

“Everything We Do, It's Cedar”: First Nation and Ecologically-Based Forester Land Management Philosophies in Coastal British Columbia

Authors: Zahn, Marie J., Palmer, Matthew I., and Turner, Nancy J.

Source: Journal of Ethnobiology, 38(3) : 314-332

Published By: Society of Ethnobiology

URL: <https://doi.org/10.2993/0278-0771-38.2.314>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

“Everything We Do, It’s Cedar”: First Nation and Ecologically-Based Forester Land Management Philosophies in Coastal British Columbia

Marie J. Zahn^{1*}, Matthew I. Palmer¹, and Nancy J. Turner²

Abstract. People’s values and attitudes regarding the natural world determine the level of care with which they approach the use of natural resources. We studied how human relationships with nature influence people’s actions, using western redcedar (*Thuja plicata*), a major forest tree of northwestern North America, as a study system. Semi-structured interviews were conducted with eleven Northwest Coast Indigenous plant experts and eleven ecologists and foresters of mixed European descent with an ecologically-oriented perspective in coastal British Columbia. The transcripts were analyzed using NVivo qualitative data analysis software for emerging themes. Results demonstrate more commonalities than differences between the two groups; they both expressed a personal—often spiritual—connection with nature and both value long-term and interdisciplinary management strategies. First Nation individuals have a unique spiritual relationship with western redcedar that is linked to both everyday and ceremonial practices, while ecologically-based foresters and ecologists have personal and academic relationships broadly with nature. They have similar environmental concerns of damage from industrial forestry practices, particularly the loss of old growth forests, and the negative effects of climate change. Our results support the assertion that First Nation perspectives are equally scholarly as the foresters’ perspectives are reverential, and people from varied cultural backgrounds can care for the environment in similar ways. Moreover, an interdisciplinary approach that unifies science with Indigenous teachings can encourage a new moral framework for forestry management that values resources beyond commodification.

Keywords: First Nation, Indigenous knowledge, western redcedar, ecosystem-based management, forestry

Introduction

The temperate rainforests of British Columbia (BC) harbor a rich and complex history, having been shaped for thousands of years not only by their ecological and evolutionary processes, but also by the stewardship from resident First Nation peoples (Anderson 2005; Cuerrier et al. 2015; Turner and Spalding 2013). Within the past century, the preservation of the extent, structure, and composition of these forests has been threatened by a number of factors (Hansen et al. 2013). Major threats to BC forests include clear-cut logging, fragmentation, high pest pressure

(e.g., mountain pine beetle [*Dendroctonus ponderosae*] outbreak), and climate change (Kurz et al. 2008; Metsaranta et al. 2011; Murdock et al. 2013). Given these risks, new management strategies are necessary to both maintain sustainable forest ecosystems and extract sufficient resources to support local human livelihoods (Menzies 2006; Nitschke and Innes 2008).

Attitudes and values regarding nature shape the perspectives that ultimately determine forest management strategies (Allen et al. 2009; Hammond 1991, 2009; Marston 2015; Mehta and Heinen 2001). Human relationships with nature may

¹ Department of Ecology, Evolution and Environmental Biology, Columbia University, 10th Floor Schermerhorn Extension, 1200 Amsterdam Avenue, New York, NY 10027.

² School of Environmental Studies, University of Victoria, British Columbia, Canada.

*Corresponding author (m.zahn@columbia.edu).

reflect spiritual, scientific, functional, and/or economic perspectives, while related practices may be ceremonial, medicinal, recreational, industrial, or utilitarian. In this paper, we investigate how people's values and attitudes concerning the natural world determine how they approach using natural resources, using western redcedar (*Thuja plicata*; Cupressaceae), a major tree of northwestern North American temperate rainforests, as a case study.

BC comprises 55 million hectares of forested land, approximately 95% of which is publically owned and managed by the provincially mandated Ministry of Forests, Lands, and Natural Resource Operations (formerly two agencies: Ministry of Forests, Mines, and Lands and Ministry of Natural Resource Operations), herein simply referred to as the BC Ministry of Forests (BC Ministry of Forests 2015, 2016). Since the 1950s, timber tenures have been issued in the form of tree farm licenses and volume-based forest licenses to forest management stakeholders, including small and large timber companies (BC Ministry of Forests 2010). Historically, forest management in BC is largely driven by the economic interests of forest companies and not necessarily by the need to maintain sustainable ecosystems for their own sake (Burda et al. 1998; Diver 2016). There has been a tenfold increase in the total volume of timber harvest (6.7 to 68.5 million m³) between 1912 and 2015, predominantly starting in the 1950s with provincial crown land production¹ (BC Ministry of Forests 2010). More recently there have been significant initiatives in Ecosystem-Based Management (EBM) in Clayoquot Sound (Clayoquot Scientific Panel 1995) and the area known as the Great Bear Rainforest (Central and North Coast of BC and Haida Gwaii) (Affolderbach et al. 2012; McGee et al. 2010; Price et al. 2009). These are part of a broader effort to integrate conservation principles and ecosystem-based approaches into large-scale forest manage-

ment contexts (Fedrowitz et al. 2014; Gustafsson et al. 2012; Lindenmayer et al. 2012).

A common conifer in BC forests, western redcedar is a tree that carries high importance both culturally and commercially. It is a large evergreen tree with a range extending from Alaska to California along the coast and eastwards to the Rocky Mountains (Figure 1) (NRC 2011; US Forest Service 2004). In commercial forestry in the Pacific Northwest Coast, western redcedar is most commonly harvested by clear-cutting where most or all trees in a given area are logged. Sometimes, damaged logs and non-merchantable wood are pushed up into piles and burned. Nursery-grown seedlings of designated species are often planted within a year after logging (BC Ministry of Forests 2016). Cedar wood is commercially valuable because it contains an oil called *thujaplicin* that makes it rot-resistant, so it is a source of wood for exterior uses such as power poles, fences, siding, shingles, and shakes (BC Ministry of Forests 2010; Pojar and MacKinnon 1994; Wilms and Turner 2014).

First Nation and Ecosystem-Based Forestry Perspectives

Ethnobotanical applications of redcedar have been thoroughly documented, most notably by Stewart (1995), and exhibit a broad range of uses that demonstrate its vast history and cultural importance for First Nations in coastal BC (Supplementary Figure 1; Supplementary Table 1). All parts of the tree have been used for materials and objects (e.g., dugout canoes, totem poles, house boards and posts, boxes, woven baskets and mats, clothing, rope, roofing, and tinder), as well as for medicinal and spiritual applications (e.g., decoction for treatment of internal pains, colds, and heart trouble [Garibaldi and Turner 2004; Stewart 1995; Turner 2005; Turner and Hebda 2012; Turner and Turner 2004; Wilms and Turner 2014]).

