APPENDIX B

SOUTH COUNTY

COMMUNITY WILDFIRE

PROTECTION PLAN

Table of Contents

South County Community Wildfire Protection Plan Area

AREA PROFILE

Location
The South County CWPP area stretches east and west of Interstate 5, from just north of Myrtle Creek to the County east, west and southern border. The Cities of Glendale, Canyonville, Riddle, and Myrtle Creek are within the boundary. The CWPP area also contains nine Rural Fire Protection Districts. The boundary follows Hydrologic Unit Code 6 boundaries. Please see the map on Page 3 for details.

Population
The South County CWPP area has a population of approximately 21,408 people (including City limit populations).

Housing/Land Use
Using the Douglas County Planning Department's addressing plats, there are approximately 9,014 addressed structures within the CWPP Area. The majority of these are homes, but there are also commercial and industrial structures.

The South County CWPP area includes all County zoning designations, such as RR (Rural Residential 2), 5R (Rural Residential 5), AW (Agriculture and Woodlot), TR (Timberland Resource), FG (Farm Grazing), FF (Farm Forest), PR (Public Reserve), CRC (Rural Community Commercial). For specific zoning information please see the individual Community Wildfire Protection Plans.

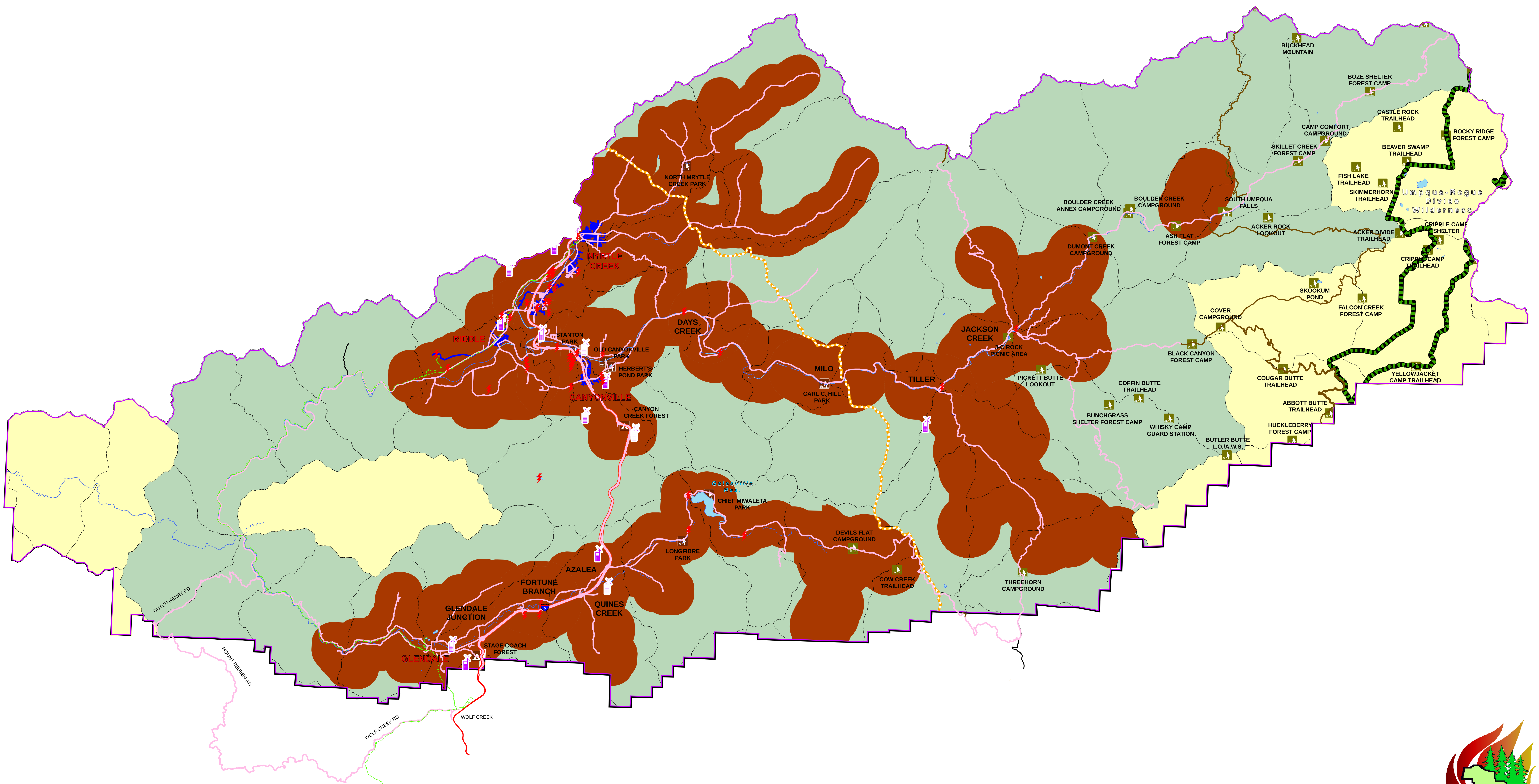
Transportation
Transportation to and from the South County CWPP is predominantly via I-5 Exits 80, 82, 83, 86, 88, 95, 98, 99, 101, 102, 103, 106 and 108.

Critical Infrastructure
Unique critical infrastructure to the South County CWPP area includes:
- BLM Tower site.
- Galesville Reservoir.
- I-5 Pass South of Canyonville.
- Lumber Mills.
- Myrtle Creek Airport.
- South Umpqua Industrial Park.
- Wooden bridge over South Umpqua River to residences and to the Milo School.

DOUGLAS COUNTY SOUTH COUNTY CWPP AREAS

- Cell Towers
- Utility Addresses
- Forest Service Recreation Sites
- County Parks
- BLM Recreation Areas
- State Parks
- Gas Lines
- Williams Pipeline Centerline
- Railroads
- Evacuation Routes
- HUC6 Boundary
- South County CWPP Boundary
- CWPPR (Resource) Boundary
- CWPP Boundary
- Existing Wildland Urban Interfaces
- Wilderness Areas (Subject to Applicable Federal Laws)

April 2011



DRAFT

Infrastructure listed as Critical to the South County CWPP area includes:

- Fire, ambulance, and police stations and equipment.
- Schools and community centers.
- Power lines/Substations.
- Industrial sites.
- Water treatment/reservoirs/well head areas/water pumping and supply areas.
- Dams.
- Railroads and railroad tunnels.
- Emergency Communication towers.
- Historical and cultural sites.
- Commercial areas of economic value to the communities.
- Gas and fuel pipelines.
- Interstate 5, Old Highway 99, and local roads deemed critical as a economic route.
- Evacuation routes.

Wildfire History

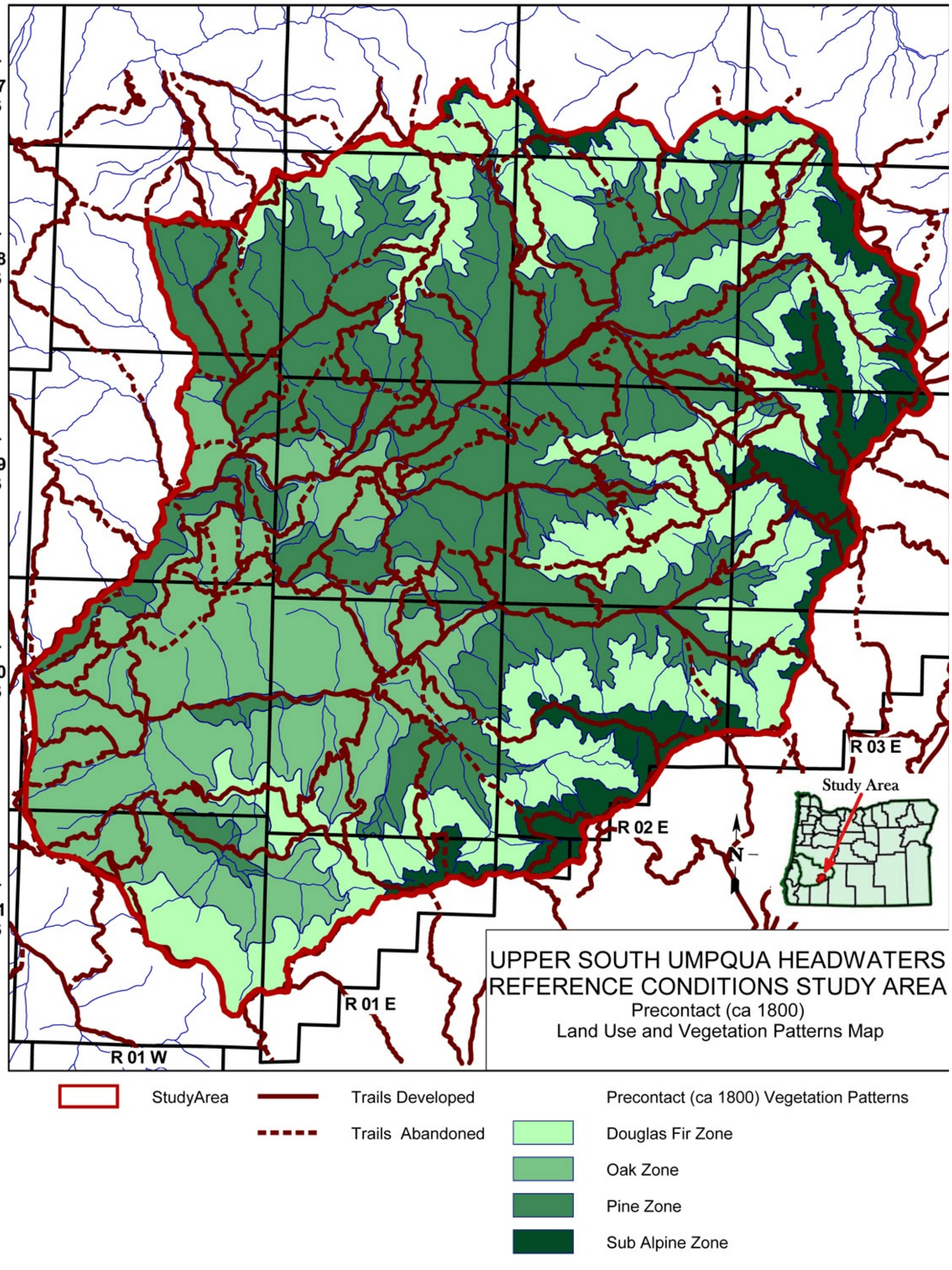
Fires are a natural part of the ecosystem in Oregon. Although a natural part of the ecosystem, wildfire is a hazard to life and property. This potential hazard to life is significant to Douglas County residents where life, property, and the economy blend together forming a way a life. Douglas County's forests play an important role in the economy, surround residents homes and businesses, and provide a setting for recreation and other activities which effect the quality of life County residents enjoy.

South Umpqua Headwaters Precontact Reference Conditions Study

The purpose of the South Umpqua Headwaters Precontact Reference Conditions Study was to produce a reliable landscape-scale description of late precontact (pre-1826; ca. 1800) reference forest conditions for the eastern portion of present-day Tiller Ranger District of the Umpqua National Forest.

The primary intended use of the Study is to enhance Community Wildfire Protection Plans. The Study was assembled from a comprehensive range of cultural, historical, and contemporary sources of information and results are displayed in a wide variety of formats -- including maps, texts, tables, photographs, video, GIS layers, and Internet -- in order to reach the broadest possible audience over time, to provide full transparency in how these materials have been interpreted, and to encourage optimum practical uses of these resources. The Study which is in the peer review process can be found on-line at http://www.co.douglas.or.us/planning/Wildfire_Plans/default_new.asp, as a Supplement to Appendix B of the Community Wildfire Protection Plan. The peer review process for the Study may result in future modifications.

The Study shows how the landscape has changed in South County over the past 100 years. Current conditions show the types of trees and vegetation are thicker and less diverse, creating a fuel loading problem in the Umpqua National Forest. The Precontact Study shows how the forest was managed (precontact) by the Cow Creek Band of Umpqua Tribe of Indians, who routinely used burning to clear areas in South County, and how the routine burning of the area produced a wider variety of plant and animal life, and reduced the threat of wildfire. The study shows a forest with tree species that are more diverse and in general typically having a smaller diameter. The following map is from the Study and shows the precontact landscape conditions.


T 27 S
T 28 S
T 29 S
T 30 S
T 31 S
R 01 W
R 01 E
R 02 E
R 03 E
N
Study Area
UPPER SOUTH UMPQUA HEADWATERS
REFERENCE CONDITIONS STUDY AREA
Precontact (ca 1800)
Land Use and Vegetation Patterns Map
StudyArea
Trails Developed
Trails Abandoned
Precontact (ca 1800) Vegetation Patterns
Douglas Fir Zone
Oak Zone
Pine Zone
Sub Alpine Zone

The study reveals the facts about the history of the area, which then lead one to conclude, that an in depth wildfire study should be the prelude to a Community Wildfire Protection Plan. The in-depth study in South County, reveals the fact the forest canopy and fuel loads have increased significantly beyond precontact conditions, creating extremely dangerous and powerful wildfire conditions. More fuel and larger diameter fuel has increased in the area, making the fires more intense.

From the Study, one can quickly draw conclusions about appropriate wildfire policy and actions which will reduce the threat of wildfire. Based on the Study, the following is a list of policies/actions which reduce the threat of wildfire in South County.

* Quickly respond to and control all wildfires.
* Quickly respond after a wildfire.
* Immediate restoration and recovery.
* Reduce fuel loads to fire resilient levels, similar to precontact conditions.
* Along roads, clear several hundred feet from the road. The current road clearing practices help but do not go far enough. This larger road buffer area is intended to give firefighters adequate time to respond when a fire starts.
* Ensure evacuation routes are protected.
* Prioritize projects from WUI boundaries outward.
* Restore Oak woodlands.

Douglas County Fires

Recent fire seasons have been the most severe in the history of Oregon. In the past 10 years, Douglas County has seen approximately 800 fires, an average of 80 fires a year.

An example of the wildfire threat Douglas County experiences, was the Tiller Complex fire. The Tiller Complex fire in the Umpqua National Forest was a 65,824-acre fire, which consisted of eight large and many small fires. The fire was on the Tiller Ranger District and in the Rogue-Umpqua Divide Wilderness Area, 25 miles east of Canyonville. Sixty-seven residences where approximately 170 people live, was threatened by the fire. In addition, the fire also threatened the lives of tourists enjoying camping and other National Forest and Wilderness Area activities.

The Bland Mountain Fires of 1987 and 2004 started less than 100 yards apart from one another and followed the same path of destruction. The '87 fire burned 10,300 acres and took two lives, while the 2004 blaze scorched 4,700 acres.

“All Lands” Approach

Douglas County faces significant challenges in protecting the Community from the threat of wildfire. Douglas County’s experience over the years in working with wildfire and planning to reduce the effects of wildfire through Community Wildfire Protection Plans has also been significant. This level of experience provides Douglas County with an understanding which is supportive of what USDA Secretary Tom Vilsack has expressed as an “All Lands” approach. The “All Lands” approach restores forest health through landscape-scale conservation which is landscape-wide across ownerships. The “All Lands” approach breaks with parochial habits of thinking and acting, and stretches across boundaries to restore forest health on landscapes we all share.

Fuel
Fuel is the material that feeds a fire, and is a key factor in wildfire behavior. Fuel is classified by volume and by type. Volume is described in terms of "fuel loading," or the amount of available vegetative fuel. Oregon, a western state with prevalent conifer, brush, and rangeland fuel types, is subject to more frequent wildfires than other regions of the nation. An important element in understanding the danger of wildfire is the availability of diverse fuels in the landscape, such as natural vegetation, manmade structures, and combustible materials. A house surrounded by brushy growth rather than cleared space allows for greater continuity of fuel and increases the fire's ability to spread.

After decades of fire suppression dog-hair thickets of trees and invasive species such as Himalayan Blackberry and Scotch Broom have accumulated. Because of these abundant fuel loads, firefighters are faced with more intense burning fires, making suppression more difficult, dangerous, and expensive.

Graphic 8-1 Fire Behavior in High Fuel Loading Area

Fire behavior in a small area that was thinned Fire burns low and on the ground.	Fire behavior in unthinned forests. Fires burn at high temperatures and reach tops of trees.

Source: Healthy Forests Initiative, http://www.whitehouse.gov/infocus/healthyforests/

Topography
Topography influences the movement of air, thereby directing a fire's course. For example, if the percentage of uphill slope doubles, the rate of spread in wildfire will likely double. Gulches and canyons can funnel air and act as chimneys, which intensify fire behavior and cause the fire to spread faster. Solar heating of dry, south-facing slopes produces upslope drafts that can complicate fire behavior. Unfortunately, hillsides with hazardous topographic characteristics are also desirable residential areas in many communities. This underscores the need for wildfire hazard mitigation and increased education and outreach to homeowners living in interface areas.

Weather
Weather patterns combined with certain geographic locations can create a favorable climate for wildfire activity. Areas where annual precipitation is less than 30 inches per

year are extremely fire susceptible. High-risk areas in Oregon share a hot, dry season in late summer and early fall when high temperatures and low humidity favor fire activity. Predominant wind directions and speed may guide a fire's path.

Drought

Recent concerns about the effects of climate change, particularly drought, are contributing to concerns about wildfire vulnerability. The term *drought* is applied to a period in which an unusual scarcity of rain causes a serious hydrological imbalance. Unusually dry winters, or significantly less rainfall than normal, can lead to relatively drier conditions, and leave reservoirs and water tables lower. Drought leads to problems with irrigation, and may contribute to additional fires, or additional difficulties in fighting fires.

Development

Growth and development in forested areas is increasing the number of human-made structures in the interface in Oregon. Wildfire has an effect on development, yet development can also influence wildfire. Owners often prefer homes that are private, have scenic views, are nestled in vegetation, and use natural materials. A private setting may be far from public roads, or hidden behind a narrow, curving driveway. These conditions, however, make fuel reduction activities, evacuation and firefighting difficult. The scenic views found along mountain ridges can also mean areas of dangerous topography. Natural vegetation contributes to scenic beauty, but it may also provide a ready trail of fuel, leading a fire directly to the combustible fuels of the home itself.

Emergency Equipment and Staffing Inventory

The South County CWPP area stretches from just north of Myrtle Creek to the east, south, and west boundaries of the County. Within this boundary there are nine Rural Fire Protection Districts, State and Federal Agencies, and the Cow Creek Band of Umpqua Tribe of Indians. The following is a staff and equipment inventory of resources available from each entity.

AZALEA RURAL FIRE DISTRICT:
15 Firefighters
1 Type 1 Class A Structural engine
1 Type 2 Class A Structural engine
2 Type 2 Water tenders
1 Type 6 Wildland engine

CANYONVILLE SOUTH UMPQUA FIRE DISTRICT:
35 Firefighters
3 Type 1 Class A Structural engines
1 Type 2 Class A Structural engine
1 Type 2 Water tender
2 Type 6 Wildland engines
1 Rescue-Salvage unit

DAYS CREEK RURAL FIRE DISTRICT:
20 firefighters
2 Type 2 Class A structural engines
1 Type 6 Wild land engine
2 Type 2 water tenders
1 Rescue Vehicle

GLENDALE MUNICIPAL / GLENDALE RURAL FIRE DISTRICTS:
15 Firefighters
1 Type 1 Class A Structural engine
2 Type 2 Class A Structural engines
2 Type 2 Water tenders
2 Type 6 Wildland engines

MILO RURAL FIRE DISTRICT:
8 firefighters
2 Type 2 Class A structural engines
1 Type 1 water tender
1 Rescue Vehicle
1 Type 6 Wildland Engine

MYRTLE CREEK FIRE DISTRICT:
40 Firefighters
4 Type 1 Class A Structural engines
1 Type 2 Class A Structural engine
2 Type 2 Water tenders
4 Type 6 Wildland engines
2 First Response Vehicle
1 Rescue-Salvage unit
1 Portable SCBA air van
1 Mobile ICP unit

RIDDLE RURAL / RIDDLE MUNICIPAL FIRE DISTRICTS:
24 Firefighters
3 Type 1 Class A Structural engines
3 Type 2 Water tenders
2 Type 6 Wildland engines
1 Rescue-Salvage unit
1 Portable SCBA air van

TILLER RURAL FIRE DISTRICT:
10 firefighters
3 Type 2 Class A structural engines
1 Type 6 Wild land engine
1 Type 2 water tenders
1 Type 3 water tenders

TRI CITY RURAL FIRE DISTRICT:
30 Firefighters
3 Type 1 Class A Structural engines
1 Type 2 Water tender
3 Type 6 Wildland engines
2 Rescue-Salvage unit

(BLM) ROSEBURG BUREAU OF LAND MANAGEMENT:
1 Type 3, 2500 gallon 2wd Engine - call # E-376
1 Type 4, 950 gal 4wd Engine - call # E-477
2 Type 6, 500 gal 4wd Engines - call #'s E-674, E-675

COW CREEK BAND OF UMPQUA TRIBE OF INDIANS:
Type 2 Tender
Type 2 Dozer

(DFPA) DOUGLAS FOREST PROTECTION ASSOCIATION:
The DFPA provides wildland fire protection on private, Municipal, County, State, Tribal, and BLM lands in the South County CWPP area. During fire season the DFPA has the following equipment staffed.

Type 6X Engine	16	2 Reserve
Type 3 Engine	3	4 Reserve
Type 2 Water Tender	1	
Type 2 Dozer W/ Transport	2	1 Reserve
Type 2 Helicopter, 300 gal. Bucket	1	

(USFS) UNITED STATES FOREST SERVICE - TILLER RANGER DISTRICT:
1 20-person hand crew
1 Type 6 Engines
2 Type 4 Engines

Evacuation Routes
In the event of a wildfire, the communities would utilize the evacuation routes found on the South County Community Wildfire Protection Plan map. Due to the number of evacuation routes, they are not listed by name in this plan. Please review the South County CWPP map on page 3 for details.

CWPP Area Identification
The 2011 Douglas County Community Wildfire Protection Plan Steering Committee concluded that the most efficient way to identify the South County CWPP area boundary was to utilize the Hydrologic Unit Code 6 (HUC6) boundaries, because they delineate major drainages which are logical firefighting control points.

The CWPP boundary identified in the South County CWPP area is defined as the HUC6 units that encompass previously identified Wildland Urban Interface (WUI) areas, the evacuation routes servicing those areas, as well as recreational areas where large groups congregate during high fire danger periods. Within the CWPP area the previously identified WUI areas are the Priority Fuel Reduction Areas. In these WUI areas there exists the greatest potential for loss of life and property because of the density of human habitation.

In addition to the CWPP boundary, there is also a Community Wildfire Protection Plan Resource (CWPPR) boundary. This boundary also uses the HUC6 boundary to delineate it and includes all lands within the county not included in the CWPP boundary. The CWPPR areas within the boundaries of the Umpqua-Rogue Divide Wilderness are subject to applicable Federal law.

MITIGATION ACTION PLAN

Within the CWPP (WUI-CWPP-HUC6 boundary)

This is the priority fuel reduction area.

Action Items:

- Clear hazardous fuels within 100' of homes, structures, and critical infrastructure areas.
- Thin 300' from structures, alongside roads, evacuation routes, and critical infrastructure. This larger road buffer area is intended to give firefighters adequate time to respond when a fire starts. Maintain all roads for fire fighting access during initial and extended attack.
- Clear hazardous fuels along escape routes within the CWPP.
- Quickly respond after a wildfire.
- Immediately begin restoration and recovery.
- Restore Oak woodlands.
- Reduce fuel loads to fire resilient levels, similar to precontact conditions.
- Prioritize projects from WUI boundaries outward.

Type of fuel reduction treatment

- Mechanical clearing and thinning in fuel reduction areas identified by the Community Wildfire Protection Plan, including harvesting, thinning, mowing, chipping, cutting and piling.
- Chemical treatment is to be done where appropriate and consistent with State and Federal Regulations.
- Prescribed burning where appropriate shall be pursued as a method of fuels reduction.
- Biologic treatment of areas (Grazing, etc.) is to be encouraged where use would be a benefit to agriculture as well as fuel reduction projects.

Structural Ignitability

Structural ignitability, defined as the home and its immediate surroundings, separates the Wildland-Urban Interface (WUI) structure fire loss problem from other wildfire management issues. Highly ignitable homes can be destroyed during lower-intensity wildfires, whereas homes with low home ignitability can survive high-intensity wildfires. Structural ignitability, rather than wildland fuels, is the principal cause of structural losses during wildland/urban interface fires. Key items are flammable roofing materials (e.g. cedar shingles) and the presence of burnable vegetation (e.g. ornamental trees, shrubs, wood piles). Source: Emerging Knowledge about Wildland immediately adjacent to homes and Urban Interface Home Ignition Potential; Jack D. Cohen, U.S. Department of Agriculture Forest Service Rocky Mountain referred to this as “survivable space”.

Action Items:

- Education of homeowners regarding reducing structural ignitability, and promotion of reduced ignitability building products and development of survivable space adjacent to their homes

- Seek assistance (technical, financial) for homeowners to replace highly ignitable building materials and thinning of burnable vegetation adjacent to homes in the South County CWPP Area.

Education

Promote existing education and outreach programs (example: Firewise Program, www.firewise.org) and develop community specific education programs which enhance and implement information on community escape routes, wildfire mitigation activities and reducing the risk to citizens, property and community values.

Action Items:

- Use and maintain the Douglas County Community Wildfire Protection Plans website for wildfire status and evacuation plans. (http://healthyforest.info/cwpp/Oregon/Douglas/)

- Identification, and public awareness of community wildfire escape routes.

- Presentations and awareness campaigns to local schools.

- Increase structural ignitability awareness and encourage replacement of flammable building materials.

Within CWPPR area boundary

Action Items:

- Clear hazardous fuels 100’ from critical infrastructure area and access/egress routes.
- Maintain all access/egress routes for fire fighting access during initial and extended attack.
- Thin 300' from structures, alongside roads, evacuation routes, and critical infrastructure. This larger road buffer area is intended to give firefighters adequate time to respond when a fire starts.
- Clear hazardous fuels along escape routes.
- Quickly respond after a wildfire.
- Immediately begin restoration and recovery.
- Restore Oak woodlands.
- Reduce fuel loads to fire resilient levels, similar to precontact conditions.

Type of fuel reduction treatment

- Mechanical clearing and thinning, including harvesting, thinning, mowing, chipping, cutting and piling.
- Chemical treatment is to be done where appropriate and consistent with State and Federal Regulations.
- Prescribed burning where appropriate shall be pursued as a method of fuels reduction.
- Biologic treatment of areas (Grazing, etc.) is to be encouraged where use would be a benefit to agriculture as well as fuel reduction projects.

The Local Rural Fire Protection District(s) hereby agree to the final contents of the South County Community Wildfire Protection Plan:

Richard H. Sohn
Chief, Azalea Rural Fire District

5/18/2011
Date

Chief, Canyonville South Umpqua Fire District

5/11/2011
Date

Kyle J. Ward
Chief, Days Creek Rural Fire District

19 MAY 2011
Date

Unavailable for Signature
Chief, Glendale Rural Fire District

6/22/2011
Date

DANNY DAHLMAN
Chief, Milo Rural Fire District

4-20-11
Date

BILL LEMING
Chief, Myrtle Creek Rural Fire District

04-20-11
Date

Jimmy Dowell
Chief, Riddle Rural Fire District

5-20-2011
Date

Kevin C Kehoe
Chief, Tiller Rural Fire District

5-23-2011
Date

Bruce A. Stimpson
Chief, Tri City Rural Fire District

4-20-11
Date

Tiller Pre-Contact Reference Condition Study

Final Report Prepared For
Resource Management Services
Roseburg, Oregon
February 14, 2011

By
Bob Zybach, PhD.
Oregon Websites and Watersheds Project, Inc.
www.ORWW.org

This project report was completed with funding authorized by Title III of the Secure Rural Schools and Community Self-Determination Act of 2007, adopted as an amendment to the Emergency Economic Stabilization act of 2008 (PL 110-343), via contractual agreements with Resource Management Services, Roseburg, Oregon, Southwest Oregon Resource Conservation and Development Council, Grants Pass, Oregon, and the Douglas County Board of Commissioners, Roseburg, Oregon;

With significant financial contributions and other resources provided by Oregon Websites and Watersheds Project, Inc., Philomath, Oregon, and NW Maps Co., Cottage Grove Oregon;

And with the cooperation and assistance of the Douglas County Surveyors Office, the Umpqua National Forest Supervisors Office, and the Cow Creek Band of Umpqua Tribe of Indians.

Tiller Pre-Contact Reference Condition Study

Executive Summary

Project Purpose

The purpose of this study is to produce a reliable landscape-scale description of late precontact (pre-1826; ca. 1800) reference forest conditions for the eastern portion of present-day Tiller Ranger District of the Umpqua National Forest in Douglas County, Oregon. The primary intended use of this information is to help update Community Wildfire Protection Plans. The findings from this study will assist Douglas County in planning for mitigation of landscape-scale fire hazards, forest restoration, cultural resource protection, and other applications in which knowledge of past forest conditions may prove useful and which have direct relevance to wildfire protection planning.

Study Area Description

The study area is in Douglas County, Oregon, on the western slope of the Cascade Mountains, and extends from the Cascade Crest at elevations greater than 6,000 feet, westward to the confluence of Jackson Creek with the South Umpqua River at approximately 1,100 feet elevation. The southern boundary of the study is the watershed line between Jackson Creek and Elk Creek and the Rogue River; the eastern boundary is the Cascade Crest; the northern boundary is the watershed line between the South Umpqua and North Umpqua rivers; and the western boundary is the South Umpqua River and the watershed line between Boulder Creek and Dumont Creek. The area is 232,000 acres in size, mostly contained within the Tiller Ranger District of the USDA Umpqua National Forest. Significant private lands also exist in the study area, with the majority of these being situated at lower elevations toward the western boundary, and primarily used for purposes of farming, ranching, or timber production. All land is located within Tsp. 27 S. to Tsp. 31 S.; and Rng. 1 W. to Rng. 3 E. (See Chapter I).

Research Methods

This study uses the “method of multiple hypotheses” as the basic framework for conducting research. 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 be asked in order to better consider the original hypothesis.

Principal datasets for this project include a literature review (see Chapter IX); original General Land Office survey notes; the systematic selection of 25 "Areas of Special Interest," stratified for more specific analysis; historical maps and other archival records; historical aerial and fire lookout tower panoramic “Osborne” photographs; oral histories and traditions; and a comprehensive set of GPS-referenced field photographs that detail current conditions. Stand reconstruction fieldwork was performed in key locations in order to quantify basic stand development changes from ca. 1800 to the present time (see Appendix B).

The basic 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 a return to past conditions could 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 distributions. Figures and text are used to illustrate and describe the ancient landscape, compare it to current conditions, and to consider vegetation patterns at a finer, more localized scale. (See Chapter II).

Human Use and Occupation

There is very little history or other information available about the people who lived in the study area 200 years ago; however, much can be inferred from what is known of neighboring Tribes of that time, the presence and extent of current and historical vegetation patterns (particularly those of traditional food and fiber plants), archaeological research, and known precontact travel and trade routes. Because people at that time did not have horses and because the South Umpqua headwaters are not navigable by canoe, travel was by foot, along well-established ridgeline and streamside trail systems. Primary destinations would have been local village sites, seasonal campgrounds, peaks, waterfalls, the mouths of streams, and various crop locations, such as huckleberries, camas, and acorns.

Trail networks indicate where people went at certain times of the year, where they stayed along the way, and where they came from (or went to). Trails connect townsites with principal seasonal campgrounds based on food harvesting and processing schedules, fishing and hunting opportunities, and trade. Freshwater springs at higher elevations were a critical element, such as Neil Spring near Huckleberry Lake or Grasshopper Spring on the border of Grasshopper Meadow. Fish runs at South Umpqua Falls, acorn harvests in the Pickett Butte area, tarweed burning at Bunchgrass Meadows, camas digging at Bear

Wallows, and huckleberry picking at French Junction would have been the types of activities and locations that would dictate where people were concentrated, and when.

Two hundred years ago, Takelma-speaking ancestors of today's Cow Creek Tribe likely occupied the lower elevations and western oak savannahs of the study area, with strong personal and family ties to local communities in the areas of present-day Tiller, Drew, and Milo. Takelmans fished the lower elevations of the South Umpqua and Jackson Creek, particularly in areas around the falls and mouths of streams, and tended crops of acorns, tarweed, camas, fawn lilies, huckleberries, salal, manzanita, and other foods on the slopes adjacent to these streams.

Southern Molalla likely occupied the ridgelines and headwater subbasins, such as the Fish Lake and Five Lakes areas. Molallans were known for elk hunting, using snowshoes and dogs, and for huckleberries. Winter villages were likely at the lower elevations of the study area, perhaps even shared with their Takelman neighbors. Summer campgrounds were likely situated along established trade routes, huckleberry fields, and sources of freshwater.

Highly probable (or possible) seasonal uses of the study area was made by the Latgawa from Rogue River to the south – most likely in the Anderson Camp, Huckleberry Lake, and Abbott Butte areas; the Klamath along the eastern ridgelines, perhaps centering on the French Junction area; Kalapuyan-speaking Yoncallans and Athapaskan-speaking Upper Umpqua from the valleys to the north and northwest; and Paiutes from the high deserts to the east. (See Chapter III).

Fire History

Because people were present in the study area on a daily basis 200 years ago, fire was also constantly present. In order to keep campfires and cooking ovens fueled, firewood and other fuels had to be systematically and regularly gathered across the landscape. Firewood gathering activities probably focused on areas closest to campgrounds, campsites, and along trail networks. Different fuels had different uses: grass, twigs, moss, and cedar for kindling; Douglas-fir and pine for heat and light; alder, maple, and vine maple for smoking; and madrone, oak, and manzanita for cooking. Patch fires were used seasonally to rejuvenate food plants, for weeding, and to create weaving materials: late winter and early spring fires were used to maintain bracken fern prairies; summer fires were used for harvesting tarweed land other seed crops; and fall burning was used to rejuvenate huckleberry fields, treat hazel clumps, and harvest acorns. Broadcast burning was performed on seasonal basis for clearing trails and underbrush, for hunting, and for creating fuels; mostly in late summer and early fall when plants were dry and before snow or heavy rains had set in. Individual and clumps of trees were burned to create logs and firewood, as hearths, and to harvest pitch.

Because intentional anthropogenic fire was a constant presence in the landscape at that time, and for thousands of years previously, vegetation composition, structure, and distribution patterns reflected the historical human uses of the landscape. Lightly-fueled areas including prairies, savannahs, and open park-like forests were established and maintained, greatly reducing the likelihood – or even possibility – of large- or catastrophic-scale wildfires. Lightning fires occurred, but they encountered limited fuels within an anthropogenic mosaic maintained by human-set fires, and hence lightning fires were constrained to burn within that established vegetation composition, structure, and distribution. (See Chapter IV).

Native Wildlife: Plants and Animals

The study area contains a wide diversity of native plants and animals typical of the western Cascades of Oregon, including the southern-most extent of Alaskan yellow cedar and northern-most extent of Shasta red fir. Although Douglas-fir currently dominates most of the study area -- with the exception of higher elevation peaks and ridgelines -- relict stands and groves of Oregon white oak, ponderosa pine, sugar pine, western redcedar, and chinquapin strongly indicate past conditions, when Douglas-fir populations were more limited and savannahs, grasslands, brakes, and berry fields were more extensive.

Significant numbers of native insects, birds, and mammals were also observed and/or documented in the study area, including elk, deer, coyotes, black bears, cougars, western gray squirrels, skunks, ruffed grouse, Canada geese, turkey vultures, frogs, butterflies, ticks, and mosquitoes. Wolves were last documented in the study area in the mid-1940s, although there is some questionable evidence they may have returned in the past few years. Other extirpated species include California condors, grizzly bears, and wolverines. The only introduced animal species noted was turkeys, and exotic invasive scotch broom, meadow knapweed, and tansy ragwort plants were observed along certain roads, trails, and landings. (See Chapter V).

Precontact Vegetation Types (ca. 1800)

Project research indicates four primary “zones” can be used to represent basic vegetation types and sub-types that existed in the South Umpqua study area 200 years ago: Oak Zone; Pine Zone; Douglas-fir Zone; and Subalpine Zone. The zones represent a west-to-east change in elevations, with the Oak Zone located to the west in the lowest elevations; the Pine Zone located more easterly, at greater elevations and along slopes adjacent to the Oak Zone; the Douglas-fir Zone adjacent to the Pine Zone on steeper lands and higher elevations; and the Subalpine Zone along the ridgelines and peaks at the highest elevations and eastern-most locations in the study area. (See Chapter VI).

Oak Zone. White oak and pine savannahs, extensive grassland meadows and prairies, and patches of Douglas-fir, redcedar, and pine typified much of the western and lower elevation (below 2,400 feet) portions of the study area 200 years ago. The presence and arrangements of these plants, as well as widespread populations of camas, cat’s ears, fawn lilies, iris, tarweed, yampah, and hazel, indicate regular systematic use of the landscape by people – most likely Takelman-speakers -- at that time. The average number of trees larger than saplings per acre was probably ten or less. Human occupation of this zone was probably year-round, with relatively large seasonal villages and campgrounds near the mouth of Jackson Creek and at South Umpqua Falls: two locations that (according to historical reports) were heavily used during times of anadromous salmonid and lamprey eel runs.

Pine Zone. The presence of ponderosa pine and sugar pine with little understory vegetation typified much of the mid-slope (2,400 to 3,800 foot elevation) areas in the study area 200 years ago. The pine zone was typically open and park-like with large, widely spaced pines; patches of oak, chinquapin, serviceberry, and hazel; scattered stands of Douglas-fir; and grassy meadows. The average number of 8-inch diameter and larger trees per acre was likely less than 20. The location and age of remnant old-growth trees indicate regular seasonal use of the pine forestlands by Takelmans from lower elevations and southern Molalla from higher elevations. The harvesting of ponderosa pine cambium in the spring and oak, sugar pine, hazel, and chinquapin nuts in the fall may have been times of most intensive occupation of this zone. Hunting for game animals with dogs by Molallans likely occurred on a year-round basis, depending on the daily and seasonal movements of deer, bear, and elk.

Douglas-fir Zone. Although Douglas-fir was present in almost every type of environment in the study area 200 years ago, it existed in nearly pure stands from 3,800 to 5,000 feet elevation, separating the lower elevation pine stands from the higher elevation subalpine vegetation types. Due to generally steep slopes, isolated location, seasonal snow, and relative lack of food plants, accessible water, and animals, this zone likely experienced the least amount of daily use and occupation by people. The densest stands of trees in the study area occurred in this zone, but they were still often (or even mostly) open and park-like with only 20 to 30 trees per acre. Grassy meadows and fern brakes also existed throughout this zone. Established ridgeline and streamside trails were regularly used by both game animals and people to reach lower and upper elevations, where food and freshwater were more available. Ridgeline trail networks that crisscrossed this zone were regularly burned to promote grassy meadows, bracken fern, beargrass, serviceberry and other food and fiber plants.

Subalpine Zone. The highest elevations of the study area (above 5,000 feet) formed an international precontact network of foot trails that connected tribes of the South Umpqua with Indian nations in California, Washington, the Columbia Basin, and beyond. This seasonal “travel zone” was covered in snow much of the year, but contained extensive fields of forbs and grasses, huckleberries, manzanita, and other berries, fruits, nuts, bulbs, edible roots, and fuels that were readily available at other times. The existence of numerous year-round springs, likely “vision quest” sites, flats, benches, and gently sloping ridgelines add further evidence of intensive year-round and seasonal use; particularly by southern Molallan hunters, who used dogs and snowshoes to hunt elk and other prized game animals throughout the Umpqua and Rogue River headwaters. In late summer and early fall, other Tribes undoubtedly visited these lands to hunt, trade, socialize, harvest huckleberries and beargrass, and to move trade goods along the landscape. Takelmans from lower elevations likely gathered at Huckleberry Lake, Big Squaw Mountain, and Quartz Mountain, among other locations, during summer and fall; Takelma-speaking Latgawans probably used Huckleberry Lake, Anderson Camp, and Hershberger Mountain areas as well. Klamaths likely moved slaves and other trade goods along the eastern ridgelines, following the Klamath Trail to campgrounds in the Black Rock and French Junction areas, before heading north along Camas Creek into the North Umpqua Basin, or south into the Rogue River basin. It is also possible that Paiutes from the east, Upper Umpquas from the north, and Kalapuyan-speaking Yoncallans from the northwest also entered the area at these times; also possibly for reasons of trade, harvesting of favored crops, spirit quests, or simply visiting friends and relatives. This area has the most extensive fields of prized huckleberries in the South Umpqua headwaters, which also contained scattered trees; principally Douglas-fir, incense-cedar, hemlock, and Shasta red fir. (See Chapter VI).

Subbasins

Two hundred years ago, transportation routes and vegetation types were in place in accord with subbasin drainage patterns and elevations. As a result, anthropogenic burning patterns often conformed to subbasin boundaries and ridgeline trail networks. There were seven primary subbasins described in this study: Jackson Creek (101,995 acres); Boulder Creek (31,522 acres); Castle Rock Fork (27,212 acres); Buckeye Creek (25,573 acres); Black Rock Fork (20, 576 acres); Quartz Creek (16,560 acres); and Zinc Creek (8,893 acres). In turn, Jackson Creek, the largest subbasin, could reasonably be subdivided into smaller subbasins: Beaver Creek; Whisky Creek; Squaw Creek; Upper Jackson Creek; Tallow Creek; and Collins Ridge. (See Chapter VII).

Conclusions

1. Two hundred years ago, vegetation types in the South Umpqua headwaters consisted of prairie and meadow grasslands, oak savannahs, park-like pine woodlands, brakes, berry patches, stands and patches of Douglas-fir forestlands, and high elevation shrublands and patches of mixed conifers.

2. Since 1825, the measured density (trees per acre) and basal area of representative South Umpqua headwater forests have increased more than five-fold. In these same stands, tree biomass has accumulated from 10 to 20 times more than they had held 200 years earlier. (See Appendix B).

3. Relative proportions of tree species have also changed significantly over the past 200 years. In late precontact time, pines and oaks were the dominant tree species below 3,800 feet elevation. Today, Douglas-fir, grand fir, and incense-cedar are the most prevalent species; particularly in younger age classes. Pacific silver fir has invaded higher elevation subalpine shrublands since late precontact time, and Douglas-fir, hemlock, and cedar have also become more common in these locations.

4. There has been a significant decrease in daily and seasonal occupation and use of the study area by people from late precontact time to the present. Related decreases in daily and seasonal hunting and fishing, plant harvesting, systematic firewood gathering, and fire use have been contemporaneous.

5. Precontact human influences on the vegetation were significant. In particular, human-set fire played a primary role in the development and maintenance of landscape-scale patterns of forests, woodlands, savannas, grasslands, brakes, trail networks, and shrublands.

6. The elimination of anthropogenic fire and other traditional human influences over the last past 200 years is the key factor that has altered forest conditions during that time. Grazing, logging, tree planting, fire suppression, and road-building have had comparable effects.

7. Large, infrequent, a-historical, wildfires have replaced low severity fires in the study area during the past two centuries, in part due to a massive build-up of biomass (fuels), resulting in increased wildfire, insect, and disease risk and in changes to native wildlife habitats and populations. A primary result of this change has been a significant and corresponding increase in snags and downed woody debris.

8. These findings will be useful in: evaluating and mitigating catastrophic fire hazards and risks; informing the maintenance and preservation of historic cultural landscape features; advancing understanding of forest dynamics, historical human influences, and historical landscape geography; and informing restoration (active management to recover historical cultural landscapes) efforts.

Questions

This research was conducted using the method of multiple hypotheses, first described by Chamberlin in 1890 (Chamberlin 1965): "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." The following questions are specific to the primary purpose of this study, may justify additional research in order to be better considered, and are briefly addressed in accordance with the specific findings of this project.

1) What is the role of climate change in these altered vegetation patterns? There are many reasons why "climate change" cannot be the cause of changes in forest conditions for the alterations in forest development pathways in the South Umpqua headwaters over the last 200 years: 1) No significant climate change has taken place in the western Cascades since 1650 (Graumlich 1985; Carloni 2005), yet wholesale changes in forest conditions have occurred; 2) Precontact cultural landscapes with prairies, brakes, savannas, berry fields, and open, park-like forests occurred across climate zones throughout the Western Hemisphere, indicating that the vegetation types were not climate-dependant; 3) No new open, park-like forests are arising in any climate, even where lightning fires are allowed to burn; 4) Anthropogenically-induced prairies, savannas, and open, park-like forests were persistent vegetation types for thousands of years despite historical perturbations in global climate; 5) Other explanations for the alteration in forest conditions (e.g., Indian burning practices) are more robust, well-documented, and free of the nagging anomalies noted above. (See Appendix B).

These conclusions confirm other recent scientific findings on the topic. For example, for an area on the eastern slope of the Cascades in Washington, Haugo, et al. (2010) found:

> Fire suppression, grazing, and logging explain changes in species composition more clearly than climate variation does, although the relative influence of these factors varies with elevation. Furthermore, some of the observed changes in composition are opposite what we expect would be most suited to projected future climates. Natural resource managers need to recognize that the current state of an ecosystem reflects historical land uses, and that contemporary management actions can have long-term effects on ecosystem structure.

2) What is the role of fire suppression in these altered vegetation patterns? Modern fire suppression is a recent (ca. 1930) addition to forest influences in the region. Prior to then, fire suppression was not a significant factor in forest development. Profound changes in forest structure and composition had already taken place in the study area by 1930. Those changes resulted from the elimination, about 100 years earlier, of traditional land management activities including intentional and expert anthropogenic burning. Modern fire suppression is applied to a greatly altered forest, one with a-historical accumulations of biomass. Without modern fire suppression, today's landscape is prone to a-historical catastrophic-scale wildfires due to the quantity and continuity of fuels across the watershed (Zybach 2003; Carloni 2005).

3) What is the role of lightning fire in past and current forest structure? Lightning ignitions interact much differently with the modern, altered landscape. In the precontact era lightning played a relatively minor role because lightning fire spread and severity were constrained by discontinuous and limited fuels within the historical anthropogenic mosaic of the cultural landscape (Kay 2007). Modern lightning fires encounter a-historically abundant and continuous fuels, leading to a-historically large and severe fires.

4) What is the risk of wildfire under current conditions? The risk of large and severe fires appears much greater today than in any other time in history due to increased living and dead fuel accumulations, continuity of fuels across the landscape, extended canopy closures, and prevalence of ladder fuels.

5) Do increased risks associated with lightning-caused wildfires correspond to increased threats to ESA habitat and populations? The recent historical increase in local wildfire extent and severity has and will continue to destroy nesting, foraging, and roosting habitat for arboreal birds. Significant increased risks from uncontrollable wildfires are also borne by other forest, grassland, and shrubland plants and animals in the area.

Acknowledgements

This report would not have been written, or this project even initiated, without the leadership, support, and direction provided by Joseph Laurance, Douglas County, Oregon Commissioner, and by Javier Golgorzoirri, consulting forester, Resource Management Services, Roseburg, Oregon.

Authorization for my own participation in this project came directly from the Oregon Websites and Watersheds Project, Inc., (ORWW) Board of Directors, for whom I have been Program Manager since 1996. ORWW is a 501 c(3) educational nonprofit based in Philomath, Oregon. Particular assistance and direction was provided by Wayne Giesy, ORWW Board Member, and by long-time ORWW forest science research associate, Nana Lapham. Lapham participated in all field research and documentation for this project, including website development, and assisted with oral history interviews and transcription.

The majority of website and written report maps for this project were produced by the "GIS Team" at the Douglas County Surveyor's Office in Roseburg. The GIS Team did a wonderful job of catching errors and repairing field miscues during the course of this project and deserve full credit for the high quality maps and tables they have assembled from Surveyor's Office files, and project archival and field research data. Special thanks are due to Terrie Franssen, Jean Crawford, and Kathy Thompson for the great product quality and attention to detail represented by their work. Remaining errors and omissions are my own.

The Umpqua National Forest Supervisors Office, under the direction of Clifford Dils, contributed important time and resources to this study. Joyce E. Thompson, Planning and Products Staff Office, was very helpful at the beginning of the project, identifying key staff people who could provide technical assistance. Gregory Orton, Soil Scientist, devoted significant time and expertise in locating historical aerial photos for the study area, and having them duplicated for Internet display and analytical purposes. Debra Barner, Heritage and Tribal Relations Program Manager, and Molly Casperson, Archaeologist, were very helpful in locating and digitizing historical photographs of the study area. Wes Yamamoto, Forester and Engineer from the Tiller Ranger District, provided significant insights and historical details regarding livestock management of the area's shrublands and grasslands. Larry Broeker, retired Forest Geologist, provided excellent geological information for the South Umpqua headwaters basin.

The Cow Creek Band of the Umpqua Tribe of Indians also participated in this project, exchanging information and offering encouragement during the course of several meetings and consultations. Sue Shaffer was instrumental in providing Tribal direction at the beginning of the study; Steven Rondeau, Tribal Forester, offered encouragement and advice throughout the course of research; and Wayne Shammel, Tribal Legal Counsel, reviewed findings and documents and expressed strong Tribal interest in continuing participation in this study and during the course of any future activities that might result.

Particular credit is due Michael Dubrasich for the outstanding field work and analysis he performed for this project (Appendix B), invaluable assistance in defining the ca. 1800 vegetation patterns that are a key product of this study (see Chapters VI-VII), and for technical advice and editorial help on this report.

Additional thanks is given to Dr. Charles Kay, Wildlife Biologist, for editorial help, encouragement, and advice; Chuck Jackson, local historian and Cow Creek Tribal member for consultations and interview; Kathi Flynn, local historian, genealogist, and linguist, for historical consultations and transcription work; Terri Trosper, NW Maps Co., for website construction and panoramic photo processing; Alan Maul, retired forester, Oregon Department of Forestry Forest History Center for research assistance; the University of Oregon Libraries Archives and MAPRS departments for historical documents and aerial photographs; Tom Fields, Douglas Forest Protective Association for historical data; and Gardner Chappell, Director, and Karen Bratton, Research Librarian, Douglas County Historical Museum, for their leadership and assistance with oral history transcriptions.

Acronyms and Abbvs.

BLM	USDI Bureau of Land Management
Ch.	Surveyors chain (66-feet)
Cr.	Creek
E.	East; or East of the Willamette Meridian
FRCC	Fire Regime Condition Class
GLO	General Land Office
HBC	Hudsons Bay Company
L.O.	Fire Lookout
Mt.	Mountain
NF	National Forest
ODF	Oregon Department of Forestry
ORWW	Oregon Websites and Watersheds Project, Inc.
OSU	Oregon State University
P.L.S.	Public Land Survey
R.	Range
R.D.	Ranger District
RMS	Resource Management Services, LCC
Rng.	Range
S.	Section; South; or South of the Willamette Meridian
Sec.	Section
SWORC&D	Southwest Oregon Research and Conservation District
Tsp.	Township
T.	Township
UO	University of Oregon
USDA	United States Department of Agriculture
USDI	Unites States Department of the Interior
USFS	United States Forest Service
USGS	Unites States Geological Service
W.	West, or West of the Willamette Meridian
W.M.	Willamette Meridian
W.W.M.	West of the Willamette Meridian

Tiller Pre-Contact Reference Condition Study

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Tiller Pre-Contact Reference Condition Study

Chapter I. Introduction: Purpose, Background, and Setting

Project Purpose

The purpose of this study is to produce a reliable landscape-scale description of late precontact (pre-1826; ca. 1800) reference forest conditions for the eastern portion of present-day Tiller Ranger District of the Umpqua National Forest in Douglas County, Oregon. The primary intended use of this information is to help update Community Wildfire Protection Plans. The findings from this study will assist Douglas County in planning for mitigation of landscape-scale fire hazards, forest restoration, cultural resource protection, and other applications in which knowledge of past forest conditions may prove useful and which have direct relevance to wildfire protection planning.

The basic research questions posed by this project were well-stated by Ken Carloni in his 2005 PhD dissertation (Carloni 2005: *ix*):

> President George W. Bush's program for federal forest lands dubbed the "Healthy Forest Restoration Act" has recently been passed by congress, but its implementation is still being actively debated. The title of this act, however, begs an important question: *To what set of conditions should we "restore" forests?* If forests are indeed in an "unhealthy" state at present, then what were the "natural" native forests of southwestern Oregon like and what forces kept these ecosystems "healthy" in the past? What changes in forest structure now cause them to spawn "uncharacteristic" fires? And most pragmatically, what can studies of current and past fire and forest patterns contribute to future management decisions?

Douglas County Commissioner, Joseph Laurance, a key visionary and sponsor of this project, provided a partial answer to Carloni's questions during his testimony to a Congressional subcommittee of The House Natural Resources Committee in Washington, DC, on July 15, 2010 (see Appendix A):

> Fire Regime Condition Class (FRCC) 1 is similar to the forest which European explorers first found here. That forest had been modified by fire for more than 6 thousand years to provide the native inhabitants with what were then life's necessities. These included abundant wild game from the most productive and diverse wildlife habitat ever known on this continent. Similarly, the regular burning of competing vegetation permitted propagation of nut bearing trees and other food producing plants. Additionally, the historic "Healthy Forest" promoted pristine rivers, streams, and lakes that provided an abundant harvest of fish and waterfowl. Within FRCC 1 the risk of losing key ecosystem components to fire is low, while vegetation species composition, structure, and pattern are intact and functioning within the natural historic range.

With the recent a-historical advent of large-scale wildfires to the South Umpqua headwaters landscape -- including the 69,000-acre Tiller Complex Fires in 2002 and the 10,600-acre Boze Fire and 6,100-acre Rainbow Creek Fire in 2009 (see Chapter IV) **–** it has become increasingly important that planning efforts be tailored to prepare for these types of events, to address the millions of dollars in damages and future risks to Douglas County families, communities, and wildlife which they create, and to reduce the future likelihood of these types of occurrences. Those are among the primary objectives of Community Wildfire Protection Plans, and to provide aid to the planning process is the purpose of this project and research.

Project Background

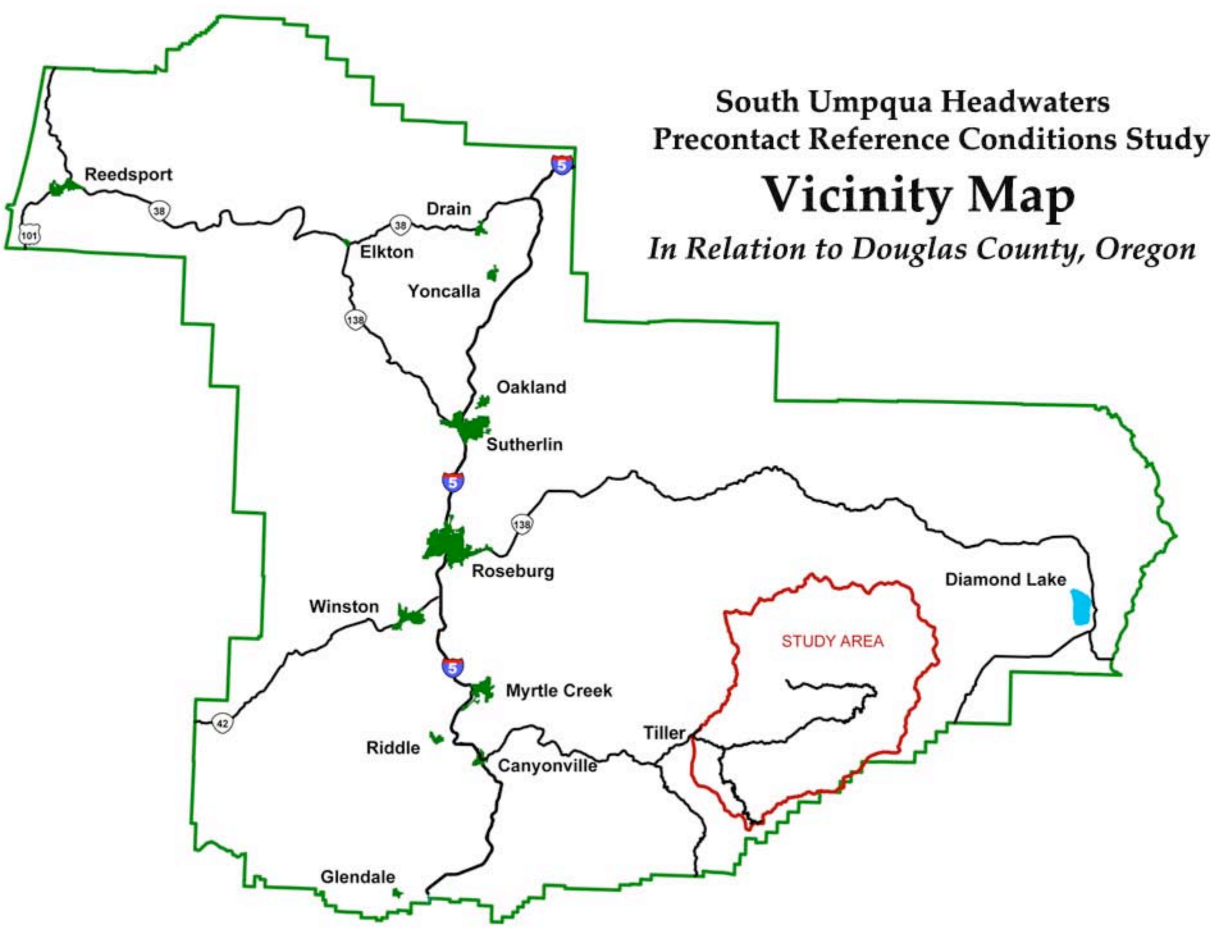
This project had its genesis in conversations involving Commissioner Laurance and Javier Goirgolzarri, Resource Management Services, LLC (RMS); in meetings of the Douglas County Forest Council and with members of Communities for Healthy Forests; in discussions and meetings with Forest Supervisor Cliff Dils and members of the Umpqua National Forest staff; and with local forest industry leaders, Cow Creek Tribal representatives, private landowners, concerned citizens, and forest scientists. As a result of these conversations, meetings, and discussions, in January 2009 strategic planning for the "South Umpqua Headwaters Pre-contact Reference Condition Study" was initiated with representatives of Oregon Websites and Watersheds Project, Inc. (ORWW) and others with knowledge and experience in conducting the types of research needed to determine and characterize historical conditions of local forestlands – particularly those areas perceived to be at increasing risk of catastrophic-scale wildfire.

On May 1, 2009, formal application for funding the study was made as a request to the Douglas County Board of Commissioners for funds under the provisions of Title III of the Secure Rural Schools and Community Self-Determination Act of 2007, adopted as an amendment to the Emergency Economic Stabilization act of 2008 (PL 110-343). The project application was approved for funding by the Douglas County Board of Commissioners on June 17, 2009. In the following months of September and October, the Boze Fire and Rainbow Creek Fire took place within the study area boundaries (see Map 1.01; Chapter IV); on December 9, 2009, the grant and project administration was assigned to the Southwest Oregon Resource Conservation and Development Council (SWORC&D) to oversee and administer the grant; RMS was subsequently selected as the contractor to conduct and oversee the study; and final plans were made with ORWW to formally begin contracted project research activities.

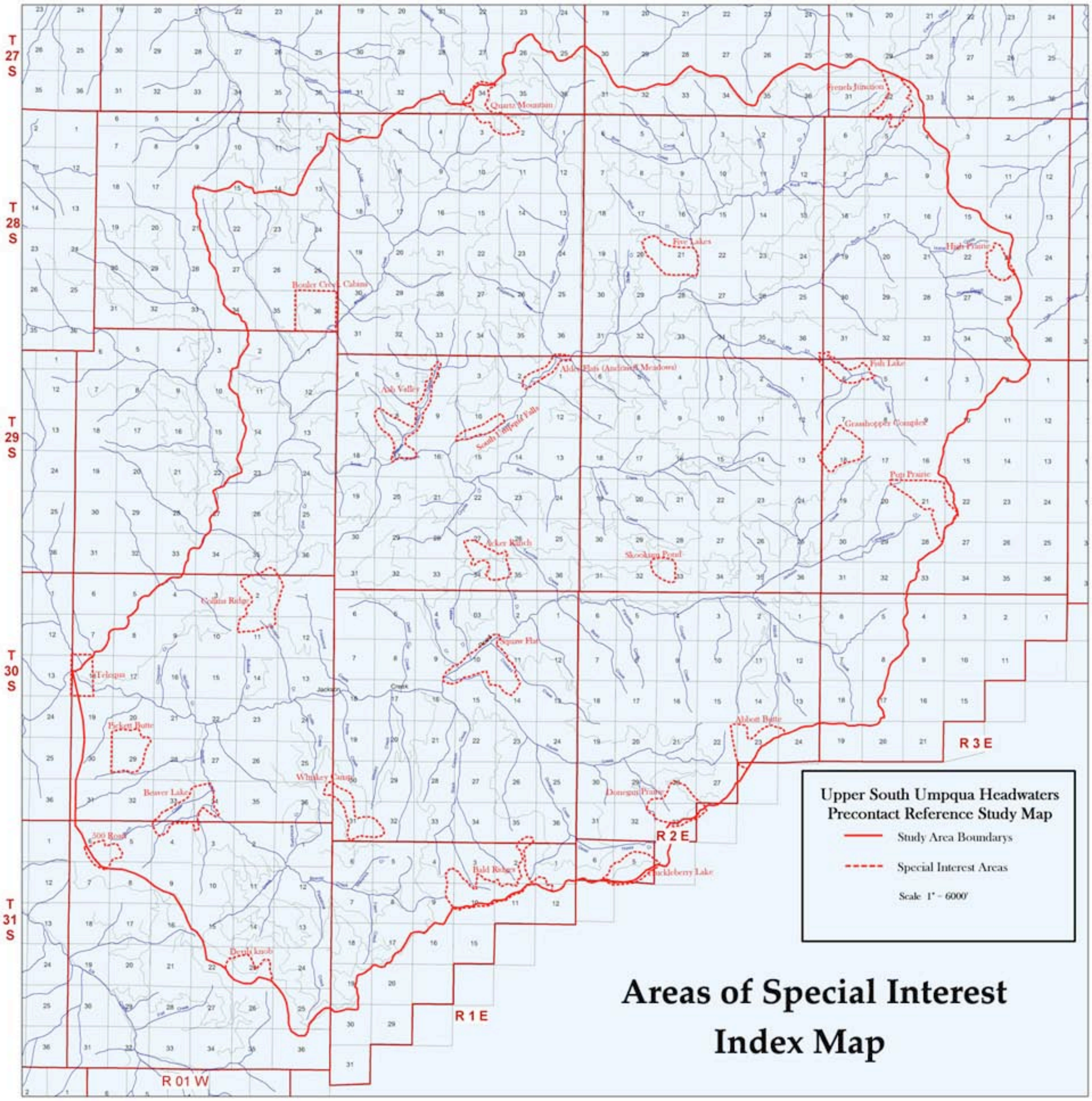
This report summarizes project research actions and findings, and represents successful completion of the study by ORWW during the 2010 calendar year.

Location of the Study Area

The study area is in Douglas County, Oregon (see Map 1.01), on the western slope of the Cascade Mountains, and extends from the Cascade Crest at elevations greater than 6,000 feet, westward to the confluence of Jackson Creek with the South Umpqua River at approximately 1,100 feet elevation. The southern boundary of the study is the watershed line between Jackson Creek and Elk Creek and the Rogue River; the eastern boundary is the Cascade Crest; the northern boundary is the watershed line between the South Umpqua and North Umpqua rivers; and the western boundary is the South Umpqua River and the watershed line between Boulder Creek and Dumont Creek. The area is 232,000 acres in size, mostly contained within the Tiller Ranger District of the USDA Umpqua National Forest. Significant private lands also exist in the study area, with the majority of these being situated at lower elevations toward the western boundary, and primarily used for purposes of farming, ranching, or timber production. All land is located within Tsp. 27 S. to Tsp. 31 S.; and Rng. 1 W. to Rng. 3 E. (See Map 1.02).



Map 1.01 Location of the study area boundaries in relation to Douglas County, Oregon.



Map 1.02 Legal boundaries of project study area, named creeks, and Areas of Special Interest.

Research Time Period

The time period for this study is given as “precontact time”: that is, the period of human history before written eyewitness accounts of the land and people were first documented (see Chapter III); also defined as the period of time before native Oregon people made first direct or indirect contact with European-based cultures. For purposes of this project, that point in time (the first written eyewitness accounts of such contact) will be 1826: the year in which David Douglas provided a written record of people he encountered and sugar pine he measured on October 26, several dozen miles upstream from present-day Elkton, Oregon (Douglas 1959: 230-231); and in which Alexander Roderick McLeod of the Hudson Bay Company described his entry into Lookingglass Valley -- tributary to the South Umpqua River -- in his daily journal on December 16 (Davies 1961: 1961).

Therefore, for purposes of this report, “precontact time” will be the period of human history in the study area before 1826, and “historical time” will be from 1826 to the present. Because this project calls for descriptions of “precontact forest conditions” – a period of time thousands of years in length, during which forest conditions changed dramatically many times – we have focused the majority of our research to “late precontact time,” which we will define as the 1775 to 1825 time period (or, “ca. 1800”).

Fieldwork based on tree ring counts (see Appendix B) can be reasonably precise to a given year, therefore the year 1825 is used to represent precontact time in those instances. To counterbalance the 50-year period described as late-precontact time (1775 to 1825; ca. 1800), the subsequent 50 years (1826 to 1875) will occasionally be referenced as “early historical time.”

Climate

For general purposes of this research, climate appears to have been relatively stable for the study area for the past several hundred years, or longer. For example, Graumlich uses regional tree-ring analyses of precipitation reconstructions from 1675 to 1975 show consistent regional patterns of seasonal variations of cool weather precipitation and episodic droughts for that time period (Graumlich 1987: 26-28). In their authoritative work on the topic of global climate change during the past 500 years, Bradley and Jones (1995: 655) cite Fritts and Shao’s analysis of tree-ring data over five North American regions to conclude: “Average conditions from 1602-1900 were warmer and drier over most of the western United States compared to the period since 1900.” Pollen studies, other fossils, and glaciation data provide additional evidence of relatively stable climatic patterns of trees and other vascular plants in southwest Oregon over the past 4,000 years (Hansen 1947: 118-120).

Although there are no weather stations in the study area (and none have ever been located there), Taylor and Hannan (1999: 57) report:

> As is the case in the rest of western Oregon, most precipitation in Zone 3 [“Southwestern Interior”] falls during the months of November through March . . . Perhaps the wettest area in Zone 3 is in the remote mountainous area east of Roseburg near Quartz Mountain. Although precipitation data in that area are scarce, it has been estimated that some of the highest peaks receive in excess of 120 inches of rain per year.

Geology

Map 1.03 shows the basic geological history of the study area. It is interesting to note the relatively strong correlations between this history and the subsequent ca. 1800 vegetation patterns shown in Chapters VI, VII, and VIII; but both patterns seem to be more a function of elevation than of soil type. Formation history and weathering of the volcanic soil and rocks in Map 1.03 correlate fairly well (but do not necessarily demonstrate a causal effect) with subsequent forest type patterns; instead, they seem to be more a function of cultural fire history and elevational differences in seasonal weather patterns than any type of slope or nutrient limitation (see Chapter VIII).

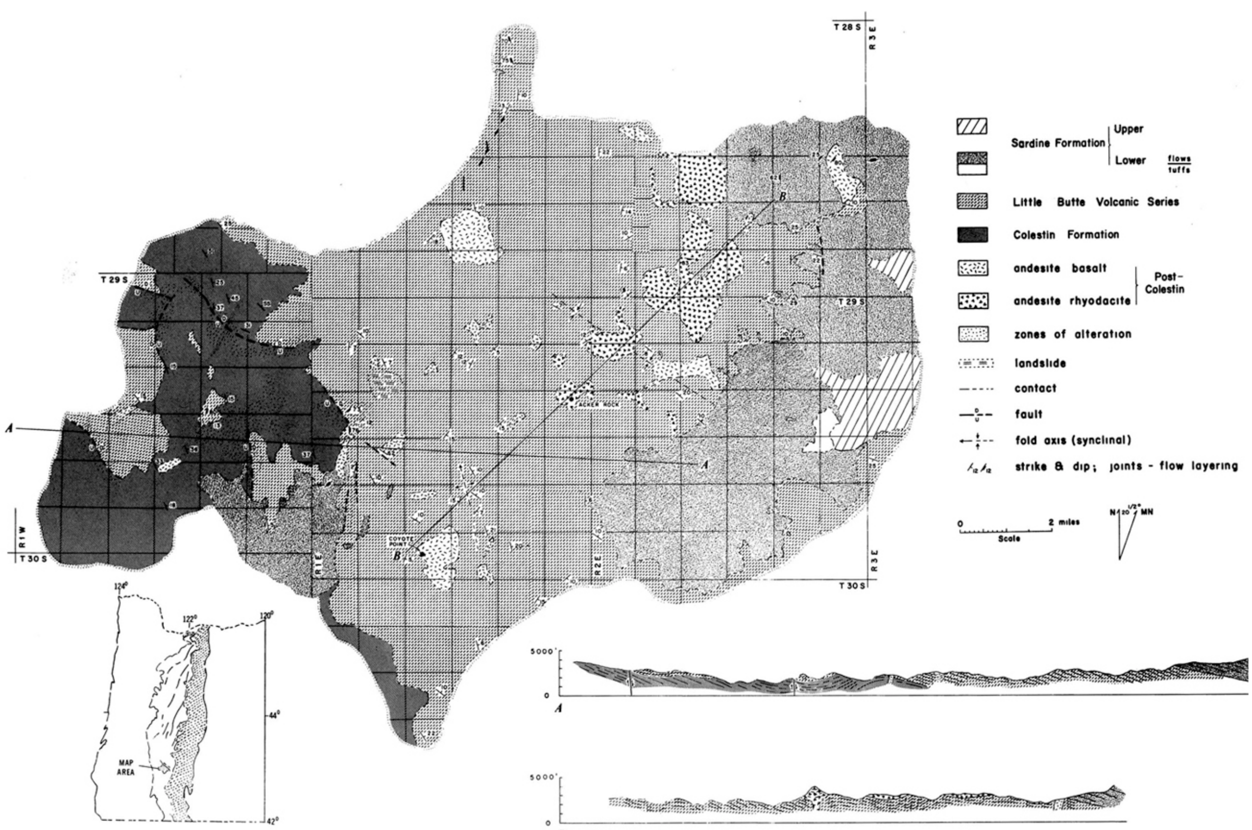


Plate 1. Geologic map of the South Umpqua Falls region, with index showing location of the map area. Shown also in the index are traces of axial planes of folds, taken in part from Peck and others (1964).

Map 1.03 Geology of South Umpqua headwaters (Kays 1970: 89).

Table 1.01 shows a variety of geological formations within the study area boundaries, as well as at least one indicator of how seasonal rain-on-snow events (such as occurred the first few days of June, 2010) can shape upland dissection of study area slopes, and directly contribute to flooding in adjacent lowland areas.

