

Human influence on landscape pattern in the Pacific Region: impacts of burning by First Nations and early European settlers.

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In coastal British Columbia and adjacent Washington state, the presence of charcoal fragments in sediments indicates a fire history dating back to 11,000 years before the present (Rigg and Richardson 1938). While climatic fluctuations have occurred and the dominant vegetation on the landscape has shifted, fire has been present in varying amounts throughout this period. In the southern interior of B.C. a similar pattern exists, with charcoal being detectable back to at least 700 years before the present at a site near the Similkameen River and just north of the border (Cawker 1983).

Dendrochronological analysis of fire-scarred trees has shown that surface fires, which for the most part burn in the understorey of ponderosa pine and interior Douglas-fir forests, have been common for centuries. Fire scar dates from the 1600s to the early 1900s indicate that such fires burned at frequencies ranging from at least every 6 to at least every 14 years (Melrose 1923, Parminter 1978, Dorey 1979, Cartwright 1983, Low 1988).

Historic fires can be attributed to natural causes, primarily lightning, long-term aboriginal burning of both a purposeful and accidental nature and to similar fires started by non-natives during the initial post-contact and settlement eras.

The role of fire as an integral part of human culture has been examined by many researchers, primarily since the early part of this century. Man has used fire since prehistoric times for warmth, cooking, hunting, toolmaking, in cultural rites and ceremonies, and has also worshipped it (Hough 1926). In the context of landscape ecology we are primarily interested in the use of prescribed fire as a method of manipulating vegetative communities.

Anthropologist Omer Stewart (1956) considered such activities to be universal:

"In ancient times, as in recent ones, thick forests and dense jungles of brush offered very little use to the hunter or collector. On the contrary, narrow trails through tangled and heavy growth were dangerous because of the concealment provided to human, as well as animal, enemies. Whenever possible, aboriginals have set fire to jungles and thick woods in order to 'open them up'. Widely spaced trees and clear meadows and plains offer better and safer hunting."

That the First Nations of the Pacific Northwest carried out prescribed burning for a variety of purposes has long been recognized, as shown by this extract from botanist David Douglas' journal for 1826 concerning the Willamette region of Oregon (Douglas 1914):

"Most parts of the country burned; only on little patches in the valleys and on the flats near the low hills that verdure is to be seen. Some of the natives tell me it is done for the purpose of urging the deer to frequent certain parts, to feed, which they leave unburned, and of course they are easily killed. Others say that is it done in order that they might the better find wild honey and grasshoppers, which doth serve as articles of winter food."

George Gruell's examination of historical references to purposeful aboriginal burns in Oregon, Idaho, Montana, Wyoming, Nevada and Colorado between 1776 and 1900 revealed that the majority were at lower to middle elevations and carried out to promote healthy grasslands and suppress shrub and tree encroachment. Fires in upper elevation Douglas-fir, lodgepole pine and spruce - subalpine fir forests were smaller, often accidental, and limited to camp areas and travel routes (Gruell 1985).

The work of Stephen Barrett and Steve Arno (Barrett 1980, Barrett and Arno 1982) with the Salish and Kootenai tribes in Montana and Idaho confirmed that native prescribed burning was carried out in ponderosa pine, Douglas-fir and western larch forests mainly to:

- improve hunting prospects by promoting desirable grasses and shrubs and facilitate the stalking or driving of game
- enhance production of certain foods (mostly berry bushes), as well as special-purpose and medicinal plants
- improve horse grazing areas
- clear campsites as a means of reducing the fire hazard and removing the hiding cover which could be used by enemy tribes during an attack
- maintain open forest stands to reduce the threat of wildfire and facilitate travel and
- to communicate with other groups by setting larger fires, often at higher elevations.

The fires used to manipulate vegetation were most often set in low elevation forests and grasslands, on an informal rather than systematic basis and sometimes covered large areas. They were ignited in the fall or spring when climate and fuel conditions would generally ensure low intensity fires. Some fires took place during the summer, but they were usually accidental.

