

**Precontact History and Cultural Legacy  
of Forest Research Sites in Southwestern Oregon<sup>1</sup>**

**Report by Bob Zybach,  
NW Maps Co.**



**Prepared for Mike Newton,  
Oregon State University College of Forestry  
March 16, 2007**

<sup>1</sup> This research was funded by the USDI Bureau of Land Management, Roseburg, Oregon, Oregon State University Department of Forest Science, Corvallis, Oregon, and Oregon Websites and Watersheds Project, Inc., Philomath, Oregon.

# Precontact History and Cultural Legacy of Forest Research Sites in Southwestern Oregon



## Contents

<b>Online Resources Index</b>	<i>i</i>
<b>Introduction</b>	<b>1</b>
<b>Purpose</b>	<b>3</b>
<b>1. Native cultural history</b>	<b>4</b>
<b>2. Types of plants and landscape disturbances</b>	<b>5</b>
<b>3. Manzanita (madrone, and tanoak)</b>	<b>8</b>
<b>4. Presumed management objectives</b>	<b>9</b>
<b>5. Contributing factors</b>	<b>11</b>
<b>6. What Happened (esp. 1850-1856)?</b>	<b>13</b>
<b>7. Huge cultural legacy</b>	<b>18</b>
<b>8. Using traditional methods to achieve modern objectives</b>	<b>19</b>
<b>References</b>	<b>21</b>
<b>Appendix A. People</b>	<b>24</b>
<b>Appendix B. Places</b>	<b>31</b>
<b>Appendix C. Plants</b>	<b>39</b>
<b>Appendix D. Chronology</b>	<b>53</b>

## Report Online Resources Index

### Report Homepage:

[http://www.NWMapsCo.com/ZybachB/Reports/2007\\_Newton\\_OSU-BLM/](http://www.NWMapsCo.com/ZybachB/Reports/2007_Newton_OSU-BLM/)

### Maps:

[http://www.NWMapsCo.com/ZybachB/Reports/2007\\_Newton\\_OSU-BLM/Maps/index.html](http://www.NWMapsCo.com/ZybachB/Reports/2007_Newton_OSU-BLM/Maps/index.html)

### 1854-1882 General Land Office (GLO) survey notes index:

[http://www.NWMapsCo.com/ZybachB/Reports/2007\\_Newton\\_OSU-BLM/Maps/GLO\\_Survey\\_Notes/index.html](http://www.NWMapsCo.com/ZybachB/Reports/2007_Newton_OSU-BLM/Maps/GLO_Survey_Notes/index.html)

### 1854-1882 GLO survey notes tabular summaries:

[http://www.NWMapsCo.com/ZybachB/Reports/2007\\_Newton\\_OSU-BLM/Maps/GLO\\_Survey\\_Notes/Diameter\\_Classes.html](http://www.NWMapsCo.com/ZybachB/Reports/2007_Newton_OSU-BLM/Maps/GLO_Survey_Notes/Diameter_Classes.html)

### 1915 Timber cruise data and tables:

[http://www.NWMapsCo.com/ZybachB/Reports/2007\\_Newton\\_OSU-BLM/Maps/Cow\\_Creek/Timber\\_Cruises.html](http://www.NWMapsCo.com/ZybachB/Reports/2007_Newton_OSU-BLM/Maps/Cow_Creek/Timber_Cruises.html)

### Walling 1826-1884 cultural landscape patterns:

[http://www.ORWW.org/History/SW\\_Oregon/References/Walling\\_1884/Illustrations/](http://www.ORWW.org/History/SW_Oregon/References/Walling_1884/Illustrations/)

### 1850-1856 Rogue River Indian War documentation:

[http://www.ORWW.org/History/SW\\_Oregon/Rogue\\_Indian\\_Wars/Correspondence/index.html](http://www.ORWW.org/History/SW_Oregon/Rogue_Indian_Wars/Correspondence/index.html)

## Introduction

This report regards the forest history of a portion of southwest Oregon that includes three groups of long-term silviculture research study plots. These plots were established on USDI Bureau of Land Management (BLM) forestland in 1980 and 1981 by Professors Mike Newton and John Tappeiner, and have provided study material for a number of Oregon State University graduate students. The initial purpose of the studies were to measure growth and survival of conifers under varying levels of competition between waxy-leaved “sclerophyll” vegetation (specifically whiteleaf manzanita, Pacific madrone, and tanoak) and commercial conifer species (Douglas-fir and ponderosa pine).

The principal purpose of this report is to develop supportable hypotheses and identify key sources of information regarding the landscape history of that portion of southwest Oregon, with a focus on the areas of long-term forest research plots. This report outlines human and natural disturbances that shaped the forests as they were found by European-American (“white”) explorers and immigrants in early historical time (1827 to 1856), and as they probably were present in late precontact time (ca. 1500 to 1825), based on a wide range of historical, botanical, and anthropological documents. It is not intended to be comprehensive or exhaustive, but rather, to be representative of information in the documentary record in the event future research efforts become feasible. The summary and references are complemented by sources too voluminous to include in this report, but which are referenced in citations that may be found on the author’s website and the [www.ORWW.org](http://www.ORWW.org) educational website.

The focus herein is on historical and anthropological reports that describe local American Indian (“Indian”) populations, their general activities during late precontact and early historical time, and the places where such activities affected landscape patterns of vegetation. The cultural and ecological focus is on plants favored by local families, their management, and the influence of human activities on subsequent plant cover on a landscape scale, and over centuries. Such an interpretation must be keyed on the kinds of vegetation local communities could both manage and utilize. The disturbances created by native people were not confined to their homesites, food patches, or fuel-wood supplies, especially as concerns the role of fires and emergence of fire-dependent woodlands; the role of fire in native cultivation patterns is well documented here as it is in modern shifting agricultural communities elsewhere today. While the locations of the silvicultural studies are highly specific, precontact and early historical human influences must be regarded as general.

