THE ASSOCIATION BETWEEN ANTHROPOGENIC PRAIRIES AND IMPORTANT FOOD PLANTS IN WESTERN WASHINGTON

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ABSTRACT

In part of western Washington unique physiographic prairies exist that support a complex of plants more readily associated with California or Great Plains regions than western Washington. These assemblages of plants contain the major sources of carbohydrate, most of the berries, the only significant source of vegetal protein in this region, and numerous sources of vitamins utilized in the aboriginal dietary. Historical and scientific evidence is offered which strongly suggests that these prairies were maintained through time by the native people who regularly burned them in order to preserve and fertilize these important sources of food. Without regular burnings (annual or bi-annual) these prairies would have long since vanished due to encroachment by Douglas fir (Pseudotsuga menziesii [Mirbel] Franco) and these valuable and necessary additions to the dietary would have vanished with them.

Description of the Region

The prairies of western Washington are unique floral areas, containing particular complexes of plants which were highly prized by the original inhabitants of the area. The first writer to note the uniqueness of the prairies was Dr. J. G. Cooper who visited the area in the early 1850s and collected botanical specimens. He writes:

Of the 360 species there given, more than 150 are peculiar to these prairies, being a very large proportion considering their small extent in comparison with the forests. It is also observable that these are of a group characteristic of the Great Plains and California, of which botanical regions these prairies form the northwestern outskirts [1860:23].

The origin and maintenance of these prairies has been a subject of inquiry to many early travelers, historians, and contemporary scientists because they differ from the overall physiography of western Washington which is hilly to mountainous and was once covered with dense stands of mostly coniferous trees. The prairies, on the other hand, are flat or gently undulating, contain few trees, mostly oak (Quercus garryana Dougl.) and pine (Pinus contorta Dougl. and P. ponderosa Dougl.), with a few members of the willow family. Although information concerning these prairies is scattered and incomplete I have assembled evidence and arguments which suggest that these prairies were an important source of food plants for the Indians of
western Washington and that their persistence through time was achieved by active manipulation on the part of those people. This land management was achieved by burning and the side effects of regular gathering activities using digging sticks which would have altered the landscape by tilling and aerating the soil, and thinning of plants.

The singularity of the prairies of western Washington was remarked upon by many early explorers, many of whom made reference to the fact that they appeared unnatural in origin. Those descriptions offer us the best available picture of the region during pre-contact times. George Vancouver, visiting the Straits of Juan de Fuca in 1792 wrote:

The summit of the island presented nearly a horizontal surface, interspersed with some inequalities of ground, which produced a beautiful variety, on an extensive lawn covered with luxuriant grass, and diversified with an abundance of flowers. To the northwest was a copse of pine trees and shrubs of various sorts, that seemed as if it had been planted for the sole purpose of protecting from the Northwest winds this delightful meadow...[1801:63]; and

As we advanced [in Admiralty Inlet] the country seemed gradually to improve in beauty. The cleared spots were more numerous, and of a larger size [1801:74].

Vancouver posited this theory for the origin of the prairies:

It is also possible, that most of the clear places may have been indebted, for the removal of their timber and underwood to manual labor. Their general appearance furnished the opinion, and their situation on the most pleasant and commanding emminences, protected by the forest on every side, except that which would have precluded a view of the sea, seemed to encourage the idea [1801:111].

Charles Wilkes, exploring the region in 1841, noted the prairies and some of the plants associated with them. While traveling on the Nisqually Plain he wrote that there were "...prairies here and there breaking through the pines with lupine, camass, sunflower, and the scarlet [blank] and buttercup" (1926:22). Further south he comments on the "...Lupines and Kamass flowers all seeming in the utmost order as if man had been ever watchful of its beauty and cultivation" (1926:51).

The specific area is bounded on the west by the Pacific Ocean and on the east by the Cascade Mountains. The northern boundary is the one which distinguishes Canada from the United States and excludes the Cowlitz, Chehalis, and Willapa drainages. This southern boundary is not arbitrary but is made because it is the limit of the area of western Washington which harbors the unique prairies found on glacial outwash deposited during the recessional stage of the Vashon glaciation. This area of western Washington comprises approximately 18,000² mi. (47,000² km) and some 2183 mi. (3516 km) of marine shoreline, 1784 (2870) of them in Puget Sound and the Strait of
Georgia (National Oceanic and Atmospheric Administration 1978:10). Puget Sound, generally meant to include the entire region "...from the inlets south of Olympia, Washington, to the bays south of Vancouver, Canada" (Smith 1941:197) is an inland sea which receives water from the numerous streams and rivers draining the Cascade and Olympic ranges. It flows to the Pacific through the Strait of Juan de Fuca and the Strait of Georgia. The Sound was important to the native peoples both for the marine life it supported and also as a maritime highway.

The temperature of western Washington is generally mild with warm wet summers and cool wet winters. This agreeable feature has been commented upon by innumerable writers. Typical of these comments is one by Mr. Lorin Blodget who wrote in 1857:

The winter at Puget’s Sound is warmer than at Paris, the mean being 69° at the first, and 38° at Paris; and...a distance like that from Paris to Aberdeen must be passed over, beyond the extreme at the north of Puget's Sound to find a winter as cold as that of this city, Washington D.C. [Swan 1857:45].

Summer temperatures rarely exceed 27°C (80°F) and minimum winter temperatures frequently do not drop below 0°C (32°F) in the lowland regions. While temperature does vary from area to area the range is not as extreme as the range for precipitation. The rainfall in this area varies considerably from site to site. For example, one area under consideration lies in the "rain shadow" of the Olympic Mountains and includes the northeast portion of the Olympic Peninsula, the San Juan Islands, and Whidbey Island. This region has average annual rainfalls of from 50.8 cm (20 in.) to 114.3 cm (45 in.). Whereas rainfall in the Pierce and Thurston County areas totals 101.6 cm (40 in.) to 127 cm (50 in.) a year, while Kitsap, Mason, and the western part of Clallam County have annual rainfalls of 152.4-177. cm (60-70 in.) and 203.1-228.6 cm (80-90 in.) per year respectively. Since the prairies of western Washington exist in areas which have as little rain as 50.8 cm (20 in.) a year and as much as 228.6 cm (90 in.) some factor other than rainfall or lack of it must account for the common plant associations found on these prairies.

