) sources of information can be shown to be in agreement, then the resulting conclusion can generally be assumed a “fact.” The variety of data types and methods used to develop this report are fully intended to result, whenever possible, in such conclusions.

Oral traditions. include accounts of local community and family histories and cultural beliefs that are verbally transmitted among people through stories, songs, games, myths, and other means (Nevins 1996). They have been described as unwritten knowledge passed verbally through successive generations (Vansina 1996).

Archival Research

Archival research, for purposes of this study, primarily focused on a search for historical maps, land survey notes, and photographs. Archives included the author’s personal collections, the Douglas County Museum of Natural and Cultural History, the Douglas County Surveyor’s Office, the Oregon Department of Forestry Forest History Center, the Oregon State University (OSU) Valley Library Map Room, OSU Archives, the University of Oregon (UO) Map and Aerial Photography (MAP) Library, UO Division of Special Collections and University Archive, the Umpqua National Forest (NF) Supervisor’s Office, and Umpqua NF Tiller Ranger District’s records and files. In this manner the historical maps and photographs used to develop Appendices A and B were located and assembled, and original land survey plats and field notes from 1857 to 1938; historical snapshots from 1899-1943; historical maps from 1900 to 1970;

Osborne panoramic photographs from 1932 to 1938; and aerial photographs from 1939 to 1946 were located and used to help develop both the online and the written versions of this report.

Historical Maps. Table 2.01 uses digital versions of four historical maps to show vegetation and land use patterns for the study area. Larger versions of these maps, and their legends, can be found at: http://www.ORWW.org/Rivers/Umpqua/South/Upper_Headwaters_Project/Maps
The upper left map is derived from a US Department of Interior (USDI) map of Oregon forestlands showing timber volumes (Gannett 1902; Thompson and Johnson 1900) -- the light green area, for example, represents 5,000 to 10,000 board feet per acre ("board feet" measures are in Scribner Scale, which has been in use since the Civil War to represent timber volume on commercial timberlands); the tan area represents 10 to 25 m.b.f. (thousand board feet) per acre; the pink area represents 25 to 50 m.b.f./acre, and the red area is "burnt" land. (Note that an error exists in the online legend in that the board feet and the abbreviation both show "thousand," a labeling redundancy that would erroneously produce millions of board feet per acre, if multiplied). The upper right map is derived from the 1914 Oregon Department of Forestry's (ODF) Oregon State Forester's map (Rowland and Elliott 1914), and was primarily assembled to show the great amount of forestland subjected to wildfires at that time. Red is "burned areas not re-stocking"; yellow is "burned areas re-stocking"; and green is simply "merchantable timber," which was defined as a minimum of 10 m.b.f./acre, or more, at that time. The map on the lower left was derived from a 1936 map produced by the US Department of Agriculture (USDA), showing forest vegetation types (Andrews and Cowlin 1936), including old-growth Douglas-fir. The legend for this map is shown as Table 2.02 in this chapter. The remaining map, on the lower right, is a 1936 recreation map produced by the US Forest Service (USFS) in Portland, showing trails, campgrounds, guard stations, shelters, picnic grounds, and fire lookout locations in the South Umpqua study area in use at that time. This map provides an excellent index for locating historical photographs that were taken of local landmarks during that time, such as the "Tiller Trail" or "Dumont G.S.", or Osborne panoramas taken from fire lookouts, such as Devils Knob or Little Black Rock:
http://www.ORWW.org/Rivers/Umpqua/South/Upper_Headwaters_Project/Photographs/Historical

GLO Survey Notes and Plats. Rectangular Public Land Surveys (PLS) were conducted by the USDI General Land Office (GLO) for the entire western US, beginning with Oregon in 1851 (Moore 1851). Map 1.02 and three of the four maps in Table 2.01 show the typical arrangement of six-miles apart east-to-west "township" (T. or Tsp.) lines intersecting six-miles apart north-to-south "range" lines (R. or Rng.), forming a series of 36-square mile rectangles: also called "townships." Each of these townships are further subdivided into 36 separate square mile parcels, called "sections" (S. or Sec.), each of which is given a distinctive number in a pattern identical to all other townships. Each square mile was marked with four corners by surveyors and located by (when they were available) four “bearing trees” (B.T. or BT). Figure 2.02 (Powell 2008: 2) illustrates a typical corner designated in this manner.

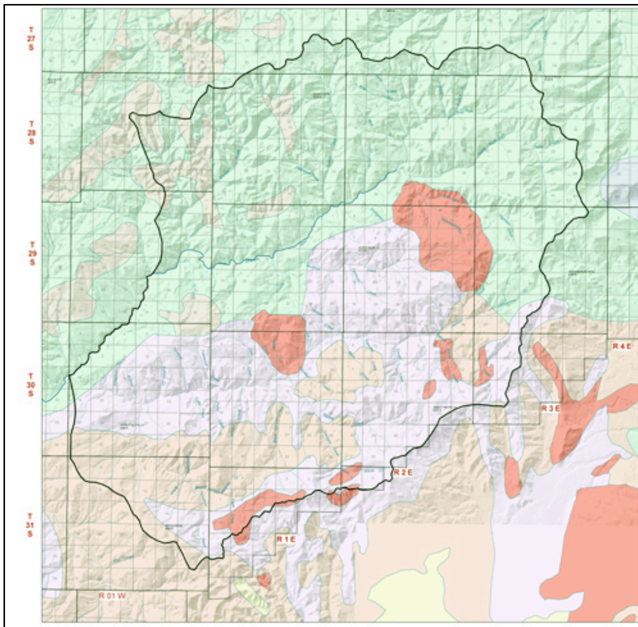
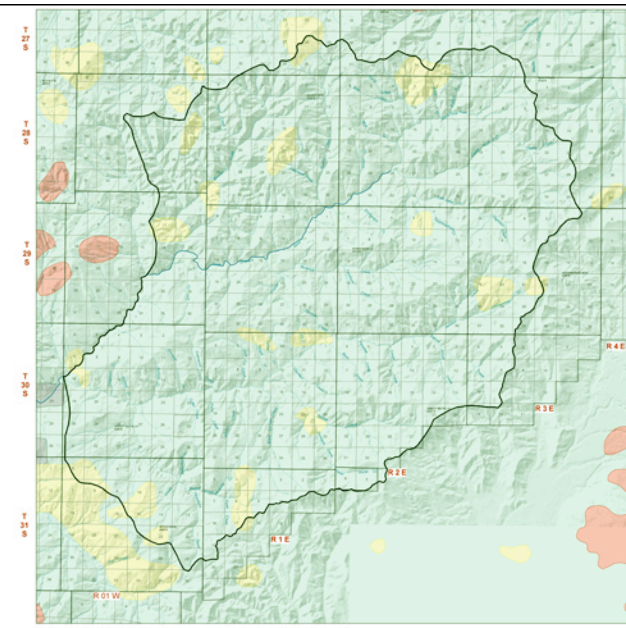
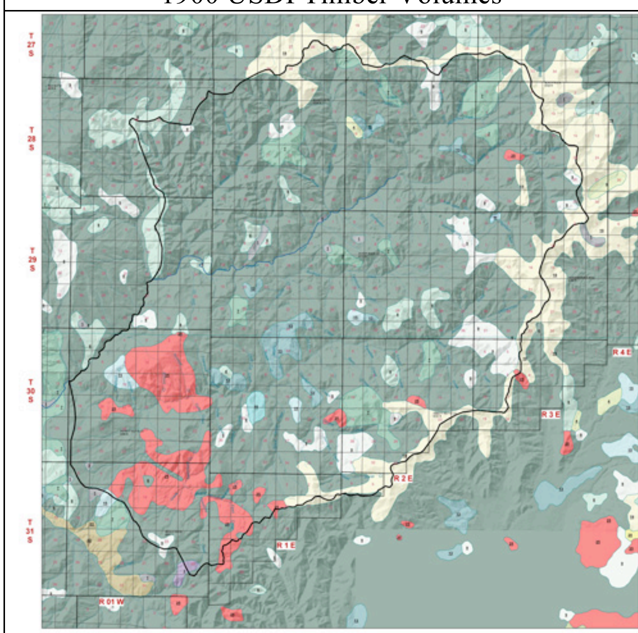
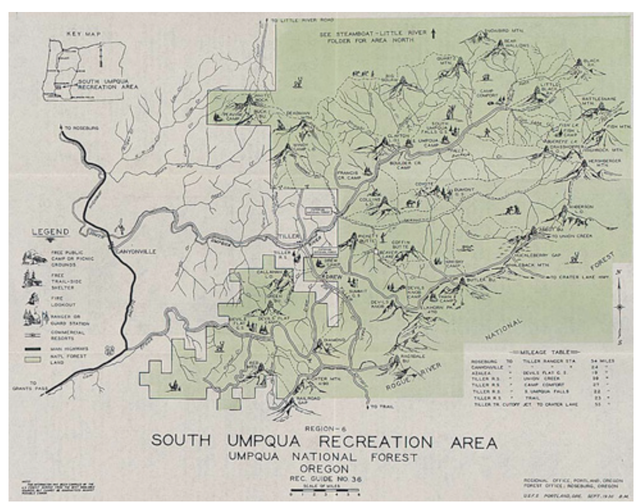
	
1900 USDI Timber Volumes	1914 ODF Fire Map
	
1936 USDA Vegetation Type	1936 USFS South Umpqua Recreation Area

Table 2.01 Historical map details, study area 1900-1936.