Local names of all plants are generally used in this report because most records researched for this report do not typically use scientific names; and because exact species cannot always be determined for named plants. Similarly, English measures of inches, feet, board-feet, acres, and miles are used instead of metric measures because all of the historic and technical survey and cruise data surveyed for this report, without exception, used English measures.

**Location.** The general location of this study is that portion of southwest Oregon that includes the Illinois and Applegate rivers, Bear Creek, Galice Creek, Rogue River, Cow Creek, and South Umpqua subbasins within Douglas, Jackson, and Josephine counties (see Maps). The three study areas are described in greater detail below, and are named China Gulch, Humbug, and Shoestring.

**China Gulch.** This study area is located in Tsp. 38 S., Rng. 3 W., Sec. 21, in the Applegate River subbasin of the Rogue River basin. It is on a southerly, low elevation slope near the northern extent of the Applegate Valley floor. These plots are located on gently sloping land, close – and readily accessible -- to major travel routes and to historical and precontact settlements. Much of this general area was likely burned annually for seed crops (tarweed, sunflower, grasses), tilled for root and bulb crops, and/or used to raise fields of fuelwoods, nut crops, berries, or weaving materials. Long-term test plots of manzanita, ponderosa pine, and Douglas-fir competition were partly compromised by inadvertent BLM management actions a few years ago.

**Humbug.** This study area is located a few miles northwest of China Gulch, in Tsp. 38 S., Rng. 4 W., Secs. 12 and 13. It is also a southerly slope of the Applegate subbasin, but it is mid-elevation, variable slope, and more isolated from human activity than China Gulch. It is well-aligned with local historical trail networks and has a named spring nearby, and may have served as a camping site; regular use as a source of acorns, manzanita fruits, or firewood is likely, and seed, root, and bulb crops are also likely. Large ponderosa pine may have grown in the area. Test plots are for pine, Douglas-fir, and manzanita; after 26 years, Douglas-fir has mostly died.

**Shoestring.** This study area is located forty miles north of China Gulch and Humbug (one or two days' travel by foot), on Tsp. 31 S., Rng 6 W., Sec. 1. These plots are at a higher elevation, on much steeper ground, with very shallow soil and a westerly aspect. It is an area that has been in forested condition for several centuries, with a wide diversity of both hardwood and conifer species dominated by Pacific madrone and Douglas-fir. The plots are located close to Cow Creek Valley settlements and are easily reached by ridgeline trail. Douglas-fir, sugar pine, ponderosa pine, canyon liveoak and madrone are the most common local tree species; Douglas-fir and madrone are the focus of research plots. The area was likely used seasonally for nut, berry, firewood, and fiber gathering purposes, and incidentally for travel purposes.

## **Purpose**

This report has been assembled to present a general landscape history of southwest Oregon in order to help provide cultural, spatial, and temporal context to a long-term forest research project in the region. Objectives are to:

- 1) Develop basic facts and hypotheses for a general forest history of southwest Oregon landscape, including three primary study areas;
- 2) Identify key sources of information providing more detailed responses to listed hypotheses;
- 3) Provide representative samples of the types of information that can be queried, and discussion of the relative reliability of such sources.

## 1. Native cultural history.

People have lived in southwest Oregon for more than 10,000 years. During the great majority of that time the principal tools and products of these people were derived from three principal sources: local plants and animals, and stone (lithics). Fire was a key tool used to manage the landscape, and stable populations of key plants were maintained for millennia in localized settings, as evidenced by ancient pollens, other fossils, and archaeological evidence (See App. C and App. D).

The area of land that is used and managed for vegetation depends on the number and location of local human populations at daily and seasonal times. Cultural differences also have a bearing. For example, it is thought that the Takelma may have had more similarities with Kalapuyan managers of oak, camas, and tarweed, than with Athapaskans, who may have tended more toward fishing and hunting, and managed vegetation less aggressively.

There is strong evidence of both reduced populations and of changing cultures in southwest Oregon during late precontact and early historical time. Pioneer field anthropologist John Harrington, for example, 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.”*

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”*

The available evidence in these two regards is used to analyze cultural landscape patterns for particular time periods later in this report.

## 2. Types of plants and landscape disturbances.

This topic is addressed in greater detail in Appendix C. Plants. Kat Anderson's book, Tending the Wild, on traditional methods of Indian management of northern California plant species, seems directly applicable to precontact management of southwest Oregon plants – which are largely the same, or very similar, species -- as well. Her work is bolstered by the work of others, including Connolly (1988; 2007: personal communications), Lake (2007; 2007: personal communications), Todt and Hannon (1988), LaLande (1991), Martinez (1993), and Pullen (1996). The brief outline and responses below are simple summaries of Appendix C. and of these authorities.

**Bulbs & Roots.** Camas, tiger lily, and cat's ears were all favored bulbs used for eating by southwest Oregon Indians. Such bulbs existed in mostly-pure stands of dozens or hundreds of acres and were dug by the ton every year. "Roots" included wild carrots, cat-tails, 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.

**Seeds & Nuts.** Seeds were most prized from tarweed and sunflowers, which were burned annually over hundreds or thousands of acres. Oak, hazel, myrtle, chinquapin, and sugar pine all produced nuts of great value, and were systematically harvested and processed seasonally throughout the great lower and middle elevation expanses of groves, orchards, stands, and woodlands of these species that existed throughout the region. Burning was done almost annually in many of these areas, although hazel sticks and other plant materials harvested two years after burning were prized by many weavers.

