AN ABSTRACT OF THE THESIS OF

Rene F. Burk for the degree of Master of Arts in Interdisciplinary Studies in Botany and Plant Pathology, Anthropology and Geography presented on November 12, 2020.

Title: An Interdisciplinary-Botanical Perspective for Cultural Resource Management: A Definition and the Application of Culturally Significant Plants in Identification, Interpretation, and Evaluation for the National Register of Historic Places.

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Abstract

Cultivated plants are often living artifacts that can aid in evaluation of historic or cultural landscapes. However, a working definition for "culturally significant plant" is currently lacking in the guidance literature for the cultural resource management practitioners. Based on a review of the literature on cultivated plants as indicators of historically and culturally significant sites a suggested working definition is provided. A discussion of how vegetation can assist archaeologists in the identification and interpretation, as a biotic cultural resource, a contributing feature, and a diagnostic tool for evaluation using the National Register of Historic Places eligibility framework is presented.

An Interdisciplinary-Botanical Perspective for Cultural Resource Management: A Definition and the Application of Culturally Significant Plants in Identification, Interpretation, and Evaluation for the National Register of Historic Places.

by

Rene F. Burk

A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Master of Arts in Interdisciplinary Studies

Presented November 12, 2020
Commencement June 2021

Master of Arts in Interdisciplinary Studies thesis of Rene F. Burk presented on November 12, 2020

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

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ACKNOWLEDGEMENTS

The author expresses sincere appreciation to the following for their advice and support.

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DEDICATION

I dedicate this to my Family

Introduction

The subject matter of this thesis is culturally significant plants of western Oregon. The contextual framework is how vegetation contributes to the archaeological assessment of cultural and historic landscapes using the National Register of Historic places eligibility criteria. The time period of the research is 1800 to 1899, where 1850 is the border line year between prehistoric and historic settlement for Oregon.

The research questions are: What is a culturally significant plant? What is not a culturally significant plant? What species can be considered significant? What qualitative evidence exists of culturally significant plants in Oregon history? What quantitative evidence exists of culturally significant plants in Oregon history?

Literature from the disciplines of Botany, Ecology, Arboriculture, plant pathology, Anthropology, Archaeology, and Geography were used to research this paper. The sources of information come from historical literature, ethnographic studies, cultural resource reports, national park service literature, state agency guidance literature, internet sources, and field observations. A combination of qualitative and quantitative research and analysis was used to draw the conclusions in this thesis. Terminology used in this paper includes terms from these disciplines, therefore a glossary is included in Appendix 1.

The contextual framework for this topic begins with the Cultural Resource Management industry that began in the early 1970's out of a need for compliance with a host of laws that protect and preserve archaeological sites (Firth, 1985; Fowler, 1982; King, 2000). Cultural resources are finite, non-renewable material remains of past peoples.

The federally mandated preservation effort began with the Antiquities Act of 1906 (16 USC 431-433) and subsequent legislation including: the Historic Sites Act of 1935, the National Historic Preservation Act (NHPA) of 1966, the National Environmental Policy Act (NEPA) of 1969, the Archeological and Historic Preservation Act (AHPA) of 1974, the Archaeological Resources Protection Act (ARPA) of 1979, and the Native American Graves Repatriation Act (NAGPRA) of 1990 (NPS, 2020; King 2000; Fowler, 1982). In order to prevent disturbance, the exact locations of archaeological sites have been excluded from the Freedom of Information Act, under the Archaeological Resources Protection Act of 1979 and Public Law 96-95 Sec 9(a).

The National Park Service administers the listing of historic places referred to as the National Register of Historic Places. Where individual states created an office of Historic Preservation (SHPO), in response to the federally mandated preservation effort, and keep an inventory of archaeological sites within the state. To assist federal agency land managers, standardized definitions were created for nearly every term in the CRM industry. The National Register of Historic Places is defined as (NPS, 1997):

> *"The National Register of Historic Places is the official Federal list of districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, National Historic Register engineering, and culture. . .By Federal law, National Register listing assists in preserving historic properties in several ways: in Recognition and appreciation of historic properties and their importance, in Consideration in planning Federal and Federally assisted projects…"*

The National Historic Register eligibility criteria:

A) associated with an important event

B) associated with an important person

C) the work of a master by design or architecture

D) may yield important information beneficial to science or education.

This criterion was developed as a system to place a value on the intangible 'significance' of a cultural resource. To be significant, the landscape or object must have a combination of the criteria and integrity. The seven aspects of integrity include location, setting, design, materials, workmanship, feeling, and association (NPS, 1997).

Where, integrity is the pristine condition of the historical, cultural, chemical, biological or technological physical form. The physical and the historic social relationship reflected in an archaeological site's characteristics are what make an object or landscape significant (NPS, 1998).

The aspects of integrity are more clearly defined. *Location* is the physical place of the occupation or event. *Setting* refers to the environment, historic character, the built environment, and the relationships to the natural landforms. *Design* is a combination of spatial relationships of features, both manmade and natural. *Materials* is defined as the physical elements, patterns, and building materials used in the construction of the built environment. The *workmanship* element, Criteria C, reflects artistic expression, construction techniques, genetic diversity, and

configurations unique to that time period. The element of *Feeling* refers to the aesthetics of and the configuration of the cultural landscape. The final aspect of integrity is *Association* or the physical evidence linking an important person or event in history, and is reflective of the National Register criteria A – D. Again, this eligibility framework is used to assign a value to intangible, non-renewable, finite cultural resources (NPS, 1998) commonly known as artifacts. Vegetation can be a living cultural resource.

A culturally significant plant is any plant species or clusters of vegetation that have had a relationship with people in the past. For a plant to be considered significant, the taxa must have a combination of National Register criteria and integrity and must have a continuous association with past and present cultural traditions and be critical to the cultural group's identity (Susan Dolan, personal communication, 2020).

Setting

Western Oregon is on the west coast of the United States. The topography of western Oregon consists of a large valley expanse, between mountain ranges, at the northern end of the state. The Willamette Valley runs North to South beginning at the Columbia River, the border between Washington and Oregon states. The Willamette valley's scenic landscape consists of large lowland wet areas with interspersed foothills. The valley floor consists of thick silty soils derived from lacustrine flood deposits (Franklin and Dyrness, 1988) known as the Bretz Floods or Lake Missoula floods. The Willamette valley terminates where the topography becomes mountainous and the elevation rises at the city of Eugene. To the east of the Willamette valley is the Cascade mountain range. To the west of this valley is the coastal Siskiyou mountain range. Southwest Oregon is where the coastal Siskiyou and the Cascade Range meet. The Southern Oregon topography consists of smaller valleys nestled between these mountain ranges.

This combination of topography along with a temperate climate supports an Oak Savanna-Camas complex, where prehistoric 'wild gardens' (Boyd, 1999) were managed by the indigenous peoples with anthropogenic burning. In the 1850's, settlers encountered this scenic park-like landscape (Cardwell, 1906) of fire-adapted species (Boyd, 1999; Douglas, 1959). Remnants of this Oak Savanna-Wild Garden landscape that early explorers witnessed (Boyd, 1999; Douglas, 1959; Cardwell 1906), were observed by the author in parks, on public lands, and unimproved pastures (David Brauner, OSU emeritus, Personal Communication, 2018).

The Cascade and Coast mountain ranges are forested with coniferous trees interspersed with deciduous trees playing a successional role (Franklin and Dyrness, 2005). The trees of this montane forest interplay include Douglas Fir (*Pseudatsuga*), true Firs (*Abies*), Spruce (*Picea*), Hemlock (*Tsuga*), and Cedars (*Thuja*, *Callitropsis, Chamaecyparis*). Endemic deciduous trees include Oak (*Quercus* spp.), Maple (*Acer*), Oregon Ash (*Fraxinus),* Madrone (*Arbutus*), and Alder (*Alnus*) (Franklin and Dyrness, 2005) Cottonwood (*Populus*) and Hazelnut (*Corylus*), Cascara (*Rhamnus*), California-laurel (*Umbellularia*), Dogwood (*Cornus*), and Chokecherry (*Prunus*). At Western Oregon's southernmost extent with the border of California, biodiversity reaches a peak with a mix of deciduous and coniferous trees. Madrone (*Arbutus*), Cedars (*Callitropsis, Chamaecyparis*), Tanoak (*Notholithocarpus*), Maple *(Acer),* Oregon Ash *(Fraxinus)*, in addition to coniferous Firs (*Abies, Pseudotsuga)*, Pines (*Pinus)*, Spruce *(Picea)*, Cedars (*Calocedrus, Chamaecyparis*), and Redwoods (*Sequioa*), were seen during field observations. These trees have documented uses by past cultures in western Oregon and are significant given the correct context.

Literature Review

A review of the literature found relevant information on the topic of Culturally Significant Plants of Western Oregon. First, synonyms related to the term culturally significant plant were found i.e., living biotic cultural resource (Firth, 1985; NPS, 2004), a botanical commodity (Balick, 1996), traditional cultural resource (Stoffel, 1990), and a source of agrobiodiversity (Volk et al, 2015, 2016; Routson et al, 2009; Gross et al, 2014).

Firth (1985) was the first author to use the term *biotic cultural resource,* and suggest that plants play a role in archaeological context. Firth (1985) discusses the National Register criteria and how it pertains to vegetation on archaeological sites with attributes of composition, community organization, placement, landscape management techniques, and setting. The author states that biotic cultural resources can provide valuable information on past land use practices (Firth 1985). Firth further states, if a historic homestead is considered *ineligible* by the National Register criteria, documentation of the plant community should be undertaken to identify rare varieties or cultivars, regardless of eligibility status. The author recommends strategies to protect and preserve rare species through avoidance and/or propagation.

A review of the literature for the term culturally significant plant found two state agency guidance reports that mentioned vegetation. The first SHPO (2013) publication, *Guidelines for Conducting Field Archaeology in Oregon,* states that plants can aid in the identification of sites and help determine functionality of the past occupation:

> *"Sites are identified by surface features such as mounds, embankments, quarry pits, remains of houses or outbuildings, wells, and cellar holes; artifacts or refuse on the surface or recovered in [subsurface excavation] tests; non-native or exotic vegetation, anomalous plant communities (clusters of native cedar or pine in hardwood forest, for example), and/or decorative or domestic plants indicating historic activity; or combinations of the above."*

The Oregon State Historic Preservation Office (SHPO), does not provide a definition or specify which taxa to look for during cultural surveys. The SHPO's has a list of plants in their online reporting *Go Digital* system. The list does not have any non-native vegetation, and the plants are by common name only, the closest choice on the list for orchards and historically introduced species is, 'Domestic/Agriculture' or 'Other,' Table 2.

In 2015, the State Historic Preservation Office released a second archaeological guidance publication, *Guidelines for Reporting on Archaeological Investigations,* uses the term, culturally significant plants, in the following paragraph:

> *"This section should be specific to the area of investigation and summarize general regional and local specific data (paleoenvironment, historic environment and current environment, and available resources [lithic materials, terrestrial and aquatic food sources, medicinal plants, trees, red ochre or mineral resource, etc.], soils, geomorphology, depositional history, watershed etc.). Describing culturally significant plants, animals and resources can assist with later discussions by the archaeologist on, for example, what may have been occurring at a site during the time of occupation."*

A review of the National Park Service's, Landscape Lines publication found the most relevant information on how the National Register Criteria and vegetation intersect. Landscape Line's bibliographies provided additional relevant sources including Firth, 1985 and Kunst, 1986. NPS's Landscape Lines 12 (2012), describes the process for completing a vegetative evaluation for a Cultural Landscape Report (CLR). A Cultural Landscapes Report is specific to an inventory of vegetation on cultural landscapes, rather than a traditional archaeological evaluation, involving an inventory of features and artifacts made by people. This 2012

publication emphasizes how to determine if and what vegetation contributes significance to a landscape. Throughout this publication, the term, *plant features,* refers to individual plants and aggregations of plants. Landscape lines (2012) indicates plants can aid in determining the functionality of archaeological sites. This NPS publication led to the conclusion that the terms: *feature, object, and cultural resources,* mentioned in the NPS and state guidance literature encompasses vegetation. The report also uses the term *biotic cultural resource*:

> "*Plant and animal communities associated with human settlement and use are considered "biotic cultural resources." These can reflect social, functional, economic, ornamental, or traditional uses of the land. . . vegetation is considered a biotic cultural resource when it can be linked to an established period of significance and adds to the overall significance of the landscape. Vegetation is a common landscape characteristic associated with the historical development of a cultural landscape or resulting from cultural activities on the land. ...Features associated with vegetation are recognized as either a system (such as a forest or wetland), an aggregation of plants (such as a hedge or orchard), or an individual plant (such as a tree or shrub), all of which have distinct, unique, or noteworthy characteristics in a landscape."*

The Secretary of Interior (SOI), creates standards and makes recommendations for Cultural Resource managers, that are published in the Federal Register, published by the National Park Service. A keyword search of the Federal Register (1983) for vegetation resulted in the following quote which recommends preservation and maintenance of the archaeological site setting:

> *"Preservation (treatment)-the act or process of applying measures to sustain the existing form, integrity and material of a building or structure, and the existing form and vegetative cover of a site...It may include initial stabilization work, where necessary, as well as ongoing maintenance."*

The Federal Register did not have a definition for the term, Culturally Significant Plant, but defined a cultural landscape as:

> "*a geographic area (including both cultural and natural resources and the wildlife or domestic animals therein), associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values.*"

Where the, *cultural and natural resources*, includes the surface vegetation that contributes to the site's eligibility, integrity, and the evaluation as a whole.

The United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) website has a comprehensive list of Culturally Significant Plants. While a definition for, Culturally Significant plant, is not given, nor is the geographic region, one must select each species to see its range statewide. The USDA's list of plants that are present in Oregon were included in the most mentioned plants analysis, Table 1, Figure 5. A comparison of

the USDA's Culturally Significant plant list to western Oregon ethnographies found the list deficient in the top 40 genera from the analysis. These include: Hazelnut (*Corylus*), and Beargrass (*Xerophyllum*), and ferns (*Pteridium, Polystichum, Blechnum*) were not on the USDA's culturally significant plant list. In the acknowledgements section of the USDA's webpage it states:

> *"The information in these Plant Guides could not have been compiled without the collaboration and cooperation of many members of Native American tribal groups actively using plants in everyday living. The information was gathered directly from tribes and through published literature sources based upon indigenous knowledge. For questions or comments about culturally significant plants please contact M. Kat Anderson"*

Anderson (2005), is author of, *Tending the Wild:* Native American Knowledge and the Management of California's Natural Resources*,* discusses how wild plants morphologically change as a result of cultivation by indigenous peoples of California. Anderson does not define, culturally significant plant, but does say that cultural significance is linked to cultivation practices such as; pruning, transplanting, coppice, or burning to manage the landscape. Anderson (2005) links the significance of plants to interactions with peoples.

Other authors that have measured the significance of plants (Turner, 1988; Hunn, 1982; Stoffel, 1990; Sujarwo, 2015, Berlin et al. 1969; Lee, 1979). The significance of plants have been linked to aspects such as, plants that have been given names by a cultural group and categorized based on usage (Hunn, 1982). Hunn (1982) addresses evaluation of the cultural significance of biological taxa and cites other studies where evaluations of significance of plants has been studied (Berlin et al., 1973; Lee, 1979).

Turner (1988b) developed the first quantitative model for evaluating the significance of plants (Stoffel, 1990) in "*The Importance of a Rose": Evaluating the Cultural Significance of Plants in Thompson and Lillooet Interior Salish.* Turner (1988b) discusses a ranking system to measure significance and the importance of plants among the Thompson and Lillooet Interior Salish people in British Columbia, Canada. Turner's approach delineates between staple foods and secondary foods:

> "*These scales are better than no attempt to gauge cultural significance but are too simplistic to account for all the variables involved, and not rigorous enough to be used with minimal bias*" (Turner, 1988:274).

Stoffel, et al. (1990) applied Turner's (1988b) model to evaluate the significance of plants of a contemporary people in Yucca Mountain, Nevada. Stoffel (1990) adapted the model to fit the needs of the undertaking. The Yucca Mountain project used an Egalitarian triage mitigation and avoidance strategy. Plants identified by the cultural group during on-site visits, were considered significant across the entire project area. Assigning a number to the density of CSP in an area. The highest scoring landscapes were avoided. Other considerations were that some plants are encouraged by ground disturbing activities, while other species would be destroyed by it. Rare and endangered species were also mitigated, as they are protected by federal legislation. The Ball et al, (2015) U.S. Coastline-Human use study contributed to the working definition in this thesis. The report provides guidance for consulting with tribes. The author states, federal guidance literature was lacking criteria for evaluating cultural landscapes and a

definition. Therefore, Ball (2015) created a definition for the term, cultural landscape":

> "*Any place in which a relationship, past or present, exists between a spatial area, resource, and an associated group of indigenous people whose cultural practices, beliefs, or identity connects them to that place. A tribal cultural landscape is determined by and known to a culturally related group of indigenous people with relationships to that place*."

