

Best of two worlds: Traditional ecological knowledge and Western science in ecosystem- based management

David Adam Lertzman¹

Abstract

Ecosystem-based management (EBM) is a rising paradigm in resource management. Social scientists agree that EBM necessitates a natural sciences foundation yet its human dimensions are less understood; a greater role for the social sciences is needed. One underutilized area is inquiry into how different cultural traditions order their universe to derive meaning and values from ecosystems in a manner directive for human behaviour. Providing insight into human perceptions of ecosystems and their components, social sciences contribute to understanding knowledge systems of Indigenous peoples and methods for relating Western and Indigenous management approaches. First Nations traditional ecological knowledge (TEK) and Western science represent potentially complementary traditions that can inform EBM. Although overlap exists, these traditions comprise distinct knowledge systems incorporating different methods and ways of knowing. An epistemological analysis of convergence and divergence between TEK and Western science is presented with attention to the social, philosophical, and methodological features of TEK systems. This framework is applied to the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound whose membership included Nuu-Chah-Nulth elders and forest scientists. Drawing equally on TEK and Western science, the Panel developed the groundbreaking silvicultural system of variable retention advancing EBM in Canada and spawning other initiatives. Ecosystems provided the shared conceptual terrain for bridging TEK and ecological science—the “best of two cultural worlds.” Special skills are required for such intercultural EBM with implications for ecosystem-based paradigms beyond this case. The boreal forest provides a worthwhile context for follow-up research.

KEYWORDS: *Clayoquot Sound, coastal temperate rainforest, cultural literacy, ecosystem-based management, epistemology, First Nations, knowledge systems, traditional ecological knowledge systems, Western science.*

Contact Information

1 Assistant Professor, Environmental Management and Sustainable Development, Haskayne School of Business, International Resource Industries and Sustainability Centre, University of Calgary, 2500 University Drive NW, Calgary, AB T2N 1N4. Email: lertzman@ucalgary.ca

Introduction

Bridging traditional ecological knowledge and ecosystem science: The best of two cultural worlds

As a rising paradigm within resource management, ecosystem-based management (EBM) can be seen as part of larger developments within industrial society. The seminal Canadian case comes from the famous forest industry conflict of Clayoquot Sound on Vancouver Island that resulted in the creation of a scientific panel consisting of First Nations elders and a multidisciplinary team of scientists. Drawing on traditional ecological knowledge (TEK) and science, the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound was mandated to develop “world class” forest practice standards in the coastal temperate rainforest. The Clayoquot Sound Scientific Panel received major recognition as an application of EBM for variable retention silviculture (Lertzman 1999, 2006; Drever 2000; Lertzman et al. 2002; Lindenmayer and Franklin 2002; Mitchell and Beese 2002; Drever and Lertzman 2003; Beese et al. 2003; Mabee et al. 2004; Zielke et al. 2004; Lertzman and Vredenburg 2005; D’Eon 2006b; Bunnell 2008; Butt and McMillan 2009). Industry applications led to an award from the Ecological Society of America. While not ignored, less attention has been given to the Scientific Panel’s cross-cultural contributions (Lertzman 1999, 2006; Atleo 2004; Lertzman and Vredenburg 2005; Turner 2005; Lertzman 2009; Trospen 2009). Though more difficult to replicate, the Panel’s efforts to bridge TEK and Western science remains its most salient feature.

I am particularly interested in this cross-cultural interface and its implications for EBM. First Nations of North America have used forests sustainably for thousands of years, often deploying fire as a management tool (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a; Turner 1999, 2001; Confederated Salish and Kootenai Tribes 2000; Berkes and Davidson-Hunt 2006; Trospen 2007a). Some object to the term “management” in reference to Indigenous peoples arguing it isolates and compartmentalizes traditional knowledge and practices from their cultural context (Lepofsky 2009). Although based on different worldviews, institutions, and practices, others argue significant parallels exist between structures of traditional Indigenous resource management systems and those based in Western science (Lertzman 2009). Indeed, features of sustainability emerging recently in modern industrial culture seem convergent with stewardship principles long practised by

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Indigenous peoples (Turner 2005; Lertzman 2006; Turner and Berkes 2006; Berkes 2008; Lertzman 2009).

It is my conviction that TEK and Western science represent parallel, potentially complementary traditions. The ecological knowledge of a given First Nation and that of Western science are derived from equally valid and authoritative cultural traditions, each having its own philosophical foundations, methods of validation, and communities of respected experts (Lertzman 1999, 2003, 2006). Thus, I juxtapose the term “traditional Western science” (TWS) alongside TEK. The Scientific Panel in Clayoquot Sound constituted an unprecedented bridge between these esteemed traditions: the best of two cultural worlds. Rather than trying to “integrate” TEK into science, the Scientific Panel fostered a bridge between cultures with ecosystems providing the common ground.

While more recent forestry efforts drawing on TEK and TWS have developed since the Scientific Panel in Clayoquot Sound (e.g., Confederated Salish and Kootenai Tribes 2000; Lertzman 2006; Coastal First Nations 2007; Trospen 2007b; O’Flaherty et al. 2007; Natcher [editor] 2008), it remains the seminal high-profile example. With its unprecedented mandate to develop sustainable forest practice standards drawing equally on TWS and Nuu-Chah-Nulth TEK, the Clayoquot Scientific Panel achieved a full consensus on all recommendations where previous land use planning attempts had failed. Its context was the largest, most organized environmental conflict in Canadian history with government pressure, industry demands, environmentalist lobbies, local and international interests amid public scrutiny. The intercultural character of the Scientific Panel and its approach resulted in a unique perspective on EBM providing the crucible for variable retention, which was one among several other key recommendations.