By using a paired stand approach and dating fire scars it was found that forests in areas heavily used by natives experienced significantly more surface fires than ecologically-similar stands in more remote areas where lightning was the primary ignition source (Barrett and Arno 1982). The time period involved was prior to the settlement era, which began in 1860. Although no such studies have been carried out in southern British Columbia one could expect the same result there if the cultural and ecological factors are sufficiently similar.

Henry Lewis studied native burning practices in the boreal forest of northern Alberta and found that there were a number of reasons for the use of fire in those ecosystems, including (Lewis 1977, Lewis 1982):

- maintenance of meadows and grasslands which without periodic fire would be taken over by shrubs and trees. These meadows were either used as horse pasture or were favoured by game species.
- reduction of fuel loadings to enable easier travel and decrease the fire hazard
- improvement of the landscape's aesthetic values
- enhancement of habitat for fur-bearers along riparian zones
- removal of forest cover and creation of meadows
- killing trembling aspen and willow to create a supply of firewood
- maintenance of berry patches, especially wild raspberries, blueberries and strawberries
- cleaning up deadfalls, camp areas and maintaining trails

Once again, no studies have been carried out regarding aboriginal burning by the native peoples of northern British Columbia, but similar results to Lewis' could be expected given the same circumstances. The Southern Tutchone of the southeastern Yukon are known to have burned to enhance wildlife habitat and enable the harvest of *Hedysarum alpinum* roots by thawing the ground early in the spring (Hawkes 1983). If prescribed fire was used by the natives of northern Alberta and the southern Yukon it seems safe to assume that it was also used in northern B.C.

In 1961, Chief Game Biologist James Hatter called the natives of British Columbia "the province's first game managers" in view of their use of prescribed fire to affect wildlife habitat (Hatter 1961):

"At some point in their history the Indians learned that hunting grounds could be created by the use of fire. The burned areas, rich in second growth, attracted deer and so provided better hunting. The practice of burning to benefit not only deer, but also moose, continued for many years after the advent of the white man...."

Comprehensive and detailed studies of aboriginal burning in British Columbia have been carried out and reported upon only recently. Nancy Turner of the University of Victoria and Leslie Johnson Gottesfeld of the University of Alberta have been the principal investigators. By combining their geographical areas of interest, the prescribed burning practices of some of the native groups living in the southern half of the province and the northwest portion as far as the upper Skeena River can be summarized.

The primary focus of these studies has been prescribed burning for the management of food plants but it is recognized that benefits to wildlife habitat, domestic range, medicinal plants and others used in traditional technologies occur. Fire was also used to reduce fuel loadings around habitations. Burning was done at specific times of the year, under certain weather conditions and required special knowledge of fire behaviour and vegetation response. Often the burn was carried out just before a rain so as to limit its spread.

At least 18 species of plants, including 12 fruiting shrubs and 6 plants with edible roots have been consistently identified by First Nations peoples as being purposefully encouraged by traditional burning practices. The major target plants were berry producers such as *Vaccinium* and *Rubus* species, nodding wild onion, several lilies, salal and soapberry. Burning for berry production also took place on the west coast of Vancouver Island and the Queen Charlotte Islands.

In some cases individual plants, such as hazelnut, would be burned but primarily specific patches were treated with fire on a cycle of perhaps every four or five years. Rotational burning kept a larger landscape area in constant production. The favourite locations for prescribed burning might have been close to the village or seasonal camp or be far enough away to require a special trip to harvest the current year's crop and perhaps carry out a prescribed burn if it was called for (Gottesfeld 1994). Some of these patches were located at higher elevations on nearby mountains.

A special case was that of the edible blue camas whose bulbs provided a source of carbohydrates for the peoples of southern Vancouver Island and nearby Washington state. Growing in prairies and in the Garry oak woodlands this plant was harvested in the summer after flowering and then the area was burned over (Turner 1991).

The fire suppression policy of the B.C. Forest Service put a stop to most traditional landscape burning by the early 1930s. However, aboriginal burning is still carried out in B.C. on a much-reduced scale since reserves are federal lands and not subject to provincial regulations (Gottesfeld 1994). Yet, for the most part the gathering of traditional fire-enhanced food plants by First Nations peoples is limited to areas affected by wildfire or logging. In the words of one of Nancy Turner's contacts, Baptiste Ritchie, recorded in 1969 (Turner 1991):

"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 food of our earliest forefathers. ...Now they have all disappeared because the hills grew weedy and no-one seems to tend them, no-one clears them as our forefathers did so thoroughly."