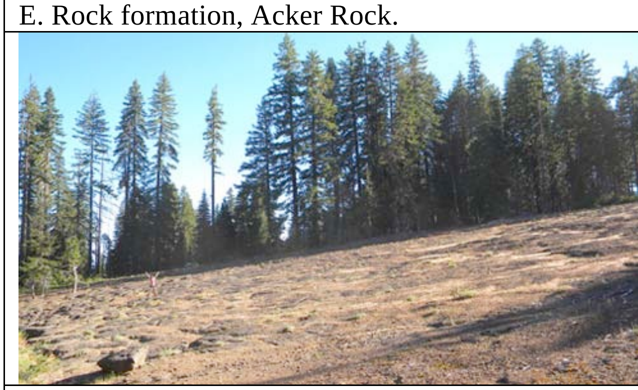
	
A. Soil erosion, Collins Ridge.	B. Large boulder, 27 Road.
	
C. Cathedral Falls, Highway 46.	D. Landmark rocks, 2938 Road intersection.
	
E. Rock formation, Acker Rock.	F. Rocky Ridge, Tsp. 28 S., Rng. 3 E.
	
G. Lava flow, Buckhead Mountain (note person).	E. Prong Creek floodwaters, June 1, 2010.

Table 1.01 Typical geological formations of the South Umpqua headwaters study area.

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 and historical aerial photographs and fire lookout tower “Osborne” panoramic photographs; the systematic selection of 25 "Areas of Special Interest," stratified for more specific analysis; stand reconstruction field work and analysis in order to quantify basic stand development changes from ca. 1800 to the present time (see Appendix B); living memory, including memoirs, interviews, consultations, oral histories and traditional practices; and a comprehensive set of GPS-referenced field photographs that detail and document current forest conditions, including persistent vegetation patterns and populations.

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 B (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 local early historical 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, 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 B).

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: personal communications, 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 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. 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 research this report were located and assembled, 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 (see Chapter III). 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.

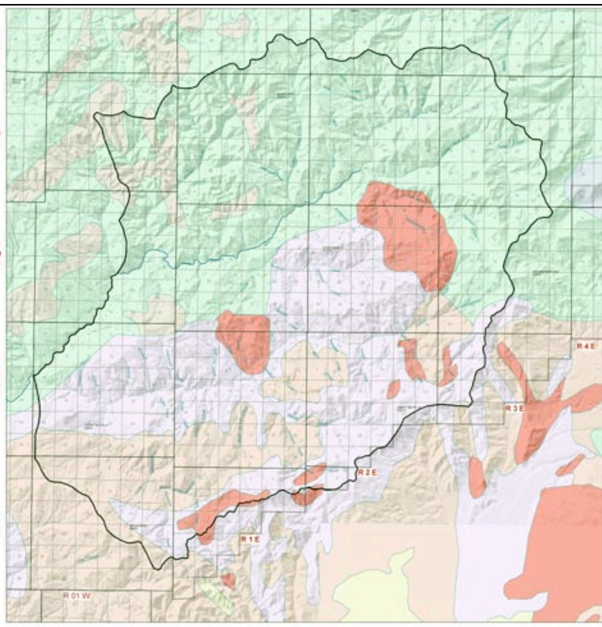
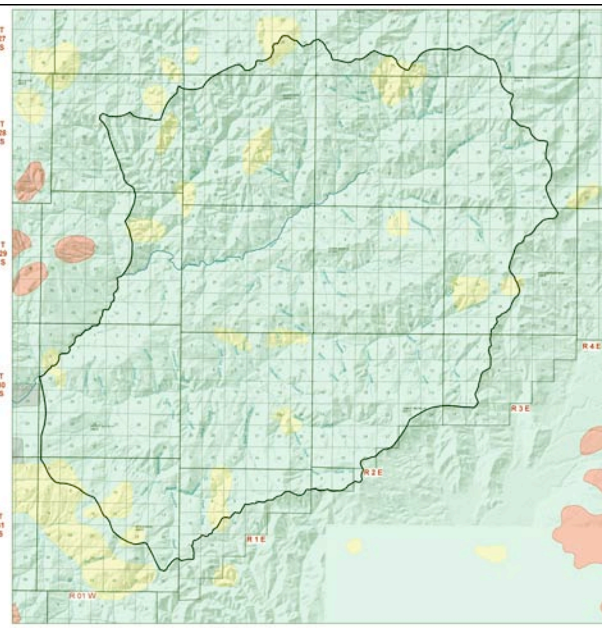
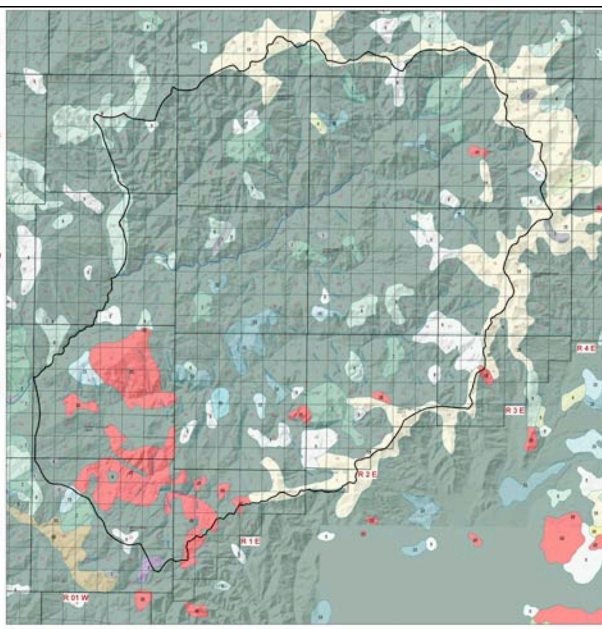
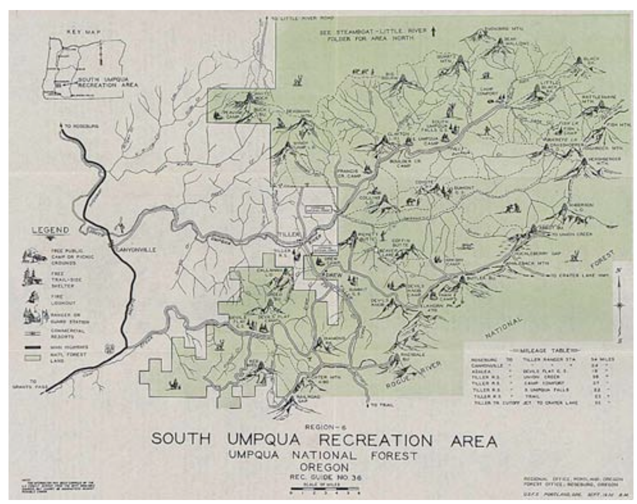
	
1900 USDI Timber Volumes	1914 ODF Fire Map
	
1936 USDA Vegetation Type	1936 USFS South Umpqua Recreation Area

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

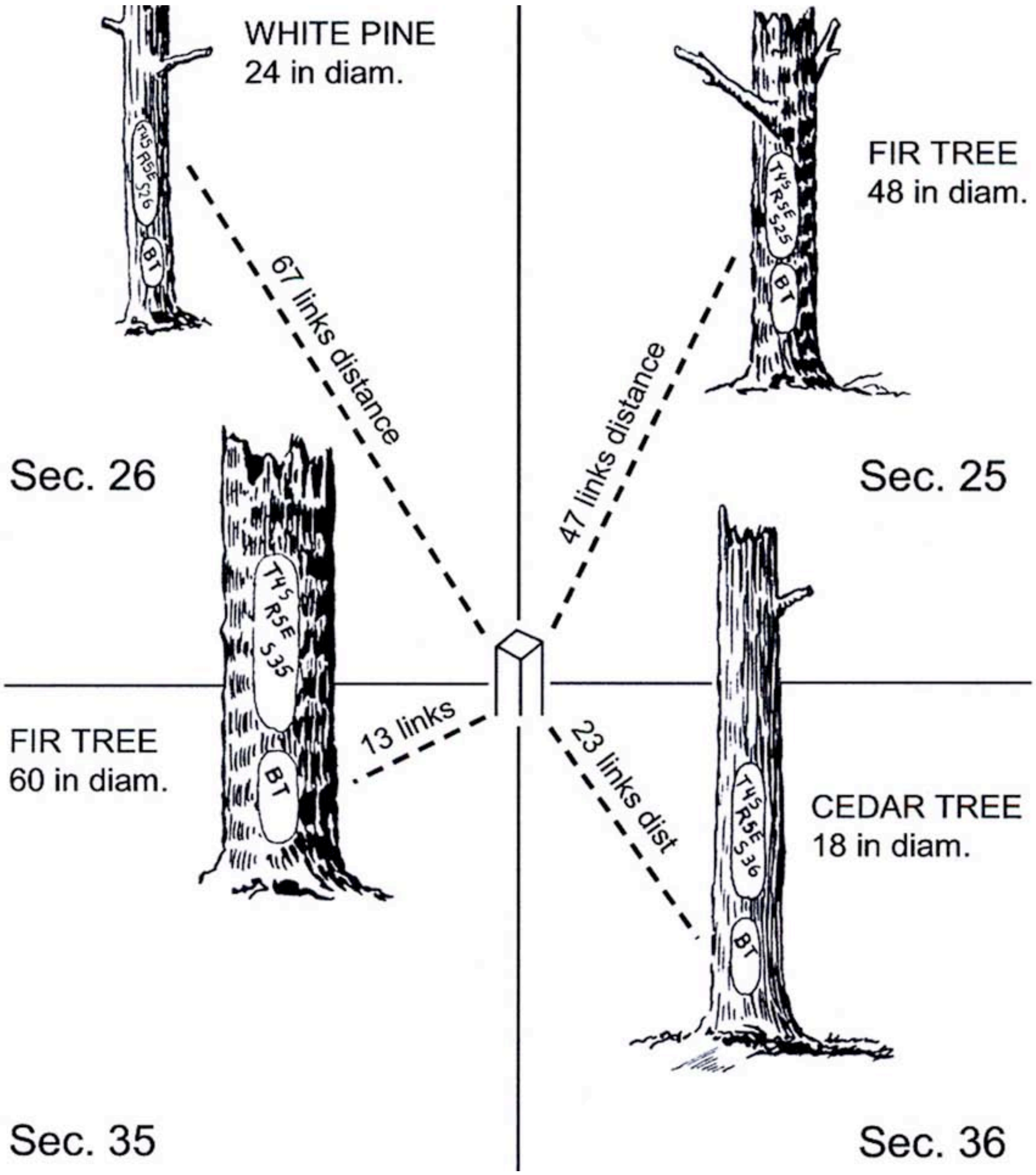


Figure 2.02 Sample GLO bearing tree diagram from a section corner (Powell 2008: 2).

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.

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.

Thence N. 89° 56' W., bet. secs. 6 and 31.

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.

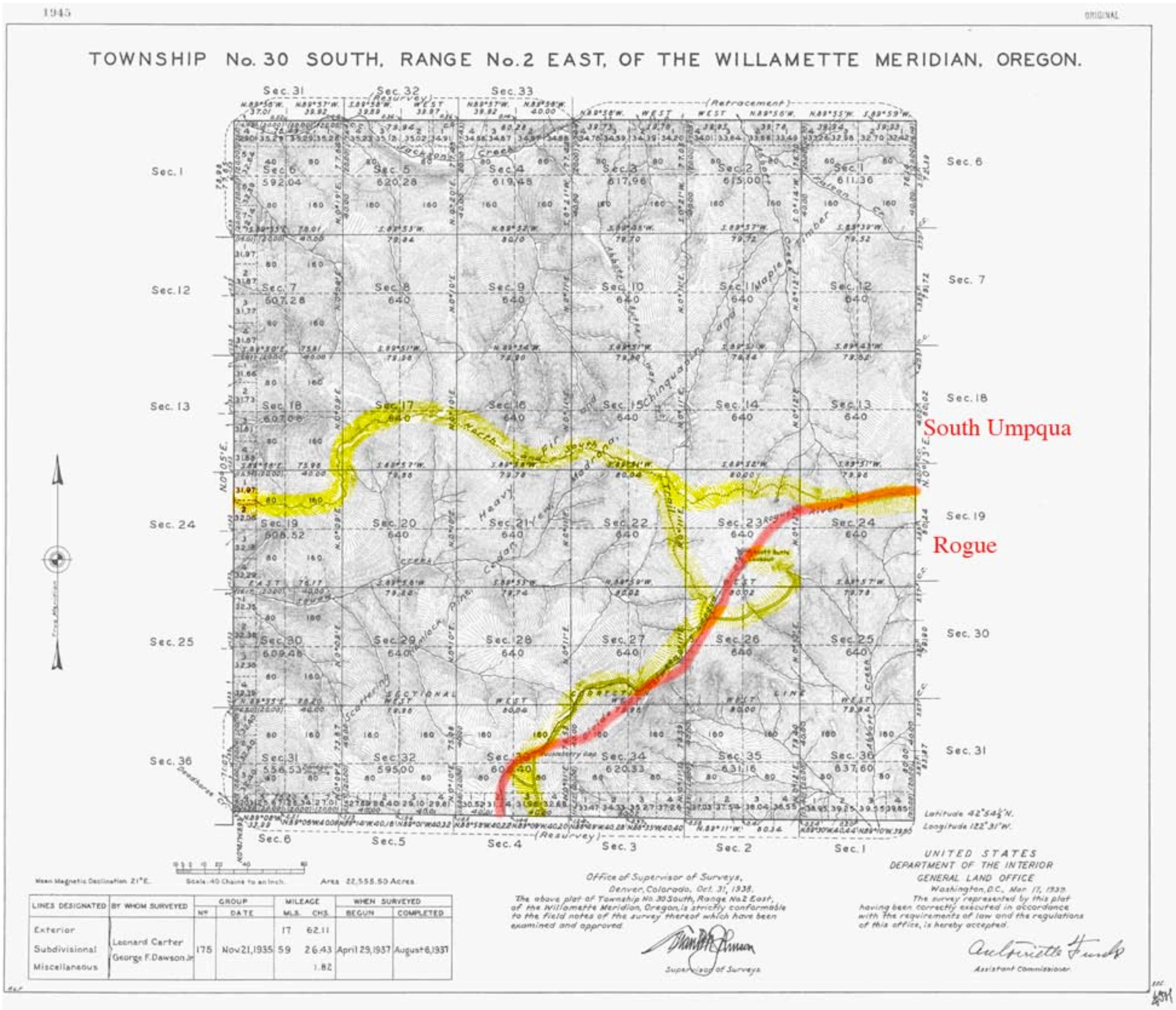
GENERAL DESCRIPTION

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.

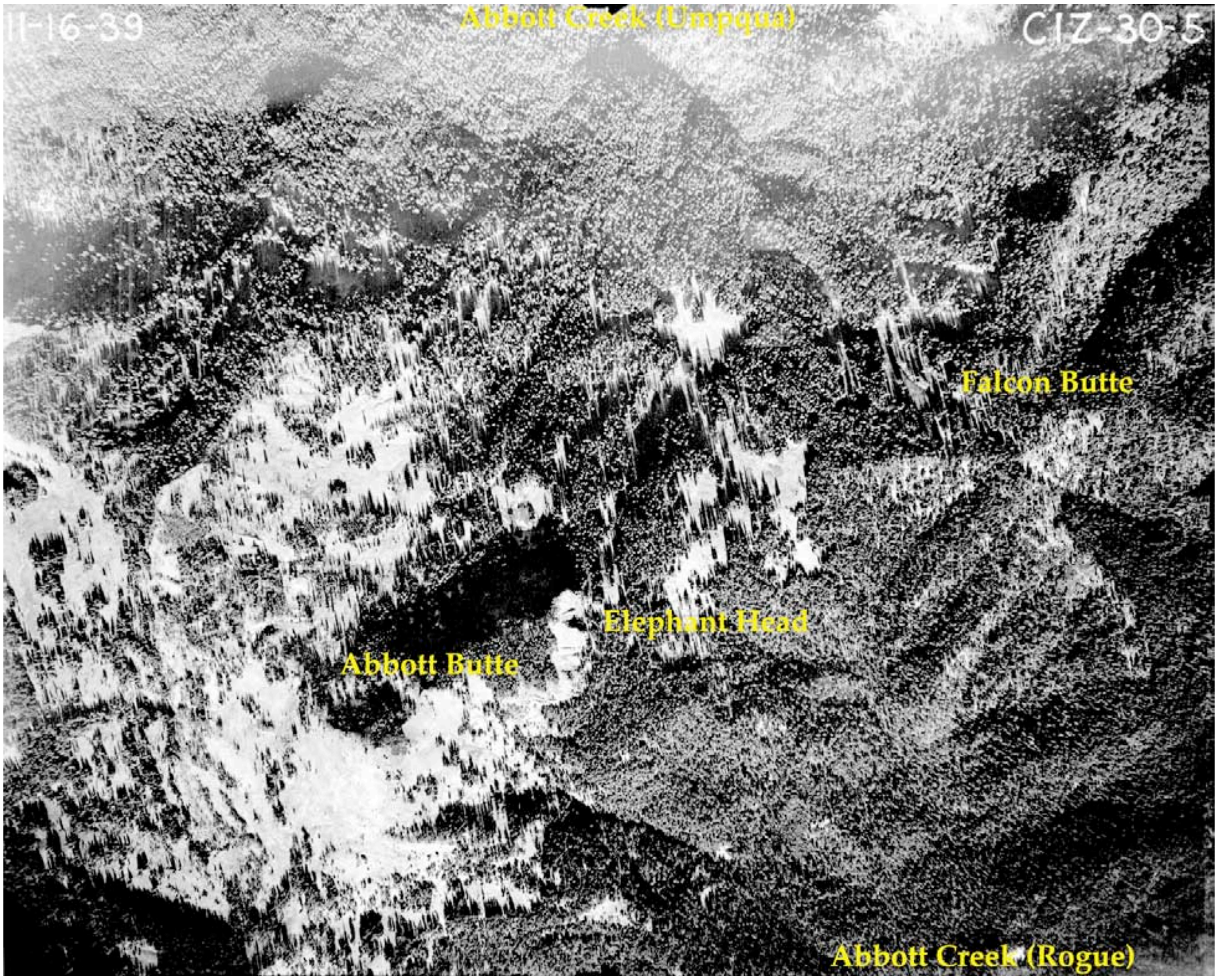
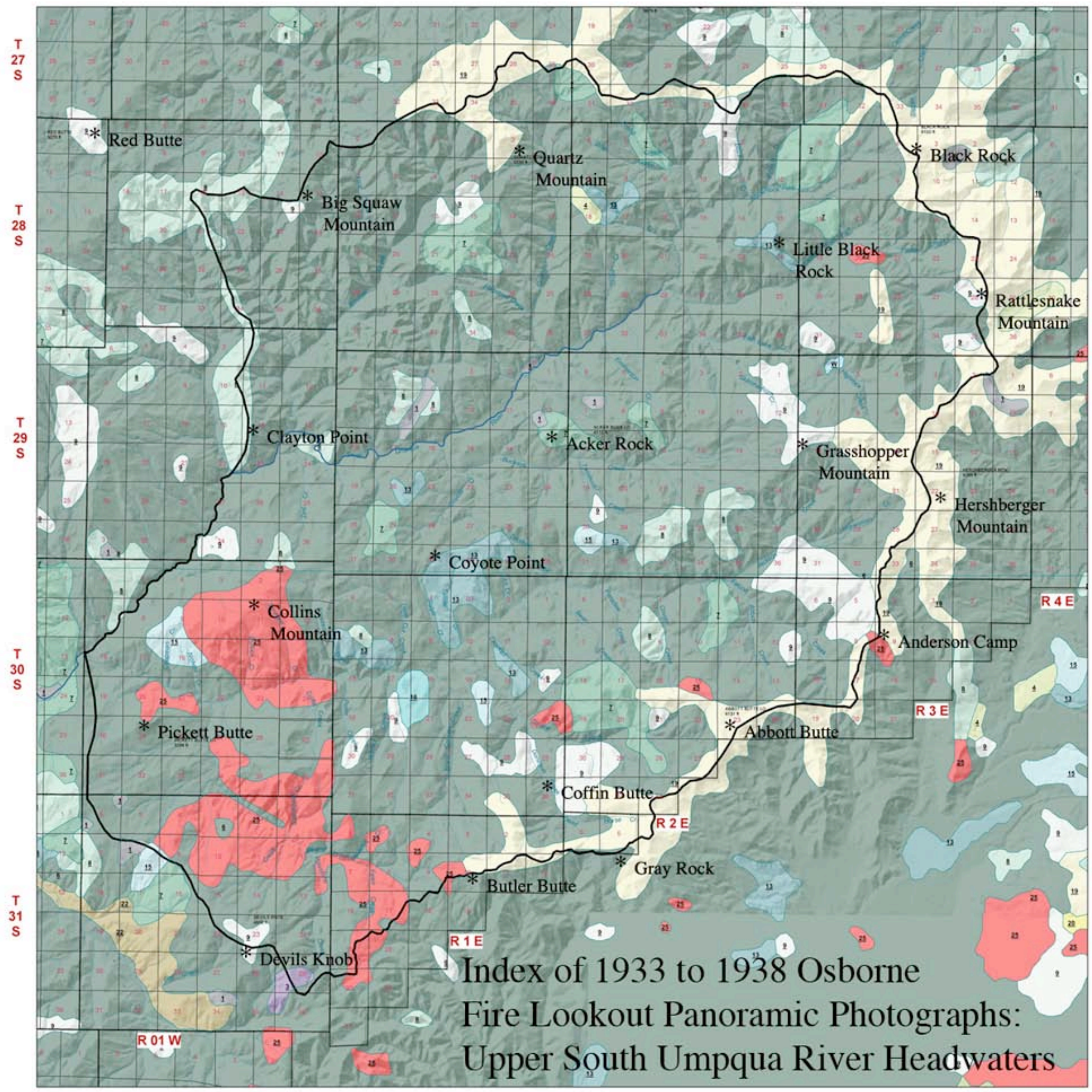


Figure 2.04 Annotated aerial photograph of Abbott Butte area, November 16, 1939.

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 visible 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

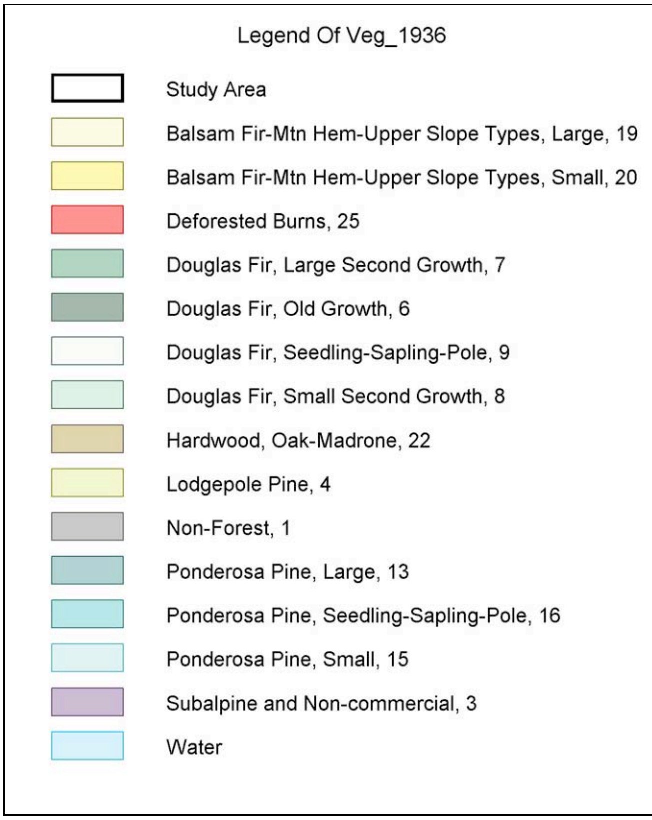


Table 2.02 1936 USDA Vegetation Type Map Legend.
(Note the overwhelming prevalence of the "Douglas Fir, Old Growth, 6" type. This map was constructed before aerial photos were taken of the study area, before GLO surveys had been completed, and before extensive logging and road building had taken place. 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.")

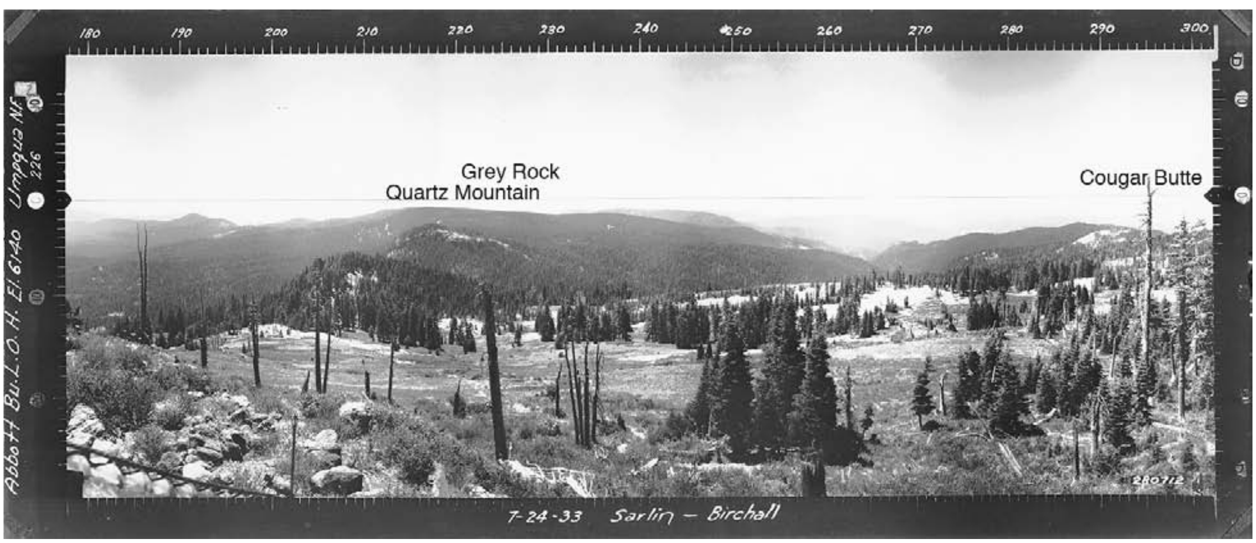
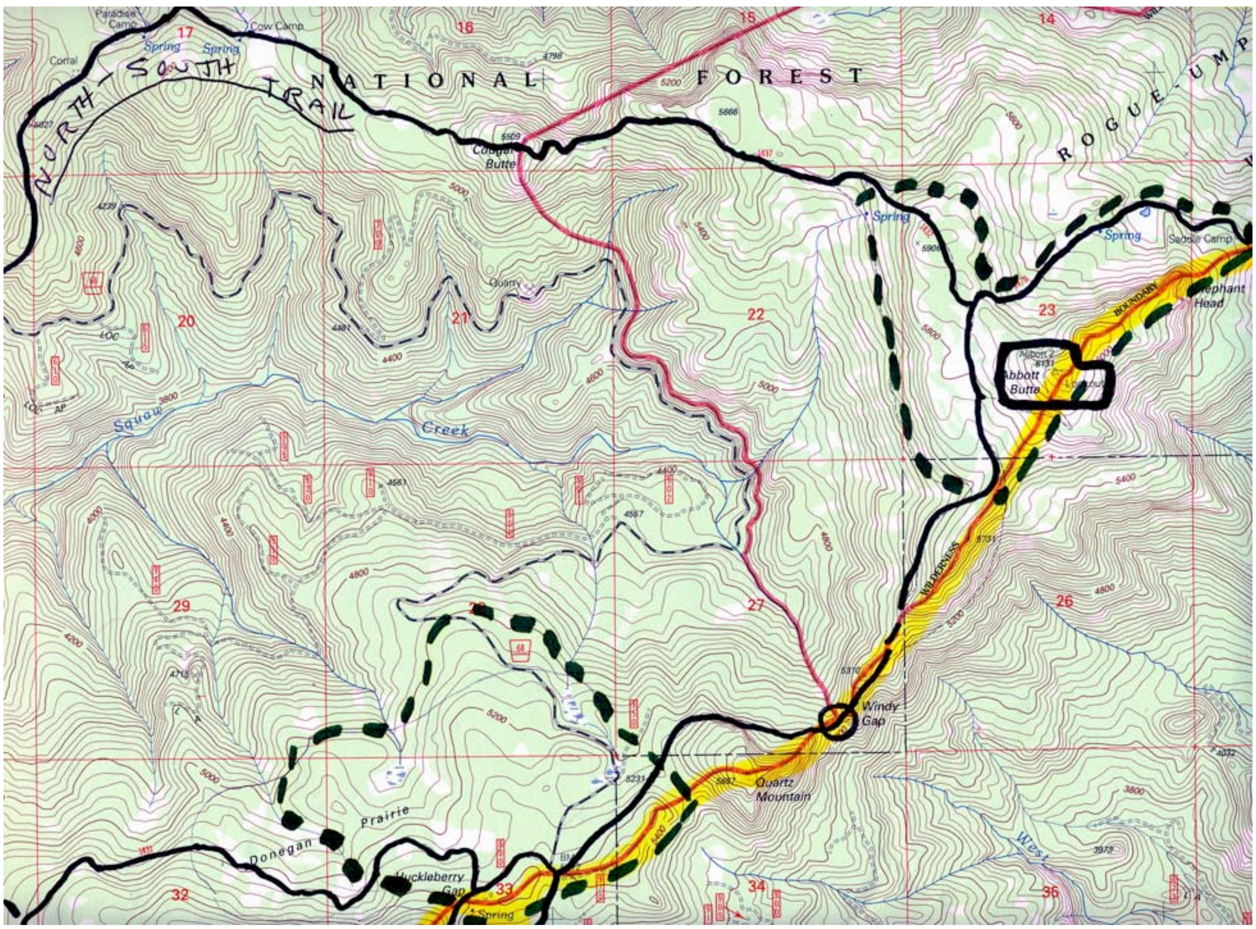


Figure 2.05 Annotated Osborne photograph of SW view from Abbott Butte L.O., July 24, 1933.

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 B); 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.

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; Jackson 2010: personal communications) 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 B).

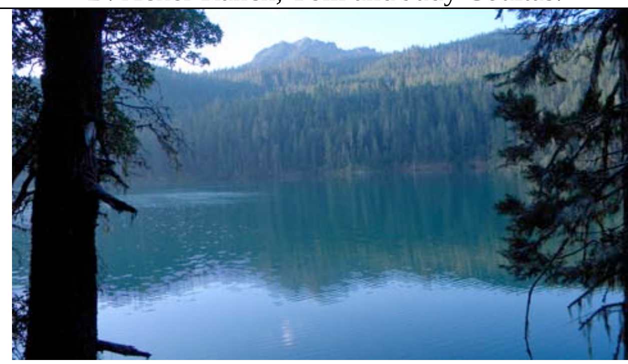
	
A. Abbott Butte fire lookout tower (center, horizon).	B. Acker Ranch, Tom and Judy Coultas.
	
C. Collins Ridge reforestation, April 21, 2010.	D. Fish Lake, Highrock Mountain in background.
	
E. Huckleberry Lake, July 15, 2010.	F. Skookum Pond, April 20, 2010.
	
G. South Umpqua Falls, recreational swimmers.	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 B).

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 measured 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.).

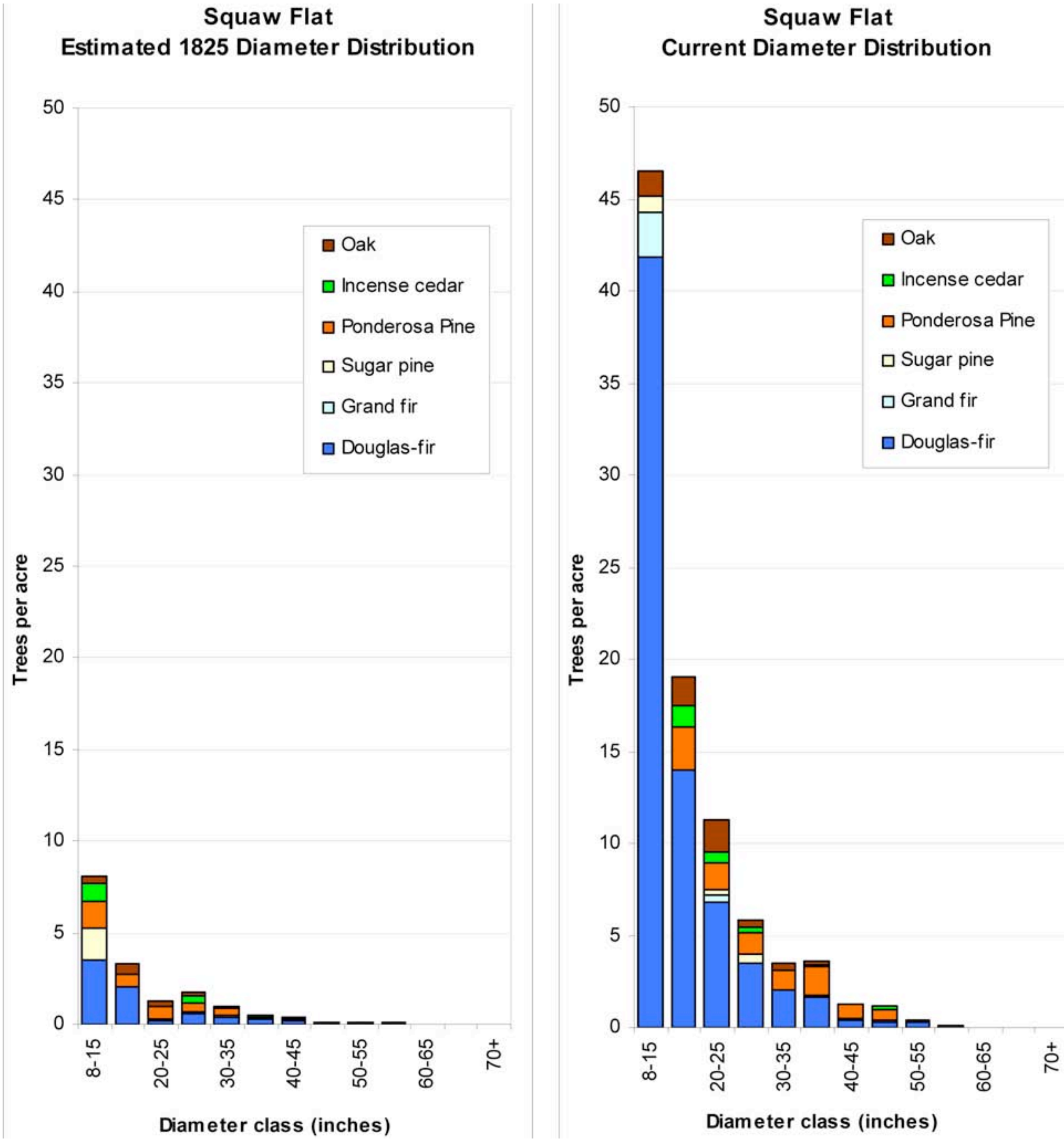


Figure 2.06 Change in Squaw Flat tree species' numbers, diameters, and ages, 1825-2010.

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 B).

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

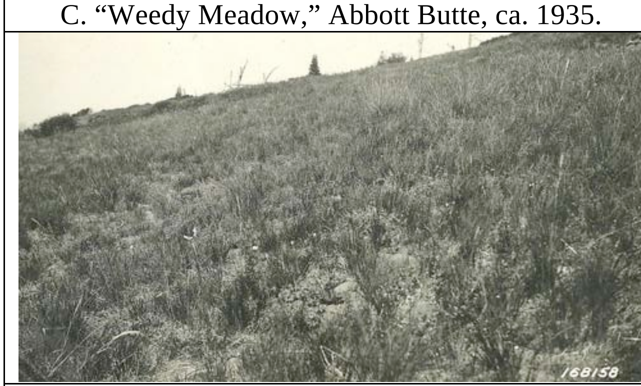
	
A. View from Abbott Butte, 1899.	B. View from Abbott Butte, 2010.
	
C. “Weedy Meadow,” Abbott Butte, ca. 1935.	D. Wildflower Prairie, Abbott Butte, 2010.
	
D. Native bunchgrasses, Abbott Butte, ca. 1935.	E. Native wildflowers, Abbott Butte, 2010.

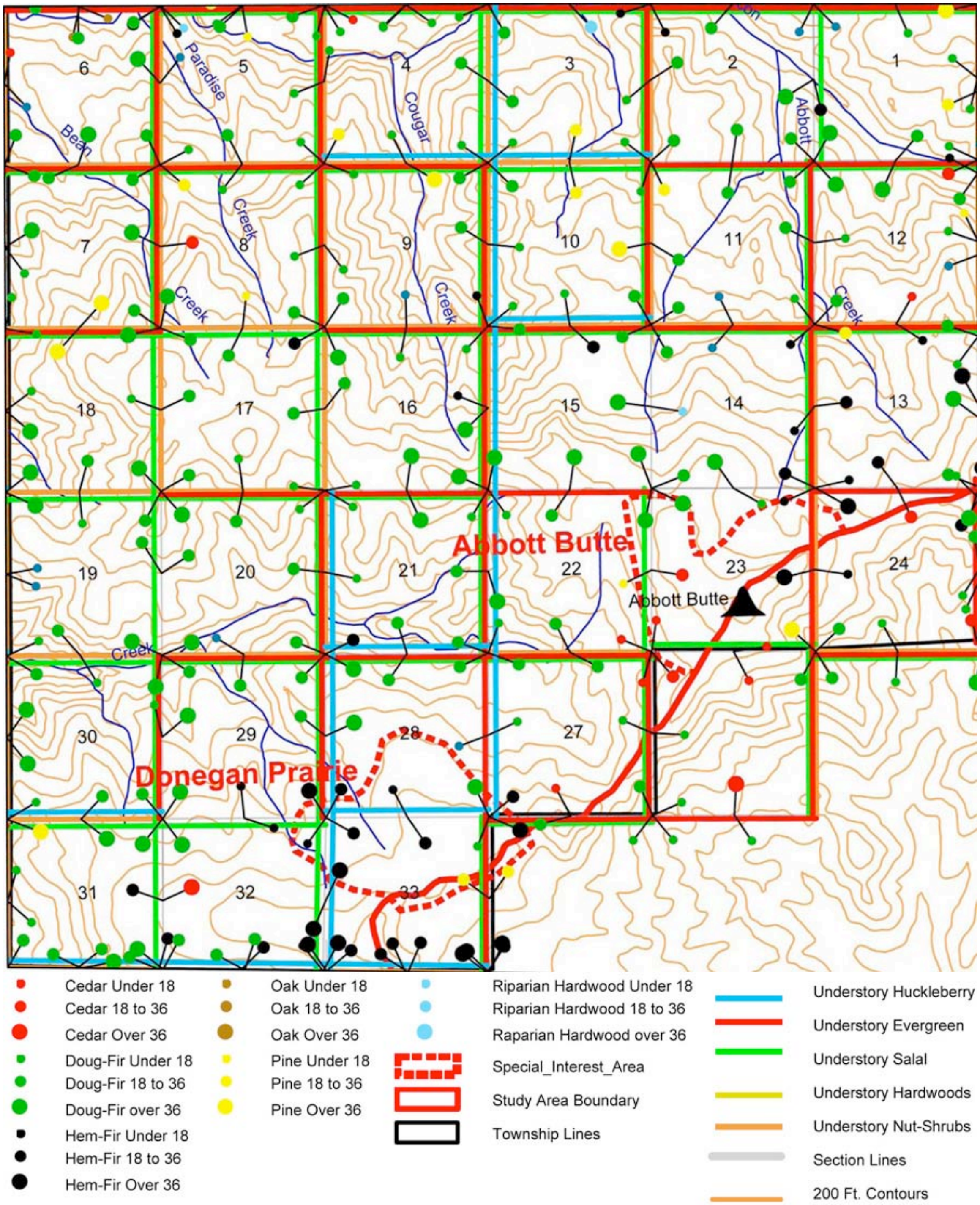
Table 2.03 Historical and documentary photographs of Abbott Butte prairie lands, 1899-2010.

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.

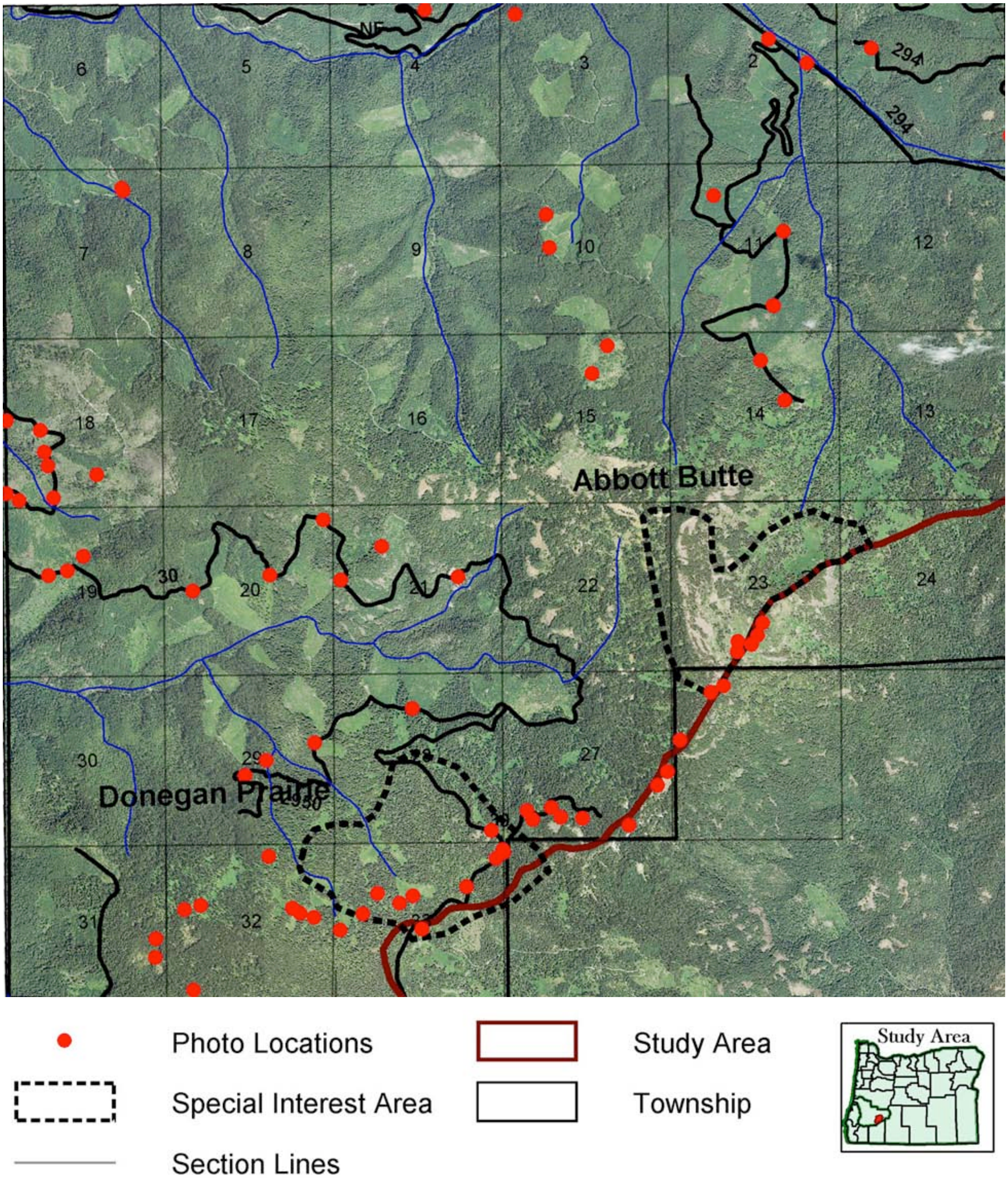
Map 2.06 is a “final product” of this study, insofar as it depicts primary trail locations and forest vegetation types for the ca. 1800 time period. See Chapters III, VI and VII for a more detailed analysis of these land use and plant distribution patterns. To illustrate how these patterns were derived, 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.

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. 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” (Applegate 1891),



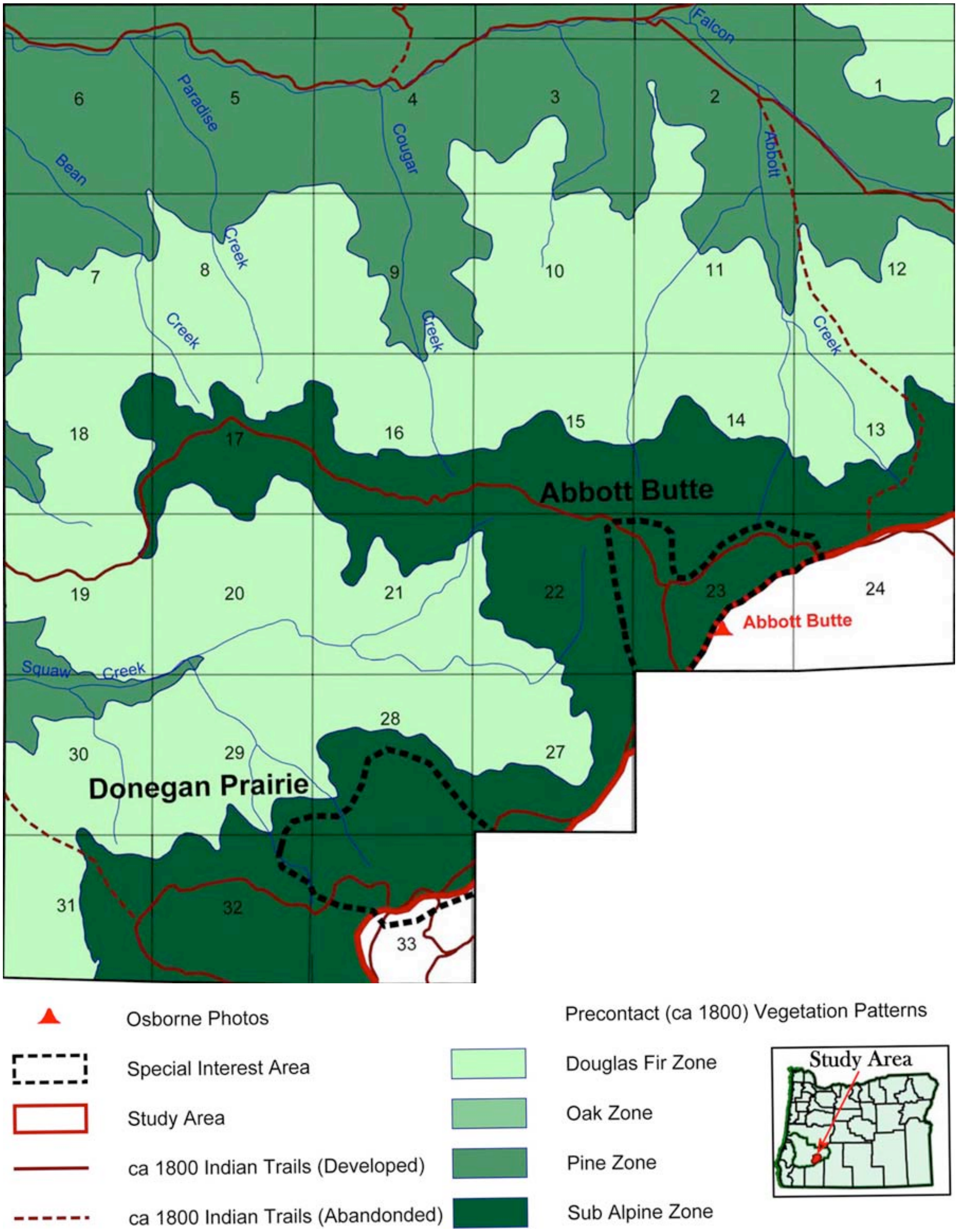
Map 2.04 GIS-generated map of GLO Bearing Trees and understory vegetation, Tsp. 30 S., Rng. 2 E.

near Elephant Head, an important cultural and spiritual site for local Indian families (Jackson 2010: personal communications). The Umpqua Trail, in turn, connects to spring-fed campsites at Huckleberry



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

Gap, Neal Spring, and Huckleberry Lake (see Map 2.03), which are also known archaeological sites (Beckham and Minor 1992; LaLande, personal communication, December 4, 2010) and traditional food



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

gathering locations (Jackson 2010: personal communications). 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 B; 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.

Chapter III. Human Use and Occupation

There is very little history or other information available about the people who lived in the study area 200 years ago. The area that became coastal Douglas County enters the historical record in the 1700s; particularly during 1788 and thereafter, with the sea voyages of Captain Robert Gray and others, trading furs, hides, and other products from California ("Mexico"), the Pacific Northwest, Alaska, Canada ("New Caledonia"), and Hawaii, with China, the eastern United States, England, and Spain (Carey1971). Beginning in 1826, Hudson's Bay Company fur trader Alexander McLeod, Scottish botanist David Douglas, and others began keeping journals and sending correspondence of their explorations throughout the interior western parts of Douglas County. In the 1830s, beaver trappers, cattlemen, and others following the "California Trail" from the Columbia River to the Sacramento Valley also began keeping journals, filing reports, and sending correspondence that added to the history of western Oregon. In 1841, a party of the US-funded Wilkes Expedition, under the leadership of George Emmons, precisely mapped, illustrated, and described their journey along the California Trail (the general route of today's Interstate 5), traveling from north to south. In 1846, pioneers following the Applegate Trail (the "South Road" of the Oregon Trail) kept records and documented memories of their south to north travels along the same route. Douglas County visitors and immigrants in the early 1850s -- most notably George Riddle, of Cow Creek Valley (Riddle 1993) -- and participants in the "Rogue River Indian Wars" of that time (Zybach 2007) also kept records; including those kept by federal and territorial government agencies.

Yet, during this entire period of early historical time in Douglas County, little or nothing was noted of the land and people upstream from present-day Tiller, Oregon, where this study takes place. The first historical records of the area begin with General Land Office survey notes in 1857 (Hathorn); the first detailed records of forest conditions in 1899 (Leiberg 1900; Dodwell and Rixon 1903); and the first accounts of local families and personalities, also in 1899 – but in the brief, unpublished memoirs of a forester kept filed in the University of Oregon Archives (Bartrum ca. 1925). Beckham and Minor (1992: 168) note:

> Between 1850 and 1900 a variety of explorers had entered the eastern portions of Douglas County. Some were driven by a quest for wealth, seeking gold, other mineral deposits, or pelts and furs. Others, like [John B.] Waldo, sought refuge from human society and contemplated the lofty peaks, pure water, and clean air. Some were government employees carrying out their jobs: surveying townships and mounting geological studies. The land continued to be the traditional use area of Indians who hunted, fished, and picked berries. Few noticed their labors and fewer cared that the Rondeaus, Thomasons, Pariseaus, McKays, Dumonts, or Fearns – Indian and part-Indian

> families who lived on the western margins of the mountains – passed their summer and early fall in the backcountry.

Because virtually no written documentation exists regarding the people who lived in the study area during the ca. 1800 timeframe, their history must be inferred and pieced together via other sources of information: from the trails and vegetation patterns and other archaeological evidence they left behind, and from anthropological data collected from nearby people and Tribes of that era who were better known.

Ca. 1800 Trail Network

Trails are a good method for determining where people are likely to be found on the landscape at different times of the day and year, why they're probably there, what they might be doing, where they came from, and where (and when) they might be going. One of the key purposes of this research is to characterize forest conditions as they were in precontact time; because of the landscape-scale influences people have on any environment in which they exist, the use and location of trails in existence for that time period is a critical element of such a characterization.

Trails connect principal seasonal campgrounds, based on food harvesting and processing schedules, fishing and hunting opportunities, and trade. Freshwater springs at higher elevations were a critical element, such as Neil Spring near Huckleberry Lake. Fish runs at South Umpqua Falls, acorn harvests in the Pickett Butte area, tarweed burning at Bunchgrass Meadows, camas digging at Bear Wallows, and huckleberry picking at French Junction would have been the types of activities and locations that would dictate where people were concentrated, and when. The oak orchard shown in Figure 3.01, for example, would have been used while acorns were being harvested; but also, perhaps, at other times of the year for hunting purposes, to harvest seeds, bulbs, or berries, or as a camping location while traveling to more distant spots.

Because people did not have horses 200 years ago and because the South Umpqua headwaters are not navigable by canoe, travel was done by foot, along well-established ridgeline and streamside trail systems. Primary destinations would have been local village sites, seasonal campgrounds, peaks, waterfalls, the mouths of streams, and various crop locations, such as huckleberries, camas, and acorns. Evidence for the great age of many of these routes is provided by archaeological lithic findings, among other evidence (Beckham and Minor 1992: 76):

> A number of archaeologists have noted that prehistoric upland sites often occur in proximity to trail systems whose use presumably extended into the prehistoric past (e.g., Jenkins and King 1988: 16; Jenkins and Churchill 1989: 13). Running along major ridges, these trails represent travel routes that often cross from one drainage into another, providing relatively easy access from sites along rivers and streams to high elevation areas. In addition to movement between resource areas, such trail systems may have facilitated the transportation of obsidian into the Umpqua Basin.

Figure 3.01 Relict oak orchard with encroaching conifers near Coyote Point, May 25, 2010.

White oak and pine savannahs, extensive grassland meadows and prairies, and patches of berries, redcedar, and pine typified much of the western and lower elevation portions of the study area 200 years ago. The presence and arrangements of these plants, as well as widespread populations of camas, cat's ears, fawn lilies, iris, tarweed, yampah, and hazel, indicate regular systematic use of the landscape by people – most likely Takelman-speakers -- at that time. Human occupation of this area was likely year-round, with relatively large seasonal villages and campgrounds near the mouth of Jackson Creek and at South Umpqua Falls; two locations that (according to historical reports) were heavily used during times of anadromous salmonid and lamprey eel runs.

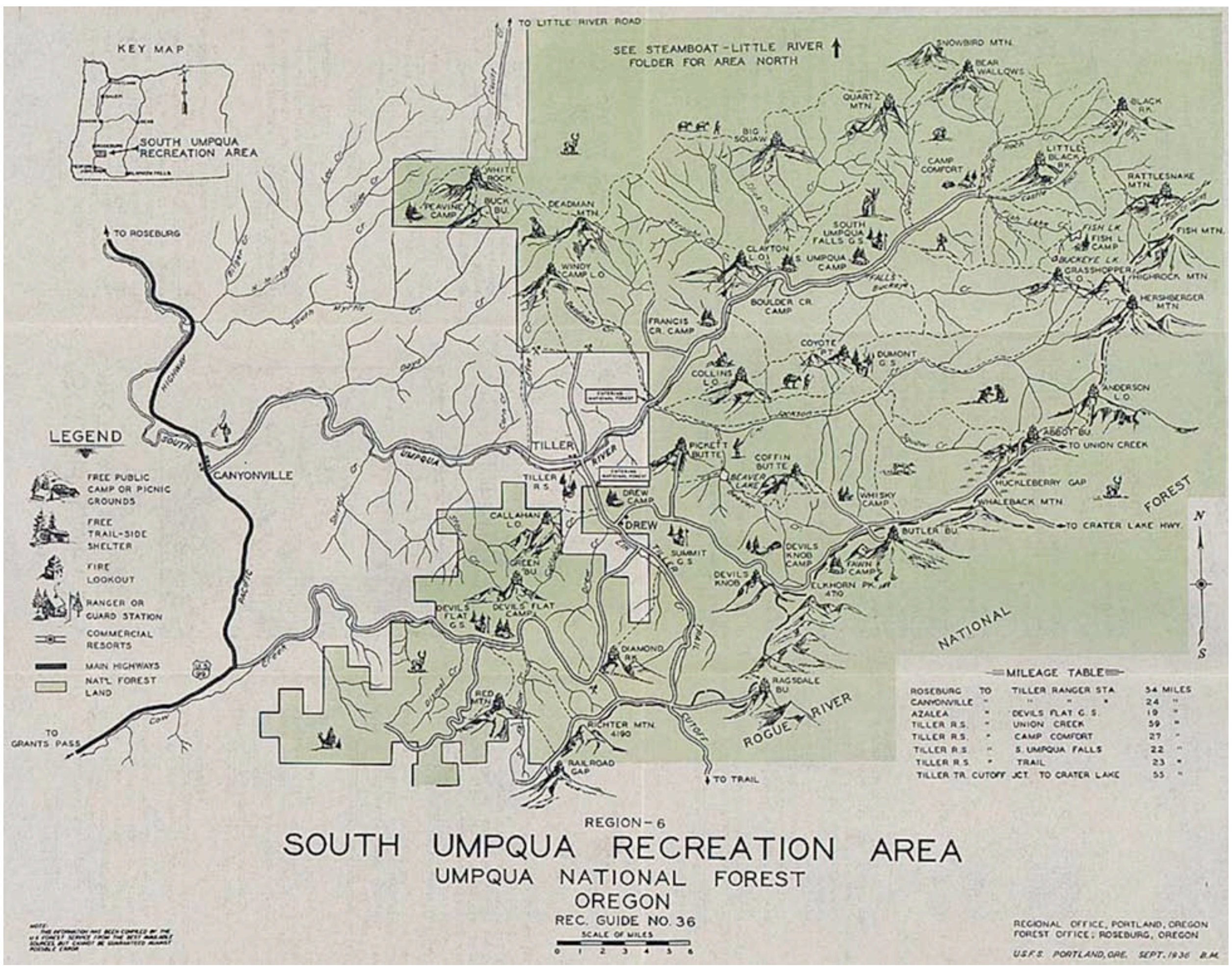
The highest elevation ridgelines of the study area formed an international precontact network of foot trails that connected tribes of the South Umpqua with Indian nations in California, Washington, the Columbia Basin, and beyond. This seasonal "travel zone" was covered in snow much of the year, but contained extensive fields of forbs and grasses, huckleberries, manzanita, and other berries, fruits, nuts, bulbs, edible roots, and fuels that were readily available at other times. The existence of numerous year-round springs, likely “vision quest” sites, flats, benches, and gently sloping ridgelines add further evidence of intensive year-round and seasonal use by local residents; principally Molallan-speakers. In late summer and early fall, other Tribes undoubtedly visited these lands to hunt, harvest huckleberries and beargrass, to move trade goods along the landscape, or simply visiting friends and relatives.

The Umpqua National Forest was created on March 4, 1907, from lands two days earlier having been declared the Umpqua Forest Reserve by proclamation of President Theodore Roosevelt. Although the portion of the National Forest in this study had been under federal control as a part of the Cascade Range Forest Reserve -- created September 28, 1893 by proclamation of President Grover Cleveland -- few improvements and no road-building or logging had taken place in the study area during the first 20 years of federal management. People were still dependent on the ancient Indian trail network to travel from one area to the next, along the very riparian and ridgeline foot-trails (now improved sufficiently to accommodate travel by horseback or to drive stock), that had been used for hundreds and thousands of years (see Figure 3.01).

Figure 3.02 Historical USFS trail marker near Fish Lake, July 30, 2010.

> Charles M. Collins, who went to work at the Tiller [nee South Umpqua] Ranger Station in 1913, recalled that the forest personnel first traveled on the old ridge trails, or “what they called the Indian trails.” When asked: Were there Indian trails in the forest at that time,” Collins replied: “That is what they called all the ridge trails, Indian trails. Who made them, I don’t know, maybe, but they was old trails, but they wasn’t blazed; you could go for mile after mile and never see a blaze (Beckham 1986: 191).

Map 3.01 shows the primary road and trail network in existence in the study area in 1936. This was still a time before significant logging and road-building had taken place, and these trail locations likely varied little from those encountered by Dennis Hathorn in 1857, Peter Applegate in 1891, Smith Bartrum in 1899, or by Charles Collins in 1913; i.e., this map is likely a good representation of the primary ancient Indian trail network that had been in existence and use for centuries before the map’s construction.



Map 3.01 Roads, trails and destination points in the South Umpqua River headwaters, 1936.

Although Map 3.01 shows roads and trails that were developed specifically for automobile and horse transport -- and for driving and pasturing domesticated livestock -- much can still be inferred about precontact forest conditions from what is known of neighboring Tribes of that (ca. 1800) time, the presence and extent of current and historical vegetation patterns (particularly those of food and fiber plants), archaeological research, and known precontact travel and trade routes.

Ca. 1800 Indian Populations

Human population had a great deal to do with what lands were exploited, to what degree, and for how long. On March 20, 1827, HBC Trader, Peter Skene Ogden made the following observations near the mouth of Cow Creek (Pullen 1996, III: 15):

> With the exception of the Climate which is at this season is very rainy this is certainly a fine Country – the soil is the variety of flowers grass Clover and trees of all kinds very rich and by culture no doubt would produce well . . . from the number of new Graves I have seen lately I am of opinion starvation has been the cause of their death.

The graves noted by Ogden almost certainly were the result of introduced diseases and plague, and could hardly have been attributed to starvation (see Chapter V). In addition to Ogden's observations, there is significant other evidence of both reduced populations and of changing cultures in southwest Oregon during late precontact and early historical time. Numerous eyewitness accounts detail the rapid human depopulation of southwest Oregon in the early 1800s and before. Hubbard, for example, noted in 1861 (Pullen 1996, App. I: 5)

> According to tradition, many years ago they were far more numerous than at the present time, wars and disease having in some instances destroyed whole tribes. The marks of the old towns and large settlements everywhere found, now entirely deserted, are strong evidence of the truth of their traditions.

Pioneer field anthropologist John Harrington, using linguistics as a basis for speculation, noted (Pullen 1996, App. I: 1):

> It is probable that the Takelma were once the occupants of a territory larger than that just described, and that later on there was an invasion by the Athapascans, who established villages on all sides of them, and imposed Athapascan names on the Takelma villages, though they never succeeded in forcing the Takelma to abandon their language.

Boyd (1999a) documents smallpox epidemics in Oregon in ca. 1775 and 1801- 1802, and malaria epidemics beginning in 1831 and every summer thereafter. By 1841, Boyd estimates, the Kalapuyan population in the Willamette Valley had fallen from a pre-smallpox count of 14,760 to 600, or 96 percent.

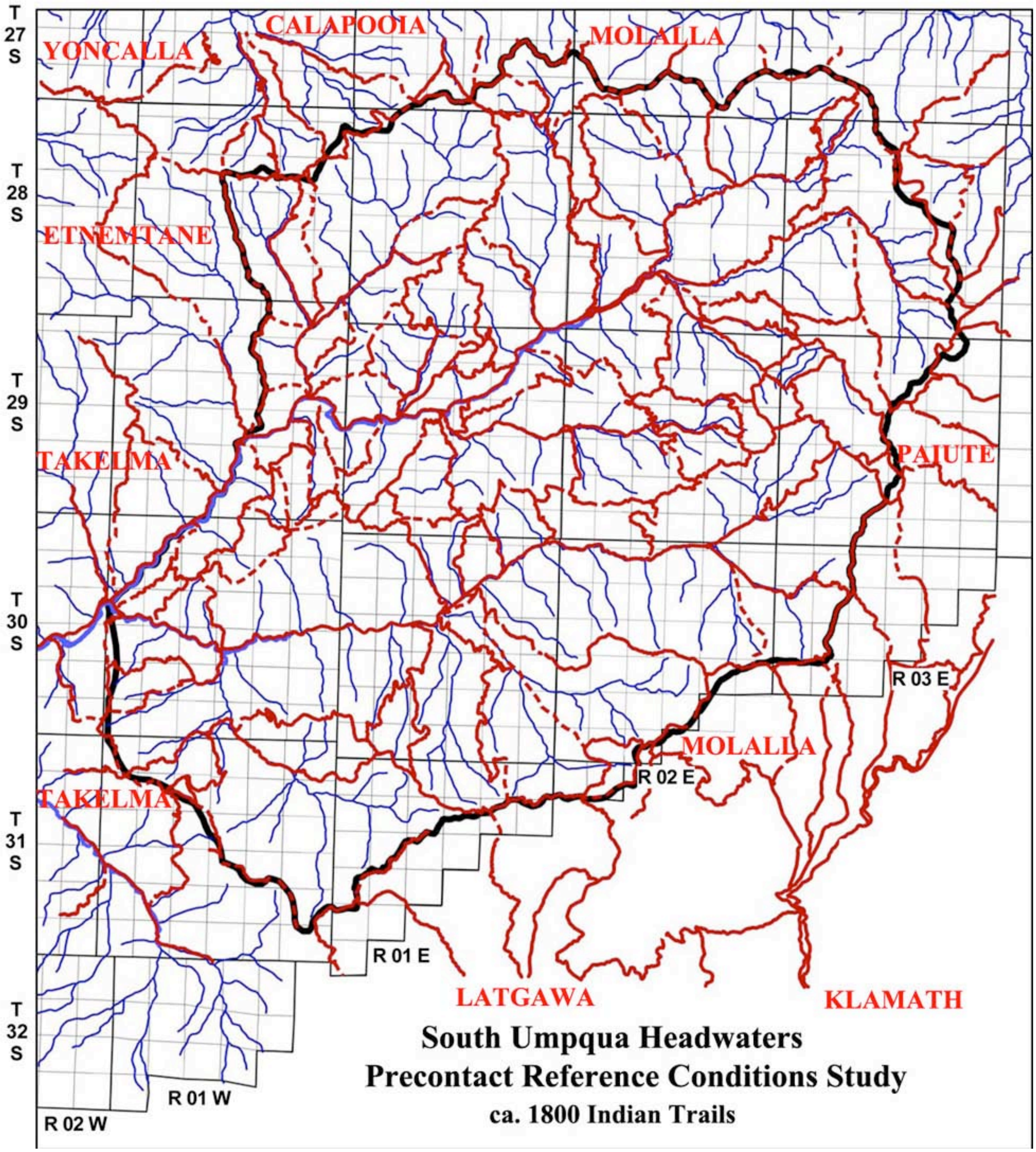
Archaeological evidence suggests that catastrophic declines in western Oregon Indian populations may have began at even earlier dates. Zybach (2003: 193-201), for example, uses regional tree ages and vegetation patterns to hypothesize that western Oregon Indian populations may have been in sharp decline since 1500, or perhaps earlier. Beckham and Minor (1992: 95) use local archaeological evidence and continental context to arrive at similar conclusions, and for the same time period:

> It is necessary to recognize the *Protohistoric Era* (A.D. 1500 to post-contact) as a subdivision of the Formative Period in Southwest Oregon. This era appears to have been a period of rapid culture change, which included replacement of the circular to oval houses observed in prehistoric sites by the rectangular house form noted ethnographically (Sapir 1907a: 267-268). Archaeological data pertaining to this interval suggest that a decline in cultural complexity occurred in the interior portion of Southwest Oregon prior to historic contact. This decline is reflected most clearly in the disappearance of the local ceramic tradition as early as A.D. 1300 or as late as A.D. 1500 (Pettigrew and Lebow 1987: 11-50).
>
> The loss of the ceramic tradition may have coincided with a rapid decline in the size of the native population. The later date of A.D. 1500 coincides closely with the occurrence of a hemisphere-wide smallpox epidemic with mortality rates around 75% from A.D. 1520-1524 hypothesized by Dobryns (1983). Archaeological evidence supporting Dobryns' hypothesis has been found in other regions of North America, including central New York, the Lower Mississippi Valley, and the Middle Missouri area of the Great Plains (Ramenofsky 1987 [1989?]) and the northern Columbia Plateau (Campbell 1990).

Human populations in the study area were undoubtedly greater in the summer and fall than during winter months, due to heavy snowfall in the higher elevations and reduced access to foods and fuel. In late precontact time, the number of people in the study area might reasonably be estimated at 1,000 or 2,000 individuals at the height of harvests, fishing, or trade gatherings. In earlier times, when regional populations may have been much greater, seasonal visitation numbers were likely much greater as well.

Map 3.02 shows the known and hypothetical (Zybach 2002; 2008; Carloni 2005) Indian foot-trail network in use throughout the study area 200 and more years ago. Names in capital red letters surrounding this network represent known tribes and nations that existed in those areas during those times.

The solid red lines on this map represent Indian foot-trail routes that have subsequently been developed into roads and trails that remain in use to this day; dashed red lines represent hypothetical connective routes that may no longer be in use at this time -- or at least are not shown on most modern maps. An analysis of these routes and Tribal locations indicates that Umpqua Takelmans from lower elevations



Map 3.02 Principal ca. 1800 Indian trails through South Umpqua River headwaters.

likely gathered at Huckleberry Lake and Quartz Mountain, among other locations, during summer and fall; Takelma-speaking Latgawans probably used Huckleberry Lake and Hershberger Mountain areas as well as, and likely at the same times as, Umpqua Takelma and Umpqua Molallans; and Athapaskan-speaking Entename ("Upper Umpqua") possibly traveled to any and all of these locations, and at the same times and for the same reasons. Klamaths likely moved slaves and other trade goods along the eastern ridgelines, following the historic Klamath Trail to campgrounds in the Black Rock and French Junction areas -- before heading north along Camas Creek into the North Umpqua Basin, or south into the Rogue River basin. It is also possible that Paiutes from the east, Santiam Molallans from the north, and Kalapuyan-speaking Yoncallans from the northwest also entered the area at these (and other) times.

Umpqua Takelma (Cow Creek; Nahankuotana)

Two hundred years ago, Takelma-speaking ancestors of today's Cow Creek Tribe likely occupied the lower elevations and western oak savannahs of the study area, with strong personal and family ties to local communities in the areas of present-day Tiller, Drew, and Milo. Takelmans fished the lower elevations of the South Umpqua and Jackson Creek, particularly in areas around the falls and mouths of streams, and tended crops of acorns, tarweed, camas (see Figure 3.02), fawn lilies, huckleberries, salal, manzanita, and other foods on the slopes adjacent to these streams.

The Nahankhuotana were Takelma-speaking people based in the Cow Creek area, although some scholars have claimed they spoke an Athapaskan dialect (e.g., Ruby and Brown 1986: 254); possibly because their historical name is Athapaskan and probably assigned to them by neighboring Tribes -- these people lived to the south of the Athapaskan-speaking Etnemtane, and to the east and southeast of the Athapaskan-speaking Mishikhwutmetunne (note Harrington observation on p. 43).

Figure 3.03 1850 Lyman sketch: Umpqua Indian women digging camas (Beckham and Minor 1996: 107).

The Umpqua Takelma maintained seasonal villages and were very dependent on acorns (Dickson 1946: 178), tarweed, and camas production for their livelihood. In many ways they maintained a type of agrarian society, and may not have ventured into adjacent territories for trade, warfare, or slave raids so much as their Athapaskan neighbors. In common with other Tribes in the region, they also cultivated tobacco.

Umpqua Athapaskan (Upper Umpqua; Etnemtane)

The Etnemtane were known as "Upper Umpqua" during historical times, and occupied the Umpqua River upriver from the Kelawatsets, and the South Umpqua headwaters to the north of the Hanis Coos and Miluk Coos, and to the east of the Mishikhwutmetunne. They were well known to Hudson's Bay Company beaver trappers, and often served as guides or hunters when opportunities presented themselves.

UMPQUA INDIAN GIRL.

Figure 3.04 Woodcut of 1841 sketch of Umpqua Indian girl by Alfred T. Agate (Wilkes 1845: 226).

Although the Etnemtane probably didn’t reside in the study area on a permanent basis, they had an obvious familiarity with the local trails and people and likely traded for South Umpqua products, such as elkskins, eels, beargrass, huckleberries, and other common trade items. There are strong indications they also captured slaves from their neighbors, and weren’t adverse to warfare (Davies 1961: 202, 213-215). They were noted for their battle dress, which included laced and ornamented two-pieced elkskin armoring, and single, white bald eagle tail feathers (Ruby and Brown 1986: 254; Riddle 1993: 44).

The Etnemtane seemed to rely more on hunting and trade, and less on fishing and vegetable production, than their neighboring Tribes. They were particularly noted, for some reason, for eating grasshoppers (Miller and Seaburg 1990: 582). In common with other Tribes in the region, they also cultivated tobacco.

