

between Anthropogenic Prairies and Important Food Plants . . ."; Blainey, *Triumph of the Nomads*; Hallam, *Fire and Hearth*, and "The history of aboriginal firing"; Jackson, "Fire, air, water and earth . . ."; and Jones, "Fire stick farming."

39. See Charles Camsell and Wyatt Malcolm, "The Mackenzie River Basin" (*Geological Survey of Canada Memoir* 108, No. 92, 1919), 49; and Jean Michea, "Les Chitra-Gottineke: Essai de Monographie d'un Groupe Athapascan des Montagnes Rocheuses" (*National Museum of Canada Bulletin* no. 190, *Anthropological Series* no. 60, *Contributions to Anthropology*, Part 2, 1960), 60.

40. Lewis, "Fire technology and resource management in aboriginal North America and Australia" (1982a).

41. The first quotation is from J. S. Rowe, "Spruce and fire in northwest Canada and Alaska" (*Annual Proceedings, Tall Timbers Fire Ecology Conference* 10: 245-55, 1970), 245; the second appears in Wein and Maclean, *The Role of Fire in Northern Circumpolar Ecosystems*, 10.

42. Ongoing studies in Wood Buffalo National Park in Alberta show that fire frequencies in an area near Fort Smith have ranged from one fire every 35 to 55 years (*Annual Report of Research and Activities, Fire Science Center* [Fredericton, NB, 1985], 11.)

43. Lewis, "Fire technology and resource management in aboriginal North America and Australia."

"Time to Burn"

Traditional Use of Fire to Enhance Resource Production by Aboriginal Peoples in British Columbia

Nancy J. Turner¹

Introduction

When they used to burn that grass above timberline they used to say the Indian Potatoes [*Claytonia lanceolata*] were as big as your fist. Now they are only that big [i.e., small], because they are not cultivated." (Baptiste Ritchie, Mount Currie Stl'atl'imx speaker, May 1977).²

The use of fire to maintain certain habitat conditions and enhance the production of important resource plants and animals has been practiced widely in human societies. One authority states, "All human groups know fire, and most use it to clear the land for food production or similar purposes." In Native North America, landscape fire was used to clear vegetation and enhance the growth of certain plant and animal species, as well as for various other purposes, and is well documented for many regions of the continent, including the northeastern forests, the northern plains; the boreal forest, particularly northern Alberta and Alaska; the interior west; and western and central Washington and Oregon to California.³

In British Columbia, aboriginal burning practices are less well known, although it is recognized that forest and meadowland fires were common and widespread in prehistoric times, and that at least some fires were intentionally set by indigenous peoples. The early aboriginal peoples and white settlers of British Columbia, for example, have been called "the first game managers . . . for they discovered that openings in the forest cover very often resulted not only in a better crop of berries but also in the presence of a larger population of deer." An 1859 surveyor in the upper Skagit area (now Manning Provincial Park) noticed that Indian hunting groups deliberately set fire to the forest "to clear the woods from underbrush and make travel easier." More recently, an archaeologist contemplated the role of intentional landscape burning in the vegetation of the Stl'atl'imx (Lillooet) area:

A striking feature of the regeneration of this burn (on Fountain Ridge in 1931) is the dominance of evenly-spaced *Amelanchier alnifolia*

[saskatoon] in the shrub stratum. The abundance of this species is greater here than that observed elsewhere in the study area. It is interesting to speculate on the potential importance of such burns as berry gathering areas to the Stl'at'imx people, and to the possibility that fires may have been deliberately set in order to create them.⁴

In this paper, various written reports and oral accounts of traditional burning practices from different regions of the province are compiled to show the physical and cultural extent of vegetation burning in British Columbia and to give some indication of the effects such burning may have had on the vegetation, particularly on the productivity of wild plant food resources. The term "landscape burning" is used here to distinguish large-scale intentional vegetation burning from the small, restricted fires used by aboriginal peoples for warmth, cooking, drying and smoking foods, smoke-tanning hides, preparing medicines, felling trees, or wood working.

Setting

British Columbia is vast and extremely diverse ecologically. Fourteen biogeoclimatic zones have been described on the basis of vegetation, climate, and geographical features. The indigenous peoples of the province, whose homelands fall within these zones, are culturally and linguistically complex. There are about 190 bands of first peoples within at least thirty distinct indigenous language groups, which are in turn classified within seven language families. Three major cultural divisions are recognized—Pacific Coast, Plateau, and Mackenzie River—and within these divisions there is a tremendous richness and variety of cultural features.⁵

Given this great environmental and cultural complexity, it must be stressed that firm records of aboriginal landscape burning as reported here are scattered and sparse, and do not necessarily prove that controlled burning of vegetation was a universal practice in British Columbia. Nevertheless, the range and extent of the records indicate more than just casual or sporadic use of fire to enhance resources.

Since organized fire suppression began in the northwestern United States and Canada in the early 1900s⁶ and has continued to the present, most of the recollections of traditional landscape burning practices are from older records, or from elders of indigenous communities who participated in vegetation burning as youngsters, witnessed their relatives or others practicing it, or were told about it by their own elders.

Causes of Landscape Fires

There are many records of prehistoric and early historic landscape fires, as shown by dendrochronological studies, charcoal in soil profiles, and eyewitness accounts from early travelers and land surveyors.⁷ Of course, not all nor even most of these fires were intentionally set. Lightning starts many fires each year, and accidental forest fires caused by unextinguished campfires or untended signal fires also have occurred regularly in the historic period. One can assume that they also occurred prehistorically. Historical references from western Montana indicate that haphazard ignitions were common and that aboriginal landscape fires often were set arbitrarily.⁸

Sometimes, too, intentional landscape fires were set by aboriginal peoples for purposes other than direct resource enhancement. For example, during a hunting expedition in the Cassiar Mountains of northwestern British Columbia in the early part of the century, the Tahltan guide set several grass fires in order to approach a herd of caribou downwind under the cover of the smoke. He claimed that his people always used this tactic under those circumstances.⁹ Driving off mosquitoes and other insect pests, eliminating unwanted snakes, driving game in hunting, obtaining edible insects, clearing campsites and village sites of brush, clearing trails, improving communication, improving visibility, offense and defense in war, protecting forests from crown fires, and creating future supplies of dry fuelwood are other reasons given for intentional landscape burning by aboriginal peoples in British Columbia and neighboring areas.¹⁰

Evidence suggests that the frequency of landscape fires increased dramatically within the historic period. White explorers, travelers, prospectors, miners, ranchers, and settlers had their own reasons for landscape burning. Deliberately set fires were used by non-native people for hunting, eliminating insect pests, and creating supplies of dry fuelwood. Fire clearing of land also was practiced on a vast scale to facilitate mineral exploration, to allow agriculture, and to promote the growth of grass for domestic livestock.¹¹ To demonstrate the effect of non-natives on the landscape, geologist and naturalist George M. Dawson (1886) compared Crows Nest Pass, which at the time of his writing had been used for a few years by White travelers, with "North Kootanie" Pass, running parallel to the Crows Nest and "... scarcely used, except by the Indians." Whereas the former was "entirely destroyed" by fire, the woods of the latter were "generally unburnt."¹² It is estimated that 75% of interior forests of British Columbia have been burned over within the past century. This is despite the policy of active fire suppression as expressed as early as 1918 in *Forests of British Columbia*: "In the development of a forest administration, such as that in British Columbia, the first efforts, as is natural,

are directed towards protection against fire and towards the collection of revenue"¹³

During his travels through British Columbia in the 1870s, George Dawson recounted his personal observations of the extent of landscape burning that had taken place. In more than fifteen different locations, he noted the landscape being extensively burned, with entries such as " . . . smoke from burning woods"; "The ground has been recently burnt over"; "Country passed over almost entirely burnt"; "following open, burnt ground covered with low bushes." This pattern was evident from southern Vancouver Island to the Chilcotin, to the Queen Charlotte Islands (Haida Gwaii), to the Skagit Valley, Coquihalla River, Vernon, and the Shuswap River area. It should be noted, however, that Dawson made no direct connection between aboriginal landscape burning and the burnt areas he observed. In general, it seems that he condoned most of the burning, and several times suggested that burning, followed by introduction of exotic feed grasses and hay species, would be advantageous for ranchers and travelers.¹⁴

Specific Records of Aboriginal Landscape Burning in British Columbia

Table 1 lists the peoples among whom landscape burning has been reported in British Columbia, plus reference sources. Table 2 lists the types of plants and plant species whose production has been reported to be enhanced by periodic landscape burning. (Both tables can be found at the end of the paper). In all, at least nineteen species of plants, including eleven fruiting shrubs, one herbaceous fruit (strawberry) and seven herbaceous "edible root" species, have been identified by various sources as having their production enhanced by periodic burning.