Ball (2015) does not define "culturally significant plant", but mentions the term:

> ". . .*an archaeological site can have culturally significant plants and modified trees above ground (peeled bark, coppiced [pruned to encourage new growth], etc.. . . where many studies focus on the archaeological components of the site, rendering the interpretation of the place incomplete*."

Boyd's (1999) *Indians, Fire, and the Land in the Pacific Northwest*-provides early settler accounts of indigenous cultivation and wild garden landscapes in the pacific northwest. Boyd connects social science and natural landscapes with ethnographic data to spread awareness of the prehistoric use of anthropogenic fire for greater yields of resources. Boyd addresses the paradigm of a "pristine landscape" is not untouched by humans, instead it has been managed for centuries by the indigenous people.

A thesis by Sabata (2018) *An Analysis of Culturally Significant Plants, Springs, and Archaeology at Grand Staircase-Escalante National Monument, Utah*, addresses the importance of springs and the biodiversity they contain that makes them culturally significant to the

indigenous people of that area. The author addresses the politics of Cultural Resource Management (CRM) evaluation of landscapes, mention that the vegetation is often overlooked, because they are not considered physical evidence. Sabata quotes:

> "*cultural resource managers would do well to become reacquainted [with] the "cultural" roots of archaeology as a subdiscipline of anthropology, shaped by the colonial western intellectual tradition, in order to help better respect and protect culturally significant plants*."

A thesis by Elliott (2013) uses Geographic Information System (GIS) models to look at the cultural environments and the distribution of *Camassia* species. Elliot's study shows that there is a correlation between prehistoric villages and the distribution of camas. As well as the occurrence of *Camassia* populations due to human dispersal and management of the camas crop Elliott makes many good observations that links *Camassia* to known occupation sites. The author also touches on indigenous land management practices.

Figure1: A Culturally Peeled Lodgepole Pine with axe marks from Lolo Pass, Idaho, 2000.

Merrell's (2005) thesis on *Culturally Peeled Lodgepole Pine: A disappearing Heritage resource along the Lolo Trail of the Clearwater National Forest,* reiterates that many of the trees peeled during prehistoric times, are reaching the end of their lifespan, and need to be recorded. The author recorded twelve stands of culturally peeled trees with dates ranging from 1854 to 1877, some were no longer standing. The later date is associated with the time period and location of the Nez Perce flight and the military that pursued them. The cambium layer was used in the early spring as a starvation food for people and horses (Merrell, 2005). Lodgepole Pine (*Pinus contorta*) was preferred for its cambium over other species. Ponderosa Pine (*Pinus ponderosa*) cambium was also used for a starvation food source. This thesis is a good example of how trees can assist archaeologists, because they lend well to interpretation of past events. The average lifespan of a Lodgepole pine is 150 years (Merrell, 2005), a similar lifespan to the apple (*Malus*). While many of the peeled pines along the Lolo trail are still alive but in a compromised condition, making them susceptible to disease and harsh climatic conditions. All heritage trees are in a similar situation due to age limitations of the species. Merrell's study also mentions that during a wildfire in Idaho, one significant tree was wrapped to protect it. Lodgepole pine (*Pinus*) is considered significant within this context described by Merrell: preferred over others, provided

nutrition in a time of scarcity in a multi-component context, retains physical evidence of past human activity, and being one of a kind, figure 1.

Methods

The research questions addressed in this thesis are: What is a culturally significant plant? What species can be considered significant? What is not a culturally significant plant? What qualitative evidence exists for culturally significant plants in western Oregon? Where is the quantitative evidence of culturally significant plants? Answering these questions involved a combination of quantitative and qualitative (ethnographic) research and analysis. Using a mixed methods approach enhanced the validity and reliability of the study, by making comparisons between the literature, the available data, and direct field observations.

The first question, what is a culturally significant plant, resulted in the creation of a working definition, as a term, as a standardized definition was not found in the federal and state guidelines. The second question, naturally being, which species can be considered significant? The opposing question, what is not a culturally significant plant, is discussed and reflects the opposite working definition. The fourth question, the Qualitative evidence of culturally significant plants, was answered through a review of the literature and field observations, figures 6, 7, 11, and 16. The last question, what is the quantitative evidence, was found by creating a spreadsheet of the most mentioned plants in the literature and by doing a frequency analysis of the most mentioned plants, Figures 2, 3, 4, 5, 9, 10 and Table 1.

Place and Time

The time period of this study was the 1800's. Where 1850 is considered the transitional year between the prehistoric and historic periods, when the settlement of Oregon began. During this time period many new species of plants, vines, shrubs and trees were introduced into the region.

Research sources

Historic literature, Ethnographies, travel journals, books, and scientific journal articles, state and federal agency guidance literature were reviewed. Historical literature was found to be the most relevant because of the firsthand accounts of reporting on the settlement period. Ethnographies are the source of the indigenous plant usage data. The state and federal agency guidance literature helped understand the context in which vegetation can be applied. Bibliographies were studied to find other relevant articles. Key article pages were photocopied or scanned into a

Google Drive digital library. Key sentences were underlined, highlighted, and notes written in the margins. Internet sources were searched using keywords: Culturally Significant Plant, Camas, Apple, orchard, and vegetation. Most of the federal and state guidance literature is available online. Some of the sources were Ethnographic and plant databases, public library catalogs, Google Scholar, and Google Books. Botanical names used in this paper were checked for the most recent botanical name at the Missouri Botanical Garden's database, Tropicos.

Field observations

Field observations were made throughout western Oregon. Field observations included 'windshield' roadside surveys along the I-5 corridor from Washington to California. Closer examinations of the vegetation were made by visiting public parks, trails, wildlife refuges, natural areas, and botanical gardens. At all site visits, the date of the visit, lists of the flora present were made, photographs were taken on an Android smartphone. Elevation was noted with an application by AR Labs call Accurate Altimeter. Google maps application was used to record the location, datum WGS84. Where permittable, herbarium specimens were collected, and will be donated to the Oregon State University herbarium. Return field visits were made during all seasons to see the vegetation at all stages of growth. University coursework field assignments led to discoveries of trees, orchards, clues to significance and concepts of integrity. One important discovery was that of the first planted seedling and first grafted fruit tree in the Pacific Northwest figures 7 and 8.

Interviews

The interview process was reviewed by the Oregon State University's (OSU) Institutional Review Board (IRB) and they determined that the research did not involve human subjects under the regulations set forth by the Department of Health and Human Services (45 CFR 46). The following industry professionals gave advice on how vegetation contributes and relates to integrity of landscapes and the eligibility requirements of the National Register of Historic Places.

> Susan Dolan was instrumental in her suggestions for the working definition of Culturally Significant Plant (Susan Dolan, USDI, National Park Service, WASO Park Cultural Landscapes Program, personal communication, 01/07/2020).
>
> Dennis Griffin, Oregon State's Historic Preservation Officer (SHPO), State Archaeologist (now retired), provided insight on how the SHPO's *Go Digital* list of plants was derived. Documentation of plants' genera during cultural surveys is sufficient for SHPO. Griffin was helpful with concepts of plants as features and offered suggestions for defining Culturally Significant Plant (Dennis Griffin, personal communication, 5/18/2018).
>
> Gayle Volk, USDA, Fort Collins, Colorado, Research Plant Physiologist, was interviewed about historic apple varieties. Volk explained the processes involved to determine apple varieties with DNA sequencing. Volk has co-authored many articles on historic apple orchards (Gayle Volk, personal communication,12/21/2018).

Informal discussions were held with archaeological colleagues, to gain their perspectives on the documentation of plants and trees during archaeological field surveys. Overall, they thought that more guidance was needed for the application of vegetation to archaeology.

Software

A personal HP Pavilion PC laptop with Microsoft Windows 10 was used for research, analysis, and writing. Microsoft Office Suite applications, Word was used to write the thesis. Excel was used for entering and analysis of the plant data. PowerPoint was used to present the material. The software used to store and organize the research data was Google Drive, provided by Oregon

State University. Google Drive was used to store draft versions of this thesis, maps and photographs. Photographs of vegetation and landscapes were created with an Android Samsung smart phone.

Maps

The map figures presented in this thesis were created with ArcMap 10 and ESRI's online story map platform. The plant location data is from Oregon Flora's Vascular Plant Atlas, figures 12-15, and 18, from verified vouchers of plants collected at that location and housed in an herbarium. Figures 6, 13, 14, 15, 18, and 19 were made in ESRI's story map platform.

The background in figures 13, 14, 15, 18 were made with the American Indian language boundaries background from the Native Languages Organization, (Redish and Lewis, 2009). The Native Language boundary background was geo-referenced in ArcMap 10, uploaded to ESRI's story map platform. The creators of the language map state, that the borders fluctuated continuously (Redish and Lewis, 2009).

Data Analysis

The ethnographic sources were chosen by their geographical location for complete coverage of western Oregon. The uses were taken directly from the ethnographies, modeled from Jacobs (2003), figure 2. One Excel spreadsheet was created for each ethnography. Microsoft Excel spreadsheet was used to enter and analyze the data. The specific flora mentioned were put in rows. The plant uses were put into 28 columns. The uses in each ethnography were lumped into broad categories. A binary coding technique was implemented i.e. for every plant use mentioned a 1 was entered into the corresponding row (plant) and column (use). If a plant was not used or mentioned, a zero was entered. An occasional 2 or 3 would appear if the plant had more than one use in the same category (column). For example, a value of 3 indicates three different uses for a particular plant. The rows of each plant were calculated, resulting in a cumulative score for each plant. The scores were sorted from the highest to the lowest value. The resulting most mentioned plants' scores were graphed, figures 3-5 and table 1. The plant data was consolidated by genera for the final presentation.

The data analysis was performed in a Microsoft Excel spreadsheet. Twenty-eight plant use categories (columns) were made and varied by the ethnographic author. Lumping the categories

into generalized actions such as food, fiber, and hunting technology did not cover all of the plant uses. For example, weaved mats were used for a variety of purposes from the construction of walls, to plates for eating, mats for sitting, laying on, and more. Therefore, a category was created just for weaved mats that were used for a variety of purposes. The categories were based on actions described in the ethnographic accounts of plant uses for: Food, shelter, clothing, tools for obtaining foods, and traditional socio-cultural aspects. Other action categories described in the ethnographies included, 'recognized seasons for harvest' and 'preferred over another species,' reflected socio-cultural significance.

The following categories in the excel spreadsheet analysis described here are a direct reflection from the ethnographies. Based on the literature review, every action lends its aspects towards cultural significance of the specified taxa. Theoretically, many florae were chosen over others based on the structural fibers that worked the best for the task at hand.

The first category (column) in the spreadsheet analysis is 'preferred over another species' for making a particular item, reflects cultural significance (Turner, 1988b). For example, Maple (*Acer*) was preferred over Oregon Ash (*Fraxinus*) for canoe paddles. The category for 'food-eaten' was an unbiased attempt to capture all foods consumed, instead of differentiating primary or secondary foods, used in Turner's (1988b) model. Early spring foods such as salmonberry (*Rubus*) shoots and greens provided nutrition when the primary staples were not available, and therefore early spring foods sustained them until the staples were ready for harvest.

Another category for 'foods processed for winter storage', reflects the extra energy requirements needed to process, grind, mix, dry, make cakes, wrap, and pack food for winter storage, which was motivated by past scarcity and hunger during late winter and early spring.

Another category 'tools used to harvest plant resources' included items such as root digging sticks and cultivation hand tools. Examples include Oceanspray (*Holodiscus discolor*) and Oregon Ash (*Fraxinus latifolia*) (Phillips, 2016) and Pullen (1996) listed Mountain mahogany (*Cercocarpus*) for digging roots and bulbs.

The category conglomerate called, 'Cultivate, burn, prune, coppice of plants,' reflects advanced thoughts for future harvest and the beginning of agriculture. Cultivation of plants shows extra time and energy spent to make better quality materials, and better yields (Anderson, 2013). Tobacco was widely cultivated by the indigenous people of western Oregon, as a social activity and for trade, according to ethnographies. Another plant use category was created for

‘Smoking’ was created, which encompassed leaves smoked and materials used to make smoking pipes. Historically, tobacco was widely used in a similar social-cultural facet (Zentgraf, 2019). Tobacco tins with hinged lids are a common occurrence on historic sites. Zenk (1976) and Phillips (2016) mentions Kinnikinnick (*Arctostaphylos*), the leaves were mixed with tobacco by the Tualatin, Yamhill, and Kalapuya. Elderberry (*Sambucus*) was used for making pipes and Kinnikinnick leaves were smoked by the Alsea according to Drucker (1939).

The ‘trade’ category captured processed foods for exchange of resources not available in the area but were sought after through trade. An example is trading baskets of salmon for buffalo hides that were utilized for protection against cold winter weather. The foods and basket materials were gathered in excess for the intension of trading. This category contributes to the survival, sustenance, and socio-cultural aspects of significance. Phillips (2016) indicated tarweed (*Madia*) and tobacco (*Nicotiana*) were traded by the Coos, Siuslaw, and Umpqua peoples.
The category for ‘Containers to collect, eat, store, and transport food’ captured any container made for the collection of foods for storage, to eat off of, and trade, is essential to survival and a technological advancement. Taxa mentioned for making baskets and containers include *Alnus* and roots of *Pinus* (Booth, 1970). Drucker (1939) mentions the Alsea utilized Beargrass (*Xerophyllum*), Tulles (*Scirpus*), and Willow (*Salix*) to make containers. The category for ‘Food Preservatives, an ingredient added to food,’ was not prevalent and seen only in Phillips (2016), for manzanita (*Arctostaphylos*). Manzanita berries were mixed with salmon eggs to make cakes, making them easier to store and transport for trade.

A category was made for plants used in the ‘Preparation of hides for clothing, blankets, and structures’. Hides must be processed or tanned before they can be used. One example of taxa used for this purpose comes from Phillips (2016), the moss that grows on Maple (*Acer*), was used for this purpose. Moerman’s (2017) BRIT ethnobotany database indicates *Lomatium* was used for hide preparation by the Klamath. The category for taxa used to make ‘dyes, paints, and brushes’ shows extra time allotments for artistic expression, instead of time spent hunting and foraging for food. Decoration was used as a marker of clans, families, and status, a social-cultural aspect (Hurcombe, 2014; Anderson, 2005). Flora in this category include *Abies* and *Alnus* (Moerman, 2017) for the Klamath of Southern Oregon. *Alnus* was used to make dyes by the Tillamook (Sauter, 1974).

The category for 'beverages and teas,' was important for hydration, when water was unsafe to drink and cold. Heated, flavored water is more palatable, especially during illnesses and cold temperatures. Plants in this category included Manzanita (*Arctostaphylos*) and Sugar pine (*Pinus*) nuts (Booth, 1970). Zenk (1976) mentioned Yerba buena (*Satureja*) and Mint (*Mentha*), which is still used today to make medicinal teas. Another category was made for 'dessert foods.' This category captured foods that were made on special occasions and for children, and is a socio-cultural aspect. Turner (2019) in personal communication said, special utensils and containers made for serving *Shepherdia*, in much the same way special bowls are made to serve ice cream today. Dessert food is remembered by children into adulthood (Nancy Turner, personal communication, 2019). *Shepherdia* was not mentioned in any of the ethnographies for western Oregon. Moerman (2017) mentions *Camassia* being used as a dessert food for the Klamath people.

Another category was 'material for creating fire', considered essential to survival based on the ability to cook foods that aid in the digestion of proteins and carbohydrates. In this category, pitch was mentioned by Jacobs (2003), and Oceanspray (*Holodiscus*) was mentioned for this purpose by Phillips (2016). Drucker (1939) mentions Willow (*Salix*) was used by the Alsea to get fire started.

A similar category was added for taxa used as: 'Fuel for firewood, to keep the fire going'. In this category, Douglas fir (*Pseudotsuga*) was mentioned for the Coos-Umpqua-Siuslaw in Phillips (2016). Modern people still use wood heat and prefer certain species over others for this purpose. For example, Cottonwood (*Populus*) is not preferred for firewood, because it makes excessive ash and has low (British thermal unit) BTUs. Tree species with a high BTU rating are preferred due to the denseness of the wood, *Quercus*, and *Pseudotsuga* have the highest ratings.