Umpqua Molalla (Southern Molalla)

South Umpqua Molallans occupied the high elevation ridgelines and upper headwater subbasins, such as the Fish Lake and Five Lakes areas. The Molallans were known for elk hunting, using snowshoes and dogs, and for huckleberries. Winter villages were likely at the lowest elevations of the study area, perhaps even being shared with their Takelman neighbors. Summer campgrounds were probably situated along established trade routes, huckleberry fields, and sources of freshwater.

The name “Molalla” has at least 27 historical spellings. It is said to be derived from the words “moolek” for elk and “olilla” for berries (Winkler 1984:5):

> The importance to Molala subsistence of both hunting and berry- picking is reinforced by the fact that all published references to Molala subsistence mention either or both of these activities . . . (Winkler 1984: 5).

This would seemingly be a good name for their land, which produced abundant elk and berries, as well as for the people, who were known to extensively trade specialty products from these plants and animals. Chuck Jackson (2010: personal communications) pronounces the name as Molawa-lawa, which adds some credence to Winkler’s assertions.

Trade goods associated with Molallans include preserved huckleberries and blackberries, elk hides, jerked meat, and elkhorn spoons. Beargrass and willow weaving materials were also important trade items, due to their universal value and general abundance in Molalla lands. The Santiam Molalla to the north were known as good elk hunters, good berry pickers, accomplished traders, bitter and fierce enemies of the

Cayuse to the east; and good friends, family, and business associates with the Klamath to the south. They were also said to be poor guides when more than 35 miles from their homes (Minto 1903); indicating the possibility of a relatively concentrated and productive Tribal territory of seasonal use and trade route patterns, and a related limitation on interactions with their namesakes to the south.

Although there is very little known about Molallan history or culture (Winkler 1984; Ruby and Brown 1986; Zenk and Rigsby 1998), there is good agreement on early historical Molallan geography. During the 1775 - 1825 late precontact and 1825-1855 early historical time periods of this study, Molallans occupied nearly the entire western slope of the Oregon Cascades Range, from the Columbia River on the north, to the Rogue River on the south. The Molalla are believed to have been organized into three (or possibly four) major "bands," or tribes: the Southern Molalla inhabited the western Cascades of the Umpqua River and Rogue River basins of the western Cascades; the Northern Molalla lived on the western slopes of Mt. Hood in the Clackamas River, Molalla River, and Pudding River headwaters, south to Silver Creek, east of present-day Salem; and the Santiam Molalla lived on the western slopes of Mt. Jefferson and Three Sisters, on the headwaters of the North Santiam, Middle Santiam, South Santiam, Smith, Blue, McKenzie, Mohawk, and Middle Fork Willamette rivers. The Mohawk, Smith, and Blue rivers are northern tributaries of the McKenzie River; an eastern tributary of the Willamette River. A possible fourth Molallan band is formed by a division of the Santiam Molalla into two groups – one along the headwaters of the Santiam River, and the other along the headwaters of the Blue, Smith, McKenzie and Middle Fork Willamette rivers (Winkler 1984). Previous research provides some evidence for the likelihood of such a fourth band, the so-called "Blue River Molalla," (Zybach 2008), to differentiate them from the 1855 Treaty Band "Santiam Molallans" (Ruby and Brown 1986) who lived along the South Santiam River.

Latgawa (Rogue Takelma)

In common with the Molallan tribes, very little is known of the history of the Takelma-speaking Latgawa of the upper Rogue River basin; but something is known of their geography. These people lived upstream from the Table Rock area in Jackson County. It is very likely they maintained a lifestyle similar to the Umpqua Takelma to their north and northwest. The study area was probably most used or visited by the Latgawa in the Anderson Mountain, Huckleberry Lake and Abbott Butte areas during summer months, after snows had melted and berries began ripening.

Yoncalla Kalapuya (Calapooia; Calapooya)

The Yoncalla were Kalapuyan-speaking people who lived in the valleys and mountains between present-day Eugene and Roseburg, to the northwest of the study area. They were known to harvest and process acorns, dig and bake camas, and burn patches of tarweed before collecting seeds for subsistence. Deer hunting with dogs and seasonal salmon fishing were also associated with this tribe. They have, at times, been separated into two or three bands: Gatschet named two bands as Chayankeld (Yoncalla") and Tsantokayu; William Martin conducted a Tribal census in 1854 that identified three bands, the Calapooia (along Calapooia Creek), the Applegate (near the Jesse Applegate homestead in Yoncalla), and the Kellogg, along the mainstem Umpqua, upstream from the mouth of Elk Creek (Beckham and Minor 1996: 109).

Eukshikni (Klamath)

The Eukshikni ("people of the lake"), better known as the Klamath, lived to the southeast of the study area, along Klamath Lake and marshes. They are a well-known Tribe and have had a continued existence on their reservation and in nearby towns since early historical time. Of particular interest to this study is their regular use of the historic Klamath Trail, by which they transported and traded slaves as far north as the Columbia River. This trail entered the study area to the south of Black Rock and followed the ridgeline trail northeasterly to French Junction. On July 4, 1883, this portion of the Klamath Trail was noted, by name, by GLO Surveyor Samuel Flint, on the township line separating Tsp. 27 S. from 28 S., near the mid-point between Black Rock and French Junction (see Map 4.03). Another point of interest to this study is the practice of Klamath travelers to transport plants from their homeland to areas along the routes by which they traveled. Wokas (or yellow pond lilies) is a plant long associated with Klamath people and culture. It has been hypothesized that Klamath may have introduced wokas populations along the Klamath Trail to the north, of the study area, in ponds near Wolf Rock and Bear Pass in east Linn County, in precontact time (Zybach 2008). If so, it is worth noting that wokas was also documented in Skookum Pond, Five Lakes, and a few other locations in the South Umpqua headwaters, during this research (see Chapter V).

Metis (French Canadians)

The Metis were French Canadian fur trappers of mixed Indian and white ancestry who first entered the Umpqua River basin in the early 1800s, while working for the Hudson Bay Company and other fur trading firms. Although Metis typically had eastern US Indian blood, particularly from Tribes such as the Iroquois and Cree, they often married and had children with local Indian women, including Kalapuyans, Athapaskans, and Takelmans. These men helped introduce horses into the Umpqua country, perhaps as early as 1818 (Kathi Flynn, personal communication, 2010, suspects horses may have been introduced even earlier, possibly by Klickitat traders), and began settling into the upper South Umpqua River basin with their families by the 1850s and 1860s. Many of the members of today's Cow Creek Band of the Umpqua Tribe of Indians are descended from well-known local families with such French-Canadian names as Lavadore, LaChance, Rondeau, Pariseau, McKay, and Dumont. These families frequented the study area in the late 1800s as occasional full-time residents, and to the present as seasonal visitors who visited (and visit) the mountains to fish, hunt, powwow, pick berries, peel bark, harvest greens, and – in earlier times – avoid white settlers and militia attempting to send them or their wives and children to reservations (Beckham and Minor 1992: 143):

> In spite of the removal programs, not all Indians left the Umpqua. Refugees continued to hide in the mountains and eluded repeated efforts of agents and Army personnel to track them down. In 1859 an estimated 80 Indian men, women, and children resided in the foothills of the Western Cascades . . . Several other Indian families resided at the head of bottomlands on the south Umpqua, especially in the vicinity of Tiller and Elk Creek . . . These families were of mixed ancestry and traced to French-Canadian as well as Calapooya, Umpqua, Chippewa, Cree, Assiniboin, or Algonquin ancestors . . . These Indian families married, intermarried, and lived on the margins of what became the Umpqua National Forest. They used the backcountry for hunting, fishing, and berrypicking. They lived close to the land, avoided removal to the reservations, and largely escaped the scrutiny of the Bureau of Indian Affairs in the nineteenth century.

Chapter IV. Fire History, 1492 to 2010

> All the oak timber was owned by well-to-do families and was divided off by lines and boundaries as carefully as the whites have got it surveyed today. It can be easily seen by this that the Indians have carefully preserved the oak timber and have never at any time destroyed it.
>
> The Douglas fir timber they say has always encroached on the open prairies and crowded out the other timber; therefore they have continuously burned it and have done all they could to keep it from covering the open lands. Our legends tell when they arrived in the Klamath River country that there were thousands of acres of prairie lands, and with all the burning that they could do the country has been growing up to timber more and more.
> --Chenawah Weitchahwah, 1916 (Thompson 1991: 33).
>
> Instead of finding an uninterrupted forest carrying 100,000 feet or more per acre reaching from the Cascades to the Pacific, the first settlers seventy-five years ago [ca. 1840] found in the valleys great areas of "prairie" land covered with grass, brakes, or brush which were burned and kept treeless by the Indians, and mountain sides upon which forest fires had destroyed the mature forest and which were then covered by a "second-growth" of Douglas fir saplings or poles
> --Thornton Munger (1916: 92).

The word “history” can be defined in two ways: the period of time beginning in which people enter an environment, and the period of time beginning in which eyewitness accounts were first documented for an area. For the South Umpqua headwaters, the initial written accounts we have are from General Land Office land surveyors, who first entered the study area in 1857 (Hathorn 1857). According to local archaeological data, people were at South Umpqua Falls at least 3,000 years before then, and probably several thousand years before that time as well (O’Neill 1988: 164). By appending the word “fire” to history, we can redefine the term, such as occurs when the word history is modified by other qualifying terms, such as “geological history” or “natural history.”

In recent years the practice of interpreting fire scars during the course of tree ring analysis has commonly become known as “fire history” (e.g., Agee 1993; Stephens et al. 2010). This practice is limited by several factors: e.g., such a “history” is limited to the age of the trees (or quality of the stumps) in an area, because it is their annual growth rings being considered; catastrophic stand replacement events typically involve crown fires and stop ring production altogether, so stand history must therefore be considered by other methods; not all fires leave scars (frequent ground fires are less apt to do so, for one example, and thick-barked older trees are less likely to be scarred, for another – see Stephens et al. 2010); there is no specific method for differentiating between human-caused “prescribed fires” and lightning-caused wildfires (so-called "Fire Return Intervals"); only one tree at a time can be sampled and analyzed, thereby making landscape-scale fire histories expensive, inconclusive, difficult and/or impossible, etc.

Another, related, form of "fire history" has also been developed in recent years; that of analyzing charcoal deposits in small lakes and ponds (e.g., Long et al. 1998). This method has many of the same analytical problems as tree rings, and shown to be unreliable when compared to actual documented events (Zybach: 2003: 230-234; Impara 1997; Long 1996), and impossible to differentiate between human-caused fires and lightning-caused wildfires -- or the effects of prehistoric wind patterns on the size and location of charcoal deposits.

Dubrasich (2010; Appendix B) does a good job of describing Indian burning history in the study area, and supporting his statements with current literature and field measurements. In Chapter III I discuss the likelihood that Indian populations within the study area have apparently declined significantly at intervals during the past 500+ years. Boyd (1999a) and others relate these changes in human population principally to diseases introduced from Europe and Africa, beginning in 1492. Several of the trees measured by Dubrasich exceed 600 years in age; thereby providing the availability of tree rings for fire history analysis during the entire time of local human population decreases. For those reasons (availability of long-term tree-ring data correlating with periods of human population decline, and relationship of fire use to presence and numbers of people in an environment), this chapter will cover the period of time from 1492 to 2010 (the time of this research), and will primarily depend on field observations, field measurements, and historical documentation for its construction. Tree-ring fire scar and charcoal deposition analyses will not be used, for reasons stated and for limitations of time and resources. Because of the nature and purpose of this research, three areas (and timeframes) of fire history will be considered for the study area: precontact Indian burning history, beginning in 1492; general fire history, beginning in 1857; and catastrophic (greater than 100,000 acres) wildfire history, for the entire 1492 to 2010 time period.

Indian Burning History, 1492 to 1856

Because people were constantly present in the study area 200 years ago, fire was also constantly present. In order to keep campfires and cooking ovens fueled, firewood and other fuels had to be gathered regularly and systematically stored across the landscape. Firewood gathering activities probably focused on areas closest to campgrounds, campsites, and along trail networks. Different fuels had different uses: grass, twigs, moss, and cedar for kindling; Douglas-fir and pine for heat and light; alder, maple, and vine maple for curing meat and berries; and madrone, oak, and manzanita for cooking. Patch fires were used seasonally to rejuvenate food plants, for weeding, and to create weaving materials: late winter and early spring fires were used to maintain bracken fern prairies ("brakes"); summer fires were used for harvesting tarweed and other seed crops; and fall burning was used to rejuvenate huckleberry fields, treat hazel clumps, and harvest acorns. Broadcast burning was performed on seasonal basis for clearing trails and underbrush, for hunting, and for creating fuels; mostly in late summer and early fall when plants were dry and before snow or heavy rains had set in. Individual trees and clumps of trees were burned to create firewood and harvest pitch.

Because intentional anthropogenic fire was a constant presence in the landscape at that time, and had been for thousands of years previously, vegetation composition, structure, and distribution patterns reflected the historical human uses of the landscape. Lightly-fueled areas including prairies, savannahs, and open park-like forests were established and maintained, greatly reducing the likelihood – or even possibility – of catastrophic-scale wildfires. Lightning fires occurred, but they encountered limited fuels within an anthropogenic mosaic maintained by human-set fires, and hence lightning fires were constrained to burn within that established vegetation composition, structure, and distribution.

Eyewitness accounts and knowledgeable journalists provide a number of specific references to precontact land management activities in southwest Oregon, and often made informed observations regarding apparent management objectives. Walling (1884: 334), for example, refers to broadcast burning hilltops as an aid to "seed and acorn gathering":

> If we may believe those pioneers, the country was one of primitive wildness, yet of obvious fertility and productiveness. The wild grasses grew in profusion, covering everywhere the land as with a garment of the softest and most luxuriant verdure . . . The hill tops, now mostly covered by dense thickets of manzanita, madrone, and evergreen brush, were then devoid of bushes and trees because of the Indian habit of burning over the surface in order to remove obstructions to their seed and acorn gathering.

Takelma and Molalla were the principal Tribes present in the study area during late-precontact time, as described in Chapter III. Virtually nothing is known of Umpqua Molalla plant management methods. An eyewitness observer did write, however: "On the west face of the Cascades the Molallas claimed dominion, and fire was their agency for improving the game range and berry crops" (Minto 1908: 153), and that observation is likely accurate (Minore, et al. 1979; Boyd 1999b; Stewart 2002; Zybach 2003). However, other methods of plant management, including pruning, thinning, tillage, peeling, and weeding, also had to have been performed in order to increase plant productivity and product quality, and little or nothing is known about the Molalla in those regards. These processes were probably universal throughout the range of these plants, however, (K. Anderson 2005: personal communication, September, 2010), and can reasonably be inferred for the Molalla; Anderson (1993) also suggests experimental methods by which such practices might be rediscovered.

More is known about the Takelmans use of fire in the local area, however, principally through eyewitness and oral tradition accounts. Sue Shaffer, long-time chairwoman of the Cow Creek Tribe and life-long resident of South Umpqua Valley, for example, has written (Shaffer 1990: 142):

> Indians were the first environmentalists. Our ties to our Mother earth are different than those of the people who came after us. We have always understood that we must protect the resources that sustain us. The fall burning practices to keep our forests clean were common. This was to keep the forest clear of fallen logs, underbrush and other debris that collected. It also served the purpose of killing unwanted bugs and insects, harmful to the forest. By keeping the forest floor clean there was an assurance of plentiful food for the game animals, which were the main food source for many tribes. It also provided a clear view for the hunters.

Henry T. Lewis, note anthropologist and Indian burning expert, used Shaffer as a source in his accounts of local burning practices (Lewis 1990: 83):

> Sue Shaffer: "When I was a very little girl, I remember asking (Uncle Bob Thomason), "when do you do the burning?" His reply was always, "When the time is right." He would often go out in the field, away from the house and sniff the air, also wet his finger and hold it up (although there was no wind that I could perceive, and say, "Not yet" or "it's time." I never knew on what he based his reasoning. The fires were set annually, but I'm sure on a rotating basis. As for time of year, it would appear that some burning was done in the early Spring, although the bulk of it was in the Fall, perhaps after the first rain, for even in aboriginal times the annual fires were recognized as a way to balance the ecology. After Fall fires, there was a quick greening, providing food for the forest animals."

Chuck Jackson, a life-long Drew, Oregon resident (see Figure 2.01), prominent Cow Creek Tribal member, and nephew of Bob Thomason, observed (2010: personal communications):

> Chuck: You can go and anywhere you go in the mountains, if you'll look, you'll see it. Like the big old growth cedars, the big firs and the big trees all got fire scars. All of them. I mean, anywhere you go, you'll find the fire scars.
>
> Bob: You think that was from people camping and building fires on the leeward side or starting the pitch going on the sugar pine?
>
> Chuck: I don't know, they burned everything.

Bob: Or do you think it's 'cause of the ground fires?

Chuck: The Indians burned everything. That's how you got rid of all the brush, you burned it . . . Different areas. They would burn.

Bob: Just depending on when it got decadent or something?

Chuck: They'd look at it. If the brush was getting too much in with the huckleberries or anything that was foreign was coming into 'em, they burned it. Well, when I was a kid, well, in fact, two years ago, I was trapped in a gorse patch . . . or in the nineties you go back on some of these trails and they've got some big trees across them, and I can take those trees out, it's not a problem. Doesn't cost me any money or anything to take 'em out. I go up and dig out [*motions digging under the tree*], and I'll find a big old pitch knot and I'll break it up and put it under the tree and light it, and get a good fire going and build it all up with bark and stuff and then when I come back it's gone, the trail's clear.

Bob: I think that's one of the things that a lot of people don't realize, that you obviously know a lot about. There wasn't a lot of dead wood out there. People used it for firewood or they got rid of it or the regular fires going through burned it up -- that all this dead wood they got out there now . . .

Chuck: It's just trash.

Bob: . . . never was there before.

Chuck: The whole forest is trash now. Never used to, it looked like a park before.

Types of Indian Burning. Indian burning practices are defined as those uses of fire in precontact time and early historical time that resulted in changed or stabilized landscape-scale vegetation patterns (see Table 4.01). Four principal categories of these practices are recognized: firewood gathering and burning, patch burning, and broadcast burning (Lake and Zybach: In Review). Individual trees and logs were burned, as Jackson describes, to clear trails, to fell, as hearths (windbreaks), and for pitch production. Firewood gathering and burning ("firewood burning") involved the movement of fuels to specific locations before burning, and resulted in areas that contained relatively little (or, conversely, stockpiled) large, woody debris -- and designated spots of intense, repeated, and prolonged heat. Patch burning is defined as having a specific purpose and involving fuels within a bounded area, such as burning an older huckleberry patch, a segment of trail, or a field of weeds. Broadcast burning is the practice of setting fire to the landscape for multiple purposes and with general boundaries, such as burning a prairie to cure tarweed seeds, eliminate Douglas-fir seedlings, expose reptiles and burrowing mammals, and to harvest insects.

Firewood. Firewood gathering and use was a daily process for most families, hunters, gatherers, and travelers for hundreds and thousands of years throughout the South Umpqua basin. Principal locations were probably located along trails, campgrounds, and townsites. Springs, peaks, waterfalls, meadows, berry patches, root fields, nut orchards, camas patches, and other favored locations were also sites of seasonal camping and food processing activities that required intensive localized firewood gathering. The value of firewood to families and communities -- at least in areas of scarcity -- was illustrated by Clark's April 17, 1806 assessment of "the 2nd Chief" at the Skillute trading village near Celilo Falls (DeVoto 1953: 355):

> I was envited into the house of the 2nd Chief where concluded to sleep. This man was pore nothing to eat but dried fish, and no wood to burn. Altho' the night was cold they could not rase as much wood as would make a fire.

Clark was gauging the man's wealth by the amount of fuel he had available, rather than food or housing: despite the apparent poverty of the 2nd Chief in regards to firewood, Clark also "observed maney stacks of fish remaining untouched on either side of the river" (DeVoto 1953: 353).

Type of burning	**Products and purposes**	**Timing**
Individual tree	1-2 purposes: tree felling, living hearth, pitch production, trail clearing.	Situational.
Firewood gathering and burning	1-2 purposes: heat, light, cooking, boiling, cleaning, fuel stores, celebration, ceremony, security.	Daily: concentrated near homes, trails, settlements and campgrounds.
Patch burning	1-2 purposes: hunting, berry patch maintenance, root fields harvesting, pest control, weaving materials, trail maintenance.	Seasonal and situational.
Broadcast burning	Multiple purposes: stable wildlife habitat; curing seeds; hunting; viewing; transportation; weaving materials; acorn harvest.	Seasonal: late summer, early fall for grasslands; late winter, early spring for bracken fern.

Table 4.01 Western Oregon Indian burning practices, pre-1857 (Lake and Zybach 2010).

The cumulative results of widespread and systematic firewood gathering over time undoubtedly had a major impact on the location, distribution, and quantity of fuels consumed during wildfire, field clearing, or crop management processes. The likelihood of most bonfires, campfires, oven fires, and sweathouse fires resulting in wildfire events was probably very low. Unattended fires, left for the purpose or desire of being spread were probably fairly common (Minore 1972; French 1999). Such fires were intended to spread whenever possible and cannot be considered escapements.

Patch Burning. Berry patches, hazel clumps, sugar pine groves, and manzanita fields were all burned from time to time, depending on opportunity and need. Sugar pines were burned individually to encourage pitch production or as a windbreak; huckleberries were burned to eliminate rank vegetation and weeds and to stimulate berry growth; hazel and beargrass was burned periodically to produce weaving materials. Cumulatively, these practices totaled hundreds or thousands of acres a year in southwest Oregon; and dozens or hundreds of acres within the study area. Daily and seasonal trail clearing activities, combined with occasional and seasonal brush clearing, hunting, seed curing, and sprout-inducing (for food and weaving materials) burns, made year-round open field burning a likelihood. Areas most likely to be burned in this manner included ridgeline trail segments, hilltop balds, bracken fern prairies, berry patches, hazelnut orchards, and other travel corridor segments or croplands (Zybach 2002). The escapement potential of such fires was probably moderate at times, depending on weather, the fuels being burned, and the condition of burn boundaries.

Broadcast Burning. Areas of annual seed production, particularly fields of tarweed and sunflowers, were burned every summer over large acreages (Boyd 1999b). Large bracken fern prairies were also burned annually in the Oregon Coast Range (Zybach 2003: 156-159), western Washington (Norton 1979), and western Canada (Turner 1991), but it is unknown how the plant was managed in southwest Oregon, if at all (Jackson 2010: personal communications). Oak savannas, riparian prairies, and ridgeline grasslands were often burned annually, too, to clear leaves, kill competing trees and shrubs, produce forage for deer and elk, and/or to make acorn and hazel nut harvesting easier (Boyd 1999b; Stewart 2002). Pine woodlands, were burned whenever fallen needles became thick enough to sustain flame (e.g., Leiberg 1900: 249):

> The forest floor in the type is covered with a thin layer of humus consisting entirely of decaying pine needles, or it is entirely bare. The latter condition is very prevalent east of the Cascades, where large areas are annually overrun by fire. But even on the western side of the range, where the humus covering is most conspicuous, it is never more than a fraction of an inch in thickness, just enough to supply the requisite material for the spread of forest fires.

Seasonal broadcast burning activities varied from firewood and patch burning actions in two important ways: fire boundaries were not so clearly defined, and there were multiple objectives for burning. The possibility of escapement from these actions was, as with patch burning, probably moderate at times.

Effects on Native Wildlife. Areas that were regularly burned produced a number of food plant species, as well as plants that could be used for other purposes, such as weaving materials, medicines, dyes, and construction materials (Zobel 2002: 307-308). Acorns, hazelnuts, camas, wokas, tarweed, huckleberries, blackberries, bracken fern, nettles, tobacco and other food, fiber, fuel, and medicinal crops were often managed in select areas over long periods of time. Crops were maintained and harvested in discrete locations in which the dominant species—usually the crop species itself—had been established or rejuvenated within a few days, weeks, or months time. This approach created a condition that is called "even-aged" management. Foot trails or canoe traffic, depending on location, provided direct access to favored croplands.

The development and maintenance of transportation corridors, extensive oak savannas, grassy prairies, brakes, berry patches, chinquapin and hazelnut groves, root fields, meadows, and balds by Indian burning practices also resulted in beneficial habitat to a number of plant and animal species (see Chapter V), providing sunlight, abundant food, ready travel routes, and certain types of cover. During infrequent wildfire events, these areas were not as prone to being burned, or burned at relatively low temperatures, and could also function as "refuges" for threatened wildlife species (Zybach 2003). By providing stable breaks in strategic parts of the landscape (ridgelines, peaks, and riparian corridors) with little long-term fuel build-ups, these areas also protected adjacent land areas that produced firewood, large wood products, and provided long-term habitats for big game animals, forest-dwelling species, or other useful plants, such as mosses and mushrooms (Kimmerer and Lake 2001; Zybach 2003). The use of fire across the landscape, therefore, provided benefits for people that were shared by a wide range of plant and animal species, many of whom were apparently dependent, or otherwise benefitted greatly, on these practices to maintain habitat or food.

Shrubs, flowers, and grasslands are quickly invaded and replaced by trees when prescribed fire (or other regular disturbances, such as grazing or mowing) is removed from the environment (e.g., Moravets 1932; Zybach 1999). These plants provided much of the basic food stores for precontact people in the forms of fruits, nuts, seeds, roots, stems, and bulbs (Todt and Hannon 1998; Boyd 1999b; Anderson 2005). Many of the same foods were also important to the survival of such animals as bear (Wilkes 1845b: 184), deer (Whitney 2001), and butterflies (Schultz and Crone 1998). Coblentz (1980: 348), for example, notes, "acorns are among the most important fall and early winter foods for numerous wildlife species."

Times of Indian Burning. The seasonality and timing of firewood gathering, patch burning, and broadcast burning was critical to the success of these practices, both to human practitioners and to affected plant and animal populations. Table 4.02 shows the general correlation between historical South

Umpqua (and western Oregon, generally) weather patterns and the seasonal timing of local precontact Indian burning practices.

Month	Season	Weather	Temperature	Plant Fuels	Burning
Jan.	Winter	Wet	Freezing	Dormant	Firewood
Feb.	Winter	Wet	Freezing	Dormant	Patches
Mar.	Spring	Wet	Freezing	Budburst	Patches
Apr.	Spring	Mixed	Cool	New Growth	Patches
May	*Transition*	*Mixed*	*Warming*	*Growing*	*Projects*
Jun.	Summer	Dry	Warm	Growing	Firewood
Jul.	Summer	Dry	Warmest	Growing	Firewood
Aug.	Late Summer	Dry	Warmest	Dormant	Broadcast
Sep.	Late Summer	Dry	Warm	Dormant	Broadcast
Oct.	*Transition*	*Mixed*	*Cooling*	*Fall Growth*	*Patches*
Nov.	Fall	Wet	Freezing	Dormant	Firewood
Dec.	Fall	Wet	Freezing	Dormant	Firewood

Table 4.02 South Umpqua basin precontact seasonal burning patterns.

General Fire History, 1857 to 2010

Beginning in 1857, GLO Surveyors noted whenever their lines crossed into burned areas, and sometimes even recorded the names of burns, or commented on their extent. These are the only historical records of wildfires or purposeful burning we have for the study area until it was surveyed by foresters in 1899: Dodwell and Rixon (1903) from the north, and John Leiberg (1900; 1903) from the south. From that point in time the record improves dramatically, beginning with maps and occasional photographs and extending to annual reports, aerial photos, panoramic photos, GIS analysis, and Infrared imagery.

Leiberg surveyed most of the southern Cascade Range in Oregon, covering both the east and west sides of the range north to Tsp. 28 S., expertly remarking on timber species and volumes, reforestation history, and fire effects. In summarizing his findings for the region, he wrote (Leiberg 1900: 276): “Of the forested area examined, comprising in round numbers 3,000,000 acres, a total of 2,975,000 acres, or 99.992 per cent, are fire marked.”

Leiberg was an accomplished botanist with an eye for detail. His first-hand examination of millions of acres of forest land – which he measured, photographed, and also helped mapped – enabled him to make a number of perceptive observations regarding the history of the land he was examining. He counted tree rings and measured diameters of trees being sent to sawmills, observed Klamath Indians peeling bark from pine trees, sheep herders setting fires to alpine forests to create pasture, and homebuilders felling sugar pines to make shakes for their roofs. These observations, and others, allowed him to be very analytical in his assessments of forest conditions, and the effects of fire over time. For example, this observation on forest soils (Leiberg 1900: 255):

> On ground where fires have not run for one hundred to two hundred years humus covers the forest floor to a depth which varies from 3 to 5 inches. The litter consists of broken trees and branches. It is enormously increased in quantity when a fire, even of low intensity, sweeps through the forest.

In Leiberg's examination of Tsp. 31 S. Rng. 3 E. in the study area, he observed (Leiberg 1900: 285-286):

> Where the yellow-pine reforestations have reached an age of 200 years and upward, the yellow pine is giving way to the encroaching red-fir growth. Where fires of modern date [1855-1899] have burned away the reforestations in these places, lodgepole pine or brush growths have taken possession.

Leiberg also made insightful observations regarding the transition from Indian burning (where he was able to make eyewitness accounts in the Klamath Lakes area), to white immigration and landscape-scale fire use more adapted to land clearing, grazing, mining, and forestry practices that then typified the western slopes of the range (Leiberg 1900: 277-278):

> Without much doubt the present agricultural areas, once grass covered and carrying scattered stands of oak, were burned over quite as extensively as the timbered tracts; at least there are few oaks that do not show fire scars . . .
>
> The age of the burns chargeable to the era of Indian occupancy can not in most cases be traced back more than one hundred and fifty years. Between that time and the time of the white man's ascendancy, or, between the years 1750 and 1855, small and circumscribed fires evidently were of frequent occurrence . . .
>
> The aspect of the forest, its composition, the absence of any large tracts of solid old-growth of the species less capable of resisting fire, and the occurrence of veteran trees of red fir, noble fir, white pine, alpine hemlock, etc., singly or in small groups scattered through stands of very different species, indicate without any doubt the prevalence of widespread fires throughout this region long before the coming of the white man. But, on the other hand, the great diversity in the age of such stands as show clearly their origin as

> reforestations after fires, proves that the fires during the Indian occupancy were not of such frequent occurrence nor of such magnitude as they have been since the advent of the white man . . .
>
> It is not possible to state with any degree of certainty the Indian's reasons for firing the forest. Their object in burning the forest at high elevations on the Cascades may have been to provide a growth of grass near their favorite camping places, or to promote the growth of huckleberry brush and blackberry brambles, which often, after fires, cover the ground with a luxuriant and, to the Indian, very valuable and desirable growth. The chief purpose of the fires at middle elevations and on the plans or levels probably was to keep down the underbrush in the forest and facilitate hunting.

Cattlemen, sheepherders, hunters, and miners began moving into the study area in the 1850s and 1860s and thereafter. This was almost entirely an all-male population, although many of these men began setting up residences and occasionally bringing in wives and children in the late 1800s. Fires were set for entirely different reasons than when the land was occupied by Indians, but the pattern of vegetation limited the size and extent of the fires, no matter their purpose or when they were set.

Fred Mensch, in his August 27, 1905 summary description of Tsp. 29 S., Rng. 1 W., was among the first GLO surveyors in the study area to note large burns, to record their names, and to associate them with identified homesteaders (Mensch 1906: 6101 1/2-6101 3/4):

> The whole district is heavily timbered with the exception of some pine openings in sec. 28, and in places where the timber has been destroyed by fire, denuded tracts called "burns." These burns are timberless but are covered with dense undergrowth in the greater part of their extent. The Big Burn is some two miles long and a mile wide, embracing portions of secs. 18, 19, 20, 29, and 30.
>
> The Horseshoe Burn is about a mile long and a half mile wide and lies in secs. 28 and 29 . . . Many of the red firs and sugar pines are magnificent trees, some of them attaining a diameter of eight feet . . .
>
> Isadore Rondeau, in sec. 33, has a good house, barn, and other buildings, some 40 acres under fence with about 10 acres under cultivation, several head of horses and a small herd of cattle . . . Graham in sec. 28, has a cabin and about ten acres under fence . . . Geo. Rondeau has a cabin and a considerable area of cleared land on the Horseshoe Burn in sec. 29.

Although these locations are just outside the boundary of the study area, they do give an idea as to the size and importance of the areas that have been burned. The "Big Burn," for example, is two miles wide and a mile long -- at most, an area of about 1300 acres, which is relatively small by the wildfire standards of today. The "Horseshoe Burn" is even smaller, although it contains relatively successful homesteader George Rondeau; only about 320 acres in size.

Figure 4.01 shows a typical burn created to produce forage. This photo appears to have been taken in the mid-1930s, after the USFS had successfully reduced prescribed burning within the Umpqua NF boundaries – but while local ranchers continued to use the land for grazing purposes. Note three things here: the wide spacing and relatively small diameter of the snags in the burned area; the brush that has grown up among the snags due to the elimination of continued burning; and the perimeter of large, wide-spaced conifers in the background.

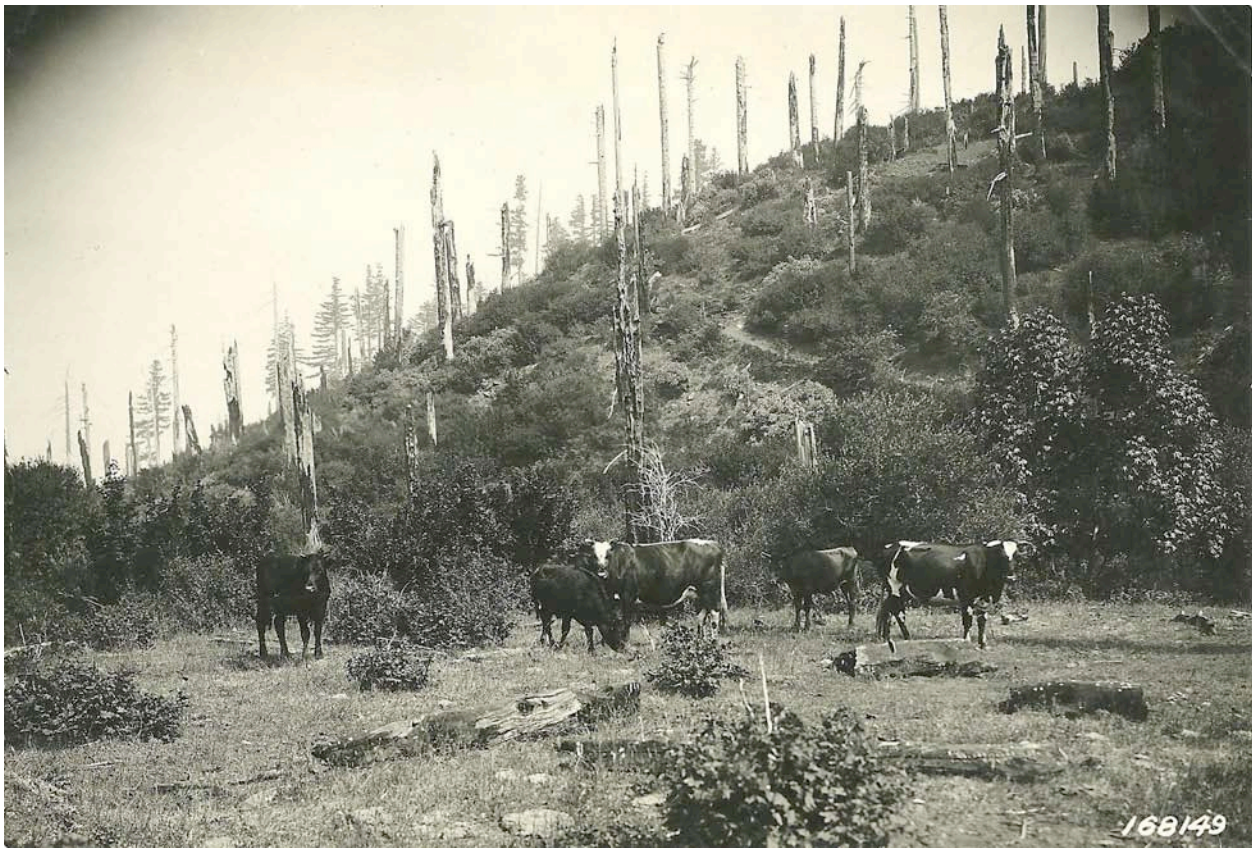
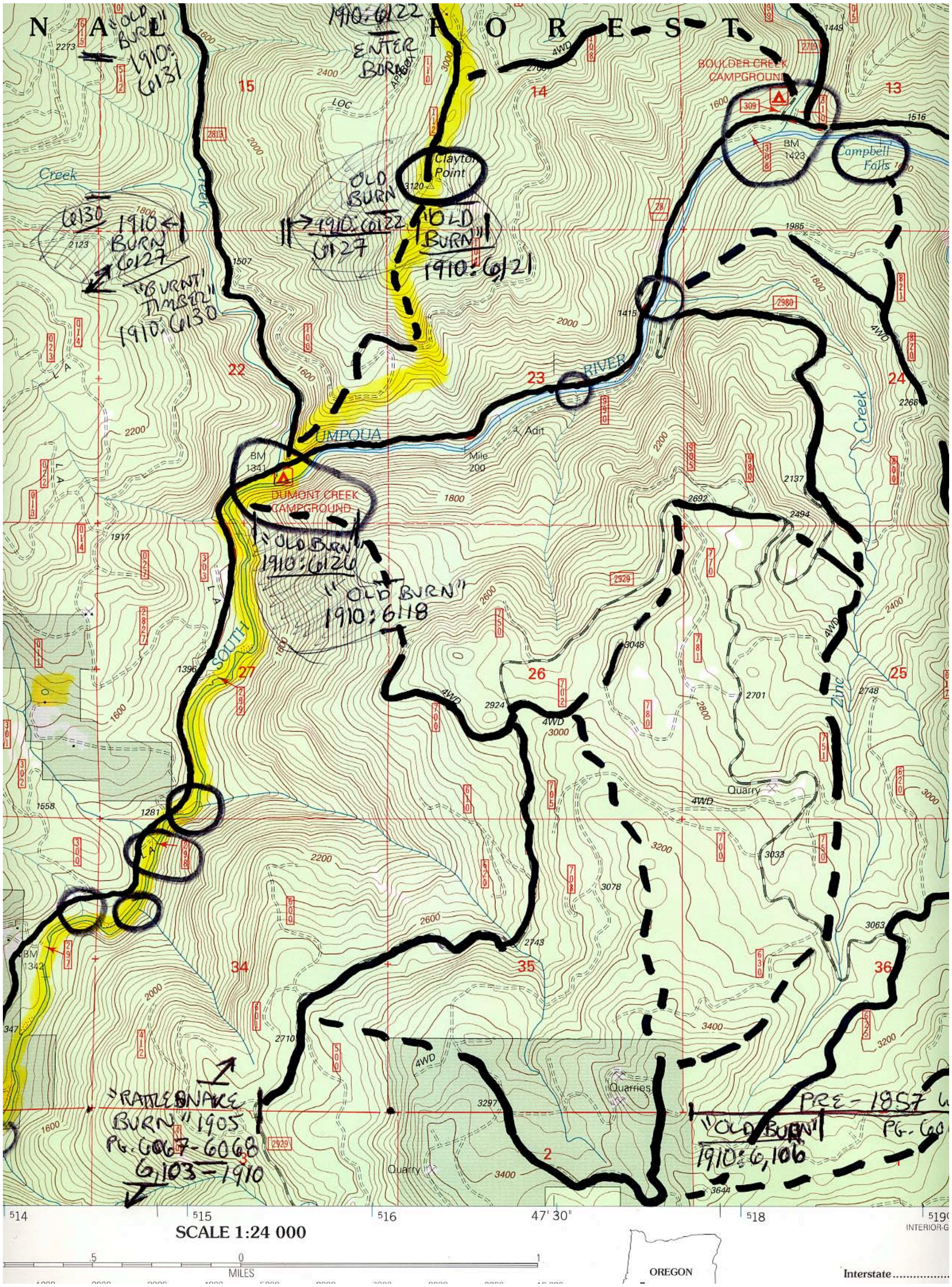


Figure 4.01 "Salting grounds, summit divide," ca. 1935, Rogue-Umpqua Divide (USFS collection).

Map 4.01 shows the location of a number of pre-1910 fires noted by the GLO surveyor during that year (Rands 1910). This survey includes Clayton Point, which was still surrounded by snags when Osborne photographs were taken from that location in 1932 (see Chapter VII). The yellow line separates the study area to the east from the perimeter to the west (surveyed by Mensch in 1906). Note the number and size of "burns" and "old burns" (as determined in 1910): most of these areas appear to be less than 100 acres in size, and the largest appear to be less than 200 acres, at most.



Map 4.01 Transcribed 1910 GLO locations of "Burns" and "Old Burns," Tsp. 29 S., Rng. 1 W.

Figure 4.02 is a 1946 aerial photograph showing that portion of Tsp. 29 S., Rng. 1 W. in Map 4.01, 36 years after Rands' GLO survey and 14 years after the Osborne photographs were taken from Clayton Point L.O. The South Umpqua River location is a good method for aligning these perspectives, as is the mouth of Zinc Creek, and Clayton Point, along the study area boundary. Note that the size and locations of earlier burns have not changed significantly in the intervening decades: whether this is a result of long-term snag recruitment of repeated burning is unknown, but the consistent patterning over time is significant.

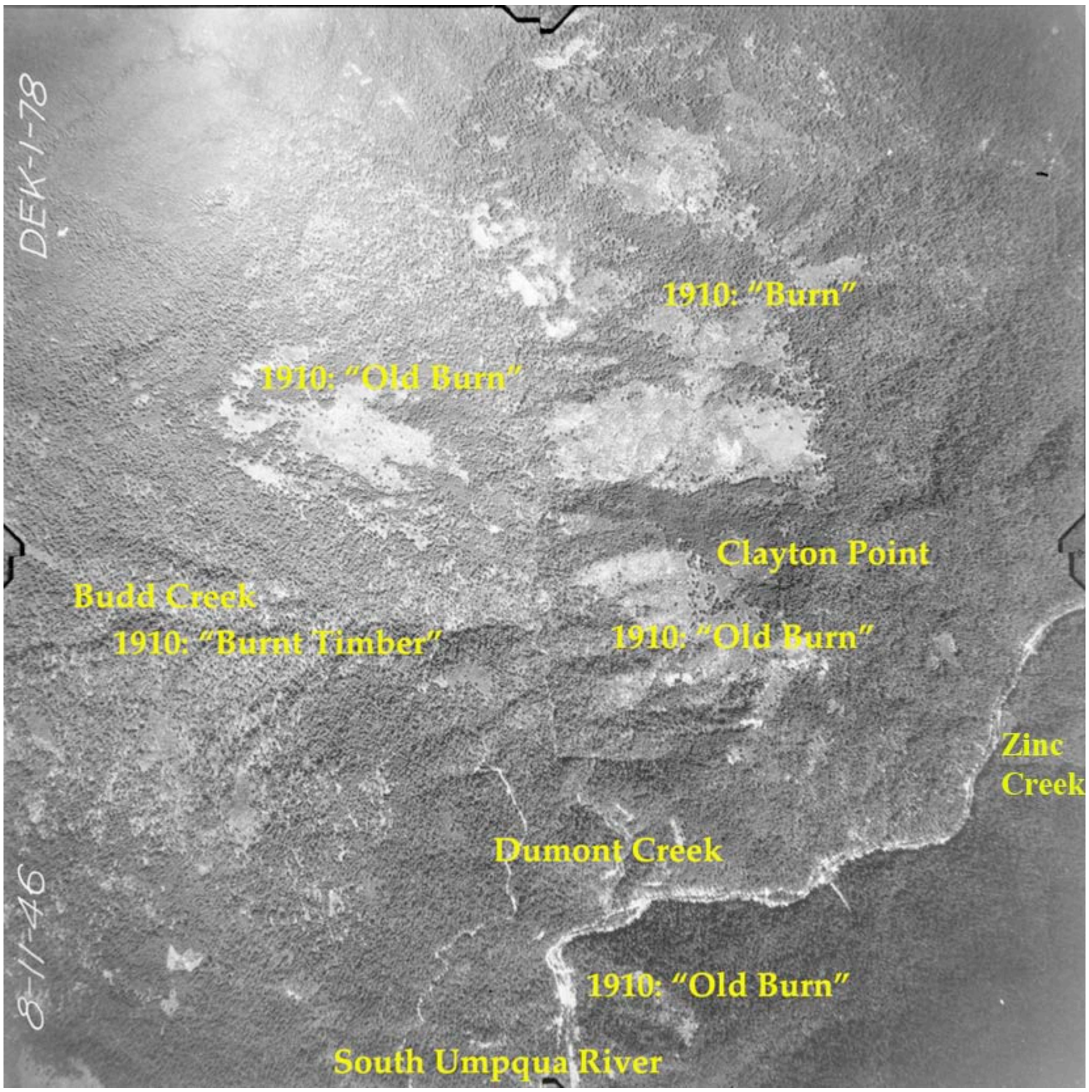


Figure 4.02 1946 aerial photo with 1910 GLO survey notations, Tsp. 28 S., Rng 1 W.

The widespread fires of 1910 caused a national awareness of the damage to forests and communities that could result from forest wildfires (Pyne 1982: 239-268). One result was the formation of state departments of forestry and privately funded fire protection organizations throughout the western US. In Oregon, the Department of Forestry (ODF) was created in 1911 to manage the State's forestlands and to fight wildfires on state and private lands. In Douglas County, the Douglas County Fire Patrol Association (now called Douglas Forest Protective Association) was formed in 1912 to prevent and fight wildfire on state, private, and USDI (now called Bureau of Land Management, or BLM) lands within the county's boundaries.

The ODF was put under the guidance of the Oregon Board of Forestry; among who's first duties was to appoint a State Forester to immediately begin coordinating fire prevention and fire suppression activities with the various county and private fire patrols around the State. The cooperative efforts of the State Forester and the fire patrols were (and are) summarized into an annual report, which the State Forester then presented to the Governor. These actions often resulted in conflicts with rural ranchers, hunters, and others, such as Bob Thomason (Shaffer 1989; Jackson 2010: personal communications), who continued to set fires along ridgeline trails, to rejuvenate huckleberry patches, to clear pastures, and for other purposes – and resented the need to apply for permits or report their activities in order to continue doing so. Officials from the US Forest Service, the Oregon Department of Forestry, and local Fire Patrol Associations soon began labeling these traditional practices as "incendiary," or even "arson." Some examples of this major shift in thinking in regards to long-standing prescribed burning practices can be seen in the Annual Reports of the ODF State Forester to the Board of Forestry. The Sixteenth Annual Report, for example, contained the following passages (Oregon State Board of Forestry 1927: 23):

> Incendiarism again heads the list of man-caused fires. It is possible that the field men are too prone to list fires as incendiary where the cause is unknown, or a little time devoted to investigation and reasoning would prove otherwise, nevertheless it is a fact that the greatest damage to standing timber in Western Oregon was due to this cause. The total number of fires from this cause is listed at 299 or 30 per cent of the total number of man-caused fires.
>
> During the night of July 27, over 50 incendiary fires were started on South Myrtle Creek in Douglas County. The lookout discovered the fires at 2:00 A. M. on July 28, and immediately reported them. Men were immediately sent to the fire but winds and low humidity caused them to merge into one immense fire, burning over 6,000 acres, and destroying 14 million feet of timber. Another incendiary fire was set on July 13, and destroyed 18 million feet of timber.
>
> The net loss in merchantable timber in Douglas County was 37,752 M board feet and over 37 million of this was due to incendiarism. Both Jackson and Josephine counties suffered from incendiary fires, but the loss was low in comparison to Douglas.

The Eighteenth Annual Report elaborated on this theme (Oregon Department of Forestry 1929: 13-14):

> The incendiary ranks first in the number of man-caused fires and second in the amount of property destroyed . . . The greatest difficulty with incendiary fires is encountered in Douglas, Jackson and Josephine counties. Apparently there are several motives. Some fires are set in order to burn out brush and small trees so that the land will be available for grazing. Other4s evidently desire to improve the hunting, some want to clean up the land so as to make prospecting easier, a few desire to secure work on the fire line, while some set fires out of pure maliciousness.
>
> While there might be some question as to the origin of a single fire, there can be no question as to the cause when so many fires start in a string along some trail, stream or ridge within a short time, as was very frequently the case last summer.

From the Twenty-First Annual Report (Oregon Department of Forestry 1932: 9-10):

> There were 1,621 fires on lands patrolled by the state and associations [in 1931]. This is the largest number of fires since 1924. Ninety-five per cent of the fires were man-caused – and increase of 18 per cent over 1930. Only 85 fires were set by lightning . . . The incendiary was the principal cause of fires. Five hundred and forty-eight or 34 per cent of the total number of fires were maliciously set. This is the largest number of incendiary fires for any one season. The incendiary situation was the worst ever faced by protection agencies, due primarily to the unemployment problem which was acute through the state . . . Josephine County had 116 incendiary fires, Douglas 109 and Jackson 76.

From the Twenty-Second Annual Report (Oregon Department of Forestry 1933: 4-5):

> During 1932 Oregon experienced one of the most destructive fire seasons in the history of organized protection . . .
>
> There were 1,686 fires reported during the season. This is the largest number occurring in one season since 1924. Ninety-five per cent were man-caused. Only 87 fires or 5 per cent were caused by lightning. As usual, incendiaries accounted for the largest number of fires by causes. There were 674 fires classed as incendiary which represented 40 per cent of the total number. Smokers ranked second with 352 fires or 20 per cent, and brush-burning third with 198 or 12 per cent . . .
>
> Douglas county had the largest number of fires with a total of 235. Of these 185 were incendiary.

From 1933 until 2002, relatively few wildfire events of note took place in the South Umpqua headwaters area of this study. This may have been in part to the establishment of Fire Lookout stations and aerial surveillance of the forest, combined with improved road systems and telephone communications prior to

WW II, or because of great increases in clearcut logging, road-building, technical advances in fire suppression, and the widespread deployment of youthful loggers and foresters throughout the area, equipped with the latest technological advances in firefighting equipment, chainsaws, caterpillar tractors, and chemical fire retardants after WWII. Perhaps it was the climate for those years, or federal policy – that reasoning as been given as well for the dearth of wildfires throughout western Oregon that seemed to take place everywhere except Tillamook County (and maybe the Smith River basin) in western Oregon for nearly 50 years – until the Silver Complex in the Kalmiopsis Wilderness area of the Klamath-Siskiyou Mountains in southwest Oregon in 1987, some bad wildfire years in the 1990s, and then the 2002 Fire Season; which affected much of western Oregon throughout late summer and early fall.

2002 Tiller Complex. In 2002 the snags of the Silver Complex in the Kalmiopsis Wilderness caught on fire, and nearly 500,000 acres burned and reburned in southwest Oregon: the largest wildfire in the State's history, so far as cost, damage, and acreage measures. On July 12th and 13th of that summer, lightning storms hit the South Umpqua headwaters, starting dozens of wildfires in their wake. Driven by extreme weather conditions and an initial lack of fire fighting crews (due to Regional staffing decisions for other large fires), the 2002 fires on the Umpqua escaped control and burned over a large landscape leaving "a natural pattern in the native forest" (Morrison et al 2003: iii).

By August 6th there were 19 active fires within the Tiller Complex, with an estimated 31,960 acres burned, at 25% containment. The largest fire in the Complex was the Boulder Fire, with total acreage at 13,960 acres. Seven fires were larger than 1000 acres: two of the four largest fires remained unstaffed until resources could be reassigned for other fires. Falling snags (dead trees) were said to pose a serious hazard to firefighters.

On August 7th there were still numerous active fires within the Tiller Complex, with a slight increase (from August 6) to an estimated 32,005 acres burned, at 25% containment. Current strategy became to reduce fuels on the perimeters – "denying fuel to the main fires, and to tie-off the west side before offshore winds set in" – which strategies were expected to increase the fire size "by 800 acres."

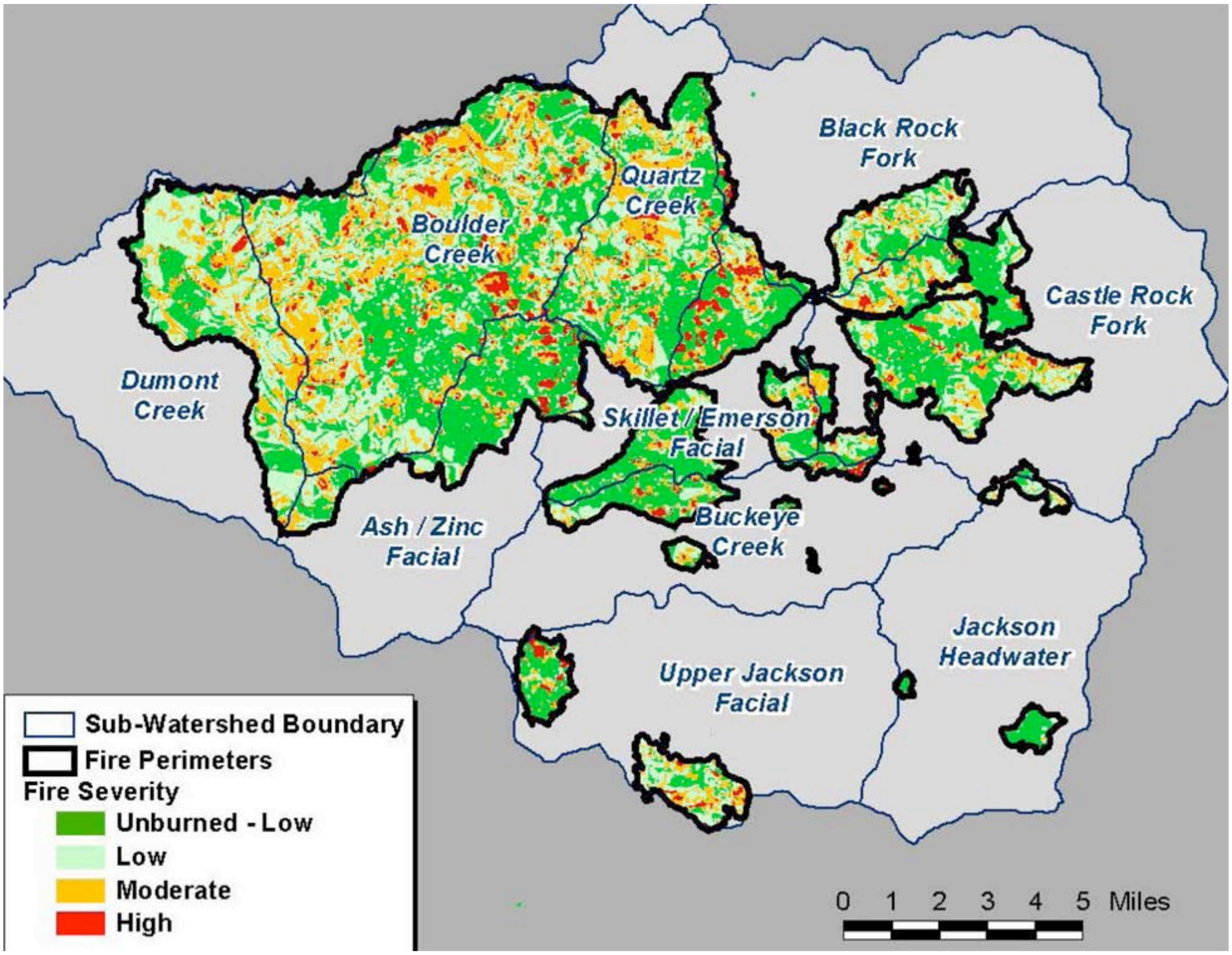
By August 18th the Tiller Complex Fire had grown to 53,900 acres and was 43 percent contained. The fire now consisted "eight large fires and numerous other small fires."

On September 4th the Tiller Complex was contained at 68,862 acres (Morrison et al. 2003: 5).

Map 4.02 shows the final extent of the Tiller Complex, including unburned land and burned lands considered to be of high, medium, and low severity. Note the general similarity with these patterns and earlier historical patterns shown on Map 4.01 and Figure 4.02. Perhaps this is the actual “natural pattern in the native forest” described by Morrison et al. (2003: iii), but it must be further noted that the earlier patterns were apparently due to human ignitions, rather than lightning storms; too, there is no way to determine the relative severity of the earlier burns, or why they remained persistent in the landscape.

Table 4.03 tabulates the areas shown on Map 4.02, based on Carloni (2005: 54). Figures are rounded to the nearest 500 acres, so the total fire size is increased 138 acres to 70,000 acres. This rounding process is for two reasons: partly to make the numbers and percentages easier to comprehend, and partly to dispel the illusion that there is more precision to the numbers generated by GIS; i.e., the 70,000 acres is every bit as accurate as the 68,862 acre figure, and easier to understand. Note that “old-growth” forest is listed as 44% of the entire area burned. Because no definition is provided for this designation, it is difficult to determine how this number was derived. Traditional definitions for old-growth trees and stands are those in excess of 200 years of age (e.g., Zybach 2003: 193-201). It is unlikely that the entire area shown is populated with 200-year old (and older) trees, so a more accurate description might be “conifer forestland,” or something of that nature. The designation of “plantation” should be straightforward enough (an area reforested with planted seedlings), so perhaps there is a more accurate determination of that condition. The remaining area of “other vegetation” – as with the term “old-growth” – is difficult to understand. Is this second-growth, grassland, seedlings, brushfields? Any or all of the above?

Despite difficulties in understanding the types of vegetation (other than plantations) affected by these fires, the map and table clearly present several important points: 1) only about 30% of the total area burned, so the actual amount of burned ground was closer to 20,000 acres than to 70,000 acres; 2) the pattern is one of dozens (or hundreds) of small fires, with no single area being heavily affected; 3) only 4,000 acres total seemed to be characterized as (roughly) “stand replacement events,” and those generally seem to be evenly distributed across the landscape; 4) plantations seemed more likely to experience major mortality during this event than other vegetation types; and 5) the fires seem to be defined by subbasin boundaries (see Chapter VII) more than any other factor – whether this was because of topography, existing vegetation/fuel patterns, and/or back burning strategies implemented on August 7 could not be determined from the cited reports.



Map 4.02 2002 Tiller Complex Fire boundaries and severity (Morrison et al 2003: 14).

Type	Unburned	Low	Medium	High	Total	Percent
Old-growth	23,000	4,000	3,000	1,000	31,000	44%
Plantation	8,500	2,000	3,000	2,000	15,500	22%
Other Veg	17,500	2,500	2,500	1,000	23,500	34%
Total	49,000	8,500	8,500	4,000	70,000	100%
Percent	70%	12%	12%	6%	100%	

Table 4.03 2002 Tiller Complex “burn intensity by stand type” (Carloni 2005: 54).

2009 Boze and Rainbow Creek Fires. The Boze Fire resulted from lightning storms that passed over South Umpqua headwaters on September 12 and 13, 2009. The fire affected the French, Boze, Prong, and Copeland Creek drainages to the immediate east and north of the 2002 Tiller Complex Fires on the Black Rock Fork subbasin of the South Umpqua River. The Rainbow Creek Fire was first reported on September 22, 2009, to the east of the 2002 Tiller Complex Fire on the Castle Rock Fork subbasin of the

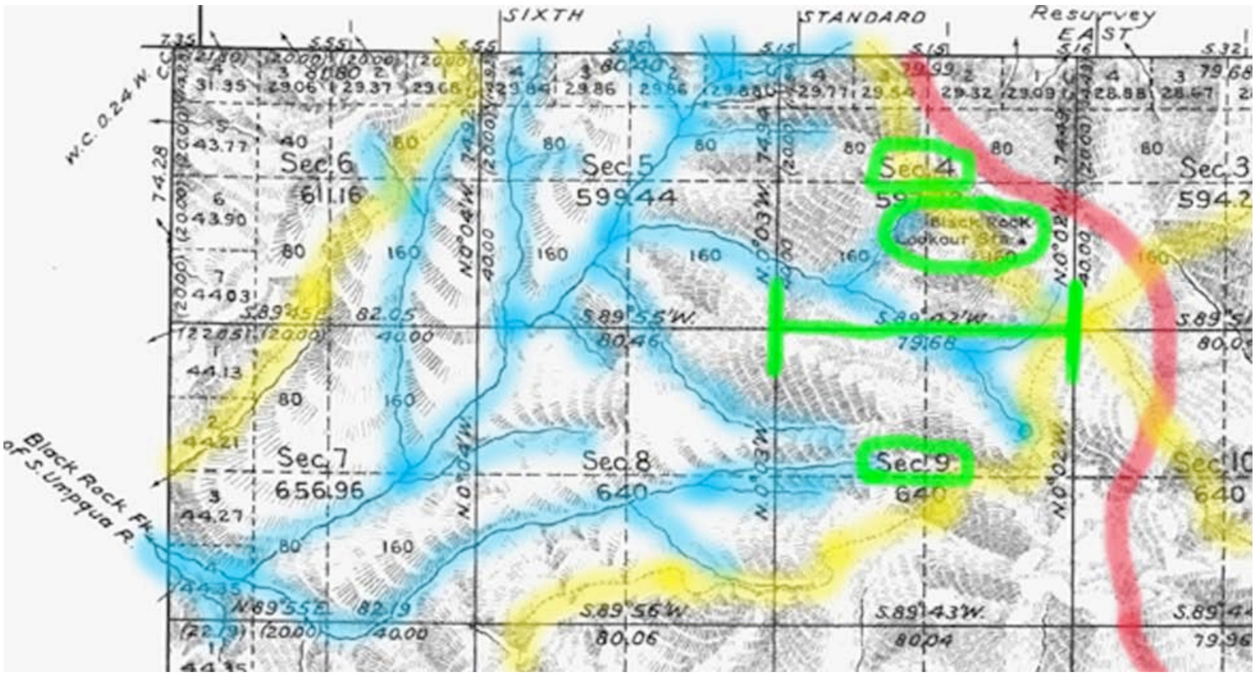
South Umpqua River. It was also ignited by one of more lightning strikes on a ridgeline separating the Black Rock Fork from the Castle Rock Fork, and then moved rapidly northward into the Black Rock Fork subbasin.

Figure 4.03 shows a portion of the GLO survey notes taken on an east-to-west transect between Section 4 and Section 9 of Tsp. 28 S., Rng. 3 E., to the immediate south of Black Rock (Raymond 1929: 10,537). This is a portion of the land that burned on September 22 during the first day of the Rainbow Creek Fire. Map 4.03 shows this area of land, with a green highlight showing the transect between Section 4 and Section 9 described in Figure 4.03. The intersection of the east-west transect line with the north-south dashed "quarter sec" line between the "Sec. 4" and "Sec. 9" labels on Map 4.03 is the point labeled "39.84" [chains] on Figure 4.03. Note that the bearing trees at this point are only 8-inches and 10-inches

0.10	Trail, bears NE. and SW.
10.00	Creek, 3 lks. wide, course SW.
39.84	Set an iron post, 3 ft. long, 1 in. diam., 30 ins. in the ground, for ¼ sec. cor., with brass cap marked
	¼ S 4 / S 9 1929
	from which
	A fir, 10 ins. diam., bears N.77*E., 62 lks. dist. Marked ¼ S 4 B T.
	A fir, 8 ins. diam., bears S.67*E., 63 lks. dist. Marked ¼ S 9 B T.
	Desc. 90 ft. over W. slope.
42.45	Creek, 5 lks. wide, course NW., enter heavy timber, bears NW. and S., asc. 290 ft. over NE. slope.
52.00	Leave heavy timber, bears N. and S., enter an old burn, very dense undergrowth.

Figure 4.03 1929 GLO Black Rock survey notes, Sec. 4 and Sec. 9 division, Tsp. 28 S., Rng. 3 E.

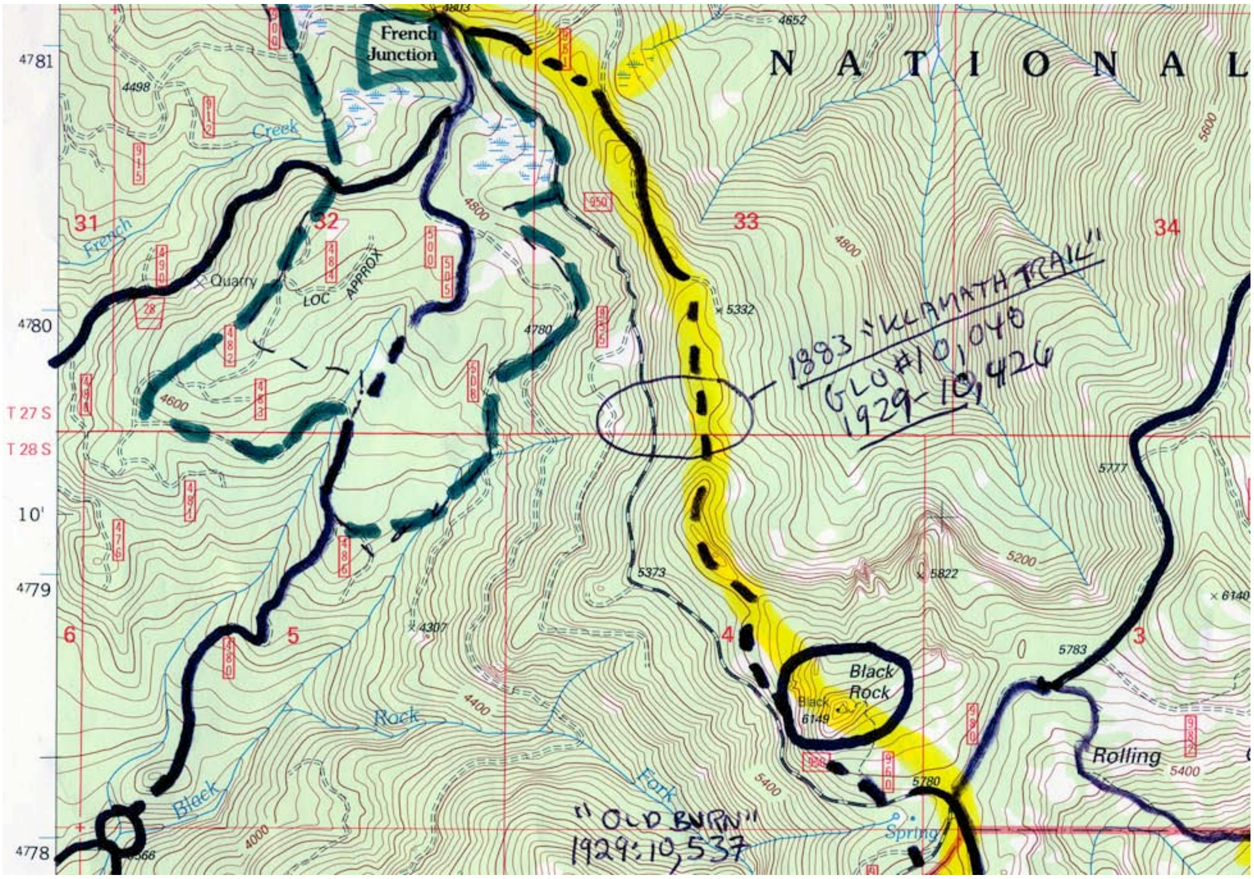
in diameter. They are not old-growth, and are far more likely to be very young [perhaps 20-year old] Douglas-fir poles or saplings. As the GLO surveyor, Raymond, continued east another 175 feet along this line in 1929, he encountered a strip of "heavy timber," bearing northwest by south; continuing due east on the same transect another 630 feet he then entered "an old burn" with "very dense undergrowth" (see Figure 4.01), bearing north and south. Therefore, in 1929, this mile-long strip of land passed through some very young trees, some older trees, and into a burn in less than ¼ mile distance.



Map 4.03 Annotated Black Rock portion of 1929 GLO map, Tsp. 28 S., Rng. 1 E.

Map 4.04 shows this same area, the east west transect between Sec. 4 and Sec. 9 in Tsp. 28 S., Rng. 3 E. to the south of Black Rock, transcribed onto a current USGS field map; along with a segment of the historic Klamath Trail surveyed in 1883 (Flint 1883: 10,048).

Table 4.03 shows photographs of the Rainbow Creek and Boze fires on September 22, 2009: the day the Rainbow Creek Fire was first reported, and the same day it burned completely across the transect described and shown on Figure 4.03 and on Map 4.03 and Map 4.04. All of these photos were taken on the same day, with the exception of photograph E., which may have been taken on a different day. All photographs were taken from the government "Inciweb" website (www.inciweb.org/incident/1893/),



Map 4.04 Annotated USGS Black Rock field map, with Sec. 4 and Sec. 9 divide, Tsp. 28 S., Rng. 3 E.

maintained by the USFS, BLM, the National Park Service, and several other federal agencies, and which contains significant additional information on these fires. All photos are credited as given at that location.

Map 4.05 shows the progression of the Boze and Rainbow Creek fires from September 15 to September 28, 2009, including the September 22 start of the Rainbow Creek Fire documented on Table 4.03. The base for this map was also obtained from the Inciweb website, but it was cropped and annotated with geographical locations, study area boundary line, and subbasin labels to make it easier to relate to other maps and illustrations in this report.

On October 3, 2009, infrared aerial photographs were taken of the two fires and determined that the Boze Fire had become an estimated 10,640 acres and the Rainbow Creek Fire an estimated 6,085 acres, bringing the total for the two fires to about 16,725 acres.