Interior Plateau

The most detailed aural account of aboriginal landscape burning is from the Pemberton Valley region within Stl'at'imx (Lillooet) territory. This account, given originally in Stl'at'imx in December 1969 by the late Baptiste Ritchie of Mount Currie, was translated by him for Salishan linguist Leo Swoboda, and later for Salishan linguist Randy Bouchard. Ritchie's general translation is provided here in its entirety.

Burning Mountainsides for Better Crops

I am telling you about the doings of our forefathers, why they always did well wherever they went for the purpose of picking all the berries

and roots like potatoes [*sk'am'c*—*Erythronium grandiflorum*, yellow avalanche lily] that they ate. They used to burn one hill and use the other. When there were a lot of bushes ["sticks"; i.e. "when it got bushy"] then the ripe berries disappear and the roots like potatoes [*Erythronium*], *skimuta* [*Lilium columbianum*, tiger lily], *skwenkwina* [*Claytonia lanceolata*, spring beauty or mountain potato], disappear, when it gets too bushy. Then they burned. It was marked out and there one did his own burning. That is what they did so that they could go here and there to pick berries. Each one watched that it was really burnt. All the other bushes were removed. Then the berry bushes grew again. The roots like potatoes [*Erythronium*], the *skimuta* [*Lilium*], the *skwenkwina* [*Claytonia*], all those that were eaten by us, that is where they grow.

It was a few years, I guess it was almost around three years, before those things grew there again. Then there were really lots of berries. Everything was all really fertile. They rarely burnt the big trees. Only the small ones, only around the bushes was burned. It was the same with one hill as with another. That is why we see, we who are grown-up Indians, that all the hills seem to be burnt, because that was what they did to their own hills. They burned them so that they would get good crops there. They told others who went there, "do the same at your place, do the same at your place." Their own hills were just like a garden.

But now, because the white man really watches us, we don't burn anything. We realize already, it seems the things that were eaten by our forefathers have disappeared from the places where they burned. It seems that already almost everything has disappeared. Maybe it is because it's weedy. All kinds of things grow and they don't burn. If you go to burn then you get into trouble because the white men want to grow trees. Because they changed our ways they do good for us and we eat the food that the white men use. Then we forget the good



Spring beauty
(*Claytonia lanceolata*)

food of our earliest forefathers. The roots like potatoes [*Erythronium*], the *skimuta* [*Lilium*] the *skwenkwina* [*Claytonia*], all of those were good to eat.

Now they have disappeared because the hills grew weedy and no one seems to tend them, no one clears there as our forefathers did so thoroughly.

That is another story for you folks. Why our forefathers burnt. Now you must do it again. Now you know why everything that was near here just disappeared. There we used to go berry picking. There we went berry picking long ago. Now nothing. The food plants have now all gone. They have disappeared. It seems that everything grows on the hills. It has become covered with bushes all over.

Where we used to pick berries, oh, they were really plentiful! Right here where our house is situated now [in Mount Currie], that is where we used to come to pick berries. Like gooseberries [*sxniz'*—*Ribes divaricatum*]. Now there are no gooseberries near us. Now the other berries are the same. They have all disappeared. We named other grounds of ours around here, called them "The Picking Places" because that is where we went to pick berries. Now you will not find one single berry there.

That is my story to you about how those things which our forefathers ate have disappeared. That is all. You will still know, now that I am reminding you folks, what the old fashioned ways were like. I am Baptiste Ritchie here in Mount Currie.

I am *En Chinemquen*. That is all.¹⁵

There are other oral accounts of burning. Baptiste Ritchie (BR) and two other Stl'at'imx elders, the late Charlie Mack Seymour (CM) of Mount Currie and the late Sam Mitchell (SM) of Fountain (*xaxl'ip*), were interviewed jointly in May 1977 by ethnographer Dorothy Kennedy. Their conversation, taped and transcribed by Kennedy, reveals further details of landscape burning:

CM: The only time they got a big fire is when they dig the roots.

BR: They burn the side of the mountain for berry places.

CM: Some time the burned hillsides burned until the snow went. To renew the roots and berries.

SM: Huckleberries [*Vaccinium membranaceum*], raspberries [*Rubus idaeus*] and roots.

CM: Indian potatoes [*Claytonia*] are the roots.

BR: The ground gets soft.

SM: At higher places, up Pavilion Mountain. [Wild] potatoes grow better if it's burnt.

BR: When they used to burn that grass above timber line they used to say the Indian potatoes were as big as your fist. Now they are only



Black mountain
huckleberry
(*Vaccinium
membranaceum*)

that big [much smaller], cause they are not cultivated. They would burn every five or six years. The ground can only support so much. Now it's only timber grows. It takes away from the other.

SM: They burned at Lillooet to make the raspberries and west of Lillooet for huckleberries.

Another contemporary Stl'at'imx speaker of Mount Currie, Alec Peters (personal communication, June 15, 1984; August 1986) also spoke of burning in a taped interview: "Well, they do that [burn] every few years, you know. Burn it . . . After a few years, the berry patches, they're not very good. And they burn it, and you get a new patch of berries." He said the areas were burned over every four to five years, ". . . when the bushes grew too old and stopped getting good crops." He also regretted that people are not allowed to do that any more: "the white people don't allow it." However, Mr. Peters said that now, people pick berries on logging sites—those logged one or two years ago. Mount Currie elder Margaret Lester (personal communication, June 15, 1984) echoed Alec Peters' recollections of burning practices, and his concern that plant resources were deteriorating from the cessation of controlled burning.

The late Annie York, Nlaka'pamux elder of Spuzzum in the Fraser Canyon, often recalled the practice of landscape burning from her early childhood, between seventy and eighty years ago.

They wait until close to fall. They know just when to burn. And then two or three years after, lots of huckleberries, lots of blueberries . . . And the *skamec* [*Erythronium grandiflorum*], that's when it grows, when you burn. I've seen it, when the old people used to do it. I was just a little girl. I'd go up the mountain with granny. After we'd pick berries, my uncle would say, "It's going to rain pretty soon, time to burn [so the fire will not spread too much]." He stays up [after we finished].

"The mountains
burned
before
settling."

Then, we go back the next year, it's all burned. Now, it turns into bush. That's why we don't get many berries any more. We're not allowed to burn. [We get] some, but not the same as it used to be. They [berries] do [grow] after logging, but its not the right kind . . .

Annie York noted that Frozen Lake near Yale used to be a prime huckleberry picking spot, but it is not as good as it used to be. "Before, it was plentiful, [when] they used to burn. Now, nobody burns." Botanie Mountain near Lytton was another area where burning was practiced, but now, according to Annie York, the *skamec* [*Erythronium*] is not as good, not as plentiful (Annie York, personal communication, January 24, 1991).¹⁶ She also blamed trampling and overgrazing of the plants by cattle and horses in places such as Botanie Valley for causing a decline in the quantity and quality of *Erythronium* corms.

Annie York also recalled that individual bushes of hazelnut (*Corylus cornuta*) were burned in the Spuzzum area: ". . . If they can get hazelnuts, they eat that for their refreshments . . . they trade with that . . . because that used to be plentiful here [at Spuzzum] . . . They come down here for it [from further up the Fraser Canyon]. And then they [were] always burning them . . . those bushes, here and there, but not all of them [at once], and that's what makes them grow and makes them plentiful . . ." Hazel bushes also were burned by the Kalapuya of the Willamette Valley in Oregon. Hazel is an early fire follower, which seems to do well on burned over sites, presumably if the fire was of low intensity.¹⁷

Nlaka'pamux elder Hilda Austin of Lytton also recalled burning (personal communication, October 20, 1982):

Yes, he burns it. So the *mecekw* [*Rubus leucodermis*—blackcap] can grow there, the *c'elc'ala* [*Vaccinium membranaceum*—black mountain huckleberry] can grow there . . . He looks at the place [to see if] it's good to burn it, and he burns it . . . [NT: he would carefully choose

Hazelnuts (*Corylus cornuta*)



what the best place to burn was?] Yes. If it's going to burn too much he just stops it [implying a fire of low intensity, easily extinguished]. [He would] just watch it. [NT: what other plants would grow well after they burned it?] I guess, those onions, *qwelewe*⁷ [*Allium cernuum*], they grow there. *caw'ak* [*Lilium columbianum*—tiger lily], he grows good, after it's burned, he grows in that. . . . There's places, you know, are burned a lot. Sometimes, you know, it'll be burn and burn, and now the *c'elc'ala* [black mountain huckleberry] grows good in there, *caw'ak* [tiger lily] grows good in there, after they burning . . . That's where I was picking the *c'elc'ala* this year. Up at Thompson Mountain . . . In the olden days, there was hardly any bushes, trees. The people burns, so the huckleberries can grow, blackcaps can grow. Nowadays, the place is so bushy, just like it burns itself. Have to have men go out and fight fires. Puts out itself . . .