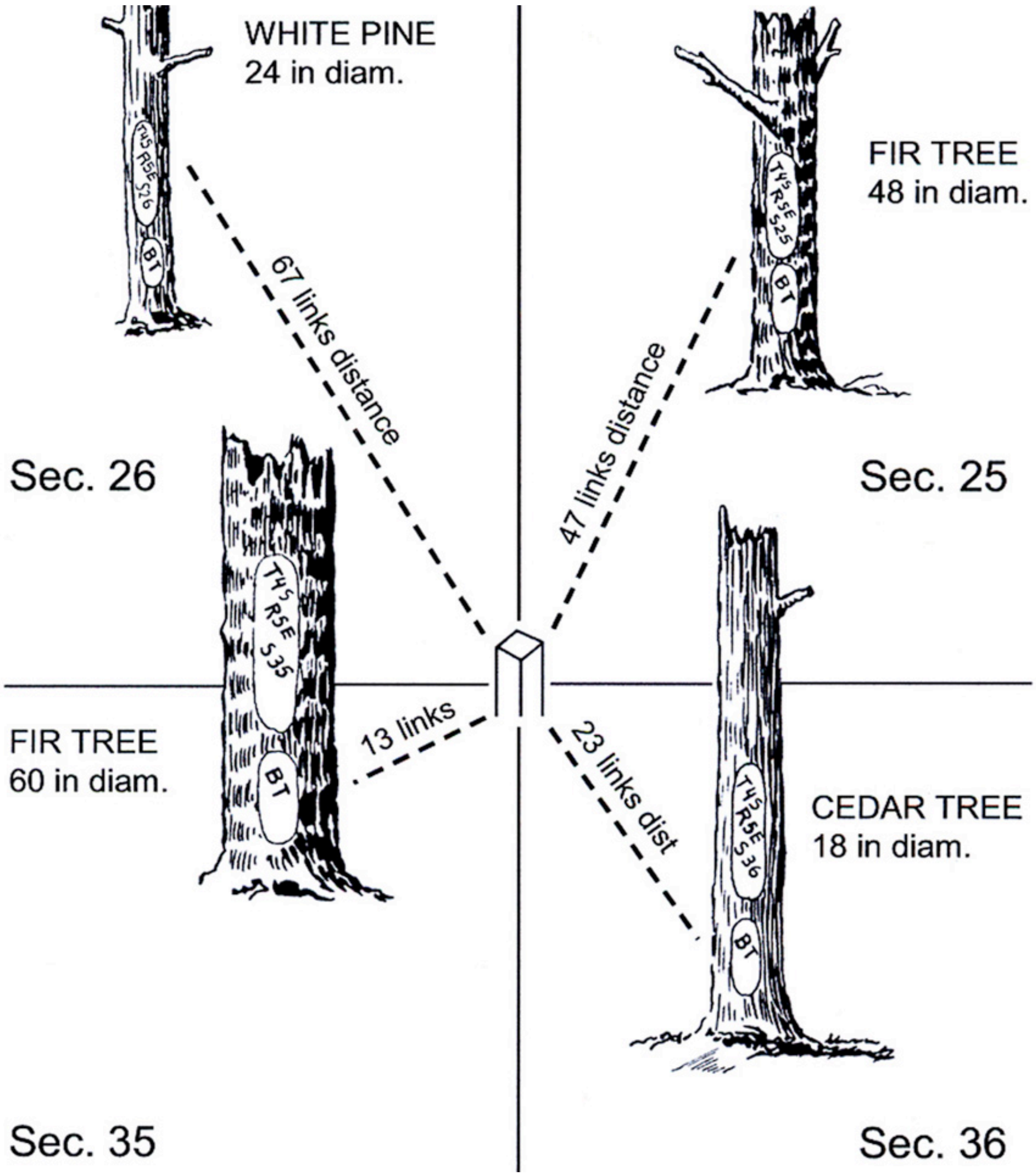


Figure 2.02 Sample GLO bearing tree diagram from a section corner (Powell 2008: 2).

In addition to establishing four bearing trees at each section corner, sections were further subdivided into quarter-sections (sometimes referred to as "quarter-secs") by establishing quarter corners with two additional bearing trees at each. Actual measurements were rarely exact (in part due to curvature of earth's surface), and some sections, townships and ranges required eventual adjustments as a result. Quarter corners were established as closely to one-half the distance between section corners as possible, given the equipment and technology of the day. Note, for example, that not all of the township lines in Map 1.02 share the same corners, and that all sections are not the same size – or even always the same shape.

GLO surveys began with the establishment of initial base lines, located for practical geographic reasons and recorded by astronomical observations. Thirty-five such base lines were established in the continental US (Stewart 1935: 74). The initial point for Oregon Territory (then including Washington and Idaho) was named the "Willamette Meridian" (W.M.), determined on June 4, 1851 (McArthur 1982: 798), in the West Hills above Portland. This location, later more permanently marked with the "Willamette Stone," was selected on the basis of landscape visibility, for the reason "that the Indians were friendly on either side of the line for some distance north and south" (Burnham 1952: 229), and because the east-west “Base Line” of the survey intersected the Columbia River in only one place, thereby further simplifying the subsequent survey process. Township lines south of this meridian are numbered consecutively and labeled as such (or “S.”), which includes most of Oregon; range lines are likewise numbered consecutively and labeled “E.” or “W.” (or “W.W.M.”, to be more precise), also dependent on their relationship to the Willamette Meridian. Therefore, Tsp. 30 S., Rng. 2 E. (Figure 2.05 and Map 2.01), for example, is the 36-square mile area located 30 township lines (180 miles) south of Portland’s Willamette Stone, and 2 range lines (12 miles) east of that point.

In addition to setting corners and marking bearing trees in the field, surveyors also kept a detailed record of each tree they marked, every distance measured, and contractually required observations as vegetation types, plant species, stream crossings, peak and ridgeline locations, and such “improvements” as trails, cabins, fence lines, ditches, fields, gardens, and orchards. These features were noted as they were encountered along a survey line and/or summarized at the conclusion of each measured mile. Survey distances were marked in “chains” (a chain is 66 feet, making 80 chains for each 5,280-foot mile), and “links” (1/100 of a chain, usually shown as a decimal, and slightly less than 8-inches in length). Figure 2.05 has been typewritten from the original field notes (Carter and Dawson 1937), shows the method in which bearing trees were described, how instruments were calibrated, and provides a summary “General Description” that was written by the surveyor at the conclusion of subdividing each township.

Map 2.01 shows the official “plat” made from the 1937 field notes of Carter and Dawson, and is also drawn to the same exacting specifications – including approved abbreviations and map symbology – that guided the field measurements and records it is based on (Moore 1851; Stewart 1935). This map has been annotated to emphasize Abbott Butte (Leiberg 1900: 309-310), the “North-South Trail,” and the

Subdivisions of T. 30 S., R. 2 E.

Chains

In order to complete the survey of sec. 6, I go to the ¼ sec. cor. of sec. 31 only, on S. bdy. of T. 29 S., R. 2 E.

Thence

N. 89° 56' W., bet. secs. 6 and 31.

Note: This location, which uses a young oak and a young Douglas-fir as bearing trees, is near a present-day quarry and the mouth of Paradise Creek. B.Z.

0.52 A point 40.00 chs. in departure from the closing cor. of secs. 5 and 6.

Set an iron post, 3 ft. long, 1 in. diam., 6 ins. in the ground, to bedrock, and in a mound of stone to top, for ¼ sec. cor. of sec. 6 only, with brass cap mkd.

¼ S 6

1937

from which

An oak, 6 ins. diam., bears S. 66° E., 51 lks. dist., mkd. ¼ S 6 B T.

A fir, 20 ins. diam., bears S. 2° W., 41 lks. dist., mkd. ¼ S 6 B T.

FINAL TESTS OF SOLAR COMPASSES

August 6, in camp, about 15 chs. West of the ¼ sec. cor. of secs. 16 and 17, at 8h 0m a.m., app. t., I set off 42° 57½' N., on the lat. arcs; 16° 43' N., on the decl. arcs; and orient the instruments with the solars; the lines of sight agree with the meridian established by Polaris observation.

At 4h 0m p.m., app. t., I set off 42° 57½' N., on the lat. arcs; 16° 37½' N., on the decl. arcs; and repeat the tests of the solars; the lines of sight agree with the meridian established by Polaris observation.

August 6, 1937.

Note: This is Cow Camp spring, at the headwaters of Paradise Creek, on the "North-South Trail" between Paradise Camp and Cougar Butte. B.Z.