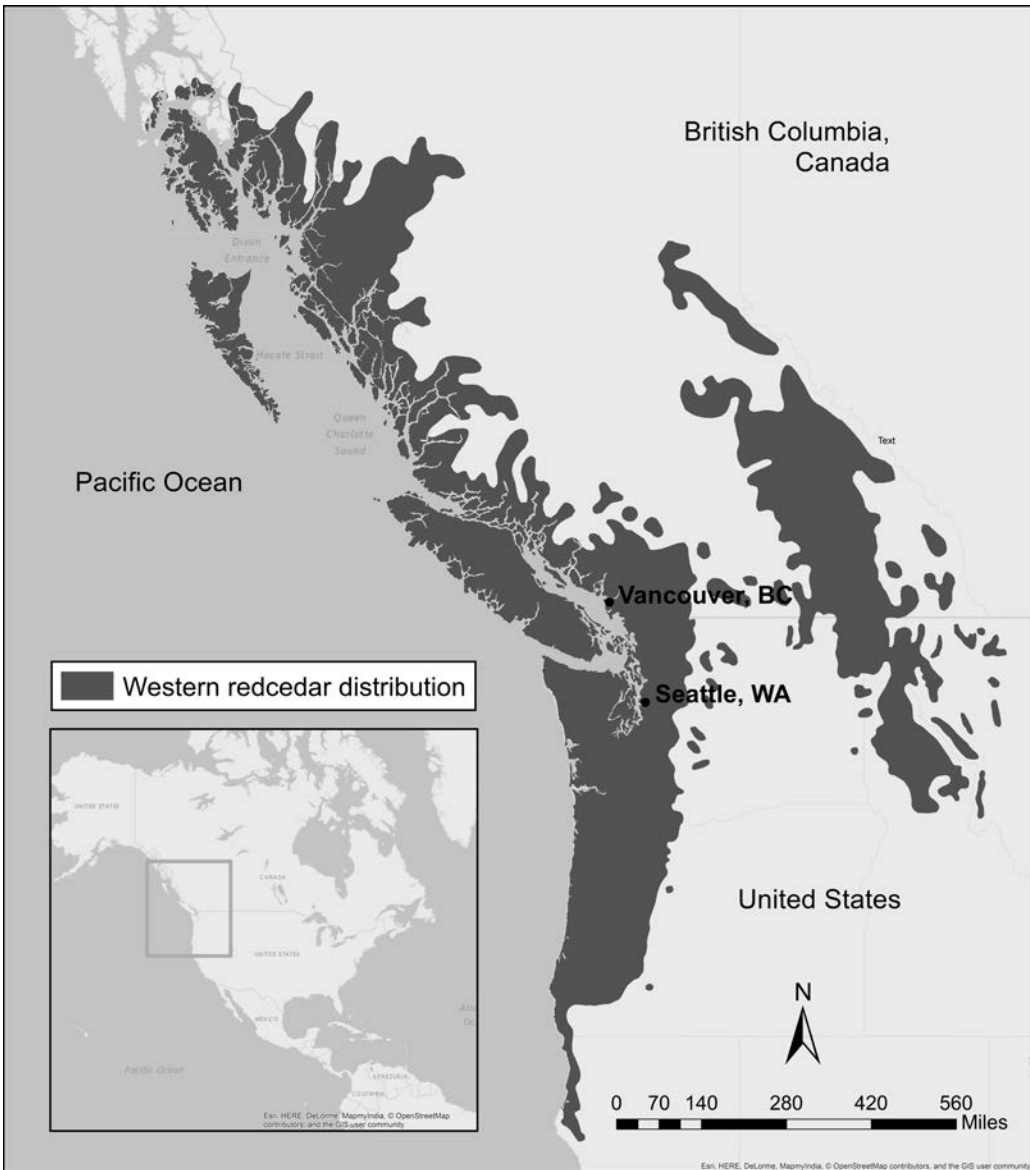


Figure 1. Distribution map of western redcedar in the Pacific Northwest Coast of North America (Distribution data from Little 1971).

Both historically and today, First Nations' close relationships with nature are foundational to how they interact with their environments (Kimmerer 2013; Salmón 2000; Turner 2005, 2008). There is a commonality among Indigenous Peoples in the world where they generally see themselves to be inextricably connected

to their natural environments, a kinship that bears responsibility in its management and protection (Atleo 2004; Berkes et al. 2000; Gadgil et al. 1993; Turner 2005). Indigenous Peoples, long-time residents of particular places, acknowledge that their physical, spiritual, mental, and social health depends on the ability to practice

their traditional customs by living harmoniously with nature (Deloria 1969; Menzies 2006; Salmón 2000; Simpson 2004; Wilson 2008). On the northwest coast of North America, western redcedar is considered a cultural keystone species of the Indigenous communities because it is integral to their cultural identity (Garibaldi and Turner 2004; Vickers 1996). Ancient practices of harvesting and modifying tree products reflect cultural values of reverence, as seen with partial harvesting, where only parts of the tree were removed in order to keep the tree alive (Sewid-Smith et al. 1998).

Concerns regarding forest sustainability in BC continue to challenge industrial forestry methods, namely clear-cutting, and demand the valuation of forest ecosystems over timber production (Burda et al. 1998; Butt and McMillan 2009). EBM is a worldwide movement that values the preservation and conservation of native ecosystems and their inherent complexity over product yield and short-term profit; it aims to support ecosystems to self-maintain and self-order while still accommodating human use and occupancy (Burda et al. 1998; Christensen et al. 1996; Drengson and Taylor 1997; Grumbine 1994). It recognizes social-ecological systems are ever-changing and adaptive, and, as such, our strategies for managing them should be as well (Biggs et al. 2012; Clayoquot Scientific Panel 1995). In forest ecosystems, EBM aims to minimize soil disturbance, road densities, and damage to retained trees and forest structures (e.g., nurse logs and snags; Clayoquot Scientific Panel 1995), and it often supports the involvement of local governments and Indigenous communities (Butt and McMillan 2009).

In BC, EBM was first substantially implemented around 2005 at a large scale in the Clayoquot Sound (260,000 ha; Clayoquot Scientific Panel 1995) and the Great Bear Rainforest (6.4 million ha; McGee et al. 2010). Both regions are landmark cases to demonstrate how EBM values pushed

BC government agencies away from clear-cutting to a middle-ground approach, employing a variable-retention silviculture system (Affolderbach et al. 2012; Butt and McMillan 2009; Clayoquot Scientific Panel 1995; McGee et al. 2010; Price et al. 2009). These are two large-scale projects, but ecosystem-based initiatives are expressed in a range of contexts; these perspectives are most strongly seen in a smaller group of ecologically-oriented researchers and practitioners, some of whom have been leaders in the development of ecosystem-based thinking in BC (Hammond 1991, 2009; Fedrowitz et al. 2014; Gustafsson et al. 2012; Lindenmayer et al. 2012). In this paper, we use the terms "ecosystem-based forestry" and "ecosystem-based management" in reference to these smaller groups composed of individuals—advocates, practitioners, and thinkers—who maintain ecologically-oriented values; it is important to emphasize that these smaller groups are different from the broader EBM movement employed in larger political and industrial contexts.

The Nexus of Relationships and Practices

As new forest management solutions are developed in BC and elsewhere, it is important to consider the underlying land management philosophies that determine them. The influence of individual land management philosophies on forestry practices has not been directly investigated, especially with groups of different ethnic backgrounds (e.g., First Nations and people of European-descent). This research investigates what relationships and practices people in coastal BC have towards western redcedar and whether these vary according to an individual's cultural background. We chose to investigate western redcedar due to its importance both in First Nation communities and in commercial forestry. Specifically, we ask the following questions:

1. What perspectives and approaches do people in coastal BC who work

- with western redcedar have towards this tree and its products?
2. How do the perspectives of Northwest Coast Indigenous Peoples towards this tree compare to those of ecosystem-based foresters from other cultural backgrounds, and how do these reflect their worldviews?
 3. What concerns do they have for the long-term sustainability of western redcedar populations?

Ecosystem-based foresters provide a useful comparison to First Nation individuals because, while having different ethnicities, these two groups seem to have similar philosophies in addressing nature as an integrated system. We hypothesized that both groups share perspectives and have influenced each other's thinking being that they both stand at the forefront of change as advocates—and sometimes activists—for promoting environmental ethics and forest sustainability.

Methods

Recruitment and Interview Procedure

Eleven First Nation members and eleven ecosystem-based foresters in coastal BC were recruited to participate. One of the authors, Nancy J. Turner, approached prospective interviewees for each group based on her professional connections; we then used a snow-balling technique to recruit remaining participants. The Institutional Review Board for Columbia University approved this study before research activities commenced in July 2015 (No. IRB-AAAP2300). Semi-structured interviews were conducted with selected individuals representing these two groups based on a common set of questions (Supplementary Table 2) and their responses were analyzed thematically (Alexiades 1996; Martin 2004).