Mabel Joe, Nlaka'pamux elder of Shulus in the Nicola Valley, also confirmed the practice of landscape burning (personal communication, October 1984). She said that in the old days they would do that every few years, when a place started to get "too bushy." Now, she says, Coquahilla Pass, for example, is all grown over and not as good as it used to be for huckleberries [*Vaccinium membranaceum*]. She mentioned blackcaps [*Rubus leucodermis*] and wild raspberries [*R. idaeus*] as two other types of berries that grow well after a burn. She said the sidehill at Botanie Valley must have been burned over a short while ago because the blackcaps there are really thick and good. Now, people are not allowed to burn. "You just start a fire, and right away they put it out." Nora Jimmie, another Nlaka'pamux speaker (personal communication, August 8, 1984) recalled that burning the mountainsides promoted the growth of nodding onions, wild raspberries, blackcaps, and probably huckleberries.

Secwepemc elder Mary Thomas (personal communication, 1994) also recalled traditional burning by her parents and grandparents:

A lot of people couldn't believe that our people deliberately burned a mountainside when it got so thick, nothing else would grow in it. They deliberately burned it, at a certain time of the year when they knew there was rains coming, they'd burn that, and two years, three years after the burn there'd be huckleberries galore and different vegetations would come up that were edible [roots, berries] . . .¹⁸

Mary Thomas also noted that morel mushrooms (*Morchella* spp.) also flourish after burns, but said that she did not recall her people eating those in the old days. She learned about their edibility more recently. Nellie Taylor, Secwepemc elder from Skeetchestn (personal communication, 1996) remembered from the time she was a girl that the older people in the community worried about the decline of berries from places where they were no longer allowed to burn.

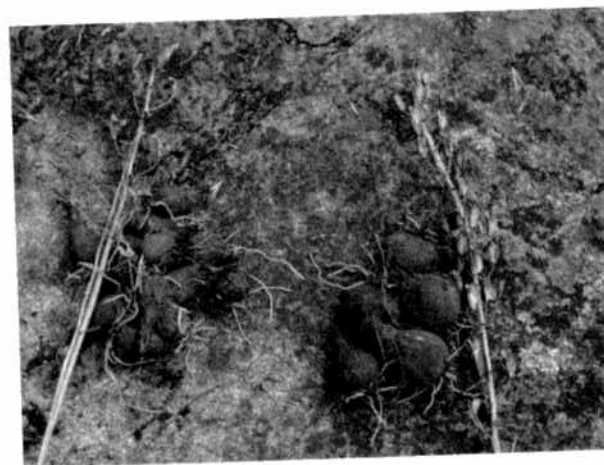
Yellow avalanche lily [*Erythronium grandiflorum*], one of the root vegetables mentioned by Baptiste Ritchie and Annie York, also is mentioned in connection with burning in a Nlaka'pamux (Thompson) narrative, "The Grizzly Bear and the Hunters." In the text, it was mentioned that a sister had four brothers who had "burned a piece of the mountain side so that the *skamitch* root should yield a better crop, and it was here that the little sister went to dig roots."¹⁹ Other references to landscape burning in the interior are provided in Tables 1 and 2.

Southeast Vancouver Island

In the early 1800s, several travelers and settlers on southern Vancouver Island commented on the landscape burning practices of the Straits Salish people. For instance, an anonymous 1849 newspaper article, "Colonization of Vancouver Island," noted

Miles of the ground were burnt and smoky, and miles were still burning. The Indians burn the country in order to [promote] . . . more especially, the roots which they eat. The fire runs along at a great pace, and it is the custom here if you are caught to gallop right

Blue camas (*Camassia leichtlinii*)



Bulbs of edible camas (*Camassia leichtlinii* [left] and *C. quamash* [right])

through it; the grass being short, the flame is very little; and you are through in a second . . .

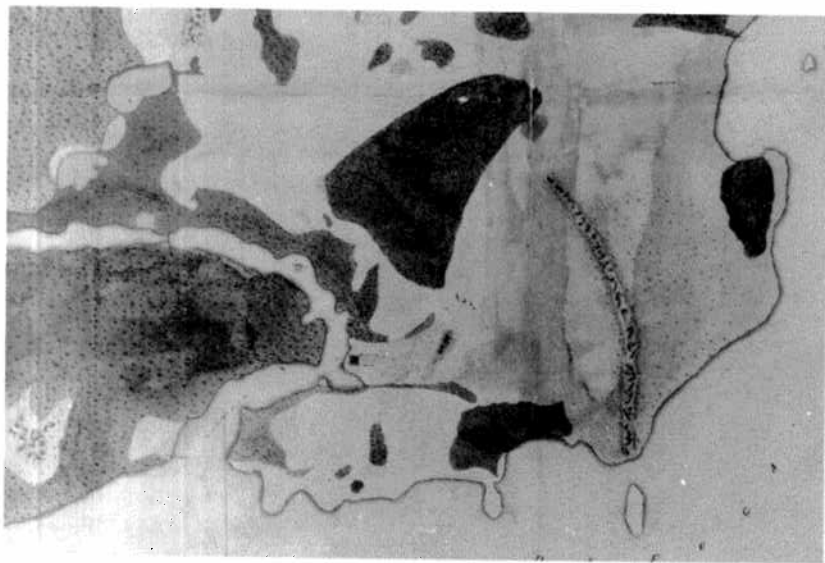
"The roots which they eat" undoubtedly pertains to the edible blue camas (*Camassia quamash* and *C. leichtlinii*), whose bulbs were a staple carbohydrate source for the aboriginal peoples of southeast Vancouver Island.²⁰ The suggestion that one could simply run through the fire implies a burn of low intensity, apparently within a garry oak savanna-type landscape. There is convincing evidence for aboriginal landscape burning of camas prairies in western Washington and large-scale burning by aboriginal people on Whidbey Island, Washington, in the latter case specifically to improve deer habitat and, hence, hunting.²¹

Many others also were impressed with the park-like qualities of the landscape. As early as 1790, Captain George Vancouver wrote about the islands in the vicinity of the future site of Fort Victoria, "I could not possibly believe any uncultivated country had ever been discovered exhibiting so rich a picture. Stately forests . . . pleasingly clothed its eminences and chequered its vallies; presenting in many places, extensive spaces that wore the appearance of having been cleared by art." Vancouver apparently never realized how the "delightful meadow[s]" he observed were maintained.²²

The Hudson's Bay Company's "Fort Victoria Journal" records many days from July through September 1846–49 that were "very hazy" or "very smoky and hazy." On September 12, 1847, for example, is the notation, "Weather very hazy as yesterday with dense smoke." On August 23, 1849: "Fine dry weather . . . favourable to the spreading of the Fires which are burning fiercely in all the forests around the place destroying in the short space of a few hours more timber than half a century will replace." The fires were regarded as "very alarming" and unwelcome. It is unclear whether they were linked to the activities of the local Salish in this case, but it is likely that at least some of

these summer fires were set by the aboriginal people. It is ironic that the landscapes so appreciated by the early explorers and colonists actually were created by the very fires they feared and disliked. In his official report in 1842 on the suitability of southeastern Vancouver Island for relocation of Hudson's Bay Company headquarters from Fort Vancouver, at the mouth of the Columbia, James Douglas described "a range of plains nearly six miles square containing a great extent of valuable tillage and pasture land equally well adapted for the plough or feeding stock." In a letter the following year, he portrayed this area as "a perfect 'Eden'"²³

Wayne Suttles's Straits Salish consultants provide information on the growing and harvesting of camas, including post-harvest burning practices. Suttles notes that after settlers began encroaching on the "mainland" (southern Vancouver Island) camas prairies ("these were usually the first places to be settled"), the offshore islands around Victoria and the Saanich Peninsula became the only source of bulbs. Some of these islands were open to anyone for digging, whereas others, especially some with prime camas beds, were owned and tended by individual Straits Salish people. For example, Mandarte Island in Haro Strait belonged to three people, and an islet south of Sidney to another. Each summer, after the plants had flowered, the owners came with their families and relatives (and sometimes, their slaves). The men would go off fishing early in the morning while the women dug camas bulbs. The bulbs



Victoria area, 1842, showing prairie extent. Lightly shaded areas were prairies; darker areas were forested. "Ground Plan of Portion of Vancouver Island Selected for New Establishment taken by James Douglas Esqr. Drawn by A Lee Lewes, L.S., 1842." HBCA Map collection G. 2/25 (N11761). Courtesy of the Hudson's Bay Company Archives, Provincial Archives of Manitoba.

were steamed in underground pits. "After they were through digging for the season, they burned off the island so that it would be more fertile the next year." Other beds on other offshore islets, whether privately owned or open to anyone for digging, also were burned off at the end of the digging. It is possible that the dense smoke noted around the Gulf Islands by George Dawson on August 10, 1876 came from post-harvest burning of camas beds, since it would have been in mid-summer, when the bulbs generally were harvested.²⁴