While local aboriginal prescribed burning is well-documented, the fact remains that their accidental fires affected larger areas on the landscape. Some of the early travelers in the boreal forest remarked that the natives were careless with fire while others observed just the opposite. Nevertheless, there is ample evidence of wildfires having been started by unextinguished native campfires. Omer Stewart was of the opinion that Amerindians in general did not put out their campfires so as to have another source of fire should their slow match go out and in addition they recognized that no real harm would result from the burning of flammable vegetation (Stewart 1963).

The use of fire as a means of signaling parties of natives was commonplace in Alaska and the Yukon. Handfuls of moss would be set alight or individual trees would be torched in order to attract the attention of other people in the vicinity or to convey specific messages. There is evidence in the journals of many of the first white men to visit the region that these signal fires often caused large forest fires but this did not greatly disturb the native peoples, given the vastness of the region and their small population (Lutz 1959).

The accounts of early travelers provide some insight into the location and timing of forest fires in B.C., especially from the late 1800s into the 1900s. An example is that of Joseph Mannion who traveled on the trail from Bella Coola to Fort Alexander in June of 1862 and made note of forest fires (Mannion n.d.):

"Looking around, we saw no sign of blaze or trail; nothing but devastation or smoke... So, after twenty-four hours we dragged ourselves out of this inferno."

Given the size of British Columbia and its limited population in the mid-1800s, there is no doubt that the majority of forest fires passed almost unnoticed. With the province's economy being largely based on fur and gold rather than timber, which was seen to be inexhaustible, little concern was expressed regarding forest fires.

Indeed, they were judged to help rather than hinder the traveler, if the comments of Spencer Palmer of the Royal Engineers are any indication (Palmer as cited by Hatter, 1961):

“Fallen trees, stumps, roots and mud-holes everywhere encumber the path, and, though the burnt forests permit, in summer, the constant access of the sunshine and dry currents of air, the tenacity of the soil is such that it is late in the season before the trail becomes dry enough to be fairly passable for traffic. Where the forest is green -- the case, happily, for five miles only between Beaver Lake and the descent to Quesnel River -- even these wholesome influences are excluded and, in the driest part of the autumn, the trail is but a slippery slough.... There are few travellers by this route who do not remember with disgust the abominations of the ‘Green Timber’ and of the mud-holes in the swales beyond.”

In cases when weather conditions and/or man's activities led to many forest fires over a larger area, the record of their coverage is more complete. For example, in an account written in 1906, William Shannon told of a drought that lasted from April to November of 1868, covering most of the west coast of North America. Many fires broke out from Oregon to Alaska and forests in the lower Fraser Valley and on the Gulf Islands burned. The inhabitants of the coast reportedly never saw the sun for a period of two months and water transport came to a halt (Shannon 1906).

Prospectors, lumbermen and careless campers were blamed for many of these fires and Shannon recommended that logging slash be disposed of each fall to reduce the fire hazard. It was estimated that 1.5 million hectares of timber worth a minimum of \$18 million had been destroyed in British Columbia in the years leading up to 1906.

Written near the end of his term as British Columbia's first Chief Forester, H.R. MacMillan had this to say about the fire history of B.C. up until 1915 (MacMillan 1915):

“Forest fires began with the heroes of the Northwestern and the Hudson's Bay Company, who burned their way through Tete Jaune, down the Canoe, the Columbia, the Thompson, and through Cassiar, Cariboo, and Atlin; again in 1860 the forests blazed, lighting the way of the placer miners up the Fraser, the Kootenay, and a hundred other streams. The prospectors who uncovered the mines of the Boundary District wrecked the forests of the region. During the first sixty years every valley has felt the effects of fire; in this period the Province of British Columbia has lost by fire about seven hundred billion feet of merchantable timber, more than now exists in the whole of Canada, enough to supply the whole Canadian domestic and export demand for over one hundred years. There is no record in history of such a loss as the fire loss of British Columbia during the past two generations.”