Land Management for the Production of Food Plants and Forage

Burning as a method of land management is widely known to have been used by hunters and gatherers, horticulturalists, and herders (Gould 1977; Wolf 1966; Evans-Pritchard 1940). Proudfoot argues for the development of grasslands throughout the world from deliberate burning of forests by hunting groups which preyed on herbivores. He ranks fire as the preeminent method used by humans to modify the landscape, and consequently the soil (1971:12). In the literature of the Northwest burning is cited as a common method of land-plant management for the Indians of western Washington but all too often no references are given (Franklin and Dyrness 1969; Kellogg 1922). For example, Morris (1934:338) discusses the evolution of fire control in Oregon and Washington from 1806 to 1933 and writes "First, the Indian burned off the valleys each year, then the whites drove them from the valleys and prevented annual burning." There is no way of checking his sources or knowing which region he is discussing.
While the references to the aboriginal practice of burning by ethnographers or others in the field are few for this area they do exist and are associated with either berries (Rubus sp.), camas (Camassia quamash [Pursh] Greene), bracken (Pteridium aquilinum Kuhn.), or hunting. Collins (1974:57) reports a cautious remark which appears to reflect an awareness of white disapproval of native burning "One spirit supplied the song to make the berries grow, together with the knowledge of how to burn an area of the forest in a careful, controlled way." She adds that the Skagits were well aware that berries grew more profusely in a burn than in other areas. Twana women were also aware of this for Elmendorf (1960:126) writes that they "...journeyed sizeable distances to the burnt-over areas where berries were abundant." These two reports tally well with a communication from L. D. Parsons, Supervisor of Big Game Management for the Washington State Department of Game, who writes that "The best way to provide forage for deer is to set a forest fire, which we cannot do for obvious reasons" (Personal Communication 1978). The plants listed by Parsons which form the major portion of deer forage are:

- Trailing blackberry - 25%
- Grasses - 10%
- Plantain - 9%
- Vine Maple - 9%
- Annual Agoseris - 8%
- Salal - 6%
- Red Alder - 5%
- Red Huckleberry - 4%
- Salmonberry - 3%
- Clover - 3% [Personal Communication].

These plants rapidly move into burned areas. It should be noted that the burn Collins reports is a forest burn, which presumably would not be done on a regular basis. The blackberry and most of the other plants would be destroyed by annual or bi-annual burning.

Reagan, Indian Agent at the Quileute Reservation, discussed bracken root as an important source of food for the Quileute and Hoh, and also as forage for deer. He wrote:

The burning of the fern year by year was what kept up the "prairies" of the peninsula and extended these areas. The Indians burned the ferns for the purpose of clearing out the prairies so they could shoot the deer and elk when they came to feed on the young "fern sprouts" (1934:56-57).

He is probably correct that the Forks and Quileute prairies were burned each year in the process of plant management but he is incorrect in stating they were burned so that the deer could feed on the "fern sprouts." As noted above bracken does not comprise much if any forage for deer and may have the same fatal effects on deer as it does on cattle (Pohl 1955). And, also, regular burning would destroy the very plants on which deer feed. The burning of these prairies may have provided some grasses for deer but the principle reason for burning was undoubtedly to fertilize the bracken crop and destroy adventitious species.

A nineteenth century observer writing extensively about the unique prairies of western Washington notes that they are of several types but the most interesting are those which are dry - the ones of concern in this paper - scattered about the area and from one to four miles in length. Cooper's (1860:23) description of these prairies gives a good picture of the territory as it must have looked for thousands of years.
A few remarks are necessary upon the origin of the dry prairies so singularly scattered throughout the forest region. Their most striking feature is the abruptness of the forests which surround them giving them the appearance of lands which have been cleared and cultivated for hundreds of years. From various facts observed I conclude that they are the remains of much more extensive prairies, which, within a comparatively recent period, occupied all the lower and dryer parts of the valleys, and which the forests have been gradually spreading over in their downward progress from the mountains. The Indians, in order to preserve their open grounds for game, and for the production of their important root, the camas, soon found the advantage of burning... On some prairies near Vancouver and Nisqually, where this burning has been prevented for twenty years past, young spruces are found to be growing up rapidly, and Indians have told me that they can remember when some other prairies were much larger than at present.

Cooper (1860:33) also reports that "...the introduction of the horse, about the beginning of this century was a further inducement for burning...." The Nisqually region originally included both a large grassy plain and numerous smaller prairies. The Nisqually Plain produced a good grazing grass and the Puget Sound Agriculture Company imported thousands of sheep, Spanish "horned cattle," and horses to feed on this grass. These animals (over 16,000 all together) competed with native animals for forage and the sheep soon ruined all the prairies as sources of food plants according to a letter written by Dr. William Tolmie (1841) concerning his qualifications for the position of Indian Agent in British Columbia.

The difficulty of Indian management at Nisqually had been greatly enhanced by the introduction of sheep and cattle in large numbers on the plains. The Indians themselves, owners of horses, and considerably dependent on roots of native growth for subsistence found the innovation so much for the worse that discontent was often exhibited.

Hunt and Kaylor (1917:181) cite Edward Huggins, agent for the Puget Sound Agriculture Company, concerning the changes wrought on the Nisqually Plain and prairies, and the disappearance of the original grass due to these animals and increasing white settlers.

...The nutritious blue bunch grass was plowed up or killed out by too close pasturing and followed the cattle into the things of the past. The most diligent cultivation failed to make the gravelly soil of the plains produce profitable crops; fields again were turned into pastures which produced a scant growth much inferior to the original blue bunch grass which, Huggins says, he has seen waving in the breeze like the great fields of ripening grain.

The Nisqually Plain then, originally produced grass in quantities sufficient for numbers of horses, was burned to increase this forage which would also provide forage for deer while the prairies held an important supply of roots.
Historical Evidence of Fires in Western Washington

Historical sources confirm that there were fires in western Washington, in prairie areas, at the time of year fires would most likely have been set, just prior to the onset of fall rains. Tolmie, scribe at Nisqually house writes on

7 July 1833  Fire has today consumed all the herbage on the plain for an extent of several miles [1915:190];

and the following year he writes:

6 September 1834  The weather warm and we are surrounded by a thick smoke owing to fire being put to the field behind us [1916:73];

11 September 1834  The weather has become clear and the smoke has partly disappeared [1916:74].

Tolmie's entries for 1835, again indicate fires:

14 August 1835  The country around us is all on fire and the smoke is so great that we are in a measure protected from excessive (illegible)

17 August 1835  No change in the weather  everything burning up.

18 August 1835  The country side on fire, weather warm.

19 August 1835  Weather still smoky and warm.

23 August 1835  Some rain fell during the night.

25 August 1835  Weather fair. The sun nearly hid from us owing to the smoke.

29 August 1835  During the night we had a thunder storm and some rain fell.

8 September 1835  The weather fair but we scarcely can see the sun from the smoke around.

12 September 1835  Smoke disappearing [1833-39].

In the following year he writes, after a spell of fair weather, that on the 16 of September it was cold and foggy and on

17 September 1836  Cloudy weather, very smokey.

18 September 1836  The country around us on fire

19 September 1836  We have not seen the sun from the smoke. The wind from the northeast.

20 September 1836  Thick smoke around us [1833:39].
These entries do not indicate who or what set the fires. They do occur at the time of year when Indians would have burned and also when lightning caused fires would be most likely. However these are the same Nisqually plains where Dr. Cooper reports that burning by the Indians was prevented some 20 years past which would place the prevention of fires in the early 1830s. Since the Puget Sound Agriculture Company had brought 300 horses, 8000 sheep, and 6000 "horned cattle" to feed on the Nisqually Plains and established a large agricultural center it seems likely that aboriginal burning practices would have been discouraged during this time (Tolmie 1878: 20).