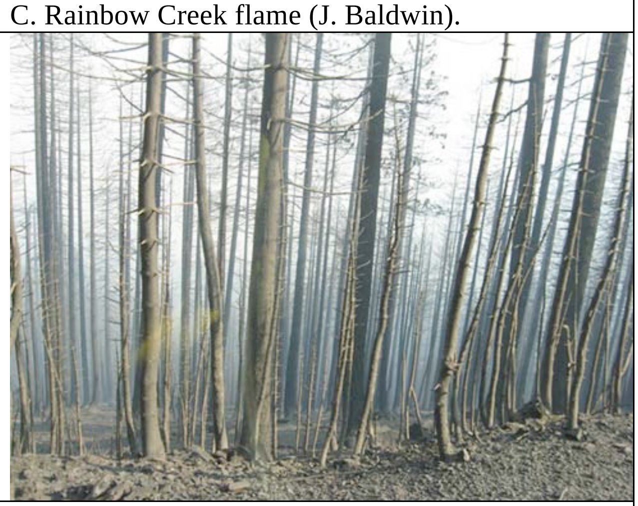
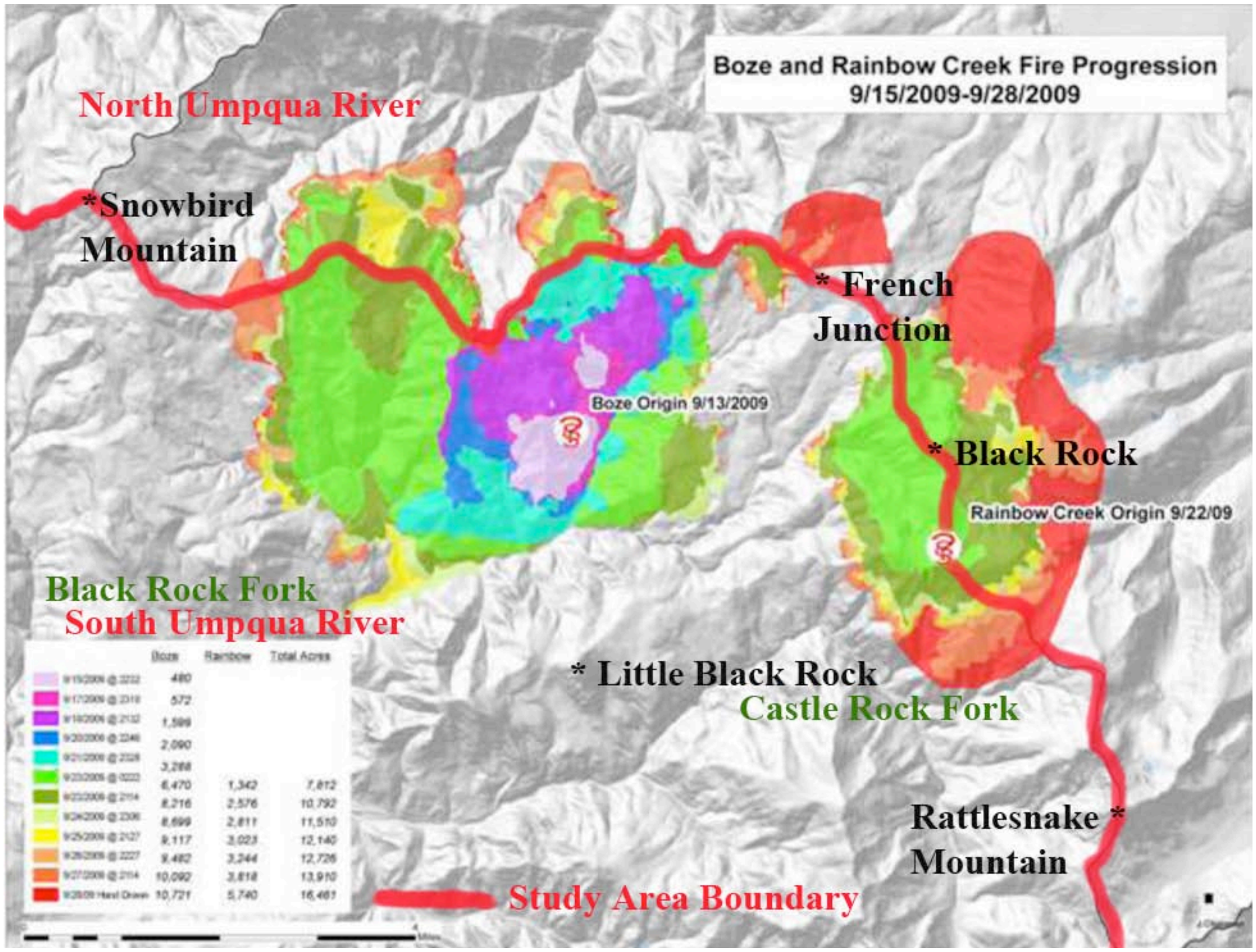
	
A. Rainbow Creek Fire start (P. Zerr).	B. Rainbow Creek Fire blow-up (J. McEnroe).
	
B. Boze and Rainbow Creek fires (J. Baldwin).	C. Rainbow Creek flame (J. Baldwin).
	
D. Boze Fire night patrol (XTreme Wildlands, Inc.)	E. Boze Fire aftermath (K. Sands).

Table 4.04 Boze and Rainbow Creek fires, September 22, 2009 (www.inciweb.org/incident/1893/).



Map 4.05 Boze Fire and Rainbow Creek Fire daily burning progression, September 15-28, 2009.

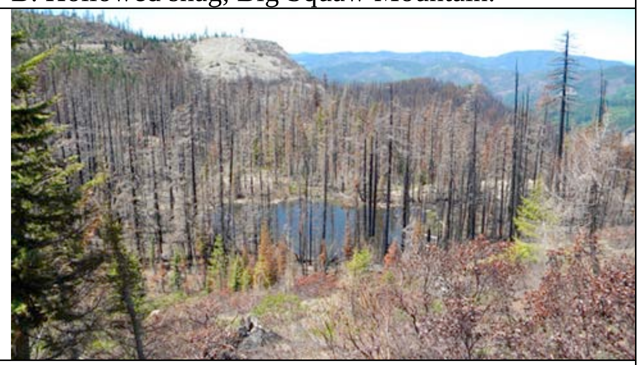
Table 4.04 shows the aftermath of the 2002 and 2009 wildfires in the study area. Photographs, C., F., and H. show effects of the Tiller Complex eight years after it occurred. Not in particular the ridgeline burn pattern on C. This type of "natural break" in fire effects is typical of the types of vegetation patterns representing historic Indian burning practices, as well as the subbasin-defined patterns shown on Map 4.02. Also, compare the snag-overstory/shrub-understory pattern of H. with Figure 4.01. The two individual snags likely burned during 2002 as well, but note the differences in their patterns: A. is an isolated snag with evidence of large lower limbs, demonstrating that it was open-grown throughout much or all of its existence; B. is hollowed out as if it had an entirely different burn history, and is surrounded by smaller diameter snags that moved in during more recent times.

Figure 4.04 is a last look, toward the northeast, at the Sec. 4 and Sec. 9 survey transect line south of Black Rock that burned on September 22, 2009 -- as it appeared one year later, on July 13, 2009

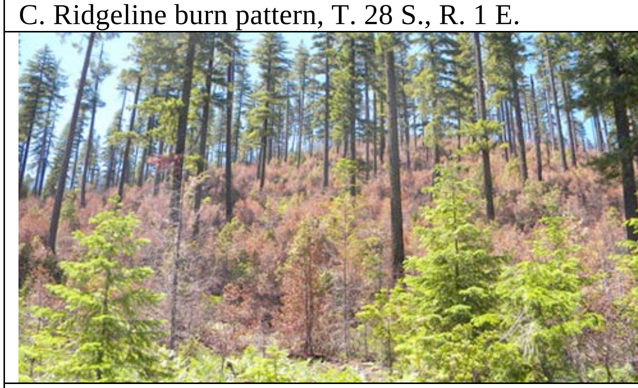
A. Burned snag, Big Squaw Mountain.

B. Hollowed snag, Big Squaw Mountain.

C. Ridgeline burn pattern, T. 28 S., R. 1 E.



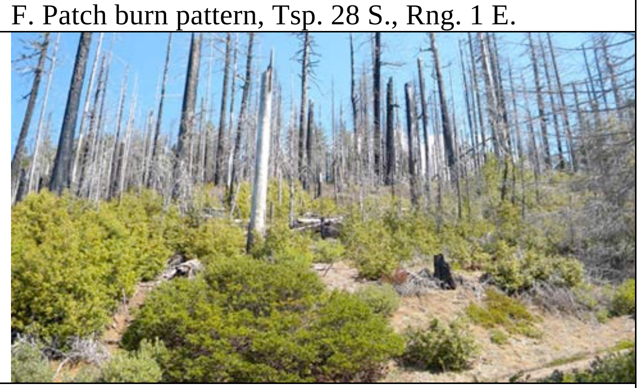
D. Riparian burn pattern, Black Rock Fork head.



E. Understory burn pattern, French Junction.

F. Patch burn pattern, Tsp. 28 S., Rng. 1 E.

G. Spot burn pattern, Quartz Creek bridge.



H. Old burn, Cavitt Mt., Tsp. 28 S., Rng. 1 E.

Table 4.05 South Umpqua headwaters wildfire aftermath patterns, 2010.

Catastrophic Wildfire History, ca. 1490 to 2010

Catastrophic forest fires, by definition, are wildfires that cover more than 100,000 acres of contiguous forestland during the course of a single event (Zybach 2003: 6-7). Catastrophic fire years are calendar years in which more than 100,000 acres of forestland within a given area are burned by wildfire, whether during the course of a single event, or as a result of numerous events (ibid.: 93).

The South Umpqua headwaters area, surprisingly, has no history of catastrophic-scale wildfires. Although large, stand-replacement events have become more commonplace in recent years, a variety of conditions and circumstances seems to have kept this area free of wildfires approaching the scale of the historic Coast Range "Great Fires" (Zybach 2003); the more recent 1987 Silver Complex and 2002 Biscuit Fires in southwest Oregon; or the 2003 B&B Complex to the north**.**

This pattern (catastrophic-scale wildfires to the north and west of the study area; but not inclusive of the study area) seems to have been consistent throughout historical time, and likely for several hundred years before then as well.

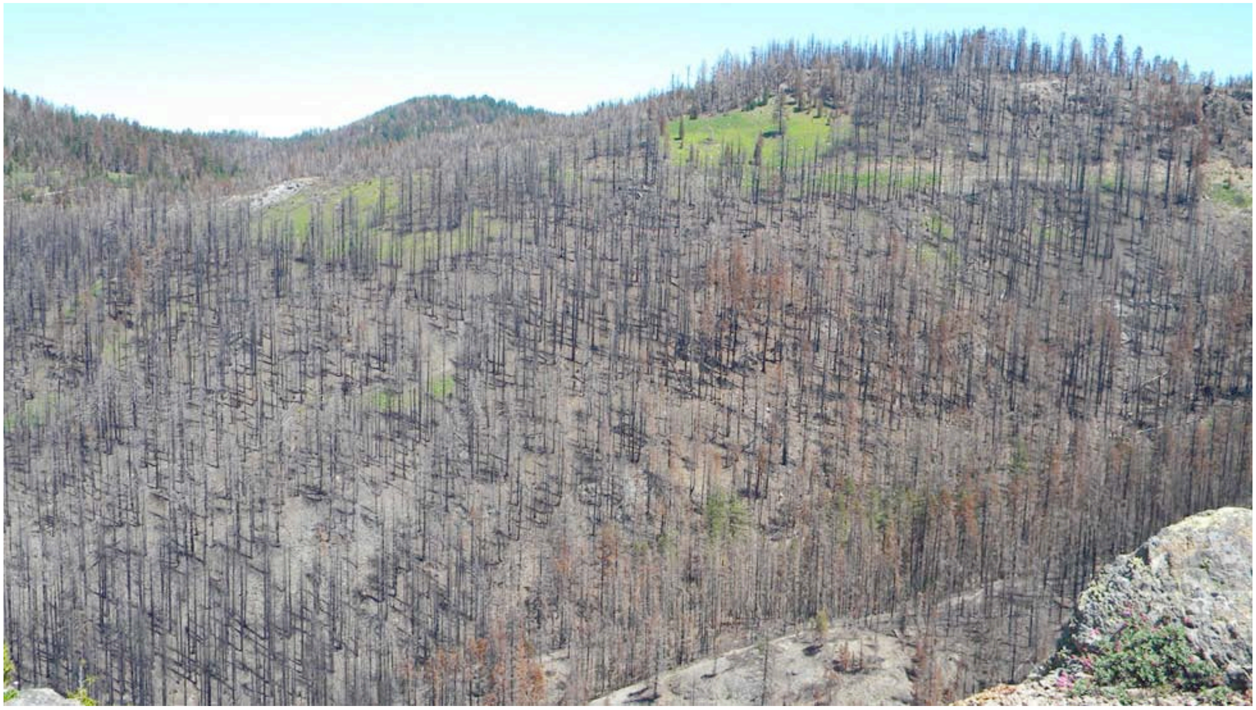


Figure 4.04 Looking NE of Black Rock, across Sec. 4 and Sec. 9 divide of Tsp. 28 S., Rng. 3 E.

The1900 USDI GIS map shown on Table 2.01, is the earliest historical map shown in the sequence. The original 1900 USDI map (Thompson and Johnson 1900) was included with a report by Gannett (1902). In describing map, he stated (Gannett 1902: 11):

> The most startling feature shown by the land-classification map of this State is the extent of the burned areas, especially in the Coast Range and in the northern half of the cascades. It must be understood that the areas represented here as burned are only those in which the destruction of timber was nearly or quite complete. Areas which have been burned over with only a partial destruction of the timber are not here represented.

In considering this record, two questions come to mind: 1) Has the South Umpqua headwaters regions simply been fortunate to have escaped such catastrophic-scale wildfire events during the past few centuries (with recent indicators being that this won't likely continue indefinitely); or, 2) Does some configuration of topography, geology, local weather patterns, and/or vegetative cover exist in this area that – at some point – confines such extensive wildfires and restricts their spread?

The recent increase in size and severity of wildfires within the study area boundaries suggests that a trend may be developing in which future wildfires will become ever more destructive and difficult to contain, unless something is done to alter that trajectory.

Chapter V. Native Wildlife: Plants and Animals

The study area contains a wide diversity of native plants and animals typical of the western Cascades of Oregon, including the southern-most extent of Alaskan yellow cedar and northern-most extent of Shasta red fir. Although Douglas-fir currently dominates most of the study area -- with the exception of higher elevation peaks and ridgelines -- relict stands and groves of Oregon white oak, ponderosa pine, sugar pine, western redcedar, and chinquapin strongly indicate past conditions, when Douglas-fir populations were more limited, and savannas, grasslands, brakes, and berry fields were more extensive.

Significant numbers of native insects, birds, and mammals were also observed and/or documented in the study area, including elk, deer, coyotes, black bears, cougars, western gray squirrels, skunks, ruffed grouse, Canada geese, turkey vultures, frogs, butterflies, ticks, and mosquitoes. Wolves were last documented in the study area in the mid-1940s, although there is some questionable evidence they may have returned in the past few years. Other extirpated species include condors, grizzly bears, and wolverines. Turkeys were the only introduced animal species noted, and exotic invasive plants included scotch broom and tansy ragwort observed along certain roads, trails, and landings.

This chapter profiles native plants and animals documented in the study area in 2010 during field research activities. Select plants and animals thought to be of particular importance to ca. 1800 Takelma and Molalla occupants of the upper South Umpqua River basin are given specific attention. Because the area was subjected to regular burning and fuel-gathering activities over time, additional attention is given to general effects to native species in that regard.

As most gardeners know, harvesting fruits and pruning away dead growth tends to stimulate additional growth, decrease disease and insect problems, and to produce significantly more fruit and fiber products the following growing seasons. Indian women are believed to have systematically harvested fruits and deadwood from fields of manzanita and huckleberries, as examples, and then burned the shrubs or trees when they needed to be replaced or rejuvenated. Digging bulbs, harvesting hazel and willow cuttings, and breaking off dead oak limbs all had similar positive management effects on those plant species.

Native Plants and Fire

Table 5.1 lists the common names of several important precontact food, fiber, and fuel plants still found in the study area. Although regular landscape-scale burning activities and widespread firewood gathering and use have been generally eliminated from the environment, these plants continue to persist, and much remains known about their individual adaptations to regular fire, pruning, and harvesting disturbances related to past human presence and use (e.g., Dickson 1946; Anderson 2005). The column marked "Fire" denotes whether plants were dependent on (or otherwise benefitted by) regular disturbance for their survival -- such as provided by fire -- or whether they were merely tolerant of such actions, and tended to persist despite human actions. "XX" denotes plants largely dependent on fire and other regular disturbances for their existence, and "X" denotes plants tolerant of fire; blank spots denote plants in which the relationship to fire is unclear. Note that no plants are intolerant of regular fire: all have either

Food Type	Food Name	Fire
Berries	Blackberry	XX
	Gooseberry	X
	Huckleberry	XX
	Strawberry	XX
	Thimbleberry	XX
Bulbs	Beargrass	XX
	Camas	XX
	Cat’s Ears	XX
	Fawn Lilies	XX
	Onions	XX
	Tiger Lilies	XX
Fruits	Chokecherry	XX
	Manzanita	XX
	Rosehips	XX
Grains	Grass seed	XX
	Indian peas	XX
	Sunflower	XX
	Tarweed	XX
	Wokas	X
Greens	Dock	XX
	Miner's Lettuce	XX
Mushrooms	Morels	XX
	Puffballs	XX
	Shaggy Manes	
Nuts	Acorns	XX
	Filberts	XX
	Chinquapin	XX
	Pine nuts	XX
Roots	Bracken fern	XX
	Mountain carrot	XX
	Yampah	XX
Stalks	Cattail	X
	Fiddleheads	XX
	Thistle (Edible)	XX

Table 5.01 Important native food and fiber plants of the South Umpqua River headwaters, ca. 1800.

benefitted by its regular use, or adapted to its presence in the environment. Other forms of disturbance related to plant management, such as tillage, picking, and pruning, were also present in all environments but seem far more likely to have occurred in regularly burned areas, and are included under the single heading for that reason.

Note that only plants directly associated with ponds (wokas and cattails) do not seem to directly benefit from regular burning or harvesting activities. Gooseberries and shaggy mane mushroom responses to regular fire are not so well understood (at least to this author) as the other plants listed. Important plants which are not on the list, such as incense-cedar and madrone, also likely benefited by regular fire – possibly at much longer intervals that the majority of listed plants – in order to reduce competition from invasive Douglas-fir and other large, long-lived conifers.

Energetically, many of the plant species used and managed by people were also important to other plants and animals for habitat, cover, or forage (Norton et al 1984; Todt and Hannon 1988). Table 5.2 provides photographs of a sampling of such species; several of which have become greatly limited in population and range since late precontact time. Still, these plants continue to provide important cover, nectars, pollens, nesting materials, fruits, bulbs, nuts, shade and other benefits of value to associated native plants and animals that also continue to persist to this time.

In addition to indicating the great diversity of species that continues to define the environment of the upper South Umpqua headwaters region, these tables also indicate the wide variety and abundance of important foods and trade items available to local people in late precontact time -- as well as the generally beneficial response of favored species to regular fire management practices.

Types of Plants Used by People

Seeds and Nuts. Seeds were most prized from tarweed and sunflowers, which were burned annually over thousands of acres throughout western Oregon in precontact and early historical time, including fields and patches that were grown and harvested within the study area. Oak, hazel, chinquapin, and sugar pine all produced nuts of great value, and were also systematically harvested and processed seasonally throughout the great lower and middle elevation expanses of groves, orchards, stands, and woodlands of these species throughout the region; and also including large portions of the study area (see Chapters IV and VI).

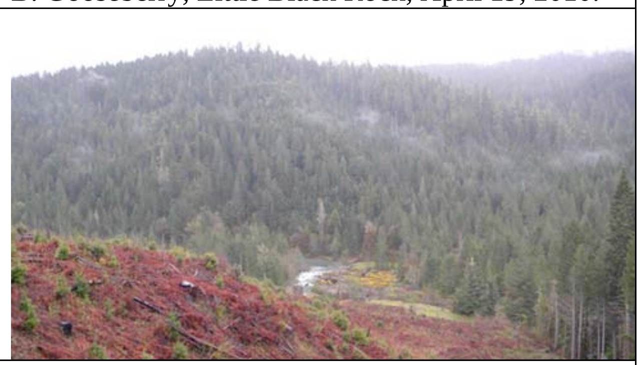
	
A. Manzanita, Big Squaw Mountain.	B. Gooseberry, Little Black Rock, April 19, 2010.
	
C. Camas, Boulder Creek mouth, May 12, 2010.	D. Bracken fern, Collins Ridge.
	
E. Tarweed, Bunchgrass Meadows, May 31, 2010.	F. Cat's Ear, Tallow Butte, May 25, 2010.
	
G. Beargrass, Ash Valley knoll.	H. Fawn lilies, Whisky Camp, May 31, 2010.

Table 5.02 Selection of persistent native plants documented in the study area in 2010.

Burning was done almost annually in many of these areas, although hazel sticks and other plant materials harvested two and three years after burning were prized by many weavers.

Fruits and Berries. All fruits and berries produced by native plants in southwest Oregon and the western Cascades were used by local people for thousands of years, mostly as foods, but also dye, medicines and other products. Manzanita berries for cider, huckleberries, elderberries, salal berries, strawberries, choke cherries, blackberries, thimbleberries, etc., were all harvested, eaten, and processed in great quantities during picking season. Because these foods grew on shrubs, vines, and small trees, patches were burned on a more discrete basis, and intervals might vary from a few years to several decades between fires.

Roots and Bulbs. Camas, tiger lily, fawn lilies, and cat's ears were all favored bulbs used for eating by western Oregon Indians during precontact and early historical time. Such bulbs existed in mostly-pure stands of dozens or hundreds of acres and were dug by the ton every year. Edible roots used by people during that time included wild carrots, cattails, yampah, and bracken fern, and were also systematically harvested in great amounts by seasonal digging. Such harvesting practices created hundreds or thousands of acres of bare dirt every year, usually in wet prairies, along riparian areas, ridgelines, and balds, where these plants were grown.

Stalks, Greens and Bark. Sunflower stalks, the leaves of miner's lettuce, clover greens, and the cambium bark of willow, ponderosa pine, and sugar pine were all favored foods of western Oregon Tribes, including those of the South Umpqua River basin. Bark was often prepared by baking or roasting, but the others were often eaten fresh, or with minor preparation. Sprouts of young thimbleberries and bracken fern "fiddleheads," for example, were often eaten as they were picked; much like fresh berries.

Construction Fibers. Beargrass leaves, willow sticks, hazel sticks, cedar bark, iris leaves, and many other parts of shrubs, trees, and grasses were (and continue to be) used by western Oregon Indians to weave and otherwise produce a wide range of products. In addition to a great variety of baskets that were produced to perform a similarly great variety of tasks, plant fibers were also used to produce clothing, traps, fishing line, rope, mats, platters, seed beaters, temporary housing, and numerous solid wood and stem products. Skilled weavers could assemble most of the non-food needs for a person or family fairly quickly, no matter what plants were made available; but particular quality was attained if they were able to spend a few years to produce, harvest, and process the fibers first.

Fuels. Gathering, storing, and using fuels were a daily and seasonal occupation of most precontact people, as with pre-industrial society people everywhere. Precontact people in southwest Oregon depended on local plants for most fuels, although some animal oils were known to be used at times. Small logs, pine knots, limbs, mosses, leaves, grasses, deadfall, etc., had to first be systematically gathered before they could be stored or used as fuel. Woodlands and forest areas – connected by ridgeline and riparian trail networks – would have been logical fuel gathering places in spring, following winter storms or receding floodwaters. Another source was simply harvesting incremental deadwood from living shrubs and trees; which seemed to be a common practice with oak, manzanita, and other hardwoods in northwest California and western Oregon.

Miscellaneous Products. In addition to the general categories and uses just listed, native plants were also used for medicines, dyes, smoking, poultices, musical instruments, home construction, bows, arrows, toys, tools, weapons, art, and in any other manner that can be imagined.

Key Plant Species

A number of plant species known to be important to late precontact Umpqua Takelma and southern Molalla people who occupied the study area are profiled in the following pages. These plants were selected because of their perceived importance to these people, and because their current physical conditions, persistence and locations in the environment often provide strong evidence of past conditions and uses.

Oaks. Precontact Indian people prized oaks for many reasons, including the tree's ability to produce acorns. In western Oregon areas where oak are left undisturbed by fire, grazing, mowing, plowing, logging, or other management processes, they are soon replaced by competing conifers, particularly Douglas-fir (Sprague and Hansen 1946; Zybach 1999: 102-117). Many Indians prized oak trees and groves highly, and viewed most conifers in their midst as invasive weeds (Thompson 1991: 33).

> The staple food of the Takelma is probably to be considered the acorn (yana), of which there were several recognized varieties, the black acorn (yana yahal) being considered the chief. The first acorns appeared in the early spring, at which time they were gathered and prepared by the women (Sapir 1907: 258, quoted by Pullen 1996, App. I: 30).

> Bread is made of acorns ground to flour in a stone mortar with a heavy stone pestle, and baked in the ashes. Acorn flour is the principal ingredient, but berries of various kinds are usually mixed in, and frequently seasoned with some high-flavored herb. A sort of

> pudding is also made in the same manner, but it is boiled instead of baked (Walling 1885: 180, quoting Bancroft).

Pines. The two pine species of particular importance to the Takelma and Molalla people who resided in the study area were Ponderosa pine and sugar pine. Both were probably used to make boards or as fuels, and for other purposes, but sugar pine was also valued for its large, tasty nuts and for its sweet pitch, which could be used as a condiment in cooking, while Ponderosa was often peeled for its inner-bark during the spring:

> The custom of the Indians of peeling the yellow pine at certain seasons of the year to obtain the cambium layer which they use for food, is in some localities a fruitful contributory cause toward destruction of the yellow pine by fire. They do not carry the peeling process far enough to girdle the tree, but they remove a large enough piece of bark to make a gaping wound which never heals over and which furnishes an excellent entrance for fire. Throughout the forests of the Klamath reservation trees barked in this manner are very common. Along the eastern margin of Klamath marsh they are found by the thousands (Leiberg 1900: 290-291).
>
> At midday [October 26, 1826] I reached my long-wished *Pinus* (called by the Umpqua tribe *Natele*), and lost no time in examining and endeavouring to collect specimens and seeds. New or strange things seldom fail to make great impressions, and often at first we are liable to over-rate them; and lest I should never see my friends to tell them verbally of this most beautiful and immensely large tree, I now state the dimensions of the largest one I could find that was blown down by the wind: Three feet from the ground, 57 feet 9 inches in circumference; 134 feet from the ground, 17 feet 5 inches,; extreme length, 215 feet. The trees are remarkably straight; bark uncommonly smooth for such large timber, of a whitish or light brown colour; and yields a great quantity of gum of a bright amber colour. The large trees are destitute of branches, generally for two-thirds the length of the tree; branches pendulous, and their cones hanging from their points like small sugar-loaves in a grocer's shop . . . A little before this the cones are gathered by the Indians, roasted on the embers, quartered, and the seeds shaken out, which are then dried before the fire and pounded into a sort of flour, and sometimes eaten round (Douglas 1959: 230-231).

Hazel. Hazel was managed in two distinct manners: it was either burned in clumps every two or three years or so, in order to produce prized weaving sticks, arrow stock, and flexible construction materials, or it could be let to grow into large shrubs for hazelnut production.

> Hazel Nuts (Suthxale) – In about the middle of the summer, the headman of the village had to burn off the brush. All the hazel nuts fell off and the people went out to pick them up. The nuts are roasted by the burning of the brush. They are whipped with a stick in the basket in which they have been collected. This husks them. The nuts are then picked out by hand (Cora DuBois, 1934, quoted in Pullen 1996, App. I: 32).

> Their supper consisted of fresh salmon, and a species of hazel-nut, which is found in the country in great abundance. Having made a suitable fire, they commenced the operation of cooking their salmon . . . Stones were then provided for the purpose of cracking nuts, and all being seated on the ground, the eating process commenced. The extreme novelty of their appearance, the nut cracking, the general merriment, the apparent jokes, ready repartee, and burst of laughter, were sufficient to have excited the risibilities of even a Roman Catholic priest, however phlegmatic (Gustavus Hines, 1850, quoted in Pullen 1996, App. I: 32).

> Arrows were generally made from hazel, but sometimes Indian arrow[wood], willow, and other wood was used. Straight limbs were gathered in the winter, and they were tied up in bundles and seasoned. The limbs were cut and smoothed down and soaked in warm oil. The men rolled and straightened the arrows between their hands (Ward 1986: 12)

Yew. Yew is one of the hardest, heaviest woods found in the forests. It is a small, slow-growing tree that was typically disregarded as a "junk tree" (little or no value) by most loggers and foresters in the early 20th century; until the value of a chemical contained in its bark and needles (taxol) was discovered to be an effective cancer-fighting medicine in the 1980s (Hartzell 1991: 175-195). At that time, it was heavily harvested for several years, until a method of manufacturing taxol artificially was developed. Local Indian men and boys seemed to have valued yew for almost one purpose entirely – the manufacture of hunting bows:

> Boys hunted with their small bows and arrows. They worked with the men, and learned to make strong yew wood bows. Yew wood was cut in the winter when the sap was down and well seasoned. The men shaped their bows with stone knives, scraped the wood with clamshells, and smoothed it with sandstone. The bow-staves were soaked in hot fish oil to soften the wood. The craftsman bent the bow over his knee, and held it to get the right curve. Bow strings were made from leg tendons and sinews of wild game and nettle twine. (Ward 1986: 12).

> On our arrival most of the Indians were armed with bows and arrows. The bows were made of yew-wood, the backs covered by the sinews of the deer held by some kind of glue. The bows were about thirty inches long and very elastic. They could be bent until the ends would almost meet. The quiver holding the bow and arrows was made of the whole skin of the otter or fox and swung across the back so that the feather end of the arrow could be reached over the shoulder. They were so expert in reaching the arrows and adjusting the bow that they could keep an arrow in the air all the time (Riddle 1993: 58-59).

Huckleberries. Several varieties of huckleberries exist in tracts in the study area that were once obviously much larger in size than their present extent, particularly near Huckleberry Lake, Huckleberry Gap, French Junction, and other locations along the high elevation ridgelines. These tracts have become compromised by rank growth of unmanaged shrubs and seedlings, and by extensive invasion of conifers from scattered old-growth and from adjacent stands of second-growth. Writing of an area in the eastern Cascades of Washington, Minore (1972: 7-8) noted:

> The heavily used Twin Buttes field is an example. This field once encompassed over 8,000 acres of old burn. Before the days of fire protection, it was perpetuated by periodic fires set by the Indians. However, fires have been kept out of the area for over 40 years, and the original area has dwindled to 2,500 acres as huckleberries have been replaced by brush and trees. Local foresters estimate that the Twin Buttes field is disappearing at the rate of 100 acres per year. In 25 years it could be gone. Huckleberry fields throughout the Northwest are similarly deteriorating. Some will disappear in less than 25 years if competing vegetation is not controlled.

The cultural importance of huckleberries to western Oregon Indian Tribes is well-known and widely recognized. Berrypicking was often a season for socializing in large groups from many different Tribes, while harvesting and drying tons of berries into tasty, nutritious raisin-like foods that could be easily transported and stored for long periods of time. Gwennede (Mrs. James) Maple was a life-long native and resident of Empire, Oregon, on the coast west of the study area. Her close friend and neighbor was Daisy Wasson Codding, a Kusan-Athapaskan oral historian. In 1952, in an essay titled "How the Coos Indians Lived" (Peterson and Powers 1952: 23-28), she wrote:

> They also dried the huckleberry, blackberries and blueberries. They were very fond of the salalberry fresh, but never dried it. They liked to pick the salalberries on long stems, dip them in hot melted elk tallow and eat them off the stems. The red elderberry juice was a much relished beverage. They also drank several kinds of tea – bush tea, vine tea, yerba buena, swamp tea, fir tea.

Camas. Camas was found in numerous locations throughout the study area – from the lowest elevations adjacent to the South Umpqua River (see Table 5.02 C.), to the river's headwaters near Buckhorn Mountain, Huckleberry Gap, or along the ridgeline trail from Black Rock to French Junction. Wherever this plant is found it is a very strong indicator of precontact Indian land use. Camas was a primary food crop for most precontact Indian families throughout all of North America, including the Takelma and Molalla of the Umpqua River basin. Haskin (1934: 29-30) states:

> Of all the food plants used by the Western Indians the camas was the most important and widely known. There is more romance and adventure clustered around the camas root and flower than about almost any other American plant.

Walling (1884: 180) also noted:

> The principal root used was the camas, great quantities of which were collected and dried during summer and stored for the coming winter's provision. This is a bulbous root much like an onion, and is familiar to nearly every old resident of Oregon.

Coquille Thompson, an Athapaskan born west of Cow Creek Valley, reported to John Harrington (Pullen 1996, Appendix I: 39) on one favored method of preparing camas:

> The Indians used to mash camas and make it into a loaf like a loaf of bread called Wistae. Not very big. Made of finely pounded-up camas. When they eat this, they slice it with a knife as one does bread. When this loaf is all sliced up ready to eat they call it by the special name of hammi.

Other important bulbs used for food – also members of the lily family, in common with camas – included cat's ears (Dickson 1946: 29-31; Pullen 1996, Appendix I: 40; Fluharty 2007: 213), tiger lilies (Dickson 1946: 32-33), fawn lilies (Fluharty 2007: 213), and bear grass (Pullen 1996, Appendix I: 43).

Iris. "Flags," also known as wild iris or Oregon iris (Fluharty 2007: 229), was first discovered and named by David Douglas near present-day Eugene, on his way to the Umpqua River with Alexander McLeod in October, 1826. Douglas named it *Iris tenax*, because he noted the extremely strong fibers being used to make ropes for snaring elk. Riddle (1993: 57-58) describes how these snares were made, used, and valued:

> The deer was the principal game, which, before they had guns, were taken with snares. To capture a deer in this manner they must have ropes and good ones. These were made from the fibre taken from a plant – a kind of flag – growing in the mountains. From each edge of the long flat leaves of the flag a fine thread of fibre was obtained by the squaws, stripping it with their thumb nails. This was a slow process and would require the labor of one squaw a year to make a rope five-eights of an inch thick and fifteen feet long, but the rope was a good one and highly prized by its owner . . . I remember at one time a great antlered buck came across the field with a rope around his neck with a piece of root on the end. The deer in plunging through the brush at the river's edge entangled the rope and being in swimming water was unable to pull loose. An Indian soon came running on the track and was greatly pleased at the capture of the buck and recovery of his valuable snare rope.

Yellow leaf iris (*Iris chrysophylla*) is still found in extensive clumps throughout the study area, from the lowest elevations to ridgelines. The use of iris for making rope seems universal among west coast Indian Tribes; perhaps particularly those of western Oregon, where the plant grows in abundance. Cora DuBois, living at the Siletz Reservation in 1934, differs from Riddle in her understanding of who made the ropes (quoted in Pullen 1996, App. I: 23):

> Net twine made of iris fibers. Temele. Fiber extracted by splitting leaf with teeth. Fibers spun by rolling on thigh. Gathering iris, spinning, and net making all men's work. Informant didn't know how nets were made because work was carried out in sweathouse from which women and children barred.

Manzanita. Manzanita was used as a fuel, and its fruits (manzanita means "little apples") were used to make a favored cider-like drink. Fruits were also dried and used as condiments or made into a flour (Zybach 2007). Sapir and Dixon were two early anthropologists who had an opportunity to interview Athapaskan and Takelma elders who could still remember early historical time; before they had been removed from their lands and sent to reservations. Sapir (Pullen 1996, I: 34) noted in 1907:

> A favorite food was the manzanita berry (loxom). These were pounded into a flour (pabap), mixed with sugar-pine nuts (tgal), and put away for future use; they were consumed with water.

During the same year (1907), Dixon also recorded that (Pullen 1996, I: 34):

> Berries and nuts were in abundance. Manzanita-berries (Arctostaphylos Manzanita Parry) grew in great quantities and were used to make the well-known 'manzanita-cider' . . . Manzanita-berries were crushed, and used to make manzanita-cider in a manner similar to that described among the Maidu. The winnowed meal was also mixed with the acorn-meal in making a special variety of acorn-soup.

Bracken fern. Bracken fern was a major source of winter food and starch for precontact western Oregon Indian families (Dickson 1946: 65-68; Norton 1979a; Fluharty 2007: 210). Bracken fern prairies (or "brakes") were common along major ridgeline trail systems and along certain bottomlands throughout the Umpqua basin, including the study area. In addition to being dug for their roots, young sprouts were gathered and eaten in the spring. Louisa Smith, a Siuslawan, for example, stated in 1911:

> They had dried salmon, and likewise (dried) fern-roots, which they ate during the winter. They ate fern-roots (mostly). Thus the people did during the winter . . . Such was the food of the people belonging to the past (Frachtenberg 1914: 81-83).

Typically, brakes were burned in late winter and grasslands burned in late summer. There is a biological reason for this timing. As Ross (1971: 2) notes:

> The name "brake" or bracken, which traces back into a number of European languages, may have come from the broken appearance of the fern cover after the first heavy frost. The leaves lie collapsed like a miniature forest hit by a tornado.

Prior to being desiccated by frosts in the fall and early winter, bracken fern plants simply held too much moisture to burn effectively (Zybach 2002). Following a burn, roots (and animals) were left exposed, making root harvest and localized hunting easier tasks. New sprouts in the spring could also be readily located and harvested once the heavy plant cover had been removed. Dickson (1946: 66) describes bracken fern use specific to the Molalla:

> When the young fronds of the Brake fern first shoot out from the ground, they are very tender and have been eaten like asparagus. In fact, the young shoots of the Brake fern were roasted in the ashes by the Molala Indians. Then, they ate these shoots after they were cooked tender just as we eat asparagus today.

Tarweed. Takelma were well known for raising fields of grains, which white immigrants often referred to as "Indian oats." Food grains included various grasses, balsamroot (Dickson 1946: 160-161), and sunflower (Dickson 1946: 61-62; Pullen 1996, Appendix I: 36), but the most important in western Oregon, by far, was tarweed (Dickson 1946: 155-160; Pullen 1996, Appendix I: 35-36). Burning and harvesting tarweed were important community events, and the resulting roasted seeds were valued both for their flavor and for their nutritional value.

Tarweed was grown extensively throughout the South Umpqua Valley, and several relict populations were documented in the study area; most notably in and near Bunchgrass Meadows. Because it was viewed as a noxious weed and poor forage by white immigrants, it was systematically removed from pasturelands and hayfields wherever possible.

> Indian-oats. They burn a patch of wild-oats to gather the seeds – the seeds do not burn. These oat patches belonged to tribe or village – a stranger would not touch them. The burned 'meat' was black. (Coquille Thompson to John Harrington, in Pullen 1996, App. I: 35).
>
> During the summer months the squaws would gather various kinds of seeds of which the tarweed seed was the most prized. The tarweed was a plant about thirty inches high and was very abundant on the bench lands of the [Cow Creek] valley, and was a great nuisance at maturity. It would be covered with globules of clear tarry substance that would coat the head and legs of stock as if they had been coated with tar. When the seeds were ripe the country was burned off. This left the plant standing with the tar burned off and the seeds left in the pods. Immediately after the fire there would be an army of squaws armed with an implement made of twigs shaped like a tennis racket. With their basket swung in front, they would beat the pods into the basket. This seed gathering would only last a few days and every squaw in the tribe seemed to do her level best to make all the noise she could, beating her racket against the top of her basket (Riddle 1923: 46).

Sunflowers. Sunflowers, also known as "wild sunflowers" or "Oregon sunflowers," are also sometimes called "mule ear's" because of the characteristic way their leaves stand up. They are not actually members of the sunflower family, but a species of wyethia. Large patches of these plants were documented in the Coffin Butte area.

> A wild sunflower, grows 4 ft. high, used to grow where 'Indian oats' [Tarweed] patches grew. Indian oats and sunflowers would be burnt together. The Indians would burn only an oat-patch and would not let fire spread. Then the next day they would gather the seeds up. (Coquille Thompson to John Harrington, in Pullen 1996, Appendix II: 15)

Wokas. This yellow water lily (Haskin 1934: 95-97) was an unexpected find when first observed in Skookum Pond. According to Ruby and Brown (1986: 137): "From the Molalas the Klamaths obtained elk-horn spoons in exchange for the wocus lily roots of the Klamath Marsh." The Klamaths were also reputed, according to several sources, to have sown plants of their native land along the great trade routes they established in western Oregon and northern California. If this story is accurate, then it stands to reason that the Klamaths' most treasured plant, the wokas, might be distributed in much the same way, at favored ponds and camping spots. Wokas was also documented at Five Lakes, and both areas are within ready hiking distance to the historic Klamath Trail, as well as being highly likely campground sites used by precontact Molalla.

Indian Hellebore. This plant is sometimes called false hellebore. It is highly poisonous and known to cause deformities in calves and sheep. It grows more than 5-feet tall in wet prairies, woodlands and meadows and is a member of the lily family; large fields were found in the Donegan Prairie and Grasshopper Meadow areas. According to Haskin (1934: 54):

> Among the Indians of the North Coast no plant was more highly valued for its magical potency than this [Indian hellebore]. It was truly "skookum medicine," if we may judge from their myths and legends, which record endless instances of its marvelous use and powers.

Haskin then recounts several stories regarding the types of "supernatural" and "magical" uses of the plant, but no medicinal uses. Haskin was a local historian, amateur botanist, and photographer of some re-known in the early- to mid-1900s; he was also an avid collector of oral histories and regional Indian stories and was paid by the WPA during the Depression to conduct such interviews in, so he is an acknowledged authority on this topic.

An Internet search of western US Native American uses of Indian hellebore turned up more than 100 separate entries, including:

> Used mainly as a poultice of the mashed raw root as a treatment for rheumatism, boils, sores, cuts, swellings, bruises, and burns;
>
> The root is analgesic, disinfectant and febrifuge. A decoction has been used in the treatment of venereal disease;
>
> It also had quite a reputation as a contraceptive. A decoction of the root has been taken orally by both men and women as a contraceptive;
>
> A dose of one teaspoon of this decoction three times a day for three weeks is said to ensure permanent sterility in women;
>
> The roots have been grated then chewed and the juice swallowed as a treatment for colds;
>
> The powdered root has been rubbed on the face to allay the pain of toothache;
>
> Dried powder of Indian hellebore was used to treat fleas and other skin parasites;
>
> The roots were eaten to commit suicide.

[Note: I am not a botanist or an ethnobotanist, and it is entirely possible I have misidentified this plant. However, the plant documented at Huckleberry Gap and several other locations is so similar in appearance and description to Haskin's "Indian hellebore," that even if it is a slightly different species I assume it may have been used for entirely similar purposes as listed above, much as the different varieties of edible bulbs, ribes, or huckleberries were used in the same manners. BZ]

Tobacco. Tobacco was universally grown, used, and traded among the Tribes of western Oregon. According to Zenk (1990: 573), "The only plant cultivated by Siuslawans and Coosans was tobacco." Miller and Seaburg (1990: 582) state:

> Among the [Athapaskan-speaking] Tututni, Galice, and Upper Coquille, old men would burn over and fence an area in which they grew tobacco . . . Men fished, hunted, and tanned hides with a mixture of elk brains, tree moss, and starfish. They also made nets, planks, canoes, and tended tobacco.

Kendell (1990: 590) says of the Takelma:

> The primary food was the acorn; other commonly used vegetables were camas bulbs and various seeds and berries. Their diet also included deer, salmon, and other fish. The only cultivated crop was tobacco.

Note: It is uncertain why tobacco was considered to be “cultivated” by anthropologists and other experts, yet tarweed, camas, oak, huckleberries, bear grass, and hazel were not.

Native Animals and Fire

As described in Chapter V, the development and maintenance of transportation corridors, extensive oak savannas, root fields, grassy prairies, bracken fern prairies, berry patches, nut orchards, pine woodlands, meadows, and balds by Indian burning practices also resulted in beneficial habitat to a number of plant and animal species, providing sunlight, abundant food, ready travel routes, and certain types of cover. Haswell first noted the relationship of western Oregon Indian burning practices to wildlife habitat as he sailed along the southern Oregon Coast near Coos Bay in August, 1788 (Elliott 1928: 167-168):

> . . . this Countrey must be thickly inhabited by the many fiers we saw in the night and culloms of smoak we would see in the day time but I think they can derive but little of there subsistance from the sea but to compenciate for this the land was beautyfully diversified with forists and green veredent launs which must give shelter and forage to vast numbers of wild beasts most probable most of the natives on this part of the Coast live on hunting for they most of them live in land this is not the case to the Northward for the face of the Countrey is widly different

Table 5.03, as with Table 5.01, uses a column marked "Fire" to denote if animals benefited by regular burning practices (XX), had adapted to such practices (X), or were independent of such practices (O).

Food Type	Food Name	Fire
Crustaceans	Crawdads	X
Fish	Eels, Lamprey	X
	Salmon, Chinook	X
	Salmon, Coho	X
	Trout, Cutthroat	X
Birds	Ducks	XX
	Grouse, Ruffed	XX
	Geese	XX
	Pigeons, Band-tailed	XX
Insects	Grasshoppers	XX
	Yellow jackets (larvae)	XX
Red Meat	Bear, Black	XX
	Deer, Black-tail	XX
	Elk	XX
	Squirrels, Gray	XX
Shellfish	Mussels, freshwater	X

Table 5.03 Important native food animals of South Umpqua headwaters.

This table indicates that all of the basic food animals that lived on the land benefitted by regular burning practices of local Takelma and Molalla people in precontact time, and assumes that even anadromous fishes and other freshwater animals had to adapt to influxes of carbon and changes in solar energy caused by fire – whether those adjustments were beneficial or detrimental to freshwater populations could not be determined by the research scope of this project.

Table 5.04 shows some of the native animals documented during this research, whether by direct observation and photograph, or by bones, bedding areas, scat, prints, or (in the case of owls) pellets. All of the animals (and animal signs) shown were found in open, sunny environments; typically those created and maintained in precontact time by regular burning practices. Heavily forested areas documented during this project were generally found to contain significantly less evidence of animal life, including – in addition to the visual evidence shown in Table 5.04 -- the sounds of songbirds, chirping mammals, insects, flying birds, and running or climbing animals.

Key Animal Species

Fish. South Umpqua Falls has been a favored fishing location for hundreds of years, as evidence by local archaeological findings, oral traditions, and historical documentation. The river has well-known runs of Chinook, coho, steelhead, and cutthroat trout, and lesser-known runs of lamprey eel, placing anadromous fish in the stream nearly every month of the year. Resident native cutthroat trout also populate higher elevation lakes and streams and archaeological excavations show that people also used “crustaceans” and “mollusks” in precontact times (Beckham and Minor 1992: 75) – most probably crawdads and freshwater mussels.

Eels. Lamprey eels and eel runs figure prominently in the anthropological and oral history interviews of most western Oregon Tribes (e.g., Pullen 1996, Appendix I: 27-28; Downey et al. 1993); the Coquille River in western Douglas County derives its name from the Chinookan name for this fish, which is also the namesake for the Eel River in northwest California.

> Eels swarmed in the river. They wriggled through the rapids, and they sucked on the rocks and their long snake-like bodies hung down in the water. Men speared the eels off the rocks, and they set funnel shaped nets in the stream. They used canoes in the deep places, and dipped up the eels with long handled dip nets (Ward 1986: 23).


A. Black-tail deer and beargrass, Coyote Creek.


B. Ruffed grouse, Fish Lake Creek.


C. Bear print, Flagstone Peak ridgeline.


D. Bear scat, Castle Rock Fork.


E. Elk bones, Black Rock Fork brake.


F. Skunk, Acker Rock.


G. White spider on camas, Huckleberry Gap.


H. Friendly butterfly, Clayton Point.

Table 5.04 Native animals and animal signs of the South Umpqua headwaters, 2010.

Riddle (1993: 60) states:

> Lamprey eels were highly prized by the Indians. They were a scaleless, snake-like fish which would hold to the rocks with their sucker mouth and the Indians would dive into the icy water, seize the eel with both hands and, coming to the top of the water, kill the squirming thing by thrusting its head in their mouth and crushing it with their teeth.

Eagles. The name Yoncalla is said to mean “home of the eagles” (McArthur 1982: 818). There are no landmarks in the study area named for eagles, and their use as decoration in the historical record seems limited to single feathers, and war dress. It is interesting to note that both the Upper Umpqua and the Cow Creek Takelma were noted for using eagle feathers in an identical manner. This might be either confusion on the parts of the informants, on the part of the anthropologists, or a more universal method of adornment (Ruby and Brown 1986: 254):

> In historic times their [“Upper Umpqua”] men had entered combat wearing thick, impregnable two-piece elk-skin cuirasses, which were laced at the sides and ornamented with figures and designs. Other ceremonial elements in their battle dress were single white eagle tail feathers.

Mammals. When white immigrants all but replaced local Indian families in the South Umpqua basin in the early 1850s, the new arrivals depended heavily on hunting and trapping for their survival – in common with their predecessors -- as critical elements of pioneer subsistence farming and survival. However, the immigrants had steel traps, horses, and guns to aid in their efforts and were able to achieve great, and relatively easy, success until local game populations began to decline under the pressure. One result of those circumstances is that virtually all accounts of birds and mammals from early historical time have to do with hunting success (or failure), or encounters with dangerous carnivores; usually cougars or grizzly bears. The following index of select mammals provides a fair idea of the relationship between immigrant hunter success and native species decline that characterized the first few generations of white settlement in eastern Douglas County. Almost all references given will reinforce those patterns rather than provide much in the way of alternative information.

Bear. When Douglas and McLeod traveled through the Umpqua basin in the late fall and winter of 1826-1827, they encountered both black bears and grizzly bears; however the black bears seemed to be more associated with the coastal and upland forests, while grizzlies seemed to be encountered more in the prairie-type of environments found in the broader valleys of that time. One reason for the separation of the two species is that grizzlies were known to predate on black bears. In 1937 the last grizzly bear was killed in Oregon, on Billy Meadows, near Enterprise. There have been no sightings since. There are no archaeological or historical records of grizzly bears ever being in the study area (although they most probably were), but there is significant archaeological and historical evidence that black bear have been present for thousands of years. Bear Wallows, near the camas prairie and campground at the headwaters of Prong Creek, is along the ridgeline trail from French Junction to Quartz Mountain and appears to be prime black bear habitat. Bear signs were noted throughout the study area during the course of research (see Table 5.04), with a significant amount of sign concentrated near a private pond on Emerson Creek, to the northeast of Acker Rock.

Beaver. Beaver Creek and Beaver Lake (which apparently washed out some years ago, according to Chuck Jackson 2010: personal communications) form a major tributary to Jackson Creek, indicating past populations of these animals in that area. Map 3.01 shows Beaver Lake as being the likely crossroads location of a primary precontact trail network – and probable campground site – connecting present-day Drew with the mouth of Jackson Creek (and South Umpqua Falls) to the west and north; with nearby Pickett Prairie; and with the Coffin Butte-Green Prairie ridgeline to the east. The Rondeau and Thomason families were known to have been frequented these areas from the late 1800s to the present. Because these people were expert trappers (especially beaver trappers, being directly descended from Hudsons Bay Company trappers) and hunters, these names may take on special significance. Today there is little, if any, evidence of beaver in the South Umpqua headwaters. They were probably extirpated by the 1950s or before, and have not been reintroduced in large numbers since. The biological, ecological, and hydrological values of beaver ponds have become better understood during the past few decades, but land managers have been reluctant to support reintroduction because of expensive problems related to the animals cutting down trees and plugging culverts.

In speaking of Athapaskan Tribes to the west of the study area, McLeod observed on December 12, 1826 (Davies 1961: 197):

> These people seemingly never molest those animals [beaver], I presume others either judging from appearances they never kill an animal and depend solely on the produce of the waters for subsistence, with roots that grow spontaneously in the vicinity, the same observation is applicable to the natives on the great [Rogue] river, who never trouble themselves about furs, and have little or no intercourse with strangers.

Cougar. There was a lot of discussion in the town of Tiller during the time of this research, regarding the spotting of a cougar in town, near the school. A landmark two miles northwest of Abbott Butte is named Cougar Butte, located on the ancient ridgeline trail, connecting Elephant Head to Paradise Camp (see Chapter II). Fresh prints and scat, thought to be cougar, were also found in the snow near the parked car, during a hike back from Little Black Rock L.O. on April 19, 2010. According to Chuck Jackson and several local informants, cougar populations have been on the increase in the study area during the past several years and are posing a threat to local pets and livestock. During an interview on July 14, 2010, Jackson (2010: personal communications) had this to say:

> Lots of cougar. Cougar are eatin' the deer, they've eat all the deer around here. In fact, there was a cougar and I witnessed his tracks, would be out here all the time, but since we got the dog why we haven't seen his tracks out here. I'd come in at night, I'd come in and he'd chirp at me when he was here, you know he'd make his rounds. I called him Billy, I even had a name for him, but he would come in and he kept everything cleared out, there was no deer, and no nothing. And he had a big track, boy he had a good track, and then there was a smaller track down there in the mud. When I go out at night to my clothesline to go in, I take a gun with me . . . But they won't let 'em run 'em with hounds now, and they've eaten the deer population here, there isn't any here, and there was thousands of deer in these mountains. And they're onto the elk now.

Local Angora goat farmers, Stanley and Alexandra Petrowski, who had to kill a large cougar that was eating their goats in 1996, confirm Jackson's concerns and assertions. The Petrowski's maintain a website for their farm, where Alexandra has written of this incident, further observing (http://www.singingfalls.com/scribe/catland.html):

> This area is laced with cougars. In 1995 eleven full-grown cougars were known to have been "relocated" to Tiller, Oregon, the mountainous region where we live, by state officials whose duty it is to protect the catamount. There have been no recorded human fatalities yet due to the predator catamount, but realistically that kind of track record will have to someday soon be marred. There are too many of the big felines around; even the government officials in charge of monitoring and protecting them have admitted that over and over again

Deer. Deer, rather than elk, seemed to form a significant portion of the diet of precontact people in the western portion of the study area for thousands of years. Archaeological analysis of the South Umpqua Falls upper and lower rock shelter sites, for example, revealed nearly 2,000 identified remains of deer – and only 6 for elk for the 3,000 years of occupancy for those two locations; the nearby Times Square rock shelter had similar findings -- evidence of 371 deer or "deer-sized" remains, vs. only two for elk, and one for bear (Beckham and Minor 1992: 75). From this evidence the authors conclude (ibid.: 72):

> Faunal remains accumulated by occupations spanning the last several thousand years indicate a long-standing reliance on the hunting of deer, presumably the common black-tail but possibly also including the rarer white-tail . . . A number of the faunal collection, especially those containing a large amount of unidentified material, consist of small burnt fragments, which may reflect marrow extraction and soup/grease production.

This is an unusual finding, because elk were known to have existed in large numbers in the valleys to the west of the study area, and Molalla were renowned for their elk hunting abilities and elk products in the higher elevations.

In early historical time, Riddle (1993: 57) reports that "we found them (Cow Creek Indians) dressed in the skins of wild animals, principally in dressed deer skins," and "deer was the principal game." Within a few years, possibly due in part with the decimation of local Indian populations, or the elimination of large predators attacking livestock, there was an irruption of game animal populations in the Cow Creek area, including deer, elk, and bear:

> The wholesale slaughter inflicted on the deer and elk herds was tremendous. Appalling is a better word for it. They were slain, their carcasses left to rot in the woods, only their hides being taken. In the case of elk their two ivory teeth were taken along with their hides, both bringing fair prices on the market. Often whole herds of elk would be slain and only a ham be removed from a single animal, to be used for food, the rest being left for predators.
>
> My Dad told of five hunters making their way by trail and taking along pack animals over into the Eden Valley country [on the west fork of Cow Creek] during the pioneer days. They returned a couple of weeks later with 300 deer hides and not even a mess of venison . . . Elk and deer hides were towed down the Coquille River after being loaded upon large scows – hundreds of hides at each trip and shipped from Bandon to the various markets and dealers (Lans Leneve, Peterson and Powers 1952: 180-181).

Elk. Although Indians used dogs for hunting elk, they were also known for using pits, snares, and drives:

> Indians didn't hunt when elk were rutting, but they made drives at other times of the years. They dug a big hole in an elk trail; then they drove a sharp stake down in the center of the hole and covered it over with limbs and brush. Then the hunters beat the brush and drove the elk over the pit, and it got impaled on the stake and that made it easy to kill. They had special canyons and places where they drove the deer (Ward 1986: 22).

The advent of horses and repeating rifles changed everything. John Coke remarked upon this change in the late 1890s (Dodge 1898: 179):

> Game was plentiful, and Mr. Krantz and Mr. Swan, with the faithful dog, Traitor, enjoyed many a chase. At one time 38 elk were counted in one band and at another time the result of a few hours' chase was a large elk, a large bear, a deer and a wildcat. The introduction of the repeating rifles soon caused this great help to sustain the early settler to disappear, and now after a quarter of a century the elk are scarcely seen.

By 1900, most grizzly bears, wolves, and elk had been extirpated from western Oregon. A statewide moratorium was declared on elk hunting for nearly 30 years, and animals were brought in from the Rocky Mountains for breeding purposes and to rebuild the herds. No concerted effort, at least locally, has been made to restore grizzly bear or wolf populations in this part of the state to this time.

Dogs. Molallans were known for hunting elk with dogs, and for using snowshoes in the winter: characteristics that separated them from their Takelma neighbors to the west and Latgawa neighbors to the south. Dogs were said to be kept by Indian men for hunting purposes, and to guard their families at night. They were also an important part of the lives of white immigrant settlers, who used them for much the same purposes. Dogs were given names and treated as members of a family in early historical time; even receiving the last names of their owners when referenced by others. People often recalled the specific names of special hunting dogs for decades, whether they were the owner, a neighbor, or a hunting enthusiast with an appreciation of local hunting lore, and this reverence and affection for these animals probably extended back into precontact time as well.

When Coquelle Thompson told Harrington stories about his father's prized elk hunting dogs (Wasson 2001: 116-117), he said they "were just like people, knew their names, they would sit down," and that their names were "K'uhlyo alias 'K'uhl yo ch'oh,' and the other was named 'Wun uh sht' gee,' meaning White neck. And he looked at you when you mentioned one name, and when you call his name he come." Thompson, an Athapaskan from the Upper Coquille River country in southwest Douglas County, described elk hunting with dogs to anthropologist John Harrington in 1943 (Wasson 2001: 116):

> My father bought 2 Indian male elk-dogs from K'ammahss-dunn rancheria at the mouth of the Coquille River. The Indians there raised these pure-breed of dogs known as "elk dogs." These dogs grabbed the elks by the hind legs . . . they told the dog to go after the elks: "dushleet-ch'uh" or "dushle-cheh'." Then you would hear the dog bark when he arrived where the elks were. You could tell the arrival by the kind of bark.

Wolves. The existence of wolves in the South Umpqua headwaters has been a local topic of conversation for more than 60 years. They were certainly present in relatively large numbers during late precontact and early historical time, and the study area has been a focus of wolf stories and encounters since. Hartley (1993), for example, recounts being tracked by wolves across the snow when she and her husband were returning to Butler Butte Lookout in 1942 – after wolves were said to have been exterminated throughout Oregon. On January 11, 2010, large canid scat was documented on Devils Knob; significantly larger than other coyote scat routinely encountered in that area (see Figure 5.01). On January 17, 2010 an Associated Press article appeared in local papers, claiming that wolves had been present in the study area as recently as 1946 and had currently been sighted in the Cascade Mountains again, near Sisters, Oregon (see Figure 5.02).

	
Large canid scat, Devils Knob, January 11, 2010.	Large canid print, Donegan Prairie, July 17, 2010.

Figure 5.01 Large canid signs along the South Umpqua – Rogue River watershed.

During the July 14, 2010 interview with Chuck Jackson (2010: personal communications), the topic of local wolf populations was discussed:

> Bob: When was the last wolf [around here], about ‘46, ‘47?
>
> Chuck: No, the last wolf I seen was about, oh boy, we was horseback, you know where Grasshopper Lookout is? We went to Grasshopper Lookout and we was comin’ down on that side, you know where Grasshopper Springs are? That wolf was drinking right there. My uncle and I…
>
> Bob: How long ago was that?
>
> Chuck: 20, 27 years ago [ca. 1983-1990], it was before he died.
>
> Bob: Wow, so not very long ago?
>
> Chuck: Yeah, well, when I’d trap all the time, I’d see wolf tracks ‘d come down, they’d come down right this road, right here behind the house, then they’d go the other way.

Bob: We found some scat that was either the world's largest coyote, or we were hoping a wolf, up by Devil's Knob, just in January.

Chuck: They used to be thick at Devil's Knob. Devil's Knob got a lot of wolf up in that area.

Bob: And that's why we thought, you know, there might be wolf here, you know, this scat's pretty big or it's a hundred fifty pound coyote.

THE REGISTER-GUARD **CITYREGION** SATURDAY, JANUARY 16, 2010

Wolf sightings on rise in Cascades

Their appearance this far west is sooner than expected

BY JEFF BARNARD
The Associated Press

GRANTS PASS — Wolves that have moved into Oregon from Idaho appear to be extending their range west, with recent sightings in the southern Cascades and the Ochoco Mountains.

U.S. Fish and Wildlife Service biologist John Stephenson said the reports of sightings and tracks have been growing since last January, when a photo was taken of an animal that looked like a wolf along U.S. Highway 20 east of Sisters.

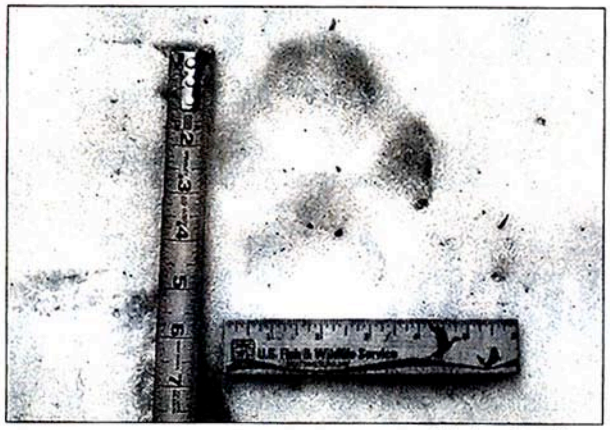
In December, tracks were spotted in the southern Ochoco Mountains and near Wickiup Reservoir in the Cascades, Stephenson said.

Stephenson said it was not confirmed these are wolves, but that he followed the tracks through the snow and they tend to go in straight lines the way wolves travel, not meandering the way dogs run.

"At this point, we are not sure whether we actually have wolves occupying the Cascades or single dispersing animals wandering through," he said.

Wolves were hunted out of existence in Oregon in the early 20th century, but have moved back into the state from Idaho, where packs were re-established in the 1990s. The last Oregon wolf was killed in 1946 on the west side of the Cascade Range on the Umpqua National Forest.

They are federally protected as an endangered species in the western two-thirds of the state and listed as a state endangered species.



The Associated Press

A U.S. Fish and Wildlife Service photo *shows an apparent wolf track in the Cascade Range in Oregon. Wolves were reintroduced in Idaho in the 1990s and have been moving west.*

The state wolf management plan calls for establishing four breeding pairs east of U.S. Highway 97, and four breeding pairs west of the highway.

Russ Morgan, wolf coordinator for the Oregon Department of Fish and Wildlife, said they had expected wolves to fill up the habitat in eastern Oregon before moving into the Cascades, so their appearance is a surprise. Two known packs are established in northeastern Oregon, and 15 to 20 are thought to be in the state.

"One thing that is absolutely sure about wolves throughout the efforts to recover them is that they always surprise us," said Steve Pedery, conservation director for Oregon Wild, a conservation group.

"They don't need a lot from humans other than habitat and not shooting them. Even with these sightings and the documented packs we've got in Eastern Oregon, we still have a very long way to go before wolves are recovered."

Cottage Grove Rancher Bill Hoyt, the new president of the Oregon Cattlemen's Association, said he had no immediate fear wolves could start attacking livestock in western Oregon but expected that would become inevitable as wolf numbers increase.

Government hunters killed two wolves that were attacking livestock in Baker County.

Duane Dungannon, state coordinator for the Oregon Hunter's Association, said they were not looking forward to increasing numbers of wolves, but that the sooner wolf numbers hit repopulation goals, the sooner wildlife authorities could start controlling them.

Spencer Lennard of Big Wild, a conservation group, said several studies have found that when wolves move into an area, deer and elk become more wary and are less likely to overgraze willows and trees along streams, helping to preserve fish habitat.

Figure 5.02 January 17, 2010 Barnard article about Cascades wolf sightings (Barnard 2010)

> Chuck: See, Laura Hartley wrote a book.
>
> Bob: Yep, I've read it, the world war there, the lookout? Yeah, and then she wrote a couple of them, she wrote the one where she was back on the…where they were doing mining. But then they were up at the lookout.
>
> Chuck: Yeah, and she tells about the wolves -- at that time.
>
> Bob: Yeah, that was '42 and then they said they were all, she said they were supposed to be gone, she said no they're still here. And then I read an account where the last one was trapped up in here in '46 or something.
>
> Chuck: No. See the guy from the [Milo, Oregon] academy down here, he told me not to tell. If anybody…'cause he would go up, and it was probably the same wolf or whatever that I seen up at Grasshopper, he'd go up in the snow and he asked, he was talking to me, and he said, "Are there any wolves here?" And I said, "Yeah," and he said, "I've been trackin' 'em." Said, "I've got pictures of tracks in the snow," and I said, "Yeah."

A few days after the Jackson interview, very large canid prints were documented about 10 miles east of Devil's Knob, on Donegan Prairie (see Figure 5.01). Hartley's Butler Butte sightings during WW II (Hartley 1993) were about half-way between Devil's Knob and Donegan Prairie, along the same ridgeline.

Chapter VI. Precontact Vegetation Types and Zones (ca. 1800)

The study area contains a wide diversity of native plants and animals typical of the western Cascades of Oregon, including the southern-most extent of Alaskan yellow cedar and northern-most extent of Shasta red fir. Although Douglas-fir currently dominates most of the study area -- with the exception of higher elevation peaks and ridgelines -- relict stands and groves of white oak, ponderosa pine, sugar pine, redcedar, and chinquapin strongly indicate past conditions, when Douglas-fir populations were more limited and savannas, grasslands, brakes, and berry fields were more extensive.

Precontact Vegetation Zones: Forest Types and Subtypes

Leiberg (1900: 245) provided a good definition of forest types and subtypes in his report on the southern Oregon Cascades, based on his 1899 field observations:

> The term forest type, as here employed, is used to define large aggregations of one or many species of trees, usually comprised within definable territorial limitations . . . The term subtype is applied to a multitude of lesser groupings of the species which form this type. Collectively they give each type its characteristic features . . . The duration of the forest type is indefinite. While undoubtedly subject to evolutionary changes, its modifications or transitions to other types are so slow as to be quite imperceptible to us. Not so with subtypes, they frequently change, sometimes two or three times in a generation. Forest fires are fertile causes for inducing such rapid changes. But even when left undisturbed a subtype rarely persists in any particular locality for more than 250 or 300 years.

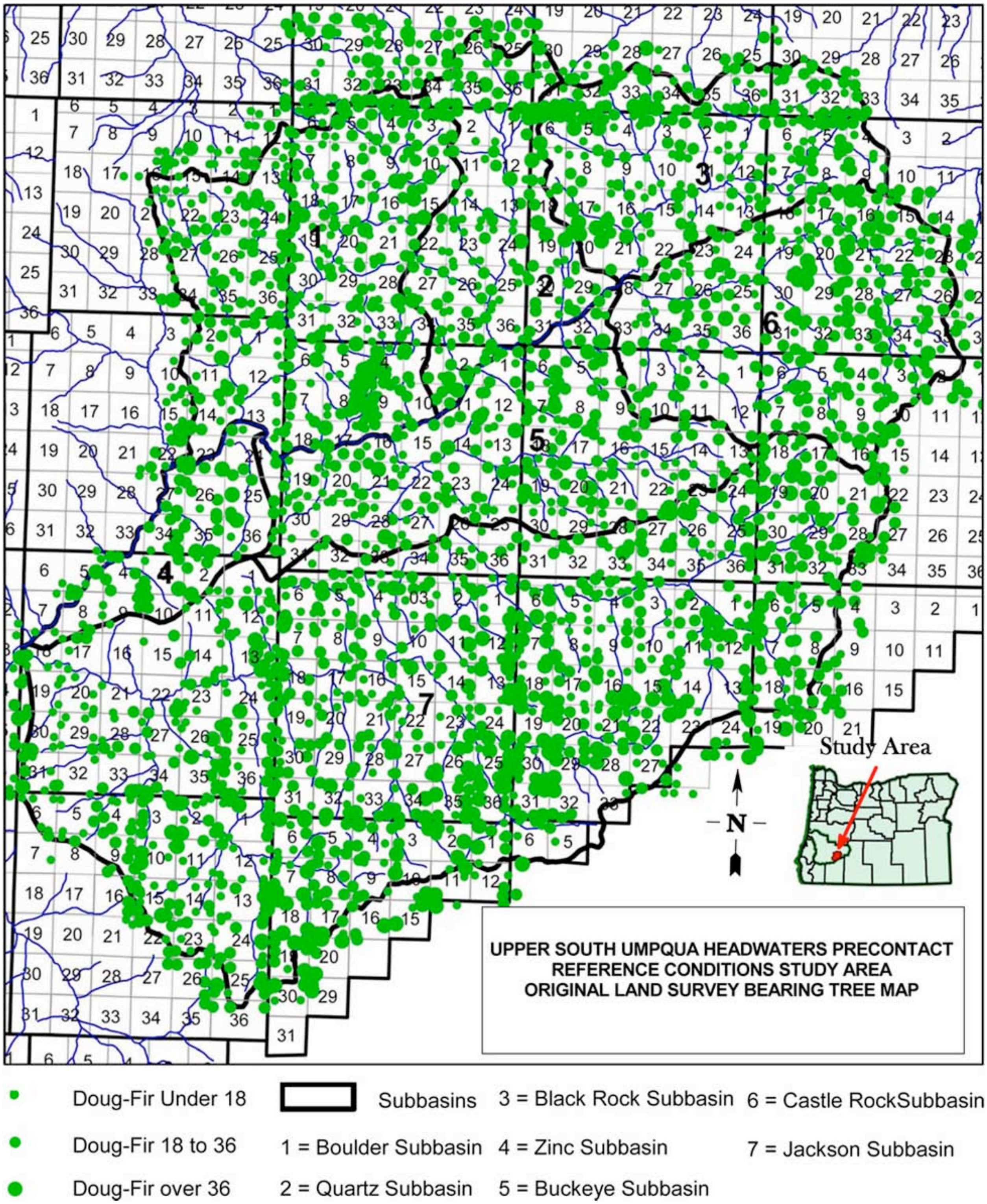
I have chosen to use the more general term "zones" – identified by a characteristic tree or vegetation type for each area – to describe the combination of types and subtypes that existed in late precontact time. In this manner, research findings indicate that four primary "zones" can be used to represent basic vegetation types and sub-types that existed in the South Umpqua study area 200 years ago: Oak Zone; Pine Zone; Douglas-fir Zone; and Subalpine Zone. For the most part, the zones represent a west to east change in elevations, with the Oak Zone located to the west in the lowest elevations; the Pine Zone located more easterly, at greater elevations and along slopes adjacent to the Oak Zone; the Douglas-fir Zone adjacent to the Pine Zone on steeper lands and higher elevations; and the Subalpine Zone along the ridgelines and peaks at the highest elevations and eastern-most locations in the study area.

These zones were derived by using the principal datasets and methods described in Chapter II, with the direct assistance of forester Mike Dubrasich, who was also familiar with the local landscape and species (see Appendix B), for analytical and definitional purposes. GLO notes and GIS maps of bearing trees and understory vegetation were of particular value during this process, often involving direct use of field notes for specific locations: http://www.ORWW.org/Rivers/Umpqua/South/Land_Surveys/Index.html.

The proliferation of Douglas-fir throughout the study area since 1800 provided some difficulty in determining localized conditions before its dramatic increases in population, volume, and range that apparently began taking place in the 1700s, or perhaps even somewhat earlier (see Chapter III). Map 6.01 shows the extent of Douglas-fir bearing tree distribution throughout the study area by the time GLO surveys had been completed in the 1930s. Note the large number of small (under 18-inch) and medium (18-inch to 36-inch) diameter trees represented on the map. Field observations and measurements determined that the vast majority of these trees had germinated sometime after 1825, during historical time. The question then became whether they were primarily a product of reforestation (e.g., following a stand replacement wildfire event or insect infestation) or of invasive reproduction -- entering and populating savannas, woodlands, grasslands, and brush fields that had previously been dominated by other species. Again, field observations and measurements demonstrated that it was the latter instance; see Figure 2.06 as one measure of this change in the Squaw Flat area and Figure 6.01; a photograph taken near Squaw Flat in 2010 that illustrates how this change appears on the ground. Note the majority of the trees in the photograph appear to be less than 8-inches in diameter and would not be represented on the Figure 2.06 graph.