An 1863 account from the Tsolum River area north of Courtenay describes "miles of beautiful prairie land" and "beautiful rolling prairie," and may be evidence of fire-maintained landscapes of the Comox Salish. Nick Page (personal communication, 1991) has surveyed a site in the Tsolum River drainage that shows evidence of landscape burning by the Comox. It is the northernmost location for garry oak (*Quercus garryana*) and because, unlike other garry oak sites, it falls within the moist coastal Western Hemlock Biogeoclimatic Zone, Page is convinced that the oaklands here are anthropogenic in origin and were maintained in the past by periodic burning. Further studies of this site are ongoing.²⁵

W. Colquhoun Grant's 1857 description of the Sooke area of southern Vancouver Island included the following statement pertaining to landscape burning along the coast:

Although the thermometer sometimes reaches a height of 90 and 92 degrees [Fahrenheit], that is, only during the few hottest days in August, the usual thermometrical range during the dry season is from 60 to 80 degrees. *The natives all along the coast have a custom of setting fire to the woods in summer [emphasis added], which doubtless adds to the density of the fogs, and increases the temperature of the atmosphere.*²⁶

Those who did recognize that aboriginal people set fires intentionally either did not understand the purposes of burning or did not appreciate the significance or the necessity of it. Grant, in his report to Governor James Douglas, complained of the practice and described his efforts to stop the fires that were

... kindled promiscuously by the natives both in wood and prairie between the months of August and October. Their object is to clear away the thick fern and underwood in order that the roots and fruits on which they in a great measure subsist may grow the more freely and be the more easily dug up. I have endeavored in the neighbourhood of Mullachard [Grant's home in Sooke] to check these fires by giving neither potlache [gifts] or employment to any Indians so long as a fire was blazing in sight of my house.

To Grant, the habit of burning was "abominable" and destructive.²⁷

Grant's successor, surveyor Joseph Pemberton, however, seemed more appreciative of the results of burning. He noted, "The open grounds also grow berries of many kinds, and roots such as onions, kamas, etc. on which the Indian, to a great extent, subsists." About the same time, a visiting naval officer, Edward du Verney, likewise noted the richness of the region's berries: "The forest is as full of wild strawberries as possible, and it abounds with other fruit bearing shrubs: last summer the officers of the 'Grappler' made enough preserves from the wild berries to last them all through the winter." These last observations undoubtedly reflect the effects of intentional landscape burning by local First Nations on southern Vancouver Island.²⁸

Coastal Peoples

Evidence for aboriginal landscape burning within the central and north coastal region of British Columbia is more sporadic, but indications are that it was practiced at least to some extent. Franz Boas recorded a Kwakwaka'wakw (Southern Kwakiutl) prayer to berries, spoken by a woman before she picks the berries:

I have come, Supernatural Ones, you, Long-Life-Makers, that I may take you, for that is the reason why you have come, brought by your creator, that you may come and satisfy me; you Supernatural Ones; and this, that you do not blame me for what I do to you when I set fire to you the way it is done by my root (ancestor) who set fire to you in his manner when you get old on the ground that you may bear much fruit.[emphasis added]. Look! I come now dressed with my large basket and my small basket that you may go into it, Healing-Women; you Supernatural Ones. I mean this, that you may not be evilly disposed towards me, friends. That you may only treat me well . . .²⁹

On the west coast of Vancouver Island, in the Nuuchahnulth homeland, a small area in Clayoquot Sound was said by George Louie (Manhousht/Ahousht) to have been burned deliberately to stimulate the growth of berries. This area, called *iihatis* (lit. "sudden flooding of the river"), is around a small creek on the east side of Herbert Inlet, south from Gibson Cove. It originally was part of the territory of the Otsosht, one of the Clayoquot Sound tribes, but later, through warfare, became part of Ahousht territory. The burning of this area was confirmed by Stanley Sam (Ahousht/Clayoquot), who noted that Alaska blueberries (*Vaccinium alaskaense*), red huckleberries (*V. parvifolium*), and salal berries (*Gaultheria shallon*) grow particularly well after an area has been burned over.³⁰

Another intriguing reference to fire in the region is a statement from the 1860s by pioneer businessman Gilbert Sproat:

Here and there in the forest are open spaces where the trees burnt by a fire—caused perhaps by the careless Indians—lie blackened on the ground, or where they appear lying white and withered, as if destroyed by some blast or circle of wind that left the surrounding trees uninjured.³¹

Larry Paul (personal communication, 1994) recalled that his mother, Alice Paul, told him they used to burn the meadowlands behind Hesquiaht village in order to kill the trees and create ready sources of firewood, which could be gathered as needed. Perhaps this is the same type of burning as that described by Sproat.

Nuxalk elders of the Bella Coola area also recalled landscape burning. When he was a boy, Willie Hans of Bella Coola (personal communication, May 1981) asked his father why there were so many burned trees around the Bella Coola valley, and his father explained that they burned to encourage the berries, especially raspberries (*Rubus idaeus*) and blackcaps (*R. leucodermis*). The late Felicity Walkus, who originally was from South Bentinck Arm, recalled that they "burned lots" around that area, and the late Dr. Margaret Siwallace, born at Kimsquit, said they also used to burn there to promote berry growth (both personal communications, May 1981).

The Haisla also burned areas within their territory in the vicinity of Kitimaat, to encourage the growth of berries, which were an important element in their diet.³²

On Haida Gwaii (Queen Charlotte Islands) there is further evidence of burning. Haida elder Hazel Stevens of Skidegate said that one of the small offshore islands off Queen Charlotte City, Guden Island (the Haida name translates as "diarrhea island" because of its appearance) used to be burned, and was well known as a prime berry site for salal (*Gaultheria shallon*) and red huckleberries (*Vaccinium parvifolium*). People often stopped there to pick berries. Mrs. Stevens' implication was that the burning had enhanced the growth of berries, although she did not state this directly. In interviews dating



Salal (*Gaultheria shallon*)

from the 1970s, the late Solomon Wilson of Skidegate also alluded to burning berry patches. He mentioned a small camp called *hwt'uu* on the south side of Maude Island in Skidegate inlet, where in historic times people grew potatoes and had a smokehouse. Salal berries and huckleberries were abundant around this camp, and, again, the implication was that this was because the area was burned frequently. The late Charlie Williams of Skidegate said in 1973 that large areas behind the villages of Skidegate and Tanu formerly were burned "so berries could be found afterward."³³

The food plant species of indigenous peoples of British Columbia mentioned in this paper are described and illustrated in Nancy Turner, *Food Plants of Coastal First Peoples* (1995) and *Food Plants of Interior First Peoples* (1997); and in Harriet Kuhnlein and Nancy Turner, *Traditional Plant Foods of Canadian Indigenous Peoples: Nutrition, Botany and Use*.³⁴ Aside from the direct production increase in plant food resources, First Nations peoples recognized that landscape burning also resulted in enhanced forage for deer and other game.³⁵ Later, production of forage for horses and cattle, as mentioned by George Dawson in his journals, also must have been a factor in decisions about landscape burning by aboriginal peoples of British Columbia, as it was in neighboring areas.³⁶ Furthermore, although no direct mention has been made of landscape burning enhancing the growth of medicinal plants or species used as materials in traditional technologies, this also may have occurred. One Lower Kootenai (Ktunaxa) man interviewed by Barrett said fire also was used to protect medicine plants, in particular the important ceremonial plant *7ayut* (*Ligusticum* sp.).³⁷

Controlled Burning Techniques

Techniques of controlled burning are little known, since most of the elders who recalled the practice remembered only observing it from their younger days, not actually participating in it. From available evidence, mainly the accounts cited earlier, specific sites were preselected for burning over, and from all indications, the times for burning and the conditions also were selected, as they were by other peoples such as the Slavey (Dene-thah) of northern Alberta and the Salishan and Kootenai (Ktunaxa) peoples of western Montana. Annie York's (Nlaka'pamux) recollections of her uncle waiting until huckleberry picking was finished, then choosing a time just before a rainfall to carry out the burning, is in keeping with this suggestion. The Gitksan and Wet-suwet'en peoples to the north practiced similar timing, with the addition of some types of burning in the spring. On southern Vancouver Island burning was carried out in the summer, after the camas harvest. This would have been a dry period, but since, at least in historic times, burning was carried out mainly on small islands, it would have been easier to control.³⁸

Factors determining the nature of landscape burning for indigenous peoples of Montana and Alberta include seasonality (fires usually were set in fall or early spring when the ground was wet and hence control was better), time of day, relative humidity of certain fuel types, knowledge of winds, slope, size of areas burned, and frequency of burning. To further control set fires, the Slavey employed natural and human-made fire breaks, backfires, and active use of wetted conifer boughs to extinguish or direct the fire.³⁹ It can be assumed that these factors also were important to indigenous peoples of British Columbia.