The next report of fire is from an early American settler on prairie land which is today Olympia. Levi Smith (1952:300) writes in his Journal that on the 8th, 14th, 15th, and 17th of August 1846 that "...it is very smokey." He gives no cause for the smoke.

Col. and Mrs. I. N. Ebey (1917:309), early settlers on Whidbey Island, report that on 9 June 1852 "A great deal of smoke is to be seen on the other side which I suppose is caused by the Indians burning the woods" (note that the date is June and that woods are being burned). They also report that Indians had set fires on the 9th and 17th of August of that year during a period of cool weather. On 22 August 1855 Winfield Ebey (1855:93) ferried from Port Townsend to the mouth of the Skagit and wrote of his trip "Fair wind and tide, the only drawback the smokey state of the atmosphere which prevents seeing objects at any great distance" and on the 27th of August, while at Port Townsend reports "Morning very foggy. In the afternoon it became more clear of fog (or I believe the most of it was smoke)" (Ebey 1855:103). He gives no reason for the smoke and the site, or sites of the fires are indefinite.

Col. and Mrs. Ebey's diary is the only historical source which gives direct evidence for aboriginal burning. Their diary and the reports of Cooper, Reagan, and Collins are the only accounts which specifically cite Indians as burning or having burned in western Washington. That these fires occurred when the area would be most subject to thunderstorms might argue for lightning caused fires. However the instances of forest fires in western Washington are not altogether frequent and the extent of the fire is determined by the condition of the forest, the amount of rainfall which falls during the storm, and whether or not the fire is controlled. Forest fires, in the past, would have burned until extinguished by rains. A look at lightning caused fires for the State of Washington for a 10 year period gives some indication of the variability of forest fires on a portion of Washington forests (State Protected Lands only).

<table>
<thead>
<tr>
<th>Year</th>
<th>Fires</th>
<th>Acres Involved</th>
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<tbody>
<tr>
<td>1977</td>
<td>178</td>
<td>170</td>
</tr>
<tr>
<td>1976</td>
<td>56</td>
<td>72.6</td>
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<tr>
<td>1975</td>
<td>176</td>
<td>176</td>
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<td>1974</td>
<td>120</td>
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<td>1973</td>
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<td>192</td>
<td>114.3</td>
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<td>1970</td>
<td>203</td>
<td>4698.6</td>
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<td>1969</td>
<td>63</td>
<td>9.5</td>
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<tr>
<td>1968</td>
<td>68</td>
<td>12.1</td>
</tr>
</tbody>
</table>

(Department of Natural Resources, Personal Communication)
These figures are for both eastern and western Washington with the majority of fires, over 85%, occurring in eastern Washington. As noted above, uncontrolled fires would involve more acreage and indefinite time periods. Lightning caused fires are a consideration when reviewing the historical record and although they occur infrequently in western Washington, and even less frequently in the lowland region where the prairies are established, if they went uncontrolled, they might have burned for long period, making the atmosphere "very smokey." Some of the fires noted by the early settlers then may have been the results of lightning.

Another natural phenomenon which must be taken into account in evaluating the reports from Tolmie and Smith are indicated in these remarks made about a journey over the Cascades in early August 1854.

During our ascent of the western slopes of the Cascades range we passed for days through dead forests, perhaps burnt by ignition from the hot ashes which were thrown out by Mt. St. Helens several years before; but large tracts were on fire at the same time, filling the air with smoke, so that we could not see the surrounding country for several days...It is only where it, *Pseudotsuga menziesii* [Mirbell] Franco, abounds that extensive tracts are found killed by conflagration [Cooper 1859:20-21].

Mt. St. Helens erupted in 1831, 1835, 1842, and 1857. The eruptions consisted of strong pyroclastic explosions and steam. Whether or not these eruptions would have affected the Nisqually region is uncertain. Mt. Rainier eruptions are cited as 1820, 1841, 1843 (?), and 1854 (?) (Harris 1976). They consisted of light pumice ash. The smokey atmosphere noted by Tolmie and Smith may have been caused by these eruptions. Evidently fire was not involved in the Rainier eruptions.

To summarize to this point I believe we can take as evidence for burning by the Indians the reports of Cooper, the Ebey's, Reagan, and Collins. Their reports indicate that Indians burned both prairies and woods. They also indicate that the burning of the prairies was on a regular basis. Burning of the prairies on a regular basis would preserve the prairies from invasive species and fertilize the food plants growing on them, and while it might not provide much forage for deer or elk, sporadic burning of forest lands would offer just such forage. Although the evidence is sparse I believe these reports together with evidence for burning offered below will show that the Indians of western Washington regularly burned the prairies to maintain valuable food sources.