First Nation participants were selected based on logistical constraints from as many different communities in coastal BC

as possible to provide the greatest breadth of First Nation perspectives. We invited people to participate who, we believe, identify themselves as understanding the traditions of their people. We recognize, however, that there is a diversity of worldviews among coastal First Nations and the response of these individuals cannot represent all coastal First Nations' views on the forest. Non-indigenous interviewees were purposefully selected on recommendations from peers as either active ecosystem-based foresters or ecologists subscribing to ecosystem-based forestry in southwestern BC. The term "forester" in BC is restricted to Registered Professional Foresters (RPF); here, we use the term more broadly to refer to individuals with considerable forestry experience but do not necessarily maintain an RPF accreditation. This group of ecosystem-oriented foresters and ecologists in general has a strong ecological focus, tends to think holistically about forests, and tends to work in a community-based management context. Thus, though there may be some shared values and experience between them and foresters more generally, this group cannot be assumed to represent the broader community of forest professionals responsible for implementing ecosystem-based forestry in an industrial context in coastal BC.

Interviews took place in participants' private residences, those of a friend or family member, a central location, or a field site. With permission, interviews were recorded (audio, photos, and/or video). Informed consent was obtained before each interview commenced. Some participants demonstrated specific practices or protocols associated with western redcedar, including harvesting the bark, weaving the bark, showing culturally modified cedars, and demonstrating cultural traditions or sacred songs. None of the participants requested confidentiality due to the nature of the material, but they were offered a choice to do so.

Transcription and Data Analysis

Interview recordings were transcribed and thematic analyses of the transcripts were conducted using QSR International's NVivo 10 qualitative data analysis software (Richards 1999, 2005). Similarities and differences were examined both within and among the two groups. First, all the transcripts were read twice to identify a list of emerging concepts. Then, these concepts were consolidated into 30 categories and assigned names. These categories, or "nodes," (e.g., "cultural value of cedar") were coded in the transcripts to distinguish major themes.

The relative significance of a theme was determined across participants' responses based on the personal background of the speaker, additional cues from the interview (e.g., tonal emphasis and facial expression), and quantitative values from NVivo (including the frequency of a theme referenced in the transcripts, the number of respondents who mentioned it, and percent coverage). Percent coverage in NVivo indicates how much of the source content has been coded for that particular node (the number of times a character is coded for a node divided by the total number of characters in the transcript). Any material used for this research was shared with the participants for review to check for accuracy and confirm that the information could be shared without harm to the participants or their communities.

Results

Eight Nations were represented among the eleven First Nation interviewees: Vancouver Island Coast Salish (specifically Tsartlip, Hul'q'umi'num, T'Sou-ke, and Tsawout), Nuuchah-Nulth (specifically Ahousaht), Kwakwaka'wakw, Interior Salish (specifically Nlaka'pamux), and Haida. Most of the interviewees reside in the coastal regions of BC, as opposed to the interior, where redcedar is also used but not to the same extent nor in the same ways. Most of the interviewees are famil-

iar with forest regions on Vancouver Island, but the archipelago of Haida Gwaii and the mainland territories of Kwakwaka'wakw and Nlaka'pamux (an Interior Salish group) are also represented (Figure 2A).

In the ecosystem-based forestry group, nine individuals have knowledge and direct experience with ecologically-based forest management and two participants are ecologists who hold ecosystem-based ideals in an academic setting with field work centered in the central coast of BC (Supplementary Table 3). All of these people are well known for their work in forest ecology and ecosystem-based forestry in southwestern BC and most are past or present members of, or advisors to, the Ecoforestry Institute Society in BC. Participants of this group were raised in the Western education system and are not of coastal BC First Nation descent. Most of the participants are familiar with BC land on Vancouver Island and along the continental coast (Figure 2B).

Four major themes expressed by both groups were in reference to their relationship with nature: a personal connection, their spirituality, attitudes of respect, and attitudes of reciprocity (Table 1). Forest management approaches that were referenced were ecosystem-based and interdisciplinary (Table 1). Both groups shared concerns for the damage to western redcedar from industrial forestry practices, climate change, and, on Haida Gwaii, deer browsing (Table 1). No major thematic differences were discovered between the two groups other than the number of references of a given theme (Table 1).

First Nation Responses

Western redcedar was often described as "everything" by coastal BC First Nation participants, referring to its broad applications within every part of their lives.

Everything we do, it's cedar. Because we didn't have pots and pans, we used bent boxes—it's cedar. We dressed with cedar, cedar bark, and we paddled

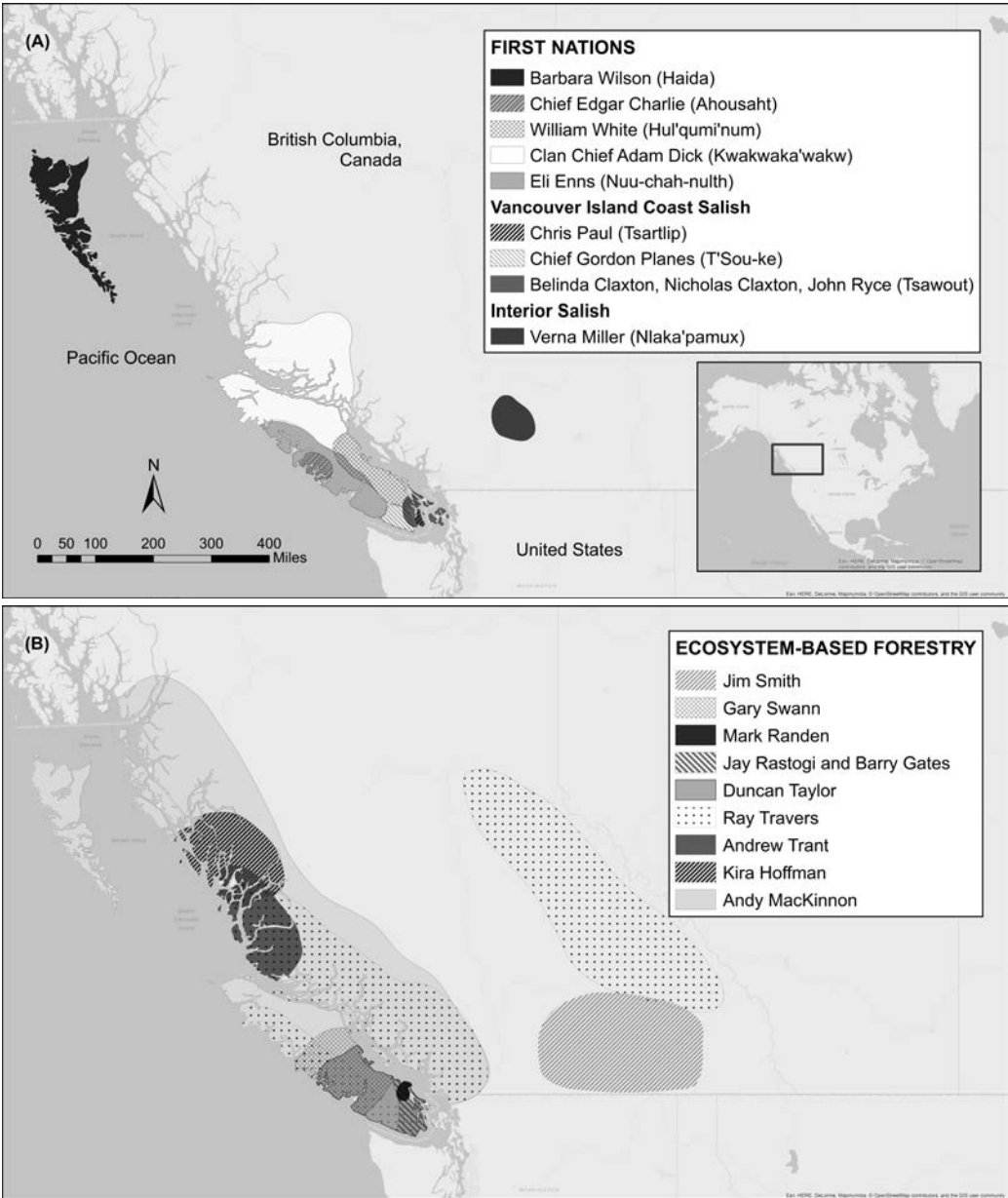


Figure 2. (A) Map showing general regions of familiarity for First Nation interviewees. Participants' tribal affiliations are provided in parentheses. Belinda Claxton, Nicholas Claxton, and John Ryce are individual participants from the same First Nation: Tsawout. (B) General regions familiar to ecosystem-based forestry participants. Forester Herb Hammond is familiar with the full range of western redcedar's distribution, so is not included in this map.

with cedar. We built houses with cedar. We made totem poles with cedar. We made masks and things like that with cedar. Everything. Make spoons like the one I showed you there—that's cedar.