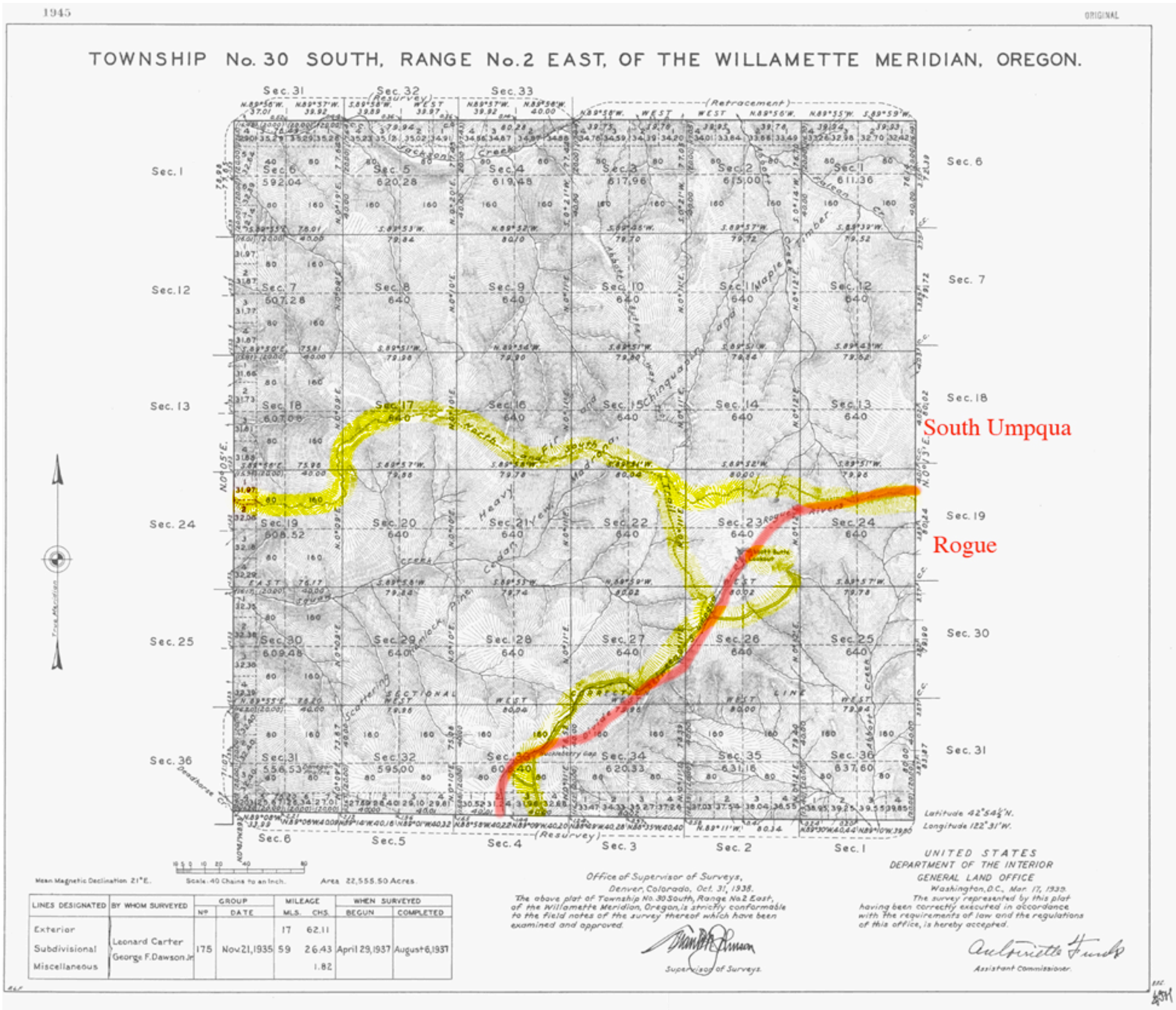
GENERAL DESCRIPTION

Township 30 South, Range 2 East, which lies in the Rogue River and Umpqua National Forests, consists, for the most part, of quite rough mountainous land. The elevation varies from about 2,250 ft. above sea level, at Jackson Creek's most westerly crossing of the N. bdy., to 6,140 ft. above sea level on Abbott Butte. The soil is a shallow, loose sandy loam or sandy clay that produces a good growth of vegetation. None of the township is adapted to agricultural purposes other than grazing, and most of it is too heavily timbered for the growing of forage plants suitable for the grazing of sheep or cattle. Practically all of the township is covered with a dense growth of vinemaple, huckleberry, rhododendron, young fir, hemlock, and cedar, manzanita, slickleaf, hazel, spiraea, syringa, willow, salal, Oregon grape, and bracken.

X Above 3,000 ft. elevation the timber is mostly, white, Noble, silver, and Shasta fir, but below this elevation the timber is predominantly Douglas fir. There are also scattering patches of hemlock, yellow, sugar, and white pine, incense and western red cedar, yew, madrona, chinquapin, and maple. A large part of this timber is of commercial size and quality, but at the present time is inaccessible.

Figure 2.03 Annotated GLO field notes, Tsp. 30 S., Rng. 2 E., August 6, 1937.

Umpqua Trail (Applegate 1891); the latter feature of which closely follows the South Umpqua and Rogue River divide that forms a portion of the southern watershed boundary of this study.



Map 2.01 Annotated 1938 GLO survey plat, Tsp. 30 S., Rng. 2 E.

GLO surveys are also known as "original land surveys," because they were officially performed and recorded by the US government and have formed the basis for all private property and government land boundaries and transactions since their completion. Most original land surveys for western Oregon were completed between 1850 and 1910, although more isolated areas (typically those without significant private property claims) were not completed until the 1920s and 1930s – including, for that reason, most of the land in the study area. This has resulted in a voluminous source of detailed information that is both quantitative and qualitative; is arranged in precise spatial components at a relatively fine scale; were made less than 100 years after American Indian resource management practices had been dramatically curtailed due to their removal by disease epidemics and European immigrants; and was – significantly -- gathered by a large number of trained surveyors operating under a single set of specific instructions (Bourdo 1956; Schulte and Mladenoff 2001). Indexed plats and survey notes for the entire study area can be found at: http://www.ORWW.org/Rivers/Umpqua/South/Land_Surveys/Index.html.

Aerial photographs. Aerial photography was first implemented in Oregon in the 1920s by such organizations as the USDA Forest Service, the Oregon State Highway Commission, and the US Soil Conservation Service. The US Works Progress Administration (WPA) assembled a good inventory of aerial photographs taken in Oregon before the summer of 1937 (Bennett and Stanbery 1937). After World War II, the availability of military aircraft and sophisticated photographic equipment and techniques developed during the war led to significant improvements in image quality and flight frequency (Spurr 1948). The University of Oregon has the most complete collection of aerial photographs available in Oregon, but businesses such as W.A.C. (Western Aerial Contractors) in Eugene and organizations such as the Forest Service maintain extensive collections that allow for the purchase and/or use of individual "site-and time-specific" sequences. Copies of aerial photographs of the entire study area, taken in 1939 and 1946, were provided by the Umpqua NF Supervisor's Office. The few missing photos in these sequences were obtained from the UO MAP Library. A selection of these photographs, annotated with named landmarks for locational purposes, can be found at: http://www.ORWW.org/Rivers/Umpqua/South/Upper_Headwaters_Project/Photographs/Aerials

Aerial photographs, are, in effect, highly detailed and time-specific maps of landscape features and patterns. Before aerial photography came into widespread use in the 1930s, people had to use maps or travel to scenic vistas to consider landscape scale patterns of vegetation and human constructs. Figure 2.04 is an annotated copy of an aerial photograph ("C1Z-30-5") from a 1939 USDA flight sequence as it passed over Abbott Butte. As noted, this photograph is of a lesser quality that subsequent aerials taken after WW II, yet it contains a remarkable amount of information regarding drainage patterns and locations, ridgeline alignments, forest and prairie areas and boundaries; even such detailed data as tree crown sizes and locations, and whether individual trees are living or dead ("snags"). A comparison of aerial photographs to mapped vegetation patterns (Table 2.01) provides excellent insights regarding the quality of map construction and content and good documentation of landscape-scale forest patterns at a given point in time.

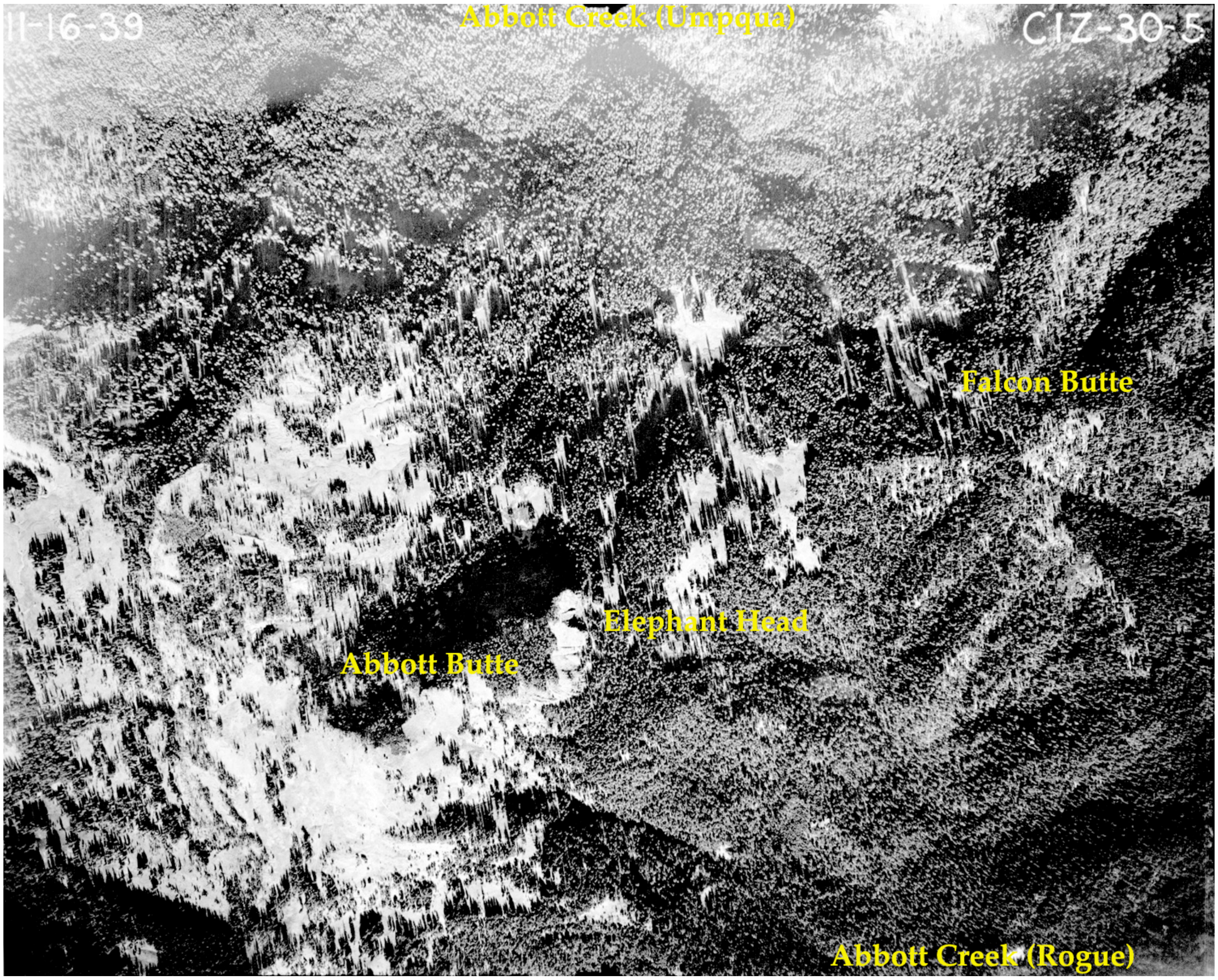
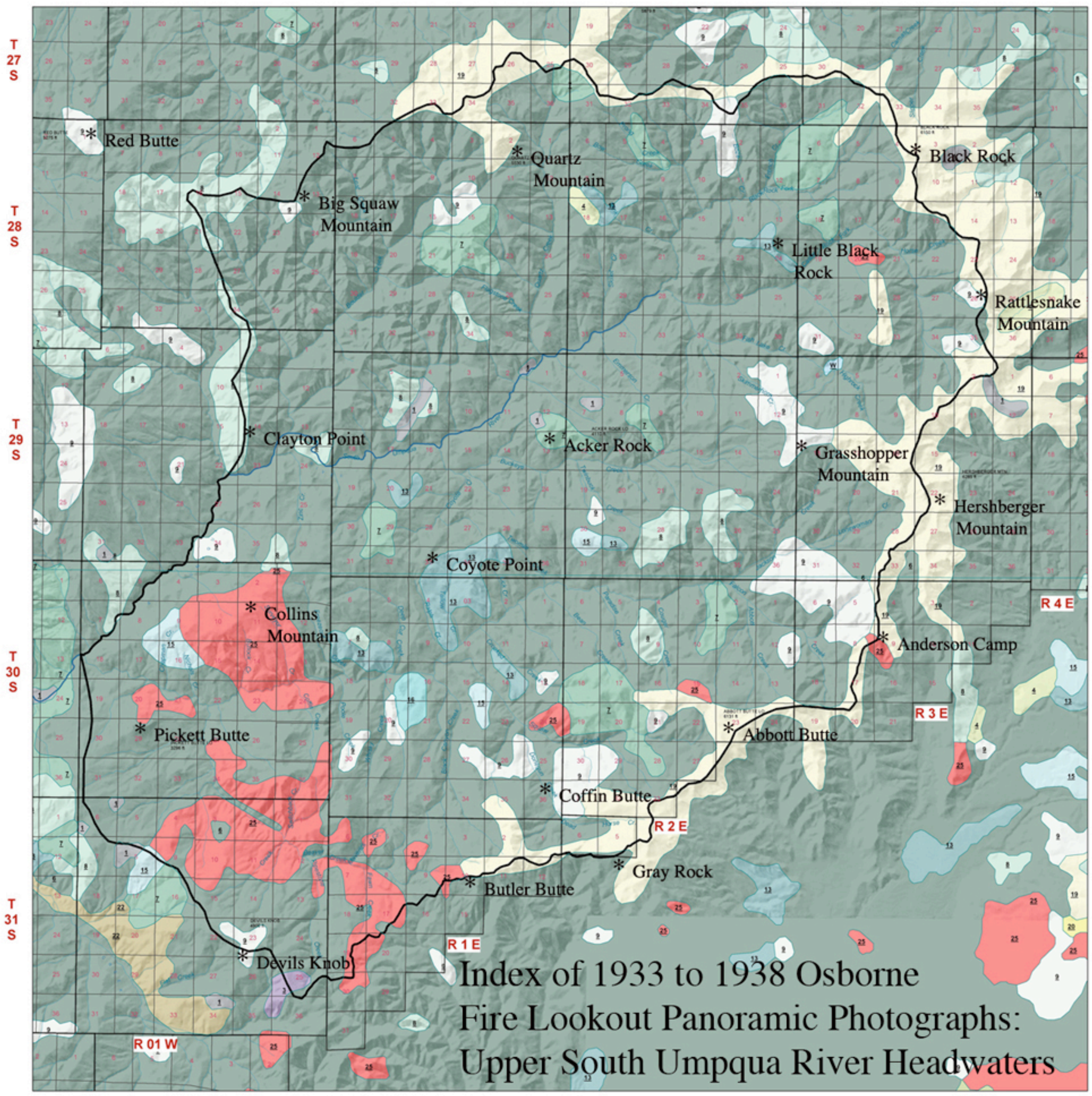


