

Increasing our Understanding of Indigenous Burning Practices using Historical Photographs

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Introduction

Identifying historic disturbance patterns is a critical prerequisite before undertaking any ecological restoration or for that matter, planning and implementation for landscape or ecological management. Of equal or greater importance is the need to understand how those disturbance patterns came into being and were maintained. Indigenous fire has been recognized as a principle tool for a variety of resource uses and benefits. While the scale of use has been debated, there is increasing consensus that cultural fire was used to shape and maintain ecosystems.

In the latter stages of ecological succession, the historical use of frequent fire is onerous to ascertain. Low intensity frequent fire patterns leave a lighter footprint on the landscape and are lost through successive vegetative change or expansion of coniferous forests as a result of fire exclusion. Regardless, there are ecological indicators that can be found through careful assessment and interpretation

Until recently, historic and repeat photographs often provided some insight but usually consisted of a single image or a few images. A criticism of their use is that they may not represent the landscape and as such have limited usefulness. That argument is diminished with the use of the Mountain Legacy Project collections as numerous photos were taken systematically.

In the late 19th century, early Canadian surveyors took systematic glass plate photographs as they surveyed the mountain regions of western Canada. Through the Mountain Legacy Project (MLP), these collections are being identified, digitized, and retaken in an effort to explore change in Canada's Mountain environments. MLP researchers seek to re-photograph these images as accurately as possible and create resulting image pairs available for further investigation. With careful interpretation, these collections could contribute to a deeper understanding of the patterns and scale of Indigenous fire-use prior to European settlement, as well as provide a baseline for ecosystem management.

Background: Humanity and the use of fire

At the time of this writing, the earliest known use of fire by hominids is estimated to have occurred at least 1.5 million years ago. Fire, as we know it, is not just unique to our planet, but also our solar system. Only Earth has the correct mix of fuel, oxygen, and ignition in order for fire to occur. Further to that, Homo Sapiens are the only species on the planet with the ability to kindle and use fire. Fire is a fundamental key to the human existence. It stirs our dreams, haunts our souls, and is the reason for our existence.

Fire is the forge that shaped humanity and undoubtedly set the course for human evolution. Without fire, early hominids would not have evolved into modern man, or developed the capacity for languages. That ability to kindle and use fire, is one of the defining traits that separates humanity from the rest of the species on the planet.

With the passage of time, the significance of fire, its adaptation and use by humans became much more than just warmth, cooking, and protection from predators. Humans learned to use fire to change and shape the surrounding ecosystems to suit their needs. Denevan (1992) describes the conversion of landscapes through the use of fire:

The most significant type of environmental change brought about by Pre-Columbian human activity was the modification of vegetation. ... Anthropogenic fires, for which there is ample documentation, tended to be more frequent but weaker, with a different seasonality than natural fires, and thus had a different type of influence on vegetation. The result of clearing and burning was, in many regions, the conversion of forest to grassland, savanna, scrub, open woodland, and forest with grassy openings.

The constant use of fire for countless generations resulted in a wealth of knowledge and understanding of fire response. This knowledge was passed on through practical application and oral tradition. Within nomadic hunter-gatherer societies around the world, concepts related to the use of fire such as when to burn, what to burn, reasons for burning, etc., all became embedded within daily activities with barely a thought of its use or value. As agrarian cultures developed, they still used fire, but lost the understanding of many of the ecological responses to fire.

North America

With the European discovery and colonization of North America, two mythological patterns developed and have persisted from early European settlement onwards.

The first was that the Indigenous peoples were thought to be a primitive, savage, stone aged people that did little more than roam the wilderness following game for subsistence and that they were a benign people treading lightly on the land. This was augmented with the romantic era notion of the “noble savage”, a primitive wild man who had not been corrupted by civilization and depicted humanity’s innate goodness. This stock character can be found from James Fenimore Coopers’ book “The Last of the Mohicans” to James Cameron's movie “Avatar”.

The second myth that continues to endure is that North America was a pristine wilderness, a New Eden, a paradise lost, etc. The landscapes “discovered” by Europeans were “natural” and “wilderness” abounded. The mythology is that these landscapes had been sustained indefinitely without human intervention for millennia. This neither acknowledges or gives credence to the management practices applied by Indigenous peoples. Around the world, the failure to recognize the application of Indigenous peoples traditional knowledge of land management has resulted in a convoluted understanding of ecological management. In many cases, the current application of land management policies may be bordering on negligence.