Everything. (Adam Dick [Kwaxsistalla], the last traditionally trained Clan Chief of the Kwakwaka'wakw Nation)

The Kwakwaka'wakw people call the tree *Auda*, meaning "grandmother," demon-

Table 1. NVivo matrix data showing the number of times each theme was coded (# references) per number of respondents in each group and % coverage (Mean \pm SD [range]) for the major themes found.

Theme	First Nation		Ecosystem-based forestry	
	# References / # Respondents (n = 11)	Mean \pm SD (range) for % coverage	# References / # Respondents (n = 11)	Mean \pm SD (range) for % coverage
Basic Theme				
Connection	35 / 11	6.51 \pm 5.88 (0-19.34)	55 / 11	7.38 \pm 7.71 (1.34-24.08)
Spirituality	31 / 11	8.09 \pm 8.55 (1.98-29.12)	21 / 6	3.50 \pm 4.95 (0-12.52)
Respect	18 / 9	5.04 \pm 4.37 (0-11.19)	10 / 6	0.73 \pm 0.72 (0-1.76)
Reciprocity	14 / 6	3.45 \pm 5.56 (0-17.9)	6 / 5	0.58 \pm 0.69 (0-1.87)
Ecosystem-based approach	12 / 4	2.74 \pm 5.22 (0-15.98)	83 / 11	11.13 \pm 8.14 (0-22.27)
Interdisciplinary approach	9 / 6	3.27 \pm 4.55 (0-13.94)	34 / 9	7.01 \pm 8.48 (0-27.4)
Concerns				
Industrial forestry destruction	32 / 11	7.28 \pm 4.06 (0.94-13.66)	45 / 10	7.40 \pm 6.14 (0-15.7)
Old growth loss	13 / 6	3.35 \pm 5.30 (0-16.47)	18 / 7	3.40 \pm 4.72 (0-13.5)
Climate change	7 / 5	2.26 \pm 2.84 (0-6.99)	36 / 11	6.30 \pm 3.47 (1.65-12.65)
Deer browsing	2 / 1	1.34 \pm 4.47 (0-14.84)	10 / 3	0.72 \pm 1.75 (0-5.76)

strating their familial relationship with cedar.

I think the main thing about cedar is you feel connected to it. I think a lot of First Nations people in this area feel really connected to it. They talk about it as a friend...even just to smell it, you can see the look in their eyes. When you smell it, it's like they're seeing an old friend that they haven't seen in a long time. (Chris Paul of the W̱JÖŁŁP [Tsartlip] Nation)

All First Nation participants expressed a spiritual connection with western redcedar that necessitates their responsibility to be stewards of the land (Atleo 2004, 2011;

Sewid-Smith et al. 1998). In addition to their reverence of western redcedar, participants acknowledged the practical applications of the tree. They explained that every part of the tree can be utilized for both everyday and spiritual purposes, and, furthermore, there is not a separation between these two spheres; what is practical and utilitarian is also sacred.

Participants' personal connection with western redcedar is directly reflected in their practices with the tree, and a common example used was harvesting cedar parts. Barbara Wilson (Kii'iljuus), of the Haida Nation, described the process for harvesting cedar bark:

In the Haida world, the women and their helpers go out and pray... not a prayer so much as a thanksgiving. You thank the tree [cedar] for its bark and you explain to it what you're doing, because if you truly respect something, you don't take it without asking permission. You don't leave it without saying *haawa*, or thank you, and you always are mindful that you don't take too much off the individual tree, so that the tree can continue to grow for many years after you've taken your little piece.

Pepeyla (Verna Miller), of the Interior Salish Nlaka'pamux people, explained analogous protocols when her grandmother harvested western redcedar roots: first ask permission from the tree, then make an offering, and acknowledge what will be done with the part of the tree taken.

Ceremony and ritual are central to First Nations cultures and teachings, and western redcedar assumes a distinct role. Clan Chief Adam Dick (Kwaxsistalla) described that there is a prayer for every component of cedar work as they transform the tree into a new life. For instance, when a totem pole is raised they say that they are "waking it up." He explained that one of the most notable examples of traditional ceremonial practices with western redcedar is the sacred Cedar Bark Ceremony, known as the *t'seka*, that takes place in the Kwakwaka'wakw Nation's winter ceremonies. Traditionally lasting eight days, the Chief said the *t'seka* is the religion of the Kwakwaka'wakw people, with songs and dances that dramatize his ancestor's contact to the spirit world, featuring regalia, masks, and props made of western redcedar wood, bark, and boughs.

Within all eleven First Nation interviews, western redcedar perspectives were contextualized within their cultural worldview, reflecting their feelings of respect and reciprocity for nature in its entirety. Eli Enns

discussed the Nuu-chah-nulth First Nation worldview described as *heshook-ish tsawalk*, meaning "everything is one and everything is interconnected." *Heshook-ish tsawalk* is more than a set of concepts and principles; it is a way of thinking and interacting with one's environment. Eli explained that to be respectful is "to observe, appreciate, and act accordingly." To be respectful isn't going into a forest, cutting down a cedar tree, and then finding a use for it. Instead, people first observe what they need, and then carefully find a tree that has the characteristics necessary for the project, while being aware of the entire ecosystem and not destroying important habitat. Eli continued, "Two things are very important when you're harvesting [cedar]: that you're only taking what you need and that you provide a reciprocity of some kind." Historically a form of reciprocity would be leaving food scraps in the woods after eating, to support other wildlife and natural systems. Interviewees explained that, while their relationship with cedar was especially unique, their worldview encompasses all natural organisms and processes:

We're told to respect everything. To listen to everything. To be kind, and so you treat the trees, you treat everything around you with respect, because we've learned lessons that when we're disrespectful, things disappear... and always remember that we have a responsibility for the things that can't speak for themselves, and that's the trees, the rocks, the plants, the fish. We have a responsibility to speak for them and to look after them. (Barbara Wilson [Kii'iljuus] of the Haida Nation)

A notable term mentioned was the concept of "seven generations," which is the practice of managing their environment to sustain its health for seven generations—or roughly 200 years—ahead.

Ecosystem-Based Forester Responses

The ecosystem-based forester and ecologist group presented similar themes to those of the First Nation participants (Table 1). They expressed a personal connection with nature that is accompanied by an academic perspective from their scientific education. Andy MacKinnon explained: "[nature is] interesting from a descriptive and scientific point of view but it's also—I don't know how to put it concisely—I feel at home in forests." All eleven participants expressed their relationship in terms of profound respect, value, and admiration—many describing it as spiritual.

The most important thing to me is my relationship with the forest...I make a decision on taking a tree down and it's not easy for me. I'm not a guy who just cuts trees down; it has to fit the scope of what we're trying to achieve. The biggest and the most commercial trees that are on my property are all still standing. (Mark Randen)

Mark discussed the intuitive and mechanical aspects of his work when selecting a tree to cut down for timber. The former aspect is guided by his intimate connection with the forest that he manages, a relationship that takes years to foster to become familiar with each individual tree. The mechanical aspect of his relationship deals with the physical means of felling a tree and how to minimize the damage to surrounding forest. He anticipates and plans for how each tree removal will affect the forest in the long-term.