Flora used for hunting and fishing categories were considered essential for protein procurement. A category for 'Fishing Technologies,' included vegetation used to make hooks, nets, weirs, and dip nets. Flora mentioned for this purpose included: Nettle (*Urtica*) (Jones, 1972), Beargrass (*Xerophyllum*) (Pullen, 1996), and Cedar Bark (*Cupressus*, *Tsuga*) (Sauter, 1974). A category for 'Hunting Technology' included vegetation used to make tools for hunting game. Oak (*Quercus*) and Spruce (*Picea*) (Booth, 1970) and Arrowwood (*Holodiscus*) by Zenk (1976) were mentioned.

A category for 'Transportation Technology' covers vegetation used for the construction of canoes and paddles. Canoes were essential for transport of people, trade goods, and to procure other goods not available in the immediate region. This category was considered essential for survival and for socio-economic aspects. For this category, Jacobs (2003) mentions, Ashwood (*Fraxinus*) and spruce pitch (*Picea*). Cedar (*Cupressus*, *Tsuga*) was mentioned by Sauter (1974) as used for making canoes.

A category specifically for 'Plant materials used for making shelter', considered essential for survival against the elements and a basic human necessity. Pullen (1996) includes, Willow (*Salix*), Vine Maple (*Acer*) and Cottonwood (*Populus*) thickets as fences around village sites.

The category for 'Fiber' encompassed weaved materials used for making mats and clothing. Mats were used for a variety of purposes, a barrier against the ground for processing foods, as partition walls in the longhouse, and as insulative material for protection against the elements. Pullen (1996) states, Beargrass (*Xerophyllum*) and Big Leaf Maple (*Acer*) were used for clothing. .

A 'Hygiene' category was created from the ethnographic data. This column was considered essential as a preventative measure against infections, and for menstrual cycles. Oregon Grape (*Berberis*) and Douglas Fir (*Pseudotsuga menziesii*) (Phillips, 2016) were used prehistorically for hygienic purposes. Jacobs (2003) listed Gooseberry (*Ribes*) and Hemlock (*Tsuga*). A similar category was 'Sweat bath' which encompasses the plants used during sweat baths and to build the structure. Sweat baths were an important aspect for ceremonial (social/cultural) activity and for preparation for hunting by the men. Alder (*Alnus*) was mentioned by Phillips (2016) and Hemlock (*Tsuga*) by Jacobs (2003).

The final category created was for 'Horse/Animal Care'. The introduction of the horse created a shift in cultural norms from the 'old' way to the 'new' way and therefore plants were used for animal care. Horses were a valuable asset for trade, status symbols, and as transportation for gathering resources. Moerman (2019), was the only author to mention *Lomatium* for caring for wounds on horses by the Klamath.

Figure 2: The most frequently mentioned plants from Jacobs (2003) The Nehalem Tillamook: An Ethnography

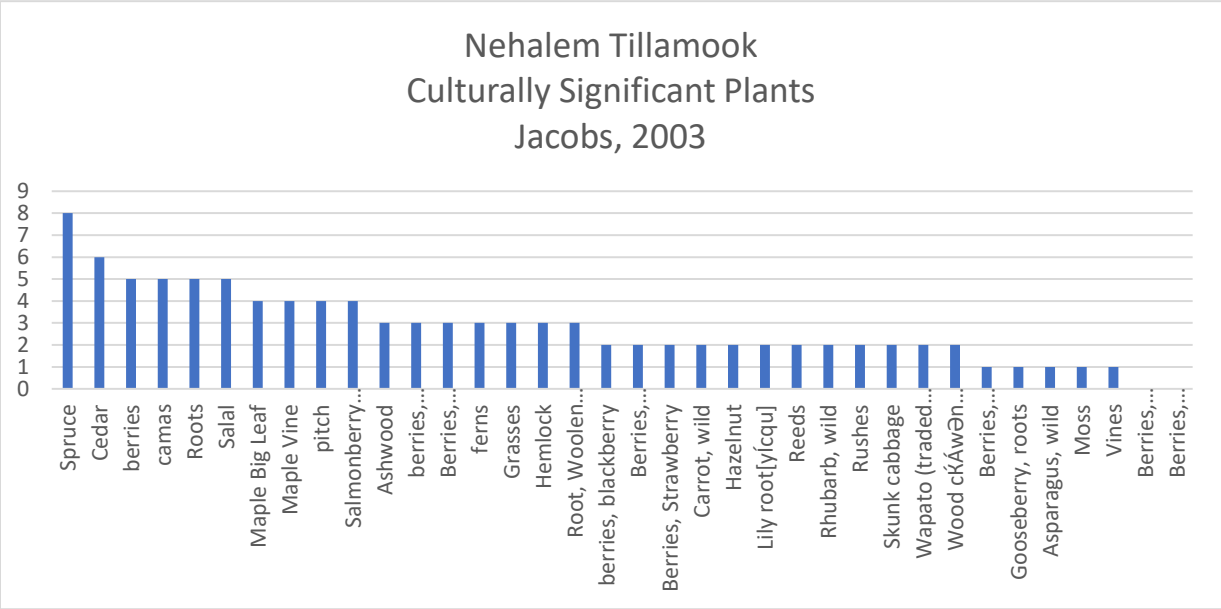


Figure 3: Excel spreadsheet of the most mentioned plants historically/prehistorically.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Occurs in Western Oregon	Genera	Common Name	OR SHPO CSP	USDA CSP List	Umpqua FS CSP	BLM CSP List	Zybach, 2008	Booth, 1970	Heckert, 1977	Pullen, 1996	Jacobs, 2003	Boyd, 2013	Dickson, 1946	Coquille Ethno2010	Phillips, 2016	Drucker, 1943	Sum Totals
2		?	Berry, Black Mountain	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3	x	Abies spp.	Fir, Unspecified	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
4	x	Abronia latifolia	Yellow Sand verbena	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
5	x	Acer circinatum	Maple, Vine	0	0	0	0	0	0	0	1	1	0	0	1	1	1	5
6	x	Acer macrophyllum	Maple, Big Leaf	0	0	0	0	1	1	0	1	1	1	0	1	1	1	8
7	x	Achillea millefolium	yarrow common	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2
8	x	Achlys triphylla	Vanilla Leaf	0	0	0	0	0	1	0	0	0	0	0	1	0	0	2
9	x	Achnatherum hymenoides	Grass, Indian Rice	1	0	1	1	0	0	0	0	0	0	0	0	0	0	3
10	x	Adiantum aleuticum	Fern, Maidenhair	1	0	1	1	0	0	0	1	0	0	1	1	0	1	7
11	x	Adiantum, Blechnum, Gymnocarpium, Polypodium, Polysti	Ferns	1	0	1	1	0	0	0	1	1	1	0	2	0	1	9
12	x	Aesculus californica	California buckeye	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
13	x	Alectoria fremontii, jubata	Moss, Black or Bearded	**0**	**0**	**0**	**0**	0	0	0	0	0	0	1	0	0	0	1
14		All grass species and genera excluding Bear Grass	Grasses all	2	1	2	2	0	1	0	1	1	1	1	3	1	2	18

This is how the graph in Figure 10 and table 1 were derived. The rows list all the taxa from the literature and the columns are the citations.

Figure 4: CSP Analysis-combining genera methodology

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	In Western Oregon	Genera	Common Name	RSHP	USDA	Umpq	BLM	Zybach, 2008	ooth, 197	ckert, 1	Pullen	Jacobs	yd, 20	kson, 19	le Eth	hillips, 201	Drucker, 1943	Sum Totals
174	x	Prunus americana	Plum, American wild	1	1	1	0	0	0	0	1	0	0	0	1	0	0	5
175	x	Prunus emarginata	Cherry, bitter, wild	0	1	0	0	0	0	0	0	0	0	1	0	1	1	4
176	x	Prunus subcordata	Plum, Western Wild	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2
177	x	Prunus virginiana var. demissa	Cherry, Choke	1	1	1	1	0	0	1	1	0	0	1	0	0	0	7
178	x	Prunus spp. All species	Cherry and Plums all species	2	3	2	1	0	0	2	2	0	0	3	1	1	1	18
179	x	Pseudotsuga menziesii	Douglas fir	0	1	0	0	0	0	0	1	0	0	0	1	1	1	5

After data entry and analysis of several ethnographies, the USDA, and the SHPO's plant lists, the results were combined into an Excel spreadsheet using the same binary system of ones and zeros.

The list of plants created in 2017 for the BLM's database are included (Burk, 2017). The plants were listed by their common name and their Latin/Greek botanical Genus name. Genera (plural for Genus) that appear similar in nature were combined in the spreadsheet.

The research questions of what is and what is not a culturally significant plant were determined, through the literature review, interviews, and field observations. A Culturally Significant Plant is any plant or tree species can be considered culturally significant that is in the correct context where it was originally planted or modified. In addition to a historical interaction and continued association with people of the past.

Results

There was no definition for Culturally Significant Plant in the state and federal agency guidance literature no was there a definitive list of commonly occurring introduced vegetation on historic sites.

What is a culturally significant plant?

A Culturally Significant Plant (CSP) is defined here operationally as it must include at least one aspect of the National Register criteria (associated with a significant event, activity, or person from history or yields scientific data). The vegetation on the site must contribute to the cultural landscape's integrity of location, design, setting, material, workmanship, feeling and/or association. This can include the aspect of genetic diversity of rare varieties. The flora must also have a socio-cultural relationship with past the past and for at least two recent generations and be considered critical to the culture's identity (Susan Dolan, personal communication, 2020). A plant or community of plants can be considered significant if they contribute aspects of integrity to the cultural landscape. Introduced vegetation on historic sites that were deliberately planted and cultivated adds to the integrity of the site. Another aspect of importance to be considered is as a potential bio-cultural resource or as a source of genetic diversity for agriculture. We revisit the quote from the literature review, Oregon SHPO (2013):

> *"Sites are identified by surface features such as mounds, embankments, quarry pits, remains of houses or outbuildings, wells, and cellar holes; artifacts or refuse on the surface or recovered in tests; non-native or exotic vegetation, anomalous plant communities (clusters*

> *of native cedar or pine in hardwood forest, for example), and/or decorative or domestic plants indicating historic activity; or combinations of the above."*

Determining which plants may be potentially significant within an undertaking, will become apparent with background research, doing a vegetation inventory, and consultation with interested parties, and an ethnobotanist, while keeping in mind aspects of this thesis during cultural surveys.

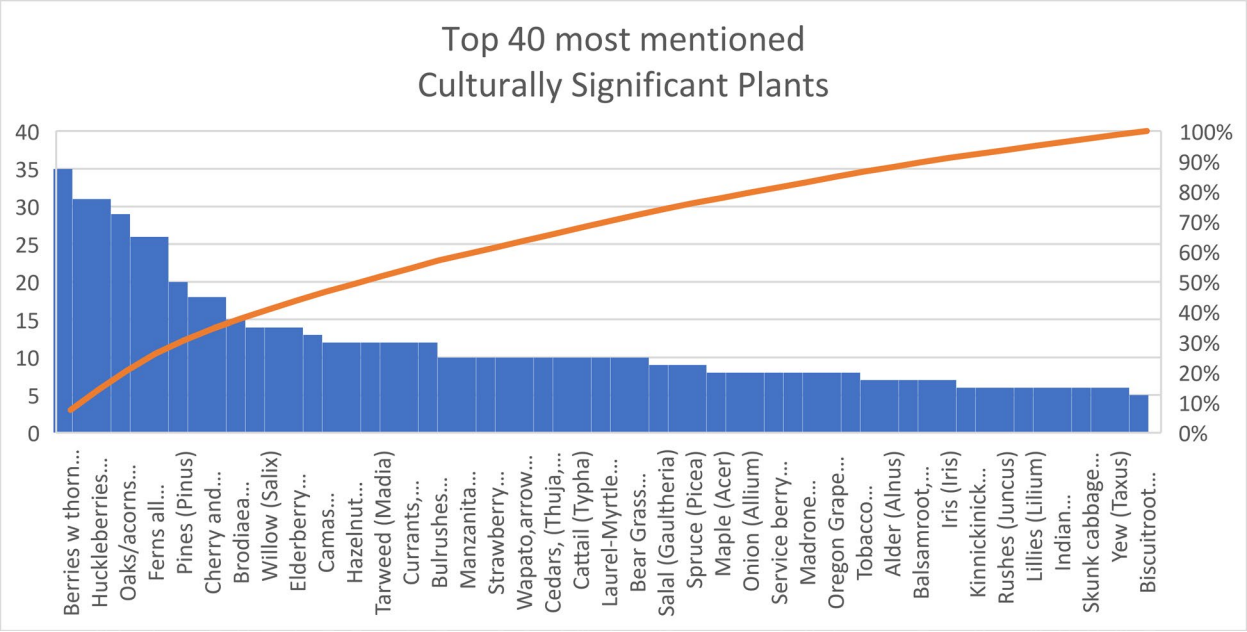
What species can be considered culturally significant?

The top 40 genera listed in Table 1 and figure 5 are the most mentioned taxa from the ethnographies, historical publications, field observations, and web sources (NPS, 2020; SHPO, 2019; USDA, 2020). The plants in this list meet the definition of culturally significant when they are in the correct context i.e. alignments, within site boundaries, contribute to aspects integrity outlined by the National Park Service (NPS, 1995).

Table 1: Culturally Significant Plants from most mentioned top 40 genera results.

Top 40 Results of most mentioned CSP	Number of mentions
Berries (*Rubus*)	35
Huckleberries (*Vaccinium*)	31
Ferns all (*Pteridium, Polystichum, Blechnum*).	26
Oaks/acorns (*Quercus, Lithocarpus*)	29
Pines (*Pinus*)	20
Cherry and Plums (*Prunus*)	18
Brodiaea (*Brodiaea*)	15
Willow (*Salix*)	14
Elderberry (*Sambucus*)	14
Camas (*Camassia*)	13
Hazelnut (*Corylus*)	12
Tarweed (*Madia*)	12
Currants, Gooseberry (*Ribes*)	12
Bulrushes (*Schoenoplectus*)	12
Manzanita (*Arctostaphylos*)	10
Strawberry (*Fragaria*)	10
Wapato,arrowhead (*Sagittaria*)	10
Cedars, (*Thuja, Calocedrus, Callitropsis*)	10
Cattail (*Typha*)	10
Laurel-Myrtle (*Umbellularia*)	10
Bear Grass (*Xerophyllum*)	10
Salal (*Gaultheria*)	9
Spruce (*Picea*)	9
Maple (*Acer*)	8
Onion (*Allium*)	8
Service berry (*Amelanchier*)	8
Madrone (*Arbutus*)	8
Oregon Grape (*Berberis, Mahonia*)	8
Tobacco (*Nicotiana*)	8
Alder (*Alnus*)	7
Balsamroot, Sunflower (*Balsamorhiza*)	7
Iris (*Iris*)	7
Kinnickinick (*Arctostaphylos*)	6
Rushes (*Juncus*)	6
Lillies (*Lilium*)	6
Indian Carrot,Yampah (*Perideridia*)	6
Skunk cabbage (*Lysichiton*)	6
Yew (*Taxus*)	6
Biscuitroot (*Lomatium*)	5

Figure 5: Graph of Results of most mentioned CSP



What is not a culturally significant plant?

Introduced species that are out of context and outside site boundaries are not significant. Any naturally occurring, endemic, invasive, and/or noxious vegetation are not typically significant. Volunteer seedling fruit trees (Gayle Volk, personal communication, 12/21/2018) that are not intentionally planted are not significant but can be indicators of a nearby parent tree on a historic occupation.

A plant or tree that was not chosen by people over another. Taxa that do not have meaning to a cultural group, are not significant. A plant that does not have a relationship with past events, persons, or places or was otherwise avoided and unnamed (Hunn, 1982). Modern agricultural crops, landscapes without a connection to the past, and groves of trees deliberately planted for timber production are not culturally significant. Domesticated cultivars that are widely available and are not rare, are not significant.

Qualitative evidence of culturally significant plants in Oregon history

Qualitative evidence for this thesis was collected from field observations, herbarium specimens, ethnographies, attending conferences, and conducting interviews.

Plants used by native peoples

The indigenous people of western Oregon practiced some form of cultivation or early agriculture in the Pacific Northwest prior to settlement (Suttles, 1951b; Minore, 1972; Turner, 2011; Anderson, 2005). Indigenous fire management interfered with settlers' establishment of homesteads, therefore anthropogenic fire was halted in the 1850s (Boyd, 1999). The native people were removed from their traditional lands to reservations, no longer able to continue their traditional resource gathering. The extent of traditional plant usage by modern indigenous peoples is unknown by the author, because the time period studied was the 1800s.