Indigenous peoples were resource managers with a very deep understanding of landscape and ecological management. They developed a very sophisticated understanding of the use of fire,

first and second order fire effects, its benefits, and applied it extensively. Through the use of fire, they created and maintained the vast biodiversity of these landscapes that the European explorers claim to have discovered.

With the expansion of European settlement across North America, the use of fire for ecological maintenance all but stopped. Many cultural practices including the use of fire were prohibited. Early anthropologists failed to recognize the extent and use of fire, as well as its cultural roots within Indigenous society. The ecological impacts of the deliberate anthropogenic use of fire and our acknowledgement of that use as an agent of ecological change and maintenance has been greatly understated.

A greater understanding of the complexity of Indigenous cultural knowledge of the use of fire is now being acknowledged. Recent works by Stewart, Lewis, Anderson, Ferguson, Pyne, and others, have been changing our perspectives and understanding of Indigenous practices and their impacts on shaping the landscape.

The Mountain Legacy Project

While there are many references to the use of fire (i.e., recent fires, etc.) in journals of explorers, fur traders, and settlers, the extent of the use of fire as a tool for ecological change and maintenance still has limited acceptance. In part because of bias, and that the subject is not easily substantiated. Williams (2003, p.1) noted that the, “Evidence for the purposeful use of fire by American Indians (also termed Native Americans, Indigenous People, and First Nations/People) in many ecosystems has been easy to document but difficult to validate.”

Documenting Indigenous burning patterns through multiple lines of evidence can help substantiate these practises. Historical photographs are a widespread source of empirical data but it can be difficult to determine landscape-scale patterns in random or non-systematic photographs. Generally, with random photographs, the intent of the photo was usually to capture something different from what is be analyzed (Hindley, 1996). Having said that, not all historical photographs are random. Canadian surveyors refined the “Photo-Topographic Survey System” while surveying the mountain regions of Canada. In addition to standard surveying equipment, surveyors brought glass plate cameras and used them to capture a series of panoramas from each of their camera stations. The photographs were used with a focal plane technique, in conjunction with the collected survey data, to create the first topographic maps. Using this system from early 1860 to 1955, surveyors captured over 140,000 systematic landscape photographs from across Western Canada. Surveyors captured entire regions in one season.

The Mountain Legacy Project, through the University of Victoria School of Environmental Studies, is leading research with the various Canadian survey collections. Project members utilize archival research, digitization of the glass plates, repeat photography, as well as scientific, historical, and cultural analyses of photograph pairs to assess landscape change in the Canadian Rocky Mountains over the last century. There is considerable evidence within these collections that much of the landscape change relates more to fire exclusion (the decline of Indigenous use of fire) rather than modern fire suppression as is often expounded.

Strict scientific standards are maintained for repeating the historic imagery. The repeat camera is located within meters of the original camera location. This may result in moving the camera and resetting several times as the original camera was moved to obtain the best view for that specific image. Care is taken in selecting camera/lens combinations to ensure that they are comparable to the original camera field of view, have appropriate resolution, and compatibility. Detailed field notes are kept of each image taken including weather conditions, GPS location, site description, access, etc. These are used as reference during follow up research as well as for future return trips to the same station for “third views”. Third views are further repeats of the same station over time or after major disturbances such as fire. This provides opportunities for tracking temporal ecological or landscape change.

The Mountain Legacy photographs provide an excellent tool for research in a variety of disciplines. They were taken in a very systematic fashion, are well documented, have exceptional resolution, and cover entire landscapes in the same season. Evidence of Indigenous fire at both the localized and landscape level becomes apparent when comparing the historic images to the repeat images taken. Often both pre-European contact disturbance patterns as well as early European incursions can also be identified in the same image.

Comparative Image Analysis

Evidence of Indigenous burning patterns of localized sites, travel corridors, and broader landscape burning are evident on many of the MLP survey images. Indigenous burning was generally done outside of the more severe burning conditions found during mid-summer or the peak of “fire season” (Lewis and Ferguson, 1988). This practice generally resulted in lower intensity fires with less severity impacts. Frequent fire intervals kept the forest in early seral stages providing better habitat for key species that supported Indigenous peoples.

Open grass lands in forested areas, open grown stands, lack of burnt stems, dead and down, low shrub growth, etc., are all indicators of the use of frequent fire. These sites can be validated with comparative analysis of repeat imagery. Further substantiation is possible through fire regime analysis. In addition, photo analysis and interpretation can be supported through references from other disciplines as well as historical documentation. Differentiation of fire maintained sites from other existing openings is crucial. Vegetation growth can be limited site specifically due to xeric or hydric conditions, soils, elevation, aspect, etc. This may look similar to frequent fire interval sites on the historic images. Most often, once the frequent disturbance regime stopped, those areas in which Indigenous burning had historically occurred have grown back in with forest cover. The following photographs illustrate a simple comparative analysis.