Other Evidence for Anthropogenic Prairies in Western Washington

Examination of literature other than historical or anthropological reveals that burning did exist on the prairies of western Washington to a time extending well into the past. The paper by Lotspeich and others, "Vegetation as a Soil-forming Factor on the Quillayute Physiographic Unit in Western Clallam County, Washington," contains information which confirms work to be cited below but does not arrive at the same conclusions as other works. This paper is unique in that it assumes no disturbance of the prairies.
by aboriginal people, in fact, it presents a totally static view of the en-
vironment except for periodic flooding prior to white settlements. Lotspeich
and others (1961:53) find that the herbaceous plants have been established
on the Quillayute Prairie for a long time and that "There is no evidence
that trees have ever grown on the main portion of the Quillayute Prairie."Sitka spruce (*Picea sitchensis* [Bong.] Carr) has encroached on the prairie
only where the soil has been disturbed by settlers with the most mature
trees being 70 to 80 years old. They further note that the "...boundary is
marked by an abrupt change from low growing herbaceous plants to dense for-
est," a feature for all prairies of western Washington. To account for the
lack of trees they analyze the composition of the soil to determine if this
is the tree inhibiting factor. The Quillayute soil is organic (which deters
invasion by Douglas Fir, although they do not say this), blackish in color
(Ugolini & Schlichte) which contrasts with the yellow red or brownish soil
of the forest, fine textured, contains charcoal in the surface layers and
lies on estuarine beds of pebbles and gravel which allows good drainage.
They conclude that this textured soil along with other factors such as stream
cutting, fire, human disturbance, and lack of seed source (they do not indi-
cate how there could have been a lack of seed source) have been the deter-
mining factors in stopping the encroachment of the surrounding forest. I
find their conclusions inadequate for the following reasons. The fire and
human disturbance they write about occurred in the late 1870s which does
not explain the absence of trees on the prairie since the withdrawal of
glacial ice some 12,000 years ago. They further find that Sitka Spruce is
invasive in disturbed areas, concluding that it is resistant to smothering
by bracken (*Pteridium aquilinum* Kuhn) noting that "The physiognomy of the
prairies is determined in a large degree by the fern *Pteridium aquilinum
var. pubescens* (L) Kuhn" (Lotspeich and others 1961:53). However, they
contradictorily state that in those disturbed areas Sitka Spruce "...does
not appear to be reproducing itself" (Lotspeich and others 1961:57) which
leads one to conclude either that it is not resistant to smothering by
bracken or some other factor, such as too rapid drainage and dry summer con-
ditions, or organic soil have kept it from invading the prairie. They do not
explain the charcoal in the surface soil nor do they give any time depth
data concerning it. The reader is left assuming that the charcoal source
was fire caused by the whites since the underlying assumption of this paper
is that no human intervention occurred on the prairie prior to 1879. It
should be remembered that this is one of the prairies mentioned by Reagan
as having been regularly burned. Although the paper by Lotspeich and others
is unsatisfactory in many ways it does point out some of the distinctive
features of the prairies of western Washington; their flatness, lack of
trees, organic and quickly drained soil, and abundance of bracken and other
herbaceous plants. A list of the plants they found while sampling the soil
is found in Appendix I. This list reveals that they found relatively few
camas (*Camassia quamash* [Pursh] Greene) plants which is interesting because
Reagan reports that this prairie was a good source of those plants. The
probable reason for this discrepancy is discussed below.

Ugolini and Schlichte (1973:218) offer a scholarly, well reasoned argu-
ment for the origin and maintenance of prairies in Pierce and Thurston
counties based on the unique geology of the prairies.
The prairies are found on level glacial outwash areas of several hundred hectares deposited approximately 14,000 years B.P. during the retreat of the Puget lobe of the Vashon Stade of the Fraser Glaciation. The outwash deposits on which the prairies have developed are dominated by sand and gravel and display an excessive drainage. Smaller isolated outwash areas, deposits of glacial drift other than outwash, and areas of uneven sloping topography have apparently never supported prairie vegetation.

They present evidence that a period of maximum warmth occurred in western Washington between 7500 and 4500 BP which allowed the prairie plants to become well established before a cooler climate set in and this has been confirmed by Hansen (1947:271). "This climate period, which has been called the Hypersithermal Interval by Deevey and Flint had a considerable effect on vegetation as shown in pollen sequences..." (Ugolini and Schlichte 1973:219). Following deglaciation pollen diagrams reveal that for several thousand years the area was dominated by conifer species. Oak (Quercus garryana Dougl.) first appears in the area about 10,000 BP along with increasing non-arboreal pollens which indicates that these outwash areas began to support complexes of prairie plants at about the same time humans entered the area. Gradually the climate shifted and became cooler and more moist, conditions which favor conifer forests. Pollen diagrams "...for the last 4000 years show little evidence for climatic or vegetational changes and reflects the present floral assemblage" (Ugolini and Schlichte (1973:220). The authors find that these prairies have persisted over time resisting conifer encroachment for two reasons:

(1) the resistance of the prairie community to invasion by other species and (2) the occurrence of frequent prairie fires started by Indians.

They argue that the ability of the prairie plants to repulse invasive species is due to the fact that in undisturbed areas the thick cover of moss which exists between the grasses and other forbs acts as a shield, preventing invasive seeds (particularly Douglas Fir) from reaching the mineral bed which is necessary for their germination. Periodic burning would destroy any seedlings which may have become established. They also note that the oak, which is found only on the prairies of western Washington, is a tap-rooted species well adapted to the summer drought conditions created by the rapidly drained soil. Douglas Fir is not tap-rooted and does not tolerate drought.

In an analysis of the Spanaway soils of these prairie regions Ugolini and Schlichte (1973:226) report that they have been "...affected by infusion of finely divided charcoal originated from the burning of the prairies by the Indians" and that they are a dark brown to black color. The only source they quote for evidence of aboriginal burning is Lang (1961). Although as Ugolini admits (Personal Communication) the evidence for aboriginal burning is scarce, the material accumulated in this paper supports their theory and makes their argument even more persuasive.

Hansen's work also supports the theory postulated by Ugolini and Schlichte as do that of Stuiver, Lang and Hedlund. Hansen finds that pollen profiles taken from 13 sphagnum bogs in the Puget Sound region show that climate has
not been the major controller of forest succession but rather fire and soil conditions have been. He finds soil conditions on the prairies favored xerophytic species such as oak and pine (*Pinus contorta* Dougl. and *P. ponderosa* Dougl.) which are relics of a warm dry period between 8000 and 4000 BP, and that they have persisted to the present because of the dry, well drained soils in the prairie areas and periodic fire. Pine is a pioneering species, intolerant of shade, which invades near the ice front of glaciers and in burns. This species, along with oak is found on all the prairies of the area from the San Juan Islands to the Nisqually region. Hansen (1947:271) also writes that "Periodic fire may have also favored the persistence of the open prairies." Although they give no direct evidence for burning, Stuiver and others offer information which makes explicit what is implicit in Hansen's work. They find that periodic fire is indicated in their pollen profiles by the "...significant percentages of *Pinus*" (Stuiver and others 1978:19) which is a fire dependent species. They also note "...the absence of Douglas Fir in the Puget Lowland during much of the Holocene."

Lang (1961) finds that the Euroamerican invasion has wrought more change on the prairie landscapes than has occurred since the Vashon Glacier. By comparing U.S. Survey maps made in the 1850s with those of today he shows the prairies have been considerably reduced in size. This reduction in size is due to the steady encroachment of the Douglas Fir onto the prairies. He notes that by 1900 Douglas Fir had made considerable advancement and since there had been no change in climate or soil which accounts for this encroachment Lang (1961:75) concludes that mechanical disturbance of the soil along with absence of controlling fire has allowed this degradation of the prairies in Pierce and Thurston counties.

The only prairie which is burned with any regularity is at Lake Nisqually. This prairie is the U.S. Army artillery impact range. It is either purposely burned by the military authorities as a safety measure, or it is accidently set on fire by shelling every year...One can see (by comparing the maps) that this area is the only one upon which no apparent encroachment of the Douglas Fir on the prairies has taken place in the last 100 years.