Figure 2.04 Annotated aerial photograph of Abbott Butte area, November 16, 1939.

Osborne Panoramic Photographs. William B. "W. B." Osborne pioneered the establishment and use of fire lookout stations throughout the forested areas of the Pacific Northwest in the early 1900s. His inventions included the "Osborne Fire Finder" in 1915 and the "Osborne Camera" in 1930. The camera was used to take 360-degree panoramas of the landscape from each lookout tower to aid in the location of wildfire smokes by seasonal "fire lookouts" hired by the USFS to man the towers. The cameras were specially designed to reduce spatial distortion on the edges of the photographs, and to be exactly correlated with the 360-degrees of the compass. These photographs are, in essence, highly detailed maps of the landscape created at an exact point in time (Kresek 1984; Arnst 2000).

Map 2.02 is an index of fire lookouts within the study area from which Osborne panoramic photographs were taken from 1933 through 1938; during the time that GLO survey maps were being completed for the area, and immediately prior to the creation of aerial photographs in 1939 and 1946. The combination of these three elements -- GLO field survey notes (and plats), Osborne panoramic photographs, and aerial photographs – before the post-WW II advent of major road building and logging activities, provides a highly detailed and accurate depiction of forest conditions in transition from precontact time to now.



Map 2.02 1933-1938 Osborne panoramic photo index, with 1936 USDA vegetation patterns.

The Osborne photo index is superimposed on the 1936 USDA forest type map, for which Table 2.02 provides a legend and brief discussion. Figure 2.05 provides an example of an Osborne photograph, taken in a typical south-to-northwest direction from Abbott Butte in 1933 – one of the first Osbornes ever made. The remaining Osborne photos for the study area can be found at:
http://www.ORWW.org/Osbornes_Project/River_Basins/South_Umpqua

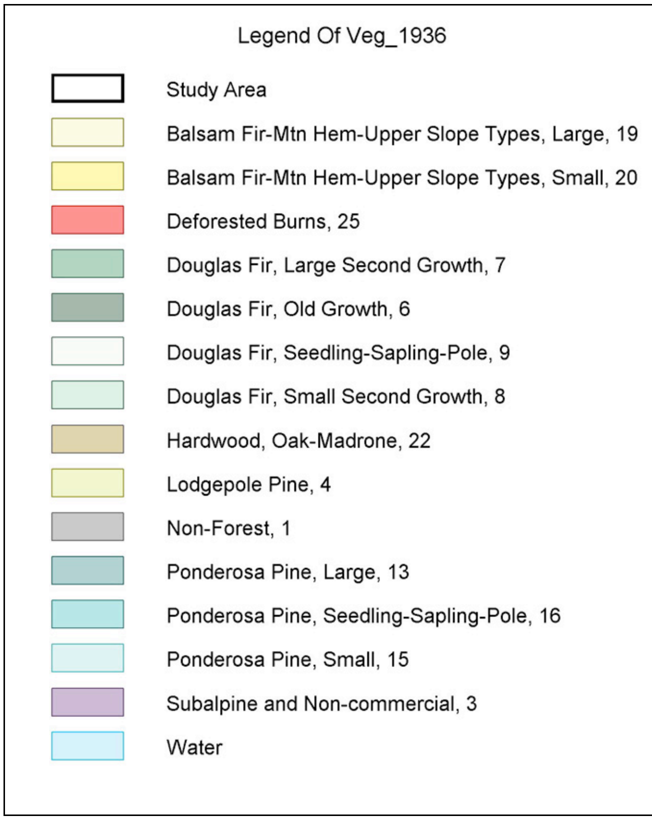


Table 2.02 1936 USDA Vegetation Type Map Legend.
(Note the overwhelming prevalence of the "Douglas Fir, Old Growth, 6" type. This map was constructed before aerial photos were taken of the study area, before GLO surveys had been completed, and before extensive logging and road building had taken place. In fact, most of the timber volume of Douglas-fir at that time was in the forms of saplings, poles, and second-growth, as shown by analysis of the subsequent data sources. Also note the extensive "Balsam Fir-Mtn Hem-Upper Slope Types, Large, 19" depicted on the eastern, higher elevation study area boundaries, and the relatively limited areas shown of "Ponderosa Pine, Large, 13.")

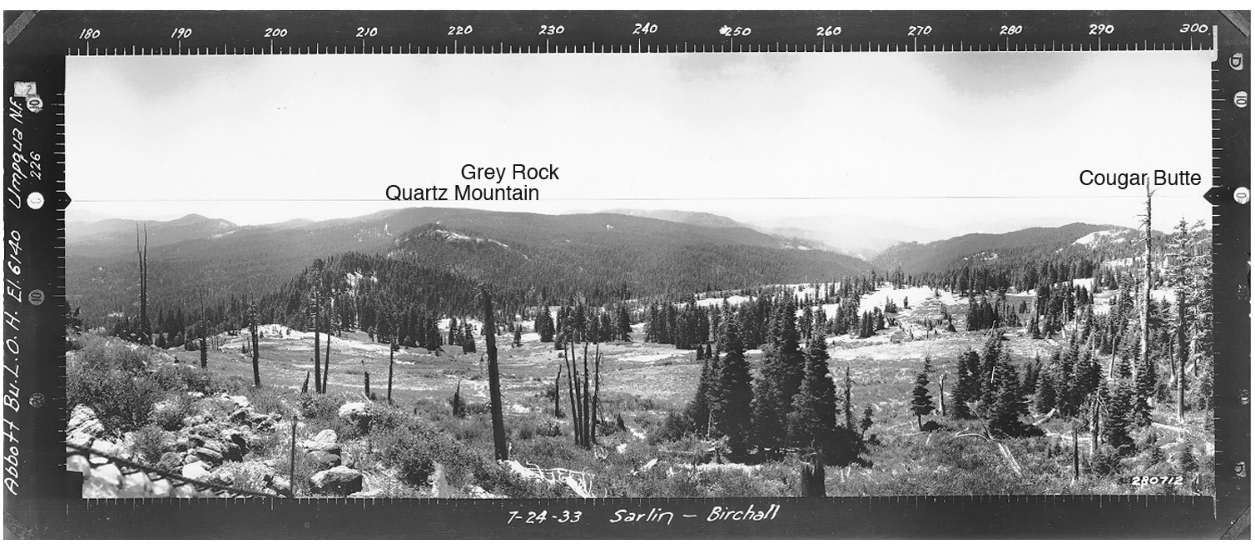
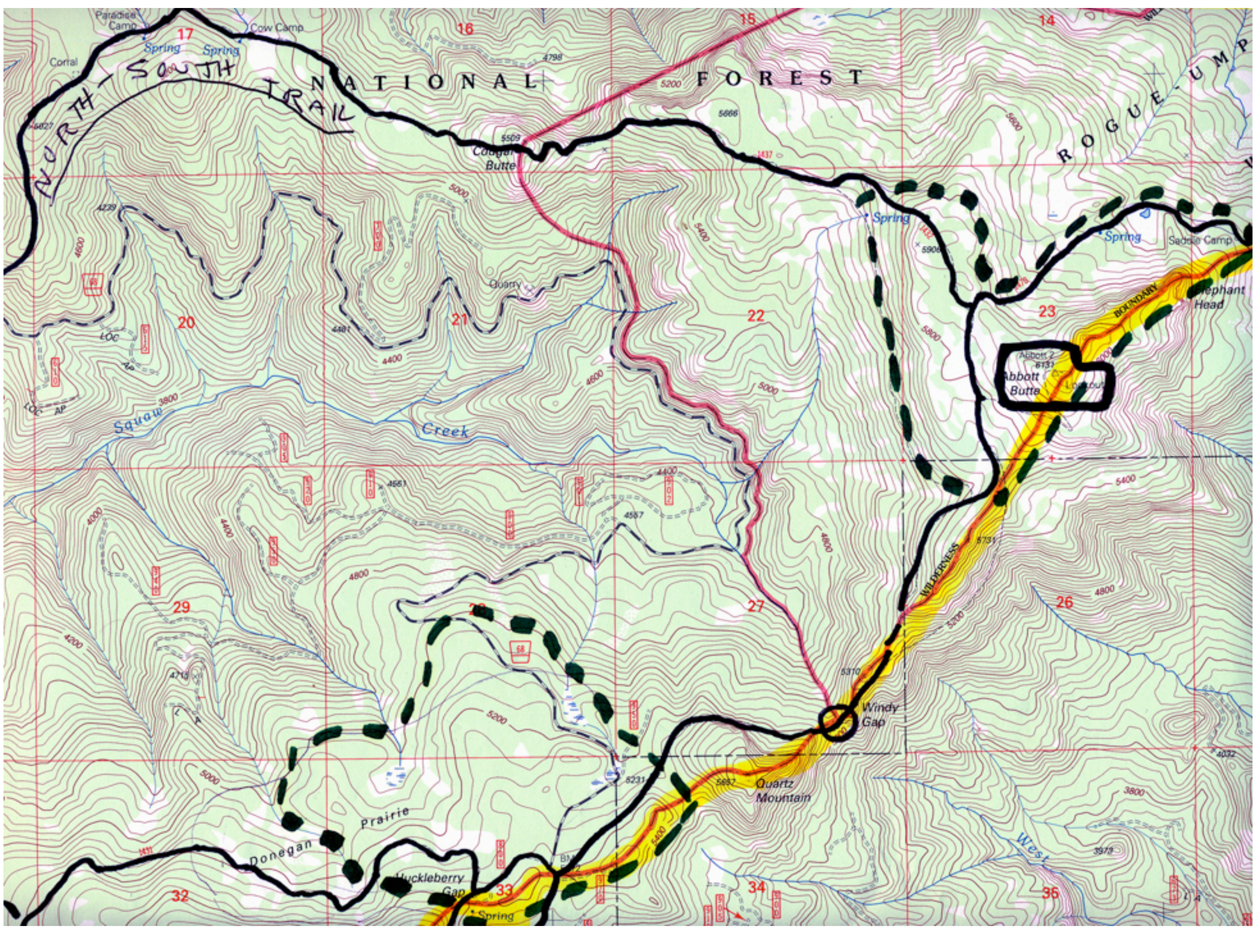