Ecoforestry is probably not a really precise definition of methodology, it's more a philosophy. The overarching philosophy is that we want to maintain natural function and composition, resiliency, and then how you do that, I think, is maybe more open to interpretation, but also dependent on site, species composition, so I would say

ecoforestry can be practiced anywhere. (Jay Rastogi)

All eleven ecosystem-based forester interviewees have worked with First Nation communities and consequently have been influenced by First Nations' land management perspectives. Herb Hammond explained one of the most important things that he learned from First Nations elders was for him, "to connect my heart to my brain and to trust my intuition as much as I did my science." It is the ancestral, earth-centered values that Herb and the other forestry participants hope First Nation communities can maintain, disseminate, and integrate into the Western world. Similar to Herb, Dr. Duncan Taylor described his connection as a "profound relatedness to the non-human world...not as subject to object, but subject to subject. It is an 'I-thou' relationship, not merely an 'I-it' relationship."

Forestry participants shared numerous examples to demonstrate how the ecological importance of western redcedar influences what management strategies they employ. Andy MacKinnon explained that cedars host a large and diverse assemblage of fungi associated with their roots that are not found with other tree species in the region, so cedar promotes species diversity in the soil biota. Herb Hammond discussed how western redcedar proves to be important in water management and regulation because its foliar structure—broad and flat—helps disperse water throughout the forest system. He explained that it can grow slowly in shade, so it is integral to develop multi-layered canopy ecosystems in old-growth forests that vary in tree age and species composition. Several foresters mentioned that, due to the rot-resistant property of its wood, the tree provides important habitat for other species in the form of a dead snag tree or "nurse" log for years after the tree has died. Participants discussed the significant role of all species within the forest ecosystem

and aim to develop sustainable use plans projecting at least 100 years or more into the future.

Concerns for Western Redcedar

When asked about any concerns for the population sustainability of western redcedar, both groups reported three primary concerns: climate change, depletion from industrial forestry (particularly the loss of old growth cedars), and inability to regenerate from the pressure of introduced deer on the islands of Haida Gwaii (Table 1). A majority of the participants explained that western redcedar is especially subject to stress from more frequent hot and dry conditions in recent years, since it requires a moist environment. Belinda Claxton (Seliliye), of the Tsawout Nation, observes climate change by picking berries and harvesting cedar bark a month earlier now, in July instead of August. According to forester accounts, cedar flagging (recognized by the leaves turning yellow then brown due to soil-moisture deficit before shedding) is happening earlier and more extensively, where more of the limbs die or, in some cases, the tree dies completely. Five of the forester interviewees described western redcedar as an “indicator species,” or a “canary in the coal mine,” because it is the first tree species to show signs of stress from a changing, warming climate.

The majority (N = 10) of interviewee responses mentioned the concern over industrial forestry practices, particularly clearcutting and the loss of old growth cedars since the mid-twentieth century.

We need to see old growth forests and large, old cedar trees as nonrenewable resources. We need to stop this foolishness of thinking that planting a tree is planting a forest...We can probably grow old trees to a certain point, but we don't know how to grow or develop the complexity that you find in old growth forests. We've done enough exploitation of them and we need to

back off wherever we haven't. I think that old trees, in general, are trees that hold, not only in the ecological, but spiritual wisdom for this planet, and I think if we destroy them, that eventually we will destroy ourselves. (Herb Hammond)

Participants stated that industrial forestry practices have declined with a number of closures of forestry companies and pulp mills, but, unfortunately, the high-grading of forests (selective removal of the most economically valuable trees) has removed the majority of old growth. Many participants recognized that industrial forestry practices stem from Western values that focus on short-term economic gain. Forestry is not entirely a technical discipline but instead it is “highly embedded in the local culture,” as Ray Travers explained it.

The ecological cycles and the short-term economic cycles are completely out of whack. That's one of the reasons why, for forest companies, liquidation is the way to go. We need to change that. We've been changing our ecology to meet the short-term needs of our economy and we need to flip it around 180 degrees so that our economy meets the imperatives of our ecology. That's going to be a huge cultural shift. (Duncan Taylor)

Finally, three foresters and Barbara Wilson, from the Haida Nation, talked about the introduction of deer on Haida Gwaii and how it places an added stress on the tree's ability to regenerate, since deer tend to eat the young seedlings and newer growth. They explained that deer are not native to Haida Gwaii, as they are on the mainland, so western redcedar has evolved for thousands of years without them and, as such, the cedar populations are genetically distinct and do not produce the defensive compounds that mainland trees do (Vourc'h et al. 2001, 2002).

Deer were put on the islands in about 1898 and then again more were introduced between 1910 and 1925. Because our plants and our trees evolved for thousands and thousands of years without deer, without any ungulates that would eat everything, they grew and were able to be used by our people without the chemicals that would deter deer or elk from nibbling on them. (Barbara Wilson [Kii'iljuus] of the Haida Nation)

Discussion

More commonalities than differences were found within the perspectives represented by the First Nation and ecologically-based forestry groups. Coastal BC First Nation relationships and practices with western redcedar are both spiritual and empirical/practical (see Figure 3A), while the perspectives represented by the ecosystem-based forestry group are both personal and academic/practical (see Figure 3B). Both sample populations recognize that they are caregivers and stewards of the land and, consequently, have a responsibility to pass the land on in a healthy condition to future generations. Participants reported their concern of the negative impacts of climate change, industrial forestry practices (especially the loss of old growth), and deer browsing on Haida Gwaii. These matters are becoming increasingly relevant as new management methods are employed to maintain the structure, function, and composition of forests, while still extracting material resources for human use.

Due to the extensiveness of western redcedar in First Nation everyday uses, both materially and spiritually, there is an evident emphasis for the importance of western redcedar for coastal BC Indigenous people when compared to other tree species (Garibaldi and Turner 2004; Sewid-Smith et al. 1998; Stewart 1995; Turner 2014). It doesn't merely satisfy the practical needs of these communities but is a centerpiece in

many First Nation ceremonial, medicinal, and spiritual practices. This is not to say First Nation individuals do not equally see the sacredness in all plant and animal life and have comprehensive, empirical knowledge of it. Relationships and practices with western redcedar provide a strong case study to demonstrate First Nation worldviews, like *heshook-ish tsawalk*. While the ecosystem-based foresters and ecologists have an academic background, all expressed feeling a personal connection—often spiritual—with nature; these two elements correspond to both intuitive and logical, long-term management practices (Figure 3B). Ecosystem-based foresters are influenced by their practical knowledge of forest ecology, personal experiences, and, as we hypothesized, by traditional knowledge from First Nation individuals.

Being that they are reduced terms, the overarching themes identified and discussed in this research carry depth and meaning far greater than they can accurately represent on their own. While it is useful to categorize themes from the interviews, participant responses are deeply contextual and inspire an open dialogue for a variety of related subjects, such as history, culture, emotion, oral narratives, and so on. Categorical themes are presented here, but it is necessary to evaluate the interrelatedness among them. In this case, despite the division of concepts into "relationships" and "practices," and then into the subcategories of "spiritual/personal" and "practical," there are undeniable overlaps of these terms (Figure 3). First Nation perspectives are equally scholarly as the foresters' perspectives are reverential.

A useful addition to this study would be to investigate the industrial forestry perspective by interviewing individuals currently working in this field—including loggers, forestry engineers, forest company executives, and individuals practicing EBM in an industrial forestry context—and comparing their perspectives with those of the groups discussed here. This perspective