Map 6.02 shows the distribution and size classes of other species of GLO bearing trees in the study area, absent Douglas-fir. For the most part, the larger- and medium- diameter trees represent late precontact and early historical distributions of forest and woodland trees prior to extensive Douglas-fir invasions. For example, note the oak bearing trees in Tsp. 30 S., Rng. 1 W. (see Map 1.02 for reference), which was surveyed in the Pickett Butte area in 1858 (Hathorn 1858). A comparison with Map 6.01 shows scattered, widely spaced small- or medium-sized Douglas-fir trees in that area at that time. Figure 6.02 further illustrates the resulting change in forest type (or sub-type) during the 152 years subsequent to the original survey.

Another example from Map 6.02 is shown in the Abbott Butte area (see Chapter II), which was first surveyed in 1937 (Carter and Dawson 1937) and shows a preponderance of large-diameter “Hem-Fir,” which the surveyors more accurately described as “mostly white, Noble, silver, and Shasta fir” (see Figure 2.03). Note, again, the relatively wider-spaced and smaller-diameter Douglas-fir bearing trees

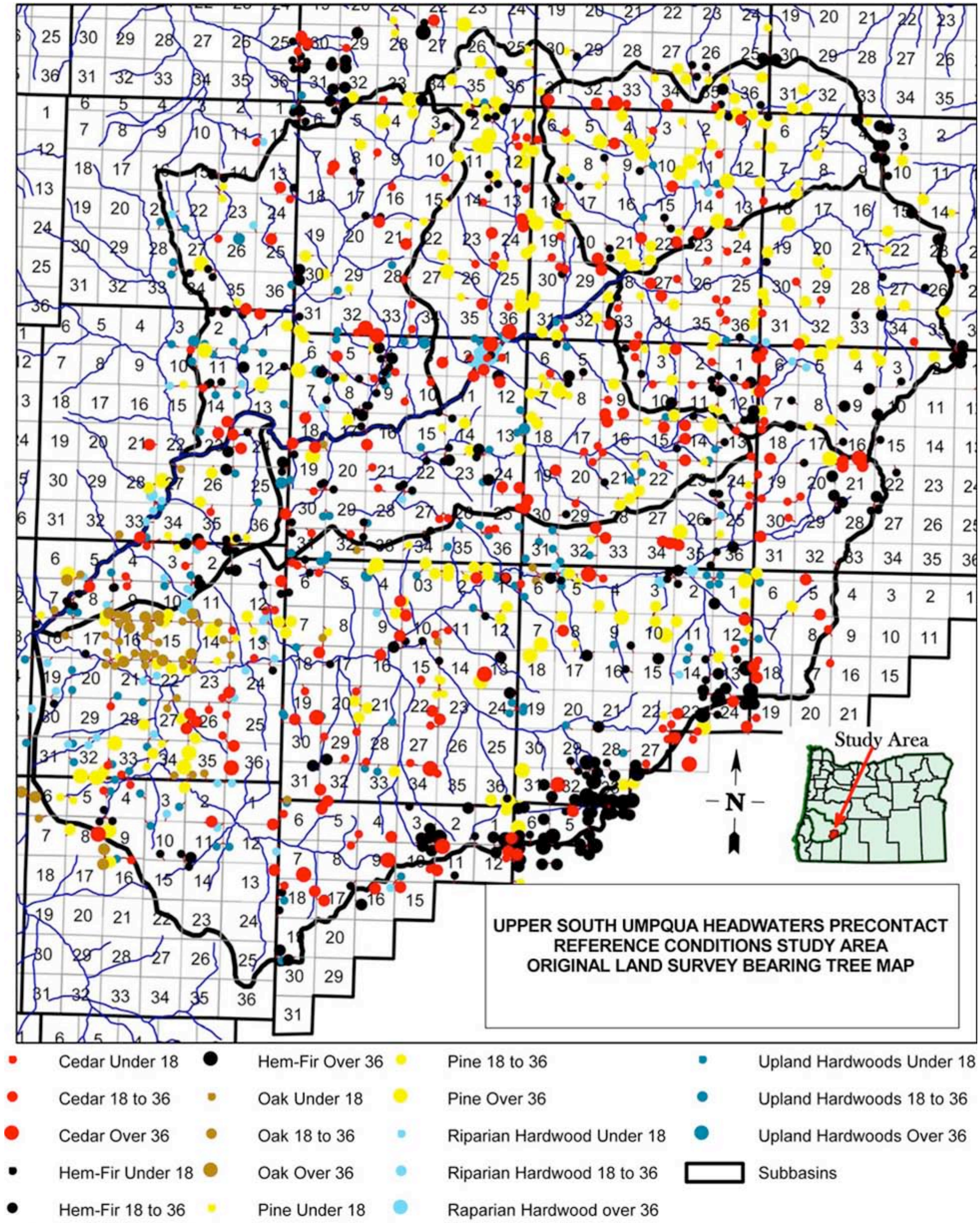


Map 6.01 GLO Douglas-fir bearing trees, as located and measured from 1856 to 1937.

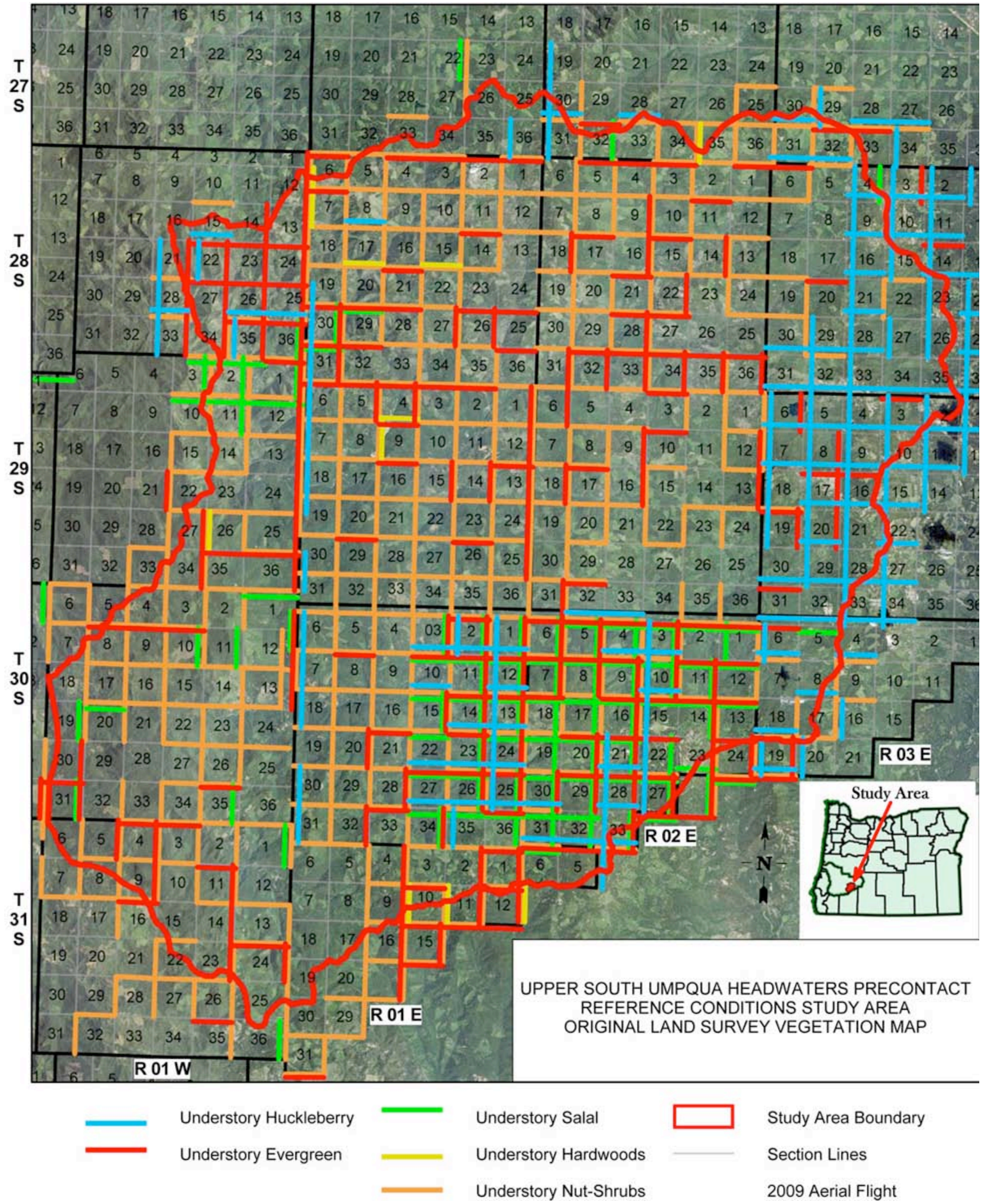
Figure 6.01 Late precontact pine woodland with invasive Douglas-fir and madrone, Squaw Flat, 2010.

measured in this same general area. Table 2.05 more clearly shows the continued invasion of this area of grasslands and shrublands by conifers during the past 100 years.

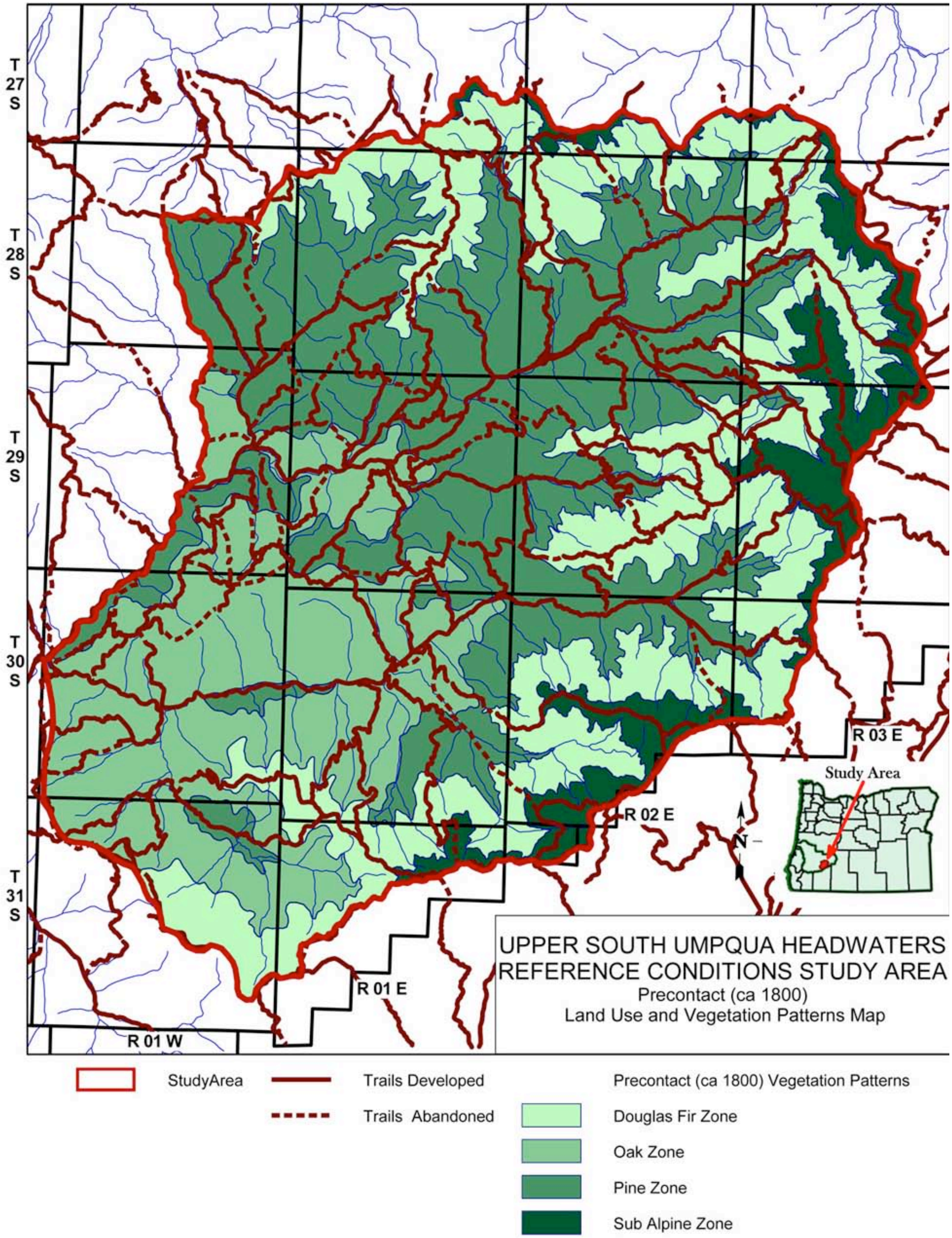
Map 6.03 shows GLO descriptions and locations of understory vegetation, which add more detail to an understanding and description of precontact forest conditions. These patterns are shown in conjunction with a 2009 geo-referenced aerial fly-over, which provides further context to changed forest conditions from the 1857-1937 GLO surveys to the present time. The location of huckleberries at higher elevations and along ridgelines are expected and self-explanatory – and give a good idea as to when, and by whom, primary foot-trails were used in precontact times (see Chapter III). Less obvious, but just as important, is the grouping of oak, chinquapin, and hazel into "Understory Nut-Shrubs" locations. These plants provided important sources of protein to native peoples and animal wildlife and were obviously visited during the fall season for hunting and gathering purposes – but hazel also provided a very important source of weaving material, and hazel clumps were burned and shoots were also gathered at different times of the year for those purposes, too (Anderson 2005). Salal berries were another important food crop, and these plants also indicated more general associations with other species as well. The same can be said for "Understory Evergreens," which included yew (Hartzell 1991) and madrone – important for fuel, food, medicinal, and construction materials, and also good indicators of associated native plant and animal species.



Map 6.02 GLO Non-Douglas-fir bearing trees, as located and measured from 1856 to 1937.



Map 6.03 GLO Understory vegetation types, as located and measured from 1856 to 1937.



Map 6.04 Ca. 1800 land use patterns: vegetation zones and primary foot-trails network.

Map 6.04 represents the culmination of precontact forest type and subtype analysis for the study area, in conjunction with ca. 1800 foot-trail locations (see Chapter III). It is a combination of forest vegetation types and land use patterns, providing good insights as to what types of vegetation were on the landscape in late precontact time, where people were most likely to be present within that landscape, and during what times of the year.

The remainder of this chapter provides brief descriptions of each of the vegetational zones represented in Map 6.04, and a current figure depicting typical conditions within those zones at this time.

Oak Zone

White oak and pine savannahs, extensive grassland meadows and prairies, and patches of Douglas-fir, redcedar, and pine typified much of the western and lower elevation (below 2,400 feet) portions of the

Figure 6.02 Old-growth relict pine and oak with invasive Douglas-fir, Pickett Butte, 2010.

study area 200 years ago. The presence and arrangements of these plants, as well as widespread populations of camas, cat's ears, fawn lilies, iris, tarweed, yampah, and hazel, indicate regular systematic use of the landscape by people – most likely Takelman-speakers -- at that time. The average number of trees larger than saplings per acre was probably ten or less. Human occupation of this zone was likely year-round, with relatively large seasonal villages and campgrounds near the mouth of Jackson Creek and at South Umpqua Falls; two locations that (according to historical reports) were heavily used during times of anadromous salmonid and lamprey eel runs.

Pine Zone

The presence of ponderosa pine and sugar pine with little understory vegetation typified much of the mid-slope (2,400 to 3,800 foot elevation) areas in the study area 200 years ago. The pine zone was typically open and park-like with large, widely spaced pines; patches of oak, chinquapin, serviceberry, and hazel; scattered stands of Douglas-fir; and grassy meadows. The average number of 8-inch diameter and larger trees per acre was likely less than 20. The location and age of remnant old-growth trees indicate regular seasonal use of the pine forestlands by Takelmans from lower elevations and southern Molalla from

Figure 6.03 Old-growth relict pine and Douglas-fir on Black Rock Fork, 2010.

higher elevations. The harvesting of ponderosa pine cambium in the spring and sugar pine, hazel, and chinquapin nuts in the fall may have been times of most intensive occupation of this zone. Hunting for game animals with dogs by Molallans likely occurred on a year-round basis, depending on the daily and seasonal movements of deer, bear, and elk.

Douglas-fir Zone

Although Douglas-fir was present in almost every type of environment in the study area 200 years ago, it existed in nearly pure stands from 3,800 to 5,000 feet elevation, separating the lower elevation pine stands from the higher elevation subalpine vegetation types. Due to generally steep slopes, isolated location, seasonal snow, and relative lack of food plants, accessible water, and animals, this zone likely experienced the least amount of daily use and occupation by people. Although the densest stands of trees in the study area occurred in this zone, they were still often open and park-like with only 20 to 30 trees

Figure 6.04 Invasion of elderberry orchard by Douglas-fir, true fir, and pine, near Wolf Prairie, 2010.

per acre. Grassy meadows and fern brakes also existed throughout this zone. Established ridgeline and streamside trails were regularly used by both game animals and people to reach lower and upper elevations, where food and freshwater were more available. Ridgeline trail networks that crisscrossed this zone were regularly burned to promote grassy meadows, bracken fern, beargrass, serviceberry and other food and fiber plants.

Subalpine Zone

As described in Chapter III, the highest elevations of the study area (above 5,000 feet) formed an international precontact network of foot trails that connected tribes of the South Umpqua with Indian nations in California, Washington, the Columbia Basin, and beyond. This seasonal “travel zone” was covered in snow much of the year, but contained extensive fields of forbs and grasses, huckleberries, manzanita, and other berries, fruits, nuts, bulbs, edible roots, and fuels that were readily available at other times. The existence of numerous year-round springs, likely “vision quest” sites, flats, benches, and gently sloping ridgelines add further evidence of intensive year-round and seasonal use; particularly by southern Molallan hunters, who used dogs and snowshoes to hunt elk and other prized game animals throughout the study area. In late summer and early fall, other Tribes undoubtedly visited these lands to

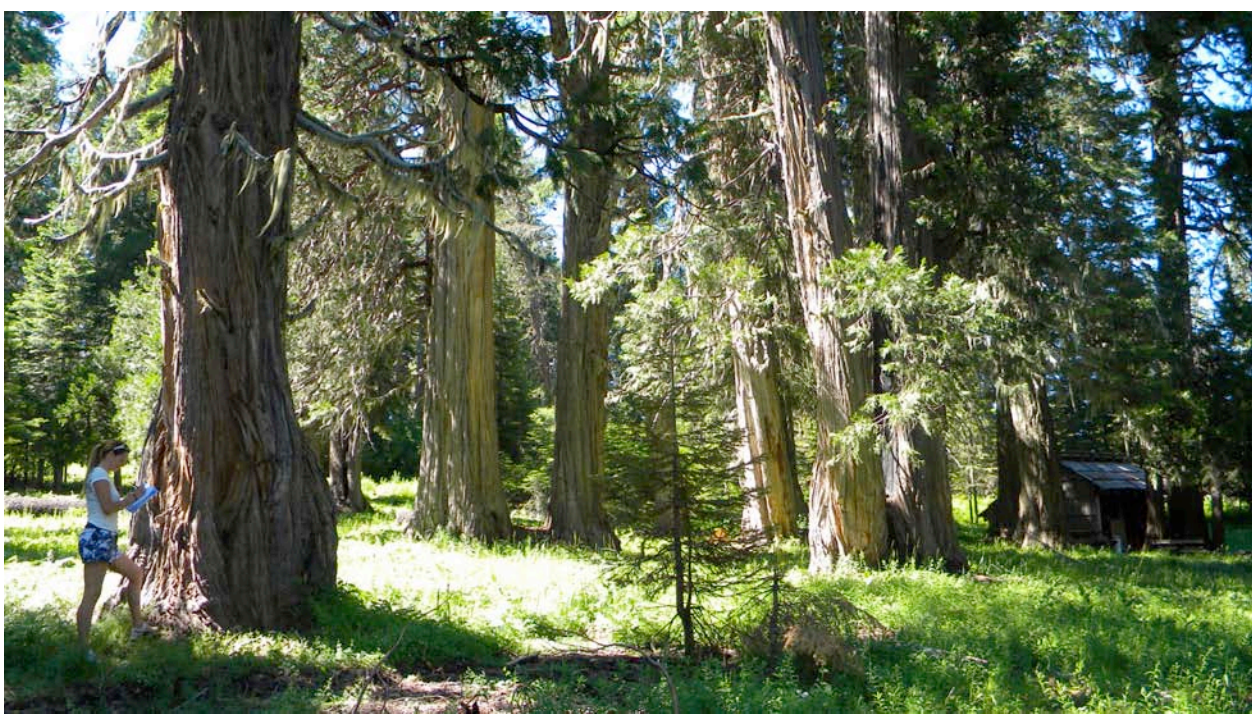


Figure 6.05 Old-growth cedar and cabin on perimeter of French Junction prairie, 2010.

hunt, harvest huckleberries and beargrass, and to move trade goods along the landscape. Takelmans from lower elevations likely gathered at Huckleberry Lake and Quartz Mountain, among other locations, during summer and fall; Takelma-speaking Latgawans probably used Huckleberry Lake and Hershberger Mountain areas as well. Klamaths likely moved slaves and other trade goods along the eastern ridgelines, following the Klamath Trail to campgrounds in the Black Rock and French Junction areas, before heading north along Camas Creek into the North Umpqua Basin, or south into the Rogue River basin. It is also possible that Paiutes from the east, southern Molallans from the north, and Kalapuyan-speaking Yoncallans from the northwest also entered the area at these times; also possibly for reasons of trade, harvesting of favored crops, spirit quests, or simply visiting friends and relatives. This area has the most extensive fields of prized huckleberries, which contained scattered trees; principally Douglas-fir and Shasta red fir.

Chapter VII. Subbasins: ca. 1800 Land Use Patterns

The South Umpqua River headwaters study area extends from the Cascade Crest at elevations greater than 6,000 feet, westward to the confluence of Jackson Creek at approximately 1,100 feet elevation and is 232,000 acres in size, mostly contained within the Tiller Ranger District of the USDA Umpqua National Forest. Two hundred years ago, transportation routes and vegetation types were in accord with subbasin drainage patterns and elevations; one result being that anthropogenic burning patterns also generally conformed to the same subbasin stream courses, watershed boundaries, and foot-trail networks.

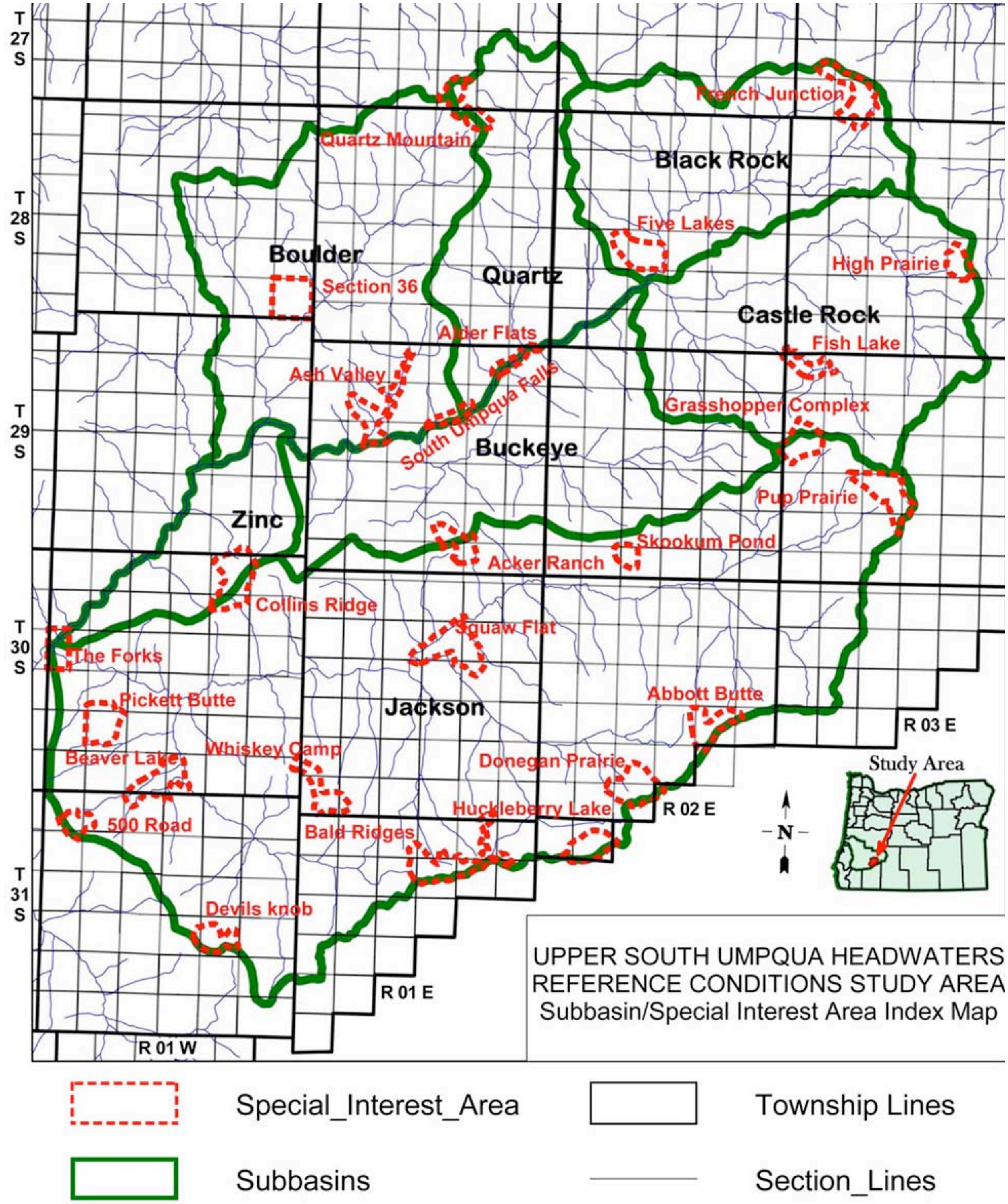
Map 7.01 depicts the seven primary subbasins described in this study: Jackson Creek (101,995 acres); Boulder Creek (31,522 acres); Castle Rock Fork (27,212 acres); Buckeye Creek (25,573 acres); Black Rock Fork (20, 576 acres); Quartz Creek (16,560 acres); and Zinc Creek (8,893 acres). In turn, Jackson Creek, the largest subbasin, could reasonably be subdivided into smaller subbasins: Beaver Creek; Whisky (or Whiskey) Creek; Squaw Creek; Upper Jackson Creek; Tallow Creek; and Collins Ridge.

Each of the primary subbasins is represented in this chapter by a map of GLO bearing tree and understory vegetation species and locations, Osborne photographs of representative portions of the area taken during the 1930s, and a map representing ca. 1800 forest type and land use patterns, as described in Chapters II and VI. In order to present the maps at a more useful scale, and because all of the maps have nearly identical legends, many of the maps are shown without legends; instead, Table 7.01 can be used as a legend for the subbasin-scale GLO bearing tree and understory vegetation maps, and table 7.02 can be used in conjunction with the ca. 1800 forest type and land use patter maps.

Table 7.01 shows how GLO bearing trees are denoted by size-classification, and by species. Species determination was made in accordance with common names provided by the surveyors (e.g., Applegate 1891 describes “larch” as Noble fir), or recent analysis (Powell 2008: 16-18). Understory vegetation

Cedar Under 18	Oak Under 18	Riparian Hardwood Under 18	Upland Hardwoods Under 18
Cedar 18 to 36	Oak 18 to 36	Riparian Hardwood 18 to 36	Upland Hardwoods 18 to 36
Cedar Over 36	Oak Over 36	Raparian Hardwood over 36	Upland Hardwoods Over 36
Hem-Fir Under 18	Pine Under 18	Doug-Fir Under 18	Section Lines
Hem-Fir 18 to 36	Pine 18 to 36	Doug-Fir 18 to 36	Township
Hem-Fir Over 36	Pine Over 36	Doug-Fir over 36	Understory Hardwoods
Understory Huckleberry	Understory Evergreen	Understory Hardwoods	Understory Nut-Shrubs

Table 7.01 Legend to GLO bearing trees and understory vegetation types for maps in this chapter.



Map 7.01 Index of South Umpqua study area subbasins and Areas of Special Interest.

Types were selected from each survey in accordance with their known or perceived value to local people during late precontact time: huckleberries; nuts and acorns (hazel, oak, chinquapin); evergreens (yew, madrone); salal (green: the table is in error; see Map 7.10); and hardwoods (fuel and carving materials). More detailed information on these surveys, and original survey notes for the study area, can be found at: http://www.ORWW.org/Rivers/Umpqua/South/Land_Surveys/Index.html.

Table 7.02 is for the subbasin-scale ca. 1800 forest type and land use pattern maps. Trails are the same as shown in Chapter III, and vegetation types as described in Chapter VI. Areas of Special Interest boundaries are shown to provide context to the trails and vegetation types, and Osborne photo locations are indexed to provide context to the Figures used to illustrate representative portions of the subbasins as the existed during the final years of the GLO surveys; i.e., the years before logging, road-building, and tree planting began to have a noticeable effect on the modern landscape.

Osbornes	Precontact ca 1800 Vegetation Patterns
Special Interest Area	Douglas Fir Zone
Study Area	Oak Zone
ca 1800 Indian Trails (Developed)	Pine Zone
ca 1800 Indian Trails (Abandonded)	Sub Alpine Zone
Township	Section Lines

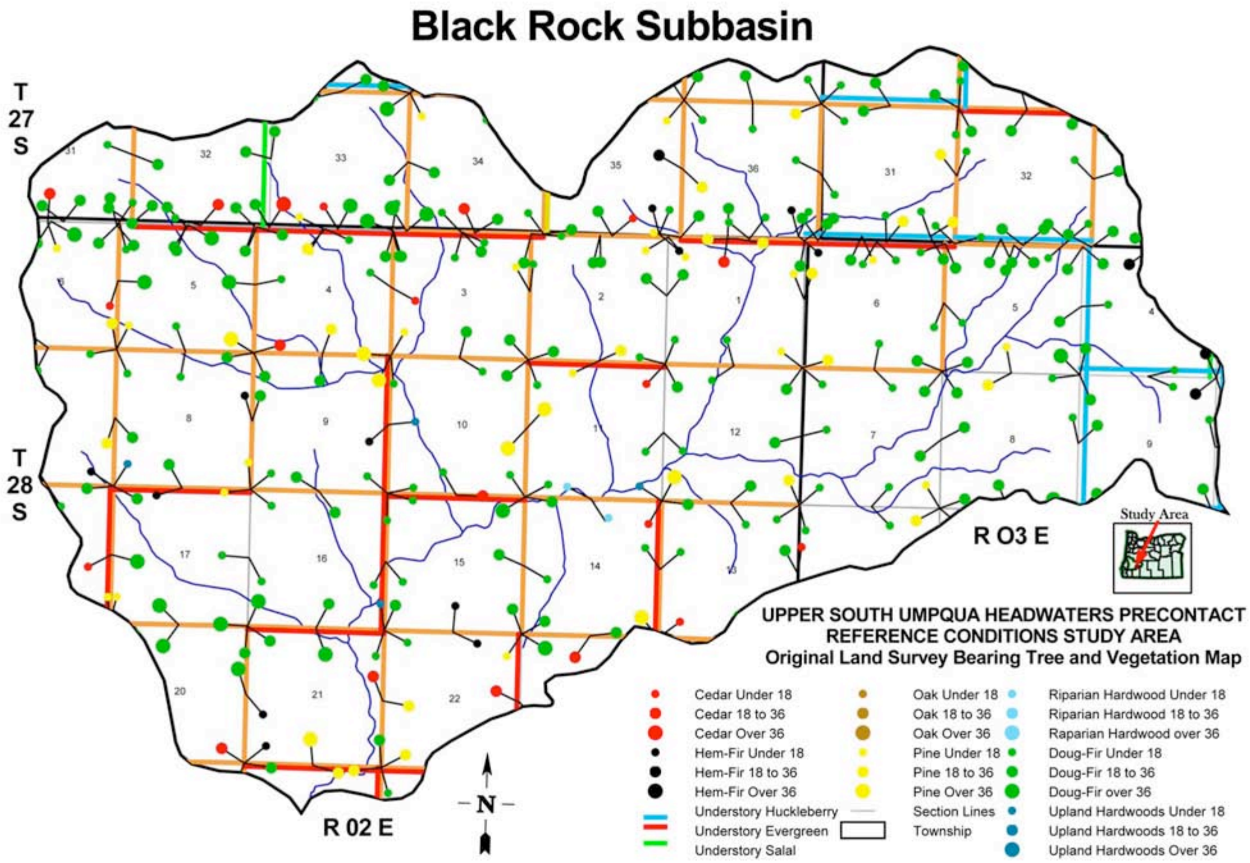
Table 7.02 Legend for ca. 1800 forest and land use patterns for maps in this chapter.

Black Rock Fork

The Black Rock Fork subbasin is 20,576 acres in size and includes Bow Creek, Boze Creek, French Creek, Mink Creek, and Prong Creek as principal tributaries. It is the northeastern-most subbasin in the study area and was the site of the 2009 Boze and Rainbow Fires (see Chapters I and IV). This area is located in portions of Tsp. 27 S., Rng. 2 E.; Tsp. 27 S., Rng. 3 E.; Tsp. 28 S., Rng. 2 E.; and Tsp. 28 S., Rng. 3 E.

Five Lakes and French Junction are Areas of Special Interest contained within this subbasin, and Little Black Rock L.O. (see Figure 7.01) and Black Rock L.O. (see Figure 7.02) are located on its perimeter.

On Map 7.02 note the number of pine located mostly at mid-elevation between Black Rock Fork and its watershed boundary; the relatively large numbers of cedar and true fir at the higher elevations (see Figure

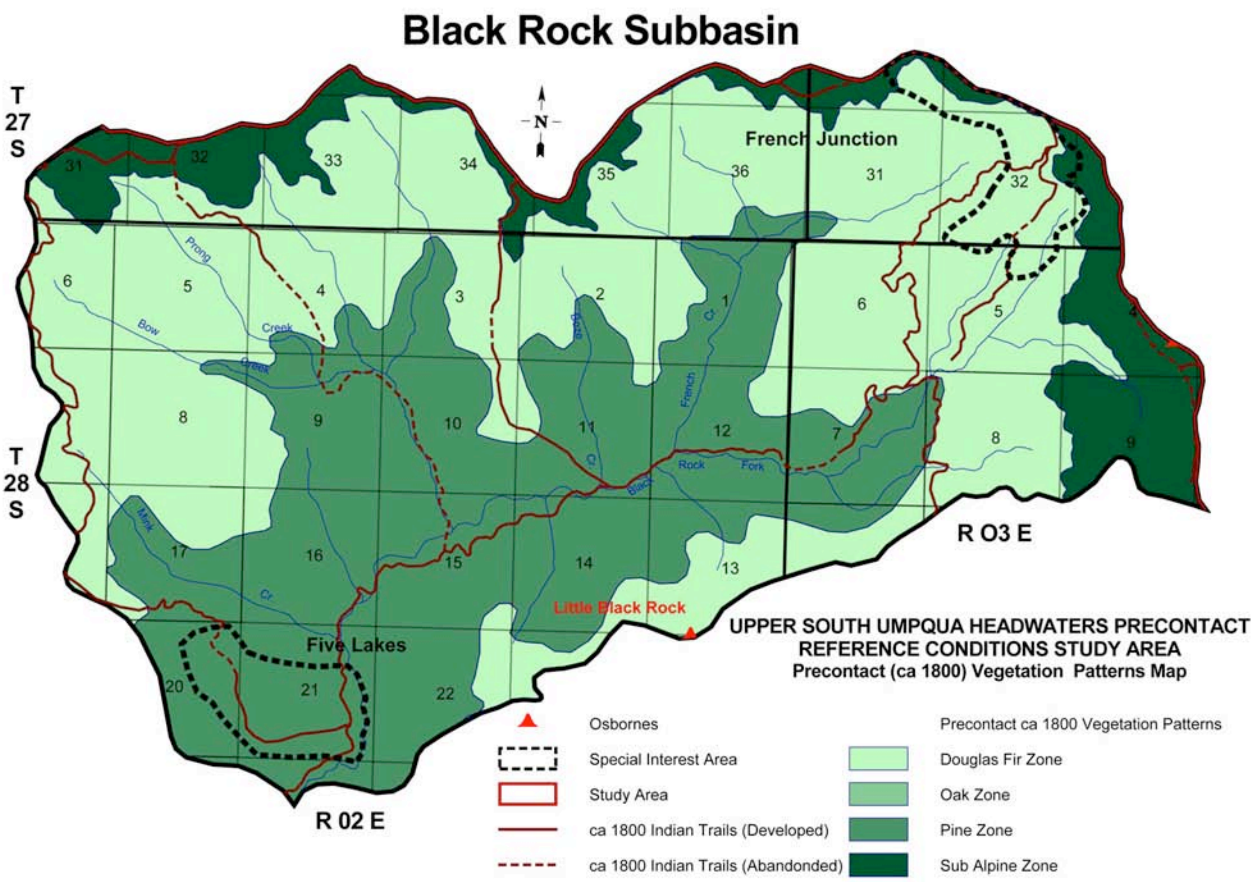


Map 7.02 GLO bearing trees and understory vegetation of the Black Rock Fork subbasin (see Table 7.01).

Figure 7.01 View NW to NE of Black Rock Fork subbasin from Little Black Rock L.O., 1936.

6.05); and the mix of cedar, pine, and Douglas fir that populate the area between mid-slope and highest elevations (see Figure 6.03). Also note the relatively small diameters of the bearing trees immediately adjacent to the mainstem Black Rock Fork, the presence of huckleberry along the eastern ridgeline, and the presence of acorn and nut bearing shrubs and trees throughout.

Map 7.03 reflects the same patterns as shown in the GLO surveys (Map 7.02) and in current photographs (Figures 6.03 and 6.05). The trail along the mainstem Black Rock Fork connects the Five Lakes area to French Junction; both areas rich in food and fiber plants, freshwater sources; and offering a possible explanation as to why older, larger trees are not present in this area (regular human use and seasonal riparian disturbances). The historic Klamath Trail passes through French Junction and connected southern Oregon with the Columbia River during precontact and early historical time; this location also intersects the east-west ridgeline trail separating the North Fork Umpqua from the South Fork, thereby offering numerous additional travel options.



Map 7.03 Ca. 1800 forest type and land use patterns of the Black Rock Fork subbasin

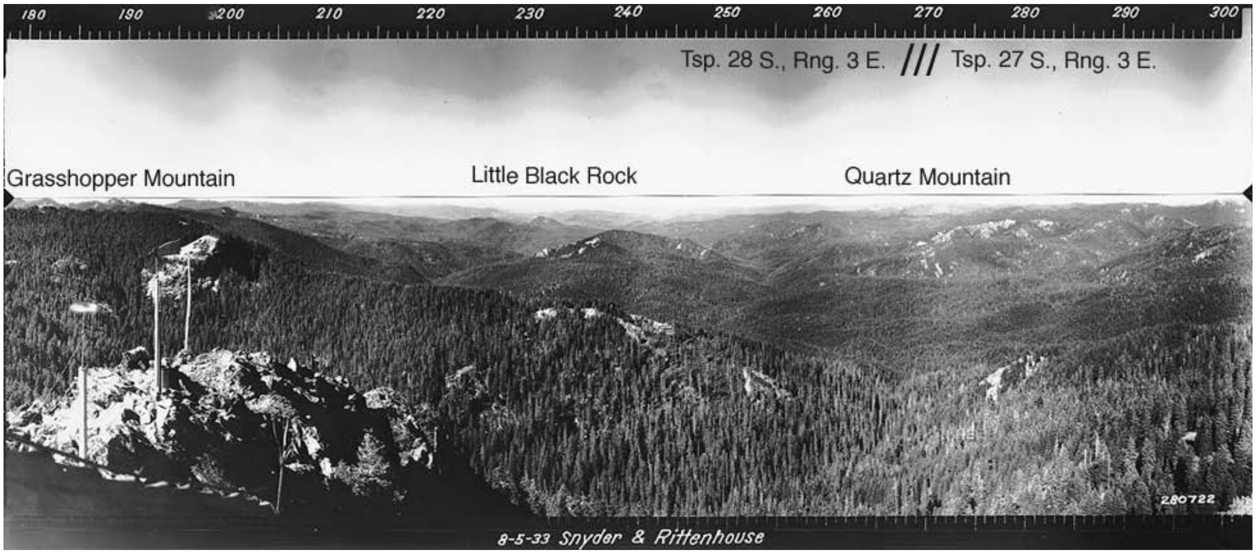


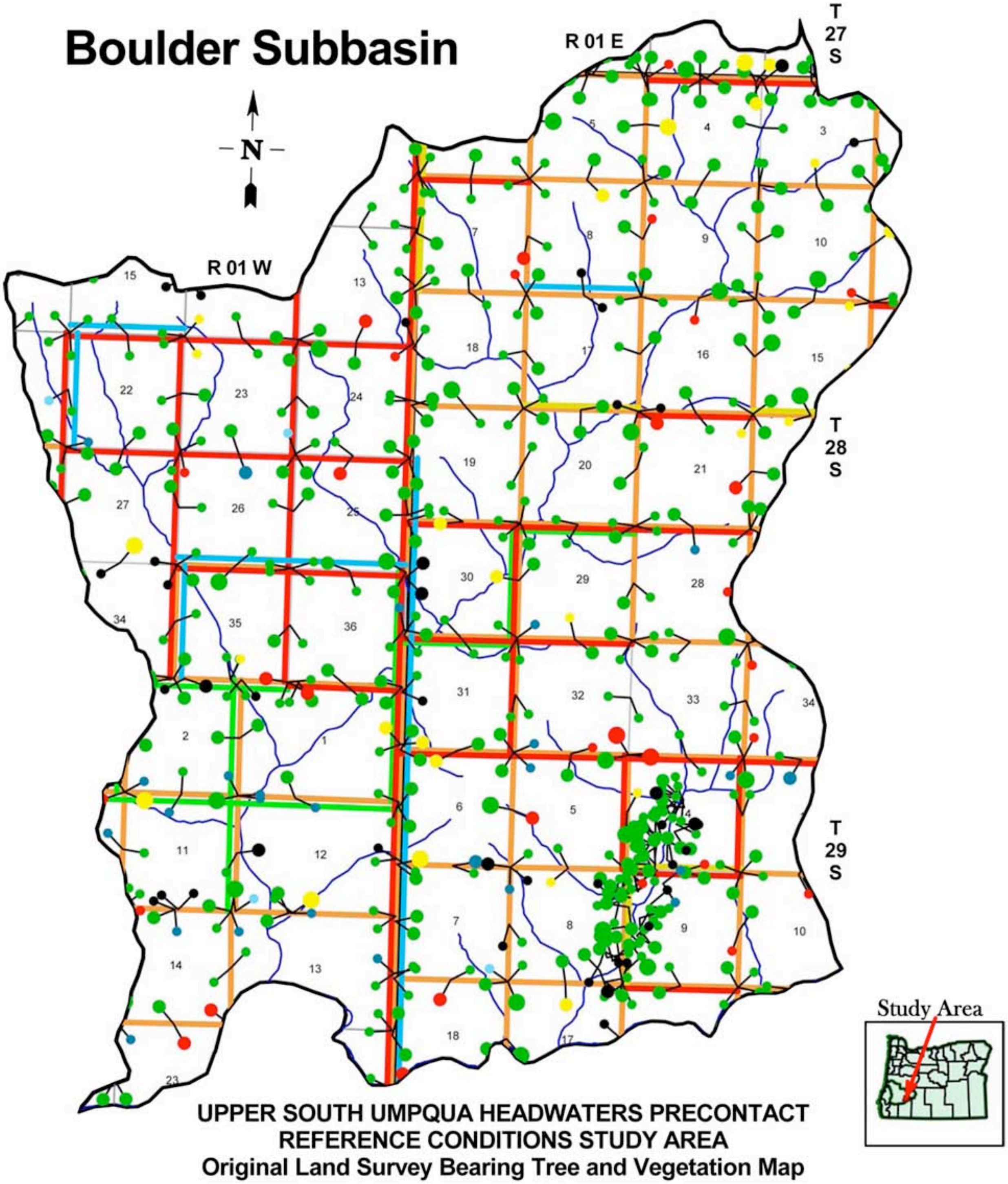
Figure 7.02 View South to NW of Black Rock Fork subbasin from Black Rock L.O., 1933.

The route from Black Rock (also directly connected to the Klamath Trail) westward toward Cow Creek Valley, and southerly into the Rogue River basin, thereby added even further transportation options to seasonal visitors and travelers to this area. The presence of cedar, pine, camas, huckleberries, meadows, prairies, abundant freshwater and numerous camping sites all point to the strong probability that this area was heavily used during most summers and falls by Umpqua Takelma, Latgawa, Molalla, and Klamath people during late precontact time, and likely regularly visited by Athapaskans, Kalapuyans, Paiutes, and others as well.

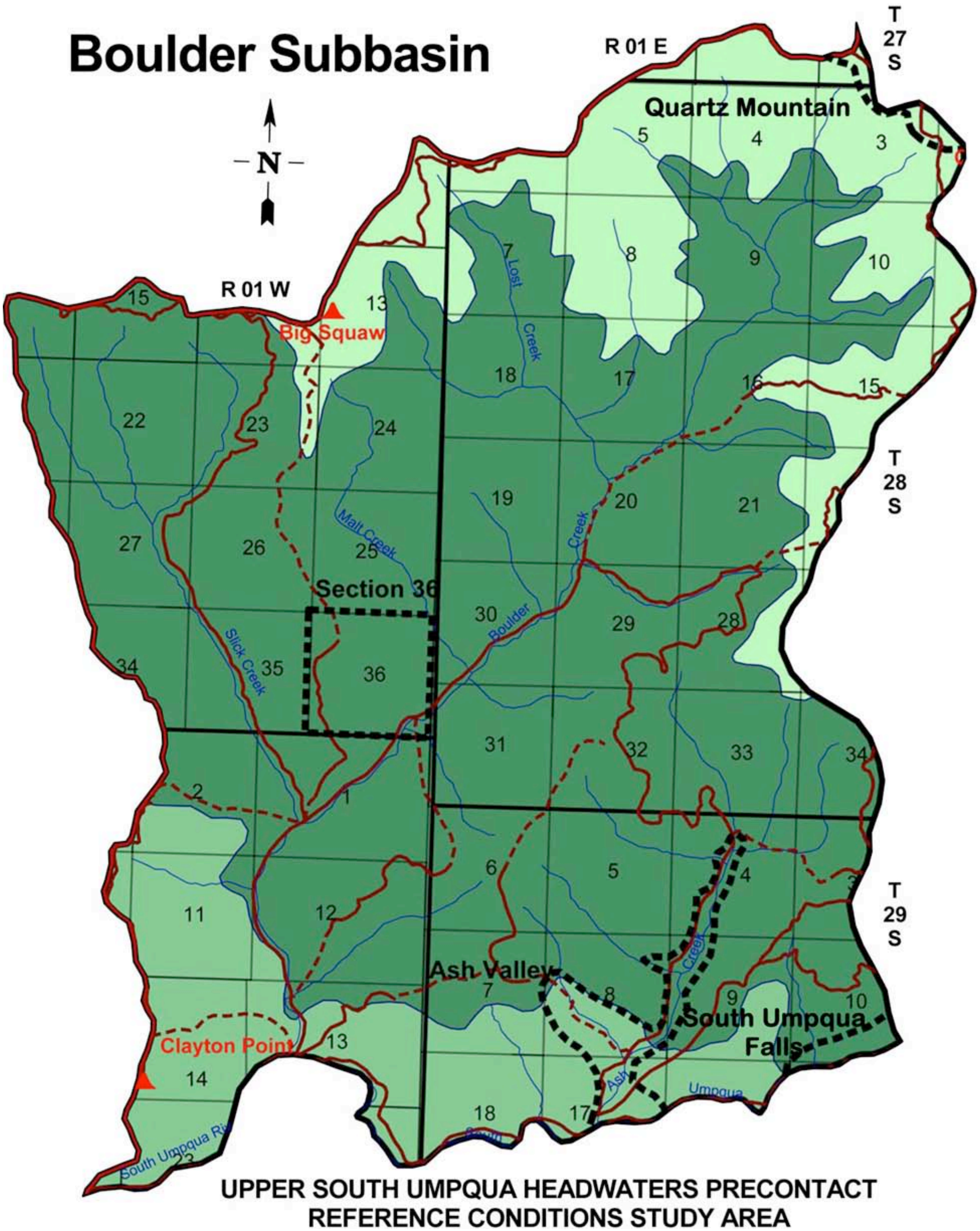
Boulder Creek

The Boulder Creek subbasin is 31,522 acres in size, has Malt Creek, Lost Creek, Pinnacle Creek and Slick Creek as principal tributaries, and includes the Ash Creek drainage. It is the northwestern-most subbasin in the study area, located in portions of Tsp. 27 S., Rng. 1 E.; Tsp. 28 S., Rng. 1 W.; Tsp. 28 S., Rng. 1 E.; Tsp. 29 S., Rng 1 W.; and Tsp. 29 S., Rng. 1 E.

Ash Valley and Section 36 are Areas of Special Interest contained within this subbasin, as are portions of Quartz Mountain and South Umpqua Falls. Clayton Point L.O., Big Squaw Mountain L.O. (Figure 7.03), and Quartz Mountain L.O. (figure 7.04) are located on its perimeter. On Map 7.04 note the scattering of large pine and cedar throughout the subbasin and the presence of nut and acorn bearing trees and shrubs along the mainstem of Boulder Creek. Also, note the large number of bearing trees shown in Ash Valley: this was due to the number of private land claims and subsequent surveys that took place there prior to WW I: http://www.ORWW.org/Rivers/Umpqua/South/Land_Surveys/Tsp_29S_Rng_1E/index.html.



Map 7.04 GLO bearing trees and understory vegetation of the Boulder Creek subbasin (see Table 7.01). Map 7.05 shows the large portion of this subbasin characterized by pine forests and woodlands, as indicated by Map 7.04. Principal trails connected the fisheries and campgrounds of the South Umpqua



Map 7.05 Ca. 1800 forest type and land use patterns of the Boulder Creek subbasin (see Table 7.02). River mainstem with the east-west ridgeline trail segment from Quartz Mountain to Big Squaw Mountain, separating the North Umpqua River from the South Umpqua. The Ash Valley and South Umpqua Falls areas were likely used year-round by local Takelma in late precontact time, with visitations from upstream Southern Molalla and from Athapaskans and Kalapuyans from the north and northwest on a more seasonal basis.

Figure 7.03 View South to NW of Boulder Creek subbasin from Big Squaw Mountain L.O., 1933.

Figures 7.03 and 7.04 reveal a rugged forested environment, heavily populated with Douglas-fir second-growth (see Map 7.04), that characterized Boulder Creek subbasin by the 1930s; but the remnants of precontact ridgeline meadows, prairies, trails, and campgrounds still remain apparent to the present time.

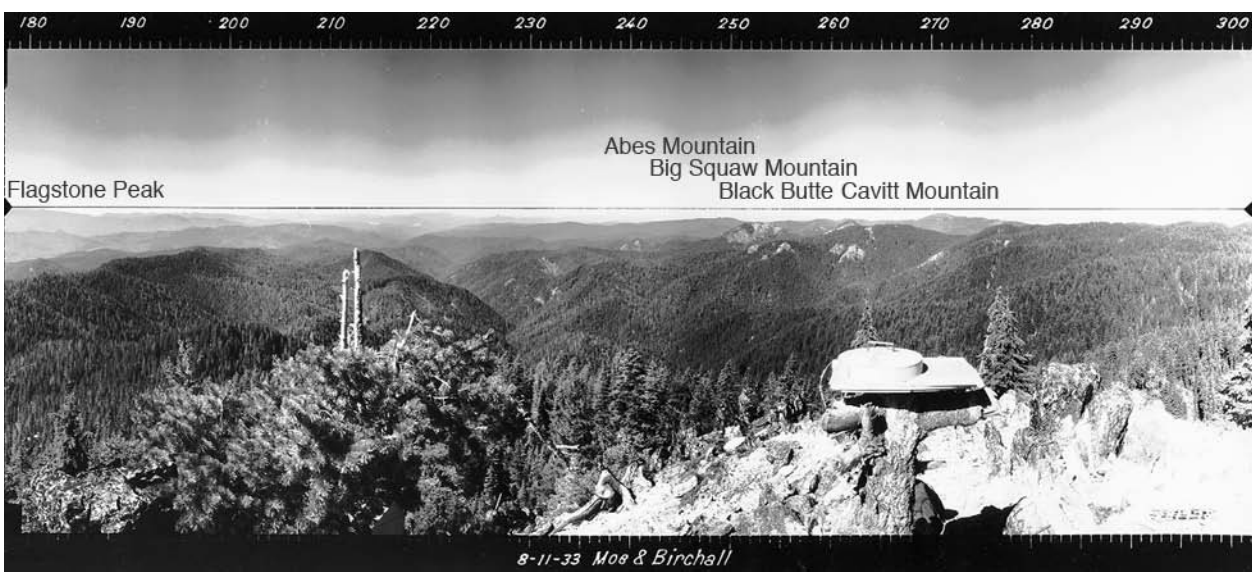


Figure 7.04 View South to NW of Boulder Creek subbasin from Quartz Mountain L.O., 1933.

Buckeye Creek

The Buckeye Creek subbasin is 25,573 acres in size, with Coyote Creek and Twin Buck Creek as principal tributaries, and also includes Emerson Creek and several unnamed smaller drainages to the mainstem South Umpqua River. It is the most centrally located of the study area's subbasins (see Map 7.01) and includes portions of Tsp. 28 S., Rng. 2 E.; Tsp. 29 S., Rng. 1 W.; Tsp. 29 S., Rng. 1 E.; Tsp. 29 S., Rng. 2 E.; and Tsp. 30 S., Rng. 1 W.

Portions of South Umpqua Falls, Alder Flats, and Acker Ranch Areas of Special Interest are contained within this subbasin. The most prominent landscape feature is Acker Rock, claimed to have been named after early immigrant settler Hiram Acker in 1899 (Bartrum ca. 1925), and the site of Acker Rock L.O. (Figure 7.05). Grasshopper Mountain L.O. is located near the headwaters of Buckeye Creek, and offers a good view of the subbasin from the east (see Figure 7.05). The name "Buckeye" is something of a mystery, and the best guess is that it was given by a USFS employee because of the resemblance of chinquapin trees within the drainage to eastern horse chestnuts (see Chapter II).

On Map 7.06 note the scattering of pine and cedar throughout the subbasin – with the notable exception of coyote creek, the oak and pine in the northwest corner near the mainstem South Umpqua River, and the concentration of riparian hardwoods near Alder Flats. Also note the uniform existence of acorn- and nut-bearing shrubs and trees throughout the subbasin.

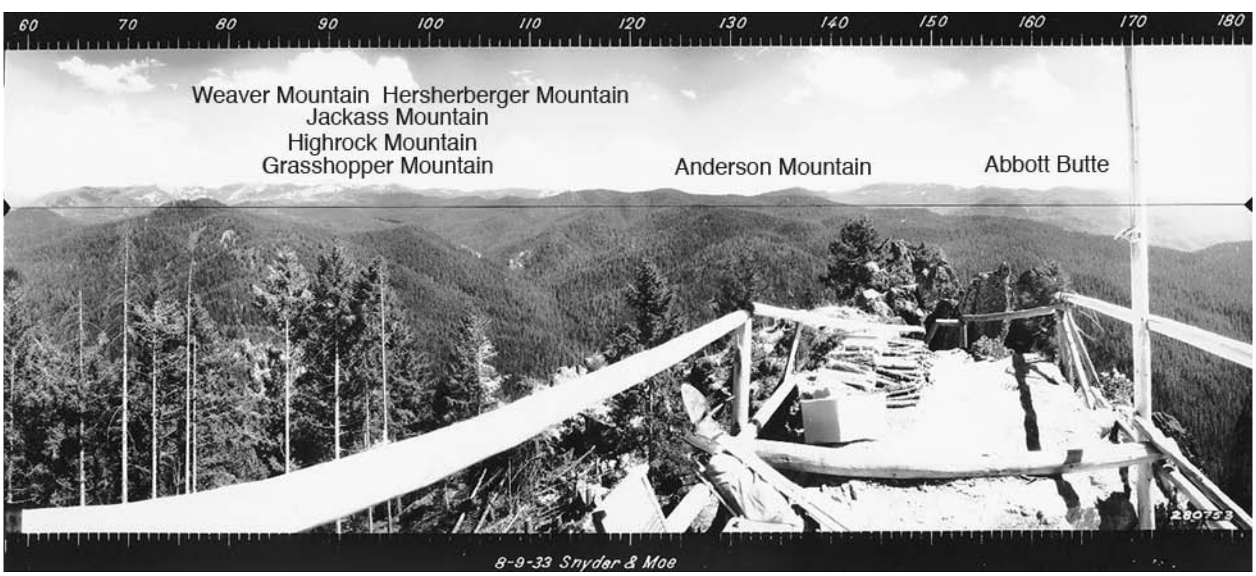
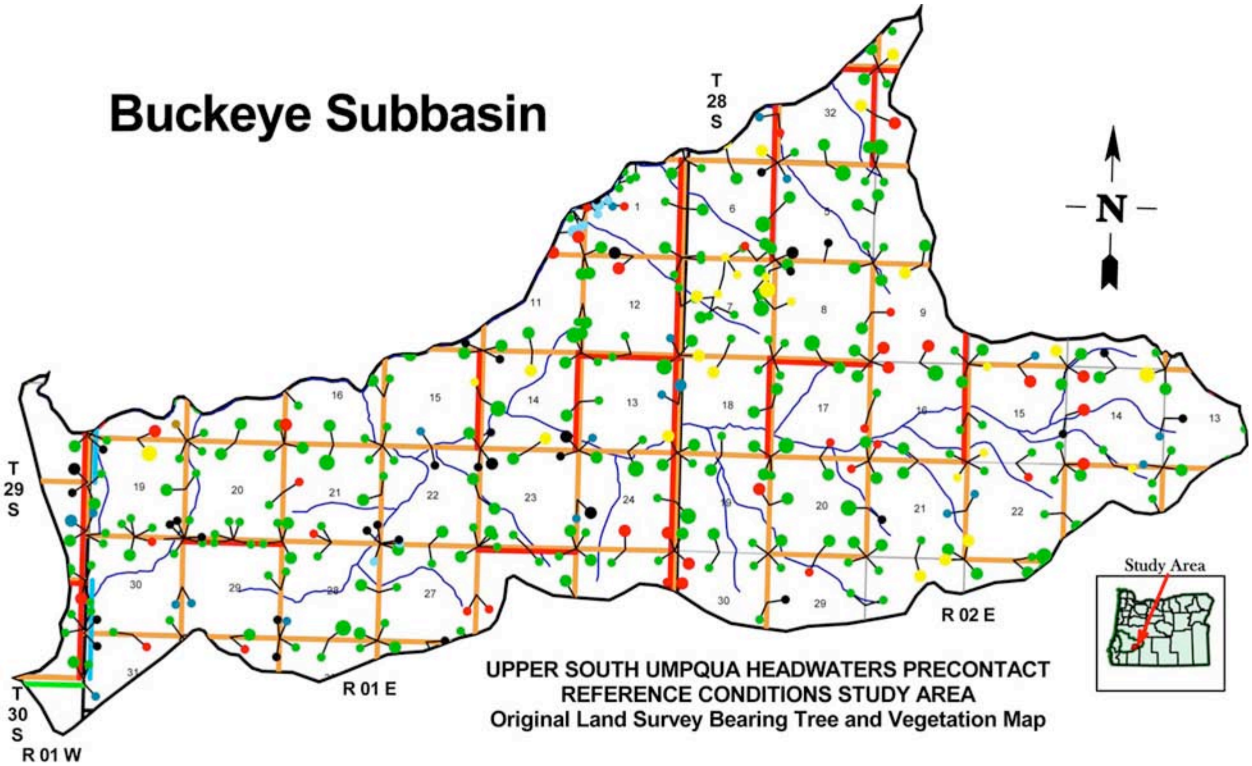


Figure 7.05 View NE to South of Buckeye Creek subbasin from Acker Rock L.O., 1933.



Map 7.06 GLO bearing trees and understory vegetation of the Buckeye Creek subbasin (see Table 7.01).

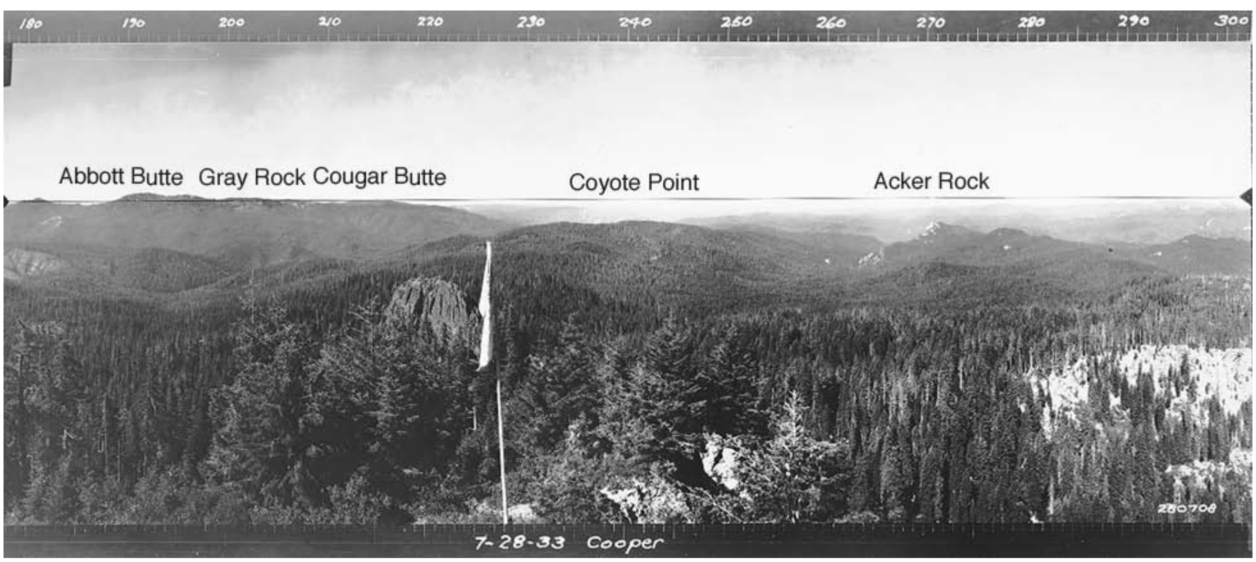
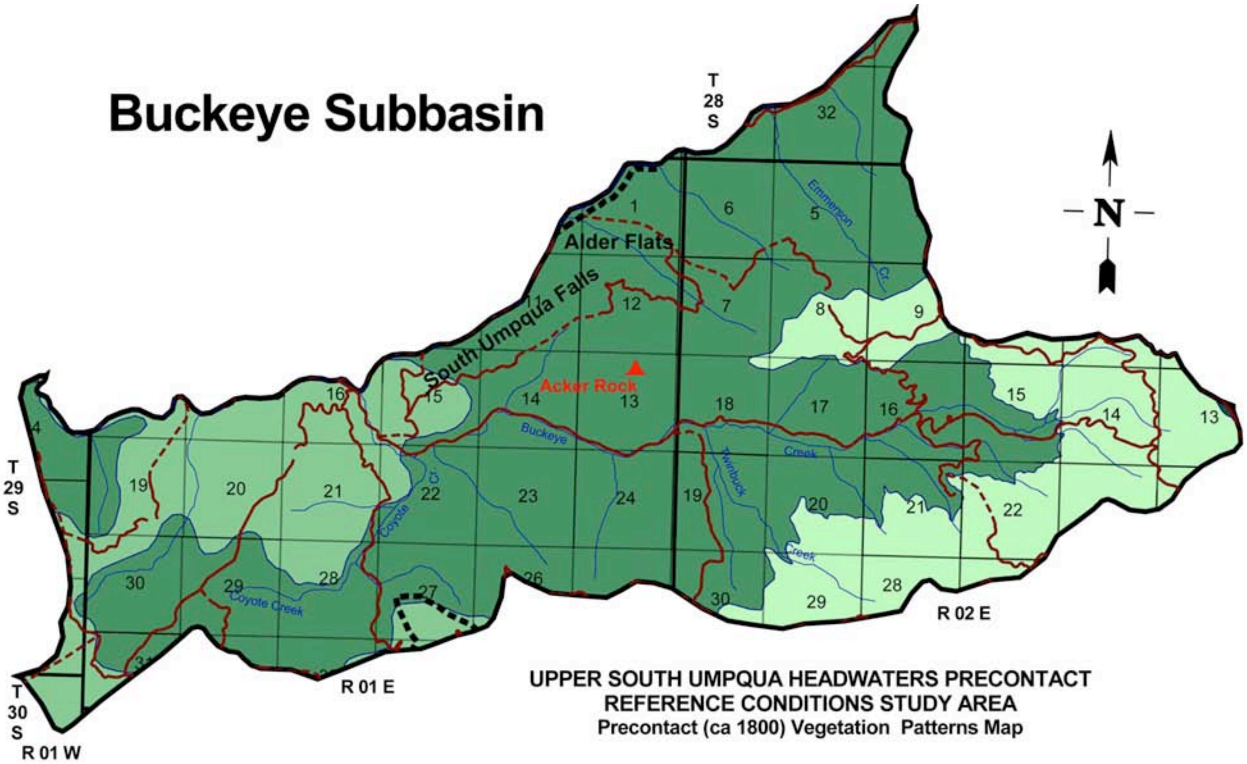


Figure 7.06 View South to NW of Buckeye Creek subbasin from Grasshopper Mountain L.O., 1933.

Map 7.07 indicates heavy precontact use throughout this subbasin, with primary trail routes following the South Umpqua River, mainstem Buckeye Creek, the east-west watershed ridgeline separating Jackson Creek from Buckeye Creek, and the north-south ridgeline separating Buckeye Creek subbasin from Castle



Map 7.07 Ca. 1800 forest type and land use patterns of the Buckeye Creek subbasin (see Table 7.02).

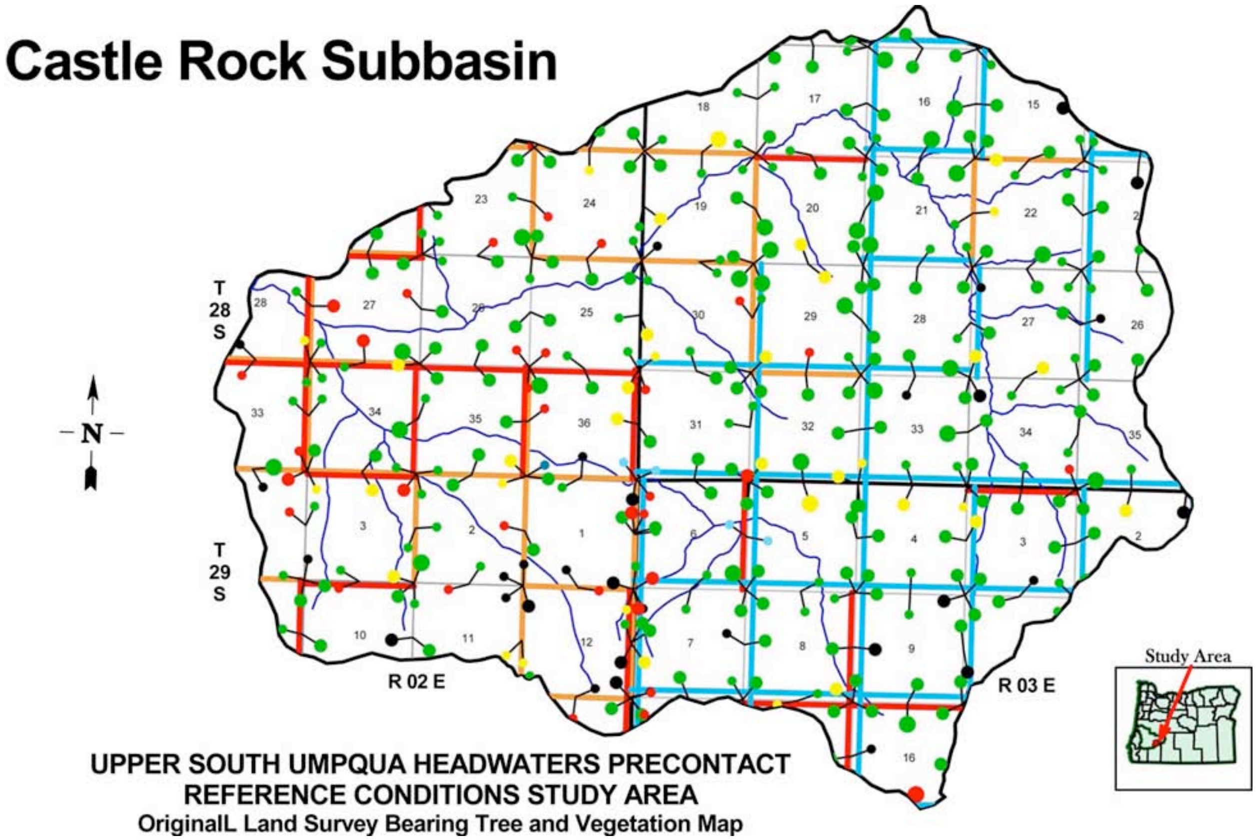
Rock Fork subbasin. This area was likely most heavily used by Takelma from the north and west, and by Molalla from the east. Important locations included South Umpqua Falls fisheries, the prairies and oak savannas of the Tallow Butte (Acker Ranch) area, and the prairies, meadows, lakes, and ponds stretching from Grasshopper Mountain to Fish Lake, Emerson Creek, and Five Lakes to the east (see Map 7.01).

Castle Rock Fork

The Castle Rock Fork subbasin is 27,212 acres in size and includes Fish Lake Creek, Gale Creek, Highrock Creek, Horse Creek, Hummingbird Creek, Hunter Creek, Skimmerhorn Creek, and Slice Creek as principal tributaries. It is the eastern-most subbasin in the study area and was the site of the 2009 Rainbow Fire (see Chapters I and IV). This area is located in portions of Tsp. 28 S., Rng. 2 E.; Tsp. 28 S., Rng. 3 E.; Tsp. 29 S., Rng. 2 E.; and Tsp. 29 S., Rng. 3 E.

Fish Lake and High Prairie and a portion of Grasshopper Complex are Areas of Special Interest contained within this subbasin, and Rattlesnake Mountain L.O. (see Figure 7.07) and Grasshopper Mountain L.O. (see Figure 7.08) are located on its perimeter.

On Map 7.08 note the number of pine scattered throughout this subbasin, with cedar being mostly located to the west. Also note the abundance of huckleberries along the higher elevations to the east and the presence of large diameter true fir along the higher elevation southern and eastern watershed boundaries.



Map 7.08 GLO bearing trees and understory vegetation of the Castle Rock Fork subbasin (see table 7.01).