Figure 2.05 Annotated Osborne photograph of SW view from Abbott Butte L.O., July 24, 1933.

Field Research

Following (but not discontinuing) background investigations accomplished by literature review, discussions with knowledgeable individuals, and archival research, predictive maps were constructed to guide subsequent field work activities. Field work was conducted in two principal operations: a stratified sampling and measuring of tree ages, sizes, species, and distribution in select locations for the purpose of reconstructing past conditions on an individual tree-, plot-, or stand-scale (see Appendix D); and a comprehensive examination and photo documentation of current forest conditions over the entire study area for the purpose of reconstructing past conditions on a stand- and landscape-scale (see Appendix E).

Predictive Map Construction. Map 2.03 shows a sample portion of one of the 18 USGS 7.5 minute quadrangle maps of the study area used to make predictive maps for field work research purposes. Note the transcription of North-South Trail and Umpqua Trail locations from GLO data sources (Map 2.01; Applegate 1891), and the dashed lines surrounding Abbott Butte and Donegan Priairie areas.



Map 2.03 Fragment of 2010 USGS Predictive Field Map, developed from historical sources.

Predictive maps are often assembled to assist in the location of archaeological resources by using the types of methods shown and described here. For example, the names Squaw Creek, Donegan Prairie, and

Huckleberry Gap provide strong clues of precontact land use; the location of Elephant Head (an identified landmark associated with local Indian cultural and spiritual uses; see Appendix E) at the conjunction of two established ridgeline trails, and the linear distribution of named campsites and springs along those trails all point to a high likelihood of discovering lithic materials and/or cultural plant populations in those specific locations. It is the "high likelihood" (and closely related "low likelihood") designation to which "predictive" refers. And, in fact, just such evidence was readily found at each of these exact locations. The dashed lines represent more general areas of "special interest," in which it was assumed that major components of precontact forest conditions may have persisted – such things as groves of old-growth trees, "culturally-modified" pines (older trees that show evidence of having been peeled in past times to obtain cambium layers for food or medicine), fields of huckleberries, and patches of camas, iris and other cultivated food and fiber plants. Because the entire study area was more than 230,000 acres in size, and due to logistical limitations in time and resources, the decision was made to concentrate most field research activities into areas in which the greatest likelihood of positive findings might occur.

Areas of Special Interest. Table 2.03 provides a list of the 25 "Areas of Special Interest" selected for additional research focus, as illustrated on Map 2.03. Table 2.04 presents a representative photographic sampling of eight of those areas. The selection was made following discussions among project principals based on the study's research design, combined knowledge of the landscape, personal field observations, and detailed considerations of relevant historical documents; including written and oral histories, photographs, original land survey records, historical maps, and government reports.

These "Areas of Special Interest" were then systematically bordered and labeled, based primarily on geographical location, geological formation, cultural and historical significance, and vegetation type. Every effort was made to select a widely diverse group of locations that would be best representative of the entire study area. The primary research purpose of these areas is to provide a practical means to sample and test key portions of the study in greater detail so that findings might by generalized with some confidence over the entire landscape. In this manner aerial photographs, tree ring counts, direct field observations and measurements, timber cruises, tax maps and other methods can be used to more closely examine these key locations in lieu of the impossibility (because of time and resource constraints) of performing such detailed analyses over the entire study area.

Because of the intended purpose of this study -- to assemble and document precontact land use and vegetation pattern reference conditions – particular attention has been placed on selecting areas of special interest that might best represent precontact ("pre-1826") conditions, or that might contain information by which such conditions might be more readily inferred or determined; such as relict plant populations (including old-growth trees, huckleberry fields, and other persistent vegetation patterns) or archaeological remains. For that reason, selection bias was given to known and suspected seasonal Indian village sites, campgrounds, and other primary precontact destinations; such as likely hunting, fishing, gathering, trading, and/or food growing and processing sites.

Special Interest Areas	**TSP**	**RNG**	**SEC**	**USGS MAP**	**Acres**	**D**
500 **Road**	31 S.	1 W.	05-06	**Pickett Butte, OR**	257	
Abbott **Butte**	30 S.	2 E.	23	**Abbott Butte, OR**	448	
Acker **Ranch**	29 S.	1 E.	27, 35	**Acker Rock, OR**	359	01
Alder **Flats**	29 S.	1 E.	01-02	Acker Rock, OR	190	
Ash **Valley**	29 S.	1 E.	04, 08-09	Acker Rock, OR	597	
Bald **Ridges** (Rip Gut)	31 S.	1 E.	02, 10-11	**Butler Butte, OR**	877	
Beaver **Lake**	30 S.	1 W.	33-34	Pickett Butte, OR	577	
Collins Ridge	30 S.	1 W.	02, 11	Pickett Butte, OR	731	
Devils **Knob**	31 S.	1 W.	23	**Ragsdale Butte, OR**	349	02
Donegan **Prairie**	30 S.	2 E.	28, 33	Abbott Butte, OR	600	
Fish Lake	29 S.	3 E.	05-06	**Buckeye Lake, OR**	285	
Five Lakes	28 S.	2 E.	20-21	Buckeye Lake, OR	547	03
French **Junction**	27 S.	3 E.	32	**Fish Creek Desert, OR**	450	04
Grasshopper **Complex**	29 S.	3 E.	07, 18	Buckeye Lake, OR	458	
High Prairie	28 S.	3 E.	23	**Fish Mountain, OR**	251	
Huckleberry Lake	31 S.	2 E.	05	Abbott Butte, OR	436	05
Pickett Butte	30 S.	1 W.	29	Pickett Butte, OR	525	06
Pup Prairie	29 S.	3 E.	20, 28	Fish Mountain, OR	624	
Quartz **Mountain**	28 S.	1 E.	02-03	**Quartz Mountain, OR**	446	
Section 36	28 S.	1 W.	36	**Dumont Creek, OR**	640	
Skookum **Pond**	29 S.	2 E.	33	Buckeye Lake, OR	184	07
South Umpqua **Falls**	29 S.	1 E.	10-11	Acker Rock, OR	172	08
Squaw Flat	30 S.	1 E.	10-11	Butler Butte, OR	756	09
The **Forks**	30 S.	1 W.	18	**Tiller, OR**	347	
Whisky **Camp**	30 S.	1 E.	31	Butler Butte, OR	436	10

Table 2.03 List of 25 Areas of Special Interest, with legal descriptions and acreage figures.

The Special Interest Areas column has highlighted names that emphasize differences in selection criteria involving geological or geographical variations (e.g., Road, Lake, Knob, Prairie, etc.). The Tsp., Rng. And Sec. Columns provide the general legal description for each area, as determined by GLO surveys. The USGS Map column lists the individual 7.5-minute quadrangle maps used to assemble the predictive field maps, as shown on Map 2.03. Highlights are used to identify names of each of the separate maps used. The Acres column lists the general size of each Area of Special Interest. Column D lists the 10 Areas selected for more intensive plot measurements (see Appendix D).

A. Abbott Butte fire lookout tower (center, horizon).

B. Acker Ranch, Tom and Judy Coultas.

C. Collins Ridge reforestation, April 21, 2010.

D. Fish Lake, Highrock Mountain in background.

E. Huckleberry Lake, July 15, 2010.

F. Skookum Pond, April 20, 2010**.**

G. South Umpqua Falls, recreational swimmers.

H. Whisky Camp, Green Prairie forestation.

Table 2.04 Selection of 2010 field photographs showing eight research Areas of Special Interest.