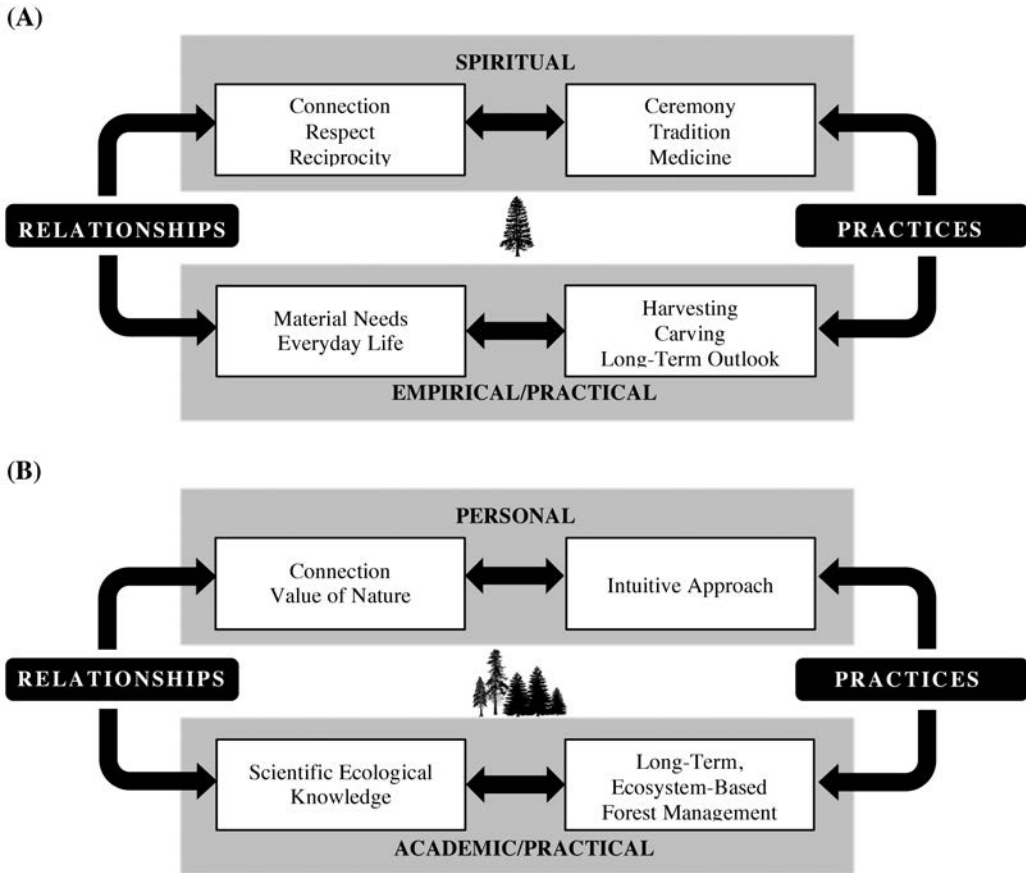


Figure 3. Diagram showing the relationships and practices with western redcedar for the (A) First Nations group and (B) ecosystem-based forestry group.

is crucial to uncover some critical data gaps to understand how forestry professionals relate to their work and the natural world and potentially demonstrate the compatibility of those relationships with First Nation perspectives. Moreover, considering participant demographics, such as gender and age, could provide some further detail to the perspectives of each group.

This research adds to an existing body of literature (Atleo 2011; Berkes et al. 2000; Bohensky and Maru 2011; Gadgil et al. 1993; Kimmerer 2013; Salmón 2000; Wohlleben 2016) that demonstrates shared land management philosophies and offers a potential for a unified approach where Western science and First Nations' perspectives can sustainably maintain forests for

centuries to come. Several communities in BC have already exemplified an ecosystem-based approach, including the Xáxli'p Community Forest, forests within the Great Bear Rainforest, and the forests of Haida Gwaii (Diver 2016; Price et al. 2009; Takeda and Ropke 2010). Menzies (2006, 2015) argues that while a collaborative approach has become orthodoxy for social scientists, there are sometimes caveats to this relationship because, historically, there have been some cases where Indigenous individuals have been exploited as "informants" and treated like "specimens." With a goal to have an interdisciplinary approach or to "democratize conservation science and practice," as Salomon et al. (2018) effectively puts it, Western scientists

should not be the only voices permitted to contribute to conservation science discussions; Indigenous knowledge holders must be able to participate with equal contribution and benefit to the other people involved (Western scientists, policymakers, or industry professionals; Deloria 1992; Menzies 2006, 2015).

While there are obvious differences between modern science and traditional ecological knowledge, there is also considerable overlap, as our research demonstrates here. Generally, science tends towards the separation and reduction of target variables with an objective lens, whereas Indigenous knowledge is grounded in the experience of interrelationships subjectively (Agrawal 1995; Lertzman 2009; Menzies 2006). In our results, we see the co-evolution of the foresters and ecologists with First Nation members where their perspectives share tenets of science—objective, empirical, practical, and methodological—and Indigenous worldview—experiential/sensorial, oral, contextual, and epistemological (Agrawal 1995; Lertzman 2009; Menzies 2006; Wohlleben 2016). This research provides an initial look at the diversity in forestry perspectives in BC and the blending of Western science and First Nation principles to achieve mutual goals. Foresters and forest ecologists are influenced by First Nation individuals, while, at the same time, Indigenous leaders are learning from and participating in the scientific world. Future research that challenges the classical split between Western science and Indigenous knowledge will be useful to support academic and First Nation alliances, especially at larger, industrial scales.

As the valuation of Indigenous knowledge grows, conservation ethics inherent to First Nation culture can be incorporated into mainstream management practices and approaches (Agrawal 1995; Menzies 2006; Simpson 2004; Wilson 2008; Wohlleben 2016). Perhaps science-based forest management and Indigenous ecological knowledge do not need to be primarily

seen as dichotomous but instead complementary. As society evolves and needs to address issues impacting individuals from all backgrounds and perspectives, the collaboration of these historically separate traditions can unify.

Conclusions

Based on our results, experiencing a unique connection with nature—particularly a spiritual connection—is not exclusive to First Nations individuals; however, Indigenous teachings provide the invaluable reminder that humanity must respect nature and act accordingly with practices of reciprocity, conservation, and protection of natural systems long-term. Many of the ecosystem-based foresters and ecologists expressed how they were influenced by First Nations customs to develop a more intimate relationship with nature, and these attitudes consequently guide their professional work. As such, it is not only important to preserve traditional perspectives for ethnographical reasons, but the dissemination and legitimization of First Nations worldviews can both support Indigenous Peoples in reclaiming their native teachings and provide an ethical foundation for the sustainable use of natural resources (Deloria 1992; Lepofsky 2009; Menzies 2006, 2015).

While relationships influence practices, practices also impact relationships. Specific practices or activities provide an important teaching environment. When First Nations lost ownership of their homelands and were brought into the residential school system, they could not take part in traditional practices to the same extent—as seen with the Potlatch ban; they no longer had access to special places and lost many opportunities to teach their youth about how to interact and, thus, relate to their natural environment (Lepofsky 2009; Turner 2014). If experiential learning in nature can be applied to mainstream academic settings, potentially a new moral framework can be fostered, moving from

independence to interdependence. The BC Ministry of Forests advocates a vision for both economic prosperity and environmental sustainability; however, strong economic pressures can outweigh the ecological needs of forests (Diver 2016; Takeda and Ropke 2010). When a worldview that values both the material and spiritual elements of nature is incorporated into provincial management discussions, the respect and care for the community of life forever held by First Nation communities can be implemented.

Notes

¹ Includes unpublished empirical data on timber volume harvest from Albert Nussbaum of the BC Ministry of Forests, Lands and Natural Resource; available from Albert.Nussbaum@gov.bc.ca.

Acknowledgments

This paper is dedicated to Kwax-sistalla (Clan Chief Adam Dick), of the Kwakwaka'wakw Nation, in honor of his mentorship, friendship, and teaching. His unparalleled wisdom and enormous impact on both the Northwest Coast First Nation and the ethnoecology communities have been appreciated more than can be expressed and will be remembered for generations to come.

We want to express our deepest gratitude to all the participants for generously sharing their perspectives and knowledge: Clan Chief Adam Dick (Kwax-sistalla; Kwakwaka'wakw), Kim Recalma-Clutesi (Ogwiloqwa; Kwakwaka'wakw), Barbara Wilson (Kii'iljuus; Haida), Belinda Claxton (Seliliye; Tsawout), William White (Xelimuxw, Kasalid; Coast Salish), Chris Paul (Tsartlip), Chief Edgar Charlie (Hanuquii; Ahousaht), Eli Enns (Nuu-chah-nulth), Chief Gordon Planes (T'Sou-ke), John Ryce (Tsawout), Dr. Nicholas Claxton (XEMT OLTW; Tsawout), Verna Miller (Pepeyla; Nlaka'pamux), Dr. Andrew Trant, Andy MacKinnon, Barry Gates, Dr. Duncan Taylor, Gary Swann, Herb Hammond, Jay Rastogi, Jim Smith, Kira Hoffman, Mark

Randen, and Ray Travers. We also want to express our thanks to Dr. Dana Lepofsky and Dr. Ken Lertzman for providing thoughtful comments on earlier drafts of this paper. Finally, we thank the Department of Ecology, Evolution, and Environmental Biology at Columbia University as well as Nancy Turner's research grant for "Changing Landscapes: New Insights into Change, Resilience and Continuity within BC Anthropogenic Landscapes," a project funded by The Social Sciences and Humanities Research Council, for funding this research.