**Fruits & Berries.** All fruits and berries produced by native plants in southwest Oregon seem to have been used by local people. Manzanita berries for cider, huckleberries, salal, strawberries, choke cherries, blackberries, 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.

**Stalks, Greens & Bark.** Sunflower stalks, miner's lettuce, clover greens, and the cambium bark of willow, ponderosa pine, and sugar pine were all favored foods. Bark was often prepared by baking or roasting, but the others were often eaten fresh, or with minor preparation.

**Construction Fibers.** Beargrass, willow sticks, hazel, cedar bark, Oregon iris, and many other parts of shrubs, trees, and grasses were used 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, fishline, rope, mats, platters, seed beaters, temporary housing, and numerous solid wood and stem products. A community's weavers were able to put together a reasonable lifestyle fairly quickly, no matter the plants that were made available; but particularly if they were given 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 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. Riverine areas and seashores provided driftwood from distant forests, but otherwise grasses, deadfall, limbs, etc., had to 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 likely gathering places in spring, following winter storms. 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 California and southwest Oregon.



**Miscellaneous Products.** Plants were also used for medicines, dyes, poultices, musical instruments, home construction, bows, arrows, toys, tools, weapons, art, and any other manner imagined.

**Tillage.** As briefly discussed above, in “Bulbs & Roots,” tillage was practiced seasonally over large areas, to harvest underground plant foods and products. These areas were mostly confined to riparian floodplains, low elevation benches, meadows, ridgelines, and grassy peaks. Often, this produced a near-monoculture result, such as with camas or bracken fern prairies. The constant turning of soil over generations may have aided in soil fertility and carbon retention during that time.

**Pruning & Harvesting.** 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 over time, 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, as with manzanita.

**Broadcast Burning.** Areas of annual seed production, particularly fields of tarweed and sunflowers, were burned annually over large acreages. Bracken fern was also burned annually in the Oregon Coast Range, but it is unknown how the plant was managed in southwest Oregon, if at all. Oak woodlands, riparian prairies, benches, and ridgeline grasslands were often burned annually, too, to clear leaves, kill competing trees and shrubs, produce forage for deer and elk, and to make acorn and hazel nut harvesting easier. In large pine stands, surface burning was done whenever needles became thick enough to sustain flame. Broadcast burning was done for hunting purposes, to cure nuts and seeds, and for other reasons as well, but the practices just mentioned accounted for the burning of thousands of contiguous acres annually throughout all of southwest Oregon. Leiberg, for example, observed in 1899:

*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.*

**Patch Burning.** Berry patches, hazel stands, 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; huckleberries were burned to stimulate berry growth; hazel and beargrass was burned to produce weaving materials. Cumulatively, these practices totaled hundreds or thousands of acres a year in southwest Oregon.

**Cooking & Heating.** See “Fuel” above. Wood was systematically gathered over a wide area on a daily and seasonal basis, and then burned in localized ovens and firepits, principally for cooking, heating, and lighting purposes. Between seasonal broadcast burning and daily firewood use, large areas around homes, fields, settlements, campgrounds, and travel routes were virtually fuel-free during much of the year, and were largely unaffected by wildfire as a result.

**Non-human Disturbances.** All of the landscape-scale disturbances described above are human in origin. Other landscape pattern-altering disturbances include lightning fires, heavy winds, heavy snows, freezes, droughts, bugs, bears, beavers, and diseases. The incremental and cumulative effects of both types of disturbance result in relatively stable, diverse, and productive patterns of landscape vegetation over time.

### 3. Manzanita (madrone, and tanoak).

Whiteleaf manzanita (“manzanita”) is of particular interest to this study because it is the principal competitor with Douglas-fir and ponderosa pine (“pine”) in the China Gulch and Humbug study areas. In recent years significant research has begun to center on manzanita use and management by precontact northern California and southwestern Oregon people by Lake (personal communication), Anderson (2005), Pullen (1996), and others. Madrone and tanoak were the other two competitive sclerophyll vegetation species considered in this study, but less is known about the precontact cultural uses of madrone than manzanita at this time, and tanoak is widely known for its production of edible acorns (See App. C).

**Manzanita as Food.** 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.”*

**Manzanita as Fuel.** See following discussions of “objectives” (parts 4 and 8).

**Tanoak as Food.** Another early ethnographic interview, by Harrington, recorded a method of patch burning used to prepare tanoak acorns for eating (Pullen 1996, I: 31):

*“Taprivna, special name for tanoak acorns after a fire has burnt the leaves off the ground. They are good eating, are kind of sour. A piece of dried salmon and a few of these acorns taste pretty good. They wait till these acorns have fallen from the trees and then set fire to the leaves and it roasts them thus.”*

#### 4. Presumed management objectives.

Land and plant management objectives were discussed in previous pages, in reference to native plants, food and fiber production, and disturbance. 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.”*

Leiberg (1899), a highly accomplished forester and botanist, discussed hunting, berry production, brush control, stand maintenance, and browse production (mentioned prominently by many Indian informants to early anthropologists as a method of improving deer numbers and hunting) as apparent uses of landscape fire by southwest Oregon Indians:

*(p. 277) 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.*

*(p. 250) The more open oak growths, where they form a fringe between the yellow pine and the nonforested semiarid tracts of the Rogue River Valley are from 95 to 100 per cent pure growth.*

*(p. 278) 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 plains or levels probably was to keep down the underbrush in the forest and facilitate hunting.*

*(p. 288) Another after-affect of fires consists in the substitution of grass-covered tracts for the former forest cover. This feature may be observed everywhere along the upper slopes and summits of the Cascades and the Siskiyou in this region. The growth is often grass, but much more commonly it is low growing mountain sedges or a mixture of both.*

Leiberg’s observations of regular fire being used to maintain distinct stands of pure oak was confirmed by a local (northwest California Yurok) Indian historian, Chenawah Weitchahwah (“Lucy Thompson”), in her 1916 memoirs (Thompson 1991: 33):

*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 all the open lands.*

Other objectives, both recognized and presumed, are discussed in more detail in the Appendices and in the following sections of this report.