A result of the anthropogenic burning on the vegetation are also traits of domestication; larger and sweeter fruit, seeds, bulbs, roots, and color change (Anderson, 2005) and early successional--fire adapted species. During field observations, the following were noted: Thistle (*Cirsium*), Salal (*Gaultheria*), Beargrass (*Xerophyllum*), Snowbrush (*Ceanothus*), and berries of the *Rubus* genera. Fire adapted taxa from the literature include Oregon Grape (*Mahonia*), Huckleberry (*Vaccinium*) (Minore, 1972), and ferns (*Pteridium, Polystichum*).

Trees that have developed fire resistance include: Hazelnut (*Corylus*), Oaks (*Quercus*), Pine (*Pinus*), Incense Cedar (*Calocedrus*), and Madrone (*Arbutus*). *Vaccinuim* and *Rubus* bear more fruit the following year after fire (Minore, 1972; Anderson 2005). These fire-adapted plants and trees are mentioned in ethnographic studies and historic publications as used in the past by peoples of Western Oregon.

Plants introduced by European colonists

The first crop of potatoes planted in Western Oregon was at Fort Astoria in 1811 (Olsen, 1970) by the Pacific Fur Company. In 1825, Dr. John McLoughlin, of the Hudson Bay Company (HBC) trading post, began the first garden at Fort Vancouver, with seeds from England, to sustain fort operations and accommodate new settlers. Visitors to Fort Vancouver saw and recorded gardens with cucumbers, peas, beans, beets, cabbage, tomatoes, pumpkins,

watermelon, muskmelon, squash, eggplant, onions, celery, parsley, strawberries, currants, gooseberries, and grapes (Olsen, 1970; Speulda, 1989; Erigero & Taylor, 1992). Domesticated vegetable annuals rarely persist in the landscape on their own, without human intervention.

Fort Vancouver became a National Historic Site and was reconstructed due to a mandate from congress in 1966. It played a significant role in Great Britain's claim of the Pacific Northwest and was a self-sustaining headquarter of agriculture and trade (Erigero & Taylor, 1992). The site was listed as eligible under Criteria A, as a British occupation event and under Criteria D, for the *in situ* artifacts or physical evidence of the occupation (NPS, 2019). Dr. McLoughlin, a significant person in Oregon's history and was named the Father of Oregon. He encouraged the other Hudson Bay Company forts and trading posts to plant gardens for subsistence purposes. The oldest known seedling Apple tree in Washington State was planted by Dr. McLoughlin. The apple tree has a park dedicated to it called, 'Old Apple Tree Park' that grows at the southern end of Fort Vancouver's grounds, figure 8. Ellison (1937) states, apples from this tree were made into a pie for President Franklin D. Roosevelt when he visited Fort Vancouver in 1934. This tree died in the summer of 2020. The tree's DBH was 31 inches.

In 1850, the settlement of Oregon territory began with the Donation Land Claim Act of 1850 and the Homestead Act of 1862. There are 62, 926 recorded homesteads in Oregon (BLM, 2012), on the lands ceded from tribes by treaties. The first settlers to the Willamette Valley noticed that the native fruit and nut bearing trees had larger fruit and no pests or diseases (Cardwell, 1906) likely due to the anthropogenic burning. Cardwell (1906) listed the following taxa as transplanted by early settlers: Plum (*Prunus*), Grape (*Vitis*), Elderberry (*Sambucus*), Blackberry (*Rubus*), Strawberry (*Fragaria*), Currant (*Ribes*), Huckleberry (*Vaccinium*), Oregon grape (*Mahonia*), Salal (*Gaultheria*), Oak (*Quercus*), and Hazelnut (*Corylus*).

The settlers built small cabins and introduced non-native species such as Daffodil (*Narcissus*), Lilac (*Syringa*), Walnut (*Juglans*), Locust (*Robinia*), Periwinkle (*Vinca*) and fruit orchards of Apple (*Malus*), Pear (*Pyrus*), Plums and Cherries (*Prunus*) and Quince (*Cydonia*). Quince is similar to a small round pear with a denser flesh and is not as sweet. The Quince was used as a pollinator for pear trees. Quince is a quintessential indicator of nearby historic orchards, figure 11. Ethnographies indicate that currants were not used by native peoples, they were used by settlers to make jams and jellies, due to their high pectin content. These trees and

shrubs were widely propagated by settlers and are common on historic sites, and contribute to the setting, aesthetics, look, and feel of original homesteads. In many cases they are the only remaining evidence of a historic occupation, because the original cabins have deteriorated or burned.

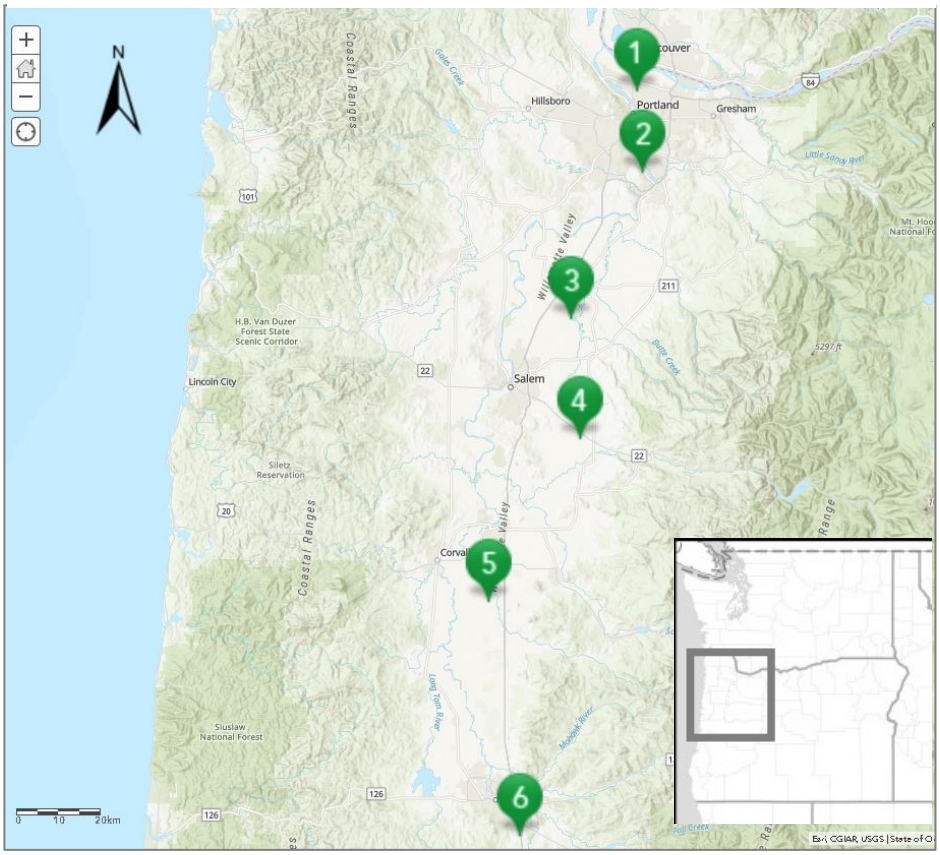
The first grafted fruit varieties were brought to Oregon by the Luellings (spelled various ways). The different varieties ripened at different times of the year, ensuring settlers a source of fresh fruit throughout the year. The first varieties to ripened in early summer were called: Sweet June, Red Astrachan, Golden Sweet, Summer Pearmain, and Summer Bellflower.

Apple varieties that ripened in the late summer to fall were named: Gravenstein, Red Cheek Pippin, Seek-No-Further, Rambo, and King of Tompkins County.

Apples that ripened after the first frost and sometimes remain on the tree through winter, were stored for winter and early spring use: Golden Russet, Yellow Bellflower, Baldwin, Lady Apple, White Pearmain, Northern Spy, Esopus Spitzenberg, Winesap, Yellow Newtown Pippin, Jenneting, Tulpehocken and the Siberian Crab apple (Ellison, 1937; Olsen,1970; Cardwell 1906; Himes, 1910). Pear (*Pyrus*) varieties brought by Luelling family include Bartlett, Early Butter, Seckel, Flemish, Fall Butter, Winter Nelis and Orange Quince (Olsen,1970). It is unknown if any of these varieties still exist on homesteads in western Oregon.

1. Fort Vancouver-Center of Diversity of seedling fruit stock.
2. Luelling's Orchard-The first grafted fruit trees in Pacific Northwest.
3. Settlemeir & Son Nursery, Woodburn, OR began in 1857(National Nurseryman 1896).
4. Ralph Geer Nursery began in 1851 (Ibid).
5. Pacific Nursery Company, Tangent, OR 1857-1862 (Ibid).
6. Dorris Ranch Filbert Orchard, a recorded historic orchard.

Figure 6: Map of early nurseries in Western Oregon.



Identifying plants cultivated by European colonists

Many settlers planted orchards from seed, because seed was easily transportable, and grafted fruit was not yet available. The method of pruning shows functionality of historic occupations. Fruit trees were pruned in a high-headed fashion to keep livestock and wildlife from eating the fruit in pastures, while the pollard technique was used for easy hand picking near the main occupation. Homesteaders planted different varieties of fruit because different cultivars ripen at different times of the season. Fresh fruit was stored in cellars, making it possible to have fresh fruit throughout the year. Apples have been observed hanging from trees throughout the winter (Thoreau, 2000).

Trees are commonly used as a meeting place to hold events (Turner, et al. 2009), as burial markers, peeled for cambium, fibers or planks. Trees as features include blazes for geographical markers, embedded objects, alignments of trees and shrubs are an indication of historic boundaries of yards, roads, driveways, and or property boundaries. Many historic plantings are bordered with alignments of wood or stones. Foundation plantings (Kunst, 1986) are an

indication of structural remains of foundation features. Homesteaders used the vegetation as 'foundation plantings' shortly after getting the main occupation structure built, as they thought it settled the house into the ground and linked the house and garden (Kunst, 1986). The lawn mower wasn't invented until 1830 (by Edwin Beard Budding) (Shukitis, 2014) and didn't become accessible to the general public until the 1890's. This tells us that early settlements didn't maintain traditional lawns until the early 1900s in western Oregon. Instead the foundation plantings are the best indicator of an early settlement landscape (Kunst, 1986). Trees were also used as site datums for original recordings by early archaeologists. Therefore, modified trees and domesticated fruit trees are indicators of historic sites. Graft scars are sometimes apparent at the base of the fruit tree.

Seth Lewelling was named the Father of Oregon horticulture, who brought the first grafted fruit trees to the Pacific Northwest (McClintock, 1967; Olsen, 1970), making him a significant person to Oregon's history. By 1850, the Luelling-Meek orchard was selling grafted fruit trees in Oregon to settlers and other early nurseries as stock (Olsen, 1970; Ellison, 1937; Himes, 1910). Lewelling was best known for creating the Bing cherry variety. The Bing variety of cherry was created by Seth Lewelling and would be culturally significant if it was still in the original place where it was created under Criterion C. The Bing cherry became one of the principal market varieties grown on the Northwest Coast. The Lewellings also made a significant contribution to Oregon's early agricultural economy. At the time grafted trees began producing fruit, gold was discovered in California, and the mass migration ensued. This brought a high demand and price for fresh market fruit (McClintock, 1967; Cardwell, 1906).

The first nurseries of grafted fruit trees were instrumental in starting Oregon's agricultural economy. P.W. Gillette brought nursery stock to Oregon in 1852 (Cardwell, 1906; National Nurseryman, 1896). Other early nurseries were started by Ralph Geer in Waldo Hills of West Salem in 1851; J.H. Settlemeier established a nursery in Tangent in 1857, and in Woodburn in 1863. J.H. Lambert established a nursery in 1896, when he purchased the Luelling property and orchard stock at the time of Lewelling's death (National Nurseryman, 1896; Olsen, 1970; Hines, 1893). Early grafted varieties are considered biotic cultural resources, are rare and/*or the only one of its kind* (NPS-LL, 2012). A quote from the National Park Service Landscape Lines 12 (2012):

> "*Plant and animal communities associated with human settlement and use are considered "biotic cultural resources". These can reflect social, functional, economic, ornamental, or traditional uses of the land." "Vegetation is considered a biotic cultural resource when it can be linked to an established period of significance and adds to the overall significance of the landscape. Vegetation is a common landscape characteristic associated with the historical development of a cultural landscape or resulting from cultural activities on the land. The features associated with vegetation are recognized as either a system (such as a forest or wetland), an aggregation of plants (such as a hedge or orchard), or an individual plant (such as a tree or shrub), all of which have distinct, unique, or noteworthy characteristics in a landscape."(NPS-LL, 2012)*

Examples of historic sites in Oregon with biotic cultural resources include Dorris Ranch filbert orchard, nominated and listed as a historic site on the National Register eligible on several aspects: Under criteria A, George Dorris was a significant person because of his efforts in creating the orchard/ranch and by his pioneering method of propagation or grafting technique. Mr. Dorris delivered the first speech on filberts at the Oregon State Horticulture Society in 1914 (NPS, 2020), which is part of what makes him a significant person to Oregon's history. Under criteria B, Dorris ranch is nationally recognized for being the first successful commercial filbert orchard in the United States and Oregon. Under criteria D, for yielding information about the early cultivation and breeding of filberts i.e. genetic composition (NPS, LL-12) of the Barcelona filbert variety. The Dorris Ranch's eligibility is linked to the site's integrity of its attributes such as alignments, spacing, and contributions to the look and feel of the Springfield historic district in Lane County. The final aspect of significance is that the ranch continues to produce filberts. The filbert became Oregon's official state nut in 1989. Through research, Apples appear to be the most significant fruit to the history of the nation. Several references to the significance of apples were observed in field visits and the literature. Common apple idioms include: '*As American as Apple pie'* (Champoeg Orchard Sign, 2019), '*An Apple a Day keeps the Doctor Away*', '*An Apple for the Teacher'*, '*The Big Apple',* as a reference to New York City, and the story of Johnny Apple Seed. Other contributors to the fruit's significance include their long-term storage capacity, they are easily transportable, and the pressed fruit natural specific gravity of 1.000 to 1.055, that can easily be made into cider (Poulon, 2002). Research concludes that apples have made a significant contribution to the broad patterns of American history.

Figure 7: The oldest known grafted fruit tree in Oregon, from Luellings stock.

Figure 8: Oldest known seedling apple tree in Washington State, photographed in spring of 2019, died in the summer of 2020, with a DBH of 31 inches.

The tree in Figure 8, is thought to be the oldest seedling apple tree in the Pacific Northwest. The tree was planted when Fort Vancouver was established (Cable News Network, 2020):

> *"It was considered the matriarch of the region's bustling apple industry and produced a green apple that was bitter to the taste but great for baking*.
>
> The main trunk of this tree died during the summer of 2020 at 194 years of age. Showing that a maintained tree can live many years past its natural lifespan when maintained.

Quantitative evidence of culturally significant plants in Oregon history

Jacobs (2003) ethnography of the Nehalem Tillamook was used for the model to create the initial spreadsheet, for all the other ethnographies. The categories were added to as each ethnography described similar actions and interactions with the flora. The number of times the plant or tree was mentioned in the text is the frequency. The results are grafted in figure 2 and 5.

Figure 2: Jacobs (2003) ethnography was used as a model for most frequently mentioned plants.