Lang (1961:85) also concludes that periodic burning by the Indians would have kept out invasive species and would not have harmed the prairie plants.

Hedlund (1973:94) has also done work on these prairies and like other scholars finds no reason why they should not have been invaded by Douglas Fir unless they were deliberately maintained. He offers the following evidence for these anthropogenic prairies:

Perhaps the best evidence that the prairies were man-made or kept is their location. All of the prairies in the area of study (five) have the following characteristics:

1. All have archeological sites (with considerable evidence of cultural activity).
2. All are located near permanent water courses where salmon would be expected to run.
3. All are located on relatively level or low-lying areas.

4. All consisted of at least a section or more of open land.

5. Although streams are found in the area of such prairies, the archaeological sites are not especially oriented to them, i.e., on Connel's prairie the Imhof and Schodde sites are over one mile from the White River.

The fifth point above is perhaps the best evidence for the creation or keeping such open sites. If the prairies had not been maintained, the occupants of the sites would have lived in an evergreen forest of perpetual darkness or twilight even during sunny days at noon... Such open sites in the forests would have been desirable on more than a sunshine basis, since open areas, if managed by regular-burning, would help sustain a larger human population by sustaining larger plant and animal populations. Animals would have more and better grazing on the grasses and brush in such areas, while plants would be stimulated by increased sunlight and fertilized by the ash from burning.

To summarize to this point, the prairies of western Washington have unique glacially deposited gravel beds which allow rapid drainage, creating drought conditions in the summer months of least rainfall. The soils associated with the prairies differ in kind from soils of the forested regions. Oak and other nonarboreal plants became established on these prairies about 10,000 BP, a period when humans also entered the area. The Spanaway soils support thick expanses of moss on the prairies which does not afford Douglas fir access to needed mineral soils, however without periodic burning some considerable encroachment or annihilation of these prairies would have occurred in 10,000 years. The presence of Pinus, particularly Pinus contorta Dougl. offers further evidence that burning occurred in these areas as it is a fire dependent species. Historical and ethnographic evidence lend support to the thesis that the prairies were regularly fired.

The Association Between These Prairies and Important Food Plants

If we can accept the argument that the prairies of western Washington have been periodically burned over a long time period, and I believe that the evidence offered above strongly suggests that this is the case, then the next move is to ask, why were they burned? The answer may lie in the suggestion given by Hedlund (1973:94) that the natives would otherwise have lived in eternal gloom but I find his second suggestion more accurate "...plants would be stimulated by increased sunlight and fertilized by the ash from burning."

White (1976:332) finds that the Salish of Whidbey and Camano islands burned the prairies to increase production of camas and bracken. He writes that

The abundance of these plants on the prairies was not fortuitous. Rather than being major Indian food sources because they dominated the prairies, bracken and camas more likely dominated the prairies because they were major Indian food sources.
Bracken, probably a major source of starch in this area, is reported as being profuse and very large on these prairies (Cooper 1860; Reagan 1934; Lotspeich and others 1961). Both bracken and camas can survive fall burnings because the root systems are protected and as Lang (1961:85) notes "Most native species are perennials and have their perennating buds at or below the surface of the soil" and are therefore biologically capable of surviving periodic fire. An examination of Appendix I and II shows that many of the plants associated with the prairies would be unharmed by burning. Burning would also fertilize the soil and Suttles (1951b) reports that the Saanichton, Samish, and Songish burned their camas beds for precisely that reason. And, burning would destroy adventitious species.

The importance of bracken as a source of starch has been documented elsewhere and will not be repeated here (Norton 1978). The abundance of camas on the prairies and its importance as a food has likewise been well documented (Gunther 1945; Cooper 1860; Swan 1857; Suttles 1951b). What is not as well known is that the first white settlers homesteaded on these prairies, partly because of the ease of building without taking down a forest, and partly because of the camas itself. Suttles (1951b:59) has noted that sheep caused degradation of camas beds on the San Juan Islands but on Whidbey Island it was undoubtedly pigs which are responsible. Mrs. Ebey (1917:134) writes

We have but a few hogs yet; but in another year we expect to have more. They can do well on Kamus. There are quantities of it here on this island, and it is excellent for both Indians and hogs.

Hogs are quite fond of camas and root up the bulb, eventually destroying the camas beds (Haskins 1977:33). Since early settlers depended on the camas as a source of fodder for their pigs this may account for the lack of camas in the sample of Lotspeich and others of the Quillayute Prairie. The destruction or degradation of many of the prairies in western Washington by sheep, hogs, and horned cattle at an early date ruined them as the sources of food for the natives and has hindered our understanding of how the prairies and the plants associated with them contributed to the subsistence of pre-contact people. An entry from Winfield Ebey's diary for 21 May 1855, echoes what other writers have so frequently noted, that the prairies were sources of food for people from all parts of the Puget Sound lowland.

There is quite a number of Indians from about Seattle and Port Madison encamped along the beach near my brother [Col. I. N. Ebey, Whidbey Island]. They are on the regular visit to the island to dig the "Kamas" which they collect in large quantities from the prairies which after a certain process make excellent food.

Besides bracken and camas the oak is also a prominent member of the prairie plant complex. Although the oak is little noted as a source of food in this region it may have played a more important part than has been previously thought. Gunther (1945:28) writes "...in the true evergreen forest area that [acorn] is an unknown dish." However, Tolmie (1833:39) writes on 9 August 1833 that a large party of "...natives have pitched near us for the purpose of gathering acorns and berries." He mentions that they include the
Ah qua mish (Duwamish or Suquamish) and the Sin no oh mishes (Snohomish). On October first of the same year he writes that Indians are still gathering acorns. This is also a time when fires are being set in the fields at Nisqually. Boyd reports that the Karok burned under the oak to kill diseases or pests on the tree and clear the ground making it easier to pick up the acorns (1976:33). The Indians in this area may have burned for the same reason. Curtis (1913:58) reports that hundreds of bushels were harvested annually in peculiar little prairies.

The Nisqually plains, at the head of Puget Sound, furnished the chief supply of nuts for the Sound tribes, and thither in the fall came canoes from all points on the neighboring waters and even from the Straits of Juan de Fuca.

Curtis' account fits well with Tolmie's report. The oaks of western Washington were early used by shipbuilders as they found the wood "...excellent for frames and knees" (Swan 1859). Oak was widely used by other manufacturers as well which may account for its relative scarcity today.