## 5. Contributing factors.

There are several contributing factors as to what grows where in a forest environment in southwest Oregon. These factors were critical to the survival of all past generations of people; before the advent of metal tools, livestock, exotic plant species, and other technical changes associated with white contact in the 1770s and thereafter. The following list gives a brief description of some of the principal contributing factors affecting local southwest Oregon landscape management during precontact time.

**Weather (and climate).** Southwest Oregon weather is well-known as representing a Mediterranean-type climate. That is, two seasons a year: wet and dry; but with seasonal snow and heavy rains in higher elevations, and very dry with low humidity during much of the remainder of the year. All of the plants prized and used by local Indian families during the past 10,000 years are well adapted to Mediterranean climates: oak; sugar pine; bulbs; manzanita; Douglas-fir, madrone, annual grasses and wildflowers; berries, etc.

[http://www.ORWW.org/History/SW\\_Oregon/References/Walling\\_1884/Illustrations/Climate\\_300.jpg](http://www.ORWW.org/History/SW_Oregon/References/Walling_1884/Illustrations/Climate_300.jpg)

During the past few decades there has been much discussion regarding the Little Ice Age as a factor in establishing local forest stands (Tom Atzet, personal communications), or affecting their age or migration history. If such an effect actually exists, it would have seemingly been outweighed by local cultural activities, as documented in this report. Additional evidence of relatively stable patterns of trees and other vascular plants in southwest Oregon over the past 10,000 years include pollen studies, fossils, and archaeological data. In their (formerly) 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.*" My own research on the Oregon Coast Range, to the immediate north of southwest Oregon—and also including the past 500 year period -- supports this conclusion.

**Native Plants.** Native vascular plant populations are among the most diverse in Oregon, for a variety of reasons, including current assemblages of ice-age refugia. Human populations capitalized on those species that were most productive and sustainable, either limiting or preserving diversity, over time.

**Soil.** Serpentine soils are common throughout southwest Oregon, greatly affecting the types of species and plants that grow upon them. No attempt was made to document different cultural plant species or management approaches that may have been affected by these soils.

**Aspect.** Aspect is one of the more obvious factors affecting land management practices and results in southwest Oregon. The poet Joaquin Miller summed these differences up as well as anyone in 1873, when he wrote (Pullen 1996, III: 23):

*"Any one who frequents the mountains of the north [Klamath-Siskiyou Mountains] will soon notice that on all the hill-sides facing the sun there is no undergrowth. You may ride there, provided you do not wedge in between the trees that grow too close together to let you pass, or go under a hanging bough, the same as in a park. But if you get on the north side of the hill, you find an undergrowth that is almost impassable for man or beast. Chapparral, manzanita, madrono, plum, white thorn, and many other kinds of shrubs and trees, contribute to make a perfectly safe retreat from men for the wild beasts of those regions."*

**Slope.** Flat land, rolling hills, steep embankments, benches, and gentle slopes all have an effect on the types of vegetation that might do best on them (wetlands are usually flat, for example), and all have a

direct effect upon the types of management practices that can take place, and that have taken place in times past.

**Elevation.** Elevation has similar effects on species distribution and management options as aspect and slope. These patterns are well known, and are documented in the maps, illustrations, and eyewitness accounts contained in this report.

**Population.** Human population had a great deal to do with what lands were exploited, to what degree, and for how long. On March 20, 1827 (almost exactly 180 years ago, as this is being written), 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. However, Ogden had been traveling in the Great Basin during an unusually harsh winter the previous year and had observed widespread death and starvation in that region, so his error is understandable. The flowers and clover, of course, represented, “by culture,” abundant local food supplies.

## 6. What Happened (esp. 1852-1856)?

After more than 10,000 years of relatively stable and sustainable use and management, the forests and grasslands of southwest Oregon began to change abruptly about 250 years ago; a process that continues to the present time, and directly coincides with white contact and occupation. The most critical -- and incredibly rapid and brutal -- period of transformation took place between 1852 and 1856, when ownership and management of local resources transferred directly from centuries and millennia of American Indian occupation and control, completely over to white European occupation and management. It is important to note there was virtually no concurrent transfer in resource management knowledge between these two cultures that abruptly changed places in the early 1850s, amid significant differences in values, plants, animals, tools, survival strategies, aesthetics, cultural understanding, and mutual respect. See Appendix A. People; Appendix D. Chronology; and:

[www.ORWW.org/History/SW\\_Oregon/People/Indian\\_Residents\\_1826-1856.html](http://www.ORWW.org/History/SW_Oregon/People/Indian_Residents_1826-1856.html)

[www.ORWW.org/History/SW\\_Oregon/Rogue\\_Indian\\_Wars/Correspondence/index.html](http://www.ORWW.org/History/SW_Oregon/Rogue_Indian_Wars/Correspondence/index.html)

Dennis Martinez (1999) writes of the visible landscape as an expression of “the culture of the people.”