Even though the indigenous peoples of North America were sometimes careless or unthinking in their use of fire and were the cause of forest fires, their impact upon the forest environment was small in comparison with the activities of the white man. Harold Lutz (1959) was of the opinion that carelessness with fire was the rule rather than the exception and that the

"...white man enjoys the unenviable reputation of having been a major cause of forest fires in the North. No single class of men can be singled out as being primarily responsible for this reputation, nearly all walks of life are represented. ...These include fur traders, missionaries, surveyors, explorers, prospectors etc. and, nearer to civilization, railway builders, common-road makers, lumbermen, bush-rangers, and settlers."

There are many accounts of the white man's wildfires which resulted from campfires escaping as well as from firing the forest to create a supply of dry fuelwood, drive off mosquitoes and other insect pests, signal other parties, drive moose in the direction of hunters and to promote the growth of grass for use as forage for domestic stock. Fire was routinely used in mining operations and for clearing land, with mixed results.

Nor was carelessness with fire necessarily limited to the ordinary man as two early explorers of the Canadian Rocky Mountains, geologist and M.D. Sir James Hector and his companion Robert Sutherland found out. Both were pioneer travellers, Hector having discovered and named the Kicking Horse Pass in memory of a personal encounter with an unruly pack-horse. On September 13, 1858 Hector and Sutherland returned to their camp after making the second alpine ascent ever recorded in the Rockies, above the Lyell icefield, but

"Alas...the fire they had left at their campsite of two days before had gotten away into the timber and not only was their sleep disturbed by the glare, but their exit from the valley the next day was made more difficult." (Putnam 1978).

The apparent increase in the number of forest fires brought about by the coming of the white man probably had some influence on the native peoples. The pioneer geologist George Mercer Dawson remarked upon this in 1885 (Dawson 1886):

"It is often stated that the Indians are responsible for this (forest) destruction, and it is doubtless true that since they find the whole region in process of being ravaged by fires which they can not prevent, they have become more careless than before. They would not, however, willingly destroy their own hunting grounds, and the best evidence of their care is found in the fact that, while along the North Kootanie Pass (which so far has been scarcely used, except by the Indians,) the woods are generally unburnt, those in the vicinity of the parallel Crow Nest Pass, which has now been for a few years a route used by whites, are entirely destroyed and represented only by bleaching or blackened trunks."

If any single group of men can be considered to be responsible for much of this forest destruction, the prospector appears to be the prime candidate. Many sources credit prospectors with having set fire to the forest in order to expose the rock beneath and thus make the search for ore less strenuous. In spite of the number of times that this activity has been mentioned in the literature, there is very little concrete evidence to suggest that the practice of firing the forest to expose mineral deposits was widely carried out in British Columbia.

Since the majority of the gold was placer gold found in old streambeds and valley bottoms it is unlikely that burning off the forest cover on the hillsides would be of much benefit. Of course there were and are other minerals and even gold-bearing quartz veins which could potentially be more easily located following a forest fire of the proper nature. This aspect most often is associated with the Kootenay area of southeastern B.C. Drewry, as reported by A.O. Wheeler in his treatise on the Selkirk Range, said in 1894:

"I believe the great body of prospectors and miners are careful about setting out fire, but undoubtedly there are some who are utterly reckless, and even wantonly burn over tracts of country difficult of access, that they may more readily prosecute the search for minerals. So great an area has already been denuded of timber as to warrant the employment of drastic measures for the preservation of what is left...." (Wheeler 1905).

In a discussion of conditions in the Lardeau district of the Kootenays, geologist R.B. Brock (1904) noted that

"Fires did a great deal of damage to the forests during the summer and also to some of the mines. Some of the fires may be unavoidable in a dry season but it is certain that if the public realized the value of the forests, steps would be taken for their preservation and fires would be much less widespread and frequent. A large number of the fires noticed this summer started where there was a desire to have the ground cleared for ranching or prospecting."