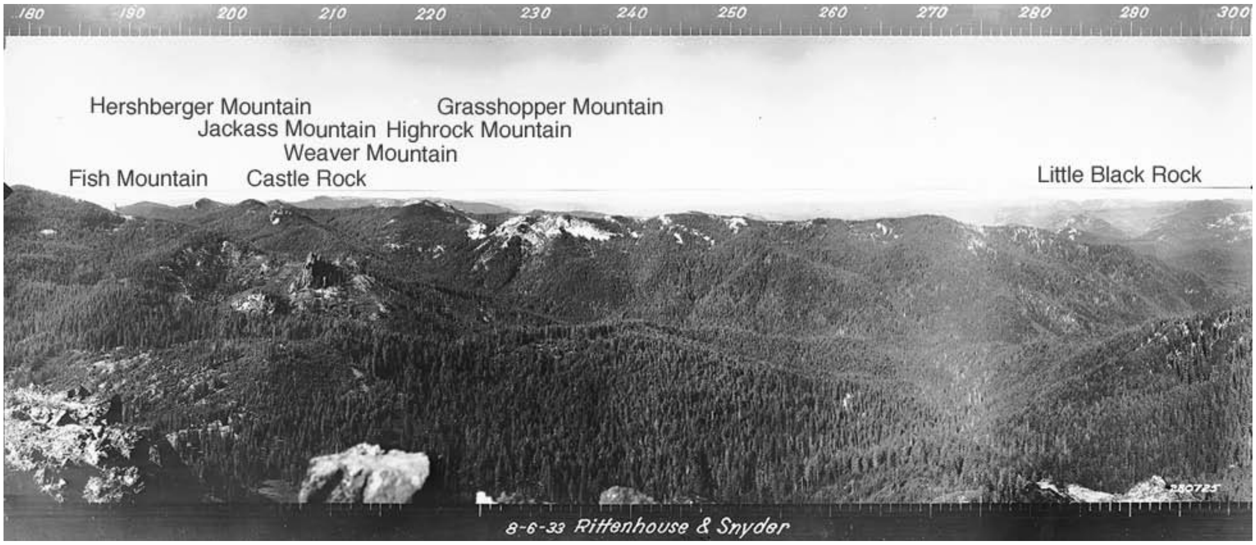
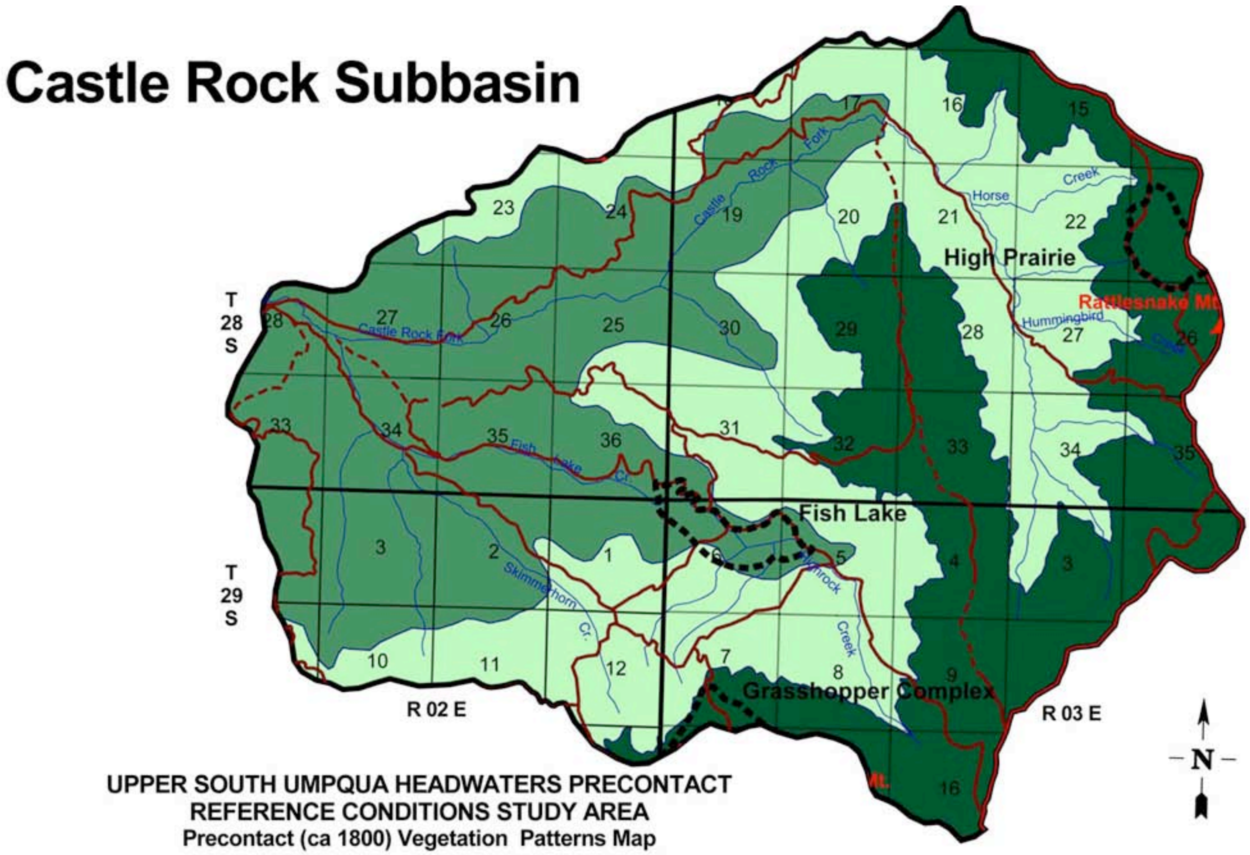


Figure 7.07 View South to NW of Castle Rock Fork subbasin from Rattlesnake Mountain L.O., 1933. On Map 7.09 note the ridgeline trail complex connecting the mainstem tributaries. These would have been primary travel routes for connecting lower elevation resources of the Umpqua Takelma and southern Molalla with high elevation huckleberry crops and regular seasonal trade routes used by Klamath and Latgawa from the south and southeast, with perhaps some visitations by Paiute from the east.

Fish Lake was an area known to local people for its precontact archaeological resources: as were the extensive springs, prairies, meadows, and huckleberry fields in the Grasshopper Mountain and Rattlesnake Mountain areas. Although this subbasin is steep and rocky throughout, it also contains numerous important resources in key locations that were equally well known to local Tribes in precontact time, and that were readily accessible via well-established trails that persist to the present time.



Map 7.09 Ca. 1800 forest type and land use patterns of the Castle Rock Fork subbasin (see table 7.02).

Figure 7.08 provides a perspective on the relatively isolated scattered lakes, sloping basins, and upland prairies that characterize key portions of the Castle Rock Fork subbasin, from its highest elevations, to its confluence with the South Umpqua River. For these reasons, and others, it was likely an area also favored by precontact Molallans for hunting big game animals such as deer and elk.

Figure 7.08 View NW to NE of Castle Rock Fork subbasin from Grasshopper Mountain L.O, 1933.

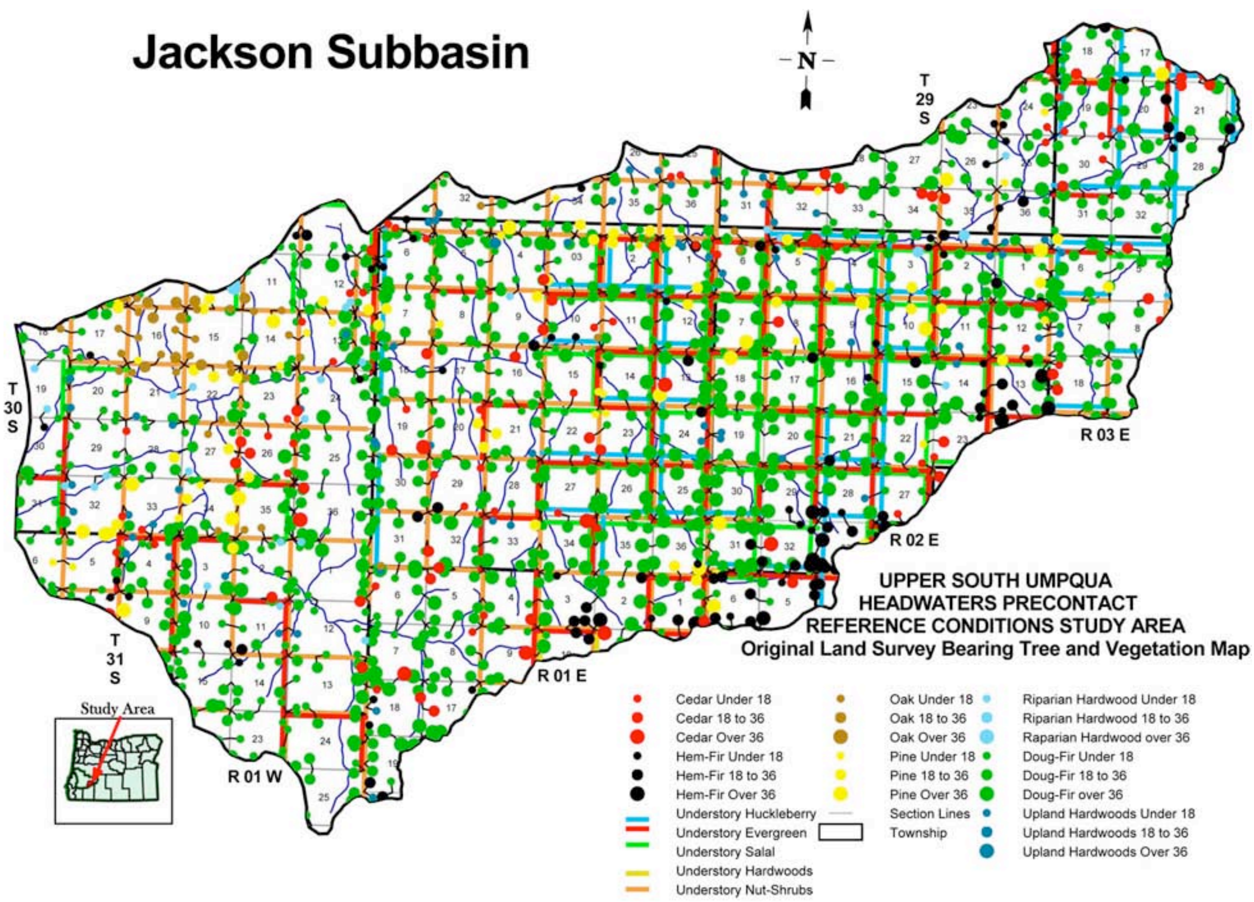
Jackson Creek

Jackson Creek subbasin is the southern-most of the seven subbasins, is 101,995 acres in size, and nearly equal in area to the other six subbasins combined. For the latter reason, it could reasonably be subdivided into smaller subbasins: perhaps Beaver Creek; Collins Ridge; Squaw Creek; Tallow Creek; Upper Jackson Creek; and Whisky Creek. Other important tributaries to Jackson Creek include Abbott Creek, Bean Creek, Black Canyon Creek, Bullock Creek, Burnt Creek, Chapman Creek, Coffin Creek, Cougar Creek, Crooked Creek, Dead Horse Creek, Deep Cut Creek, Devils Knob Creek, Donegan Creek, Eden Creek, Falcon Creek, Fawn Creek, Freezeout Creek, Lonewoman Creek, Luck Creek, Maverick Creek, Mule Creek, Nichols Creek, Paradise Creek, Pipestone Creek, Ralph Creek, Serviceberry Creek, Stampede Creek, Surveyor Creek, Swirchback Creek, Tallow Creek, Three Cabin Creek, and Twomile Creek. This area contains nearly all of Tsp. 30 S., Rng 1 E. and portions of Tsp. 29 S., Rng. 1 E.; Tsp. 29 S., Rng. 2 E.; Tsp. 29 S., Rng. 3 E.; Tsp. 30 S., Rng. 1 W.; Tsp. 30 S., Rng. 2 E.; Tsp. 30 S., Rng. 3 E.; Tsp. 31 S., Rng. 1 W.; Tsp. 31 S., Rng. 1 E.; and Tsp. 31 S. Rng. 2 E.

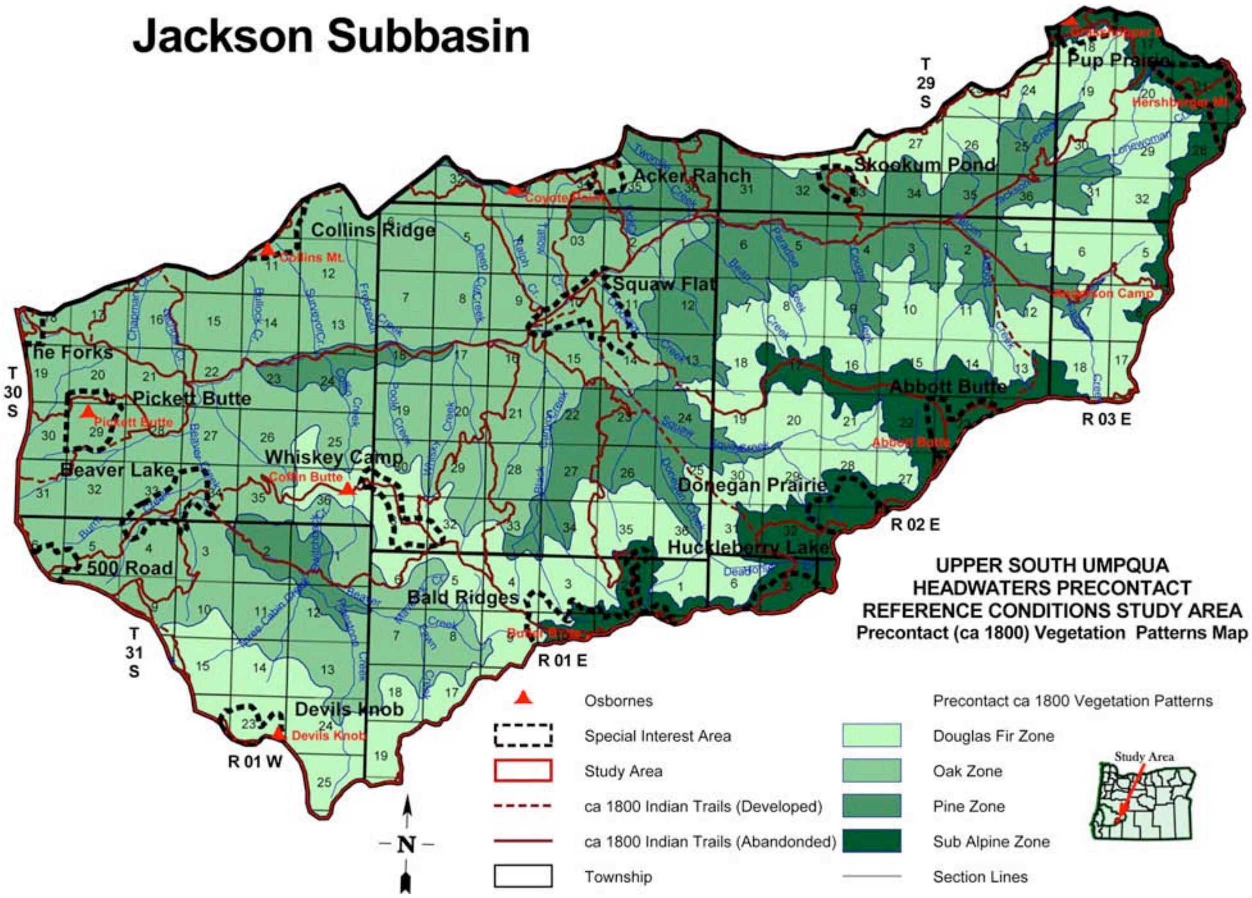
The early historical name for Jackson Creek is South Fork of the South Fork of the Umpqua River, but this was changed in the early 1900s in honor of Clarence Jackson, a former Umpqua NF Ranger. 500 Road, Abbott Butte, Bald Ridges, Beaver Lake, Devils Knob, Donegan Prairie, Huckleberry Lake, Pickett Butte, Pup Prairie, Skookum Pond, Squaw Flat, and Whiskey Camp are Areas of Special Interest contained in Jackson Creek subbasin, which also includes portions of Acker Ranch, Collins Ridge, Grasshopper Complex, and The Forks (see Chapter II). Abbott Butte L.O. (see Figure 2.05), Anderson Camp L.O., Butler Butte L.O., Collins Ridge L.O. (see Figure 7.09), Coyote Point L.O., Devils Knob L.O., Grasshopper Mountain L.O., and Hershberger Mountain L.O. are located around the border of this subbasin; Coffin Butte L.O. and Pickett Butte L.O. (see Figure 7.10) are located within its interior.

On Map 7.10 note the distinct clustering of oak and pine bearing trees in the northwest portion of the subbasin; the upslope large diameter pine and cedar that buffer them and extend eastward throughout the subbasin, running parallel to the Jackson Creek mainstem; the significant number of medium and large diameter true fir along the Umpqua-Rogue watershed divide; and the extensive band of large diameter Douglas-fir throughout the subbasin, separating the pine from the true fir. Compare these patterns to the precontact forest type zones shown on Map 7.11.

Another distinct pattern of interest on Map 7.10 is shown by the expected presence of huckleberry along the highest elevations of the southern and eastern parts of this subbasin – but also in pronounced strips



Map 7.10 GLO bearing trees and understory vegetation of the Jackson Creek subbasin.



Map 7.11 Ca. 1800 forest type and land use patterns of the Jackson Creek subbasin.

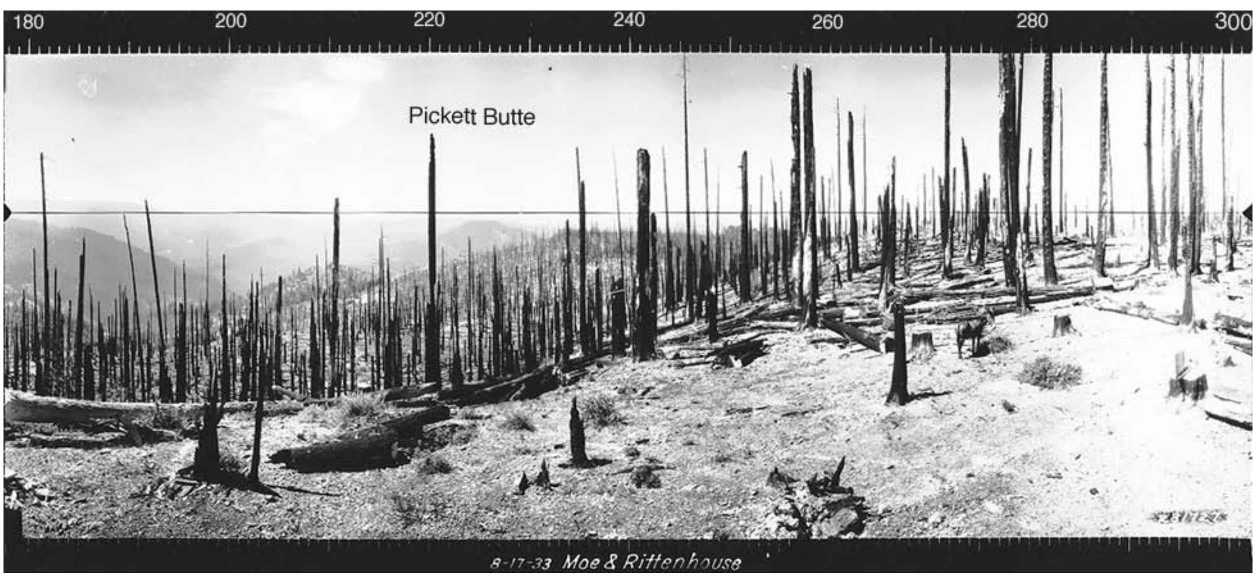


Figure 7.09 View South to NW of Jackson Creek subbasin from Collins Ridge L.O., 1933.

running northward from Bald Ridges and Abbott Butte to Squaw Flat, and eastward from Squaw Flat to Anderson Camp. Again, compare these vegetation survey patterns to the ca. 1800 trails shown on Map 7.11. The well-developed precontact trail network not only directly connects such expected destinations as Whiskey Camp, Huckleberry Lake, Acker Ranch, Abbott Butte, and Anderson Camp from an apparent nexus at Squaw Flat; they also seem to be defined by significant populations of large pine, huckleberries, and nut-bearing trees and shrubs. These factors all seem to indicate a year-round use of Jackson Creek subbasin by Umpqua Takelma from the west along the mainstem to at least Squaw Flat, and along the ridgelines to Devils Knob, Whiskey Camp, and Abbott Butte; by southern Molalla upland and to the east of those locations; shared locations and resources by the two groups throughout the subbasin; and regular use and visitations to the area by Latgawa from the south and Klamath from the southeast.

Figure 7.10 View NW to NE of Jackson Creek subbasin from Pickett Butte L.O., 1936.

These indications are further bolstered by examinations of Figures 7.09 and 7.10. Note the diameter and spacing (and apparently well-developed ridgeline trail) of the larger snags in Figure 7.09. Before the historical wildfire-kill of invasive understory trees (indicated by the great number of smaller-diameter snags in the picture), it is easy to imagine this as an important park-like connective route in precontact time between The Forks and Coyote Point along the ridgeline, and to South Umpqua Falls and other locations to the north. Figure 7.10 shows a similar pattern of small-diameter stumps and logs of fire-killed trees that had likely invaded the Pickett Butte savanna during historical time; and the well-developed prairie complex that extended from Collins Ridge to Coyote Point, and the Tallow Butte and Acker Ranch meadows and oak savannas to the east.

Quartz Creek

The Quartz Creek subbasin is 16,560 acres in size, has Flagsone Creek as a primary tributary, and includes the smaller Flood Creek and Skillet Creek drainages to the east. This is the northern-most subbasin in this study, and includes portions of Tsp. 27 S., Rng. 1 E.; Tsp. 27 S., Rng. 2 E.; Tsp. 28 S., Rng. 1 E.; Tsp. 28 S., Rng. 2 E.; and Tsp. 29 S., Rng. 1 E.

Alder Flats, South Umpqua Falls, and Quartz Mountain are Areas of Special Interest partly contained within this subbasin, and Quartz Mountain L.O. (see Figure 7.11) is located along its northwest perimeter. Figure 7.12 is another perspective of this subbasin, taken from Acker Rock L.O., two miles to the south.

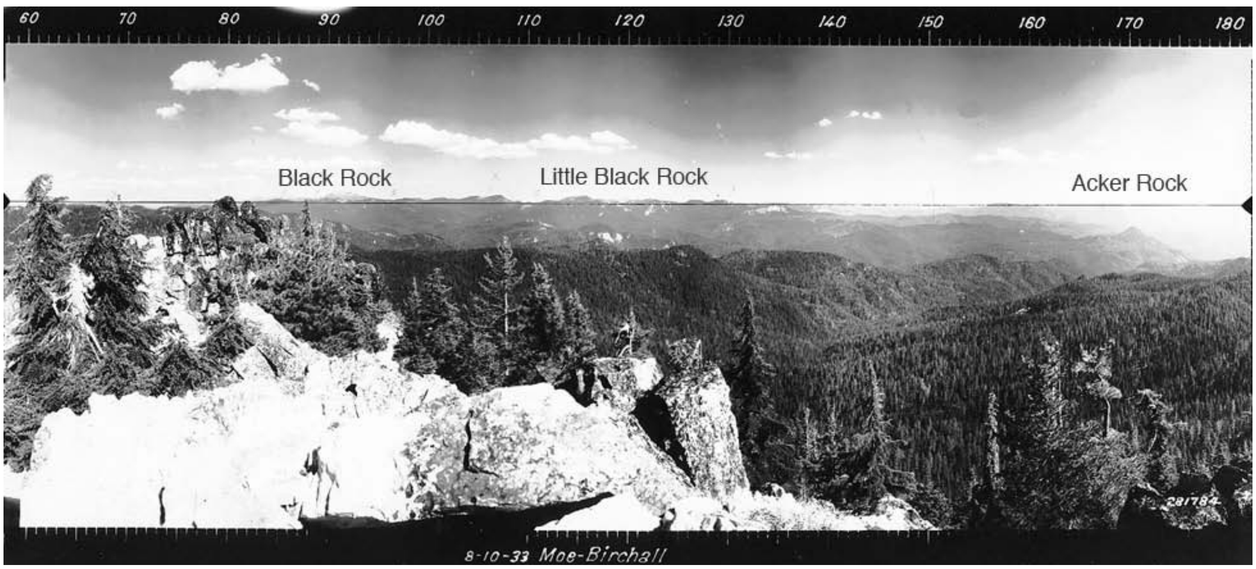
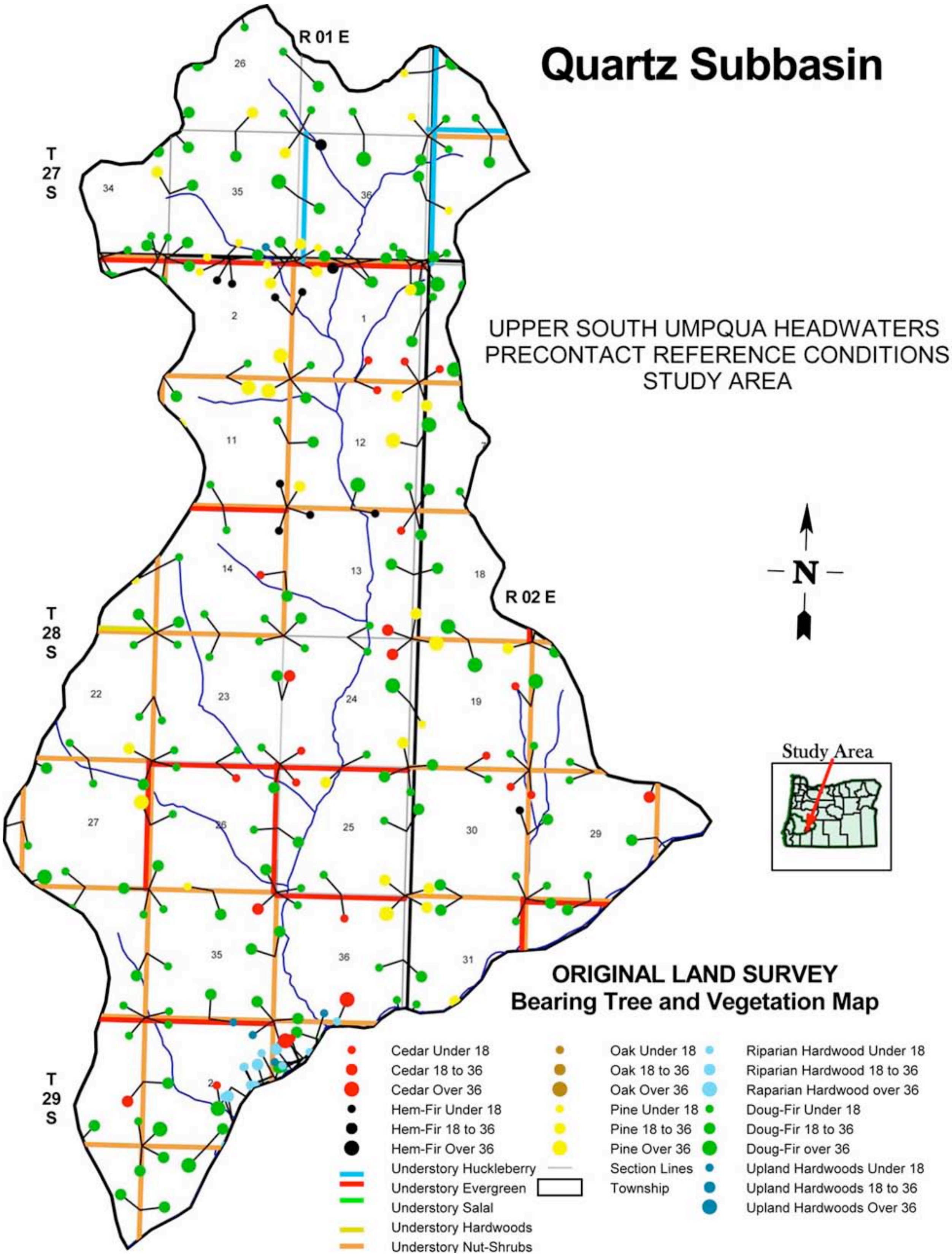


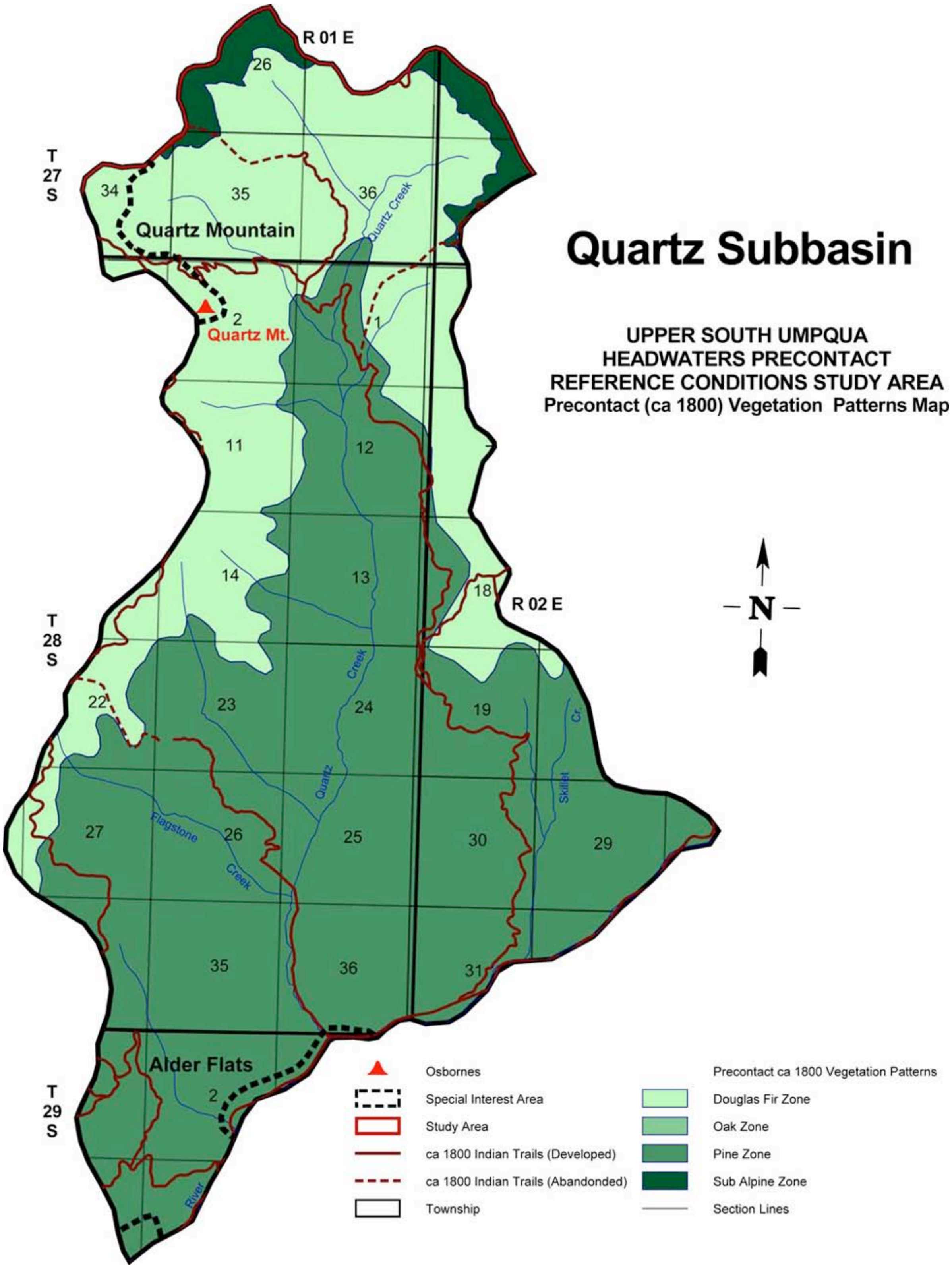
Figure 7.11 View NE to South of Quartz Creek subbasin from Quartz Mountain L.O., 1933.

Map 7.12 shows a significant amount of riparian hardwoods present in the Alder Flats area, as might be expected. Pine and cedar are shown as present in all elevations, and huckleberry is shown at the highest elevations, along the east-west ridgeline trail segment, connecting Quartz Mountain to French Junction, 10 miles to the east (see Map 7.01).

Map 7.13 reflects the patterns shown in Map 7.12, including a predominantly Douglas-fir pattern along the ridgeline separating Boulder Creek from Quartz Creek. This is a particularly steep and rocky subbasin, and most precontact activity appears to have been concentrated near the South Umpqua mainstem, the Flagstone Mountain trail segment (which includes numerous meadows and prairies), and



Map 7.12 GLO bearing trees and understory vegetation of the Quartz Creek subbasin.



Map 7.13 Ca. 1800 forest type and land use patterns of the Quartz Creek subbasin.

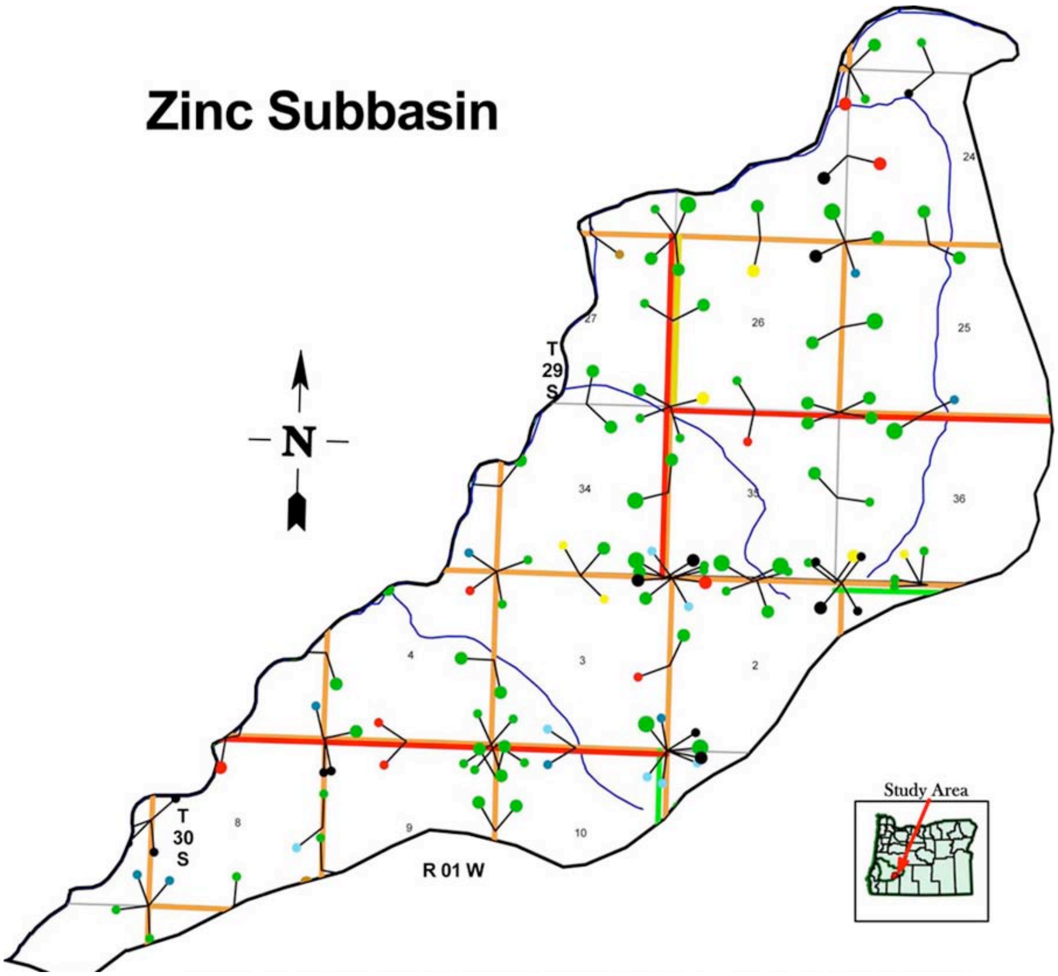
Figure 7.12 View NW to NE of Quartz Creek subbasin from Acker Rock L.O., 1933.

the headwater huckleberry fields; which included the well-used east-west trail, several excellent camping locations, camas, yampah, and cedar, and likely provided excellent seasonal hunting opportunities as well. The southern part of this subbasin was most likely used regularly by Umpqua Takelma, because of its proximity to South Umpqua Falls, and the higher elevations by southern Molalla on a regular basis, and by Calapooians and Umpqua Athapaskans visiting from the north and west.

Zinc Creek

The Zinc Creek subbasin is 8,893 acres in size and is the smallest of the study area subbasins. Zinc Creek has no named tributaries, but this area includes several unnamed creeks that drain westward from Collins Ridge and empty directly into the South Umpqua River. This subbasin is located in portions of Tsp. 29 S., Rng. 1W. and Tsp. 30 S., Rng. 1 W., and includes parts of The Forks and Collins Ridge Areas of Special Interest.

Map 7.14 shows a variety of bearing tree species scattered throughout this area; of particular note is their generally small diameter, indicating that they had either invaded the area during historical time, or that they were the products of natural reforestation, following wildfires, mining, or logging operations. Research indicates that they likely represent a combination of both of these histories. Figure 7.13, taken from Clayton Point, about one mile north of the mouth of Zinc Creek, shows an area covered with what appears to be a fairly uniform stand of moderately-sized trees, with some indications of former meadows,

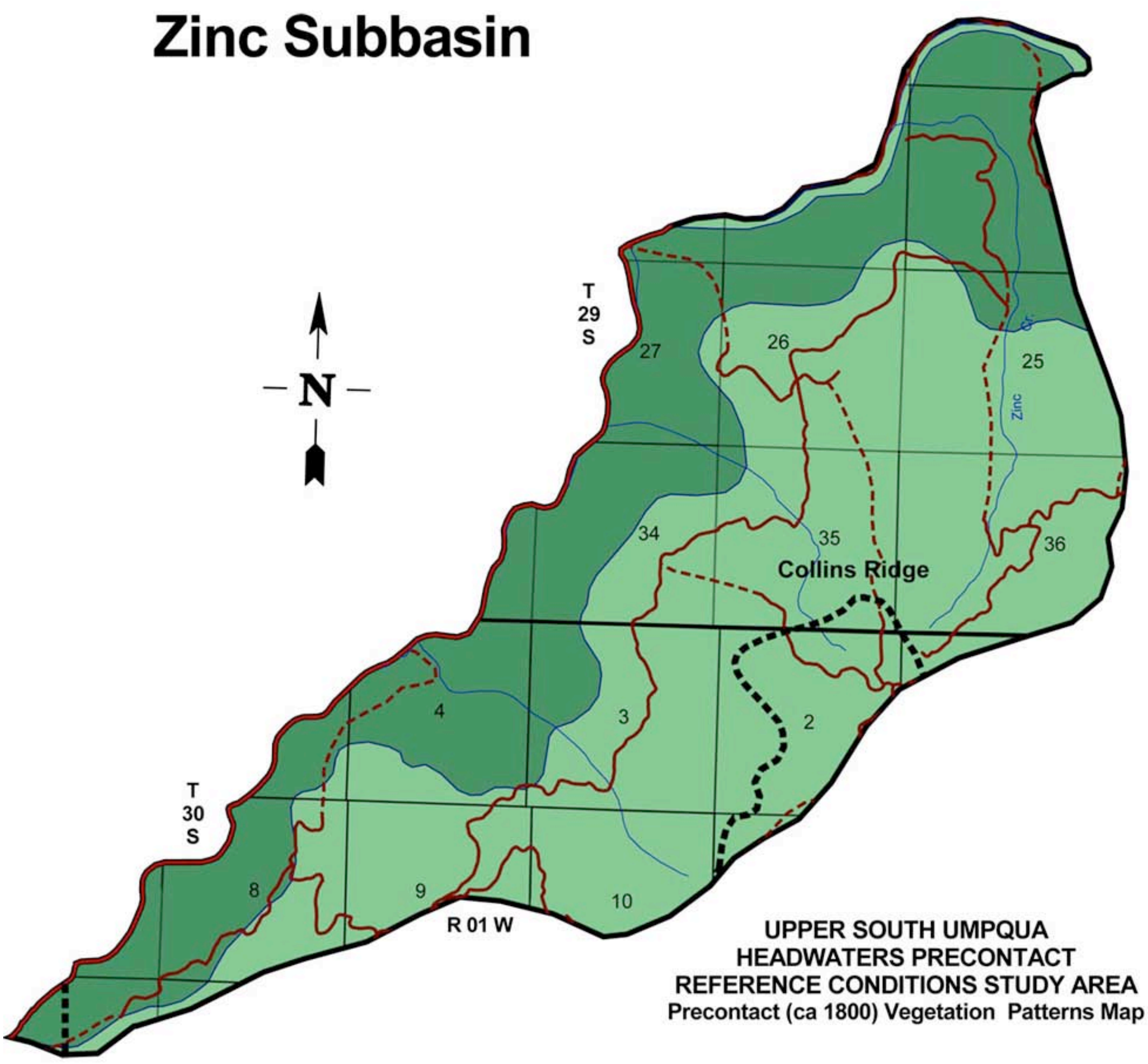


Map 7.14 GLO bearing trees and understory vegetation of Zinc Creek subbasin (see Table 7.01).

Figure 7.13 View NE to South of Zinc Creek subbasin from Clayton Point L.O., 1938.

while Figure 7.14 (centered on Clayton Point and showing the mouth of Zinc Creek and the portion of the subbasin visible in Figure 7.13), taken eight years later, shows evidence of several small wildfires in the area and includes annotations showing the locations of earlier fires documented during the 1910 GLO subdivisions survey of Tsp. 29 S., Rng 1 W. (Rand 1910).

Map 7.15 does not correlate to GLO survey patterns so well as do the other subbasins in this study, but the trail system provides insight as to why that might be: in addition to a major travel route defining the western boundary of this subbasin (mainstem South Umpqua River corridor), as well as the eastern



Map 7.15 Ca. 1800 forest type and land use patterns of the Zinc Creek subbasin (see Table 7.02).

boundary, both trails intersect at the southern and northern terminus points of the subbasins -- and a third major trail runs through the interior of the subbasin as well, in a course parallel with the two perimeter trails. The inference is that this subbasin was heavily used in late precontact time as a major travel route by the Umpqua Takelma, connecting The Forks with upstream South Umpqua River sites; to the north with the east-west ridgeline trail on the South Umpqua-North Umpqua divide; and to the east, toward Coyote Point and Acker Ranch, along the Jackson Creek-South Umpqua divide trail. The interior trail suggests a gently sloping bench that would have provided good camping locations along the unnamed creeks, and the whole (including absence of large diameter bearing trees) would suggest a largely treeless savanna or prairie during precontact time, due to the pervasive presence of people and fire.

Chapter VIII. Discussion, Conclusions, and Questions

This report has provided descriptions of late precontact forest conditions in the South Umpqua River headwaters for the ca. 1800 time period, based on several lines of evidence and using modern technology to display findings. The purpose of this study was to produce such a result for the intended use of helping to update Douglas County Community Wildfire Protection Plans. The question is: How might knowledge of past forest conditions, in a practical sense, prove useful and have direct relevance to wildfire protection planning? As Carloni (2005: *ix*) states: " And most pragmatically, what can studies of current and past fire and forest patterns contribute to future management decisions?"

County Commissioner Laurance's answer (see Appendix A) to this conundrum is, in part: "Fire Regime Condition Class (FRCC) 1 is similar to the forest which European explorers first found here . . . Within FRCC 1 the risk of losing key ecosystem components to fire is low . . ." His perspective is shared by many others, including numerous scientists, foresters, land surveyors, resource managers, and local residents quoted and referenced in this study. GLO Surveyor Norman Price, for example, provides an excellent summary of this perspective (see Figure 8.01).

The following discussion provides an example of how the perspectives and technical products from this study can be used to assist in establishing objectives and prioritizing geographical areas during the planning process. The most salient findings of this research are listed as "conclusions," for the consideration of resource managers, wildfire protection planners, and interested citizens – and hopefully have added educational value as well for teachers and students with a focus on Oregon history, forest ecology, geography, anthropology and/or other related studies. Finally, in line with the "multiple hypotheses" methodology used to conduct this study, a series of more refined questions are listed for which additional research might be justified to address the objectives of this study. Brief answers are also supplied for each question, based on the current findings of this study, but with the idea that entirely different answers might be forthcoming with additional data or alternative perspectives.

Discussion

Chapter VII provides a series of maps purporting to show ca. 1800 forest vegetation and land use patterns for each of the subbasins in the study area. These maps were carefully assembled following the methods described in Chapter II with data and perspectives described and given in the remaining chapters and the appendices. Map 6.04 shows the sum total of these findings for the entire study area.

Figure 8.01 GLO Surveyor Norman Price and wife, ca. 1940.

Price helped survey much of the study area in the late 1930s (e.g., Price et al. 1929). His observations regarding his survey of Tsp. 34 S., Rng. 8 W. to the southwest of the South Umpqua River are relevant to the findings of this research:

"Most of the township is covered with such a dense growth of buckthorn, manzanita, lilac, madrona, chinquapin, and sweet acorn that no grasses can thrive. A small area on what is known as Peavine Mountain, in sec. 21, sustains a growth of native peavine sufficient to graze a few head of cattle for about six weeks. It is an historical fact that in the days immediately following the occupation of this country by the Indians this country was all covered with a fine growth of native grasses and practically no underbrush. The Indians accomplished this by setting fire to the vegetation on one side of the river one year and the other side the next year. Thus they kept the country open and clean and were never in danger of a forest fire."

Map 8.01is the ca. 1800 forest vegetation type patterns shown in Map 6.04, but without the ca. 1800 trail network. Superimposed on this map are two separate interpretations of FRCC 3 independently supplied to the Douglas County Surveyor's Department by a Douglas County forestry consultant in the form of a printed map. The image was then scanned and converted to a GIS layer by the Surveyor's "GIS Team" (see Acknowledgements), combined with Map 6.04 and resulting in Map 8.01.

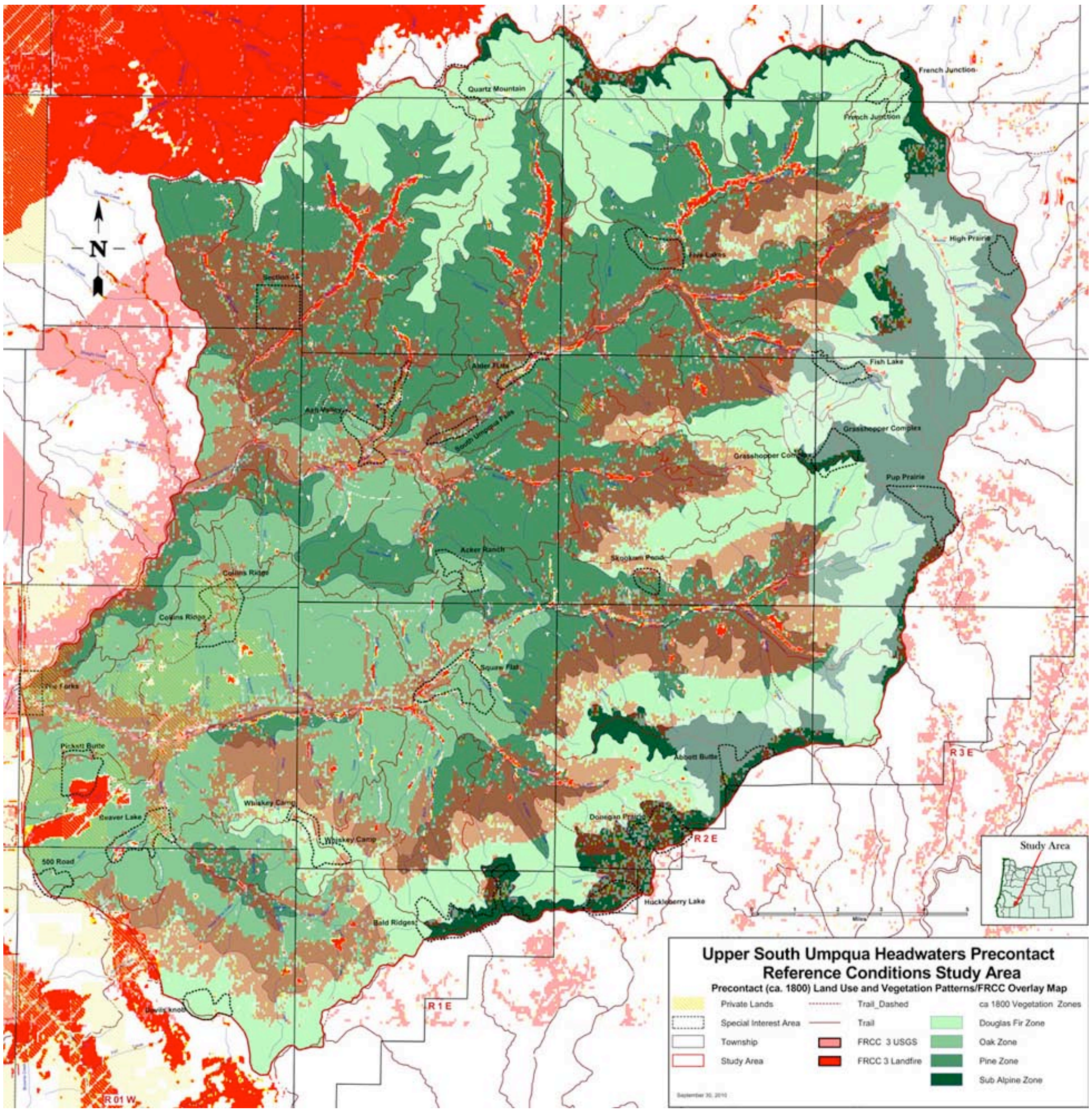
(Note: FRCC is the standard assessment tool used by federal agencies in implementing Goal #3 of the National Fire Plan, "Restoring Fire-adapted Ecosystems." The exact methodology or particular version of the FRCC classification system used to produce the hard copy map used for Map 8.01 is unknown at this time; but that information is largely irrelevant for these purposes – the important aspects are that 1) the map was produced and provided independent of this project, and 2) it represents two valid interpretations of FRCC 3 for the study area at some point during the past few years).

FRCC is defined as (National Interagency Fuels, Fire, & Vegetation Technology Transfer 2010: 98):

> A measure of departure from reference (pre- settlement or natural or historical) ecological conditions that typically result in alterations of native ecosystem components. These ecosystem components include attributes such as species composition, structural stage, stand age, canopy closure, and fuel loadings.

FRCC 3 is defined as (National Interagency Fuels, Fire, & Vegetation Technology Transfer 2010: 98):

> Greater than 66 percent departure: Fire regimes have been substantially altered. Risk of losing key ecosystem components is high. Fire frequencies may have departed by multiple return intervals. This may result in dramatic changes in fire size, fire intensity and severity, and landscape patterns. Vegetation attributes have been substantially altered.



Map 8.01 GIS-generated ca. 1800 vegetation pattern and 2010 USGS and Landfire FRCC 3 patterns.

Notice three distinct correlations: 1) the invasion of pine woodlands with Douglas-fir seeding moving downhill on the southern and eastern portions of the study area, creating a closed canopy and stress on existing older trees, resulting in predictable increase in risk of catastrophic-scale wildfire (see Figure 8.02); 2) the exact correlation with riparian areas currently choked with dead trees and shrub closed canopies, creating strong potentials for wildfire spread and reduced potential for streams to serve as wildfire buffers (see Figure 8.03); the strong correlation of FRCC 3 with subalpine vegetation, due to invasions of conifers into historical brushfields and grassy prairies and meadows (see Figure 8.04).

Figure 8.02 Example of FRCC 3: Aftermath of Boze Fire, July 12, 2010.

Map 8.01 and Figures 8.02, 8.03, and 8.04 demonstrate two important aspects of this study. First, the strong independently derived correlation between the research findings of this study and the FRCC 3 pattern confirm the quality and utility of this work and the methodology from which it is derived. Second, risks and conditions associated with FRCC 3 classification are confirmed by recent events and on-site documentation of current conditions. Note, also, the condition of relict grassy prairie relicts in Figure 8.04; despite the severity of the 2009 Rainbow Creek Fire depicted in this photograph, the grassland areas were expanded and rejuvenated due to this event.

Figure 8.03 Example of FRCC 3: Fish Lake Creek large woody debris, July 30, 2010.

Conclusions

1. Two hundred years ago, vegetation types in the South Umpqua headwaters consisted of prairie and meadow grasslands, oak savannas, park-like pine woodlands, brakes, berry patches, stands and patches of Douglas-fir forestlands, and high elevation grasslands, shrublands, and patches of mixed conifers.

2. Since 1825, the measured density (trees per acre) and basal area of representative South Umpqua headwater forests have increased more than five-fold. This measure represents only trees currently greater than 8-inches in diameter; in these same stands, tree biomass has accumulated from 10 to 20 times more than they had held 200 years earlier. (See Appendix B).

3. Relative proportions of tree species have also changed significantly over the past 200 years. In late precontact time, pines and oaks were the dominant tree species below 3,800 feet elevation. Today, Douglas-fir, grand fir, and incense-cedar are the most prevalent species; particularly in younger age classes. Pacific silver fir has invaded higher elevation subalpine shrublands since late precontact time, and Douglas-fir, hemlock, and cedar have also become more common in these locations.

4. There has been a significant decrease in daily and seasonal occupation and use of the study area by people from late precontact time to the present. Related decreases in daily and seasonal hunting and fishing, plant harvesting, systematic firewood gathering, and fire use have been contemporaneous.

5. Precontact human influences on the vegetation were significant. In particular, human-set fire played a primary role in the development and maintenance of landscape-scale patterns of forests, woodlands, savannas, grasslands, brakes, trail networks, and shrublands.

6. The elimination of anthropogenic fire and other traditional human influences over the last past 200 years is the key factor that has altered forest conditions during that time. Grazing, logging, tree planting, fire suppression, and road building have had comparable effects.

7. Large, infrequent, a-historical, wildfires have replaced frequent low severity fires in the study area during the past two centuries; in part due to a massive build-up of biomass (fuels), resulting in increased wildfire, insect, and disease risk and in changes to native wildlife habitats and populations. A primary result of this change has been a significant and corresponding increase in snags and downed woody debris. Another primary change has been the spread of large numbers of even-aged Douglas-fir and understory shrubs throughout the study area, creating large contiguous stands of ladder fuels and closed canopies across the landscape.

8. These findings will be useful in evaluating and mitigating catastrophic fire hazards and risks; informing the maintenance and preservation of historic cultural landscape features; advancing understanding of forest dynamics, historical human influences, and historical landscape geography; and informing restoration (active management to recover historical cultural landscapes) efforts.

Questions

This research was conducted using the method of multiple hypotheses, first described by Chamberlin in 1890 (Chamberlin 1965): "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." The following questions are specific to the primary purpose of this study, may justify additional research in order to be better considered, and are briefly addressed in accordance with the specific findings of this project.

1) What is the role of climate change in these altered vegetation patterns? There are many reasons why "climate change" cannot be the cause of changes in forest conditions for the alterations in forest development pathways in the South Umpqua headwaters over the last 200 years: 1) No significant climate change has taken place in the western Cascades since 1650 or before (Graumlich 1985; Zybach 2003; Carloni 2005), yet wholesale changes in forest conditions have occurred; 2) Precontact cultural landscapes with prairies, brakes, savannas, berry fields, and open, park-like forests occurred across climate zones throughout the Western Hemisphere, indicating that these vegetation types were not climate-dependant; 3) No new open, park-like woodlands or grassy prairies are arising in any climate, even where lightning fires are allowed to burn; 4) Anthropogenically-induced prairies, savannas, and open, park-like forests were persistent vegetation types for thousands of years despite historical perturbations in global climate; 5) Other explanations for the alteration in forest conditions (e.g., Indian burning practices) are more robust, well-documented, and free of the nagging anomalies noted above (see Appendix B).

These conclusions confirm other recent scientific findings on the topic. For example, for an area on the eastern slope of the Cascades in Washington, Haugo, et al. (2010) found:

> Fire suppression, grazing, and logging explain changes in species composition more clearly than climate variation does, although the relative influence of these factors varies with elevation. Furthermore, some of the observed changes in composition are opposite what we expect would be most suited to projected future climates. Natural resource managers need to recognize that the current state of an ecosystem reflects historical land uses, and that contemporary management actions can have long-term effects on ecosystem structure.

2) What is the role of fire suppression in these altered vegetation patterns? Modern fire suppression is a recent (ca. 1930) addition to forest influences in the region. Prior to then, fire suppression was not a significant factor in forest development. Profound changes in forest structure and composition had already taken place in the study area by 1930. Those changes resulted from the elimination, about 100 years earlier, of traditional land management activities including intentional and expert anthropogenic burning. Modern fire suppression is applied to a greatly altered forest, one with a-historical accumulations of biomass. Without modern fire suppression, today's landscape is prone to a-historical catastrophic-scale wildfires due to the quantity and continuity of fuels across the watershed (Zybach 2003; Carloni 2005).

3) What is the role of lightning fire in past and current forest structure? Lightning ignitions interact much differently with the modern, altered landscape. In the precontact era lightning played a relatively minor role because lightning fire spread and severity were constrained by discontinuous and limited fuels within the historical anthropogenic mosaic of the cultural landscape (Kay 2007). Modern lightning fires encounter a-historically abundant and continuous fuels, leading to a-historically large and severe fires.

4) What is the risk of wildfire under current conditions? The risk of large and severe fires appears much greater today than in any other time in history due to increased living and dead fuel accumulations, continuity of fuels across the landscape, extended canopy closures, and prevalence of ladder fuels.

5) Do increased risks associated with lightning-caused wildfires correspond to increased threats to ESA habitat and populations? The recent historical increase in local wildfire extent and severity has and will continue to destroy nesting, foraging, and roosting habitat for arboreal birds. Significant increased risks from uncontrollable wildfires are also borne by other forest, grassland, and shrubland plants and animals in the area.

Figure 8.04 Example of FRCC 3: Black Rock Lookout, July 13, 2010 (see Chapter IV; Bartrum ca. 1925).

Chapter IX. References

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Appendix A.
Congressional Testimony of Douglas County Commissioner Laurance, July 15, 2010.

On July 15, 2010, the House Subcommittee on National Parks, Forests and Public Lands held an Oversight Hearing in Washington DC on "Locally Grown: Creating Rural Jobs with America's Public Lands." Among the testimonies given was that of Joseph Laurance, County Commissioner, Douglas County, Oregon. Laurance preceded his written comments with a copy of the National Association of Counties Officials (NACo) resolution he had written and which had been successfully adopted by the NACo Public Lands Steering Committee earlier in the year:

A NACo Resolution to Promote Healthy Forest Ecosystems and Reduce the Release of Green House Gases through Active Management of the Nation's Forests.

Issue:
Each year catastrophic wildfires throughout the nation contribute to global warming, jeopardize the national treasury, threaten fish and wildlife habitat, degrade both water and air quality, and cause devastation to forest dependent communities through loss of life, property, jobs, and the nation's timber resource. Federal Forests should be actively managed to reduce the threat of wildfire and the release of greenhouse gases. Restoration and conservation of our National Forest will insure a sustainable economic and environmental legacy for future generations.

Proposed Policy:
NACo urges Congress to enact legislation to direct and enable federal forest management agencies to reduce Fire Regime Condition Class 3 (FRCC 3) to the standard of FRCC 1 in all federal forests by the year 2030, and to reduce FRCC 2 to the standard of FRCC 1 in all federal forests by the year 2050, through the means of active landscape scale management, fuels reduction, and immediate post-fire restoration.

Background:
Some 73 million acres or 38% of the nation's federal forests are at "a high risk of ecologically destructive wild land fire" according to a 2007 report of the Inspector General of the USDA. An average of 7 million acres of forest has burned each year for the past 10 years in the US, primarily on federal lands. An estimated 47.5 Million Metric Tons of greenhouse gasses were released last year in the US through forest fire. An Executive Order of Oct.5, 2009 directs federal agencies to "consider and account for... emissions of greenhouse gases resulting from Federal land management practices". With this resolution, NACo joins the White House in an effort to reduce greenhouse gasses caused by forest fires on federal lands.

Fiscal Urban/Rural Impact:
The cost to taxpayers to fight these fires exceeds $1 Billion each year. The value of the timber thus consumed costs taxpayers $10.5 Billion every year. If Congress enacts this legislation, then directs federal land management agencies to implement the resultant policy, thousands of communities throughout the nation would experience significant social and economic recovery with the creation and return of forest based employment as well as the many other benefits of multi-use forest management. Urban areas would benefit from reduced taxation which now serves to support neighboring distressed rural communities. The nation would benefit from reduced greenhouse gas emissions, increased carbon sequestration and storage, improved fish and wildlife habitat, enhanced air and water quality, greater quantities of biomass based energy and forest products derived from federal lands serving to increase the national treasury, and an ultimate reduction in the cost of federal land management, half of which is devoted to fire suppression each year.

Federal fiscal savings realized from this effort could contribute to offsets required for "Secure Rural

Schools" funding, so vital to the educational and service needs of over 700 counties and 4000 school districts nationwide.

Sponsored by: Commissioner Joseph Laurance, Douglas County, Oregon

At a meeting of Oregon county commissioners last summer, I complained to my colleagues that while endless debate continued in congress about how federal forests should be managed, fires were ravaging federal timberlands in my county and throughout the western United States. The worldwide financial crisis that was draining the national treasury made re-authorization of "Secure Rural Schools" funding seem doubtful, threatening many of Oregon's 36 counties with social and economic ruin. Bad news just kept coming with the word that unemployment in Douglas County had reached 16.4% and if unreported joblessness was considered, was probably greater than the 19% experienced here during the height of the "Great Depression". Talks were ongoing in Copenhagen about greenhouse gas emissions while the three fires in my county burned toward an eventual total of 20,000 acres, equal to the greenhouse gasses emitted by one million cars in a year's time. My fellow commissioners suggested that I craft a solution to the problems you of this body are all too familiar with. The resultant resolution has been carefully considered by commissioners from across the western United States who helped in its preparation. It has been unanimously adopted by the Association of Oregon Counties, Western Interstate Region of Counties, and the National Association of Counties (NACo) Public Lands Committee and is expected to be adopted by NACo at its annual national conference next week.

Twenty years and twenty days ago the Northern Spotted Owl was listed as threatened under the federal "Endangered Species Act". It was then thought that loss of old growth habitat through logging was the culprit causing a declining population. In response, federal timber harvests were vastly curtailed. The Umpqua National Forest in my county saw an annual harvest of 397 million board feet in 1988 reduced to 4 million board feet in 2002. In the years since a policy of "benevolent neglect" of federal lands has seen Spotted Owl numbers continue to decline through habitat destruction caused by increasingly numerous and intense forest fires and through predation by the Barred Owl which favors this new "unmanaged" forest habitat. Federal policy, which had been multiple use of the forest with an emphasis on industrial harvest, sought a new strategy which has yet to be formulated in all these intervening years.

The resolution presented you provides that needed new strategy, not only for Oregon but for all of our nation's federal forests from Appalachia to Alaska. Federal forest managers would now have a clearly defined desired forest condition that must be obtained within a specified time. If this becomes the "Intent of Congress", the Forest Service and BLM would join with private industry to restore forest health and rural economies without drawing on the national treasury.

The various Fire Regime Condition Classes described within the resolution indicate the extent of departure from the natural, historic conditions prior to fire exclusion or suppression. Typically, this departure occurred as native peoples were progressively displaced by European Americans during the westward expansion. Fire Regime Condition Class (FRCC) 1 is similar to the forest which European explorers first found here. That forest had been modified by fire for more than 6 thousand years to provide the native inhabitants with what were then life's necessities. These included abundant wild game from the most productive and diverse wildlife habitat ever known on this continent. Similarly, the regular burning of competing vegetation permitted propagation of nut bearing trees and other food producing plants. Additionally, the historic "Healthy Forest" promoted pristine rivers, streams, and lakes that provided an abundant harvest of fish and waterfowl. Within FRCC 1 the risk of losing key ecosystem components to fire is low, while vegetation species composition, structure, and pattern are intact and functioning within the natural historic range.

FRCC 2 is a moderate departure from natural, historic conditions described above, with a moderate risk of losing key ecosystem components. Fire frequency, intensity, and size are increased with moderate increases in density, encroachment of shade tolerant tree species, or moderate loss of shade intolerant tree species.

FRCC 3 is the highest possible risk of catastrophic fire with dramatic changes to fire size, intensity, severity, and landscape patterns. High increases in density are typically associated with high mortality as a result of disease or insect infestation. These areas typically need high levels of restoration through hand or mechanical treatments. For purposes of this discussion, the full range of treatments available for active landscape scale management would be employed including fuels reduction, thinning of selected stands, and harvest where needed. These treatments must be successfully implemented before prescriptive fire can be used to maintain optimum forest conditions.

Of a total national forest system of 191 million acres, information provided by the Forest Service and derived from the ‘LANDFIRE Project” list an FRCC 3 total of 40,677,000 acres nationwide. FRCC 2 is said to be 72,553,000 acres; FRCC 1 is listed at 83,230,000 acres. Other information regarding Fire Classes is drawn from a 2007 report of the Inspector General of the USDA which lists FRCC 3 at 73,000,000 acres while other sources suggest FRCC 2 at 55,000,000 acres and FRCC 1 at 63,000,000 acres.

The total acreage of fuels reduction on the national forest by means of mechanical treatment to for 2008 (the last available figures) totaled 1.2 million acres. Treatment required based on the figures above for the defined time period would amount to between 2 million and 3.65 million acres for reduction of FRCC 3 to FRCC 1 during the first 20 year period and between 2.75 and 3.63 million acres for a reduction from FRCC 2 to FRCC1 during the second 20 years.

More specific information regarding the work required and the costs associated will be forthcoming this August from a Title III study of 250,000 acres of Forest Service lands in my county which will identify, with scientific precision, the characteristics of that
“anthropogenic” forest in the year 1800, immediately prior to the European American presence. These characteristics will closely approximate the natural, historic conditions described in FRCC 1 in a forest where all three classes now exist.

The study referred to is titled Upper Pre-Contact Reference Condition Study and is revealing a mosaic forest, heavily populated by people, who actively managed and maintained their travel ways, their camp sites, and their hunting and gathering grounds. These areas tended to be more open with fewer and larger trees together with a wide diversity of species. The forest we are finding on those sites today are more dense with the majority of the trees less than 150 years old and far fewer of the oaks and pines, although we find a profusion of relics of their existence.

The study area would seem to be an excellent candidate as a pilot project to provide specific information related to healthy forest restoration as envisioned by the resolution described earlier.

One example of a locally grown effort at forest restoration while creating rural jobs is Communities for Healthy Forests, Inc. CHF is a non profit organized in 2004 after devastating fires in Oregon galvanized Douglas County, Oregon community leaders into action. While attorneys, judges and elected officials deliberated upon what course of action to take on the millions of acres burned forest, the health of our rural communities and the health of the forests surrounding them were ignored. The decision to debate environmental policy in the face of an emergency becomes a decision to limit any restorative action. Economic opportunities of removing dead material to fund replanting and other restoration activities are lost as are the multitude of jobs these activities could support. The fire-killed material left on site becomes fuel for the next fire, and carbon to be emitted into the atmosphere, adding to the greenhouse gas emissions.

In contrast, actively restoring these insect and fire damaged forests can put local people to work. Putting people to work to restore overgrown forests can reduce the fire hazard; sustain healthy growing forest conditions resistant to catastrophic fire and insect attack. As scientists like Dr. Thomas Bonnicksen and many others tell us, these were the conditions our forests contained for thousands of years due to the influence of Native Americans, conditions and people which were sustained for thousands of years.

This active management is widely supported as shown by polls conducted by Communities for Healthy Forests as well as The Oregon Forest Resources Institute. The vast majority of Oregonians agree that we must act if we are to sustain our beautiful forests, our rural economy and the communities which are capable of sustaining them.

Similar projects have been undertaken by The Douglas Forest Protective Association who has provided job skills training for 2000 youth since 1971. Among their number is our current County Sheriff. Tasks being completed by area youth include fire training and fuels reduction projects. These youth will also be in the fire line in a few days time.

The Oregon Youth Conservation Corp has provided similar opportunities for an average of 400 youth per year for the past decade. Our local Phoenix School has done the same for 200 area youth this most recent school year with 250 expected to participate next year.

The resolution anticipates that significant volumes of biomass will be generated through forest restoration efforts. Three weeks ago I witnessed a demonstration of Biomass utilization in the midst of 10,000 acres of an insect infested pine forest. BioChar Products of Halfway, Oregon converted a bone dry ton of biomass into 120 gallons of Bio-oil while producing 400 lbs. of Bio-char, a rich growth medium. By means of this technology, my county could produce 120 million gallons of Bio-oil and 400 million pounds of Bio-char every year for at least 20 years and probably in perpetuity.

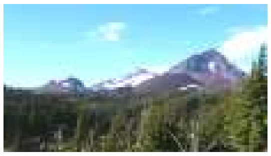
I wish to thank in particular Committee members Stephanie Herseth Sandlin and Peter DeFazio for their efforts to permit biomass and fuels reduction efforts on federal forest lands.

Forest Restoration is a complex and controversial topic that should be further discussed. I would be delighted to participate in other oversight hearings regarding that subject.

Much of the efforts described here have had their genesis in Title II and III projects funded through the Secure Rural Schools Act, which also provides vitally needed support for 4000 school districts and 700 counties nationwide.

Thank you for permitting me the honor of appearing before the House Sub-committee for National Parks, Forests and Public Lands.

Joseph Laurance Douglas County Commissioner Douglas County, Oregon



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November 22, 2010

W.I.S.E. White Paper No. 2010-5

Stand Reconstruction and 200 Years of Forest Development on Selected Sites in the Upper South Umpqua Watershed

By Mike Dubrasich

Prepared for the ***South Umpqua Headwaters Precontact Reference Conditions Study***, November 2010.

Abstract

Stand development of ten structurally complex forest stands in the Upper South Umpqua Watershed was studied by backdating (reconstructing) stand conditions circa 1825. Mixed conifer and conifer/hardwood stands across a selected range of "Areas of Special Interest" sites were sampled for tree ages, tree characteristics, and fire history. Logistic regression analysis was used to create age/diameter models and the stands were backdated using increment core data and tree positions to create

stand statistics for 185 years prior to measurement. The changes in number of trees and basal area over the last 185 years were calculated by species for each stand. Density of trees greater than 8 inches DBH increased from an average of 20 trees per acre to 90 (from 10 to 35 trees per acre to 60 to 115 trees per acre). Basal area increased 5-fold on average, from 65 square feet per acre to 225 (from 25 to 150 sqft/ac to 150 to 300 sqft/ac). In 1825 the ten stands were open and park-like with widely spaced trees. By 2010 the ten stands had accumulated from 10 to 20 times the tree biomass they had held 185 years earlier. In 1825 pines and oaks were dominant in stands below 3,800 feet in elevation. Today those same stands are dominated by Douglas-fir, grand fir, and incense-cedar, especially in younger age classes. In higher elevation stands the most abundant species has changed from Shasta red fir to Pacific silver fir.

Several lines of evidence suggest that the prairies, savannas, and open forests have been persistent vegetation types in the Upper South Umpqua Watershed for the last few thousand years, at least. Precontact forest development pathways were mediated by frequent, purposeful, anthropogenic fires deliberately set by skilled practitioners, informed by long cultural experience and traditional ecological knowledge in order to achieve specific land management objectives. At a landscape scale the result was maintenance of an (ancient) anthropogenic mosaic of agro-ecological patches. In the absence, over the last 150 years, of purposeful anthropogenic fires, the anthropogenic mosaic has been invaded and obscured by (principally) Douglas-fir. As a result, the Upper South Umpqua Watershed is now at risk from a-historical, catastrophic stand-replacing fires.