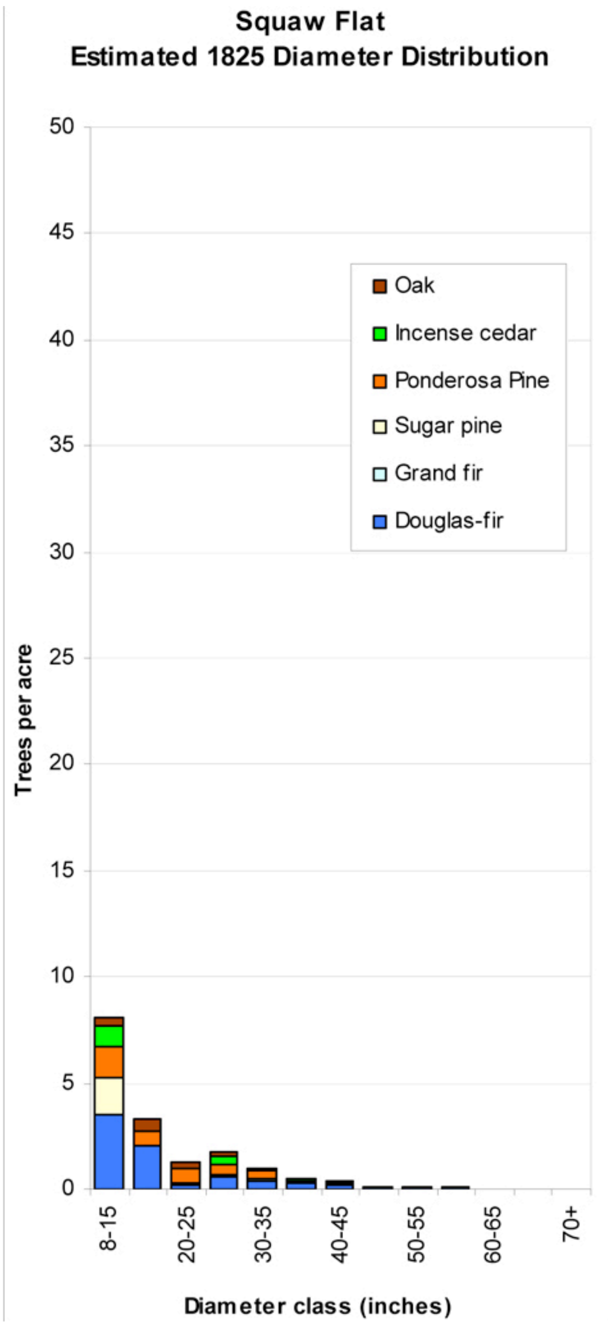
Forest Stand Reconstruction. Ten structurally complex multicohort stands were selected for more detailed field measurements and (Table 2.04). All ten stands were deemed "Areas of Special Interest" because of known early historical use, and were investigated as part of the larger study of precontact conditions in the South Umpqua headwaters. The stands were also chosen to represent a range of plant community types, from low elevation ponderosa pine/Oregon white oak to upper elevation subalpine mixed conifer. All ten stands had at least two distinct age cohorts of trees. Field work and analysis was performed by Mike Dubrasich, with occasional assistance from others (Appendix D).

Graphs were developed from field data for each of the ten areas, as illustrated by the Squaw Flat example (Figure 2.06). Squaw Flat is connected to Abbott Butte by the North-South Trail that follows the ridgeline above Squaw Creek (Map 2.03). The analytical description for this area is contained in pages 15-17 of the final report on this field work (Dubrasich 2010):

> The Area of Special Interest at Squaw Flat is a hanging plateau with gentle slopes 400 feet above Jackson Creek at approximately 2,240 feet in elevation. Today the stand is comprised mainly of Douglas-fir although Oregon white oaks and ponderosa pines are scattered throughout. Poison oak, snowberry (*Symphorocarpos albus*), ocean-spray (*Holodiscus discolor*), and Oregon grape dominate the understory, but serviceberry, camas, and bracken fern are also present.
>
> Current density is 92.7 trees per acre, and basal area is 197.2 square feet per acre. Seventy-six percent of the density and 62 percent of the basal area is Douglas-fir. Pines (ponderosa and sugar) account for 11.2 trees per acre. Ninety percent of the existing trees are less than 185 years old [see Figure 2.06].
>
> As was Pickett Butte, in 1825 Squaw Flat was an oak/pine savanna. There were only 16.6 trees per acre with as many oaks and pines (ponderosa and sugar) as Douglas-firs. Basal area was only 38.4 square feet per acre [see Figure 2.06] The understory was probably grasses and prairie plants. The anthropological evidence is abundant, indicating that human beings occupied and tended Squaw Flat for thousands of years. In the absence of that human tending a thicket of Douglas-firs has arisen. The cause has not been organized fire suppression but elimination of anthropogenic fire. Fuels loadings today threaten catastrophic fire in the future as a result.

Found in one or more of the ten stands were a variety of conifer and hardwood species including Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco), sugar pine (*Pinus lambertiana* Dougl.), ponderosa pine (*Pinus ponderosa* Dougl. ex Laws), grand fir (*Abies grandis* Dougl. ex D. Don Lindl.), Shasta red fir (*Abies magnifica* Andr. Murray var. *shastensis* Lemmon), Pacific silver fir (*Abies amabilis* Dougl. Forbes), incense-cedar (*Libocedrus decurrens* Torr.), mountain hemlock (Tsuga mertensiana Bong. Carr.), western red cedar (*Thuja plicata* Donn.), western yew (*Taxus brevifolia* Nutt.), Pacific madrone

(*Arbutus menziesii* Pursh), Oregon white oak (*Quercus garryana* Dougl.), and big-leaf maple (*Acer macrophyllum* Pursh.).



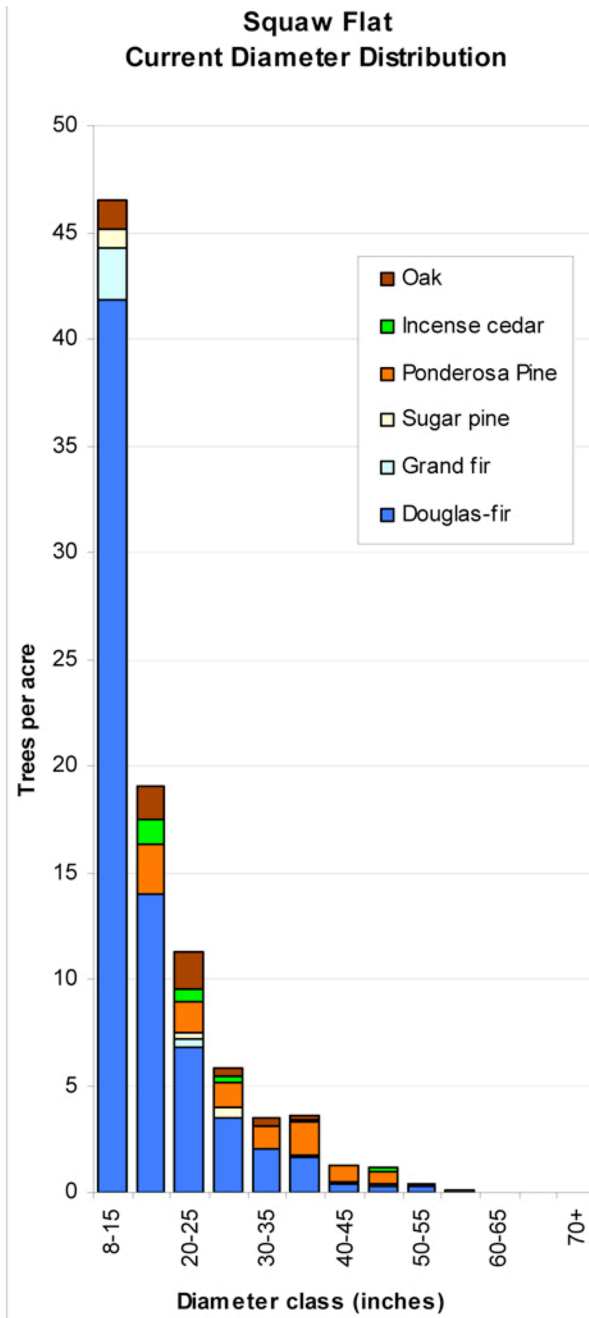


Figure 2.06 Change in Squaw Flat tree species' numbers, diameters, and ages, 1825-2010.

Although portions of some of the ten stands had been thinned or had received other treatments, only untreated areas within the stands were measured, with the exception that individual tree ages were obtained by counting rings on cut stumps in adjacent areas. Transects with measurement plots every five chains (330 feet apart) were established in each stand. Among the measurement protocols used were variable radius plots using a 20 BAF prism for trees larger than 8.0 inches DBH (diameter at breast height: approximately 4 ½ feet above the surface of the earth). Snags, duff concentrations, and fallen trees were measured and recorded, as well as live trees. Increment cores were taken to determine tree ages and diameter growth rates. Associated vegetation was observed and recorded. A total of 1,157 trees (live and dead) were measured in the stands for DBH and distance to plot center, and increment cored for the latest twenty-five-year radial growth rate. Sixty-one trees were either increment cored to the pith for breast height age, or were stumps and their rings counted to determined age. Fire scars were cored to estimate of year of the most recent fire, and earlier fire dates. Fire scars on cut stumps within stands and on adjacent logged stands were also used to estimate fire dates (see Appendix D).

Documentary Photographs. A comprehensive field examination of the entire study area was made from January through July, using digital photographic documentation methods first used and field tested by Zybach and Lapham in 2004: http://www.ORWW.org/B&B_Complex/Repeat_Photography_Grid
The principal purpose of this fieldwork was to document persistent patterns of vegetation that continued to exist in original locations since precontact times, as they can provide highly detailed information regarding precontact forest and fire history. Several native species of trees, shrubs, forbs, and grasses are useful for reconstructing precontact and early historical landscape patterns of vegetation. Trees (e.g., Douglas-fir, white oak, sugar pine) are particularly valuable for such uses for at least four reasons: 1) they are long-lived and stands of individual and mixed species have been routinely documented that are hundreds of years old, therefore the distribution and structural patterns of these stands have remained consistent from precontact time into historical time; 2) they are usually the dominant form of vegetation in a stand, are readily identifiable from a distance (therefore providing consistency in interpretation from a variety of sources, including maps, drawings, landscaped photographs, and aerial photographs), and can usually be characterized by only one or two principal species (e.g., an oak grove, a stand of Douglas-fir, or a pine woodland); 3) following death, remaining snags, logs, and stumps can persist for dozens or hundreds of years, thereby providing additional opportunities for interpretation; and 4) annual and seasonal growth is recorded in "rings," which can be used to age stands and interpret past climatic conditions. While shrubs (such as salmonberry and huckleberry), forbs (such as camas and bracken fern), and perennial grasses are not so reliable or versatile for interpretation as trees, they do form identifiable patterns across the landscape and can also persist in the same locations for decades or centuries.