In Figure 1, few burnt sticks can be seen on the slopes. This is an indicator of a more frequent fire return interval, trees do not have a chance to establish and mature in shorter fire return intervals. The south facing xeric slopes on the left of the image do not have the moisture regime to support forest or even shrub growth. On the upper slopes to the right, the north to north east aspect have older coniferous stands that remained cooler and damper in the spring when most indigenous burning would have occurred. In the foreground and along the slopes, younger forest growth is starting to establish has most indigenous burning was stopped around the signing of the

treaties almost 20 years earlier. The use of frequent fire renewed species that produced excellent winter forage that is a necessity for both Elk and Rocky Mountain sheep.



Figure 1. Highwood Gap, Wheeler 1897

In Figure 2, heavy forest cover has filled most of the open spaces across the image. The exceptions being the more xeric slopes. Two major fire events (1910, 1936) occurred in the Highwood area. Much of the young regen visible in Figure 1 did not burn as is evident by the mature conifer stand in the centre of the image. The older conifer stands did burn and the stands that established post fire are evident. The heavier forest growth creates better hiding cover for large predators. Forest cover fill in has resulted in a decline of Rough Fescue, a valued winter forage species. Both factors are impacting elk and mountain sheep populations.

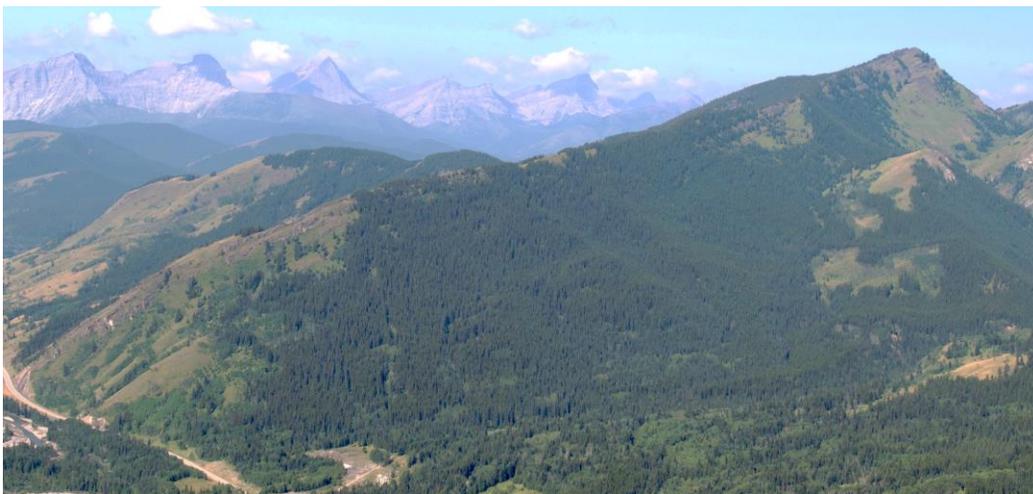


Figure 2. Highwood Gap, MLP 2014

The effects of fire exclusion can be readily seen across the landscapes of North America today. Some of these would include the homogenization of forest cover as forests age without disturbance, the loss of biodiversity, loss of critical habitat, more severe impacts from larger

wildfires, increased hiding cover for carnivores, large scale insect outbreaks, heavier fuel loads, etc.

Summary

Systematic photograph collections created by early Canadian Surveyors provide a unique opportunity for research in a number of disciplines. Repeat photography of the historic images completed to a scientific standard enhances the comparative analysis of those landscapes. The use of fire by Indigenous peoples is clearly evident in numerous surveys across the Mountain Regions of Western Canada. Contrary to colonial views, Indigenous peoples, had a keen understanding of fire response and fire effects. This enabled them to apply frequent fire on the landscape with specific objectives. They applied their knowledge of first and second order fire effects to ensure that their goals were achieved.

This perspective necessitates a significant change in approach to land management policies. The current practices of fire exclusion and the historic Indigenous peoples use of fire must be further explored and researched. Defining a baseline for land management decisions related to habitat, biodiversity, forests, and fauna is a necessity. Incorporating historic disturbances including Indigenous burning practices is essential. Over time, there is a strong likelihood that many threatened or endangered species adapted to anthropogenic fire, and as a result fire exclusion has a negative impact on those species. Historic disturbance patterns provide information that can be used to successfully manage the landscape.

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