*“The landscape that people saw when they came from Europe was a landscape that was literally an expression of the culture of Indian people . . . There is absolutely no separation between the way the landscape looked in pre-contact times, the species composition and structure of that forest, or that prairie, and the cultural needs and expressions of the Indian people.”*

The same can be said for other cultures in other places, too. The matrix of people (and their structures), places, and plants at any given time will likely produce a recognizable set of visible landscape patterns closely representative of local culture at that time and place. “Cultural landscapes,” then, can be defined as visible patterns of human structures and local vegetation that can be linked to particular times, places, and people. Typically, a landscape-scale pattern covers hundreds or thousands of acres, and can be viewed from wide range of viewpoints. Such examples include the extensive pear orchards associated with Bear Creek Valley vistas; fenced and pastured cattle ranches of the Illinois River basin; and fragments of oak savannah associated with early historical Kalapuyans in Cow Creek Valley.

The period of forest history of most value to this study is that which took place during the past 500 years, or within the potential life-span of many tree species in the landscape. The ancestry of local trees and forests goes back much further in time, though, to the last ice age, and perhaps earlier. Of most practical interest in that context are the past 10,000 years of human use and occupation. For the purposes of this report, then, it is possible to consider ten periods of cultural landscape patterns occurring over the past ten millennia; of which eight are focused on the last 500 years:

**1) 10,000 BP to 1000 AD: Ancient Lands & People.** There is little direct forest history evidence we can gather from this period. Pollens, lake sediments, and archaeological data allow some very general idea as to fire history, and permit the presence of certain plant species to be verified. Henry Hansen’s work from the 1940s might be helpful in learning more about forest structure and extent for this time period.

**2) 1000 to 1500: Ancient Forests.** For the three research areas, there is no direct evidence of ancient forests or old-growth from 500 or 1000 years ago. No living trees, snags, stumps, logs, survey data, photographs, eyewitness accounts, or other means was discovered that could document such old trees in those areas. GLO data from the Applegate Valley might change this assessment, though. Leiberg (1899) remarks on the great age of some sugar pine in the region (mostly in the western Cascades), and emphasizes how these areas were among the first to be logged, in the late 1800s.

**3) 1500 to 1650: Historical Old-growth Forests.** This is a surprising period. Little or no evidence survives from this time period, either, that would indicate the existence of anything other than a few scattered conifers and perhaps a few groves of oak in the vicinity of the three research areas that survived from this time period into early historical time. Trees from this time would be the old-growth (200+ year old) that would have been present during early white settlement, in the 1850s. Patterns from this period include old-growth sugar pine and Ponderosa pine, black oak and tanoak groves, berry patches, camas fields, and other areas, including persistent patches of native vegetation used for fuel, food, carving, construction, or weaving.

Leiberg, writing in 1899 (pg. 274), noted a regional quality to this observation:

*The age of the timber utilized in sawmill consumption varies from 100 to 350 years [ca. 1550-1800]. Most of the yellow pine falls below 175 years; the higher limit is reached chiefly in the sugar pine. Most of the sugar pine in the region is of great and mature age. Comparatively little red fir [second-growth Douglas-fir] is sawn.*

**4) 1650 to 1775: Historical Second-growth Forests.** There is little evidence of this age class in China Gulch or Humbug at this time, but an analysis of Shoestring GLO survey data indicates a widely spaced forest of relative young trees (in the mid-1800s) likely established during this time period. Most of the trees appear to be Douglas-fir, black oak, and madrone, but several other species are represented as well. See:

[www.NWMapsCo.com/ZybachB/Reports/2007\\_Newton\\_OSU-BLM/Maps/GLO\\_Survey\\_Notes/Diameter\\_Classes.html](http://www.NWMapsCo.com/ZybachB/Reports/2007_Newton_OSU-BLM/Maps/GLO_Survey_Notes/Diameter_Classes.html)

Leiberg (1899: 277) was writing of an area immediately east of the Shoestring study plots, but occupied by the same nations of people, when he observed:

*The largest burns directly chargeable to the Indian occupancy are in Ts. 30 and 31 S., Rs. 8 and 9 E. In addition to being the largest, they are likewise the most ancient. The burns cover upward of 60,000 acres, all but 1,000 or 1,100 acres being in a solid block. This tract appears to have been systematically burned by the Indians during the past three centuries [ca. 1600 to 1855]. Remains of three forests are distinctly traceable in the charred fragments of timber which here and there litter the ground.*

**5) 1776 to 1851: Early Historical Forests.** These trees are the seedlings, saplings, and poles of early historical description, including General Land Office surveys. A particularly poignant observation in this regard was made by prominent Deer Creek and Applegate Valley resident, Chief John, who told US Army representative Robert Buchanon, while refusing to sign a treaty on May 22, 1856 (see Appendix D. Chronology): “*This is my country; I was in it when those large trees were very small, not higher than my head.*”

Leiberg (1899: 277) noted:

*“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.”*

**6) 1852 to 1856: Rogue River Indian Wars.** This is the most critical period of the past 500 or 1,000 years, or more, in the history of forests and grasslands in southwest Oregon. Other portions of this report cover this time period in significantly more detail. However, very few references specifically discuss vegetation patterns at that time. One exception is the August 22-23, 1853 entries cited by Pullen (1996):



*“Scouts sent out reported that the Indians had retired a long distance into the mountains, setting fire to the woods in their rear, and almost obliterating their trail . . . Early the following day (August 23), the line of march was taken up and the Indian trail was followed through very difficult country, mountainous, precipitous and bushy, where there was constant prospect of going astray, as the trail left by the savages was very dim and nearly obliterated by fire. Late in the afternoon, having crossed a high mountain, the command reached a branch of Evans’ creek and halted for the night. The horses were allowed to feed on the bulrushes which grew by the side of the stream and which alone escaped the forest fires.*