Bracken, camas, and the acorn all grew on the prairies. The first two have been proven to be important sources of carbohydrate, acorns probably were the only significant sources of vegetable protein. Appendix II is a listing of the plants collected by Dr. Cooper in 1853 on the prairies of western Washington. It is, of course, not an exhaustive listing of plants which must have been here aboriginally, and unfortunately, he has not specifically stated where each plant was found so I could not find the 150 plants which he says are peculiar to the dry prairies. However, I found 114 plants which were associated with these prairies, of those four are exotics leaving 110 native plants. A total of 46 of those plants are reported in the literature as having been used by the native people either for food or medicine. Ten of the plants I have not been able to identify. Of the 114 native plants 46 are known to have been used and another 17 may have been used making a total of 63 useful plants. Since these plants were necessary to the diet and herbal kits of the natives and are associated only with the prairies this strongly suggests that these prairies were very important to the economic life of the native peoples. The evidence for regular burning presented above and the fact that camas and other root plots were owned, inherited, weeded, and re-planted also gives evidence of the importance of the prairies as sources of food and medicinal plants (Stern 1934; Suttles 1951b; Collins 1974).

The 46 plants known to have been used, along with the 17 possibles, include the major sources of carbohydrate mentioned in the literature for people of western Washington except Sagittaria latifolia Willd. which is cited only for the Skagits (Collins 1974:56), and those root plants common only to coastal areas such as Abronia sp. and some lupines and clovers. They also include several "shoots," prized sources of necessary vitamins and a number of the important complex of berries, along with the acorn, the only significant source of vegetal protein in this region. The forest and other non-prairies areas would yield considerably fewer food plants. The prairie and forest ecotones, marshy areas, and beaches contain the remaining members of the berries, fruits, roots, shoots, and medicinal plants.
Conclusion

The evidence has shown that the prairies of western Washington are unique phytogeographic units established during an altithermal about 10,000 BP containing unique assemblages of flora important to the economic life of the aboriginal peoples. Further, these prairies and their associated plants would not have been able to persist through time without the active manipulation of humans who periodically burned these prairies thereby inhibiting the advance of adventitious species and fertilizing the root crops. Burning was also done on non-prairie land for the purpose of increasing berry crops. The lack of information concerning these prairies, the plants associated with them and methods of land management practiced by the natives is due to rapid settlement and degradation of these prairies by white settlers and introduction of non-native species.

Acknowledgement

I wish to express my gratitude to Eugene S. Hunn for a critical reading of a previous draft of this paper and Robert Boyd for many instructive conversations and kind encouragement.

Notes

1Lotspeich and others (1961) give an average of 116 in. (194.64 cm) of precipitation for the Quillayute Prairie with a minimum of 78 in. (198.12 cm) and a maximum of 153 in. (383.62 cm). The least precipitation occurs in August and September (1961:57).

2The prairies near Vancouver and in the Willapa and Chehalis drainages are of different geological origin than those under discussion.

3Since women are primarily associated with the gathering and maintenance of food and food plants it is interesting to read that the employees of the Puget Sound Argiculture Company hired Indian men to do carpentry and cut cedar while Indian women were employed at times digging potatoes and "...in burning out the swamp" (Journal...Nisqually House 19 October 1849).

4Swan (1857) writes about a forest fire he and some of "the boys" started on the Fourth of July which burned until extinguished by winter rains.

5White (1976:331) also reports that the Skagit burned their nettle patches in the fall after harvesting the plants for use in medicines and the manufacture of twine. The nettle grew profusely on refuse heaps which had rich soil. These beds were carefully tended by the Skagit and later became the sites for potato patches. As Suttles has noted the practice of heaping refuse from clearing around the potato patches so that it eventually became a low wall indicates a practice of long standing. This practice has been noted for all Puget Sound tribes (Suttles 1951a:280).
Appendix I

Plants found on the Quilhute Prairie by Lotspeich and others (1961:55) in 1961.

<table>
<thead>
<tr>
<th>Species Exhibiting Greatest Frequency and (or) Coverage values in Ecotone</th>
<th>Prairie-Ecotone Cov.</th>
<th>Freq.</th>
<th>Prairie Cov.</th>
<th>Freq.</th>
<th>My Comment</th>
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<tbody>
<tr>
<td>Agrostis abla</td>
<td>1.8</td>
<td>8</td>
<td></td>
<td></td>
<td>Introduced</td>
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<tr>
<td>Athyrium filix-femina</td>
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<td>72</td>
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<td>Blechnum spicant</td>
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<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bromus vulgaris</td>
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<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cystopteris fragilis</td>
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<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daucus carota</td>
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<td>16</td>
<td></td>
<td></td>
<td>Introduced</td>
</tr>
<tr>
<td>Disporum smithii</td>
<td>4.1</td>
<td>38</td>
<td></td>
<td></td>
<td>Used as a charm</td>
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<tr>
<td>Galium aparine</td>
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<td></td>
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<tr>
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<td></td>
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<td></td>
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<tr>
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</tr>
<tr>
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<td>4</td>
<td></td>
<td></td>
<td>Introduced</td>
</tr>
<tr>
<td>Polemonium carneum</td>
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<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prunella vulgaris</td>
<td>0.4</td>
<td>6</td>
<td></td>
<td></td>
<td>Introduced</td>
</tr>
<tr>
<td>Rhamnus purshiana</td>
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<td>6</td>
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<td></td>
<td>Medicinal plant</td>
</tr>
<tr>
<td>Rubus parviflorus</td>
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<td>78</td>
<td></td>
<td></td>
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</tr>
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<td>6</td>
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<td></td>
<td></td>
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<tr>
<td>Symphoricarpos albus</td>
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<td>34</td>
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<td>Food and medicine</td>
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<td></td>
<td></td>
<td>Medicinal plant</td>
</tr>
<tr>
<td>Tiarella trifoliata</td>
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<td>4</td>
<td></td>
<td></td>
<td>Medicinal plant</td>
</tr>
<tr>
<td>Viola adunca</td>
<td>0.3</td>
<td>2</td>
<td></td>
<td></td>
<td>Medicinal plant</td>
</tr>
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</table>
Species Exhibiting Greatest Frequency and (or) Coverage Values in Prairie