Many examples of this type of persistence are provided by archaeological evidence throughout the western Oregon. One good example is provided in western Douglas County of the study area, where camas, hazel, and native cherry persists to this time (Connolly 1991: 39-41; 189-191):

> Camas, filberts, and cherry pits were identified among the charred remains of excavated ovens in Camas Valley, near the headwaters of the Coquille River in Douglas County, that were radiocarbon dated from 310 to 2430 years of age.

Table 2.05 shows a series of historical and documentary photographs take from and on Abbott Butte, from 1899 and during the 2010 field season. Note the steady influx of conifers over the past 100 years, but also the persistence of many of the prairie plants. See: http://www.ORWW.org/Rivers/Umpqua/South/Upper_Headwaters_Project/Photographs

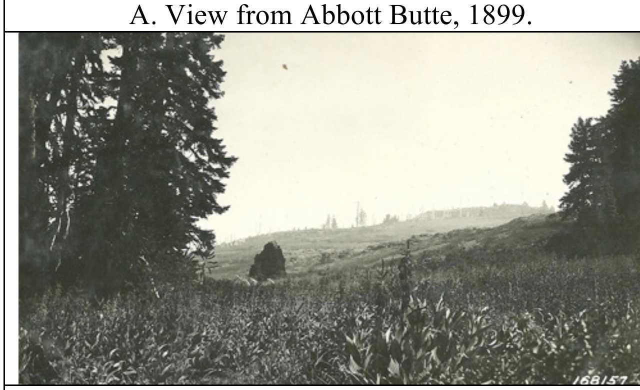
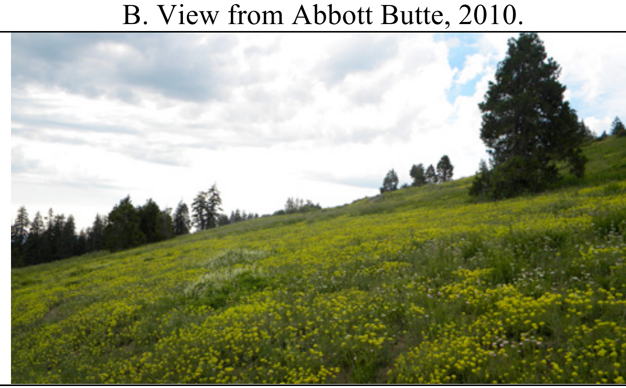
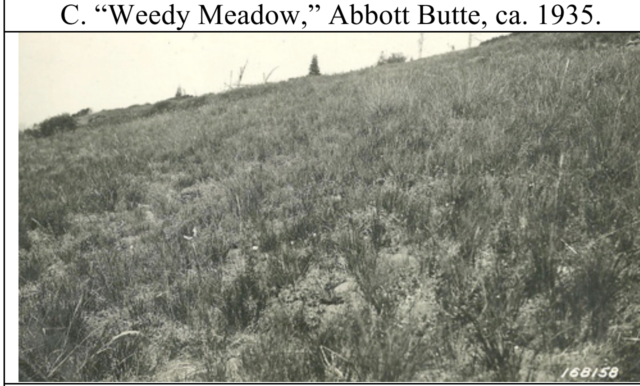
	
A. View from Abbott Butte, 1899.	B. View from Abbott Butte, 2010.
	
C. "Weedy Meadow," Abbott Butte, ca. 1935.	D. Wildflower Prairie, Abbott Butte, 2010.
	
D. Native bunchgrasses, Abbott Butte, ca. 1935.	E. Native wildflowers, Abbott Butte, 2010.

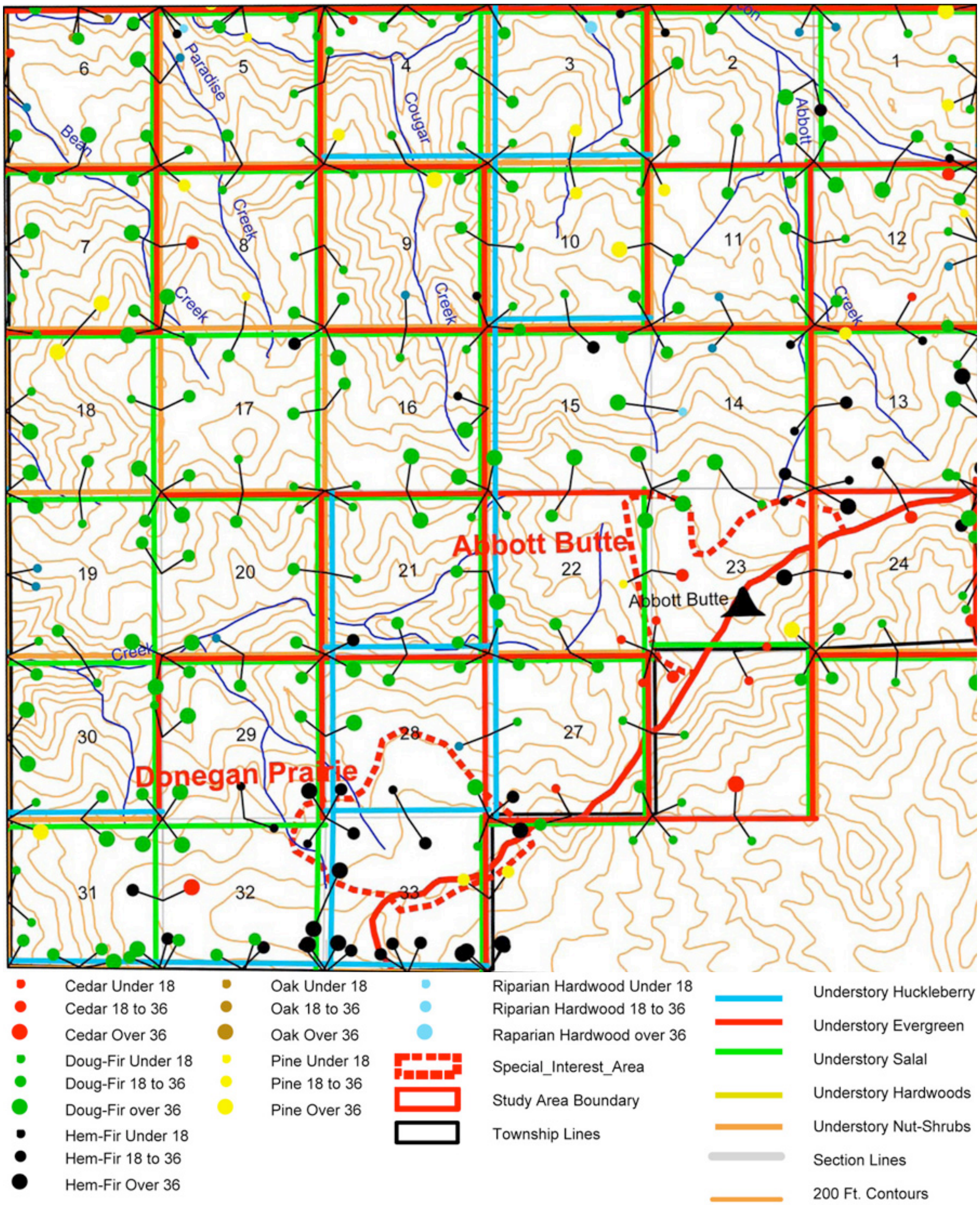
Table 2.03 Historical and documentary photographs of Abbott Butte prairie lands, 1899-2010.

GIS Synthesis

This chapter has attempted to demonstrate how (and provide examples of) principal datasets were used to develop, or "predict," descriptions of precontact forest conditions in the study area. In order to better illustrate our findings, much of this information has been put into GIS layers by the "GIS Team" at the Douglas County, Oregon, Surveyor's Office, thereby producing the majority of the maps and tables used in this report and its appendices. Map 2.04, for example, shows the types of tree species and their relative diameters of the bearing trees measured in the 1937 GLO survey of Tsp. 30 S., Rng. 2 E. (Carter and Dawson 1937). Also shown are the types of understory vegetation described in that survey, the topographical contour lines of the landscape, the geographic location of Osborne photographs, and Areas of Special Interest names and boundaries contained in the township. Map 2.05 shows the photo points in which documentary digital photographs and QTVR panoramas were made during 2010. The background is constructed from aerial photos made the year before, in 2009. All of this data is available in GIS map or tabular form, and for every township within the study area (see Appendices A and F).