Another exception is the April 27, 1856 post, also quoted by Pullen (1996):

*“On the 27<sup>th</sup> the two battalions were ready to attack. A reconnaissance by General Lamerick in person had discovered their camp on a bar of Rogue River, where the mountains rise on either side high and craggy, and densely timbered with manzanita, live-oak, chinquapin and chaparral, with occasional bald, grassy, hillsides relieving the sombre aspect of the scene. A narrow strip of bottom-land at the foot of the heights, covered with rank grass and brambly shrubs, constituted the meadows, where all winter the Indians had kept an ample supply of cattle in good condition for beef.”*

**7) 1857 to 1884: Gold Mining.** White families from the Willamette Valley began to claim land in southwest Oregon, under the Oregon Donation Land Law, in 1852. Fencelines, road right-of-ways, crop patterns, land ownership patterns, logging boundaries, reforestation patterns, and even buildings exist to the present time that were established during this time period. However, gold mining remained the principal industry of interest in the region, and had the most effect on riparian lands. Walling (1884: 325) summarized mining activity for those years in Applegate Valley and Jackson County:

*“The extent of the mining industry in Jackson county is shown by the fact that 5438 mining locations were made from October 8, 1856 to June 30, 1880. Of these sixteen were copper, one tin, 124 cinnabar, and the rest gold and silver . . . The claims were located as follows: The Big Applegate District, 466; in Little Applegate, 39; Uniontown, 2; Sterling, 151; Jackass [Forest Creek], 491; Jacksonville, 1463; Forty-nine, 234; Willow Springs, 785; Gold Hill, 361; Gall’s creek, 95, Foot’s creek, 288; Evan’s creek, 115; Sardine creek, 132; Louse creek, 25; Dry Diggings, 33; Jump-off-Joe, 114; Grave creek, 224, Coyote creek, 75, Poorman’s creek, 300; Steamboat, 45.”*

**8) 1885 to 1945: Family Farms.** Walling (1884: 317) made an extremely accurate prediction in 1884, when he wrote:

*“Since the decrease of mining and the consequent partial destruction of the home market, and more especially since the coming of the railroad, it has seemed that the heretofore isolated country will have to adopt itself to the changed circumstances in which it finds itself. . . Fruit raising, especially of the apple, pear and stone fruits, will prove at once a more laborious pursuit and a better paying one. For twenty years men have been prophesying an era when the fruits of this [Rogue] valley will be regarded universally as the best in the world and sought for at the highest prices.”*

Of most direct effect on the study plots during those years, though, was the China Gulch and Humbug forest fires of August, 1931, which appear to have directly affected the subsequent forest research plots of the same name. An account of the Humbug Fire (Johnson 1990: 100) stated that:

*“ . . . before the fire was out, the creek had become a mere course of stones twisting among the remains of what had been a magnificent timber stand on upper Humbug Creek and the ridges bordering Missouri Flat.”*

Photographic evidence of local farmers gathering to seed the killed forest with exotic grasses indicates the value landowners placed on timber growing at that time; the land was considered more valuable converted to pasturage. See:

[www.NWMapsCo.com/ZybachB/Reports/2007\\_Newton\\_OSU-BLM/Figures/Black&Black\\_1990/1931\\_Forest\\_Fires.jpg](http://www.NWMapsCo.com/ZybachB/Reports/2007_Newton_OSU-BLM/Figures/Black&Black_1990/1931_Forest_Fires.jpg)

**9) 1946 to 1986: Logging.** Major road-building and clearcut logging activities began to take place on federal lands in southwest Oregon immediately following World War II. This process is documented with forest type maps and aerial photographs of the Shoestring research area. See:

[www.NWMapsCo.com/ZybachB/Reports/2007\\_Newton\\_OSU-BLM/Maps/index.html#Shoestring](http://www.NWMapsCo.com/ZybachB/Reports/2007_Newton_OSU-BLM/Maps/index.html#Shoestring)

**10) 1987 to 2007: Forest Fires.** Catastrophic-scale wildfires entered the forests of southwest Oregon for the first time in history, in 1987. The fires were named the Silver Complex, and included all of the recently-designated Kalmiopsis Wilderness. In 2002, the Silver Complex (and Kalmiopsis) burned again, and the subsequent 500,000-acre Biscuit Fire became the largest forest fire, in terms of cost and area covered, in Oregon history.

## 7. Huge cultural legacy.

One result of consistent land management practices over centuries and millennia, is that certain plants and animals become established in relatively predictable numbers and locations over long periods of time. This pattern is shown by pollen analysis, archaeological site data, ancient tree locations (tree ring counts), and early historical records.

In southwest Oregon, consistent land management practices persisted more than 10,000 years, before they were abruptly ended in the mid-1800s with unprecedented changes in human culture, plant and animal species, and available technology. The new owners at that time were not given operating instructions for managing the plants and animals they inherited, nor did they seem to realize that former occupants were even capable of management practices at all. Newton has likened the process to a train traveling at a high rate of sustained speed, when it suddenly loses its expert engineer and crew. Worse, the new passengers don't even seem to notice!

**Weeds.** Species that were viewed as highly desired and valuable to generations of local Indians, such as tarweed, wapato, and manzanita, were seen as outright weeds by the new immigrants, and were eliminated or controlled wherever possible. Camas, bracken fern, myrtle nuts, and acorns were viewed as far more valuable as hog food than as human food. Conversely, plants that were considered undesirable weeds by Indians, such as Douglas-fir, were often valued by whites, who had access to metal saws. Sugar pine was valued and maintained for certain reasons by Indians, and valued for entirely different reasons and cut down with saws by whites.