Controlled landscape burning required a detailed and in-depth knowledge of natural systems, especially the ecological characteristics of vegetation and the successional nature of plant communities, as well as of various geographical and climatic features of the landscape. This knowledge, acquired through centuries and generations of careful observation and experimentation, seldom has been acknowledged by non-Native people. In fact, foresters and rangers often have regarded aboriginal landscape burning as nothing more than "carelessness."⁴⁰

Resource Species Enhanced by Burning

Nineteen plant species (within two general categories—berries and roots) were reported by indigenous peoples to be enhanced by periodic landscape burning (Table 2). Of the species mentioned, eleven are shrubby fruiting species, one is the herbaceous wild strawberry, and the remaining seven are herbaceous plants with edible underground parts. All of the species have the capacity to regenerate from underground rhizomes or buried storage organs. A recent study has demonstrated that fruiting shrub species such as *Sambucus racemosa* (red elderberry), *Ribes laxiflorum* (white-flowered currant), *Ribes lacustre* (swamp gooseberry), and *Rubus parviflorus* (thimbleberry) readily re-establish through resprouting from underground rhizomes after clearcutting and burning, although *Vaccinium membranaceum* (black mountain huckleberry) was slow to re-grow.⁴¹

In general, it appears that many of the species whose growth and productivity are increased following landscape burning are successional species requiring clearings or open canopy for optimum growth, or are at least somewhat tolerant of open conditions. For example, Don Minore summarizes the situation for huckleberries and blueberries:

Most huckleberry fields originated from the uncontrolled wildfires that were common in the Northwest before modern fire protection and control techniques were applied. Ecologically, these fields are seral—temporary stages in the natural succession from treeless burn to climax forest. Without fire or other radical disturbance, huckleberries

gradually are crowded out by invading trees and brush. A few years after establishment they produce a maximum amount of berries; then production gradually declines as other shrubs and trees dominate the site The acreage occupied by thin-leaved huckleberry fields is declining rapidly as old burns become reforested and new burns become increasingly rare. Many formerly productive huckleberry areas now produce no berries at all. Others are shrinking as trees and brush invade along their edges.⁴²

From the testimonies of the native elders, such as Baptiste Ritchie and the late Julia Kilroy of Coldwater in the Nicola Valley, re-growth of the "root" plants after burning is accompanied by a notable increase in the size of the edible portion. Julia Kilroy, for example, recalled having seen some bulbs of tiger lily [*Lilium columbianum*] the size of tennis balls from a place where the area had been burned over the previous year, and attributed the immense size to the burning. Possibly increased growth would result from an increased supply of available nutrients near the surface of the ground following burning. Fire increases the pH of the soil through release of alkaline ions such as phosphorus, potassium, calcium, and magnesium, and studies show that these nutrients are more readily accessible to plants after a fire. The amount of nutrients released varies with the type of soil and intensity of the burn. Burning also would be expected to reduce competition from fire-intolerant species.⁴³

Landscape Burning Today

Many aboriginal people in British Columbia still rely on wild foods for a substantial portion of their diet. The use of wild foods and traditional medicines, considered an important part of the cultural heritage of first peoples, is being promoted in native communities. In general, the traditional diet of indigenous peoples of Canada is considered to be a healthy one, and continuing and increasing use of wild foods is desirable from many perspectives. Given this situation, the enhancement of habitat for the growth of wild plant and animal foods should be given priority.⁴⁴

Fire ecologists and wildlife biologists in western North America are rethinking the strategy of total forest fire suppression, which has dominated forest management practices in the present century. For example, a recent review notes that, as well as fire control, ". . . the skilled application of fire as a forest land management tool" may be undertaken in some situations.⁴⁵

It might be argued that the present forest management policies of extensive clearcutting followed by slashburning in both coastal and interior forests is imitative of previous aboriginal landscape burning in the province. Indeed, several of the elders quoted in this study, including Alec Peters of Mount

Currie and Hilda Austin of Lytton, said that logged areas were where people now go to gather berries, and also to hunt. Hilda Austin (personal communication, 1982) discussed going to pick huckleberries on Thompson Mountain, about 20 km south of Spences Bridge, on Nicomen Creek:

We were climbing, right to the other side of the mountain. The guys logs it, cuts that, and *c'elc'ala* [*Vaccinium membranaceum*] grows on that, that's where we were picking it . . . I guess there's lots of snow when he logs it, and that's why the stumps are long. Yes, that's where we were picking the huckleberries . . . But it's just starting to grow, I guess. It's short . . . I see the boys, he went and hunts over there. They didn't cut the whole thing, you know, just certain places. Still, there're deer . . .

On the other hand, others do not consider these areas to be as good for berries as the traditionally burned places. Annie York (personal communication, January 1991) said, "They [berries] do come after logging ✓ but it's not the right kind; it's not as good." Intensive burning can be detrimental because it can result in decreased organic matter in the soil and increased erosion. Furthermore, aboriginal people say that access often is cut off to them when they try to go into logged areas of powerline rights-of-way. Additionally, with many areas now being sprayed with Roundup and other herbicides to eliminate brush and species such as alder (*Alnus rubra*) that might compete with commercial forest trees, people fear contamination. In 1986, for example, the Lillooet Tribal Council appealed six permits authorizing the forests ministry to apply Roundup in the Cayoosh, Texas, and Lillooet drainages, and a highways permit for application of Tordon 22K on a spot basis. The Haida also have expressed grave concerns about pesticides and other pollutants contaminating their wild foods and medicines.⁴⁶

Another problem complicates the picture of traditional landscape burning and aboriginal resource use. Many aggressive exotic species have been introduced within the past century and before. Some of these, such as Scot's broom (*Cytisus scoparius*) on southern Vancouver Island, invade large tracts of land formerly occupied by indigenous plants. Broom and other weedy species do not seem to be harmed by burning, and can become established quickly in burned or logged areas once the original cover is removed.⁴⁷ Introduced species such as thistles (*Cirsium vulgare* and *C. arvense*), burdock (*Arctium minus*), knapweed (*Centaurea diffusa* and *C. maculosa*), mustards (*Brassica* spp., *Sisymbrium* spp. and related species), and foxglove (*Digitalis purpurea*) are taking over large tracts of logged, burned, or otherwise disturbed lands in British Columbia. These species, and the livestock they often accompany on range and meadow lands both in coastal and interior areas, pose an increasing threat to the productivity of traditional resource species. Trampling and overgrazing of pigs and sheep on southern Vancouver Island

Top: Vegetation immediately after burn. Below: Same place, one year after burn. Facing page: Same burn four years after fire



and the small islands of Haro and Rosario Straits, and undoubtedly the weedy species that accompanied them, spoiled the once-productive camas beds of the Straits Salish people in many places. Botanie Valley, by historical account one of the most productive traditional root-digging grounds of the entire province, has been changed irrevocably by trampling, grazing livestock, and the weedy plants accompanying them.⁴⁸

Mary Thomas, Secwepemc (Shuswap) elder from the Salmon Arm area, has observed during the course of her own lifetime both a decline in burning practices and a marked deterioration in the size and abundance of traditional root vegetables such as yellow avalanche lily (*Erythronium grandiflorum*), and she believes this is due to the invasion of couch grass (*Agropyron repens*), knapweed and other weeds, and to trampling and overgrazing by livestock (Mary Thomas, personal communication, October and December 1991). In one intentionally burned area of grazing land on the Skeetchestn Reserve (Secwepemc) in Deadman's Creek valley near Savona, although there was a dramatic reduction of knapweed in the first year following the burn, the entire



area was repopulated by a dense growth of another weed, hedge mustard (*Sisymbrium loeselii*) (personal observation, 1990, 1991).

Thus, even if aboriginal landscape burning practices were reinstated, the resulting vegetation would not have the same composition as it had prehistorically. The situation is similar in California and elsewhere. The authors of a study of Chumash (Ventura County, California) burning note "... the effects and frequency of grass fires today are not necessarily comparable with those in aboriginal times before introduced weeds and heavy grazing destroyed native grasslands ..."⁴⁹

If landscape burning to increase production of traditional plant resources were to be reincorporated into forest management strategies of the future, it would have to be done with caution and with careful monitoring of effects on native plant communities. Simple mimicking of past burning techniques may not produce the same enhancement of resource species. Minimal soil disturbance obviously is desirable to avoid damage to the underground reproductive parts of berry and other resource plants, and to avoid creating areas that are easily invaded by weeds. Soil temperatures that are too high might imperil the survivability of some resource species. Forest ecologists have been accumulating data on ecological effects of fire for the past quarter century and already know much on the variable effects of burning. But we must keep in mind that aboriginal peoples used different landscape burning strategies for different objectives and on different sites. Additionally, the effects

of fire on each ecosystem and site can vary significantly; some sites might be affected detrimentally by fire. Nevertheless, with caution, it may well be worthwhile to attempt burning over certain restricted sites in traditional ways. Careful attention to season, weather, and other factors can reduce potentially adverse effects traditionally associated with fire. Hand pruning and mechanical brushcutting also might be investigated as alternatives to landscape burning.⁵⁰

Conclusions

Oral accounts by contemporary indigenous people in British Columbia, especially those of the grandparent generation, provide many records of the practice of intentional landscape burning. Although such burning has not been done for many years because of government fire suppression policies dominant in the present century, records indicate that the practice once was widespread. The main purpose of landscape burning was to enhance the growth and production of plant food resources, especially certain types of berries and "root" vegetables, as well as to create good forage for deer and other game.