In response to an ever-blackening landscape, a fire prevention law, the Bush Fire Act, was passed by the Legislative Assembly of British Columbia on March 2, 1874 (SBC 1874). This act provided for fines of up to \$100 or three months imprisonment where people were found guilty of allowing unextinguished fires in forested areas to escape and damage private or Crown land. Strangely enough, a third clause stated that the law would not be enforced unless a petition to that effect was signed by at least two-thirds of the settlers of a district and presented to the Lieutenant-Governor in Council.

That provision was repealed in April of 1887 (SBC 1887) and the act given province-wide application, perhaps in response to the destruction by fire of the fledgling city of Vancouver on June 13, 1886. The cause in that case was more than a dozen land-clearing fires smouldering on the outskirts of downtown which sprang to life on a sudden and strong west wind. In that same year the transcontinental railroad reached the west

coast and the associated dramatic increase in the number of fires caused by locomotives prompted amendments to the Bush Fire Act. These required fireboxes and smokestacks to have "...all the most approved and efficient means used to prevent the escape of fire."

In recognition of the fact that the existing legislation was not stringent enough to protect the forests from destruction by fire, it was strengthened in 1896 (RSBC 1897). It was now illegal to employ fire "in or near the woods" between May 1 and October 1 except for clearing land, cooking, obtaining warmth or for some industrial purpose. Where land clearing by fire was involved, it was necessary to fell the trees upon and build a fireguard around the area to be burned as well as to watch over the fire while it was burning and prevent its unwanted spread. These provisions certainly indicate that inadequate care was being taken with land clearing, with escaped fires and damaged forests resulting.

Regardless of its contents, the Bush Fire Act had a rather limited effect since there was no organization dedicated to enforcing it. The original legislation of 1874 predated the fire warden service within the Department of Lands by 31 years and the creation of the B.C. Forest Service by 38 years. Fire wardens were on the job as of 1905 but fire fighting technology was primitive and the patrol areas extensive such that fire suppression effectiveness was limited. It was more of a public relations exercise but eventually an effective one.

Fire was used by settlers to clear forest land and permit agricultural development as well as to dispose of hazardous slash on logging operations, all with the encouragement of the provincial Department of Lands. Nevertheless, escaped fires were common, and between 1910 and 1916 the majority of wildfires fought resulted from campers, railways and land clearing fires. Two major concerns of foresters at this time were the prevention of wildfires on areas regenerating naturally to new forest and the use of appropriate methods to reduce fires caused by railway and logging locomotives.

The experiences of the late 1800s and early 1900s were summed up thusly in 1915 (Whitford and Craig 1918):

"The prevailing attitude of the public, and particularly of the lumbermen, prospectors and settlers, whose lives were spent in the forests, was that fire as inevitable and frequently more beneficial than otherwise. The popular belief that the supply of timber was inexhaustible was expressed in the cheapness of stumpage. Unless his equipment was destroyed, the lumberman considered the damage occasioned by forest fires as negligible. The prospector welcomed fire, since it laid bare the rocks in which he sought his fortune. To the settler, the forest only encumbered the land and was an impediment to the tillage."

While prescribed burning by native peoples was likely reasonably constant and sometimes quite local, the impact of non-natives and their use of fire was more abrupt and widespread. The natives were reportedly adept at prescribed burning and in doing so they used low intensity fires to create and maintain fine-scaled mosaics of preferred plant species. In addition, their role in affecting the landscape as a result of carelessness leading to large-scale wildfires cannot be overlooked.

Current theories suggest that pre-Columbian aboriginal populations in North America were much higher than previously thought (Denevan 1992, Kay *et al.* 1994). Introduced diseases rapidly decimated native populations beginning in about 1600 so the western landscapes encountered by the first European explorers had been supporting a much-reduced native population for nearly two hundred years. If this scenario also applies to B.C. there are certainly implications regarding the long-term historical role that aboriginal fires, prescribed and accidental, played in shaping the landscape.

Although the accuracy of some accounts may be questioned and coverage is somewhat sporadic, the impacts of non-natives on the B.C. landscape have been substantial. Fire followed exploration and resource development to all corners of the province, sometimes with significant consequences at the landscape scale. The legacy of that experience is reflected in our current ability to aggressively suppress wildfires but also in our skill at prescribed burning. Ironically, in some locales we have probably taken over the historic role of aboriginal burning without realizing it.

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