**Wildfires.** Without the regular fires and harvesting of Indian people, manzanita began to expand its range and to develop thick blankets of volatile fuels across the landscape. Douglas-fir expanded its range and populations as well, providing competition and ladder fuels into the canopies of older trees; invading prairies, meadows, and woodlands; and forming solid canopies of fuel -- in concert with manzanita and other hardwoods -- closer to the forest floor. This build-up of pitchy and volatile fuels is what I believe to be most relevant to regional wildfire history the past 20-40 years; far more important, by comparison, than any suspected climate change or federal fire control policy.

**Wildlife.** Native animals -- that had adapted over millennia to stable, relatively safe, and productive cultural landscape patterns of local people -- have been directly affected by greatly reduced land area, vastly changed forest and woodland structures, an endless influx of exotic plant and animal competitors, and the ever increasing risk of catastrophic wildfires. Historical landscape change has not (with a few possible exceptions, such as field mice, bark beetles, and black-tail deer) been good for most native wildlife species.

## 8. Using traditional methods to achieve modern objectives.

American Indian cultural plants and plant management strategies may have important roles in attaining modern forest and grassland management objectives. Four possibilities are listed:

**1) Use of manzanita and madrone to produce biofuels for electrical generation.** There has been significant discussion during the past few years about producing energy from “bio-mass,” for a variety of social, economic, and biological reasons. One such facility is being planned for construction in Illinois Valley, which is centrally located to this study area. Hanson (1997) discusses manzanita energy and mass production favorably in comparison to Douglas-fir. Manzanita grows very well, at little cost, on southern slopes of southwest Oregon, where Douglas-fir typically cannot even survive for any length of time. Nearby forestlands, such as the Shoestring research area, are choked with madrone and younger Douglas-fir and could benefit greatly by systematic thinning and judicious clearcutting.

**2) Use of regular prescribed fire to reduce wildfire potential, and to better manage smoke emissions during times of burning.** Smoke released during prescribed burning is, by design, usually far safer, less intrusive, and less voluminous than wildfire smoke. Most people can agree on that point; but fewer are willing to concede a concurrent reduction in wildfire risk and severity (reduced fuels) that might also logically accompany a return to traditional Indian burning practices. GLO Surveyor Norman Price provided the following viewpoint following his survey of Tsp. 34 S., Rng. 8 W.:

*“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.”*

**3) Restoration and maintenance of cultural landscape patterns (that also function as historical wildlife habitat patterns).** In his draft paper on manzanita use among precontact northern California and southwest Oregon Indians (see Appendix C. Plants), Frank Lake describes the multiple benefits to native wildlife that accrue with the reintroduction of historic landscape patterns, and with the processes that establish and maintain them:

*“The overall cultural Native American precontact land use pattern I would suggest existed was: Fire used to burn chaparral manzanita dominated patches every 20-30 years which fostered the exclusion of dominant conifer (Douglas fir) establishment . . . subsequent harvesting of dead manzanita tops for fuel, released and promoted the Indian potatoes (cat ears, blue dicks, etc.) to flower which increased population level needs after being dormant for a couple decades (Anderson 2005), fostered spring greens such as minor's lettuce, Lатуca sp./wild lettuce, and sunflower types to sprout (greens), flower and seed (ground meal/flour), and then the 1-10 years following the burn the area was a wildlife feed lot, attracting deer, birds, fur bearers, etc. in the years after the burn (Lake unpublished tribal oral histories). Then as the manzanita resprouted or seed bank germinates matured, the area, due to it's patchy (fire induced landscape pattern) would be cover habitat for rearing and nesting of wildlife such as deer and birds.”*

This type of management approach, as Lake points out, creates a diverse set of important habitat conditions that change over time, accommodating a wide variety of species at any given time, and that might be significantly different for the same area at other times.

**4) Restoration and maintenance of threatened forest species, such as Brewers spruce, Sadlers oak, and old-growth sugar pine.** Changes in resource management methods and values have led to reduced ranges and populations of several endemic and otherwise important southwest Oregon plant species. Restoration of past processes would increase the likelihood of restoring and maintaining significant populations of such threatened plants.

## References

### **Precontact History and Cultural Legacy of Forest Research Sites in Southwestern Oregon**

Publications and individuals referenced in this report and appendices.

\*[Reliable secondary citations: original publications needed for verification as of March 15, 2007]

Anderson, Kat 2005. Tending the Wild: Native American Knowledge and the Management of California's Natural Resources. University of California Press, Berkeley, CA: 526 pp.

Atzet, Tom. Personal communications, 2003-2007.

Black, John and Marguerite Black 1990. Ruch and the Upper Applegate Valley, Webb Research Group, Medford, OR: 238 pp.

Bradley, Raymond S. and Philip D. Jones (eds.) 1995. Climate Since A.D. 1500. Raymond S. Bradley and Philip D. Jones (eds.), Routledge, New York, NY: 1-16.

\*Carey Charles H. 1928. The Oregon Constitution and Proceedings and Debates of the Constitutional Convention of 1857. State Printing Department, Salem, OR: 543 pp.

Carey, Charles H. 1971. General History of Oregon (3<sup>rd</sup> ed.). Binfords & Mort, Publishers, Portland, OR: 916 pp.

Connolly, Thomas J. 1988. "A Cultural-Historical Model for the Klamath Mountain Region of Southwest Oregon and Northern California," Journal of California and Great Basin Anthropology. Vol. 10, No. 2: 246-260.