Burning generally was done at the end of the harvest season, and optimum productivity of berries and "root crops" was said to occur after about three years. Rotation of burning areas was practiced to achieve continual production in an overall area.

The importance of wild plant resources that are noncommercial and therefore do not feature in the mainstream economy also has been generally overlooked in resource planning and management in British Columbia and elsewhere. Perhaps it is time to reevaluate the directions of forest management. New forestry should both be more accommodating of the needs and traditional practices of indigenous peoples and give more recognition to the values of traditional resources.

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Table 1. Summary of Oral and Literature Records of Aboriginal Landscape Burning in British Columbia

Language Group	References and Notes
1. Straits Salish	Anonymous 1849; Grant 1857; Suttles 1951a (meadows burned to enhance camas production; summertime)
2a. Upriver Halkomelem (Sto:lo)	Coqualeetza Education Training Centre 1981 (some patches of different kinds of blueberries were burned each year "to make more berries grow"); Butler and Campbell 1987 (note burning to enhance "blueberries")
2b. Cowichan Halkomelem (Quwutsun')	Elders recall that the wild strawberry patches "on the outside [waters]" (apparently West Coast, beyond Sooke) were fired every few years (Arvid Charlie, personal communication, 1996, from his great grandfather, Luschiim)
3. Comox	Garry oak woodland in Comox Valley said to have been anthropogenic (discussed in text; Nick Page, personal communication 1991).
4. Nlaka'pamux (Thompson)	Annie York, Hilda Austin, Mabel Joe, Julia Kilroy, Nora Jimmie, personal communication 1975-1991 cf. Turner <i>et al.</i> 1990: 123, 137, 191; Kennedy and Bouchard 1986: 128; Teit 1898: 72-74 (late summer; fall)
5. Stl'atl'imx (Lillooet)	Baptiste Ritchie, Sam Mitchell, Charlie Mack Seymour, Alec Peters, Nellie Wallace, Margaret Lester, personal communication 1977-1985 (see also quotations in text; Swoboda 1971)
6. Secwepemc (Shuswap)	Nellie Taylor, Mary Thomas, Ron Ignace, personal communication, 1995, 1996
7. Okanagan-Colville	Martin Louie, in Turner <i>et al.</i> 1980: 103; Kennedy and Bouchard 1986: 128
8. Ktunaxa (Kootenai)	Barrett 1980a (Montana Kootenai people suggested berry production was enhanced by landscape burning; this knowledge may also pertain to British Columbia Ktunaxa)

Language Group

9. Dakelhne (Carrier)
and Wet'suwet'en

10. Nisga'a
(Nishga, Niska)

11. Gitksan

12. Haida

13. Nuxalk
(Bella Coola)

14. Haisla

15. Kwakwaka'wakw
(Southern Kwakiutl)

16. Nuuchah-nulth
(Nootka, West Coast)

References and Notes

Johnson (this volume)—several accounts of burning; Rhea Joseph, personal communication, May 1981 (her father told her they used to burn off mountainsides in the Terrace area until the 1940s.)

HMCM, cited by McNeary (1974: 38).

Johnson (this volume) records numerous accounts of traditional burning around village and in montane areas of Gitksan territory

David Ellis, personal communication, January 1991, 1992 (burning off areas on islands in Skidegate Inlet and behind Skidegate and Tanu; discussed in text)

Margaret Siwallace, Willie Hans, Felicity Walkus, personal communication, 1981-84 (hillsides burned around South Bentinck Arm, Kimsquit, and Bella Coola Valley to encourage growth of raspberries, blackcaps, and soapberries)

Berry production said to be improved by burning (Lopatin 1945)

Boas (1930) (berry picker's prayer quoted in text)

Bouchard and Kennedy (1990)
(Clayoquot Sound; see discussion in text)

Table 2. Types of Plants and Plant Species Whose Production Is Reported to be Enhanced by Periodic Landscape Burning (within British Columbia and Neighboring Areas).

Berries (general)

Landscape burning to enhance berry growth mentioned for Kwakwaka'wakw, Haida, Haisla, Ktunaxa, Stl'atl'imx, Nlaka'pamux, Secwepemc, Nuuchah-nulth, Nuxalk, Wet'suwet'en, Gitksan, Nisga'a (see Table 1 for reference citations)

Edible Roots

Forage plants for deer

Allium cernuum
(nodding wild onion)

Amelanchier alnifolia
(saskatoon or serviceberry)

Camassia quamash and
C. leichtlinii (blue camas)

Claytonia lanceolata (spring
beauty)

Corylus cornuta (hazelnut)

Erythronium grandiflorum
(avalanche lily)

Fragaria chiloensis (?) (seaside
strawberry)

Fritillaria camschatensis (rice root)

Landscape burning to enhance growth of edible (general) underground parts mentioned for Nlaka'pamux, Stl'atl'imx, Secwepemc (see Table 1 for reference citations)

Mentioned for Okanagan-Colville, Nlaka'pamux, possibly Gitksan, possibly Wet'suwet'en, Straits Salish, Ktunaxa (Moravets 1932; Barrett 1980a; Kennedy and Bouchard 1986: 128; Hilda Austin, personal communication, 1984; Johnson (this volume).

Growth enhancement noted by Nlaka'pamux elders (Hilda Austin, Nora Jimmie, personal communication, 1984); large nodding onions recorded following burns in Gitksan territory (Leslie Johnson, personal communication, 1990)

Growth enhancement suggested after fires in Lillooet area by Mathewes (1978: 77)

Patches burned over in summer in southern Vancouver Island and the Gulf Islands (Suttles 1951a)

Enhanced size and productivity noted by Stl'atl'imx and Secwepemc elders (see Table 1 for reference citations)

Individual bushes burned around Spuzzum to enhance production (Annie York, in Turner *et al.* 1990: 191)

Enhanced production noted by Teit (1898: 72-74), Annie York, in Turner *et al.* (1990: 123), Baptiste Ritchie (Swoboda 1971)

Enhanced production noted for Cowichan Halkomelem (Quwutsun') (see Table 1 for reference citations) (species of strawberry implied by coastal habitat, but not confirmed)

Possible enhancement of growth from burning of floodplain garden sites (Gitksan—Johnson this volume)

<i>Gaultheria shallon</i> (salal)	Enhanced production suggested for Nuuchah-nulth and Haida areas (see Table 1 for reference citations)
<i>Lilium columbianum</i> (tiger lily)	Enhanced size and productivity noted by Baptiste Ritchie (Swoboda 1971) and Julia Kilroy (Turner <i>et al.</i> 1990: 123)
<i>Ribes divaricatum</i> (wild gooseberry)	Enhanced production noted by Baptiste Ritchie (Swoboda 1971)
<i>Rubus idaeus</i> (wild raspberry)	Enhanced productivity noted by Willie Hans, Sam Mitchell, Mabel Joe, Nora Jimmie (all personal communication, 1977–84; SM to Dorothy Kennedy, 1977)
<i>Rubus leucodermis</i> (blackcap)	Enhanced productivity noted by Willie Hans, Mabel Joe, Hilda Austin (all personal communications, cf Turner <i>et al.</i> 1990: 279)
<i>Shepherdia canadensis</i> (soapberry)	Enhanced productivity noted by Margaret Siwallace (from Sandy Moody, personal communication, 1984); and Johnson (this volume).
<i>Vaccinium alaskaense</i> (Alaska blueberry)	Enhanced productivity noted by Stanley Sam (Bouchard and Kennedy 1990: 345)
<i>Vaccinium caespitosum</i> (dwarf huckleberry)	Enhanced productivity noted for Nlaka'pamux by Mabel Joe, Julia Kilroy, and Annie York (Turner <i>et al.</i> 1990: 218); for Gitksan and Wet'suwer'en (Johnson this volume)
✓ <i>Vaccinium membranaceum</i> (black mountain huckleberry)	Enhanced productivity noted by Stl'atl'imx, Nlaka'pamux, Gitksan, Wet'suwer'en, and Okanagan-Colville elders (references cited in Table 1)
<i>Vaccinium parvifolium</i> (red huckleberry)	Enhanced productivity noted for Nuuchah-nulth and Haida (Bouchard and Kennedy 1990: 345; David Ellis, personal communication, 1991)
<i>Vaccinium</i> spp. (wild blueberries)	Enhanced productivity noted by Nlaka'pamux, Okanagan-Colville, and Sto:lo elders (Turner <i>et al.</i> 1980: 103; Coqualeetza Education Training Centre 1981; Turner <i>et al.</i> 1990: 218); and Butler and Campbell (1987)