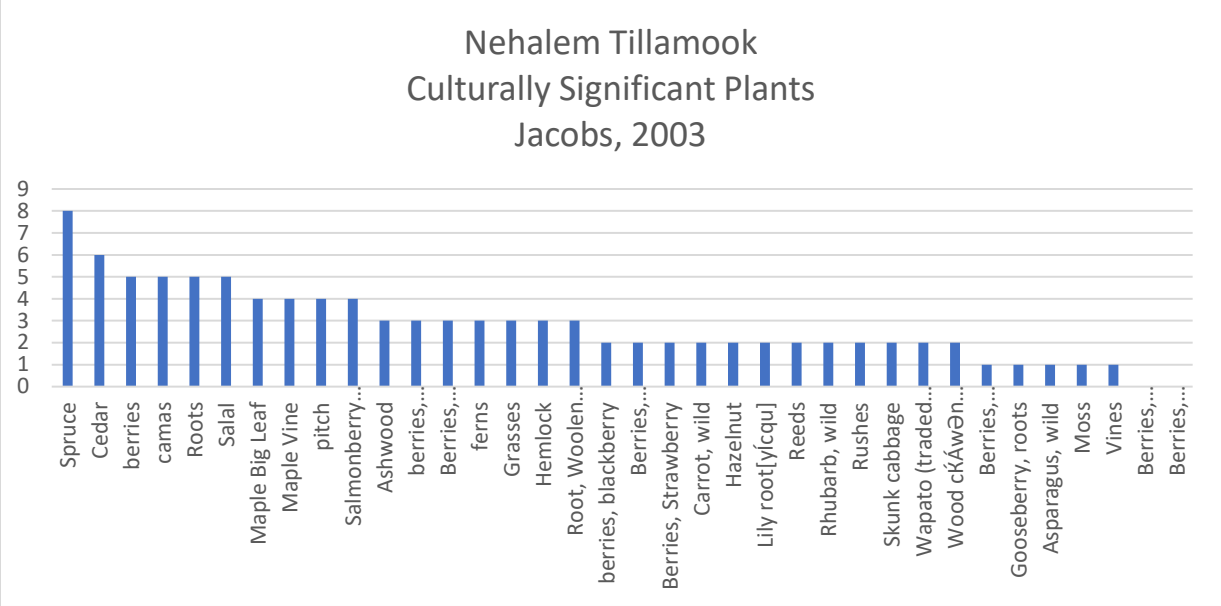


Figure 9 shows how the spreadsheet was organized. The column headings are Genera, the Common Name, and the citation source of the information on the uses of the taxa.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Occurs in Western Oregon	**Genera**	**Common Name**	**OR SHPO CSP**	**USDA CSP List**	**Umpqua FS CSP**	**BLM CSP List**	**Zybach, 2008**	**Booth, 1970**	**Heckert, 1977**	Pullen, 1996	Jacobs, 2003	Boyd, 2013	Dickson, 1946	Coquille Ethno2010	Phillips, 2016	Drucker, 1943	Sum Totals
2		?	Berry, Black Mountain	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3	x	Abies spp.	Fir, Unspecified	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
4	x	Abronia latifolia	Yellow Sand verbena	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
5	x	Acer circinatum	Maple, Vine	0	0	0	0	0	0	0	1	1	0	0	1	1	1	5
6	x	Acer macrophyllum	Maple, Big Leaf	0	0	0	0	1	1	0	1	1	1	0	1	1	1	8
7	x	Achillea millefolium	yarrow common	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2
8	x	Achlys triphylla	Vanilla Leaf	0	0	0	0	0	1	0	0	0	0	0	1	0	0	2
9	x	Achnatherum hymenoides	Grass, Indian Rice	1	0	1	1	0	0	0	0	0	0	0	0	0	0	3
10	x	Adiantum aleuticum	Fern, Maidenhair	1	0	1	1	0	0	0	1	0	0	1	1	0	1	7
11	x	Adiantum, Blechnum, Gymnocarpium, Polypodium, Polysti	Ferns	1	0	1	1	0	0	0	1	1	1	0	2	0	1	9
12	x	Aesculus californica	California buckeye	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
13	x	Alectoria fremontii, jubata	Moss, Black or Bearded	**0**	**0**	**0**	**0**	0	0	0	0	0	0	1	0	0	0	1
14		All grass species and genera excluding Bear Grass	Grasses all	2	1	2	2	0	1	0	1	1	1	1	3	1	2	18

Figure 10: Graph of the 40 most mentioned plant genera from the literature

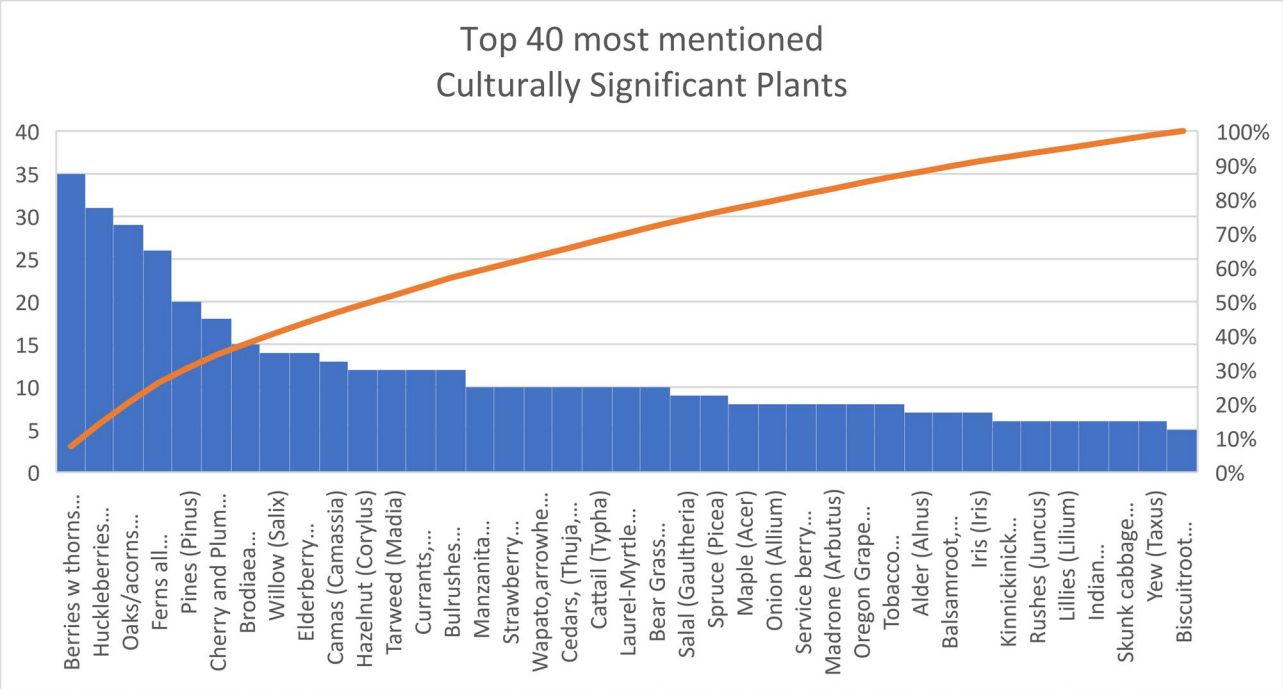
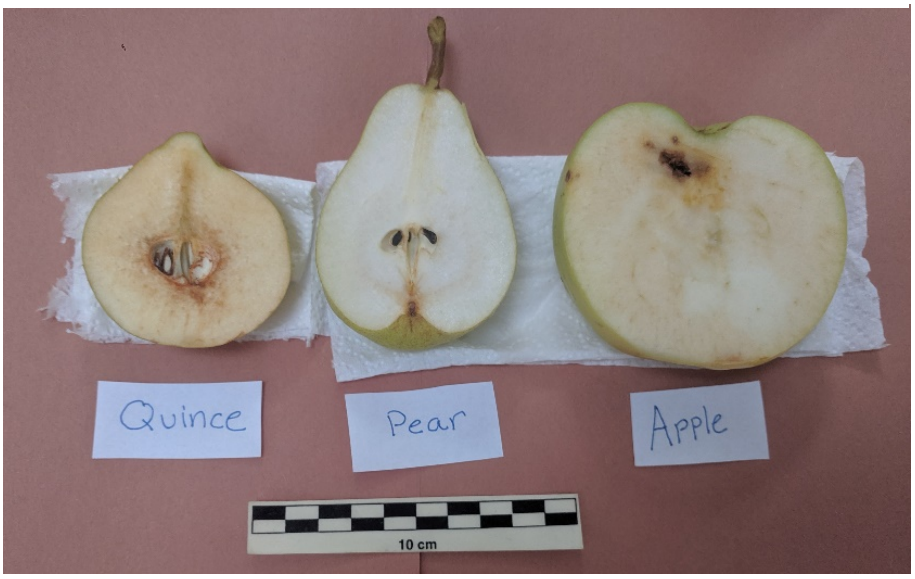


Figure 11: Comparison of shapes of Quince, Pear, and Apple shapes



Maps of distributions of culturally significant plants

The following are distributions of some potentially significant plants.

Figure 12: A photograph of *V. deliciosum* and a map of *Vaccinium* species in Western Oregon from the OSU Plant Atlas database

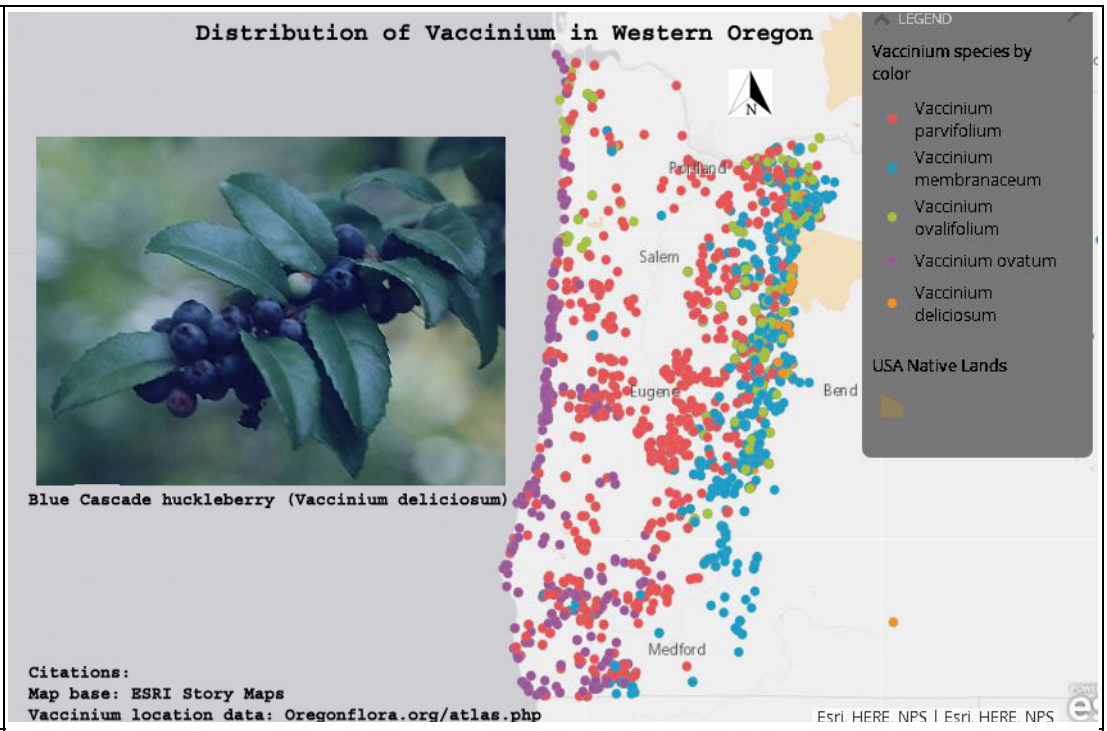


Figure 13: Red Huckleberry (*Vaccinium parvifolium*) distribution in Western Oregon

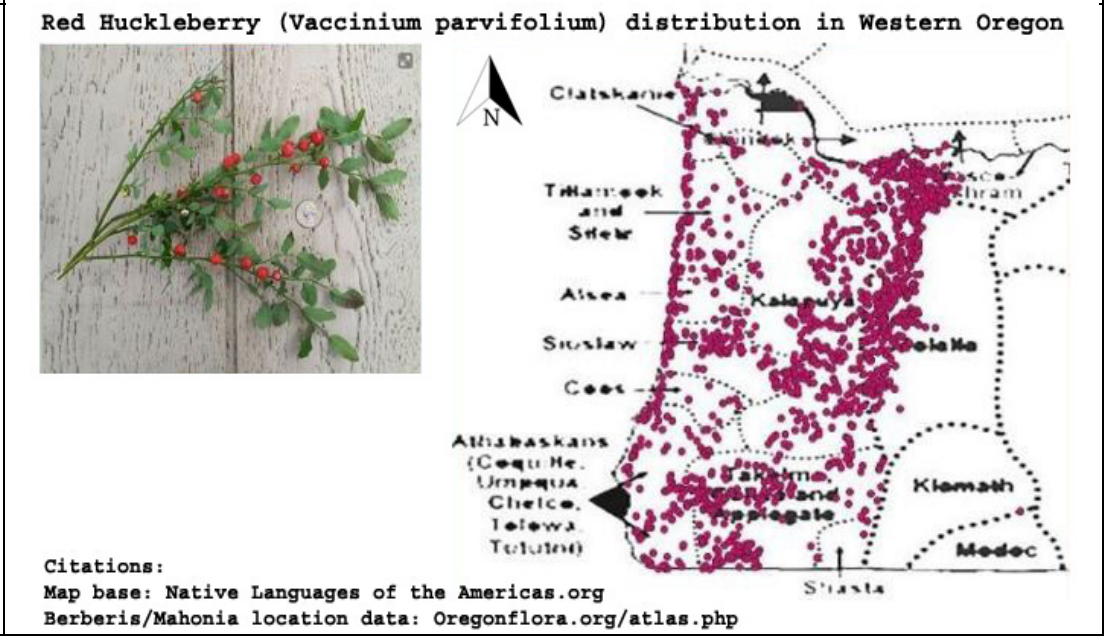
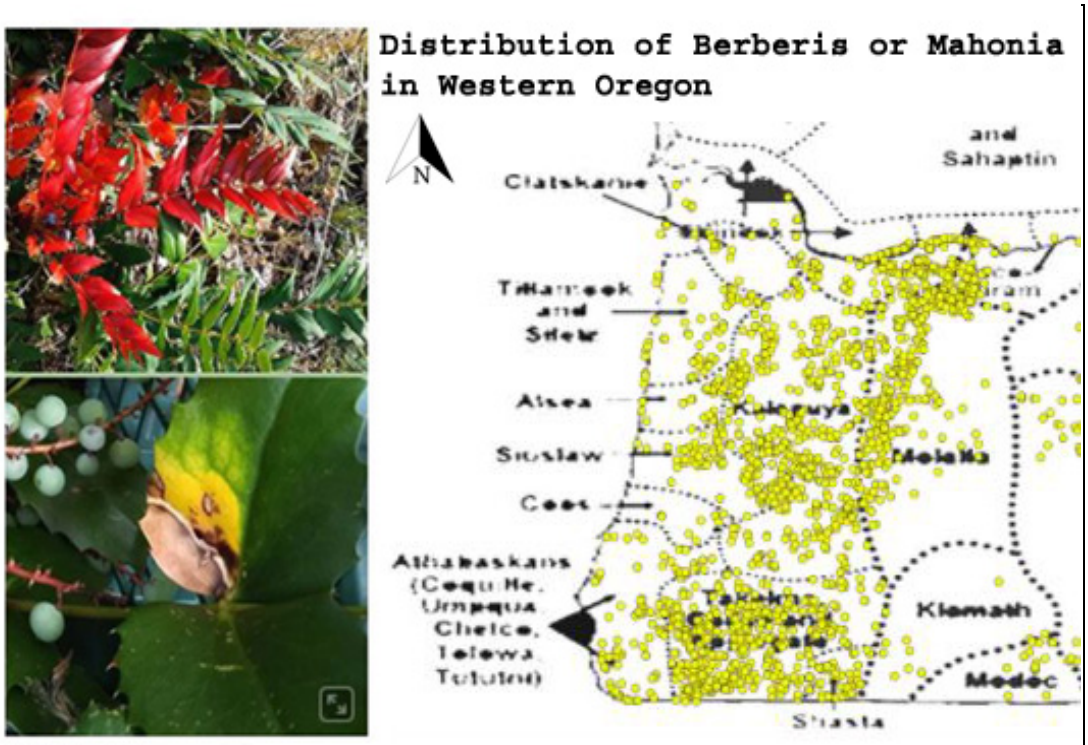
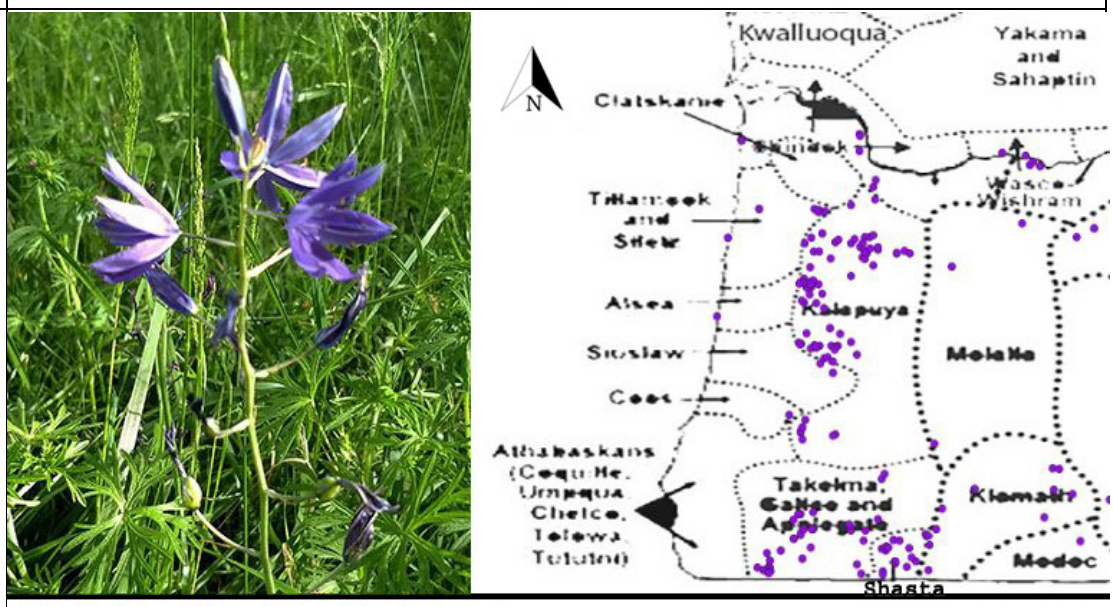


Figure 14: An example using Oregon Grape (*Berberis*) (OSU, 2020).