References Cited

- Affolderbach, J., R. A. Clapp, and R. Hayter. 2012. Environmental Bargaining and Boundary Organizations: Remapping British Columbia's Great Bear Rainforest. *Annals of the Association of American Geographers* 102:1391–1408.
- Agrawal, A. 1995. Dismantling the Divide Between Indigenous and Scientific Knowledge. *Development and Change* 26:413–439.
- Alexiades, M. N. 1996. *Selected Guidelines for Ethnobotanical Research: A Field Manual*. The New York Botanical Garden, NY.
- Allen, S. D., D. A. Wickwar, F. P. Clark, R. R. Dow, R. Potts, and S. A. Snyder. 2009. Values, Beliefs, and Attitudes Technical Guide for Forest Service Land and Resource Management, Planning, and Decision-Making. Gen. Tech. Rep: Portland, OR. Report number PNW-GTR-788. US Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- Anderson, M. K. 2005. *Tending the Wild: Native American Knowledge and the Management of California's Natural Resources*. University of California Press, Berkeley.
- Atleo, E. R. 2004. *Tsawalk: A Nuu-chah-nulth Worldview*. University of British Columbia Press, Vancouver, BC.
- Atleo, E. R. 2011. *Principles of Tsawalk: An Indigenous Approach to Global Crisis*. University of British Columbia Press, Vancouver, BC.

- BC Ministry of Forests, Lands and Natural Resource Operations. 2015. Province of British Columbia. Available at: http://www.sfmcanada.org/images/Publications/EN/BC_info_Province_and_territories_EN.pdf.
- BC Ministry of Forests, Lands and Natural Resource Operations. 2016. 2015/16 Annual Service Plan Report, Victoria, BC. Available at: http://www.bcbudget.gov.bc.ca/Annual_Reports/2015_2016/pdf/ministry/flnro.pdf.
- BC Ministry of Forests, Mines and Lands. 2010. The State of British Columbia's Forests, Third Edition. Forest Practices and Investment Branch, Victoria, BC. Available at: www.for.gov.bc.ca/hfp/sof/index.htm#2010_report.
- Berkes, F., J. Colding, and C. Folke. 2000. Rediscovery of Traditional Ecological Knowledge as Adaptive Management. *Ecological Applications* 10:1251–1262.
- Biggs, R., M. Schluter, D. Biggs, E. L. Bohensky, S. BurnSilver, G. Cundill, V. Dakos, T. M. Daw, L. S. Evans, K. Kotschy, A. M. Leitch, C. Meek, A. Quinlan, C. Raudsepp-Hearne, M. D. Robards, M. L. Schoon, L. Schultz, and P. C. West. 2012. Toward Principles for Enhancing the Resilience of Ecosystem Services. *Annual Review of Environment and Resources* 37:421–448.
- Bohensky, E. L., and Y. Maru. 2011. Indigenous Knowledge, Science, and Resilience: What Have We Learned from a Decade of International Literature on "Integration"? *Ecology and Society* 16:6.
- Burda, C., F. Gale, and M. M'Gonigle. 1998. Eco-Forestry Versus the State(us) Quo: Or Why Innovative Forestry Is Neither Contemplated nor Permitted within the State Structure of British Columbia. *BC Studies* 119:45–86.
- Butt, G., and D. McMillan. 2009. Clayoquot Sound: Lessons in Ecosystem-Based Management Implementation from an Industry Perspective. *BC Journal of Ecosystems and Management* 10:13–21.
- Christensen, N. L., A. M. Bartuska, J. H. Brown, S. Carpenter, C. D'Antonio, R. Francis, J. F. Franklin, J. A. MacMahon, R. F. Noss, D. J. Parsons, C. H. Peterson, M. G. Turner, and R. G. Woodmansee. 1996. The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management. *Ecological Applications* 6:665–691.
- Clayoquot Scientific Panel. 1995. First Nations' Perspectives of Forest Practices in Clayoquot Sound. Scientific Panel for Sustainable Forest Practices in Clayoquot Sound. Report 3 (with appendices). Cortex Consulting and Government of British Columbia, Victoria, BC.
- Cuerrier, A., N. J. Turner, T. C. Gomes, A. Garibaldi, and A. Downing. 2015. Cultural Keystone Places: Conservation and Restoration in Cultural Landscapes. *Journal of Ethnobiology* 35:427–448.
- Deloria, V., Jr. 1969. *Custer Died for Your Sins: An Indian Manifesto*. Macmillan, New York.
- Deloria, V., Jr. 1992. Indians, Archaeologists, and the Future. *American Antiquity* 57:595–598.
- Diver, S. 2016. Community Voices: The Making and Meaning of the Xáxli'p Community Forest. A Report to the Xáxli'p Community Forest. [online] URL: <http://xcfc.ca>. Accessed on February 25, 2016.
- Drengson, A. R., and D. M. Taylor, eds. 1997. *Ecoforestry: The Art and Science of Sustainable Forest Use*. New Society Press, Gabriola Island, BC.
- Fedrowitz, K., J. Koricheva, S. C. Baker, D. B. Lindenmayer, B. Palik, R. Rosenvald, W. Beese, J. F. Franklin, J. Kouki, E. Macdonald, C. Messier, A. Sverdrup-Thygeson, and L. Gustafsson. 2014. Can Retention Forestry Help Conserve Biodiversity? A Meta-Analysis. *Journal of Applied Ecology* 51:1669–1679.
- Gadgil, M., F. Berkes, and C. Folke. 1993. Indigenous Knowledge for Biodiversity Conservation. *Ambio* 22(2/3):151–156. [online] URL: <http://www.jstor.org/stable/4314060>. Accessed on March 15, 2016.
- Garibaldi, A., and N. Turner. 2004. Cultural Keystone Species: Implications for Ecological Conservation and Restoration. *Ecology and Society* 9:1. [online] URL: <http://www.ecologyandsociety.org/vol9/iss3/art1/>. Accessed on March 1, 2016.