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Introduction

The purpose of this study is to estimate and describe the precontact (~1825) forest conditions and forest dynamics within the Upper South Umpqua Watershed. This study is part of a larger research effort entitled the ***South Umpqua Headwaters Precontact Reference Conditions Study***.

The study area is in the Oregon Cascade Mountains and extends from the Cascade Crest at ~5,500 feet west to the confluence of Jackson Creek with the South Umpqua River at ~1,200 feet. The study area is 231,931 acres or 362.4 square miles in size and is in the Western Cascades bioregion.

The overall goal of the project is to build a body of evidence and analysis that will inform Community Wildfire Protection Plans. That includes increased understanding of historical forest conditions (species composition, structure, density, and age) and the forest dynamics and influences including fire history (frequencies, seasonality, intensity, fuels, spread, and ignition sources and location).

Many southwest Oregon forests are composed of complex, multi-aged mixtures of conifers and hardwoods (Morris 1934, Dickman 1978, Bailey and Kertis 2002, Sensenig 2003, Lake 2005, Carloni 2005, Skinner *et al.* 2006, Tappeiner *et al.* 2007, Zybach 2007, Dubrasich and Brenner 2008, Williams 2010, Dubrasich 2010, and others). Such stands are susceptible to catastrophic fires that endanger communities as well as degrade and destroy natural resources.

In the past, fire was a major factor influencing the structure and composition of these forests. Precontact fires in southwest Oregon forests may have sometimes been stand-replacing, but most fires prior to the 20th century did not eliminate all live trees. Prior to the 19th Century, Native American indigenous residents set fires every 1 to 3 years in Oregon interior valleys (Johannessen *et al.* 1971, Robbins and Wolf 1993, Bonnicksen 2002, Stewart 2002). These frequent fires helped to maintain prairies and savannas in the lowlands, and gave rise to upslope woodlands and forests that were relatively resistant to stand replacement disturbances (Douglas 1914, Morris 1934, Habeck 1961, Dickman 1978, Bonnicksen 2000, Bailey and Kertis 2002, Zybach 2003, Carloni 2005, Lake 2005, Dubrasich and Brenner 2008, Dubrasich 2010 and others).

Comparing past conditions with modern and probable future conditions, and increased understanding of the historical forest development pathways, will help to inform modern management in the pursuit of goals such as forest restoration, reducing catastrophic fire risk, increasing landscape resiliency to fire, insect, and other broad-scale pathogens, protecting old-growth and other heritage resources, and sustaining myriad other natural resource and community values.

The method employed by this study is *back-dated stand reconstruction*, growing the forest backwards in time (Habeck 1961, Johannessen et al. 1971, Arno and Sneck 1977, Morrow 1985, Harcombe 1986, Pitcher 1987, Keter 1995, Keter and Busam 1997, Stewart 1986, and others). This method, a form of retrospective monitoring (assessing historical time series data), begins with development of current stand tables through field inventory. Then stand-based growth models (derived from tree ring evidence) are used to deduce the stand characteristics at some point in the past. Other evidence, either collected and recorded in the field or from historical documentation, is used to refine and validate the estimated historical conditions.

Methods

We selected ten structurally complex multicohort stands (Table 1). All ten stands were deemed "Areas of Special Interest" because of known historical use, and were investigated as part of the larger study of precontact conditions in the Upper South Umpqua Watershed (***South Umpqua Headwaters Precontact Reference Conditions Study***). 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.

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 (*I,ibocedrus 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.) (Hitchcock and Cronquist 1973).

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. We measured snags, duff concentrations, and fallen trees, as well as live trees. Increment cores were taken to determine tree ages and diameter growth rates. Associated vegetation was observed and recorded.

We measured 1,157 trees (live and dead) 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, using the methods of Arno and Sneck, 1977. Fire scars on cut stumps within stands and on adjacent logged stands were also used to estimate fire dates.

TABLE 1. Current conditions of the ten "Areas of Special Interest" stands used to examine stand development histories

Stand Name	Elevation (ft.)	Principal Species[1]	Trees/acre[2]	Basal area (sqft/ac)[3]	Ages (range)[4]	Sampled tree count
South Umpqua Falls	1,680	DF, SP, IC, GF, WRC, BLM	99.2	242.2	46 - 686	109
Five Lakes	2,520	DF, SP, PP, IC, GF	106.7	223.6	43 - 568	123
Pickett Butte	3,000	DF, PP, OWO, IC, PM, GF	113.7	152.0	42 - 681	152
Squaw Flat	2,240	DF, SP, PP, IC, GF, OWO	92.7	197.3	45 - 606	217
Acker Ranch	3,200	DF, IC, SP, GF, PP	95.2	231.4	45 - 587	81
Skookum Pond	3,500	DF, SP, GF, IC, MH, PP	89.6	196.0	48 - 476	49
Whiskey Camp	3,880	DF, SP, IC, GF, PP, MH	88.7	228.6	48 - 586	80
Huckleberry Lake	5,200	SRF, PSF, MH, DF, IC	76.9	218.0	50 - 590	117
Devils Knob	4,400	DF, GF, IC, BLM	58.8	305.7	50 - 993	107
French Junction	4,800	DF, SRF, PSF, MH, IC	65.2	271.1	50 - 942	122

Notes:

1/ DF = Douglas-fir, SP = sugar pine, PP = ponderosa pine, GF = grand fir, IC = incense-cedar, WRC = western red cedar, SRF = Shasta red fir, MH = mountain hemlock, PSF = Pacific silver fir, PM = Pacific madrone, OWO = Oregon white oak, BLM = big-leaf maple

2/ and 3/ Totals for all species, trees >8 in. DBH including snags and fallen trees

4/ estimated, see text

Current diameter and age distributions were calculated and graphed (see Results).

A previously collected sample of 247 trees measured at tree base and breast height was used to develop a linear model to predict unknown breast height diameters from basal diameters. The model derived was:

$$DBH = 2.1720 (Dbase) - 4.3936 \ln (Dbase) - 0.2418 (Dbase) * \ln (Dbase) + \varepsilon \qquad (1)$$

where DBH = diameter at breast height, inches; Dbase = diameter at six inches above ground on the uphill side of the tree, inches; and ln indicates natural logarithm. Species and stand differences were not found to be significant predictors of DBH in this data set. Adjusted R^2 was 0.9695.

Trees with known ages were combined with a prior data set (468 trees) from SW Oregon (Dubrasich and Tappeiner 1995). The data were then used to develop three diameter/age models (Zumrawi and Hann 1993). The final form of the models was:

$$Age = \beta_1+\beta_2*(DBH\hat{}\beta3)) \qquad (2)$$

where DBH = diameter at breast height, inches and Age = age in years since germination. The three models, with different coefficients, were developed for Douglas-fir, Oregon white oak, and all other tree species combined.

TABLE 2. Age/diameter model statistics

Species	β_1	β_2	β_3	R^2	95% Conf. factor[1]
Douglas-fir	30	0.26	1.85	0.69	± 1.65
Oregon white oak	50	0.53	1.78	0.54	± 1.89
Other species	30	0.26	1.79	0.72	± 1.61

Note 1: Confidence intervals in years are expressed as a factor of diameter in inches. A tree with a DBH of 50 inches and a factor of 2 would have an age confidence interval of ± 100 years.

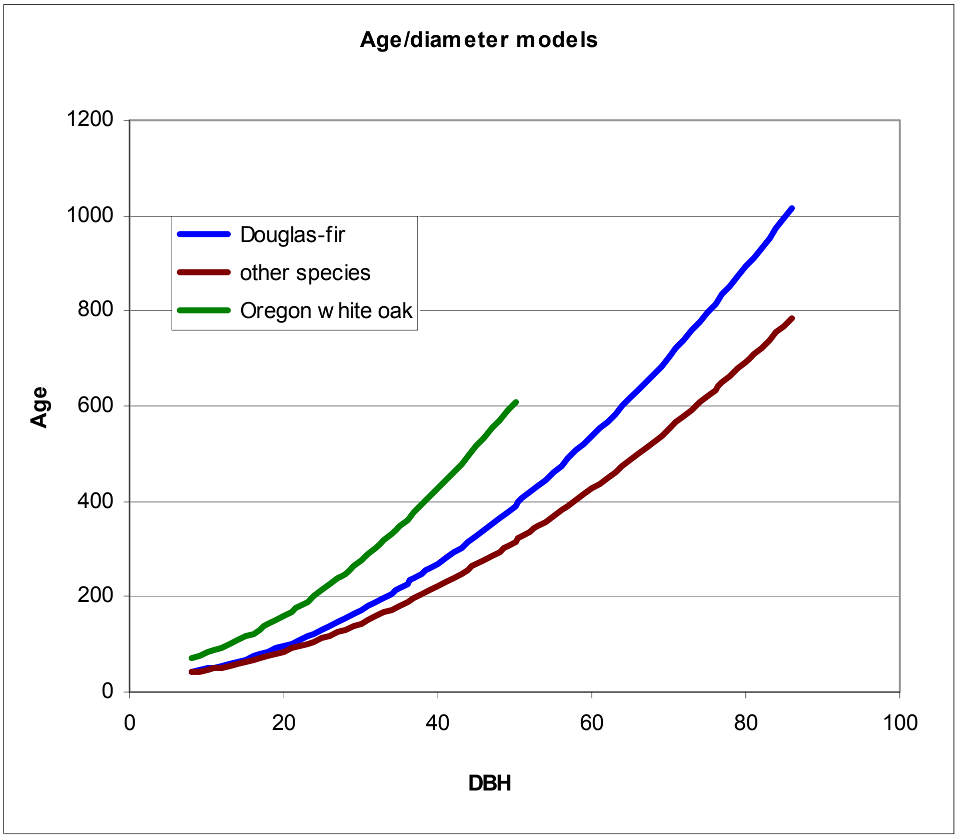

FIGURE 1. Age/diameter models used in the analysis.

Using these models, stand tables (trees per acre by diameter class) were estimated and graphed for the ten stands as they existed in 1825 (see Results). Additional trees were added utilizing a factor of 1.5 to account for missing mortality evidence. We counted and measured snags, fallen trees, and duff concentrations and other indications of former trees, but some trees that died more than 100 years ago may not have any sign left. To correct for missing evidence, each calculated number of trees per acre by diameter class in 1825 in each stand was multiplied by 1.5 to yield the final estimates.

This analysis is limited to trees 8.0 inches DBH and larger. Seedling and sapling densities were not measured because there is no way to determine those of 1825, and hence no comparison with modern seedling and sapling counts is possible.

General Results

Current diameter and age distributions and estimated diameter distributions in 1825 for each of the ten stands are displayed graphically in Figures 2 through 31.

Table 3 lists the density (trees per acre) and basal area changes that have occurred over the last 185 years.

The changes in stand structure have been dramatic. Density of trees greater than 8 inches DBH increased from an average of 20 trees per acre to 90 (from 10 to 35 trees per acre to 60 to 115 trees per acre). Basal area increased 5-fold on average, from 65 square feet per acre to 225 (from 25 to 150 sqft/ac to 150 to 300 sqft/ac).

In 1825 the ten stands were open and park-like with widely spaced trees. By 2010 the ten stands had accumulated from 10 to 20 times the tree biomass they had held 185 years earlier.

The models utilized are not exact. Diameter/age ratios vary considerably: a smaller tree may be old and a larger tree may be young. However, this author has evaluated (measured the ages of) numerous trees in numerous stands, and in my expert judgment (based on observed morphological tree characteristics such as bark thickness, branching, and top conditions) most (more than four-fifths) of the trees present were under 185 years old, confirming the calculated values.

The method utilized included adding half again as many trees in 1825 as were calculated. This generous increase in original densities was in addition to the snags, fallen trees, and duff piles recorded. There may have been smaller trees present in 1825 that died and have disappeared completely. However, even with this factor applied, it is evident that the stands have increased in density enormously over the last 185 years.

In most of the stands the species relative proportions also changed significantly. In 1825 pines and oaks were dominant in stands below 3,800 feet in elevation. Today those same stands are dominated by Douglas-fir, grand fir, and incense-cedar, especially in younger age classes. In higher elevation stands the most abundant species has changed from Shasta red fir to Pacific silver fir.

TABLE 3. Density and basal area changes over 185 years

Stand Name	Trees/acre in 1825	Trees/acre in 2010	**Percent change**	Basal area in 1825	Basal area in 2010	**Percent change**
S. Umpqua Falls	16.5	99.2	**599**	50.9	242.2	**476**
Five Lakes	17.4	106.7	**613**	53.7	223.6	**417**
Pickett Butte	8.8	113.7	**1286**	27.2	152.0	**560**
Squaw Flat	16.6	92.7	**560**	38.4	197.3	**514**
Acker Ranch	24.5	95.2	**388**	53.2	231.4	**435**
Skookum Pond	18.8	89.6	**477**	56.5	196.0	**347**
Whiskey Camp	26.6	88.7	**333**	94.8	228.6	**241**
Huckleberry Lake	14.5	76.9	**530**	49.3	218.0	**442**
Devils Knob	33.6	58.8	**175**	150.5	305.7	**203**
French Junction	24.3	65.2	**269**	87.7	271.1	**309**

Notes: trees over 8 inches DBH only

Stand By Stand Results

South Umpqua Falls

PHOTO 1. A beargrass (*Xerophyllum tenax*) meadow invaded by younger cohort (<185 years old) Douglas-firs at South Umpqua Falls.

The Area of Special Interest at **South Umpqua Falls** is a series of benches and slopes adjacent to and north of the South Umpqua River at approximately 1,680 feet in elevation. Today the stand is dominated by Douglas-fir with some grand fir and incense-cedar. Occasional sugar pines are found on the lower benches and ponderosa pines occur on the upper slopes. A western red cedar grove is found on a wet bench near the eastern edge of the tract. Sword fern (*Polystichum munitum*), vine maple (*Acer circinatum*), and Oregon grape (*Berberis nervosa*) dominate the understory.

Current density is 99.2 trees per acre, and basal area is 242.2 square feet per acre. Seventy percent of those quantities comes from Douglas-fir. Ninety-two percent of the existing trees are less than 185 years old (see Figure 4 and Table 5).

In 1825 the stand was much different. There were only 16.5 trees per acre, over a third of those sugar pines. Basal area was only 50.9 square feet per acre (see Figure 3 and Table 4). The understory had significantly more beargrass (*Xerophyllum tenax*), California hazelnut (*Corylus cornuta*), serviceberry (*Amelanchier alnifolia*), camas

(*Camassia quamash*), and fawn lilies (*Erythronium oregonum*), sparse remnant colonies of which are still present.

The former tree density and remnant species indicate that in 1825 the stand was open and park-like stand with shade intolerant plants – typical of frequent fire savanna/woodlands.

During the past 185 years Douglas-fir, grand fir, and incense-cedar have invaded, along with shade tolerant plants in the understory. The exception to this may be the western red cedar grove which appears to have been established for far longer.

Western red cedar, beargrass, serviceberry, hazel, camas, and other Liliaceae are well-known to be important plants tended and utilized by Native American cultures for thousands of years (Anderson 2005). Abundant deboutage (obsidian flakes), other anthropological evidence [1], and oral histories of Native American elders confirm that human occupancy and use of South Umpqua Falls is indeed ancient. The frequent fires that created the open woodlands there were undoubtedly anthropogenic (see Discussion).

Five Lakes

The Area of Special Interest at **Five Lakes** is an upland basin at approximately 2,520 feet in elevation. The largest of the five lakes is Carman Lake; the others are (today) boggy meadows. Today the stand is dominated by Douglas-fir with extensive grand fir and incense-cedar. Occasional sugar pines and ponderosa pines occur on the gently sloped terrain. A few western red cedars are found adjacent to the boggy, eutrophied lakes. Rhododendrons (*Rhododendron macrophyllum*) dominate the understory, but beargrass and bracken fern (*Pteridium aquilinum*) are also prevalent.

Current density is 106.7 trees per acre, and basal area is 223.6 square feet per acre. Forty-one percent of the density and 64 percent of the basal area is Douglas-fir. Pines account for only two trees per acre. Ninety-two percent of the existing trees are less than 185 years old (see Figure 6 and Table 7).

In 1825 the stand was open and park-like, with only 17.4 trees per acre. Nearly third of those were pines, chiefly sugar pine. Basal area was only 53.7 square feet per acre (see Figure 5 and Table 6). The understory had significantly more beargrass and

[1] Respect for proprieties of the Cow Creek Band of the Umpqua Tribe precludes explication of much of the anthropological evidence present at South Umpqua Falls, which is extensive.

possibly huckleberries (*Vaccinium membranaceum*), remnant colonies of which are still present.

PHOTO 2. An old (300+ years) ponderosa pine with younger cohort (<185 years old) Douglas-firs at Five Lakes. (Note author's hat used for scale).

The former tree density and remnant species indicate that in 1825 the stand was open and park-like stand with shade intolerant plants typical of frequent fire savanna/woodlands. During the past 185 years, in the absence of anthropogenic fire, Douglas-fir, grand fir, and incense-cedar have invaded, along with shade tolerant plants in the understory. The exception to this may be the western red cedars, one of which was measured at over 5 feet DBH.

Four older Douglas-firs at Five Lakes were increment cored with rings counted from 360 to 436 years breast height age. Those trees indicate that many Douglas-firs were present 185 years ago. Sugar pines and ponderosa pines of even older vintages (up to 525 years breast height age) indicate that pines were an important component of the stand in 1825. However, there are few pines younger than 185 years, and few remnant older pines as well. The increase in density has favored more shade tolerant tree species and has caused significant mortality in the older pine cohort.

Only a few of the older trees had fire scars (see Discussion) and none of the younger cohort trees (<185 years old). A cat-faced tree (possibly a culturally modified "hearth tree) had fires scars dated to 135, 160, and 220 years before present (indicating fires in 1875, 1850, and 1790). Possibly more (older) fire dates were indicated on that tree. One hypothesis is that anthropogenic fires were lit in the stand as recently as 1895. That hypothesis is supported by oral histories (Shaffer 1990).

Pickett Butte

PHOTO 3. An old (300+ years) ponderosa pine CMT (culturally modified tree) with younger cohort (<185 years old) Douglas-firs at Pickett Butte (note author's hat used for scale).

The Area of Special Interest at **Pickett Butte** consists of side slopes and terraces at approximately 3,000 feet in elevation in the western-most portion of the Upper South Umpqua Watershed. Today the stand is dominated by Douglas-fir with ponderosa pine, grand fir, incense-cedar, and Pacific madrone (*Arbutus menziesii*). Remnant Oregon white oaks are scattered throughout. Poison oak (*Rhus diversiloba*) and grasses dominate the understory, but camas, and brodiaea (*Brodiaea spp.*) are also present.

Current density is 113.7 trees per acre, and basal area is 150.0 square feet per acre. Sixty-two percent of the density and 63 percent of the basal area is Douglas-fir. Ponderosa pines account for 22.3 trees per acre. Ninety-six percent of the existing trees are less than 185 years old (see Figure 8 and Table 9).

PHOTO 4. Remnant oak/pine savanna at Pickett Butte.

In 1825 the stand was an oak/pine savanna with only 8.8 trees per acre, roughly one-third Oregon white oak, one-third pines (ponderosa and sugar), and one-third Douglas-firs. Basal area was only 27.2 square feet per acre (see Figure 7 and Table 8). The understory was probably grasses and prairie plants, typical of anthropogenically-induced frequent-fire oak savannas in Oregon (Johannessen 1971).

Squaw Flat

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 10 and Table 11).

PHOTO 5. Remnant oak/pine savanna at Squaw Flat (note author's hat used for scale).

PHOTO 6. Conifer biomass accumulation at Squaw Flat.

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 9 and Table 10). 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.

Acker Ranch

PHOTO 7. Five-foot diameter sugar pine at Acker Ranch.

The Area of Special Interest at **Acker Ranch** is a wide ridge top between the South Umpqua River and Jackson Creek sub-basins at approximately 3,200 feet in elevation. Today Douglas-fir predominates with an expanding component of grand fir in the youngest age classes. Remnant sugar and ponderosa pines are scattered throughout. Rhododendron, vine maple, salal, and Oregon grape dominate the understory, and serviceberry, chinquapin (*Castanopsis chrysophylla*), and California hazelnut are minor components. Oregon white oak and Oregon ash (*Fraxinus latifolia*) were in the vicinity although not encountered in the particular stand examined.

Current density is 95.2 trees per acre, and basal area is 231.4 square feet per acre. Forty-nine percent of the density and 61 percent of the basal area is Douglas-fir. Pines (ponderosa and sugar) account for only 2.7 trees per acre. Eighty-eight percent of the existing trees are less than 185 years old (see Figure 12 and Table 13).

In 1825 the stand was open pine parkland. There were only 24.5 trees per acre with as many pines (ponderosa and sugar) as Douglas-firs. Basal area was 53.2 square feet per acre (see Figure 11 and Table 12). The woodland included fruit and nut trees (serviceberry, chinquapin, hazelnut, oak, pines).

The ridge line between the sub-basins was an important travel corridor for the human residents. Fire scars were dated to 1860, 1845, 1835, and 1820 on cut stumps in an adjacent clearcut. Frequent, seasonal, human set fires induced the open pine parkland. In the absence of those traditional practices, species composition has shifted to densely stocked Douglas-fir, grand fir, and incense-cedar.

Many researchers (Lewis 1993, Keter 1995, Bonnicksen 2000, Stewart 2002, Zybach 2003, Anderson 2005, and others) have suggested that the open parklands maintained by anthropogenic tending were in place for thousands of years. The current thicket of invasive trees is very recent imposition on the watershed and landscape (see Discussion).

Skookum Pond

The Area of Special Interest at **Skookum Pond** is a small ridge top basin between the South Umpqua River and Jackson Creek sub-basins at approximately 3,500 feet in elevation. Today the stand is made up principally by Douglas-fir with an expanding component of grand fir and mountain hemlock in the youngest age classes. A few remnant sugar pines and older cohort incense-cedars are scattered throughout. Rhododendron, sword fern, vine maple, salal, and Oregon grape dominate the understory, and serviceberry, chinquapin (*Castanopsis chrysophylla*), and green-leaf manzanita (*Arctostaphylos patula*) are also present. Red alder (*Alnus rubra*) lines the pond where *wakas* or Indian pond lily (*Nuphar lutea ssp. polysepalum*) occurs.

Current density is 89.6 trees per acre, and basal area is 196.0 square feet per acre. Eighty percent of the density and 78 percent of the basal area is Douglas-fir. Pines (ponderosa and sugar) account for only 1.1 trees per acre. Ninety-three percent of the existing trees are less than 185 years old (see Figure 14 and Table 15).

PHOTO 8. Alder, sedges, and water lilies at Skookum Pond.

In 1825 the stand was much more open. There were only 18.8 trees per acre with about one-third pines (ponderosa and sugar), one-third incense-cedars, and one-third Douglas-firs. Basal area was 56.5 square feet per acre (see Figure 13 and Table 14). The 1825 woodland included serviceberry, chinquapin, and beargrass.

The pond may have been an important campsite. Many plants known to be used for food and fiber are still extant at Skookum Pond.

Whiskey Camp

The Area of Special Interest at **Whiskey Camp** is a wide ridge top between Jackson Creek and Beaver Creek at approximately 3,880 feet in elevation. The area is also known as Green Prairie. Today the stand is chiefly Douglas-fir with an expanding component of grand fir and incense-cedar in the youngest age classes. A few sugar and ponderosa pines (about one per five acres) occur. Ocean-spray, sword fern, vine maple, salal, and Oregon grape dominate the understory, and serviceberry and wild currant (*Ribes sp.*) are also present. Fescues (*Festuca spp.*), lupines (*Lupinus spp.*), and wild strawberries (*Fragaria spp.*) are found in open areas known as "balds".

PHOTO 9. Native bunch grasses in a former "bald" at Whiskey Camp.

Current density is 88.7 trees per acre, and basal area is 228.6 square feet per acre. Thirty-three percent of the density and 66 percent of the basal area is Douglas-fir. Grand fir and incense-cedar account for most of the remaining density and basal area. Eighty-seven percent of the existing trees are less than 185 years old (see Figure 16 and Table 17). The 11.3 trees per acre exceeding 185 years old are Douglas-firs.

In 1825 there were only 26.6 trees per acre. Two-thirds were Douglas-firs with a component of grand fir and ponderosa pines. Basal area was 94.8 square feet per acre (see Figure 15 and Table 16). The woodland included serviceberry, chinquapin, and beargrass.

The pockets of trees that were measured constituted a minority of the larger landscape at Whiskey Camp. The majority of the area had very few trees in 1825 but instead was grassy prairie. The soil and climate are conducive to tree growth, as is evidenced by the dense conifer stands that blanket most of the area today. In the precontact era, however, fires must have been so frequent as to preclude tree establishment.

Huckleberry Lake

PHOTO 10. Old (>300 years old) Shasta red fir with invasive Pacific silver fir at Huckleberry Lake (note author's hat used for scale)

The Area of Special Interest at **Huckleberry Lake** is a wide ridge top between Jackson Creek and the North Fork Rogue River at approximately 5,200 feet in elevation. The area is also known as the Rogue-Umpqua Divide, a high elevation ridgeline that extends 20 miles or more to the southwest from the Cascade Crest. Huckleberry Lake is one of the westernmost high elevation sites of the Oregon Cascades.

Today the stand is dominated by Shasta red fir with an expanding component of Pacific silver fir and mountain hemlock in the youngest age classes. Thin-leaved huckleberry (*Vaccinium membranaceum*) predominates in the understory, with numerous secondary species including vanillaleaf (*Achlys triphylla*), mountain-ash (*Sorbus sitchensis*), chinquapin, rhododendron, and Douglas-maple (*Acer glabrum var. douglasii*). The margins of Huckleberry Lake contain aspen (*Populus tremuloides*) and red-osier dogwood (*Cornus stolonifera*).

Current density is 76.9 trees per acre, and basal area is 218.0 square feet per acre. Fifty-four percent of the density and 76 percent of the basal area is Shasta red fir. Pacific silver fir and mountain hemlock account for most of the remaining density and basal area although incense-cedar, Douglas-fir, and subalpine fir (*Abies lasiocarpa* (Hook) Nutt.) and Pacific yew (*Taxus bevifolia* Nutt.) are present in small numbers.

Ninety-one percent of the existing trees are less than 185 years old (see Figure 18 and Table 19). The 6.6 trees per acre exceeding 185 years old are Shasta red firs.

In 1825 the stand was a huckleberry brushfield with scattered Shasta red firs. There were only 14.5 trees per acre. Basal area was 49.3 square feet per acre (see Figure 17 and Table 18).

Anthropological evidence of ancient human use is abundant. Deboutage (obsidian flakes), other anthropological evidence [2], and oral histories of Native American elders confirm that human occupancy and use of Huckleberry Lake is ancient. This ridge is the westernmost high elevation huckleberry site and is easily accessed by a few hours foot travel from winter occupancy sites near Tiller on the South Umpqua River. More remote huckleberry fields to the east near the Cascade Crest were accessible to multiple Native American tribes and nations. Huckleberry Lake thus may have had a greater degree of exclusivity than other summer hunting and gathering sites.

Human tending through frequent burning must have been the principal factor that maintained the huckleberry brushfields by excluding tree invasions. In the absence of such tending over the last 100 years or so, tree invasion has been extensive.

PHOTO 11. Unnamed spring feeding Huckleberry Lake. No modern name, at any rate. This spring has been used by human beings for thousands of years.

[2] Respect for proprieties of the Cow Creek Band of the Umpqua Tribe precludes explication of much of the anthropological evidence present at Huckleberry Lake, which is extensive.

Devils Knob

PHOTO 12. Ancient (>600 years old) Douglas-fir (6 ft DBH) with invasive grand fir at Devils Knob (note author's hat used for scale).

The Area of Special Interest at **Devils Knob** is a ridge top bench between Jackson Creek and Elk Creek (tributary to the South Umpqua River) at approximately 4,400 feet in elevation. The ridge is western extension of the Rogue-Umpqua Divide and overlooks Tiller, OR.

Today the stand contains two distinct age cohorts of Douglas-fir with an expanding component of grand fir youngest age classes. Sword fern, vine maple, Oregon grape, and vanillaleaf dominate the understory, and fescues, lupins, and wild strawberries are found in a few small open areas.

Current density is 58.8 trees per acre, and basal area is 305.7 square feet per acre. Forty percent of the density and 83 percent of the basal area is Douglas-fir. Grand fir makes up the remaining density and basal area. Sixty-three percent of the existing trees are less than 185 years old (see Figure 20 and Table 21). The 22.7 trees per acre exceeding 185 years old are Douglas-firs. In 1825 the stand was more open Douglas-fir parkland. There were 33.6 trees per acre. Basal area was 150.5 square feet per acre (see Figure 19 and Table 20).

Some Douglas-firs at Devils Knob were over 500 years old in 1825. Those very large specimens appear to have been open-grown by virtue of their large branches and broken tops. They contrast with a younger cohort of Douglas-firs that were stand-grown (smaller branches, intact tops, less taper). Some trees in the older cohort exceed 7 feet in diameter, whereas few trees in the second cohort exceed 4 feet DBH. It was not possible to determine ages of the older cohort, but some younger cohort Douglas-firs were cored and range between 200 and 400 years old. Grand firs in the youngest cohort are less than 185 years old.

This "true" old-growth stand is mixed with remnant grassy openings being invaded by Douglas-firs. Grazing by cattle is all that prevents total occupation by trees. In 1825 there were no cattle and it is unlikely that native browsers such as elk could have maintained the openings. Instead, frequent fire must have excluded tree invasion of the prairie areas. Those fires must have been very frequent (every 1 to 5 years) to have been so light-burning that they did not consume the pockets of established Douglas-firs. Those conditions imply intentional, timed, and located human ignitions (see Discussion).

French Junction

PHOTO 12. Remnant thin-leaved huckleberry (*V. membranaceum*) field at French Junction. Note that invading trees are young (<185 years old).

The Area of Special Interest at **French Junction** is a moderately narrow ridge top between the South and North Fork Umpqua River headwaters at approximately 4,800 feet in elevation. French Junction is near the Cascade Crest at one of the easternmost points in the South Umpqua Watershed.

Today the stands consist of older Douglas-fir with a younger cohort of Pacific silver fir and mountain hemlock in the youngest age classes. Shasta red fir and incense-cedar are minor species. Within the stands, beargrass and vanillaleaf dominate, but in more open areas, thin-leaved huckleberry, mountain-ash, chinquapin, rhododendron, Douglas-maple, elderberry (*Sambucus cerulea*), wild currant, serviceberry, grasses, bracken fern, kinnikinnick (*Artostaphylos uva-ursi*), chinquapin, lupines, and many other shrub and herbaceous species.

Current density is 65.2 trees per acre, and basal area is 271.1 square feet per acre. Sixteen percent of the density and 69 percent of the basal area is Douglas-fir. Pacific silver fir accounts for 69 percent of the density but only 29 percent of the basal area (see Figure 22 and Table 23). Incense-cedar, Shasta red fir, red alder and Pacific yew are present in small numbers.

In 1825 the stand was a huckleberry brushfield with scattered and clumped very large Douglas-firs (huckleberry parkland). There were 24.3 trees per acre. Basal area was 87.7 square feet per acre (see Figure 21 and Table 22). Roughly one-third of the trees were less than 15 inches DBH and one-third greater than 30 inches DBH. Most of the large trees were Douglas-firs with occasional Shasta red firs.

As at Huckleberry Lake, anthropological evidence of ancient human use is abundant. The Kalmath Trail, a major travel route for thousands of years, is thought to have passed through or close to French Junction. Food and fiber plants known to have been used by Native Americans are abundant.

Human tending through frequent burning must have been the principal factor that maintained the huckleberry brushfields by excluding tree invasions. In the absence of such tending over the last 100 years or so, tree invasion has been extensive.

Discussion

Introduction

Over the last 185 years the landscapes of the Upper South Umpqua Watershed have experienced significant changes in forest structure, species relative proportions, biomass accumulation, fire hazard, wildlife guilds, and landscape dynamics. These changes are geologically recent, have arisen as a result of disruption of the historical (precontact) forest influences and effects imparted by resident human beings over the last 10,000 years.

Selection of the 185-year reconstruction target is appropriate because in the Upper South Umpqua Watershed the application of traditional (millennia old) ecological management techniques was still occurring in 1825, but diminished in intensity over the next 25 years. The forests of today are rebounding from thousands of years of intensive human management. The degree of vegetative change from 1825 to today, which is considerable, reflects the degree of influence that resident human beings had over the vegetation in the precontact Holocene.

The changes in stand structure since 1825 have been dramatic. Density of trees greater than 8 inches DBH increased from an average of 20 trees per acre to 90 (from 10 to 35 trees per acre to 60 to 115 trees per acre). Basal area increased 5-fold on average, from 65 square feet per acre to 225 (from 25 to 150 sqft/ac to 150 to 300 sqft/ac).

In 1825 the ten stands were open and park-like with widely spaced trees. By 2010 the ten stands had accumulated from 10 to 20 times the tree biomass they had held 185 years earlier. In 1825 pines and oaks were predominant in stands below 3,800 feet elevation. Today those same stands are dominated by Douglas-fir, grand fir, and incense-cedar, especially in younger age classes. In higher elevation stands the most prevalent species has changed from Shasta red fir to Pacific silver fir.

By implication the forest development pathways have also changed.

1825 Map Vegetational Zones

- **Oak zone**

Includes prairie, shrublands, oak savanna, oak woodlands mostly below 2,400 feet elevation. Ponderosa pine and Douglas-fir were important components, but the presence of remnant ancient oaks is diagnostic.

Prairie lands in the **oak zone** were composed of grasses and often contained areas of extensive camas. Hazel, serviceberry, lomatiums, lilies, lupines, and a host of other prairie plant species were widespread or found in patches.

Pickett Butte is a good example of the oak zone. In 1825 there were only 8.8 trees per acre, roughly one-third Oregon white oak, one-third pines (ponderosa and sugar), and one-third Douglas-firs, at Pickett Butte.

Today there are 113.7 trees per acre, a 12-fold increase. Basal area has increased 560 percent. Douglas-fir dominates and the oak are dying out and have died out over large portions of the **oak zone**.

- **Pine zone**

Includes meadows, shrublands, pine dominated savannas, and pine-dominated mixed conifer woodlands from roughly 2,400 feet to 3,800 feet elevation. Ponderosa and sugar pine were the dominant tree species but Douglas-fir, incense-cedar, and pockets of western red cedar were also prevalent, especially along riparian corridors.

The understory was often beargrass, and serviceberry was also an important component.

Five Lakes is a good example of the **pine zone**. In 1825 there were only 17.4 trees per acre, and nearly third of those pines, chiefly sugar pine. Basal area was only 53.7 square feet per acre.

Today there are 106.7 trees per acre, a 6-fold increase. Basal area has increased 417 percent. Douglas-fir dominates and the pines are dying out.

- **Douglas-fir zone**

Includes grassy balds, shrublands, Douglas-fir dominated savannas, and Douglas-fir dominated mixed conifer woodlands from roughly 3,800 feet to 5,000 feet elevation. Douglas-fir was the principal tree species, but incense-cedar, and grand fir also occurred. Mountain hemlock, ponderosa pine, and Shasta red fir were present in low numbers.

The understory was often dominated by beargrass, serviceberry, chinquapin, and huckleberries. Fescue bunchgrasses were an important component in treeless "balds".

Whiskey Camp is a good example of the **Douglas-fir zone**. In 1825 the stand was open conifer parkland. There were only 26.6 trees per acre; two-thirds were Douglas-firs with a component of grand fir and ponderosa pines. Basal area was 94.8 square feet per acre.

Today there are 88.7 trees per acre, a 3-fold increase. Basal area has increased 241 percent. Douglas-fir is still the most prevalent species, although there is a strong component of grand fir in younger age classes.

- **Subalpine zone**

Includes grassy balds, shrublands, Shasta red fir dominated savannas, and Shasta red fir dominated mixed conifer woodlands above roughly 5,000 feet in the watershed. Shasta red fir was the dominant tree species, but Douglas-fir, Pacific silver fir, incense-cedar, and mountain hemlock, were present in low numbers.

The understory was principally beargrass and huckleberries. Nearly treeless huckleberry fields were thousands of acres in size.

Huckleberry Lake is a good example of the **Subalpine zone**. In 1825 the stand was a huckleberry brushfield with scattered Shasta red firs. There were only 14.5 trees per acre. Basal area was 49.3 square feet per acre.

Today there are 76.9 trees per acre, a 5-fold increase. Basal area has increased 442 percent. Shasta red fir is still the principal tree species, but there is a strong component of Pacific silver fir in younger age classes. Huckleberry cover is much reduced because the species (*V. membranaceum*) is not shade tolerant.

In all zones the 1825 landscape had far fewer trees. Stands had only one third to one twelfth the number of trees (larger than 8 inches DBH). A sizeable proportion of the landscape had no trees at all. Treed areas were open and park-like with widely spaced, uneven aged trees ranging from recently established to over 500 years old.

Forest Development Pathways

Prairies, brushfields, oak savannas, conifer savannas, and open, park-like forests are elements commonly included in descriptions of precontact forests in the watershed (Leiberg 1903, Carloni 2005); in the immediate region (Leiberg 1903, Habeck 1961, Johannessen *et al.* 1971, Lewis 1973, Shaffer 1990, Keter 1995, LaLande and Pullen 1999, Bailey and Kertis 2002, Williams 2002, Sensenig 2003, Zybach 2003, Anderson 2005, Lake 2005, Tappeiner *et al.* 2007, Fritschle 2008, and others), and in forests in other locales (Pyne 1982, Robbins 1993, Covington and Moore 1994, Bonnicksen 2000, Stewart 2002, Keane *et al*. 2006, Fowler and Konopik 2007, Kay 2007, and others). Those findings are based (variously) on explorer and pioneer journals, oral histories of Native American elders, and stand reconstructions such as this one.

Thus the prairie-savanna-open-forest vegetation condition is thought to have been widespread in precontact landscapes of the West. It is also thought to be an ancient landscape condition: many thousands of years old.

Evidence suggests that the precontact forests followed a different dynamic than modern forests. In this paper we use "forest development pathways" to describe the dynamics of the precontact forests instead of "succession", because plant "succession" dynamics apparent in modern forests were suspended, perhaps for thousands of years.

Besides the large body of testimonies by witnesses and historians, several lines of empirical evidence support the hypothesis that precontact open forest conditions were of long vintage (rather than a temporary transitional stage).

- The older cohort trees have the morphology of open-grown trees (Poage and Tappeiner 2002). Wide growth rings near the pith, low height-diameter ratios (< 50), crown retention, large limbs or evidence of large limbs on the lower bole, are all indicators of open-grown conditions. Older cohort trees were not stand-grown trees — they were savanna-grown trees that had little or no tree-to-tree competition (Dubrasich 2010). Stand grown trees are present today in the younger cohort and have narrow growth rings, high height-diameter ratios (> 70), small limbs, and rapid crown recession, all indicating within-stand competition.

- The older cohort trees are uneven aged. Older cohort trees aged in this study ranged from ~150 years to 526 years, but we were unable to increment bore the very large trees (4 to 7+ feet DBH) that we encountered. Even so, the wide age ranges within the stands are evidence that individual trees and the open stand structure were persistent.

- The noted decline in populations of prairie-dependent species such as the Mardon skipper (*Polites mardon*) and Siskiyou short-horned grasshopper (*Chloealtis aspasma*) (pers. comm. G. Brenner). The major threat to these insects is the loss of a large percentage of the prairie forbs upon which they depend. Presumably they became established over a long period of prairie-savanna-open-forest conditions.

- Archaeological sites with camas ovens (with charcoal that can be carbon dated) indicate "intense and continuous [occupation] between 3000 and 300 years ago" by Native Americans (Connolly 1991). Camas is a prairie and savanna plant. As discussed below, the lifeways of the aboriginal residences included extensive use of anthropogenic fire which perpetuated prairies, savannas, and open forests.

Thus the evidence suggests that the prairies, savannas, and open forests have been persistent vegetation types in the Upper South Umpqua Watershed (and other areas) for the last few thousand years at least.

The ancient, persistent, open forests and savannas must have followed a much different set of forest development pathways than are in place today. Modern forests in the area do not exhibit the same forest structure, and hence do not have the same forest dynamics.

Tree Recruitment – The 1825 stands -- with ~20 trees per acre and with persistent trees to 500 years old -- must have recruited one (persistent 8-inch DBH) tree per acre every 25 years. That recruitment rate is exceedingly slow. Since ~1850 the stands in the Upper South Umpqua Watershed have recruited one 8-inch tree per acre per year, or 25 times faster than the precontact rate (see Figures 3, 6, 9, 12, 15, 18, 21, 24, 27, and 30).

***Tree species relative proportion*s** – In 1825 pines and oaks constituted two-thirds of the trees in the oak and pine zones. Today pines and oaks constitute less than 10 percent of the trees in those zones and are almost absent in the youngest size classes. Douglas-fir dominates, as might be expected, since that species is well-known to out-compete the others (and certainly has over the last ~150 years in the stands studied). Curiously, Douglas-fir was present (and grew well) in the precontact stands yet was a minor species.

Biomass accumulation – Precontact stands accumulated biomass very slowly. In contrast, biomass today in the stands in the Upper South Umpqua Watershed have more than 10 times the gross (live and dead) biomass per unit area that they carried in 1825. Presumably gross photosynthetic productivity has not changed (diameter growth rates were actually greater in 1825, but due to open, competition-free, individual tree growing conditions, not a greater site productivity). Biomass certainly has accumulated over the last 185 years. But biomass apparently did not accumulate (at the nearly same rate) in precontact forests.

The forest development pathways of precontact forests were fundamentally different from today's forest dynamics. One or more critical environmental drivers or forcing factors has changed since 1825.

A growing body of forest scientists hypothesize that the critical factor that changed is fire — specifically the absence since ~1850 of frequent, seasonal, intentional, anthropogenic (human-set) fire (Habeck 1961, Johannessen *et al.* 1971, Pyne 1982, Keter 1995, LaLande and Pullen 1999, Lewis 1999 Bonnicksen 2000, Pyne 2000, Bailey and Kertis 2002, Stewart 2002, Zybach 2003, Anderson 2005, Carloni 2005, Lake 2005, Kay 2007, and others).

Anthropogenic Fire

Fire is a chemical process (rapid exothermic oxidation), but exogenous (outdoor) fire is biologically-driven. The fuel in a forest fire is biomass. Without biological fuels (and oxygen), there would be no exogenous combustion. Forest fires consume biomass, living and dead, and alter (disturb) vegetation. Hence fire is an important factor in biological forest development.

Wildfires differ in their intensity and severity, frequency, areal extent, ignition source, and human intentionality (purpose). These characteristics are governed by interacting factors that include fuel loading, fuel dryness or flammability, fuel continuity across the terrain, topography, ignition location, ignition timing, ignition frequency, weather, and season, and in the case of anthropogenic fire, the skill and intent of the human setting the fire.

Fire intensity and severity – Fires differ in their intensity – technically the rate at which a fire produces heat, expressed in terms of temperature or heat yield (Hartford, and Frandsen 1991) – and severity, the degree to which fires consume the available biomass (Bormann *et al.* 2008) and kill living plants (especially trees).

Precontact fires were effective at removing the biomass; precontact biomass loadings were a fraction of modern loadings. Precontact fires were less effective at killing established trees, though the survivors were few in number and well-distributed.

Modern forest fires (in modern dense forests) are often intense and severe, killing all the living trees, aka *stand-replacing* (Tappeiner *et al.* 2007). They also tend to leave a considerable amount of newly dead, unconsumed biomass behind (Bonnicksen 2008).

PHOTO 13. Mortality from the 2009 Boze Fire near French Junction. Note the high density and stand-grown morphology of the trees in this even-aged (~140 years old) post-Contact stand.

Fire frequency – Precontact fires in the Upper South Umpqua Watershed were (in the aggregate) less intense and less severe than modern fires, yet they were effective at consuming the annual biomass production. That is because precontact fires were frequent (a fire return interval less than ~15 years in SW Oregon).

Infrequent fires (a fire return interval greater than ~15 years in SW Oregon) tend to be stand-replacing. The long hiatus between fires allows biomass to accumulate, resulting in well-fueled, intense, and severe fires. Even-aged stands seed in following such fires. Precontact stands were uneven-aged and many of those trees have multiple fire scars, indicating that they survived multiple low-severity fires. Because of the short return interval, frequent fires are more effective at consuming the available biomass than are infrequent fires. Annual biomass production does not accumulate over decades, other than in widely-spaced green trees.

Based on fire scar evidence, Sensenig (2003) found a composite fire frequency ranging from 3 to 10 years in the Oregon Cascades south of the study area. Sensenig also found a group composite fire frequency (grouping fires scars where fires were aged to within +/- 3 years) ranging from 7 to 13 years. Lake (2005) reported an average period of 2 years between fires in the Klamath Mountains.

Fire frequencies derived from fire scars most likely underestimate true fire frequency (overestimate the fire return interval), especially when fires are frequent (Stephens 2010). Hence in 1825 in the Upper South Umpqua Watershed, the fire return interval probably ranged from 1 to 10 years, depending on location in the watershed.

Fire extent – Fire extent, the acreage burned per year, is the reciprocal of the burning rate (Van Wagner *et al.* 2006). For instance, if the fire return interval (averaged across point samples) is 100 years, then on average 1 percent of the total area burns every year. If the return interval is 10 years, then on average 10 percent of the total area burns every year. If the fire cycle is 3 years, then one-third of the total area burns each year, on average.

Despite the fact that frequent fires on average burn more acreage each year (than infrequent fires do), individual fires in a frequent fire regime are generally smaller than individual infrequent fires.

If there is a long hiatus between fires, biomass accumulates. Available fuels increase, as does the continuity of fuels across the landscape. Megafires (>100,000 acres) can and do result (Williams 2010). Frequent fires, in contrast, are limited by availability and continuity of fuels and tend to remain small. Frequent fires are thus small and numerous as well as frequent, and a frequent fire regime tends to create a patchy rather than a uniform vegetation pattern across the landscape.

In the precontact watershed fires were small, frequent, and burned in light fuels. Multiple fires may have burned at the same time, with contact on perimeters, but if a single fire is defined as arising from a single unique ignition point, then most fires in the precontact Upper South Umpqua Watershed were probably less than 100 acres in size.

Ignition source – Based on data from 1970 to 2002 the Umpqua National Forest reports a lightning-fire ignition rate of 59/400,000 ha per year, or 0.0382 lightning fires per square mile per year (Kay 2007). The Upper South Umpqua Watershed is 231,931 acres or 362.4 square miles, which implies an average of 13.8 lightning fires per year in the study area.

To burn one-third of the watershed each year (a 3-year fire return interval), each lightning fire would have to burn an average of 5,600 acres, or 50 to 100 times the expected average fire size in a frequent fire regime in this landscape. There was, however, another ignition source present in the watershed for thousands of years: human beings.

Boyd (1999a) estimated a Willamette Valley Kalapuyan aboriginal population density of 0.44 inhabitants per square mile. That density is consistent with other estimates of populations in precontact North America (Denevan 1992, Mann 2005, Kay 2007). In the Upper South Umpqua Watershed a density of 0.44 people per square mile yields a population count of 161.

Human populations in the study area were undoubtedly greater in the summer and fall than during winter months. In late precontact time, the number of people in the area might reasonably be estimated at 1,000 or 2,000 individuals at the height of harvests, fishing, or trade gatherings. In earlier times, when regional populations may have been greater, seasonal visitation numbers were likely even greater (pers. comm. B. Zybach).

In reviewing the literature, Kay (2007) estimates a Native American purposeful burning rate of 10 fires/person per year. That translates to 10,000 to 20,000 purposeful anthropogenic fires per year in the precontact watershed, dwarfing the lightning ignition rate of 13.8 fires per year. Kay summarizes:

> Using the lowest published estimate of native people in the United States and Canada prior to European influences (2 million) and assuming that each individual started only 1 fire per year—potential aboriginal ignition rates were 2.7–350 times greater than current lightning ignition rates. Using more realistic estimates of native populations, as well as the number of fires each person started per year, potential aboriginal ignition rates were 270–35,000 times greater than known lightning ignition rates. Thus, lightning-caused fires may have been largely irrelevant for at least the last 10,000 years. Instead, the dominant ecological force likely has been aboriginal burning. [*Kay (2007) p. 16*]

Providing further evidence of anthropogenic ignition, Lake (2005) notes that fire scars dating to 1628 in the Klamath Mountains indicate (by position of the scar relative to growth rings) that one-fourth of the fires were late winter-spring, when there are (and were) no lightning ignitions.

Henry T. Lewis noted in his *An Anthropological Critique* in Omer Stewart's *Forgotten Fires* (Stewart 2002):

> Research over the last thirty years has clearly demonstrated the significance of indigenous burning practices and the important ways that hunting-gathering technologies have differed from natural fire regimes. …
>
> Even where lightning fires occur with high frequency—such as California, the American Southwest, and semiarid parts of Australia—indigenous people neither could nor would have depended upon the distribution of natural fires. To assume that lightning ignitions, even in these most fire-adapted environments, are sufficient for human purposes is most naïve, furthering the misguided idea that hunter-gatherers could only exploit what nature provided. Setting fires in specific places, at designated times of the year, and under conditions that best sustain resource habitats and serve human goals is far more important than whether there is an abundance (or poverty!) of lightning fires that might somehow inadvertently serve human goals. In terms of what we now know about the ecologies of natural and prescribed fires, the important question is no longer why hunter-gatherers would have set fires but, rather, why on earth they would not have done so. [*Lewis in Stewart (2002) p. 33*]

Fire intentionality – Some anthropogenic fires may have been "accidental", but in the main they were intentional: deliberately set in a particular place at a particular time by a skilled practitioner, informed by long cultural experience and traditional ecological knowledge in order to achieve specific land management objectives (Habeck 1961, Johannessen *et al.* 1971, Pyne 1982, Keter 1995, Bonnicksen *et al.* 1999, LaLande and Pullen 1999, Lewis 1999, Bonnicksen 2000, Stewart 2002, Zybach 2003, Anderson 2005, Carloni 2005, Lake 2005, Kay 2007, and others).

Indians had various purposes for landscape burning including (Bonnicksen *et al.* 1999, Kay 2000):

- Stimulate the production of edible and craft fiber plants, promoting the growth of shoots, flowers, fruits, nuts, bulbs, etc.
- To thin, prune, weed, and to discourage insects and diseases on preferred food and fiber plants.
- To increase browse and forage for game animals.
- To drive game animals and facilitate hunting.
- To increase visibility for hunting and the detection of enemies and predators.
- To open and maintain trails.
- For warfare and signaling
- To mitigate fire hazards and prevent catastrophic megafires (which could have severely handicapped human survival).
- To create firewood

Firewood was used for cooking and warming. Hearth fires were maintained (kept burning 24/7). In a landscape inhabited by fuel collectors for thousands of years, there was likely limited availability of dead, down wood. One Indian practice (observed by Lewis and Clark) was the setting afire of individual green (and pitchy) conifers to burn off the needles and kill the tree, thereby producing firewood for future use. Individual tree and patch selection burning was likely also practiced as a weeding tool in huckleberry fields (Minore *et al.* 1979), acorn orchards, and other crop areas.

The very few trees that survived the frequent fires when seedlings, and were not deliberately set afire for firewood when larger, were likely protected through fuel and fire management (reduction of fuels from the base of large nut-bearing oaks and pines, for instance).

Purposeful burning guided the forest development pathways of precontact forests. Frequent anthropogenic fire, practiced across the watershed for millennia, reduced the rate of tree recruitment, selected nut tree species over non-food tree species, and consumed the available biomass at a rate that precluded most biomass accumulation.

The historic forest development pathways that led to old-growth trees in Upper South Umpqua Watershed were human-mediated. Many of today's old-growth trees (>185 years old) were individually selected for survival by the indigenous residents, and thus have human heritage value. Abandoning the forests of today to "natural" stand-replacing fires is an alteration of the historical forest development pathways and as a result will not lead to old-growth tree development in the future (Dubrasich and Tappeiner 1995, Poage 2001).

The Anthropogenic Mosaic

Purposeful anthropogenic fire over thousands of years not only modified the forest development pathways within stands, it established a persistent placement of human-modified vegetation types throughout the watershed.

The indigenous residents used fire systematically for agro-ecological purposes such as the creation and maintenance of berry patches, camas meadows, acorn and pine nut orchards, madia fields, home sites, gathering and collecting sites, hunting copses, and fishing sites (Zybach 2007). Vegetation types such as remnant meadows, savannas, and parklands are historically human-modified and maintained, traditional Native American cultural sites. Medicine wheels and other Native American religious sites may be found within the Upper South Umpqua Watershed (pers. comm. C. Jackson). Many of the old-growth trees show signs of Native American use as hearth trees and bark-peeled trees (Dubrasich and Tappeiner 1995, Keane *et al.* 2006).

Oak savanna extended from the foothills and valleys below the study area to ~2,400 feet, and in some cases as high as 3,200 feet (i.e. Acker Ranch). The savanna was diverse, however, with hazel, serviceberry, lomatiums, camas, and food and fiber plant species widespread or found in patches. Sugar and ponderosa pine open woodlands occupied mid slopes. At higher elevations beargrass and huckleberries occurred in large, maintained fields. Western red cedar occurred in patches that may be thousands of years old. Madia fields, bunch grass prairies, fern brakes, and riparian meadows were found throughout (LaLande and Pullen 1999, Carloni 2005, Zybach 2007).

Each of these patches was managed under a specialized anthropogenic fire schedule based on traditional knowledge. An extensive, frequently burned trail system interlaced the entire watershed, with access to any location no more than one or two days walk from any other (Carloni 2005, see also main report, ***South Umpqua Precontact Reference Conditions Study***).

The system of maintained patches and trails is consistent with the "yards and corridors" pattern described by Lewis (1973) and others. Of particular note is the work by Carloni (2005) in the adjacent North Umpqua Watershed. He modeled the most ergonomic (not too steep) and least cost (shortest) travel routes between ten known archaeological sites. The model was field-validated, leading to on-the-ground discovery of ancient trails and additional sites, including an ancient summer village. Dr. Carloni summarizes:

> Intentionally or not, humans have been initiators of broadcast burning in nearly every habitat they have encountered worldwide (Pyne, 2001), and there is a long local history of burning for agro-ecological purposes in southwestern Oregon … A growing body of evidence documents the influence of Native Americans on their landscapes through the use of systematic landscape fire …
>
> Pacific Northwest native societies were deeply integrated into their landscapes, and used a wide variety of materials collected over extensive areas (Lewis, 1993; Boyd, 1986; Beckham and Minor, 1992; Blackburn and Anderson, 1993; LaLande, 1995; Williams, 2001). But local material cultures persist only to the extent that key species and habitats on which they depend remain abundant, productive and resilient (Perlin, 1989; Diamond, 2005). Archaeological evidence from the Umpqua indicates that material cultures remained relatively unchanged for approximately 2000 years before contact (Isaac Barner, pers. comm., 2000) suggesting that the stewardship practices of recent peoples were sustainable …

> Historic Indian-set fires tended toward higher frequencies and lower intensities with regular intervals separating them relative to lightning sparked fires (Boyd, 1999; Lewis and Fergeson, 1999; Williams, 2001). [*Carloni (2005) 100-101*]

The Upper South Umpqua Watershed was thus a cultural landscape comprised of an anthropogenically-induced vegetation mosaic. Similar landscape conditions were widespread regionally and indeed throughout the Western Hemisphere in pre-Columbian times. Frequently burned, historical cultural landscapes (prairies, savannas, open woodlands) have been described for other parts of Oregon (Leiberg 1903, Habeck 1961, Johannessen 1971, Dickman 1978, Wilson *et al.* 1991, Robbins 1993, Boyd 1999, LaLande and Pullen 1999, Bailey and Kertis 2002, Carloni 2005, Zybach 2002 2003 2007 2008a 2008b), California (Lewis 1973, Blackburn and Anderson 1993, Keter 1995, Anderson 2005, Lake 2005, Norman 2007, Fritschle 2008), Washington (Peter and Shebitz 2006, Storm and Shebitz 2006, Anderson 2009, Shebitz *et al.* 2009), British Columbia (Turner 1991, Deur and Turner 2006, Vellend *et al.* 2008), the Rocky Mountains (Barrett and Arno 1982, Ostland *et al.* 2005, Keane *et al.* 2006,), the Great Basin (Simms 2008), the Southwest (Raish 2005, Pyne 2009), the Southeast (Fowler and Konopik 2007), the Northeast (Abrams and Nowacki 2008), throughout North America (Lewis 1982, Pyne 1982, Bonnicksen *et al.* 1999, Bonnicksen 2000, Stewart 2002, Williams 2003) and in South and Central America (Denevan 2001, Mann 2005, Heckenberger *et al.* 2007, Woods 2009).

The anthropogenic mosaic of the precontact study area was not unique but a recapitulation of the cultural landscapes in the region, continentally, and indeed worldwide, manipulated by indigenous land use technologies, chief among them purposeful fire, and sustained over thousands of years prior to the modern era.

The recent (~150 years) alterations of the forest development pathways (and concomitantly the forest structures) in the Upper South Umpqua Watershed are a result of the elimination of historical human land management.

Boyd (1999a, 1999c) documents smallpox epidemics in Oregon in c. 1775 and 1801-1802, and malaria epidemics beginning in 1831 and every summer thereafter. By 1841, Boyd estimates, the Kalapuyan population in the Willamette Valley had fallen from a pre-smallpox count of 14,760 to 600, or 96 percent. Pre-Columbian populations throughout the New World collapsed by similar percentages (Denevan 1992, Mann 2005). The effects to native cultures in Oregon were devastating, but landscape burning continued on a declining basis until "immigrant settlers put an end to the practice in the mid 1840s" (Boyd 1999a).

Some native burning continued in the Upper South Umpqua Watershed, however, perhaps to as late as 1905. Susan Crispen Shaffer (1990) of the Cow Creek Band of the Umpqua Tribe of Indians noted that:

> Indians were the first environmentalists. Our ties to our Mother Earth are different than those of the people who came after us. We have always understood that we must protect the resources that sustain us. The fall burning practices to keep our forests clean were common. This was to keep the forest clear of fallen logs, underbrush, and other debris that collected. It also served the purpose of killing unwanted bugs and insects, harmful to the forest. By keeping the forest floor clean there was an assurance of plentiful food for the game animals which were the main food source for many tribes. It also provided a clear view of the animals for the hunters. Fish habitat was protected as well. In my Great-grandfather's diaries, he has many entries of burning. My Great-uncle [Bob Thomason] continued this practice and when the Forest Service came to the Tiller Ranger District here in the Umpqua National Forest in Douglas County, Oregon, their system was not to burn. Here was this old Indian fellow that they knew was continuing to do the burning – what to do with him? They ended up hiring him so that they could keep an eye on him! Some old timers maintain that he sometimes still had a little smoke going here and there!
>
> When I was a very little girl, I remember asking Uncle Bob, "When do you do the burning?" His reply was always, "When the time is right." He would often go out in the field, away from the house and sniff the air, also wet his finger and hold it up (although there was no wind that I could perceive), and say, "Not yet" or "It's time." I never knew on what he based his reasoning. The fires were set annually, but I'm sure on a rotating basis. As for the time of the year, it would appear that some burning was done in the early Spring, although the bulk of it was in the Fall, perhaps after the first rain, for even in aboriginal times the annual fires were recognized as a way to balance the ecology. After Fall fires, there was a quick greening, providing food for the forest animals. [*Shaffer (1990)*]

It is likely that intensive traditional management of the watershed (including frequent anthropogenic fires) declined significantly after the epidemics of the late 1700s, and almost entirely by 1850.

Climate

There are many reasons why “climate change” is not responsible for the alterations in forest development pathways in the Upper South Umpqua Watershed over the last 185 years:

- No significant climate change has taken place (beyond normal variation) since 1825 (Easterbrook 2008), yet wholesale changes in the forest development pathways have occurred.

- Precontact cultural landscapes with anthropogenic prairies, savannas, and open, park-like forests occurred across climate zones (indeed throughout the Western Hemisphere), indicating that the vegetation types (and hence the precontact forest development pathways) were not climate-dependant.

- No new open, park-like forests are arising in any climate, even where lightning fires are allowed to burn. Federal land management agencies have implemented “prescribed natural fires” and “wildfires used for resource benefit” in an attempt to “reintroduce natural fire”. Yet in no case (regardless of climate zone) have open forest structures developed (such as those extant in the study area 185 years ago).

- Anthropogenically-induced prairies, savannas, and open, park-like forests were persistent vegetation types for thousands of years despite historical perturbations in global climate such as the Little Ice Age and the Medieval Warm Period (Soon *et al.* 2003).

- Other explanations for the alteration in forest development pathways (i.e. the elimination of anthropogenic fire) are more robust and well-documented, and are free of the nagging anomalies noted above.

Carloni (2005) reported strong evidence against climate as a controller of fire frequency prior to 1850 in the North Umpqua Watershed. He compared precipitation history and fire history with the ages of existing trees to test which factors (climate or fires) influenced tree recruitment, and whether climate history and fire history were correlated. They were not:

> Fire scar frequencies from 1590 to 1820 show no relationship to precipitation. However, from 1850 to 1950 a significant negative correlation ($p = 0.005$) exists between climate and scar frequency. These results suggest that in post-aboriginal times [but not earlier] high rainfall years are associated with fewer fires than low rainfall years…
>
> Tree recruitment from 1590 to 1820 is again uncorrelated with yearly precipitation. …
>
> [N]o correlation is evident between fire scar frequency and tree recruitment in the years from 1590 to 1820. From 1850 to 1939, however, dramatic positive correlations exist between fire scar frequencies and tree origins…
>
> This suggests that the recently observed short pulses of even-aged recruitment following wildfires (Pickett and White, 1985; Oliver and Larson, 1990; Bonnicksen, 2000) may be more of a post-aboriginal phenomenon. [*Carloni (2005) 73-76, 90*]

Conclusions

1. In 1825 vegetation types in the Upper South Umpqua watershed consisted of prairie, oak savanna, sugar and ponderosa pine open woodlands, and high elevation shrublands.

2. Since 1825 the changes in stand structures have been dramatic. Density of trees greater than 8 inches DBH increased an average of 450 percent and basal area increased 5-fold. By 2010 the ten stands had accumulated from 10 to 20 times the tree biomass they had held 185 years earlier. In most of the stands the species relative proportions also changed significantly. In 1825 pines and oaks were dominant in stands below 3,800 feet in elevation. Today those same stands are dominated by Douglas-fir, grand fir, and incense-cedar, especially in younger age classes.

3. By implication the forest development pathways have changed since 1825. Tree recruitment and biomass accumulation rates have increased, and tree species relative proportions have changed (from dominance by pine and oak to dominance by Douglas-fir).

4. Human-set fire has played an important role in the development of these stands. Frequent anthropogenic fires maintained uneven-aged, sparsely stocked, open and park-like stands for thousands of years. The elimination of anthropogenic fire over the last 150 years is the key factor that has altered development pathways and forest structure and composition.

5. The anthropogenic fire regime was typified by frequent, low-severity fires of limited individual extent, which cumulatively burned over the entire watershed every 1 to 10 years. At a landscape scale the result was maintenance of an (ancient) anthropogenic mosaic of agro-ecological patches. In the absence of the purposeful fires set by skilled practitioners, the anthropogenic mosaic has been invaded and obscured by (principally) Douglas-fir. Infrequent, a-historical, catastrophic stand-replacing wildfires have replaced low severity fires due to the massive build-up of biomass (fuels).

These findings should be useful in:

- Advancing understanding of forest dynamics, historical human influences, and historical landscape geography,

- Informing the maintenance and preservation of historic cultural landscape features -- the anthropogenic landscape patterns are cultural legacies by themselves (Lake 2005),

- Evaluating and mitigating catastrophic fire hazards and risks, and

- Informing restoration efforts, where restoration means active management to recover historical cultural landscapes, historical forest development pathways, and traditional ecological stewardship to achieve resiliency to fire and insects, provide sustainable resource products and services, and to preclude and prevent a-historical catastrophic fires that degrade and destroy myriad resource values (Charnley *et al.* 2008, Dubrasich 2010b).

From Carloni (2005):

> Since material cultures often reflect their landscapes (e.g. bedrock mortars in acorn country; woven nets, weirs, and traps where salmon run), stable human cultures infer stable landscape resources. And since local material culture was stable for at least 2000 years in southwestern Oregon (Beckham and Minor, 1992), then the pre-Euro-American socioecological system represents the last known stable state.
>
> If we desire a predictable suite of ecosystem goods and services that are comparable (but not necessarily equivalent) to those available to native managers, then historic ranges of ecosystem conditions represent reasonable management sideboards. Given that the historic landscape… is to a great degree the product of active aboriginal management, it will take active management on the part of land stewards to recreate and maintain analogous conditions. [*Carloni (2005) p. 154*]

Addendum: Native American Voices Regarding Anthropogenic Fire

Native American land managers are well aware of their heritage. The following excerpts from Evergreen Magazine, Winter 2005-2006, entitled "Forestry in Indian Country: Models of Sustainability for Our Nation's Forests?" express expert perspective and application of traditional ecological knowledge:

From A School of Red Herring by Gary S. Morishima, Technical Advisor, Quinault Nation:

> Tribes have been managing natural resource systems for thousands of years, but protecting tribal legacies for the future is no simple task. The resources that are essential to sustain tribal cultures are coming under relentless attack from a variety of economic and political forces … To a great extent, these threats stem from the introduction of an invasive species several centuries ago … Europeans.

From Sovereignty, Stewardship, and Sustainability by Larry Mason, Project Coordinator for the Rural Technology Initiative at the College of Natural Resources, University of Washington:

> Tribes are known to have been managers of natural resources for 10,000 years or more. In many areas of the United States, ecosystems found by early European settlers were not virgin wilderness untouched by the hand of man, but were instead forests altered through time by many generations of Natives that burned, pruned, sowed, weeded, tilled, and harvested to meet their requirements for firewood, fish and game, vegetal foods, craft supplies, and building materials. Periodic underburning not only produced desirable vegetative conditions but reduced fuel accumulations that might otherwise sustain intense fire. A severe fire in a tribal territory would have meant not only loss of property, resources, and lives, but also a long-term disaster for the well-being of the community.

From The Yakama's Prescription for Sustainable Forestry by Markian Petruncio, Ph.D., Administrative Forester, Yakama Nation, and Edwin Lewis, Forest Manager, BIA, Yakama Agency:

> Forest restoration implies that a forest will be returned to a prior condition. Nineteenth-century forest conditions on the Yakama Reservation appeared to be more sustainable than present conditions. For example, open pine stands were maintained in a healthy condition by frequent, low-intensity fires. The forestry program [on Yakama Nation lands] is using historic species composition and stand densities as references for restoration of forest health. … The pathway to sustainable forestry requires proactive management.

From The Forest Is In Your Hands by Nolan Colegrove, Sr., Forest Manager, Hoopa Valley Tribal Council, Forestry Division:

> We tended and managed the forest with many tools that were created from nature, but the most effective tool was controlled fire. … The tending of the forest with the use of fire produced annual crops which provided the daily necessities of the people; but what also occurred, by conducting low intensity burns annually for hundreds of years, was that the condition of the forest was healthy and in balance.

From Ecosystem Management and Tribal Self-Governance on the Flathead Indian Reservation, Montana by Jim Durglo, Forest Manager, Confederated Salish and Kootenai Tribes:

> The Tribes understood that both Indian-lit and lightning fires shaped the forest. Here in the Northern Rockies, fire, more than any other factor except climate, shaped the structure of our forest. It determined the kinds and ages of trees, how close together they grew, and the number and types of openings that existed. … From the stories of elders, the historical accounts of early Europeans, and the findings of modern scientific research, we know that Indians have been purposefully burning in the area for at least 7,000 years.

From The Gift of Fire by Germaine White, information and education specialist for the Confederated Salish and Kootenai Tribes of the Flathead Reservation, Montana:

> As Salish and Pend d'Oreille people, our view of fire was and is quite different from the modern western view. In our tradition, fire is a gift from the Creator brought to us by the animals. We think of it as a blessing, that if used respectfully and in a manner consistent with our traditional

> knowledge, will enrich our world. This belief explains our long tradition (12,000 years plus) of spring and fall burning …
>
> On my last trip into the Bob Marshall Wilderness Area with one of our tribal elders, Harriet Whitworth, we followed the trails she had followed seventy years previous with her mother and grandmother, trails her family had followed for multiple generations. When we arrived at Big Prairie on the South Fork of the Flathead River, Harriet described what it was like when she was a little girl. She said it was a big, open, park-like area where there were enormous ponderosa pine trees, an abundance of grass, and many animals … [with] many clearings, a series of prairies in one place, and Harriet talked of how beautiful it was when she was a child.
>
> Now there is only a little bit of a camp and small prairie or meadow left, and the big pine trees are crowded with Douglas-fir trees. Being there in that place and listening to the stories of how it used to look just a single elder's lifetime ago showed me in a vivid way what it means to exclude fire from the landscape.
>
> *All the above from Petersen, James, ed. Forestry in Indian Country: Models of Sustainability for Our Nation's Forests? Evergreen Magazine, Winter 2005-2006.*

And finally, some commentary on the inclusion of anthropology in ecosystem studies:

> Neither culture nor nature is static, and hunter-gatherer groups had a substantial impact on their environment. Because of their relatively simple technologies, their profound effects on the environment are often overlooked or minimized. The peoples who inhabited the North Fork basin during prehistoric times were, however, far more than passive observers of the environment within which they lived. The concept of a pristine wilderness untouched by human activities during the prehistoric era is not valid for this region. Aboriginal groups affected their environments through their subsistence and cultural activities. Thus, a dynamic interaction existed between the environment and the lifeways of the aboriginal inhabitants of the region. ...
>
> I believe that cultural anthropologists, historians, and archaeologists with their distinct perspectives can help to provide a deeper understanding of past environmental trends needed for ecosystems management. Without an

understanding of historical ecological processes and past human land-use activities, any attempt to make recommendations about the management of today's National Forests from an ecosystem management perspective will be inadequate.

From Keter, Thomas S. 1995. Environmental History and Cultural Ecology of the North Fork of the Eel River Basin, California. USDA For. Ser. R5-EM-TP-002.

I am struck by what appears to me as an intellectual bias; derived not from intent but from the inevitable inertia developed within a particular field of study. For example, fire and vegetation histories are freely considered in terms of possible correlations to lightning strike history, solar flare activity, and other physical phenomena, while the exceptionally well-documented human influences on fire history are often regarded as too speculative for serious consideration. Our perceptions are limited by our understanding; there is much to be gained by developing a rich critical understanding and appreciation of the tools, models, and theories of other disciplines.

From Anthropological and Archaeological Perspectives on Native Fire Management of the Willamette Valley. 2000. Thomas J. Connolly, Museum of Anthropology, University of Oregon Paper presented at the 81st Annual Meeting of the American Association for the Advancement of Science, Pacific Division (Symposium: Fire History in the Pacific Northwest: Human and Climatic Influences), June 11-14, 2000, Ashland, Oregon.

Every ecosystem in North America has been affected in some way by a fire regime… manipulated by indigenous people. Much forest science, including ecological classifications of vegetation types, arose from observation of forest that were essentially in transition from conditions of indigenous fire management to post-colonial fire suppression. Our understanding of forest processes may thus be based on an anomalous, transitional landscape"

From Kimmerer, R.W.; Lake, F.K. 2001. The role of indigenous burning in land management. Journal of Forestry. 99(11): 36–41.