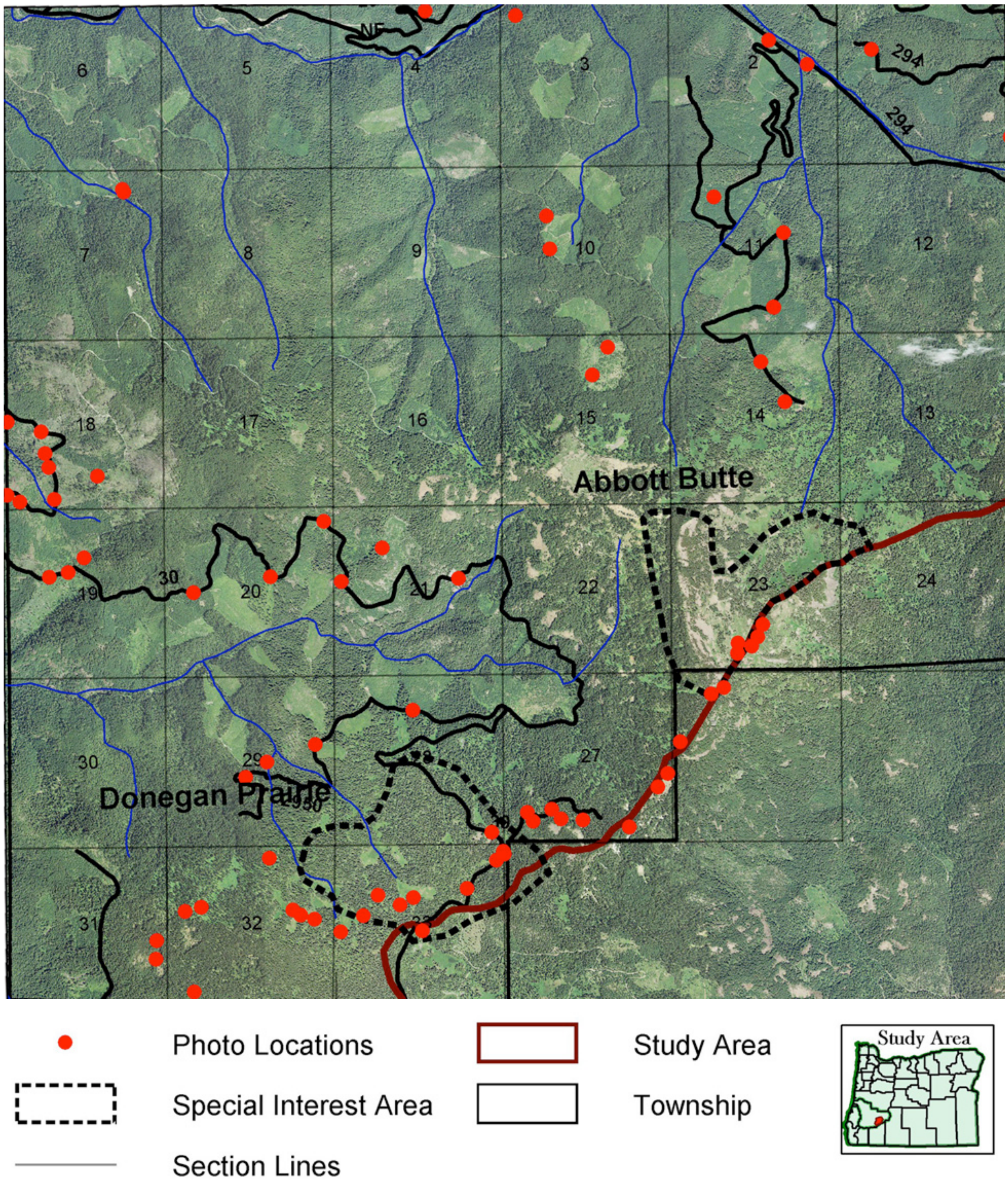
Map 2.06 is a "final product" of this study, insofar as it depicts primary trail locations and forest vegetation types for the ca. 1800 time period. See Chapters III, VI and VII for a more detailed analysis of these land use and plant distribution patterns. To illustrate how these patterns were derived, note the assimilation of details from the earlier materials represented in this chapter, including historical and documentary field photographs (Table 2.05), historical forest maps (Table 2.01), GLO land survey maps (Map 2.01) and notes (Figure 2.03), GIS-generated mapping of bearing trees and understory vegetation (Map 2.04), and field documentation and analysis of Areas of Special Interest (see Appendices C and D).

A good example of how these datasets are used to provide a final series of products comparing precontact forest conditions with the present time is provided by the "North-South Trail" segment in Tsp. 30 S., Rng. 2 E. This trail follows the route shown in the 1936 USFS Recreation Map (Table 2.01) and the 1938 GLO Map (Map 2.01); is referenced in the 1937 GLO field notes (Figure 2.03), and transcribed onto the 2010 Predictive Field Map (Map 2.03). The route shown is the eastern-most ridgeline segment from Squaw Flat to Acker Rock, both Areas of Special Interest (Table 2.03), partly because of their known use and association with precontact and early historical Indian groups (Appendix E). This trail is shown on Map 2.06 partly because of the historical references and partly because of field observations and measurements – note that it connects springs and historical campsites at Paradise Camp, Cow Camp, the headwaters of Squaw Creek, and Saddle Camp, where it connects with the ridgeline "Umpqua Trail"



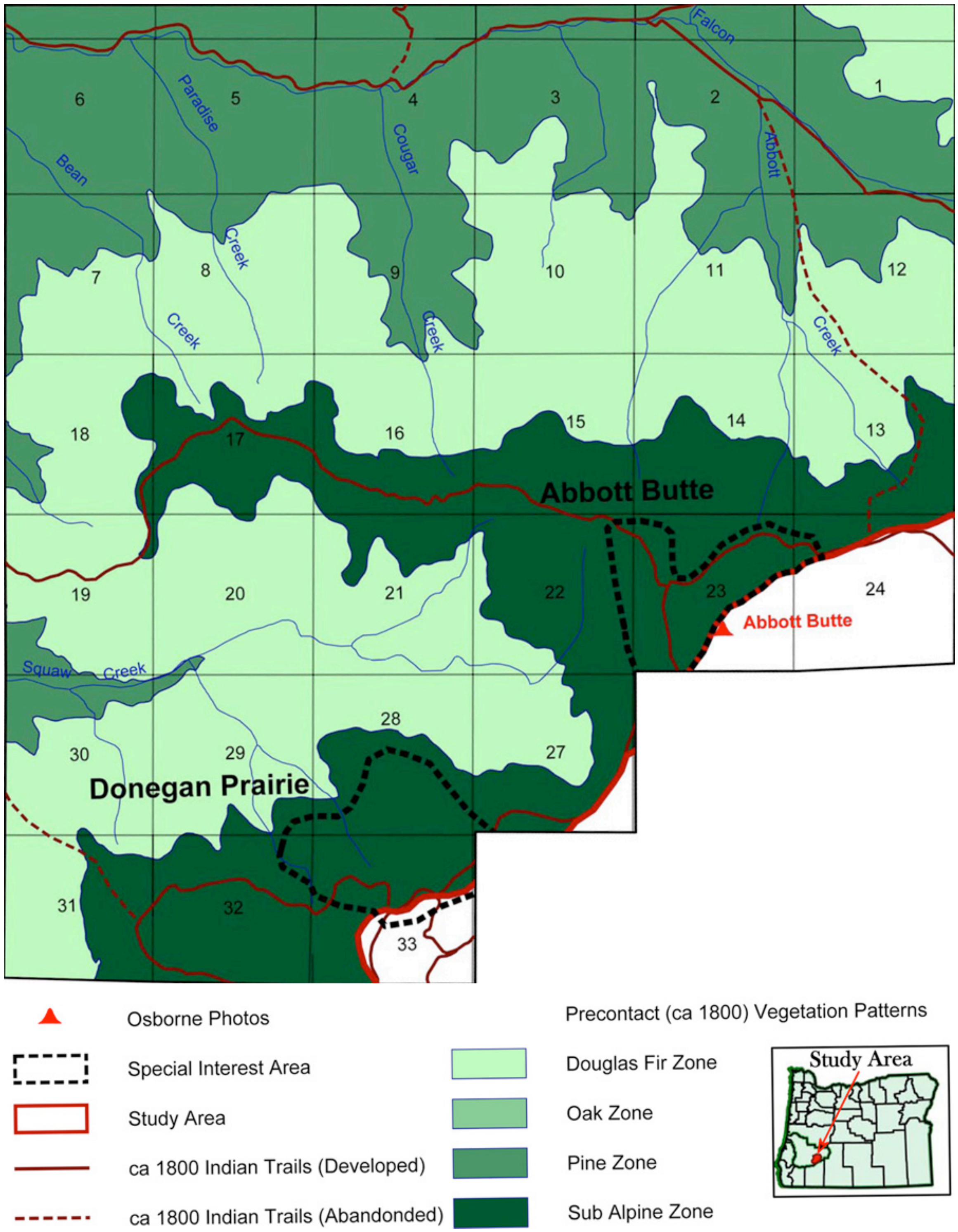
Map 2.04 GIS-generated map of GLO Bearing Trees and understory vegetation, Tsp. 30 S., Rng. 2 E.

(Applegate 1891), near Elephant Head, an important cultural and spiritual site for local Indian families (Jackson 2010: Appendix E). The Umpqua Trail, in turn, connects to spring-fed campsites at Huckleberry Gap, Neal Spring, and Huckleberry Lake (see Map 2.03), which are also known archaeological sites



Map 2.05 GIS-generated map of 2010 documentary photograph locations, Tsp. 30 S., Rng. 2 E.

(Beckham and Minor 1992; LaLande, personal communication, December 4, 2010) and traditional food gathering locations (Jackson 2010: Appendix E).



Map 2.06 GIS-generated map of ca. 1800 vegetation patterns and Indian trails, Tsp. 30 S., Rng. 2 E.

There is an anomaly along the North-South Trail and the ca. 1800 vegetation patterns that are shown, however, which relied on field observations and measurements in order to be better understood. Both the

1936 USDA vegetation map (Map 2.02) and Map 2.06 show an extension of the Subalpine forest type (see Chapter VI; Table 2.02) along the North-South Trail in a westerly direction, toward Cougar Butte in section 16. The type change from Douglas-fir to Subalpine vegetation closely follows the 5,000 elevation line, as described in Carter and Dawson's 1937 GLO survey notes (Figure 2.03: see "X" annotation). That portion of the Subalpine type that follows the Umpqua Trail through sections 13, 14, 24, 26-29, and 31-33 is clearly dominated by large, high elevation hemlock, true fir, and cedar; while the westerly-trending North-South Trail in sections 15-17 and 19-21 are almost pure Douglas-fir, many of which are small and medium diameter in 1937 (Map 2.04).

The explanation for this apparent anomaly, however, is provided by Dubrasich's analysis of the Squaw Creek area (Appendix D; Figure 2.06), historical aerial photo analysis, and field observations: The Squaw Creek ridgeline trail segment was likely a bracken fern prairie ("brake"), grassland, or huckleberry field during precontact time. Adjacent lower seed sources were probably Douglas-fir. The generally small- and medium-sized Douglas-fir that populated the area prior to the 1937 GLO field surveys were therefore a likely product of the adjacent seed sources.

In sum: by these generalized and illustrated methods of research, consultation, documentation, synthesis, and analysis, the following chapters and appendices to this report have been created.