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Notes

1. Author is professor, Environmental Studies Program, University of Victoria, Victoria, British Columbia, Canada V8W 2Y2.
2. Transcribed from a taped interview with Dorothy Kennedy.
3. The quotation is from Eugene Anderson, *The Food of China* (New Haven, 1988), 11. Regional works on Native North American fire use include 1) northeast: Gordon Day, "The Indian as an Ecological Factor in the Northeastern Forest" (*Ecology* 64(1): 78-88, 1983); 2) northern Plains: Mavis Loscheider, "Use of Fire in Interethnic and Intraethnic Relations on the Northern Plains" (*Western Canadian Journal of Anthropology* 7(4): 82-96, 1977); 3) boreal forest: Dennis Dube, "Fire Ecology in Resource Management: workshop proceedings: December 6-7, 1977" (*Canadian Forestry Service Information Report* NOR-X-210, Edmonton, 1978); Harold Lutz, "Aboriginal Man and White Man as Historical Causes of Fires in the Boreal Forest, with particular reference to Alaska" (*Yale University School of Forestry*

- Bulletin* No. 65, 1959); Henry Lewis, "Maskuta: The Ecology of Indian Fires in Northern Alberta" (*Western Canada Journal of Anthropology* 7(1): 15–52, 1977), "Traditional Uses of Fire by Indians in Northern Alberta" (*Current Anthropology* 19: 401–2, 1978), "Hunter-Gatherers and Problems for Fire History" (pp. 115–19 in Marvin Stokes and John Dieterich, "Proceedings of the Fire History Workshop, October 20–24, 1980, Tucson" (*USDA Forest Service General Technical Report* RM-81, Publication No. 17, Edmonton, 1982), and Lewis and Ferguson (this volume); 4) interior west: Stephen Barrett, "Relationship of Indian-caused Fires to the Ecology of Western Montana Forests" (M.S. thesis, University of Montana, 1980a), "Indians and Fire" (*Western Wildlands* 6(3): 17–21, 1980b), "Indian Fires in the Pre-Settlement forests of Western Montana" (pp. 35–41 in Stokes and Dieterich, "Proceedings of the Fire History Workshop . . .," 1980); Barrett and Arno (1982 and this volume); and George Gruell, "Indian Fires in the Interior West: A Widespread Influence," pp. 68–80 in James Lotan *et al.* "Proceedings—Symposium and Workshop on Wilderness Fire, Missoula, November 15–18, 1983" (*USDA Forest Service General Technical Report* INT-182, Ogden, 1985); 5) western and central Washington and Oregon: Helen H. Norton, "The Association between Anthropogenic Prairies and Important Food Plants in Western Washington" (*Northwest Anthropological Research Notes* 13(2): 175–200, 1979); French; Norton, Boyd, and Hunn; Boyd; and Robbins (all this volume); 6) California: Henry Lewis, "Patterns of Indian Burning in California: Ecology and Ethnohistory" (pp. 55–116 in Thomas Blackburn and Kat Anderson, *Before the Wilderness: Environmental management by native Californians* (Ballena Press anthropological paper no 40, 1993 [orig. 1973])); and Jan Timbrook, John Johnson, and David Earle, "Vegetation Burning by the Chumash," pp. 117–49 in Blackburn and Anderson (*ibid.*; orig. 1982). For North America in general, see Lewis, "Why Indians Burned: Specific versus General Reasons," pp. 75–80 in Lotan *et al.*, "Proceedings—Symposium and Workshop on Wilderness Fire"; Barbara Mills, "Prescribed Burning and Hunter-Gatherer Subsistence Systems" (*Haliksa'i: UNM Contributions to Anthropology* 5: 1–26, 1986); Stephen Pyne, *Fire in America: A Cultural History of Wildland and Rural Fire* (Princeton, 1982) and "Indian Fires" (*Natural History* 2(83): 6–11, 1983); and Omer Stewart, "Burning and Natural Vegetation in the United States" (*Geographical Review* 41(2): 317–20, 1951), "The Forgotten Side of Ethnogeography," pp. 221–48 in Robert Spencer, ed., *Method and Perspective in Anthropology* (Minneapolis, 1954), and "Fire as the First Great Force Employed by Man," pp. 115–33 in William Thomas, ed., *Man's Role in Changing the Face of the Earth* (Chicago, 1956).
4. See John Parminter, "A Historical Review of Forest Fire Management in British Columbia" (M.F. thesis, University of British Columbia, 1978); James Hatter, "Wildlife and People in Interior British Columbia" (*Transactions of the Thirteenth British Columbia Natural Resources Conference, Victoria, 1961*); Robert Mierendorf, "An Archaeologist's View," pp. 15–19 in Vicki Haberl, ed., *Reflections of the Past: Manning Park Memories* (Victoria, 1991); and Rolf Mathewes, "The Environment and Biotic Resources of the Lillooet Area," pp. 68–99 in Arnoud Stryd and Stephen Lawhead, eds., "Reports of the Lillooet Archaeological Project No. 1: Introduction and Setting" (*National Museum of Man Mercury Series, Archaeological Survey of Canada Paper* No. 73, 1978).
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6. Gerald Tande, "Interpreting Fire History in Jasper National Park, Alberta" (pp. 31–34 in Stokes and Dieterich, "Proceedings of the Fire History Workshop . . .," 1980); Stephen Barrett, "Relationship of Indian-caused Fires to the Ecology of Western Montana Forests" (1980a).
7. Barrett and Arno, this volume; Stokes and Dieterich, "Proceedings of the Fire History Workshop . . .," 1980; Henry Wright and Arthur Bailey, *Fire Ecology, United States and Southern Canada* (Toronto, 1982).
8. Harold Lutz, *Aboriginal Man and White Man as Historical Causes of Fires in the Boreal Forest . . .*, Parminter, "A Historical Review of Forest Fire Management in British Columbia"; and Barrett, "Relationship of Indian-caused Fires to the Ecology of Western Montana."
9. Edward House, *A Hunter's Camp-fires* (New York, 1909), cited in Parminter, "A Historical Review . . .," 5.
10. "Reasons" like these are cited or discussed in *The Journal Kept by David Douglas During his Travels in North America 1823–1827* (London, 1914); Stewart, "Burning and Natural Vegetation . . ."; H. Lutz, *Aboriginal Man and White Man as Historical Causes of Fires in the Boreal forest . . .*; Parminter, "A Historical Review . . ."; Barrett, "Relationship of Indian-caused Fires . . ."; Barrett and Arno, this volume; Lewis, "Why Indians Burned . . ."; and Boyd, this volume.
11. Hatter, "Wildlife and People in Interior British Columbia"; Parminter, "A Historical Review . . ."; Cole Harris, "Industry and the Good Life around Idaho Peak" (*Canadian Historical Review* 66(3): 315–43, 1985).
12. George Dawson, "Preliminary Report on the Physical and Geological Features of that Portion of the Rocky Mountains Between latitudes 49 degrees and 51 degrees, 30 minutes" (in *Geological and Natural History Survey of Canada Annual Report*, vol. 1, 1886).
13. See Hatter, "Wildlife and People . . .," on the percentage of burned forests; Harry Whitford and Roland Craig, *Forests of British Columbia* (Ottawa, 1918), 157 on fire prevention policy.
14. Douglas Cole and Bradley Lockner, *The Journals of George M. Dawson, British Columbia, 1875–1878* (Vancouver, 1989). Pp. 48, 130, 199, 203, 206, 214, 229, 247, 262, 320, 327, 329, 346, 350, and 493 cite burnt landscape; pp. 199, 203, and 351–52 note the advantages of burning.
15. The original text in Stl'atl'imx, together with a word-by-word translation, appear in Leo Swoboda's "Lillooet Phonology, Texts and Dictionary" (M.A. thesis, University of British Columbia, 1971), 182–91.
16. For more on Botanie Mountain, see Nancy Turner *et al.*, "Thompson Ethnobotany: Knowledge and Usage of Plants by the Thompson Indians of British Columbia" (*Royal British Columbia Museum Memoir* No. 3, 1990).
17. Turner *et al.*, "Thompson Ethnobotany," 191; see also Boyd (this volume) on burning of hazel bushes.
18. Mary Thomas also noted that morel mushrooms (*Morchella* spp.) flourish after burns too, but said that she did not recall her people eating those in the old days. She learned about their edibility more recently.
19. James Teit, "Traditions of the Thompson River Indians of British Columbia" (*Memoirs of the American Folk-Lore Society* vol. 6, 1898), 72–74.