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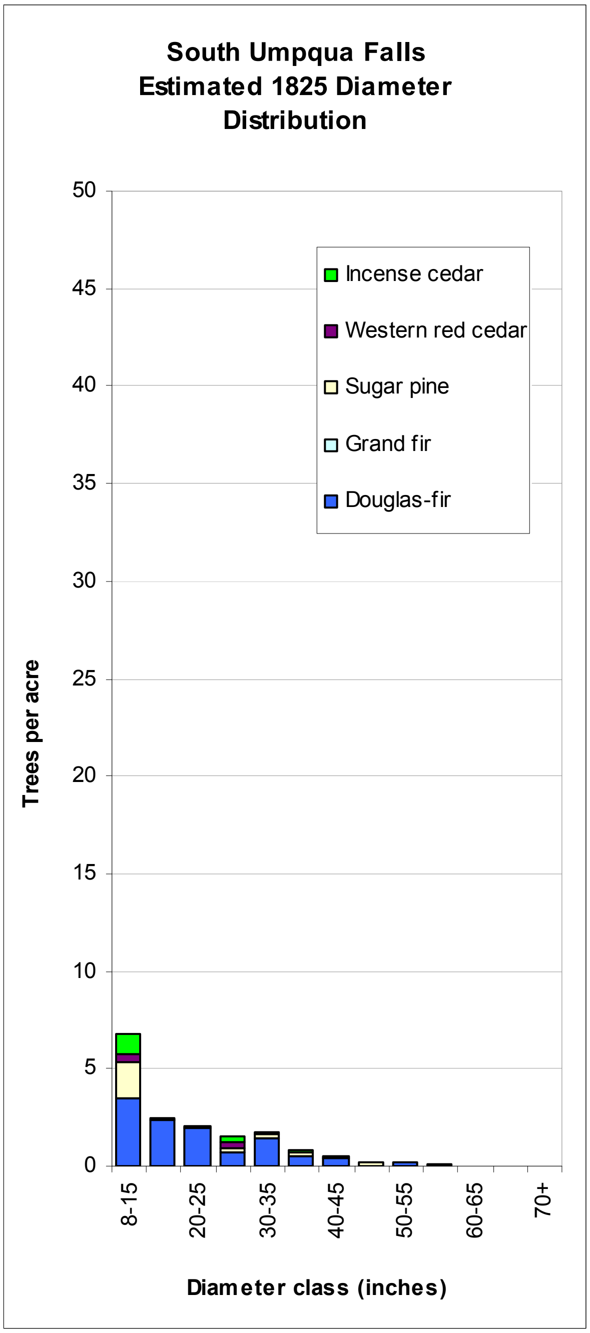
Aknowledgements

Special thanks to Douglas County Commissioner Joe Laurance, Javier Goirigolzarri of Resource Management Services, and Bob Zybach of Oregon Websites and Watersheds, Inc. for leadership and sponsorship of this project. Bob Zybach, Javier Goirigolzarri, Mike Laurance, and Nana Lapham provided invaluable assistance with the field studies. Greg Orton of the Umpqua NF provided aerial photographs. Doug MacCleery, USFS ret. provided key research documents. Bob Zybach, Javier Goirigolzarri, John Marker, Charles Kay, and Greg Brenner provided expert reviews of the draft report. The funding for the study is authorized by the PL 110-343 Title III of the Emergency Economic Stabilization Act of 2008, Title VI-Other Provisions, Sec. 601, commonly referred to as the Secure Rural Schools and Community Self-Determination Program.

Figures and Tables

Figures 3 and 4. 1825 and current diameter distributions, **South Umpqua Falls**



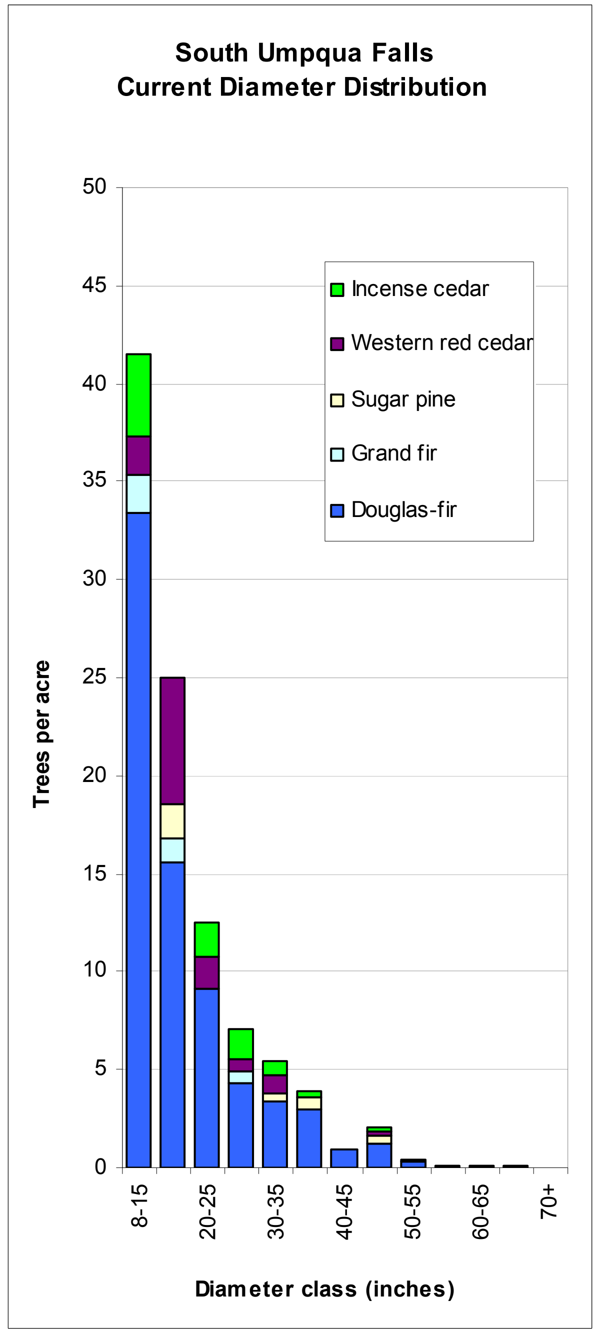


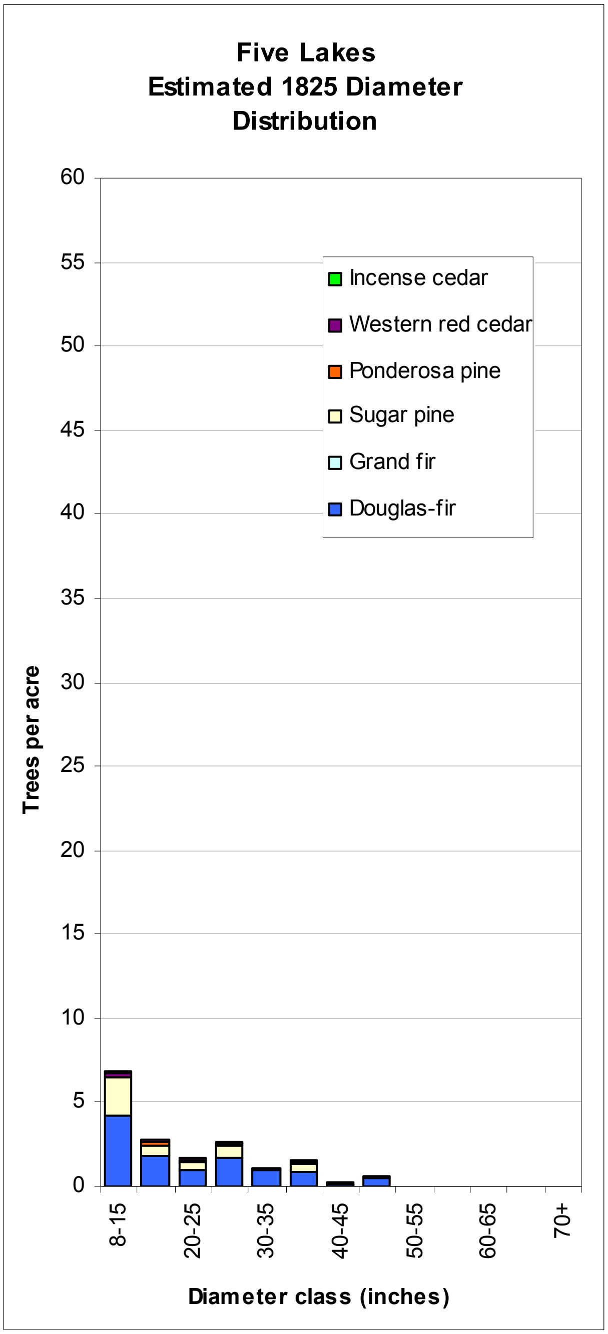
Table 4. Estimated trees per acre in 1825, by species, **South Umpqua Falls**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	3.5	0.0	1.8	0.0	0.5	1.0	0.0	6.8
15-20	2.3	0.0	0.1	0.0	0.1	0.1	0.0	2.5
20-25	1.9	0.0	0.1	0.0	0.1	0.1	0.0	2.1
25-30	0.7	0.0	0.3	0.0	0.3	0.3	0.0	1.5
30-35	1.4	0.0	0.3	0.0	0.1	0.1	0.0	1.8
35-40'	0.5	0.0	0.2	0.0	0.1	0.1	0.0	0.8
40-45	0.4	0.0	0.1	0.0	0.1	0.0	0.0	0.5
45-50	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.2
50-55	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.2
55-60	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
60-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	11.1	0.0	2.9	0.0	1.0	1.5	0.0	
							Grand Total	16.5

Table 5. Current trees per acre by species, **South Umpqua Falls**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	33.4	1.9	0.0	0.0	2.0	4.2	0.0	41.5
15-20	15.6	1.3	1.7	0.0	6.5	0.0	0.0	25.0
20-25	9.2	0.0	0.0	0.0	1.6	1.8	0.0	12.5
25-30	4.3	0.6	0.0	0.0	0.6	1.5	0.0	7.1
30-35	3.4	0.0	0.4	0.0	0.9	0.8	0.0	5.5
35-40'	3.0	0.0	0.6	0.0	0.0	0.3	0.0	3.9
40-45	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
45-50	1.3	0.0	0.4	0.0	0.2	0.2	0.0	2.0
50-55	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.4
55-60	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
60-65	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
65-70	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	71.6	3.7	3.4	0.0	11.7	8.8	0.0	
							Grand Total	99.2

Figures 5 and 6. 1825 and current diameter distributions, **Five Lakes**



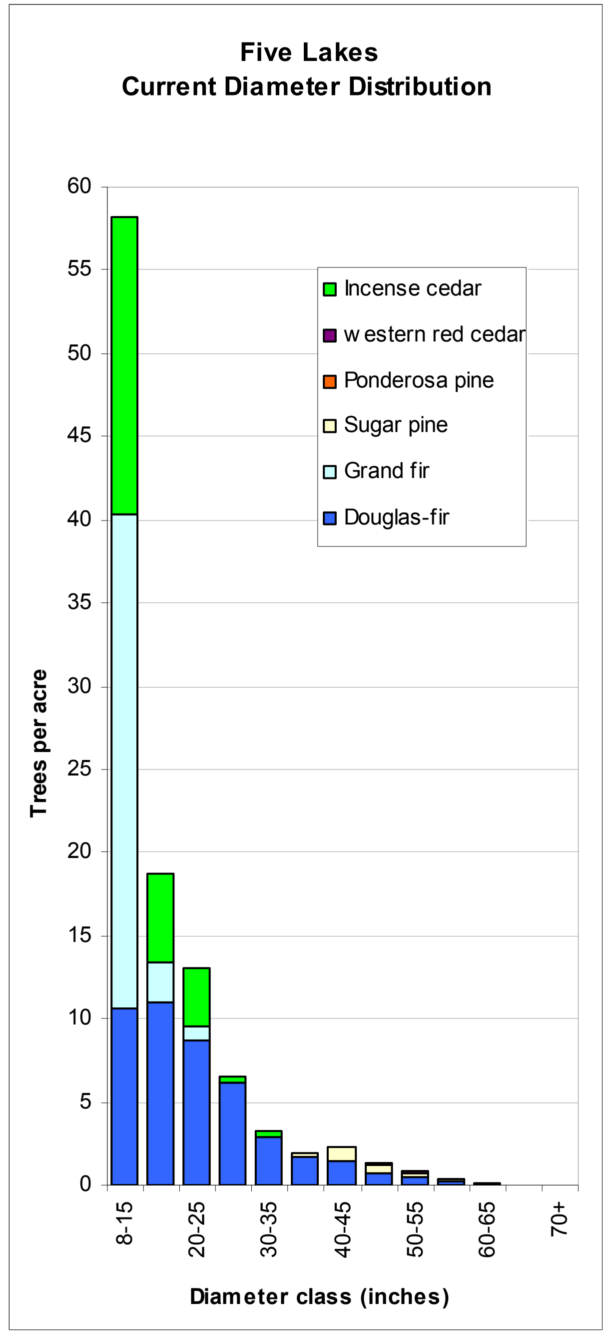


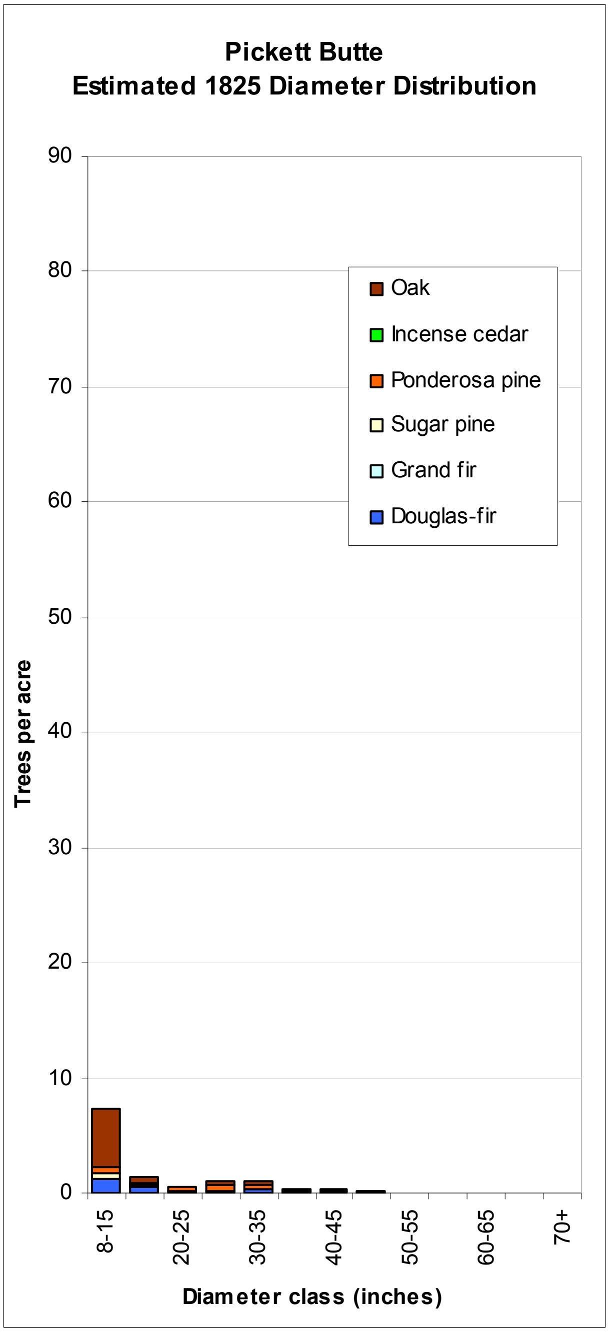
Table 6. Estimated trees per acre in 1825, by species, **Five Lakes**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	4.2	0.0	2.3	0.1	0.2	0.1	0.0	6.8
15-20	1.8	0.0	0.6	0.3	0.1	0.0	0.0	2.7
20-25	1.0	0.0	0.5	0.1	0.2	0.0	0.0	1.7
25-30	1.6	0.0	0.7	0.2	0.1	0.0	0.0	2.6
30-35	0.9	0.0	0.1	0.1	0.1	0.0	0.0	1.1
35-40'	0.8	0.0	0.5	0.1	0.2	0.0	0.0	1.6
40-45	0.2	0.0	0.1	0.0	0.1	0.0	0.0	0.3
45-50	0.5	0.0	0.1	0.0	0.0	0.0	0.0	0.6
50-55	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
55-60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	10.9	0.0	4.9	0.7	0.8	0.1	0.0	
							Grand Total	17.4

Table 7. Current trees per acre by species, **Five Lakes**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	10.6	29.7	0.0	0.0	0.0	17.8	0.0	58.2
15-20	11.0	2.5	0.0	0.0	0.0	5.3	0.0	18.7
20-25	8.7	0.8	0.0	0.0	0.0	3.5	0.0	13.0
25-30	6.1	0.0	0.0	0.0	0.0	0.4	0.0	6.5
30-35	2.9	0.0	0.0	0.0	0.0	0.3	0.0	3.3
35-40'	1.7	0.0	0.3	0.0	0.0	0.0	0.0	2.0
40-45	1.5	0.0	0.7	0.0	0.0	0.0	0.0	2.2
45-50	0.8	0.0	0.5	0.1	0.0	0.0	0.0	1.4
50-55	0.5	0.0	0.2	0.0	0.1	0.0	0.0	0.9
55-60	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.4
60-65	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	44.2	33.0	1.9	0.1	0.1	27.3	0.0	
							Grand Total	106.7

Figures 7 and 8. 1825 and current diameter distributions, **Pickett Butte**



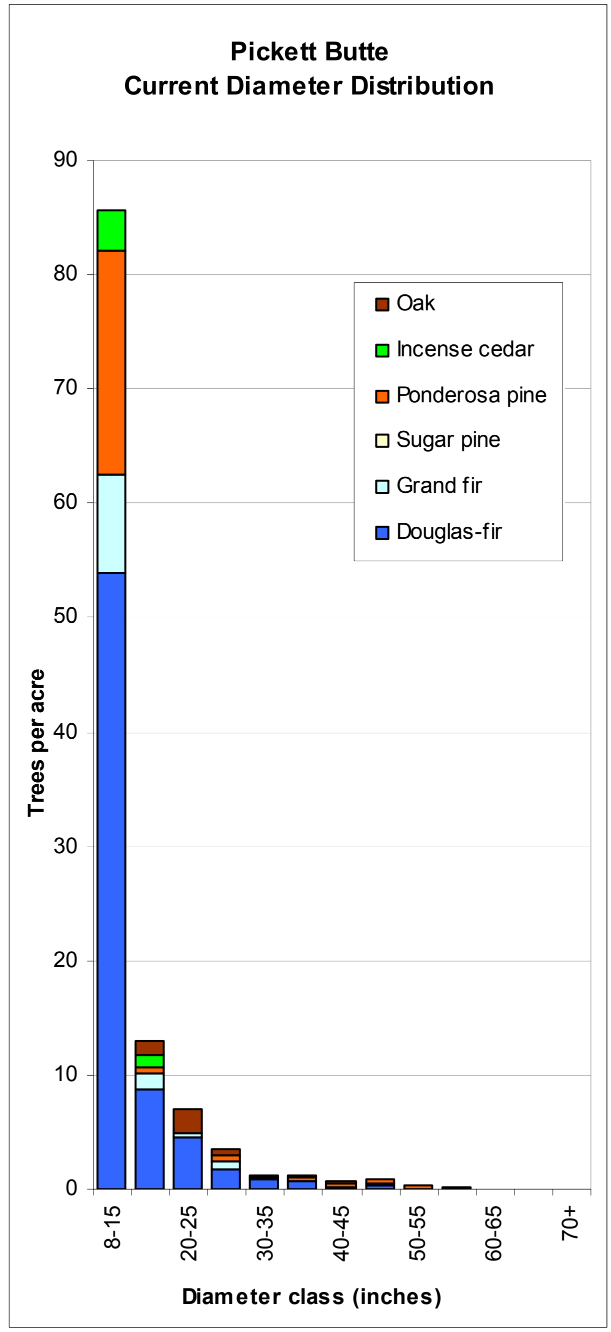


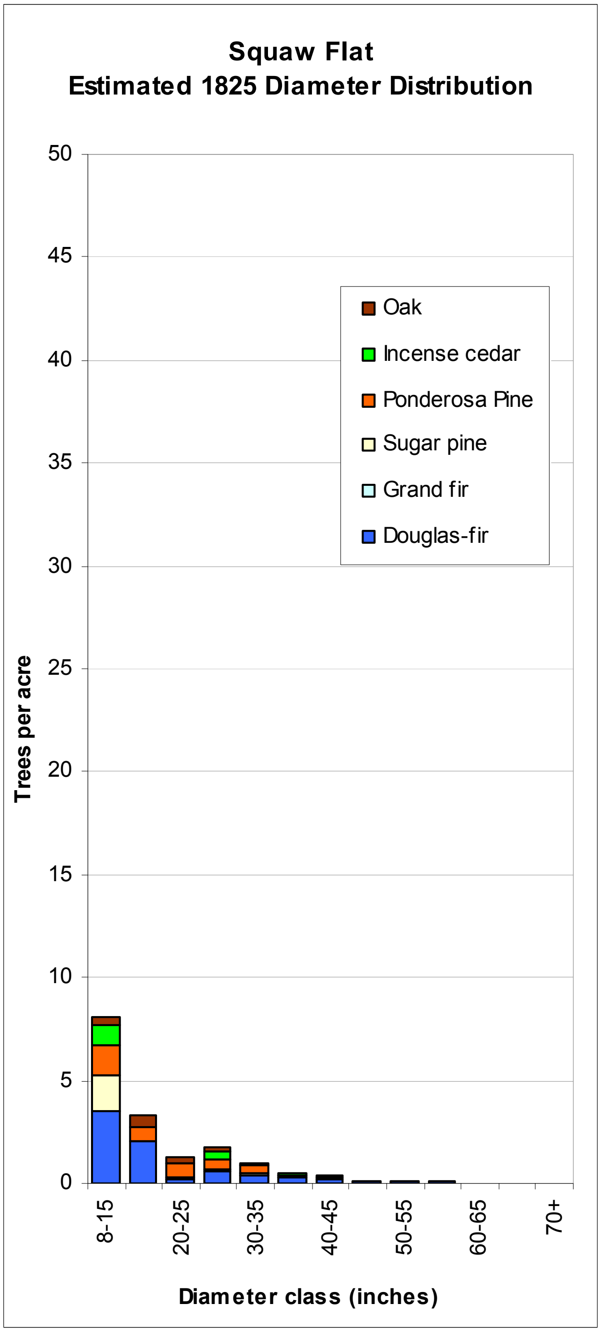
Table 8. Estimated trees per acre in 1825, by species, **Pickett Butte**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	1.2	0.0	0.5	0.6	0.2	0.1	1.0	3.6
15-20	0.6	0.0	0.1	0.3	0.1	0.0	0.4	1.4
20-25	0.2	0.0	0.1	0.3	0.2	0.0	0.1	0.8
25-30	0.1	0.0	0.1	0.5	0.1	0.0	0.3	1.0
30-35	0.4	0.0	0.1	0.3	0.1	0.0	0.2	1.0
35-40'	0.1	0.0	0.1	0.1	0.1	0.0	0.2	0.5
40-45	0.1	0.0	0.1	0.0	0.1	0.0	0.2	0.4
45-50	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1
50-55	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
55-60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	2.7	0.0	1.0	2.1	0.7	0.1	2.3	
							Grand Total	8.8

Table 9. Current trees per acre by species, **Pickett Butte**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	53.9	8.7	0.0	19.5	0.0	3.4	0.0	85.6
15-20	8.8	1.3	0.0	0.6	0.0	1.0	1.3	13.0
20-25	4.6	0.3	0.0	0.0	0.0	0.0	2.1	7.0
25-30	1.7	0.7	0.0	0.6	0.0	0.0	0.5	3.4
30-35	0.9	0.0	0.0	0.2	0.0	0.0	0.2	1.3
35-40'	0.7	0.0	0.0	0.4	0.0	0.0	0.1	1.2
40-45	0.1	0.0	0.0	0.4	0.0	0.0	0.1	0.6
45-50	0.4	0.0	0.2	0.3	0.0	0.0	0.0	0.9
50-55	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.4
55-60	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.2
60-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65-70	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	71.4	11.1	0.2	22.3	0.1	4.5	4.3	
							Grand Total	113.7

Figures 9 and 10. 1825 and current diameter distributions, **Squaw Flat**



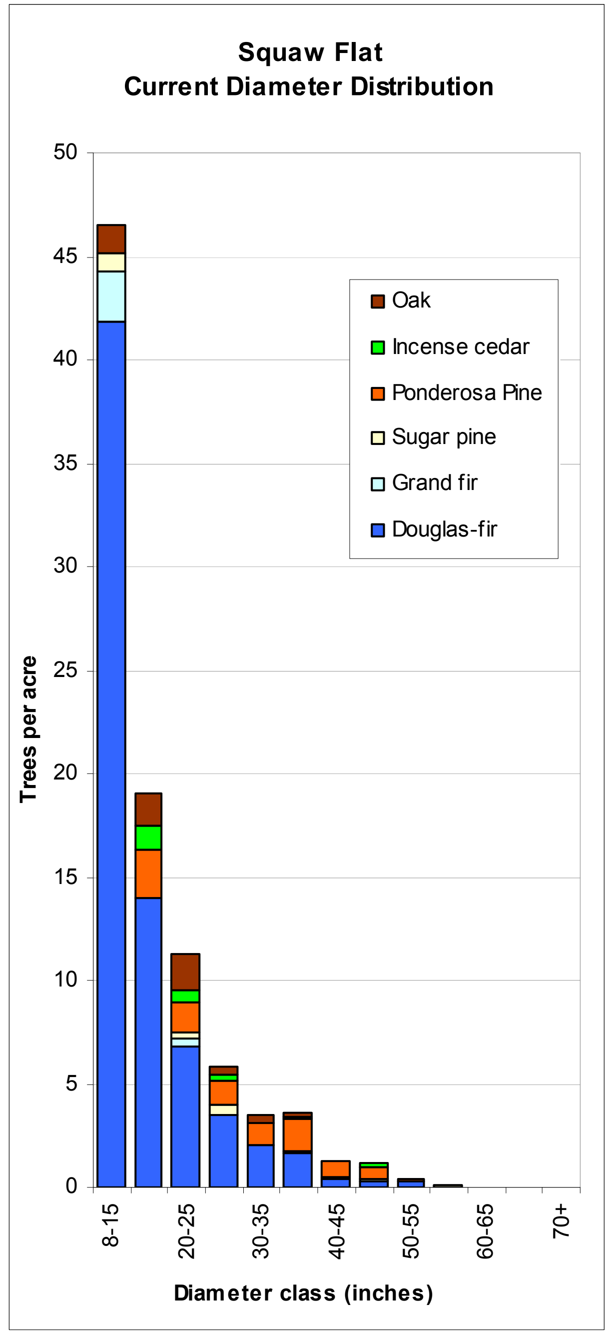


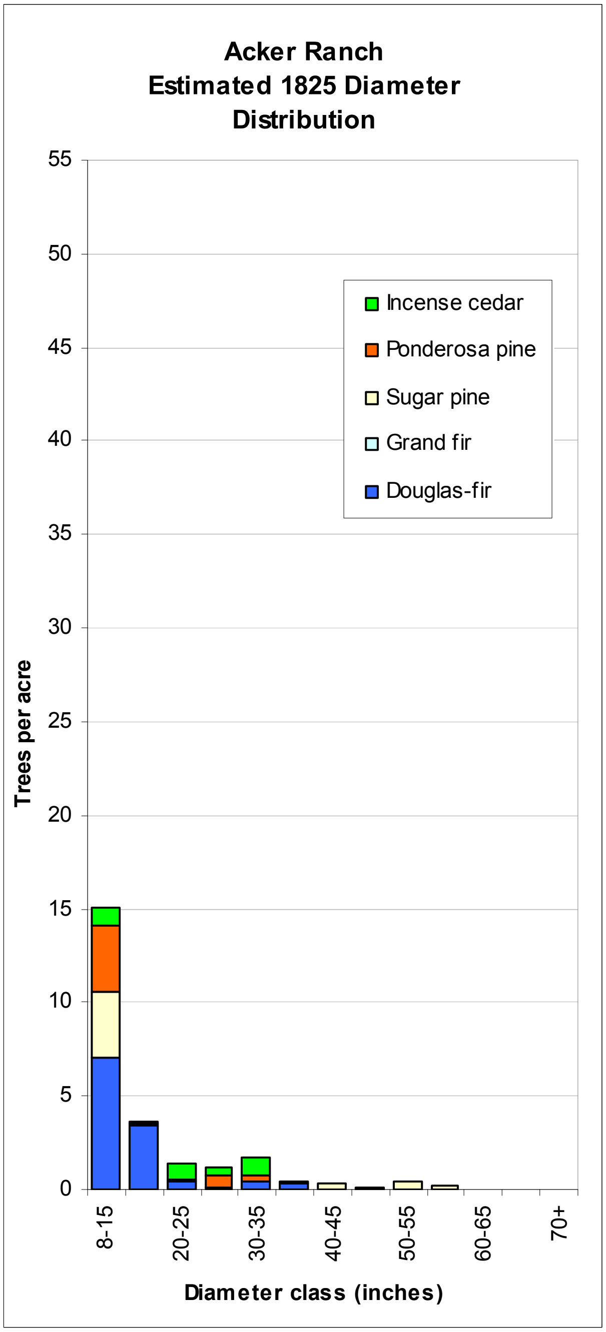
Table 10. Estimated trees per acre in 1825, by species, **Squaw Flat**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	3.5	0.0	1.8	1.4	0.0	1.0	1.0	8.7
15-20	2.0	0.0	0.1	0.6	0.0	0.2	0.1	2.9
20-25	0.2	0.0	0.1	0.7	0.0	0.1	0.1	1.0
25-30	0.5	0.0	0.1	0.6	0.0	0.3	0.3	1.9
30-35	0.3	0.0	0.1	0.4	0.0	0.1	0.1	1.0
35-40'	0.3	0.0	0.1	0.1	0.0	0.1	0.1	0.5
40-45	0.2	0.0	0.1	0.1	0.0	0.0	0.0	0.3
45-50	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1
50-55	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1
55-60	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
60-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	7.2	0.0	2.4	3.7	0.0	1.7	1.5	
							Grand Total	16.6

Table 11. Current trees per acre by species, **Squaw Flat**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	41.8	2.5	0.9	0.0	0.0	0.0	1.4	46.6
15-20	14.0	0.0	0.0	2.4	0.0	1.1	1.6	19.1
20-25	6.8	0.4	0.3	1.5	0.0	0.6	1.7	11.2
25-30	3.5	0.0	0.4	1.2	0.0	0.3	0.4	5.9
30-35	2.1	0.0	0.0	1.1	0.0	0.0	0.3	3.5
35-40'	1.6	0.0	0.1	1.6	0.0	0.1	0.1	3.5
40-45	0.4	0.0	0.1	0.8	0.0	0.0	0.0	1.3
45-50	0.3	0.0	0.1	0.6	0.0	0.2	0.0	1.2
50-55	0.2	0.0	0.1	0.1	0.0	0.0	0.0	0.4
55-60	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
60-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	70.7	2.9	2.0	9.2	0.0	2.4	5.6	
							Grand Total	92.7

Figures 11 and 12. 1825 and current diameter distributions, **Acker Ranch**



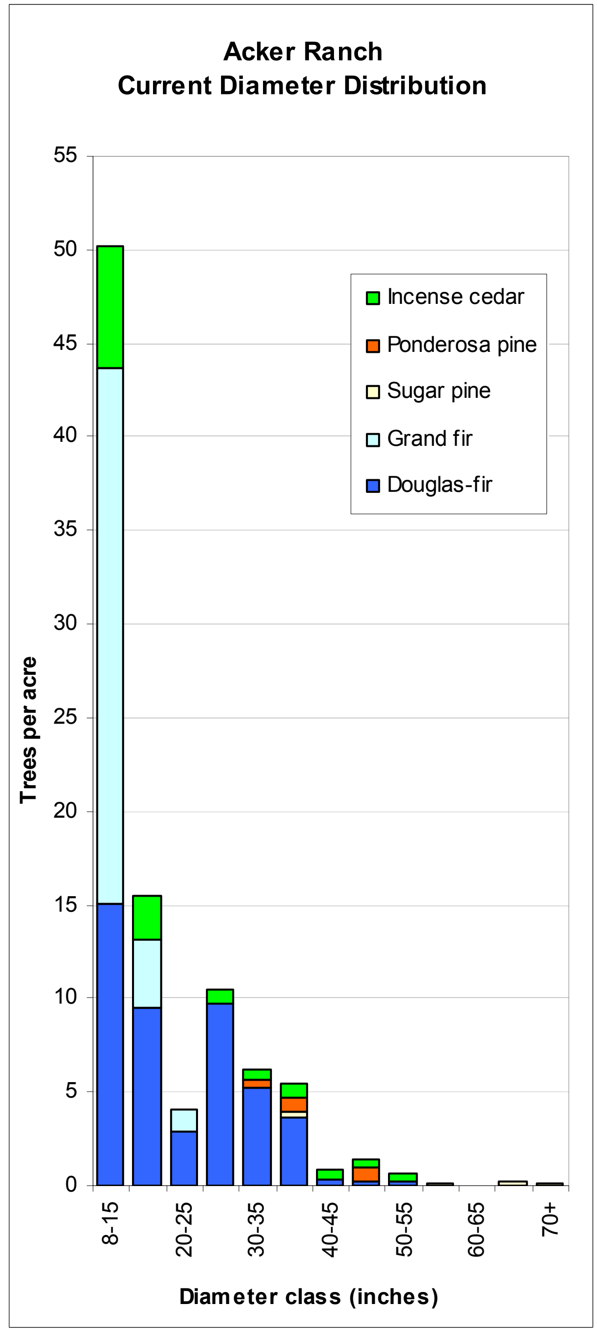


Table 12. Estimated trees per acre in 1825, by species, **Acker Ranch**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	7.0	0.0	3.6	3.5	0.0	1.0	0.0	15.1
15-20	3.5	0.0	0.1	0.1	0.0	0.1	0.0	3.6
20-25	0.5	0.0	0.1	0.1	0.0	0.8	0.0	1.4
25-30	0.1	0.0	0.1	0.7	0.0	0.4	0.0	1.2
30-35	0.4	0.0	0.1	0.3	0.0	0.9	0.0	1.7
35-40'	0.3	0.0	0.1	0.1	0.0	0.1	0.0	0.5
40-45	0.1	0.0	0.2	0.1	0.0	0.0	0.0	0.3
45-50	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1
50-55	0.1	0.0	0.4	0.0	0.0	0.0	0.0	0.4
55-60	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.2
60-65	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	11.9	0.0	4.7	4.7	0.0	3.3	0.0	
							Grand Total	24.5

Table 13. Current trees per acre by species, **Acker Ranch**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	15.1	28.6	0.0	0.0	0.0	6.5	0.0	50.2
15-20	9.6	3.6	0.0	0.0	0.0	2.3	0.0	15.5
20-25	2.8	1.2	0.0	0.0	0.0	0.0	0.0	4.1
25-30	9.8	0.0	0.0	0.0	0.0	0.7	0.0	10.4
30-35	5.2	0.0	0.0	0.5	0.0	0.5	0.0	6.2
35-40'	3.6	0.0	0.4	0.7	0.0	0.7	0.0	5.4
40-45	0.3	0.0	0.0	0.0	0.0	0.6	0.0	0.9
45-50	0.3	0.0	0.0	0.7	0.0	0.5	0.0	1.4
50-55	0.2	0.0	0.0	0.0	0.0	0.4	0.0	0.6
55-60	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2
60-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65-70	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2
70+	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Totals by sp.	46.8	33.4	0.9	1.8	0.0	12.2	0.0	
							Grand Total	95.2

Figures 13 and 14. 1825 and current diameter distributions, **Skookum Pond**

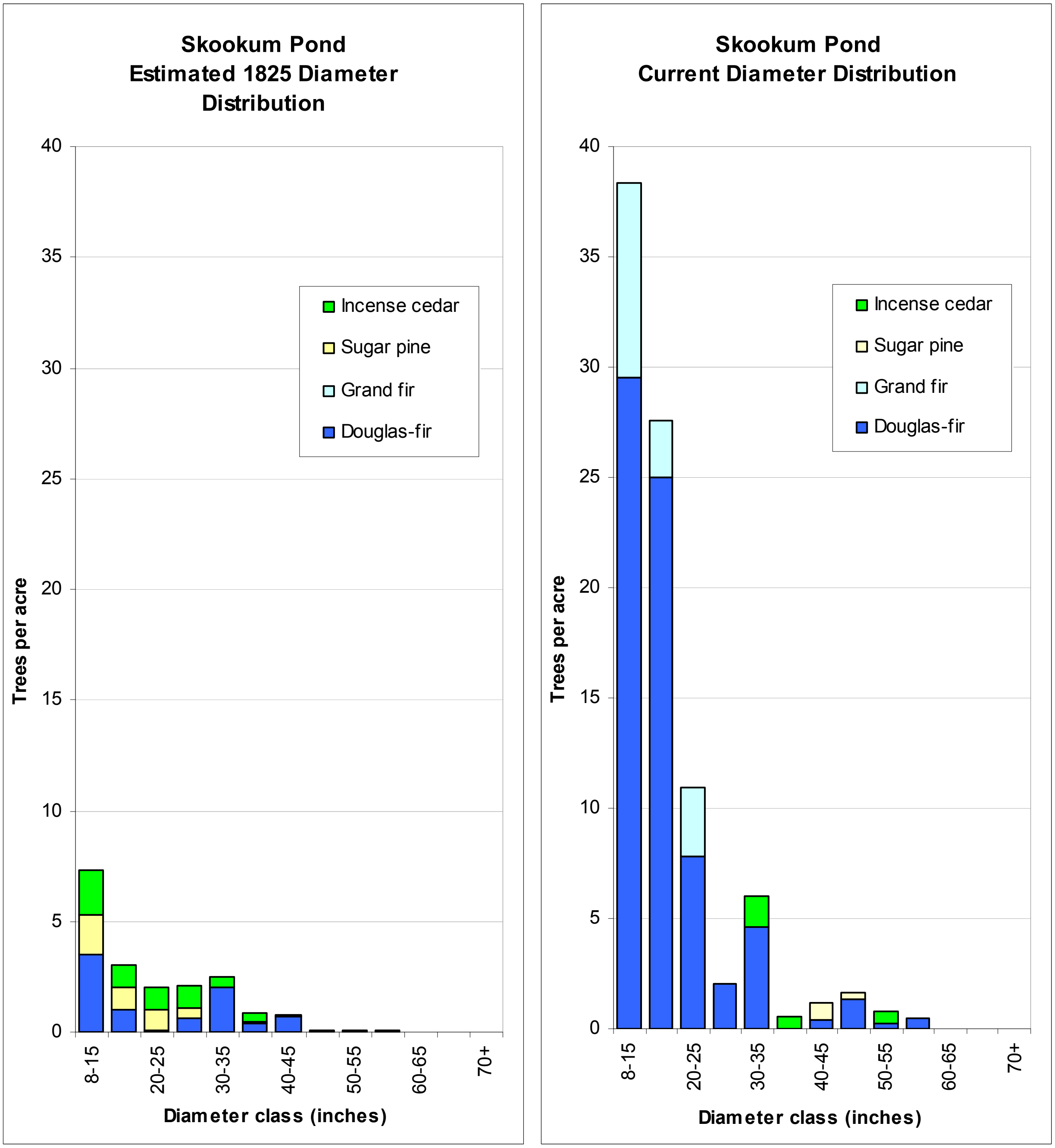


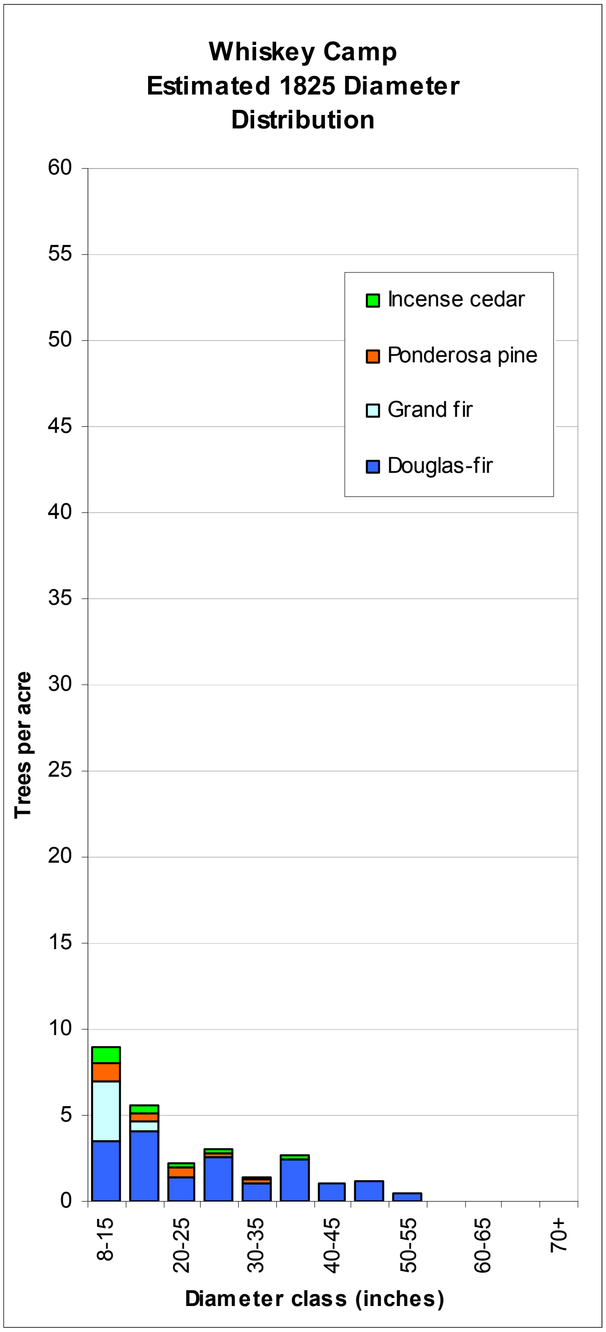
Table 14. Estimated trees per acre in 1825, by species, **Skookum Pond**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	3.5	0.0	1.8	0.0	0.0	2.0	0.0	7.3
15-20	1.0	0.0	1.0	0.0	0.0	1.0	0.0	3.0
20-25	0.1	0.0	1.0	0.0	0.0	1.0	0.0	2.1
25-30	0.6	0.0	0.5	0.0	0.0	1.0	0.0	2.1
30-35	2.0	0.0	0.1	0.0	0.0	0.4	0.0	2.5
35-40'	0.4	0.0	0.1	0.0	0.0	0.4	0.0	0.8
40-45	0.7	0.0	0.1	0.0	0.0	0.0	0.0	0.8
45-50	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1
50-55	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1
55-60	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
60-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	8.4	0.0	4.5	0.0	0.0	5.8	0.0	
							Grand Total	18.8

Table 15. Current trees per acre by species, **Skookum Pond**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	29.6	8.8	0.0	0.0	0.0	0.0	0.0	38.4
15-20	25.0	2.5	0.0	0.0	0.0	0.0	0.0	27.6
20-25	7.8	3.1	0.0	0.0	0.0	0.0	0.0	10.9
25-30	2.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
30-35	4.6	0.0	0.0	0.0	0.0	1.4	0.0	6.0
35-40'	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5
40-45	0.4	0.0	0.8	0.0	0.0	0.0	0.0	1.2
45-50	1.3	0.0	0.3	0.0	0.0	0.0	0.0	1.6
50-55	0.3	0.0	0.0	0.0	0.0	0.5	0.0	0.8
55-60	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5
60-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	71.6	14.5	1.1	0.0	0.0	2.4	0.0	
							Grand Total	89.6

Figures 15 and 16. 1825 and current diameter distributions, **Whiskey Camp**



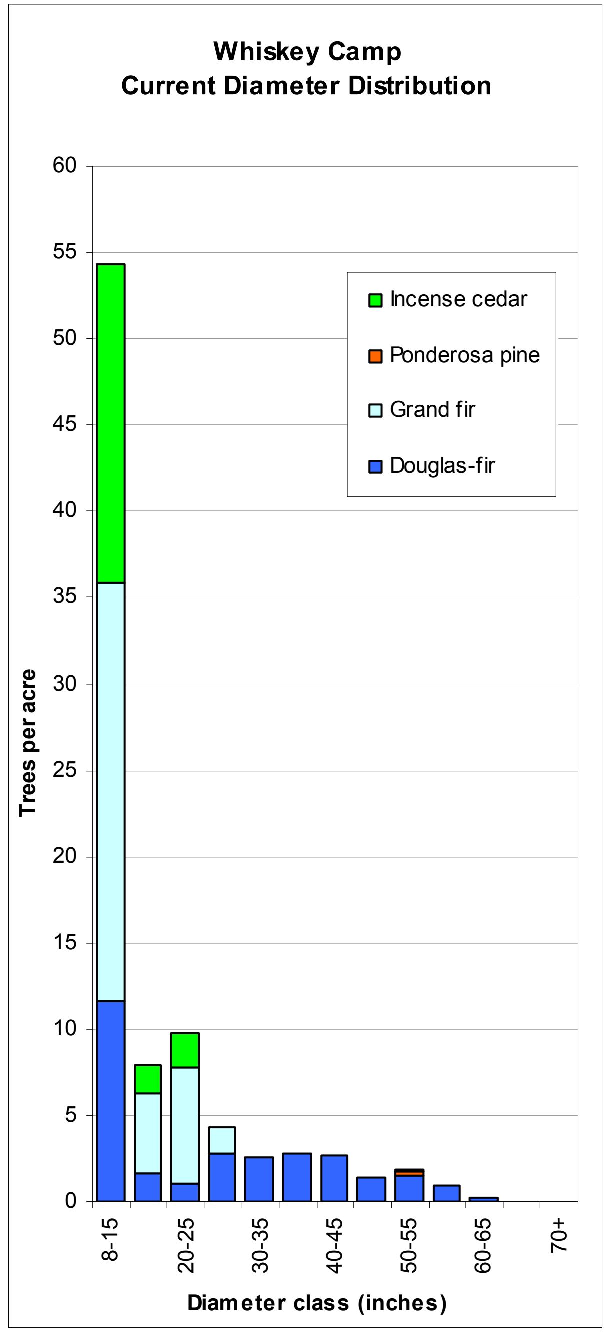


Table 16. Estimated trees per acre in 1825, by species, **Whiskey Camp**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	3.5	3.5	0.0	1.0	0.0	1.0	0.0	9.0
15-20	4.1	0.5	0.0	0.5	0.0	0.5	0.0	5.6
20-25	1.4	0.0	0.0	0.5	0.0	0.3	0.0	2.2
25-30	2.6	0.0	0.0	0.2	0.0	0.2	0.0	3.0
30-35	1.1	0.0	0.0	0.2	0.0	0.1	0.0	1.4
35-40'	2.5	0.0	0.0	0.0	0.0	0.3	0.0	2.7
40-45	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.1
45-50	1.2	0.0	0.0	0.0	0.0	0.0	0.0	1.2
50-55	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4
55-60	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
60-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	17.8	4.0	0.0	2.4	0.0	2.4	0.0	
							Grand Total	26.6

Table 17. Current trees per acre by species, **Whiskey Camp**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	Western red cedar	incense cedar	white/black oak	Totals by DBH class
8-15	11.5	24.3	0.0	0.0	0.0	18.6	0.0	54.4
15-20	1.6	4.7	0.0	0.0	0.0	1.6	0.0	7.9
20-25	1.1	6.7	0.0	0.0	0.0	2.0	0.0	9.7
25-30	2.8	1.5	0.0	0.0	0.0	0.0	0.0	4.3
30-35	2.5	0.0	0.0	0.0	0.0	0.0	0.0	2.5
35-40'	2.7	0.0	0.0	0.0	0.0	0.0	0.0	2.7
40-45	2.7	0.0	0.0	0.0	0.0	0.0	0.0	2.7
45-50	1.4	0.0	0.0	0.0	0.0	0.0	0.0	1.4
50-55	1.5	0.0	0.0	0.2	0.0	0.2	0.0	1.9
55-60	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.9
60-65	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	29.1	37.1	0.0	0.2	0.0	22.3	0.0	
							Grand Total	88.7

Figures 17 and 18. 1825 and current diameter distributions, **Huckleberry Lake**

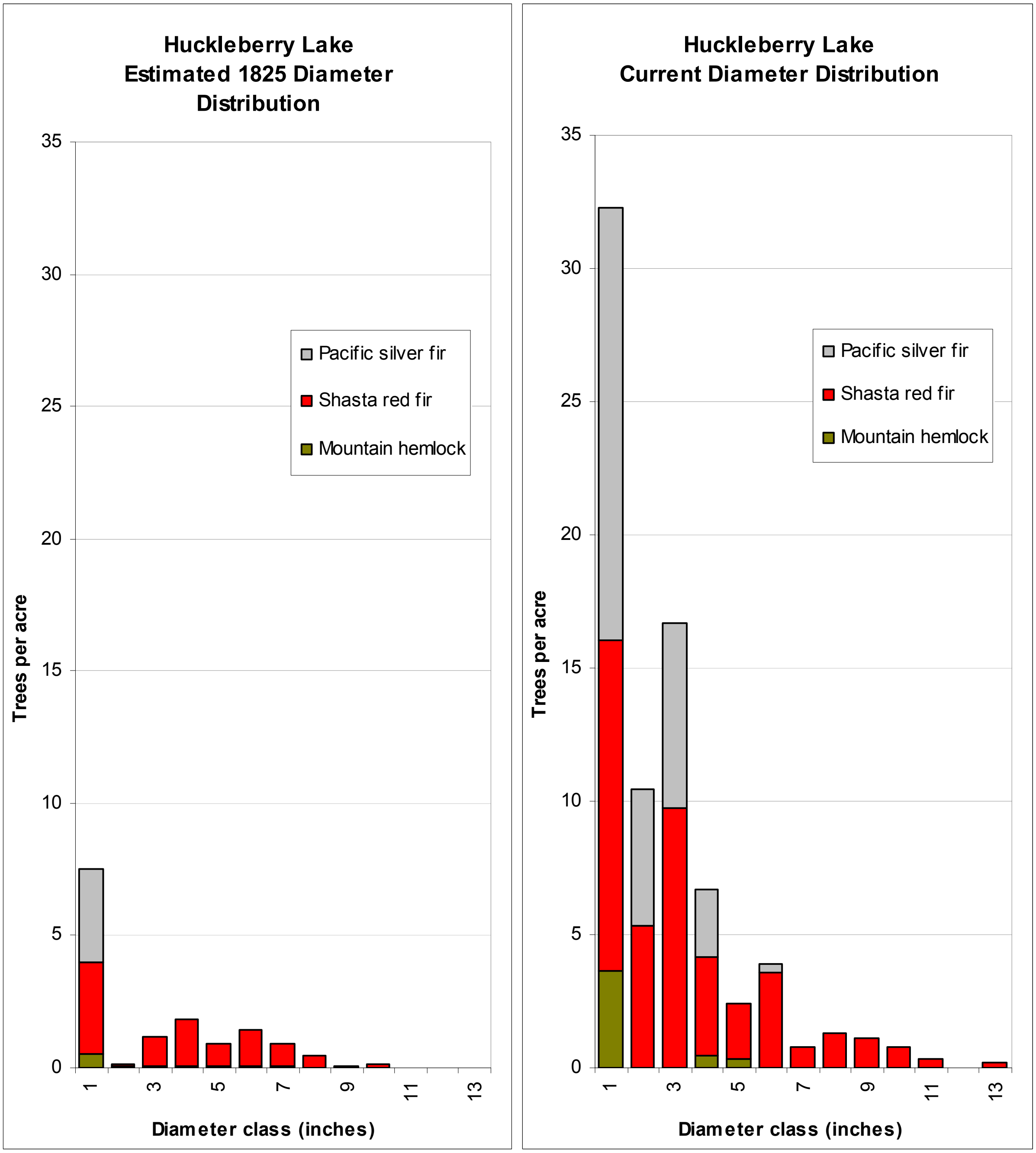


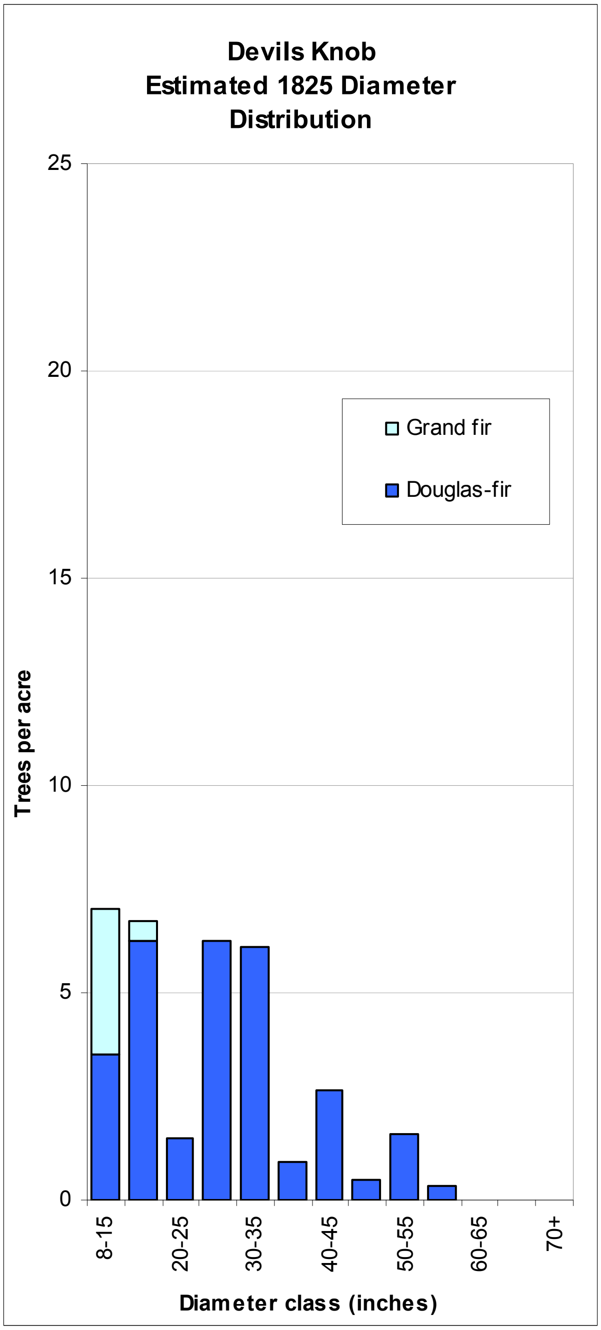
Table 18. Estimated trees per acre in 1825, by species, **Huckleberry Lake**

dbh (in.)	Shasta red fir	Pacific silver fir	sugar pine	ponderosa pine	mountain hemlock	incense cedar	white/black oak	Totals by DBH class
8-15	3.5	3.5	0.0	0.0	0.5	0.0	0.0	7.5
15-20	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.2
20-25	1.1	0.0	0.0	0.0	0.1	0.0	0.0	1.2
25-30	1.7	0.0	0.0	0.0	0.1	0.0	0.0	1.8
30-35	0.9	0.0	0.0	0.0	0.1	0.0	0.0	0.9
35-40'	1.4	0.0	0.0	0.0	0.1	0.0	0.0	1.4
40-45	0.8	0.0	0.0	0.0	0.1	0.0	0.0	0.9
45-50	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4
50-55	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
55-60	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
60-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	10.1	3.6	0.0	0.0	0.8	0.0	0.0	
							Grand Total	14.5

Table 19. Current trees per acre by species, **Huckleberry Lake**

dbh (in.)	Shasta red fir	Pacific silver fir	sugar pine	ponderosa pine	mountain hemlock	incense cedar	white/black oak	Totals by DBH class
8-15	12.3	16.3	0.0	0.0	3.7	0.0	0.0	32.3
15-20	5.3	5.1	0.0	0.0	0.0	0.0	0.0	10.5
20-25	9.7	7.0	0.0	0.0	0.0	0.0	0.0	16.7
25-30	3.7	2.5	0.0	0.0	0.4	0.0	0.0	6.7
30-35	2.1	0.0	0.0	0.0	0.3	0.0	0.0	2.4
35-40'	3.6	0.3	0.0	0.0	0.0	0.0	0.0	3.9
40-45	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.8
45-50	1.3	0.0	0.0	0.0	0.0	0.0	0.0	1.3
50-55	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.1
55-60	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.8
60-65	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totals by sp.	41.2	31.2	0.0	0.0	4.4	0.0	0.0	
							Grand Total	76.9

Figures 19 and 20. 1825 and current diameter distributions, **Devils Knob**



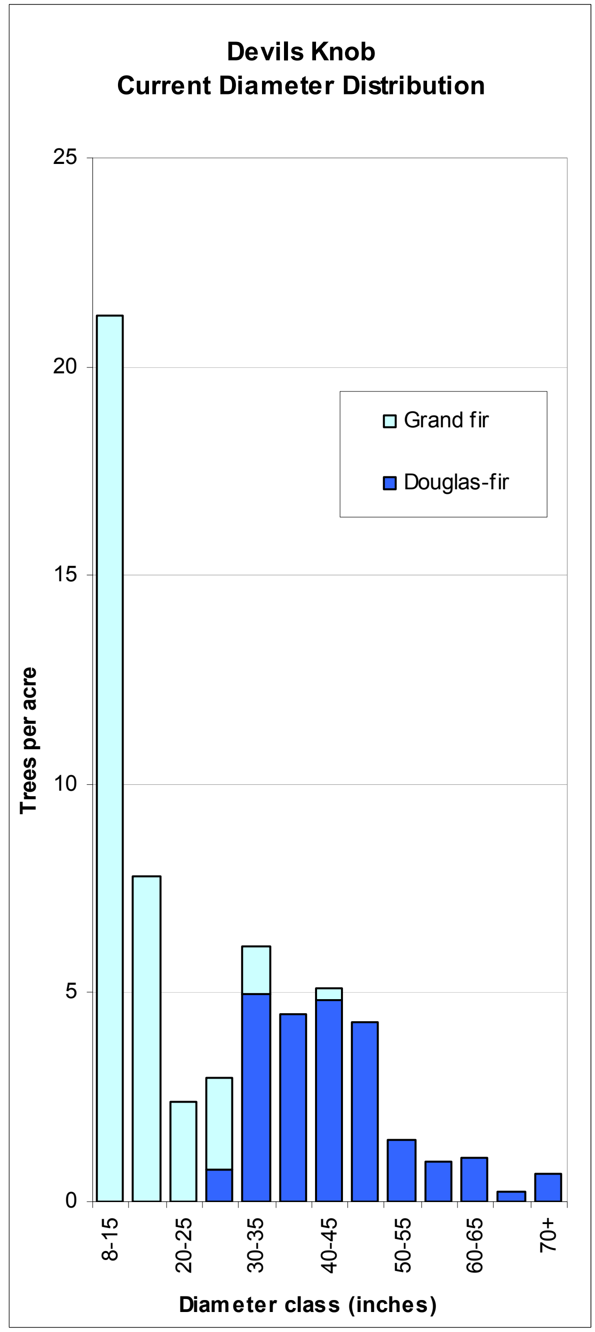


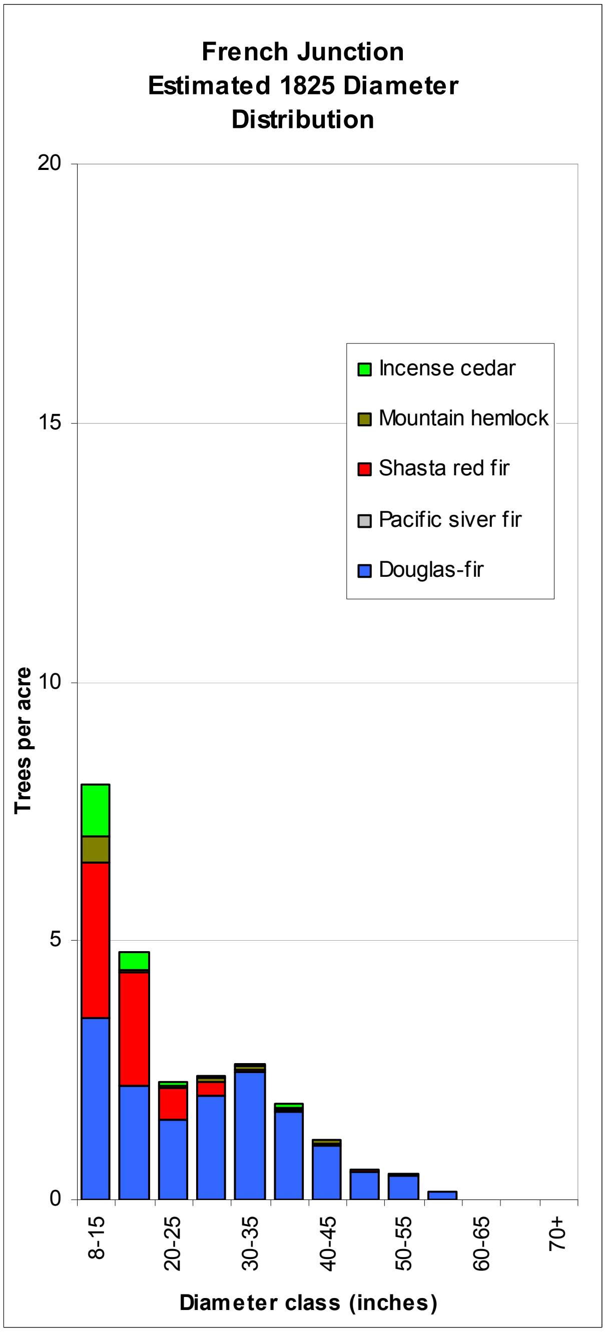
Table 20. Estimated trees per acre in 1825, by species, **Devils Knob**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	mountain hemlock	incense cedar	white/black oak	Totals by DBH class
8-15	3.5	3.5	0.0	0.0	0.0	0.0	0.0	7.0
15-20	6.2	0.5	0.0	0.0	0.0	0.0	0.0	6.7
20-25	1.5	0.0	0.0	0.0	0.0	0.0	0.0	1.5
25-30	6.3	0.0	0.0	0.0	0.0	0.0	0.0	6.3
30-35	6.1	0.0	0.0	0.0	0.0	0.0	0.0	6.1
35-40'	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.9
40-45	2.6	0.0	0.0	0.0	0.0	0.0	0.0	2.6
45-50	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5
50-55	1.6	0.0	0.0	0.0	0.0	0.0	0.0	1.6
55-60	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3
60-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	29.6	4.0	0.0	0.0	0.0	0.0	0.0	
							Grand Total	33.6

Table 21. Current trees per acre by species, **Devils Knob**

dbh (in.)	Douglas-fir	grand fir	sugar pine	ponderosa pine	mountain hemlock	incense cedar	white/black oak	Totals by DBH class
8-15	0.0	21.2	0.0	0.0	0.0	0.0	0.0	21.2
15-20	0.0	7.8	0.0	0.0	0.0	0.0	0.0	7.8
20-25	0.0	2.4	0.0	0.0	0.0	0.0	0.0	2.4
25-30	0.8	2.2	0.0	0.0	0.0	0.0	0.0	2.9
30-35	5.0	1.2	0.0	0.0	0.0	0.0	0.0	6.1
35-40'	4.5	0.0	0.0	0.0	0.0	0.0	0.0	4.5
40-45	4.8	0.3	0.0	0.0	0.0	0.0	0.0	5.1
45-50	4.3	0.0	0.0	0.0	0.0	0.0	0.0	4.3
50-55	1.5	0.0	0.0	0.0	0.0	0.0	0.0	1.5
55-60	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
60-65	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.1
65-70	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2
70+	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Totals by sp.	23.8	35.0	0.0	0.0	0.0	0.0	0.0	
							Grand Total	58.8

Figures 21 and 22. 1825 and current diameter distributions, **French Junction**



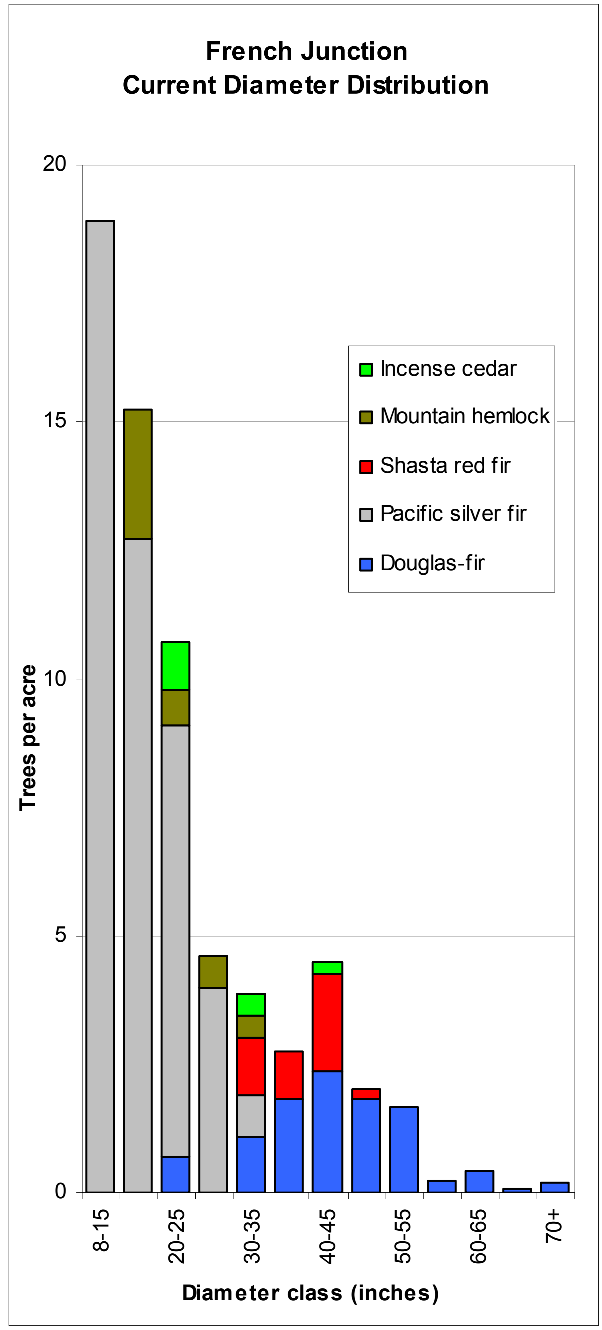


Table 22. Estimated trees per acre in 1825, by species, **French Junction**

dbh (in.)	Douglas-fir	Pacific silver fir	Shasta red fir	ponderosa pine	mountain hemlock	incense cedar	white/black oak	Totals by DBH class
8-15	3.5	0.0	3.0	0.0	0.5	1.0	0.0	8.0
15-20	2.2	0.0	2.2	0.0	0.1	0.3	0.0	4.8
20-25	1.5	0.0	0.6	0.0	0.1	0.1	0.0	2.3
25-30	2.0	0.0	0.3	0.0	0.1	0.1	0.0	2.4
30-35	2.5	0.0	0.1	0.0	0.1	0.1	0.0	2.6
35-40'	1.7	0.0	0.1	0.0	0.1	0.1	0.0	1.8
40-45	1.0	0.0	0.1	0.0	0.1	0.0	0.0	1.1
45-50	0.5	0.0	0.1	0.0	0.0	0.0	0.0	0.6
50-55	0.5	0.0	0.1	0.0	0.0	0.0	0.0	0.5
55-60	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
60-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totals by sp.	15.6	0.0	6.3	0.0	0.8	1.5	0.0	
							Grand Total	24.3

Table 23. Current trees per acre by species, **French Junction**

dbh (in.)	Douglas-fir	Pacific silver fir	Shasta red fir	ponderosa pine	mountain hemlock	incense cedar	white/black oak	Totals by DBH class
8-15	0.0	18.9	0.0	0.0	0.0	0.0	0.0	18.9
15-20	0.0	12.7	0.0	0.0	2.5	0.0	0.0	15.3
20-25	0.7	8.4	0.0	0.0	0.7	0.9	0.0	10.7
25-30	0.0	4.0	0.0	0.0	0.6	0.0	0.0	4.6
30-35	1.1	0.8	1.1	0.0	0.5	0.4	0.0	3.9
35-40'	1.8	0.0	0.9	0.0	0.0	0.0	0.0	2.7
40-45	2.4	0.0	1.9	0.0	0.0	0.2	0.0	4.5
45-50	1.8	0.0	0.2	0.0	0.0	0.0	0.0	2.0
50-55	1.7	0.0	0.0	0.0	0.0	0.0	0.0	1.7
55-60	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2
60-65	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4
65-70	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
70+	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totals by sp.	10.4	44.9	4.1	0.0	4.3	1.6	0.0	
							Grand Total	65.2

Appendix C.
Forest Service Bulletin by F. L. Moravets, May 16, 1932.

USDA Forest Service. SERVICE BULLETIN Vol. 16, No. 20. May 16, 1932

SECOND GROWTH DOUGLAS FIR FOLLOWS CESSATION OF INDIAN FIRES

By F. L. Moravets, Pacific Northwest For. Exp. Sta.

Whidby Island, once largely deforested by the Indians' repeated "light burning", is now well forested with second growth Douglas fir. It is a striking example of the ability of Douglas fir quickly to reclaim lands long scourged by fire, after the periodic burning ceased. This was noted by the author in the course of type mapping Island County, Washington, in connection with the Forest Survey of the Douglas Fir Region.

This island, the second largest in Continental United States, is approximately 110,000 acres in area. The greater portion of the islands is covered with even-aged stands of second growth Douglas fir, most of which range from 65 to 80 years in age. In practically all of these stands no evidence of previous occupation by old growth Douglas fir was to be found and apparently the areas had been deforested at one time.

This assumption was verified by questioning Charlie Snakelum, the oldest and probably the last survivor of the Indians who occupied the island before the white men came. Old Charlie, over 90 years of age, antedates the second growth stands, and still retaining full possission of his faculties, can plainly recall conditions on the island in his boyhood. Like many aborigines, he has a remarkable memory but, unlike others, he is quite garrulous.

Many of the Puget Sound Indians used the island for a hunting ground and it was also the location of an annual "potlatch" attended by many of the neighboring tribes. Deer were plentiful and large portions of the island were burned over annually to make better hunting. Charlie recalls the time when areas now forested were treeless grass plains. The white settlers located on the better soil from 1850 to 1860 and repeated history by gradually driving the Indians out, stopping the practice of light burning. A scattering stand of relict firs provided seed, and, with the strong prevailing winds disseminating the seed, the denuded areas were soon reclaimed.

Charlie pointed out one area of considerable size slashed by him for a white settler some fifty years ago, which was abandoned after a few years and now supports a dense stand of 40-year old fir. This same condition may be observed on many of the larger islands of Puget Sound, other parts of Washington, and in the Willamette Valley, Oregon.

Practically all of the forest area of these islands was found to be of low site, sites IV and V predominating; consequently, growth is slow, the stands densely stocked, and thinning a slow process. It is not uncommon to find 70-year old trees only four inches in diameter and forty feet high. Stump rot is common in the young stands and what mature trees are found are likely to be defective and wind-skahen. At present the principal use of these stands is fuel wood for lime kilns operating on some of the islands. The young stands can be utilized to some extent for piling.