Davies, Kenneth G. (ed.) 1961. Peter Skene Ogden's Snake Country Journal 1826-27. Publications of the Hudson's Bay Record Society, London, England: 255 pp. w/2 maps.

Dickson, Evelyn M. 1946. Food Plants of Western Oregon Indians. MA thesis, Stanford University, Palo Alto, CA: 218 pp.

Gray, Dennis J. 1987. The Takelma and Their Athapascan Neighbors. University of Oregon Anthropological Papers No. 37, Department of Anthropology, University of Oregon, Eugene, OR: 105 pp.

Hanson, Thomas J. 1997. Growth of Plantation Conifers and Whiteleaf Manzanita in Southwest Oregon. PhD dissertation, Oregon State University, Corvallis, Oregon: 210 pp.

Hegne, Barbara 1995. Settling the Rogue Valley: The Tough Times – The Forgotten People. Self-published, Eagle Point, OR: 110 pp.

Johnson, Olga W. 1978. They Settled in Applegate Country. Bulletin Publishing Company, Grants Pass, Oregon: 233 pp.

Lake, Frank K. 2007. Personal communications, 2002-2007. See Appendix C. Plants, re: "Manzanita."

Lake, Frank K. and Bob Zybach (In Review). "Historical Indian Burning Practices, Oregon Coast Range 1770 to 1848." Paper submitted to Ecological Restoration, December 2006.

LaLande, Jeffrey M. 1980. Prehistory and History of the Rogue River National Forest: A Cultural Resource Overview. USDA Forest Service, Medford, Oregon: 297 pp. (w/appended 40 pg. Index by Marian Place).

LaLande, Jeffrey M. 1991. The Indians of Southwest Oregon: An Ethnohistorical Review. Anthropology Northwest: No. 6, Oregon State University department of Anthropology, Corvallis, Oregon: xxx pp.

\*LaLande, Jeffrey M. 1995. An Environmental History of the Little Applegate River Watershed. USDA Forest Service, Medford, Oregon: xxx pp.

Leiberg, John B. 1900. "Cascade Range Forest Reserve, Oregon, from Township 28 South to Township 37 South, Inclusive; Together with the Ashland Forest Reserve and Adjacent Forest Regions from Township 28 South to Township 41 South, Inclusive, and from Range 2 West to Range 14 East, Willamette Meridian, Inclusive," IN: Twenty-First Annual Report of the United States Geological Survey, Part V.--Forest Reserves. US Department of the Interior, Washington, DC: 209-498.

Martinez, Dennis 1993. "Land & Culture," Winds of Change. Vol. 8, No. 1: 50-53.

McArthur, Lewis A. 1982. Oregon Geographic Names (5<sup>th</sup> Ed.). Western Imprints, The Press of the Oregon Historical Society, Portland, OR: 839 pp.

Moore, John M. 1851. Instructions to Surveyor of Public Lands in Oregon, 1851. General Land Office, Washington, DC: 86 pp.

Moore, John M. 1855. Instructions to the Surveyors General of Public Lands of the United States, for Those Surveying Districts Established In and Since the Year 1850. A. O. P. Nicholson, Public Printer, Washington, DC: 92 pp.

Moravets, F. L. 1932. "Second Growth Douglas Fir Follows Cessation of Indian Fires," Service Bulletin. USDA Forest Service, Vol. 16, No. 20: 3.

Pullen, Reg 1996. Overview of the Environment of Native Inhabitants of Southwestern Oregon, Late Prehistoric Era. Pullen Consulting, Bandon, Oregon.

Riddle, George W. 1953. Early Days in Oregon: A History of Riddle Valley. Reprints of a series of articles first appearing in the Riddle Enterprise in 1920. Riddle Parent-Teacher Association, Riddle, Oregon: xxx pp.

\*Schwartz, Earl A. 1997. The Rogue River Indian War and Its Aftermath, 1850-1980. University of Oklahoma Press, Norman, Oklahoma: xxx pp.

Sperlin, O. B. (ed.) 1931. The Brackenridge Journal for the Oregon Country. University of Washington Press, Seattle, WA: 70 pp.

Thompson, Lucy (Che-na-wah Weitch-ah-wah) 1991. To the American Indian: Reminiscences of a Yurok Woman. Heyday Books, Berkeley, CA: 292 pp.

Todt, Donn L. and Nan Hannon 1998. "Plant Food Resource Ranking on the Upper Klamath River of Oregon and California: A Methodology with Archaeological Applications," Journal of Ethnobiology. Vol. 18, No. 2: 273-308.

Walling, Albert G. 1884. History of Southern Oregon: Comprising Jackson, Josephine, Douglas, Curry and Coos Counties, Compiled from the Most Authentic Sources. House of A. G. Walling, Portland, OR: 545 pp.

White, C. Albert 1980. Durability of Bearing Trees. Cadastral Survey Training Staff, USDI Bureau of Land Management, Portland, OR: 106 pp.

\*White, Diane E. 1989. Competitive Interactions Between Douglas-fir or Ponderosa Pine and Whiteleaf Manzanita. PhD dissertation, Oregon State University, Corvallis, Oregon: xxx pp.

Whitlow, Leonard II 1988. Grande Ronde Indian Reservation, Yamhill County, Oregon: 1860 Census, 1888 Census, 1901 Family Register (Family Groups, Births 1902-1937, Deaths 1902-1937). Published by Leonard Whitlow II, Portland, OR: 82 pp.

Wilkes, Charles 1845. Narrative of the United States Exploring Expedition During the Years 1838, 1839, 1840, 1841, 1842. Lea & Blanchard, Philadelphia, PA. Vol. V: 558 pp.