20. Anonymous, "Colonization of Vancouver Island" (*The Times, London*, May 4, 1849), 18–19. On camas among southeast Vancouver Island Native Peoples, see Nancy Turner and Marcus Bell, "The Ethnobotany of the Coast Salish Indians of Vancouver Island" (*Economic Botany* 25(1): 63–104, 1971); Nancy Turner and Harriet Kuhnlein, "Camas (*Camassia* spp.) and Riceroot (*Fritillaria* spp.): Two Liliaceous 'Root' Foods of the Northwest Coast Indians" (*Ecology of Food and Nutrition* 13(4): 199–219, 1983); and Turner, *Food Plants of Coastal First Peoples* (UBC Press and Royal British Columbia Museum 1995, rev. ed.; orig. 1975).
21. Norton, "The Association Between Anthropogenic Prairies and Important Food Plants . . ."; Floyd Moravets, "Second Growth Douglas Fir Follows Cessation of Indian Fires" (*USDA Forest Service Bulletin* 16(20), 1932).
22. George Vancouver, *A Voyage of Discovery to the Pacific Ocean and Round the World, 1790–5*, vol. 1 (London, 1798), 227–29.
23. Duncan Finlayson, "Fort Victoria Journal" (Hudson's Bay Company Archives ms. B. 226/a/1, Winnipeg). The quotations from James Douglas are from 1) Douglas to John McLoughlin, July 12, 1842 (*The Beaver*, Outfit 273: 4–6, 1943); and 2) Douglas to James Hargrave, February 5, 1843 in George Glazebrook, ed., *The Hargrave Correspondence, 1821–1843* (Toronto, 1938), 420. Both are cited in John Lutz's unpublished "Preparing Eden: Aboriginal Land Use and European Settlement" (paper presented to the 1995 Meeting of the Canadian Historical Association).
24. Wayne Suttles, "The Economic Life of the Coast Salish of Haro and Rosario Straits" (Ph.D. dissertation, University of Washington, 1951a), 59, 60; and "The Early Diffusion of the Potato among the Coast Salish" (*Southwestern Journal of Anthropology* 7(3): 272–88, 1951b), 281. Cole and Lockner, *The Journals of George M. Dawson . . .*, 48, is the source of the Dawson citation.
25. The Tsolum Valley quotation comes from John Hayman, ed., *Robert Brown and the Vancouver Island Exploring Expedition* (Vancouver, 1989), 113. Other evidence for the anthropogenic origin of the Comox prairies is presented in an unpublished term paper by Nick Page, "The Importance of Garry Oak Grasslands as an Example of a Cultural Ecosystem" (Department of Forestry, University of British Columbia, November 1989).
26. W. Colquhoun Grant, "Description of Vancouver Island" (*Journal of the Royal Geographic Society* 27: 268–320, 1857), 275.
27. Grant, "Description of Vancouver Island," 275; cited in J. Lutz, "Preparing Eden . . ."
28. Joseph Pemberton, *Facts and Figures Relating to Vancouver Island and British Columbia* (London, 1860), 19; Allan Pritchard, ed., "Letters of a Victorian Naval Officer, 1862–1864" (*BC Studies* 86(1): 32–33, 1990).
29. Franz Boas, "The Religion of the Kwakiutl Indians" (*Columbia University Contributions to Anthropology* 10, 1930), 203. Boas translated the text to English; species not given in original Kwakwaka'wakw language; only a general term for "fruit" was used.
30. Randy Bouchard, personal communication, January 1991; R. Bouchard and Dorothy Kennedy, *Clayoquot Sound Indian Land Use* (Report prepared for MacMillan Bloedel Limited, Fletcher Challenge Canada, and the British Columbia Ministry of Forests, 1990).
31. Gilbert Sproat, *The Nootka: Scenes and Studies of Savage Life* (Charles Lillard, ed., Victoria, 1987 [orig. 1868]), 17.
32. Ivan Lopatin, "Social Life and Religion of the Indians of Kitimat, British Columbia" (*University of Southern California Social Science Series* 26, 1945), 140.
33. From interviews conducted by David Ellis (personal communications, January 21, 1991 and January 2, 1992).
34. The first two volumes originally were published as *Food Plants of British Columbia Indians; Coastal Peoples* (1975) and *Interior Peoples* (1978). Both were revised and republished in 1995 and 1997 by UBC Press and the Royal British Columbia Museum (Vancouver and Victoria). *Traditional Plant Foods of Canadian Indigenous Peoples* was published by Gordon and Breach Science Publishers, Philadelphia.
35. Hilda Austin [Lytton], personal communication, October 1984; Dorothy Kennedy and Randy Bouchard, "Indian History and Knowledge of the Aspen Grove to Peachland Corridor of the Coquihalla Highway" (Appendix II [pp. 121–35] in *Coquihalla Highway Project, Merritt to Peachland, B.C., Detailed Heritage Resource Inventory and Impact Assessment* (report prepared for the Heritage Conservation Branch, Ministry of Tourism and Design and Survey Branch, Ministry of Transportation and Highways, 1986), 128.
36. E.g., Barrett, "Relationship of Indian-caused Fires . . ."; and Johnson, this volume.
37. Barrett, "Relationship of Indian-caused Fires . . ."
38. Sources include Henry Lewis, "Traditional Indian Uses of Fire in Northern Alberta" (1978) and *A Time for Burning* (1982) on the Slavey; Berrett, "Relationship of Indian-caused Fires . . ." on Salish/Kootenai; Johnson (this volume) on Gitksan/Wetsuwei'en; and Suttles, "The Economic Life of the Coast Salish of Haro and Rosario Straits" on southern Vancouver Island Salish.
39. Barrett, "Relationship of Indian-caused Fires . . ."; Lewis, "Traditional Uses of Fire in Northern Alberta" and *A Time for Burning*.
40. Eugene Hunn, *Nch'i-Wana, "The Big River": Mid-Columbia Indians and Their Land* (Seattle, 1990), 130.
41. Evelyn Hamilton and H. Kanan Yearley, *Vegetation Development after Clearcutting and Site Preparation in the SBS Zone* (Victoria, 1988).
42. Don Minore, "The Wild Huckleberries of Oregon and Washington—a Dwindling Resource" (*USDA Forest Service Research Paper* No. 143, 1972, 7).
43. See Turner *et al.*, "Thompson Ethnobotany," 127 for the native citations; Minore, "The Wild Huckleberries of Oregon and Washington"; Melissa Connor and Kenneth Cannon, "Forest Fires as a Site Formation Process in the Rocky Mountains of Northwestern Wyoming" (*Archaeology in Montana* 32(2): 1–15, 1991), 5; and plant ecologist Joe Antos (personal communication, 1991), are the authorities on nutrient release and diminished competition after burning.
44. On the revival of traditional plant use, see *People of 'Ksan, Gathering what the Great Nature Provided: Food Traditions of the Gitksan* (Vancouver, 1982); Coqualeetza Education Training Centre, *Upper Sto:lo (Fraser Valley) Plant Gathering* (Sardis, BC, 1981); The People of Port Simpson and School District No. 52 (Prince Rupert), *Port Simpson Foods* (Prince Rupert, 1983); and Marc Matthew, *Foods of the Shuswap People* (Kamloops, 1986). On the nutritional value of traditional foods, see Kuhnlein and Turner, *Traditional Plant Foods of Canadian Indigenous Peoples*.
45. Parminter, "A Historical Review of Forest Fire Management in British Columbia," 3.

46. Connor and Cannon, "Forest Fires as a Site Formation Process," on the detrimental soil effects of intensive burning; Larry Pynn, "Pesticides Hurt Traditional Food, Lillooets Claim" (*The Vancouver Sun*, November 1, 1986, p. A8), and Glenn Bohn, "Haida Elder Tells Board of 2, 4-D Fear" (*The Vancouver Sun*, February 24, 1987, p. B8) on contemporary pesticide problems.
47. Plant ecologist Joe Antos, however, believes that annual burning would reduce or eliminate broom (personal communication, 1991).
48. Suttles, "The Economic Life of the Coast Salish of Haro and Rosario Straits," 59; and Turner *et al.*, "Thompson Ethnobotany," discuss the effects of domestic animals on root grounds in Straits Salish territories and Botanie Valley, respectively. See also White (this volume) and Norton, "The Association between Anthropogenic Prairies and Important Food Plants . . ." on similar effects on Whidbey Island and the western Washington prairies.
49. Jan Timbrook, John Johnson, and David Earle, "Vegetation Burning by the Chumash" (pp. 117–50 in Blackburn and Anderson, *Before the Wilderness* [orig. 1982]).
50. John Walstad, Steven Radosevich, and David Sandberg (eds.), *Natural and Prescribed Fire in Pacific Northwest Forests* (Corvallis, 1990) is a compendium of regional fire ecology research. Clinton Phillips, in "The Relevance of Past Indian Fires to Current Fire Management Programs" (pp. 87–92 in Lotan *et al.*, "Proceedings—Symposium and Workshop on Wilderness Fire"), discuss the differing fire systems of aboriginal and contemporary western peoples; Stephen Arno, in "Ecological Effects and Management Implications of Indian Fires" (pp. 81–87 in Lotan, *ibid.*), notes how fire differentially affects different areas; and Susan Little, in "Conserving Resources and Ameliorating Losses from Prescribed Burning" (pp. 283–96 in Walstad, Radosevich and Sandberg, *Natural and Prescribed Fire in Pacific Northwest Forests*), considers ways to deal with the problems associated with prescribed burning.