<table>
<thead>
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<th></th>
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<tr>
<td>Achillea millefolium</td>
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<td>38</td>
<td>23.1</td>
<td>80</td>
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<tr>
<td>Agrostis oregonensis</td>
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<td>2.1</td>
<td>14</td>
<td>Forage</td>
</tr>
<tr>
<td>Anaphalis margaritacea</td>
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<td>16</td>
<td>9.6</td>
<td>38</td>
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</tr>
<tr>
<td>Anthoxanthum odoratum</td>
<td>3.3</td>
<td>16</td>
<td>14.1</td>
<td>58</td>
<td>Introduced</td>
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<tr>
<td>Aquilegia formosa</td>
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<td>6</td>
<td>0.7</td>
<td>6</td>
<td>Edible root</td>
</tr>
<tr>
<td>Casmassia quamash</td>
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<td>8</td>
<td>0.5</td>
<td>8</td>
<td>Edible root</td>
</tr>
<tr>
<td>Cerastium viscosum</td>
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<td>2</td>
<td>0.1</td>
<td>2</td>
<td>Introduced</td>
</tr>
<tr>
<td>Chrysanthemum leucanthemum</td>
<td>0.4</td>
<td>4</td>
<td>1.7</td>
<td>16</td>
<td>Introduced</td>
</tr>
<tr>
<td>Cirsiurn arvense</td>
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<td>12</td>
<td>1.3</td>
<td>12</td>
<td>Introduced</td>
</tr>
<tr>
<td>Eriophyllum lanatum</td>
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<td>58</td>
<td>12.5</td>
<td>58</td>
<td>Medicinal/charm</td>
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<td>24</td>
<td>5.7</td>
<td>58</td>
<td>Food plant</td>
</tr>
<tr>
<td>Galium boreale</td>
<td>3.4</td>
<td>26</td>
<td>7.9</td>
<td>54</td>
<td>Charm</td>
</tr>
<tr>
<td>Holcus lanatus</td>
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<td>48</td>
<td>30.1</td>
<td>82</td>
<td>Introduced</td>
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<td>Hypericum perforatum</td>
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<td>88</td>
<td>20.2</td>
<td>88</td>
<td>Introduced</td>
</tr>
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<td>Hypochoeris radicata</td>
<td>4.1</td>
<td>26</td>
<td>4.1</td>
<td>26</td>
<td>Introduced</td>
</tr>
<tr>
<td>Luzula parviflora</td>
<td>0.3</td>
<td>2</td>
<td>0.4</td>
<td>4</td>
<td>Introduced</td>
</tr>
<tr>
<td>Malus fusca</td>
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<td>8.6</td>
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<tr>
<td>Phleum pratense</td>
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<td>0.8</td>
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</tr>
<tr>
<td>Prunella lanceolata</td>
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<td>10.6</td>
<td>36</td>
<td>Medicine</td>
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<td>98</td>
<td>61.6</td>
<td>100</td>
<td>Food plant</td>
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<td>0.3</td>
<td>10</td>
<td>Food/medicine</td>
</tr>
<tr>
<td>Rosa sp.</td>
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<td>6</td>
<td>0.7</td>
<td>18</td>
<td>Food/medicine</td>
</tr>
<tr>
<td>Sisyrinchium idahoense</td>
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<td>0.8</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Solidago canadensis</td>
<td>4.5</td>
<td>26</td>
<td>4.5</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Spiraea menziesii</td>
<td>16.9</td>
<td>52</td>
<td>15.9</td>
<td>62</td>
<td>Wood used</td>
</tr>
<tr>
<td>Stachys ciliata</td>
<td>2.8</td>
<td>22</td>
<td>3.4</td>
<td>36</td>
<td>Medicine</td>
</tr>
<tr>
<td>Trientalis latifolia</td>
<td>0.5</td>
<td>10</td>
<td>0.4</td>
<td>14</td>
<td>Medicine</td>
</tr>
</tbody>
</table>

Their results were based upon analysis of fifty 2 x 5 dm plots for each area.

Of the 48 plants examined by Lotspeich and others 11 are exotics, 9 have no known use except perhaps as forage, and the rest were important food or medicinal plants for pre-contact peoples.
Appendix II

Dr. Cooper (1860:55-71) writes that of the 360 species collected west of the Cascade range, more than 150 are specific to the prairies. Unfortunately he does not always note which plants are found in the prairies. A search of his text revealed 114 plants noted as being found on the prairies. They are listed below with common usage indicated. Those plants which were possibly used are marked †.

Plants Found on Western Washington Prairies

Ranunculaceae

1. *Ranunculus aquatilis* Linn. *Ranunculus* sp. roots were used as food, the leaves were used as a poultice.
2. *R. occidentalis* Nutt. Dry prairies, Puget Sound and Coast. †
3. *R. recurvatus* Poir. Whidbey Island. †
4. *Aquilegia canadensis* (Linn.) var formosa Fischer. Gibbs says this "root edible."
5. *Delphinium azureum* DC. now probably *D. nuttallii* Gray or *D. menziesii* DC. used as a poultice.

Fumariaceae

6. *Dicentra formosa* DC. now *Dicentra formosa* (Andr.) Walp. This plant was used as an insecticide, to kill lice, etc.

Cruciferae

7. *Nasturtium curvisiliqua* Nutt., now *Rorippa curvisiliqua* (Hook.) Bessey. †
8. *Barbarea vulgaris* R. Br., winter cress. †
9. *Cardamine oligosperma* Nutt., Bittercress. †
10. *Arabis hirsuta* Selys, now *A. hirsuta* (L.) Scop., rockcress. †
12. *S. deflexum* Harvey, introduced.
13. *Erysimum asperum* DC. now *E. inconspicuum* (Wats.) MacM., Wallflower, used as a medicine to cause blistering.

Violaceae

16. *Viola adunca* Smith, prairie and on coast, used for labor, blistering.
17. *V. nuttallii* Pursh.
Hypericaceae

18. Hypericum scouleri Hooker now (Hook.) Hitchc., St. John's wort.
19. Maehringia lateriflora Linn. unknown.

Caryophyllaceae

21. Cerastium arvense Linn. chickweed.

Portulacaceae

23. Claytonia dichotoma Nutt. now Montia dichotoma (Nutt.) Howell.
24. C. parviflora Dougl. now M. perfoliata (Donn) Howell, Miners Lettuce, edible. ♦

Geraniaceae

25. Geranium carolinianum Linn., Crane's Bill, G. oreganum has very astringent roots. ♦

Rhamnaceae


Leguminosae

27. Vicia gigantea Hooker, Giant Vetch, the seeds eaten.
28. Psoralea physodes Dougl., Bread-root, leaves used as a poultice and for tea.
29. Trifolium microcephalum Pursh, Clover, the roots may have been eaten. ♦
30. T. fimbriatum Lindl. now T. wormskjoldii Lehm., roots eaten.
31. Hosackia bicolor Dougl. now Lotus pinnatus Hook.
32. H. decumbens Benth., now L. ?
33. H. paviflora Benth., now L. ?
34. Lupinus micranthus Dougl. Lupine, roots may have been eaten. ♦
35. L. lepidus Dougl. ♦
36. L. laxifloris Dougl. ♦

Rosaceae

37. Spiraea douglasii Hook., on the ecotone, seeds used for medicinal tea.
38. Potentilla gracilis Dougl., used as a charm and medicine.
39. Fragaria virginiana Ehrh., (now Duchesne), Strawberry, a food.
41. *Rubus leucoderms* Dougl. Black cap, a food. On dry open prairies and in burned over areas.
42. *R. macroptetalus* Dougl., now *R. ursinus* Cham & Schlecht. Blackberry, a food.
43. *Amelanchier canadensis* Linn. now *A. alnifolia* Nutt. Service-berry, on prairie ecotone, a food.