Citations:
Map base: Native Languages of the Americas.org
Berberis/Mahonia location data: Oregonflora.org/atlas.php

Figure 15: An example using Camassia.



Distribution of *Camassia quamash* in Western Oregon.
Map base: Native Languages of the Americas.org
C. quamash location data: Oregonflora.org/atlas.php

Discussion

This thesis found a gap in the literature. There was no definition for Culturally Significant Plant in the state and federal agency literature, even the agencies that had lists of 'culturally significant plants' did not have a standardized definition. To discuss this topic fully, four research questions were developed by the research itself. The four research questions are: What is a culturally significant plant? What species can be considered culturally significant? What is not a culturally significant plant? What qualitative evidence exists of culturally significant plants in Oregon history? What quantitative evidence exists for culturally significant plants in Oregon history?

Table 1 includes flora that were introduced and native flora. Deliberately planted vegetation on historic landscapes are living cultural resources. There are no recent publications that list the plants, trees, and shrubs that commonly occur on historic occupations and in cultural landscapes. Knowing which vegetation to look for can help in the identification of sites, interpretation of a site's function, and contribute to the evaluation of the landscape. Although any plant or tree species can be considered culturally significant, given the right context.

Trees and Archaeology

Trees on historic sites can be an asset and a liability to land managers. An asset because trees are slow growing, long lived, and retain evidence of past human activity. Trees show evidence of past environment conditions and fire.

Trees are datable with radiocarbon dating, dendrochronology, and by the Diameter at Breadth Height (DBH) 4.3 feet/1.3 meters around the trunk. There is a correlation between trunk diameter (DBH) and the age of trees (Philipek, 1985; Franklin and Dyrness 1988; Lukaszkiewiez et al 2008). Tree age calculators are available on the internet for getting an age estimate on trees. Geochemical sourcing methodologies has shown that the isotope Strontium (Sr), can be used to source the origin of organics (Benson et al, 2006; Lopez, personal communication, 2020).

The scars left by modification on trees is called compartmentalization of decay in trees (CODIT) by arborists (Shigo, 1977; Lilly, 2010; Alvey, 2009; Eisner, 2002). Figure 16 shows the progression of CODIT, 3 1/2 centimeters seven years after the wound took place on Beech (*Fagus*) on Oregon State University campus (Bill Coslow, OSU's Arborist, personal communication, 2018).

Pruning techniques show functionality, such as 'high heading' a technique used to keep the fruit out of reach of livestock (Dolan, 2009). Later, trees were pollard-pruned for mechanical harvesting in commercial orchards (Olsen, 1970). The technique of grafting is an agricultural specialization of an artisan nurseryman (Diamond, 2010). When an exceptional tasting fruit was discovered, a bud or twig was cut off in the winter and grafted onto seedling root stock in early spring. Once the graft was established and has reached sapling size, it was transportable. Grafted trees were coveted by settlers as long-term food providers (Diamond, 2010). Grafting is still a specialized skill and could be considered under the criteria C as the work of a master by design or architecture (of trees) (Mattheck, 1994; Shigo, 1985; Lilly, 2010; Alvey, 2009; Evans, 1984).

Fruit trees on homesteads can become a liability in state quarantine areas, as they can harbor pests and disease that can spread to agricultural areas. The National Park Service addresses this:

> *Many old cultivars or varieties of agricultural crops are prohibited by federal or state law to prevent new epidemics of pests and diseases and conserve soil fertility.*" (NPS LL-4).

The National Park Service's publication, Landscape Lines-12 (2012), suggests conducting surveys exclusively for a plant inventory, to locate, and identify all existing species on a landform. The (2012) publication recommends that if plants cannot be identified in the field, a sample can be collected as an herbarium specimen, and identified by a botanist later.

Plants, Genetic Diversity, and the National Register

Rare varieties, cultivars, and original strains are considered biotic resources by the National Park Service. Genetics is an aspect of eligibility for the National Register of Historic Places. The extent of rare cultivars is currently unknown (Routson and Reilley, 2009; Richards and Volk, 2009) nationwide on private and federal lands. According to the research, the Apple (*Malus*) is the most significant fruit because it has contributed to the broad patterns of settlement and colonization of the nation. Genetic diversity of rare varieties is an aspect of integrity to consider when visiting archaeological sites. The extent of rare varieties on federally owned historic sites in western Oregon are unknown. Various researchers have demonstrated the potential of historic orchards to contribute to research, education, and agrobiodiversity (Volk et al, 2015, 2016; Routson, 2009; Gross et al, 2014; Rubenstein, 2006; Jackson, 2007). The National Park Service Landscape Lines 12 (2102) quotes this aspect:

"*Some plants of cultural landscapes are no longer commercially available, either because they are no longer fashionable (extinct as a result of lack of propagation), or they are difficult to find as "unimproved" (nonhybridized) straight species or varieties. . .But when a source cannot be found for a plant in decline, vegetative propagation guarantees the accurate identity of the replacement plant and the prevention of extinction of the cultivar, variety, or species. If old-fashioned cultivars, straight varieties of exotic plants, or other unusual forms of plants exist, it is useful to check on plant availability before the onset of mortality so that a viable propagule can be made*."

The National Park Service already has a program for conservation of germplasm of rare varieties as a genetic resource (NPS LL-12; Duan, 2017). Sites with rare varieties listed on the National Register are Dorris Ranch, the Moses Cone Estate, the Sawmill Place Orchard, the Flat top Orchards and the China Orchard. The Temperate Orchard Conservancy website (2020) states that it has the largest number of known heritage varieties. The trees are available for research for collecting leaf samples for DNA comparisons with unknown varieties (Volk and Henk, 2016). Figure 19 is a map of places with known historic cultivars available for research and sampling for base DNA comparisons (Volk, 2016, 2019) to identify unknown cultivars.

The extent of rare cultivars on state and federal agency administered lands is unknown. Most fruit trees on historic sites are unmaintained, undocumented, and can become a liability in state quarantine areas, as they can harbor pests and disease that can spread to agricultural areas. The National Park Service Landscape Lines 4 (2004) addresses this concern:

Many old cultivars or varieties of agricultural crops are prohibited by federal or state law to prevent new epidemics of pests and diseases and conserve soil fertility."

Agencies that manage cultural resources can approach the documentation of plants and trees in the same manner as traditional features i.e. structural remains of foundations, ditches, and rock alignments.

What is not a culturally significant plant?

Any naturally occurring, endemic, invasive, and noxious vegetation are typically not considered significant. Intentionally planted flora that occurred post-1950 are considered

insignificant is the standard ideology across the Cultural Resource Management industry. For example, a roadside Himalayan blackberry (*Rubus*) cane that is casually picked by pedestrians is an example of an insignificant plant.

How can culturally significant plant data be useful for scientists?

It is known in the plant sciences of botany, biology, and ecology that human-managed plants undergo *domestication syndrome*, over time that leads to full domestication. Documentation of culturally significant plants present on the landform over time, would be useful for botanical and ecological studies (Firth, 1985) of change over time.

16. Measuring CODIT progression on a Beech (Fagus) tree.

Trees on archaeological sites should be treated like other features; their characteristics, dimensions measured, and fruit photographed, figures 11, 12, 16, and 21. The measurement of the progress of compartmentalization (CODIT) of scars on trees would be useful for determining the rate of the sealing of wounds such as imbedded objects, and indicates when historic activities took place, figure 16.

The National Park Service publication, Landscape Lines-12, suggests conducting vegetation specific inventories to locate and identify all existing species on the undertaking landform (NPS, 2012). The National Park Service recommends that if plants cannot be identified in the field, a sample can be collected as an herbarium specimen, to be identified by a botanist at a later time, figure 18.

> *"Of great concern to ecologists and plant experts is the reduction in plant genetic diversity that results from the extinction of cultivars, varieties, and species"* (NPS, LL-4, 2004).

Documentation of plants on cultural surveys, would be useful in the study of morphological and ecological changes of plant populations over time. Documentation of patches of traditional indigenous use plants such as Huckleberries (*Vaccinium*) or Beargrass (*Xerophyllum*) would be of interest to modern native communities for gathering traditional resources. Documentation of species on a landscape could be used for studies of fire resistance adaptation could also benefit

from better data collection. There is a correlation between anthropogenic burning and fire-adapted species in Western Oregon, that warrants more study. Trees that have been documented that have developed fire resistance include: Hazelnut (*Corylus*), Oaks (*Quercus, Notholithocarpus*), Pine (*Pinus*) and Cedar (*Calocedrus*). These fire-adapted plants and trees are mentioned in ethnographic studies as used during prehistoric times.

Studies have demonstrated that historic orchards have the potential to contribute to research, education, agrobiodiversity (Volk et al, 2015, 2016; Routson, 2009; Gross et al, 2014; Rubenstein, 2006; Jackson, 2007), and may qualify under criteria D of the National Register.

A quote from the National Park Service Landscape Lines 12 (2012):

> *"Vegetation that can be linked to an established period of significance and that has remained relatively unchanged over time, adds to the overall integrity of the landscape. . .Some plants of cultural landscapes are no longer commercially available, either because they are no longer fashionable (extinct as a result of lack of propagation), or they are difficult to find as "unimproved" (nonhybridized) straight species or varieties. Some plants can be found in other cultural landscapes where they have been accurately identified and maintained. But when a source cannot be found for a plant in decline, vegetative propagation guarantees the accurate identity of the replacement plant and the prevention of extinction of the cultivar, variety, or species. If old-fashioned cultivars, straight varieties of exotic plants, or other unusual forms of plants exist, it is useful to check on plant availability before the onset of mortality so that a viable propagule can be made*."

Figure 18 is an example of a specimen of Wild carrot *Daucus carota* collected in 1902, recorded with: location, the nearby plant community, date of collection, and the name of collector (accession # 13389). Location data of herbarium specimens of *D. carota* were queried in Oregon State University's Vascular Plant Atlas and uploaded to the map, figure 18.

Where figure 17, from the Vascular Plant Atlas are specimens collected from 1860 to 1899. Comparing these historic plant vouchers with the current vegetation at the same location would be an interesting ecological study of how plants change morphologically over time. The Vascular

Plant Atlas database includes data sourced from all the herbariums that contributed plant data to the Plant Atlas.

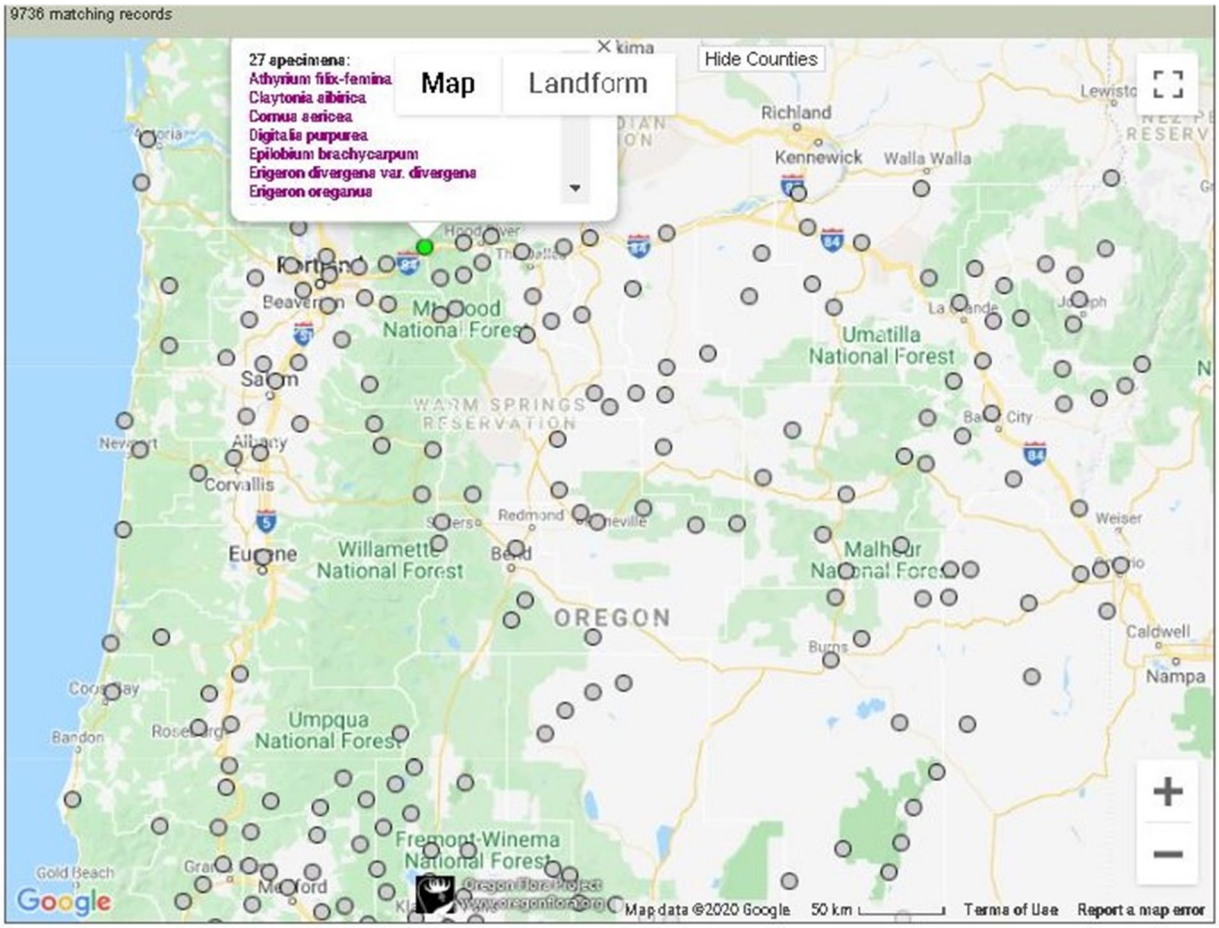


Figure 17: Map of herbarium specimens collected from 1860 to 1899. Courtesy of the OSU Herbarium and the Oregon Flora Project, 2020. Source: http://www.oregonflora.org/atlas.php

Conclusion

Federal agencies and state agencies agree that plants an integral part of cultural landscapes, yet there is not a standardized definition for the term culturally significant plant, at this time. Research of the federal and state guidance literature for archaeologists led to the conclusion that terms: *feature, object, and cultural resource,* include the surface vegetation. When it comes to native vegetation or 'wild gardens', although the context is right, the State Historic Preservation Office (SHPO) requires physical evidence of human activity i.e., berry processing features and/or associated artifacts. The presence of a concentration of traditional use flora documented in ethnographies, is not enough evidence to record a plant community as an ethnographic landscape. The SHPO's list of site types that are likely to include surface vegetation that are potentially culturally significant include: Burial/Grave/Cemetery, cabin, Homestead, Lithic Scatter, Rockshelter/Cave, Shell Middens and Village. The SHPO's list of features, where the surface vegetation contributes: Arrastra, Buried occupied surface, Cabin, Cache pit, Culturally Modified Tree, Dendroglyph, Ditch, Fence/Corral, Foundation, Guard station, Historic Structure Remains, Historic Wood – purpose unknown, Holding pond, House pit, Huckleberry Processing Trench, Irrigation, Living Floor, Lookout, Midden, Oven, Raceway, Railroad Grade/Trestle, Road, Root Gathering Area, Sawmill, Setting Pond, Sign, Stage Stop, Stock Driveway/Corridor, and Traditional Cultural Properties (SHPO, 2019). Because most native and domesticated perennials, shrubs, and trees perennate in the landscape, even with moderate disturbance.