- Grumbine, R. E. 1994. What is Ecosystem Management? *Conservation Biology* 8:27–38.
- Gustafsson, L., S. C. Baker, J. Bauhus, W. J. Beese, A. Brodie, J. Kouki, D. B. Lindenmayer, A. Löhmus, G. M. Pastur, C. Messier, M. Neyland, B. Palik, A. Sverdrup-Thygeson, W. J. A. Volney, A. Wayne, and J. F. Franklin. 2012. Retention Forestry to Maintain Multifunctional Forests: A World Perspective. *BioScience* 62:633–645.
- Hammond, H. 1991. *Seeing the Forest Among the Trees: The Case for Wholistic Forest Use*. Polestar Press Ltd., Vancouver, BC.
- Hammond, H. 2009. *Maintaining Whole Systems on Earth's Crown: Ecosystem-based Conservation Planning for the Boreal Forest*. Silva Forest Foundation, Slocan Park, BC.
- Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. High-Resolution Global Maps of 21st-Century Forest Cover Change. *Science* 342:850–853.
- Kimmerer, R. W. 2013. *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teaching of Plants*. Milkweed Editions, Minneapolis, MN.
- Kurz, W. A., C. C. Dymond, G. Stinson, G. J. Rampley, E. T. Neilson, A. L. Carroll, T. Ebata, and L. Safranyik. 2008. Mountain Pine Beetle and Forest Carbon Feedback to Climate Change. *Nature* 452:987–990.
- Lepofsky, D. 2009. The Past, Present, and Future of Traditional Resource and Environmental Management. *Journal of Ethnobiology* 29:161–166.
- Lertzman, K. 2009. The Paradigm of Management, Management Systems, and Resource Stewardship. *Journal of Ethnobiology* 29:339–358.
- Lindenmayer, D. B., J. F. Franklin, A. Löhmus, S. C. Baker, J. Bauhus, W. Beese, A. Brodie, B. Kiehl, J. Kouki, G. M. Pastur, C. Messier, M. Neyland, B. Palik, A. Sverdrup-Thygeson, J. Volney, A. Wayne, and L. Gustafsson. 2012. A Major Shift to the Retention Approach for Forestry Can Help Resolve Some Global Forest Sustainability Issues. *Conservation Letters* 5:421–431.
- Little, E. L., Jr. 1971. *Atlas of United States Trees, Volume 1: Conifers and Important Hardwoods*. US Department of Agriculture, Forest Service Miscellaneous Publication 1146, 9p., 200 maps.
- Marston, J. M. 2015. Modeling Resilience and Sustainability in Ancient Agricultural Systems. *Journal of Ethnobiology* 35:585–605.
- Martin, G. J. 2004. *Ethnobotany: A Methods Manual*. People and Plants Conservation Series. Earthscan, UK and USA.
- McGee, G., A. Cullen, and T. Gunton. 2010. A New Model for Sustainable Development: A Case Study of the Great Bear Rainforest Regional Plan. *Environment, Development and Sustainability* 12:745–762.
- Mehta, J. N., and J. T. Heinen. 2001. Does Community-Based Conservation Shape Favorable Attitudes Among Locals? An Empirical Study from Nepal. *Environmental Management* 28:165–177.
- Menzies, C. R., ed. 2006. *Traditional Ecological Knowledge and Natural Resource Management*. University of Nebraska Press, Lincoln and London.
- Menzies, C. R. 2015. Oil, Energy, and Anthropological Collaboration on the Northwest Coast of Canada. *Journal of Anthropological Research* 71:5–21.
- Metsaranta, J. M., C. C. Dymond, W. A. Kurz, and D. L. Spittlehouse. 2011. Uncertainty of 21st Century Growing Stocks and GHG Balance of Forests in British Columbia, Canada Resulting from Potential Climate Change Impacts on Ecosystem Processes. *Forest Ecology and Management* 262:827–837.
- Murdock, T. Q., S. W. Taylor, A. Flower, A. Mehlenbacher, A. Montenegro, F. W. Zwiers, R. Alfaro, and D. L. Spittlehouse. 2013. Pest Outbreak Distribution and Forest Management Impacts in a Changing Climate in British Columbia. *Environmental Science & Policy* 26:75–89.
- Nitschke, C. R., and J. L. Innes. 2008. Integrating Climate Change into Forest Management in South-Central British Columbia: An Assessment of Landscape Vulnerability and Development of a Climate-Smart Frame-

- work. *Forest Ecology and Management* 256:313–327.
- NRC (Natural Resources Canada, Canadian Forest Service). 2011. Trees, Insects and Diseases of Canada's Forests: Western redcedar: *Thuja plicata* [web page]. URL: <http://tidcf.nrcan.gc.ca/en/trees/factsheet/133>. Accessed on September 20, 2015.
- Pojar, J., and A. MacKinnon. 1994. *Plants of Coastal British Columbia: Including Washington, Oregon & Alaska*. Lone Line Publishing, Vancouver, BC.
- Price, K., A. Roburn, and A. MacKinnon. 2009. Ecosystem-Based Management in the Great Bear Rainforest. *Forest Ecology and Management* 258:495–503.
- Richards, L. 1999. *Using NVivo in Qualitative Research*. Sage Publications, London, UK & Los Angeles, CA.
- Richards, L. 2005. *Handling Qualitative Data: A Practical Guide*. Sage Publications, London, UK.
- Salmón, E. 2000. Kincentric Ecology: Indigenous Perceptions of the Human-Nature Relationship. *Ecological Applications* 10:1327–1332.
- Salomon, A. K., K. Lertzman, K. Brown, Kii'iljuus B. Wilson, D. Secord, and I. McKechnie. 2018. Democratizing Conservation Science and Practice. *Ecology and Society* 23:44. [online] URL: <https://www.ecologyandsociety.org/vol23/iss1/art44/>.
- Sewid-Smith, D. (Mayanilh), Chief A. Dick (Kwaxsistala), and N. J. Turner. 1998. The Sacred Cedar Tree of the Kwakwaka'wakw People. In *Stars Above, Earth Below: Native Americans and Nature*, edited by Marsha Bol, pp. 189–209. The Carnegie Museum of Natural History, Pittsburgh, PA.
- Simpson, L. R. 2004. Anticolonial Strategies for the Recovery and Maintenance of Indigenous Knowledge. *The American Indian Quarterly* 28:373–384.
- Stewart, H. 1995. *Cedar: Tree of Life to the Northwest Coast Indians*. Douglas and McIntyre Ltd., Vancouver, BC/Toronto, ON.
- Takeda, L. and I. Ropke. 2010. Power and Contestation in Collaborative Ecosystem-Based Management: The Case of Haida Gwaii. *Ecological Economics* 70:178–188.
- Turner, N. J. 2005. *The Earth's Blanket: Traditional Teachings for Sustainable Living*. University of Washington Press, Seattle, WA.
- Turner, N. J. 2008. Lessons of the Birch. In *Indigenous Intelligence: Diverse Solutions for the 21st Century*, edited by S. Kumar, pp. 46–49. Issue 250 of *Resurgence Magazine*.
- Turner, N. J. 2014. *Ancient Pathways, Ancestral Knowledge: Ethnobotany and Ecological Wisdom of Indigenous Peoples of Northwestern North America*. McGill-Queens' University Press, Montréal, QC.
- Turner, N. J., and R. J. Hebda. 2012. *Saanich Ethnobotany: Culturally Important Plants of the W̱SÁNEĆ People*. Royal BC Museum, Victoria, BC.
- Turner, N. J., and P. R. Spalding. 2013. "We Might Go Back to This": Drawing on the Past to Meet the Future in Northwestern North American Indigenous Communities. *Ecology and Society* 18:29.
- Turner, N. J., and S. E. Turner. 2004. Food, Forage and Medicinal Resources of Forests. In *Interdisciplinary and Sustainability Issues in Food and Agriculture, Volume II*, edited by O. Christen, V. Squires, R. Lal, and R. J. Hudson, pp. 68–118. EOLSS Publishers, UK.
- US Forest Service. 2004. Western redcedar. In *Silvics Manual, Volume 1: Conifers*. [online] URL: http://na.fs.fed.us/spfo/pubs/silvics_manual/Volume_1/thuja/plicata.htm. Accessed on December 20, 2015.
- Vickers, R. H. 1996. *Spirit Transformed: A Journey From Tree to Totem*. Raincoast Book Distribution Ltd, Vancouver, BC.
- Vourc'h, G., J.-L. Martin, P. Duncan, J. Escarre, and T. P. Clausen. 2001. Defensive Adaptations of *Thuja plicata* to Ungulate Browsing: A Comparative Study Between Mainland and Island Populations. *Oecologia* 126:84–93.
- Vourc'h, G., J. Russell, and J.-L. Martin. 2002. Linking Deer Browsing and Terpene Production Among Genetic Identities in *Chamaecyparis nootkatensis* and *Thuja*

- plicata* (Cupressaceae). *Journal of Heredity* 93:370–376.
- Wilms, J., and N. J. Turner. 2014. Aromatic Oils in Coniferous Trees of the Central Coast of British Columbia. Report Prepared for Heiltsuk Integrated Resource Management Department (HIRMD) and the Tula Foundation. Hakai Institute, Quadra Island, British Columbia.
- Wilson, S. 2008. *Research is Ceremony: Indigenous Research Methods*. Fernwood Publications, Winnipeg, MB.
- Wohlleben, P. 2016. *The Hidden Life of Trees: What They Feel, How They Communicate*. Greystone Books, Vancouver, BC.