**Onagraceae**

44. *Oenothera biennis* Linn., Evening Primrose, shoots peeled and eaten.
45. *O. vinosa* Lindl. now ?
46. *O. lepida* Lindl. now *Clarkia purpurea* (Curtis) Nels. & Macbr.
47. *O. quadravulnera* Lindl., now *C. quadravulnera* (Curtis) Nels. & Macbr.

**Cucurbitaceae**


**Saxifragaceae**

49. *Saxifraga integrifolia* Hook., on prairies, may have been used as medicine. +
50. *Lithophragma parviflora* (Hook.) Nutt., Fringecup, used medicinally.

**Hydrangeaceae**

51. *Philadelphus gordonianus* now *P. lewisii* (Pursh), leaves used as soap, wood useful.

**Umbelliferae**

55. *Conioselinum fischeri* Weim & Grab. now *C. pacificum* (Wats.) Coult. & Rose, Seashore Parsley, Gibbs says on interior prairies and coast common. Plant has the odor of anise. +
56. *Peucedanum leiocarpum* Nutt., now *Lomatium triternatum* (Pursh) Coult. & Rose, the stems were peeled and eaten.
57. *P. foeniculacum* Nutt. now *L. urtriculatum* (Nutt.) Coult. & Rose, root was eaten, found on prairie and seashore.
58. *Glycosma occidentalis* Nutt. now *Osmorhiza occidentalis* (Nutt.) Torr., Sweet-Cicely has a thick root, plant was used as a charm and flavoring for camas.
Caprifoliaceae

59. *Lonicera occidentalis* Hook., a honeysuckle. Honeysuckles were used medicinally.

60. *Sambucus glauca* Nutt. now *S. cerulea* Raf., Elderberry, a food plant.

Compositae

61. *Erigeron speciosus* DC. now *E. speciosus* (Lindl.) DC. Fleabane.


63. *Balsamorhiza deltoidea* Nutt., Balsam Root, root edible, seeds and stems eaten.

64. *Bahia lanata* Nutt. now *B. oppositifolia* (Nutt.) DC.

65. *Achillea millefolium* Linn., Yarrow a medicinal plant.


67. *Cirsium undulatum* Spreng. (now [Nutt.] Spreng.) Thistle, root eaten and plant used medicinally.

68. *Hieracium scouleri* Hook., Hawkweed.

69. *Tanacetum huronense* Nutt. Tansy now?

70. *Macrorhynchus laciniatus* Torr & G. now *Agoseris glauca* (DC. Eaton) Smiley, Gibbs reports the root as edible.

71. *M. heterophyllus* Nutt. now *A. heterophyllus* Greene.

72. *Gnaphalium purpureum* L., Cudweed.

Campanulaceae

73. *Campanula linifolia* Hkr. Harebell, Bluebell now?


75. *Heterocodon rariflorum* Nutt.

76. *Githopsis specularioides* Nutt., Common Bluecup.

Ericaceae

77. *Vaccinium caespitosum* Michx., Blueberry, a food.

78. *Arctostaphylos uva-ursi* Linn., berries used as food and leaves for tobacco.

Plantaginaceae

79. *Plantago patagonica* Jacq., Indian Wheat. †
Primulaceae

80. Dodecatheon meadia Linn. now D. pulchellum (Raf.) Merrill, Shooting Star.

Scrophulariaceae

83. Collinsia grandiflora Dougl. (now Lindl.) Blue-eyed Mary.
84. Synthyris reniformis Benth., (now Doug.) Benth.) Kittentails.
85. Castilleja spp., Indian Paint Brush, used as a sympathetic medicine.

Labiatae

86. Mentha canadensis Linn. now M. arvensis L., Mint used for teas, etc.
87. Brunella vulgaris Linn. now Prunella vulgaris L. Self-heal, used as poultice. While this is the introduced species the native species P. lanceolata (Barton) Fern. is widely distributed and was used medicinally.

Boraginaceae

88. Myosotis verna Nutt., Forget-me-not.
89. Eritrichium chorisianum (A) DC.
90. E. scouleri (A) DC. now?

Polemoniaceae

91. Polemonium micranthum Benth., Jacob's Ladder (Hitchcock says east of Cascades).
92. Collomia grandiflora Dougl., may have used the seeds for a glue. ♩
93. C. gracilis Dougl. now Microsteris gracilis (Hook.) Greene.
94. Gilia archillaefolia Benth., Blue Ball now?
95. Navarretia heterophylla Benth. now probably N. squarrosa (Esch.) H. & A.

Polygonaceae

96. Rumex domesticus Hartm. ex-Hook. now? Reported as leaves boiled and eaten.

Iridaceae

97. Sisyrinchium anceps Linn. now probably S. douglasii A. Dietr.

Liliaceae

98. Lillium canadense Linn. now L. columbianum Hanson, Tiger lily, bulb eaten
100. Fritillaria lanceolata Pursh Chocolate lily, eaten.
101. Anticlea douglasii Torr. now Zigadenus spp., poison camas, not common on the prairies according to Gibbs.
103. Hesperoscordon hyacinthinum Lindl. now Brodiaea hyacinthinum (Lindl.) Baker, the root is edible.
104. Dichelostemma congestum Kunth. now probably B. congesta Smith. Gibbs errs and says this is the poison camas but reports the flower as being purple. Eaten.
105. Brodiaea grandiflora Smith now Brodiaea coronaria (Salisb.) Engl., food.
106. Camassia esculenta Lindl. now C. quamash (Pursh) Greene, a food.

Gramineae

107. Koeleria cristata Pers., June Grass, evidently a good range grass per Hitchcock.
108. Poa annua L. a grass.

Polypodiaceae

110. Pteris aquilinea Linn. now Pteridium aquilinum (L.) Kuhn, reported as abundant on the prairies, an important food plant.

Juncaceae

111. Luzula parviflora Desvaux now L. piperi (Cov) Jones, Woodrush.

Fagaceae

112. Quercus garryana Dougl. White oak, acorn used for food.

Pinaceae

113. Pinus ponderosa Dougl. reported in the prairies as stunted. This must include P. contorta Dougl. Cambium was eaten.

Orchidaceae

114. Spiranthes cernua Rich now S. romanoffiana Cham.

The plants listed above were collected by Dr. Cooper, Dr. Suckley, and George Gibbs in 1853-1855 on the prairies of western Washington. The binomials used by them are given first and the current binomials given second are from Hitchcock and Cronquist (1973).
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