Conclusion for the working definition of culturally significant plant

The conclusion drawn from the research, for the culture resource management industry, is that a culturally significant vegetation has had a relationship with people over time. Theoretical implications conclude that human connections with vegetation have two modes of interaction:

1) A cultural group going to the plant resource and interacting with it.

2) A cultural group moving the plant resource to the occupation site.

In both instances, certain plant or tree species on the landscape indicate human activity and potential buried features. A plant or community of plants can be considered significant if they contribute aspects of integrity to the cultural landscape and reflect aspects of the national register criteria. Any plant or tree species can be considered culturally significant given the right context. The taxa in Table 1 are the most mentioned *genera* in western Oregon literature sources. Also, plants may be potentially significant within an undertaking, will become apparent after

background research, doing a vegetation inventory, and through consultation with interested parties and an ethnobotanist.

A culturally significant plant is not. . .

A non-culturally significant plant is one that is out of context and does not contribute aspects of integrity to an archaeological site. Endemic, invasive, and noxious vegetation are typically not considered significant, appendix 1. A plant that was not used by people, avoided, unnamed, or not chosen over other flora are not significant. Volunteer seedling fruit trees (Volk, personal communication, 12-2019), that are not intentionally planted are not significant, but can be indicators of the cultural landscape.

Qualitative evidence of culturally significant plants in western Oregon

The indigenous people of western Oregon practiced a form of early agriculture prior to settlement (Suttles, 1951b; Minore, 1972; Turner, 2011; Anderson, 2005). The anthropogenic fire management of the landscape interfered with settlers' establishment of homesteads. Therefore, indigenous fire management was halted in the 1850s (Boyd, 1999) and the people were removed from their traditional lands to reservations. As a result, many indigenous used plants became fire adapted and are the first to emerge after fires. Many of these fire adapted species found, are mentioned in ethnographies as used by the western Oregon tribes.

Quantitative evidence for culturally significant plants in western Oregon

The most frequently mentioned taxa with documented uses that are fire adapted include: *Rubus*, *Vaccinium*, *Quercus*, *Pinus*, *Prunus*, *Salix*, *Brodiaea*, *Camassia, Corylus,* and ferns (*Pteridium, Polystichum, Blechnum*), table 1. Field observations conclude that the most commonly occurring introduced taxa on historic sites include: Daffodil (*Narcissus*), Lilac (*Syringa)*, Periwinkle (*Vinca)*, berries with thorns (*Rubus*), and domesticated fruit trees (*Malus*, *Pyrus*, *Prunus*, & *Cydonia*). These introduced species are indicators of historic sites and are linked to the colonialization and settlement in western Oregon. Another conclusion drawn was that *Malus* appears to be the most significant of all the fruits to the broad patterns of American history. Native species transplanted on historic occupations include Mock orange (*Philadelphus*), Huckleberry (*Vaccinium*), Wild rose (*Rosa*), Honeysuckle (*Lonicera*), Currant and Gooseberry (Ribes). Trees show evidence of modification of past historic human activity with scars from

blazes, peeling, planking, or embedded objects, through a process of compartmentalization (CODIT). Culturally modified trees are compromised condition, making them more susceptible to diseases and insect infestations. Most old heritage trees are in a compromised condition simply due to the age limitations of the particular species. Most fruit trees on historic occupation sites are undocumented, unmaintained, and can become a liability in state quarantine areas, as they can harbor pests and disease that can spread to agricultural areas. The extent of rare varieties on federally administered lands in Western Oregon is currently unknown. Rare varieties are an aspect of integrity considered by the National Park Service. The best way to determine the variety is through DNA sequencing.

Vegetation on historic sites were typically planted in rows or alignments that define features. These indicator plants can aid archaeologists in the identification, interpretation and evaluation of archaeological sites and as a contributing feature. The terms *feature, object, and cultural resource* encompasses vegetation*,* in the NPS and State guidance literature. Plants identified by the cultural group during on-site visits, were considered significant across the entire project area. Rare and endangered species also need to be mitigated and taken into consideration, as they are protected by federal legislation (Stoffel, 1990).

The number of potentially cultural significant plants in Western Oregon includes 73 with less than 300 species, given the correct context. While the total number of native *genera* is approximately 1,141 with 5335 species of flora in the entire Pacific Northwest region (Hitchcock, 2013).

Broader Impacts this thesis contributes to the discipline

The next era of Cultural Resource Management (CRM) could benefit from better documentation of the surface vegetation. Agencies that manage cultural resources can approach the documentation of plants and trees in the same manner as traditional features i.e. with measurements, noting characteristics, and photographs, see the evaluation forms in the appendices.

Firth (1985) states, if a historic homestead is considered *ineligible* by the National Register criteria, documentation of the plant community should be undertaken to identify rare varieties or cultivars, regardless of eligibility status. Flora on historic occupations can be potentially rare,

original strains, or the only one of its kind (NPS, 2005). The extent of rare cultivars is currently unknown (Routson and Reilley, 2009; Richards and Volk, 2009) nationwide on private and federal lands. Many of the original fruit varieties brought to Oregon are now rare.

To identify the genetics or varieties of fruits on historic sites requires DNA sequencing, which entails sending leaf samples to a laboratory, figure 19. There are a number of nurseries and conservation orchards with heritage fruit varieties that are available for baseline DNA comparisons of rare, lost, or unknown varieties (Gayle Volk, personal communication, 2019).

Figure 18, is an example of a specimen of *Daucus carota* or Queen Anne's Lace, an introduced species that and is not included in the list of culturally significant plants in Figure 5 and Table 1. The photograph of the specimen of *D. carota* is however, a good example of good historical data because it was collected in 1902, recorded with: location, nearby plant community, date of collection, and the name of collector (accession # 13389). The location data in figures 12-15 and 18 were sourced from vouchers in the Vascular Plant Database (OSU Herbarium, 2019).

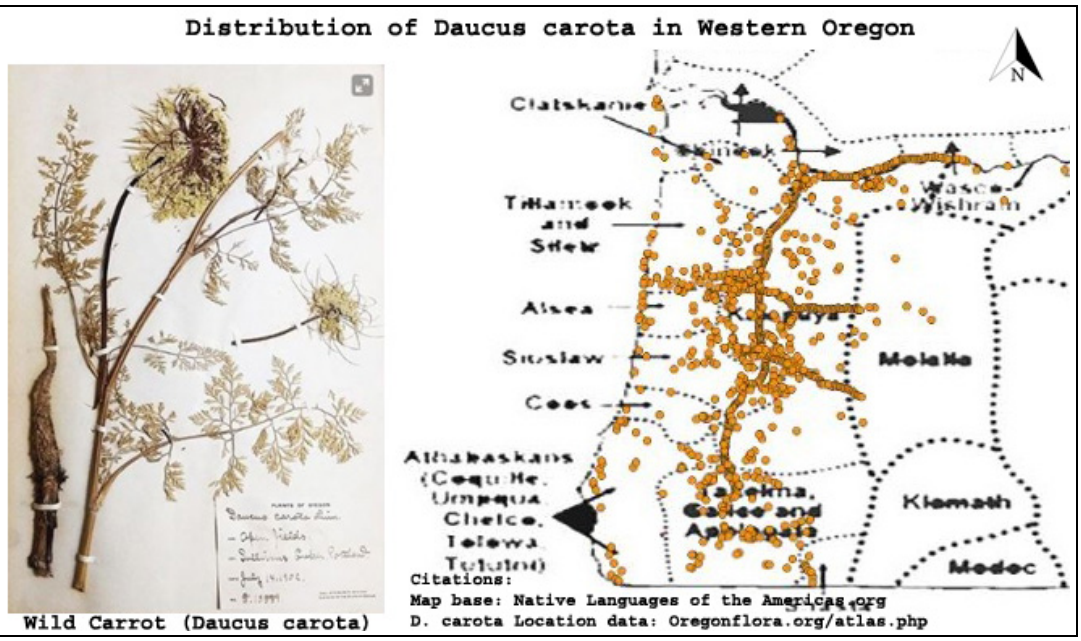


Figure 18: An example of an herbarium specimen collected in 1902, and a map of the distribution of collected specimens of *D. carota* (OSU, 2020) Background (Redish and Lewis, 2009).

An interdisciplinary perspective using disciplines of Botany and Plant pathology, ecology, arboriculture, anthropology, and geography were used to draw these conclusions The broader impacts of how the Cultural Resource Management industry documents surface vegetation could be influenced by this thesis.

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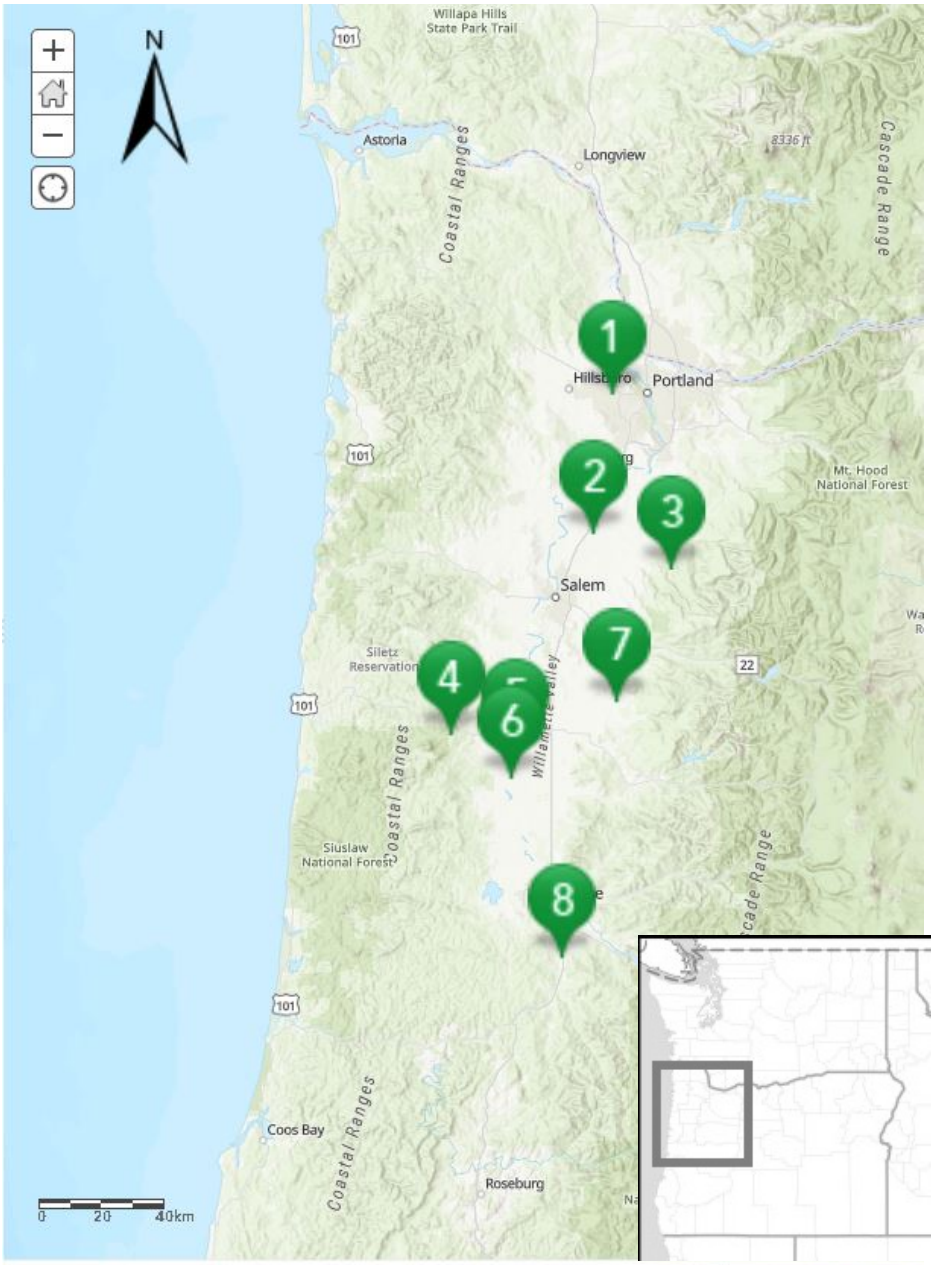
Appendices

Places with known heritage fruit varieties available for leaf samples for DNA comparison.

1. Howell Orchard, Sauvie Island
2. Champoeg State Park Orchard, St. Paul, OR
3. Temperate Orchard Conservancy, Molalla, OR
4. Fort Hoskins County Park Orchard, Philomath, OR
5. Garland Nursery, Corvallis, OR
6. USDA National Plant Germplasm for Pear, Corvallis, OR
7. Queener Farms, Scio, OR
8. Dorris Ranch Living History Farm, Springfield, OR

Link to share interactive map https://arcg.is/1K8yG1

Figure 19: Map of facilities that can assist with historic fruit variety research



Fruit Identification Services in Western Oregon

Temperate Orchard Conservancy and the Lost Apple Project
29438 S. Molalla Ave, PO Box 529, Molalla, OR 97038, (503) 338-8479
http://www.temperateorchardconservancy.org/contact-us/

Garland Nursery
5470 NE Hwy 20, Corvallis, OR 97330, (541) 753-6601

Queener Farms
40385 Queener Dr, Scio, OR 97374, (503) 689-2784

Howell historic homestead and orchard
13901 NW Howell Park Rd, Sauvie Island, Portland, OR 97231

Fort Hoskins County Park and orchard,
22953 Hoskins Rd, Philomath, OR 97370

Champoeg State Park and orchard
8239 Champoeg Rd NE, Saint Paul, OR, 97137

Fruit identification DNA Services

The following services can help identify cultivars through DNA analysis:
USDA, Agricultural Research Service
National Plant Germplasm Repository for Apples
Plant Genetic Resources Unit, Cornell University Experiment Station
630 W. North Street, Geneva, New York 14456-0462

USDA, Agricultural Resource Service
National Plant Germplasm for Pear
33447 SE Peoria Road, Corvallis Oregon 97333-2521

USDA, Agricultural Research Service
National Plant Germplasm Repository
Tree Fruit/Nut Crops and Grapes
One Shields Avenue, UCD, Davis, California 95616-8607

USDA, Agricultural Research Service
National Center for Genetic Resources Preservation
1111 S. Mason Street, Fort Collins, Co 80521

Table 2: SHPO's Plant List from Go Digital online site recording platform, accessed 2019-07-12

Balsamroot	Ocean spray (Arrow wood)
Bear Grass	Onion
Bitterroot	Oregon Grape
Black Cap	Oregon White Oak
Black Mountain Berry	Other
Brodiaea	Pacific Blackberry
California Black Oak	Pacific Yew
California Laurel (Myrtle)	Ponderosa Pine
Camas	Prince's Pine
Cascade Oregon Grape	Rattlesnake Plantain
Cascara (Buckthorn)	Red Huckleberry
Cattail	Red Osier Dogwood
Ceanothus	Rose
Chinquapin	Sadler Oak, Deer Oak
Chokecherry	Salal Berries
Currant	Salmonberry
Domestic/Agriculture	Service berry
Elderberry	Spruce
Evergreen Huckleberry	Strawberry
Ferns	Sugar Pine
Golden Chinquapin	Tanoak
Hazelnut	Tarweed
Indian Carrot (Yampa)	Thimbleberry
Indian Plum	Tobacco
Indian Rice Grass	Toughleaf Iris
Iris	Tule
Licorice Fern	Wada
Lillies	Wapato
Lomatium species	Western Juniper
Madrone	Western Red Cedar
Maidenhair Fern	Whitebark Pine
Manzanita	Wild Mustard
Mariposa Lily	Wild Plum
Mock Orange	Wild Rye
Mountain mahogany	Willow
Oak	Yerba Buena

Figure 20: International Society of Arboriculture (ISA)'s 2017 Basic Tree Risk Assessment Form

ISA Basic Tree Risk Assessment Form

Client _____ Date _____ Time _____
Address/Tree location _____ Tree no. _____ Sheet ____ of ____
Tree species _____ dbh _____ Height _____ Crown spread dia. _____
Assessor(s) _____ Tools used _____ **Time frame** _____

Target Assessment

Target number	Target description	Target protection	Target zone: Target within drip line	Target within 1 x Ht.	Target within 1.5 x Ht.	Occupancy rate (1 = rare, 2 = occasional, 3 = frequent, 4 = constant)	Practical to move target?	Restriction practical?
1								
2								
3								
4								

Site Factors

History of failures _____ **Topography** Flat☐ Slope☐ _____% **Aspect** ____
Site changes None☐ Grade change☐ Site clearing☐ Changed soil hydrology☐ Root cuts☐ Describe _____
Soil conditions Limited volume☐ Saturated☐ Shallow☐ Compacted☐ Pavement over roots☐ _____% Describe _____
Prevailing wind direction _____ **Common weather** Strong winds☐ Ice☐ Snow☐ Heavy rain☐ Describe _____

Tree Health and Species Profile

Vigor Low☐ Normal☐ High☐ **Foliage** None (seasonal)☐ None (dead)☐ Normal ____% Chlorotic ____% Necrotic ____%
Pests/Biotic _____ **Abiotic** _____
Species failure profile Branches☐ Trunk☐ Roots☐ Describe _____

Load Factors

Wind exposure Protected☐ Partial☐ Full☐ Wind funneling☐ _____ **Relative crown size** Small☐ Medium☐ Large☐
Crown density Sparse☐ Normal☐ Dense☐ **Interior branches** Few☐ Normal☐ Dense☐ **Vines/Mistletoe/Moss** ☐ _____
Recent or expected change in load factors _____

Tree Defects and Conditions Affecting the Likelihood of Failure

— Crown and Branches —

Unbalanced crown ☐ LCR ____%
Dead twigs/branches ☐ ____% overall Max. dia. _____
Broken/Hangers Number _____ Max. dia. _____
Over-extended branches ☐
Pruning history
Crown cleaned ☐ Thinned ☐ Raised ☐
Reduced ☐ Topped ☐ Lion-tailed ☐
Flush cuts ☐ Other _____

Cracks ☐ _____ Lightning damage ☐
Codominant ☐ _____ Included bark ☐
Weak attachments ☐ _____ Cavity/Nest hole ____% circ.
Previous branch failures ☐ _____ Similar branches present ☐
Dead/Missing bark ☐ Cankers/Galls/Burls ☐ Sapwood damage/decay ☐
Conks ☐ Heartwood decay ☐ _____
Response growth _____

_____ Condition(s) of concern _____

Part Size _____ Fall Distance _____
Load on defect N/A☐ Minor ☐ Moderate☐ Significant☐
Likelihood of failure Improbable☐ Possible☐ Probable ☐ Imminent ☐

Part Size _____ Fall Distance _____
Load on defect N/A☐ Minor ☐ Moderate☐ Significant☐
Likelihood of failure Improbable☐ Possible☐ Probable ☐ Imminent ☐

— Trunk —

Dead/Missing bark ☐ Abnormal bark texture/color ☐
Codominant stems ☐ Included bark ☐ Cracks ☐
Sapwood damage/decay ☐ Cankers/Galls/Burls ☐ Sap ooze ☐
Lightning damage ☐ Heartwood decay ☐ Conks/Mushrooms ☐
Cavity/Nest hole ____% circ. Depth _____ Poor taper ☐
Lean ____° Corrected? _____
Response growth _____
Condition(s) of concern _____
Part Size _____ Fall Distance _____
Load on defect N/A☐ Minor ☐ Moderate☐ Significant☐
Likelihood of failure Improbable☐ Possible☐ Probable ☐ Imminent ☐

— Roots and Root Collar —

Collar buried/Not visible ☐ Depth _____ Stem girdling ☐
Dead ☐ Decay ☐ Conks/Mushrooms ☐
Ooze ☐ Cavity ☐ ____% circ.
Cracks ☐ Cut/Damaged roots ☐ Distance from trunk _____
Root plate lifting ☐ Soil weakness ☐
Response growth _____
Condition(s) of concern _____
Part Size _____ Fall Distance _____
Load on defect N/A☐ Minor ☐ Moderate☐ Significant☐
Likelihood of failure Improbable☐ Possible☐ Probable ☐ Imminent ☐

Page 1 of 2

Figure 20: International Society of Arboriculture (ISA)'s 2017 Basic Tree Risk Assessment Form (cont).

Risk Categorization

Target (Target number or description)	Tree part	Condition(s) of concern	Likelihood: Failure: Improbable	Likelihood: Failure: Possible	Likelihood: Failure: Probable	Likelihood: Failure: Imminent	Likelihood: Impact: Very low	Likelihood: Impact: Low	Likelihood: Impact: Medium	Likelihood: Impact: High	Likelihood: Failure & Impact (from Matrix 1): Unlikely	Likelihood: Failure & Impact (from Matrix 1): Somewhat	Likelihood: Failure & Impact (from Matrix 1): Likely	Likelihood: Failure & Impact (from Matrix 1): Very likely	Consequences: Negligible	Consequences: Minor	Consequences: Significant	Consequences: Severe	Risk rating (from Matrix 2)

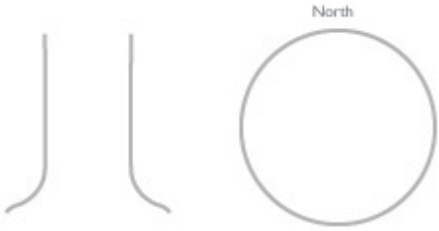
Matrix 1. Likelihood matrix.

Likelihood of Failure	Likelihood of Impact: Very low	Low	Medium	High
Imminent	Unlikely	Somewhat likely	Likely	Very likely
Probable	Unlikely	Unlikely	Somewhat likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Matrix 2. Risk rating matrix.

Likelihood of Failure & Impact	Consequences of Failure: Negligible	Minor	Significant	Severe
Very likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

Notes, explanations, descriptions



Mitigation options

1. _____ **Residual risk** _____
2. _____ **Residual risk** _____
3. _____ **Residual risk** _____
4. _____ **Residual risk** _____

Overall tree risk rating Low ☐ Moderate ☐ High ☐ Extreme ☐

Overall residual risk None ☐ Low ☐ Moderate ☐ High ☐ Extreme ☐ **Recommended inspection interval** _____

Data ☐Final ☐Preliminary **Advanced assessment needed** ☐No ☐Yes-Type/Reason _____

Inspection limitations ☐None ☐Visibility ☐Access ☐Vines ☐Root collar buried Describe _____

This datasheet was produced by the International Society of Arboriculture (ISA) — 2017

Page 2 of 2

Figure 21: National Park Service Fruit Tree Assessment form

FRUIT TREE CONDITION ASSESSMENT FORM

Park: **Inspected By:** **Date:**

Location: **Field ID:** **Latitude** **Longitude**

Genus: **Species:** **Variety:** **DBH:**

Tree significance: ☐ Contributing ☐ Non-contributing ☐ Compatible ☐ Incompatible ☐ Unknown

Documentation:

Condition Assessment

☐ **Good:** Good growth with minor physical damage, defects, disease or insect damage, or minor dieback/deadwood.

☐ **Fair:** Decreased growth with moderate physical damage, defects, disease or insect damage, or moderate dieback/deadwood.

☐ **Poor:** General state of decline with little or no growth, major physical damage, defects, disease or insect damage, or major dieback or deadwood.

☐ **Dead:** Greater than 90% of crown dieback with no growth.

Insert Photo

Zone	Description	Inspection Factors			
Zone 0: Orchard Floor	Ground beyond dripline	overgrown groundcover	rodent holes	gopher mounds	grade disturbances
		encroaching vegetation	accumulated debris	drainage issues	
Zone 1: Root System	Ground within dripline	root damage	accumulated debris	loss of soil	root suckers
		early fruit drop	exposed roots		
Zone 2: Trunk Base	Intersection of roots with trunk	loss of bark	cavities	fruiting bodies	cracks or splits
		girdling	cankers	root suckers	wildlife damage
		soil accumulation	trunk flare buried		
Zone 3: Main Trunk	Trunk up to scaffold limbs	unbalanced scaffolds	moss/lichen cover	pack rat nests	decay or cavities
		leaning trunk	deadwood	water sprouts	loss of limbs
Zone 4: Canopy	Scaffold limbs, branches and foliage	deadwood	pests	foliage discolored	foliage curled
		% live canopy	diseases	early leaf drop	foliage sparse
		unbalanced canopy	dieback of terminal shoots		
Zone 5: Above Canopy	Area above canopy	encroaching vegetation	over shading		

Recommendations

Prune/remove deadwood: _____

Install support system/cable/brace: _____

Monitor for change: _____

Potential future removal: _____

Figure 22: Visual Tree Assessment by Mattheck, et al, 1994.

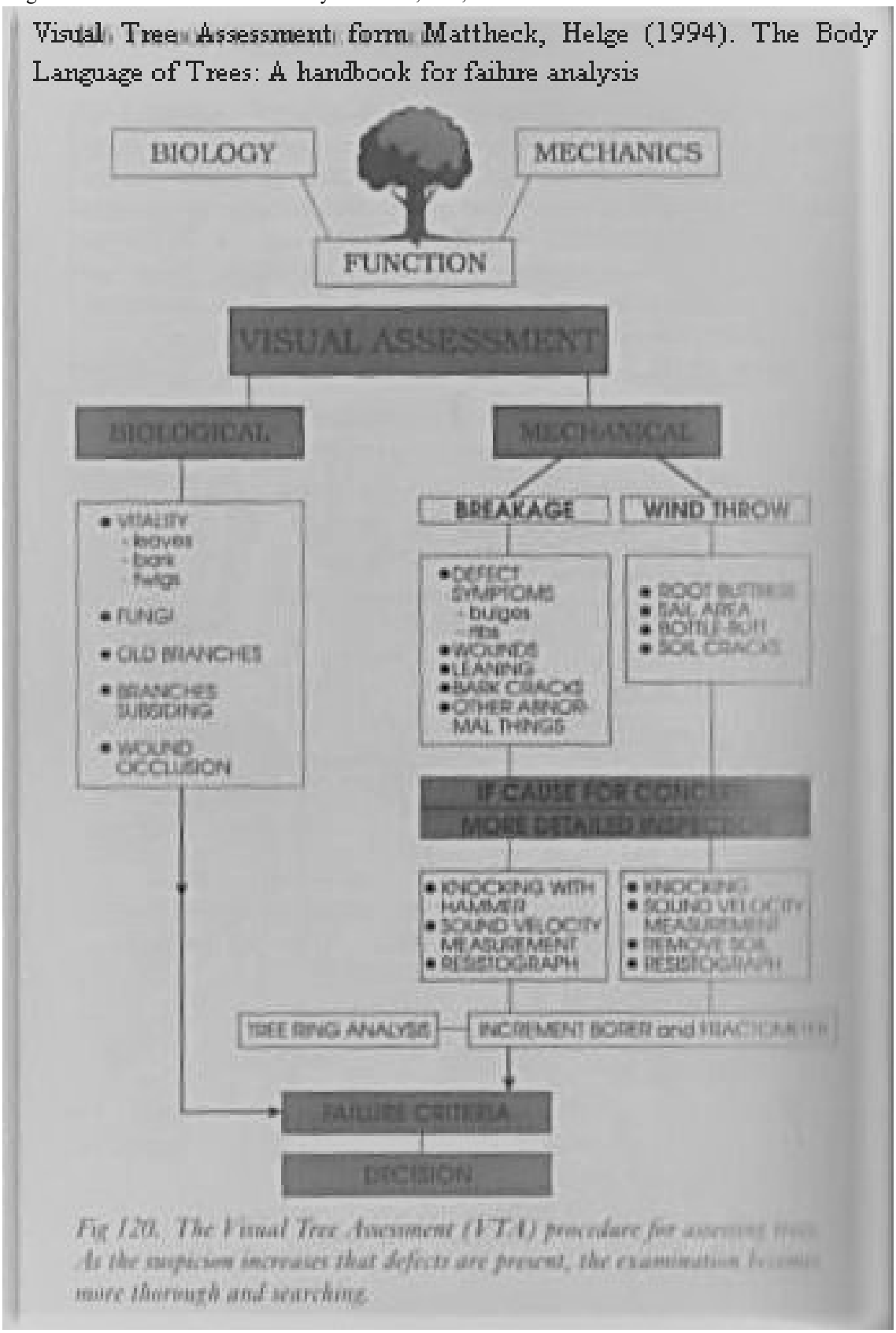


Fig 120. The Visual Tree Assessment (VTA) procedure for assessing trees. As the suspicion increases that defects are present, the examination becomes more thorough and searching.

Appendix 1:

Glossary of Terms

Aesthetics: The visual, audible, and other sensory factors within the park setting and its surrounding landscapes that, taken together, establish character or sense of place (Cal State Parks, 6/13/2020).

Anthropogenic burning: Fire caused or produced by humans

Archaeological: Pertaining to the material remains of past human life, culture, or activities (Cal State Parks, 2020).

Best management practices (BMP): The most current methods, treatments, or actions in environmental mitigation responses (Cal State Parks, 2020)

Biodiversity: Biological diversity in an environment as indicated by numbers of different species of plants and animals, as well as the relative abundance of all the species within a given area (Cal State Parks, 2020)

Contributing feature: A biotic or abiotic feature associated with a landscape characteristic that contributes to the significance of the cultural landscape (NPS, Landscape Lines-3, 1998).

Culture: A social group of people with shared values, customs, social constructs and beliefs.

Cultural landscape: A geographic area associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values. There are four general types of cultural landscapes, not mutually exclusive: historic sites, historic designed landscapes, historic vernacular landscapes, and ethnographic landscapes (NPS, 2020).

Cultural resource: A naturally occurring object used by humans. Cultural resources can be prehistoric or historic, post-European contact (Cal State Parks, 2020).

Ecology: The study of the interrelationship of living things to one another and their environment (Cal State Parks, 2020).

Domestic syndrome: Physiological changes in plants as a result of domestication or cultivation.

Ethnographic landscape: A landscape containing a variety of natural and cultural resources. Examples include contemporary settlements, sacred religious sites, and massive geological structures. Small plant communities, animals, subsistence and ceremonial grounds are often components (NPS, 2020).

Ethnographic resource: Objects and places, including sites, structures, landscapes, and natural resources, with traditional cultural meaning and value to associated peoples.

Endangered species: A species of animal or plant considered to be endangered when its prospects for survival and reproduction are in immediate jeopardy form one or more causes (U.S. Fish and Wildlife Service and/or the California Department of Fish and Game).

Ethnographic: A multi-format group of materials gathered and organized by an anthropologist, folklorist, or cultural researchers to document human life and traditions (Cal State Parks, 2020).

Exotic species: A species occurring in an area outside of its historically known natural range. Near synonyms include non-native, ornamental, or introduced species.

Endemic: Indigenous to, and restricted to, a particular area (Cal State Parks, 2020).

Evaluation: An assessment of a cultural landscape with predefined criteria.

Identification: The recognition of past human activity on the landscape.

Indicator: Any object that is present due to human activity or a disturbance event.

Integrity: the authenticity of a property's historic identity, evinced by the survival of physical characteristics that existed during the property's historic or prehistoric period. The seven qualities of integrity are location, setting, feeling, association, design, workmanship, and materials (NPS, 1995, 1998, 2020).

Interpretation: the analysis and explanation of an archaeological site's function, integrity, and significance or importance to history.

Multicomponent: A time descriptive term for an archaeological site containing both historic and prehistoric artifacts or features.

Prehistoric: The time period prior to contact with Europeans in Western Oregon pre-1850.

Protohistoric: The Protohistoric Period indicates the brief time when European manufactured goods such as beads, axes, knives, and kettles are traded with the indigenous peoples before historic records—early 1800s in Western Oregon.

Riparian: Vegetative and wildlife areas adjacent to perennial and intermittent streams and are delineated by the existence of plant species normally found near fresh water (Cal State Parks, 2020).

Threatened species: An animal or plant species that is considered likely to become endangered throughout a large portion of its range within the foreseeable future, because its prospects for survival and reproduction are in jeopardy from one or more causes. The U.S. Fish and Wildlife Service and/or the California Department of Fish and Game make this designation (Cal State Parks, 2020).

National Historic Register criterion (36 CFR 60.4): The National Register criteria for evaluation. The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that

embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that have yielded, or may be likely to yield, information important in prehistory or history.

The National Register of Historic Places: The official Federal list of districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, engineering, and culture (NPS, 1997).

Significance: The value of and importance to American history of cultural resource(s) or archaeological sites (NPS, 2015).

To nominate: To propose that a district, site, building, structure, or object be listed in the National Register of Historic Places.