This paper starts with a discussion of EBM as a rising paradigm in resource management. Theoretical materials pertaining to TEK and TWS are then presented as an analytical framework for the Clayoquot Panel followed by analysis of the Panel's work. Implementation of recommendations, although outside the Panel's mandate, is addressed when considering broader implications of the Panel's model.

Ecosystem-based management: A rising paradigm

The emergence of ecosystem-based thinking is a feature of larger developments within Western industrial society. The idea of a shift in worldview with ecosystems as a central conceptual pillar has been addressed in such diverse fields as ecology, philosophy, economics, engineering, political science, religious studies, and feminism. The seminal author to apply Thomas Kuhn's (1962) idea of paradigm shift to an ecologically based cultural transition is likely Fritjof Capra (1982) who extended his work from theoretical physics (1972) to living systems arguing that the current state of ecological decline is fundamentally a crisis of perception rooted in the Enlightenment. He lauded a scientific transition from a mechanistic, exploitive worldview to one that is ecological and holistic (Capra 1982, 1996). The transition to ecological systems theory with applications in the natural and social sciences is seen as a "change in paradigms as radical as the Copernican Revolution" (Capra and Pauli 1995:2). Some may be uncomfortable with the spiritual proclivity of this perspective and sheer grandness of the enterprise yet its popularity is hardly disputable.

Ample scholars within resource management discuss EBM as representing a paradigm shift (Roe 1995; Meyer and Swank 1996; Lackey 1998; Cortner and Moote 1999; Yaffee 1999; Lertzman et al. 2002; Quinn 2002; Quinn and Theberge 2004; United Nations Environment Programme 2006; Leech et al. 2009; Lepofsky 2009; Lertzman 2009). From this perspective, ecologists consent that as a guiding paradigm EBM poses distinct scientific, management, educational, and political challenges (Meyer and Swank 1996; Cortner and Moote 1999). Although social science commentary is growing, EBM literature resides primarily within the natural sciences, including interdisciplinary work in both terrestrial and aquatic ecosystems. A theoretical body of literature now exists for EBM and its other moniker "ecosystem management" (EM; e.g., Slocombe 1993, 1998; Grumbine 1994, 1997; Christensen et al.

1996). Much of this literature is from the United States, yet EBM has a solid, growing presence in Canada for which forestry is chiefly enthusiastic (Quinn and Theberge 2004).

The origins of EBM and its scientific basis are associated with the Forest Ecosystem Management Assessment Team, which became the foundation for the US Northwest Forest Plan. This team was initiated in 1993 by President Bill Clinton to break the controversial deadlock associated with the Northern Spotted Owl. This led to a general shift in the focus of forest management from sustained yield to conserving biodiversity with emphasis on endangered species (Ward et al. 2006). The roots of such ecosystem-based thinking lie deep within the conservation movement including such ancestors as Aldo Leopold and John Muir (Grumbine 1994, 1997; Drengson and Taylor 1997; Mabee et al. 2004; Skroch 2005) with inspiration, albeit romantically, from Native North Americans.

A growing literature defines EBM and/or ecosystem management, its elements, and scientific basis offering insights into core principles and variant themes (Grumbine 1994, 1997; Christensen et al. 1996; Yaffee 1999; Quinn 2002; Quinn and Theberge 2004; Skroch 2005; D'Eon 2006a). Leech et al. (2009:2) described EBM as an "evolving philosophical approach to managing natural resources" offering a summary of concepts and definitions adapting Yaffee's (1999) continuum from single sector to ecoregional management. In their Canadian survey, Quinn and Theberge (2004) found explicit definitions for EBM lacking in many jurisdictions. Adoption of EBM terminology in legislation and policy occurs largely at the federal level (particularly parks) with disparity among provinces and territories. Although details of meaning differ, some notion of EBM is widely accepted between various agencies, yet research into its human dimensions lags behind.

Yaffee (1999) suggested that the diversity of meanings and definitions of EM may be a good thing. The complexity of the field, difficult nature of the tasks, and the fact that unknown elements outweigh those known, make "early" consensus unlikely. He described a continuum from the anthropocentric approach of single and multi-sector use to a biocentric approach (where most efforts occur) into an ecocentric paradigm. "Although the shift from multiple use to ecosystem-based management is often correctly viewed as a paradigm shift there are significant conceptual differences between the second and third faces that

qualify as paradigmatic differences in Kuhn's definition of scientific paradigms" (Yaffee 1999:721). The main point is reversing the overall goal of management paradigms. Rather than maximizing human use subject to environmental constraints, an ecosystem-based approach seeks ecological integrity with sustainable human use.

Leech et al. (2009) drew attention to a difference in emphasis between ecosystem management and ecosystem-based management. Some prefer "ecosystem management" as EBM seems to "put ecosystems above all else." Others prefer "ecosystem-based management" as it clarifies managing people not ecosystems. I affirm the second position. "Resources" are fine on their own; human behaviour requires management. Ecosystem-based management emphasizes the paradigmatic nature of a shift in perspective from exploitive approaches of single sector, multiple use, or integrated resource management to one that is ecosystem based. Rather than maximizing extractive yields from given ecosystem components, EBM starts with ecosystems as the field of inquiry and application seeking to manage human behaviours within the scale and thresholds of ecosystems. This paradigmatic shift from anthropocentric to ecocentric reorganizes our thinking and behaviours within the context of ecosystems.

The extent to which EBM eventuates a larger cultural paradigm shift is still debatable; however, EBM has been addressed in some fashion by most sectors of North America from government to private sector and civil society. This includes federal and state governments in the United States (Morrissey 1996; Yaffee 1996), Canadian federal and provincial governments (Quinn and Theberge 2004), and industry (e.g., Weyerhaeuser 2002). Yaffee (1996) cited research revealing the presence of EM in every one of the United States. Quinn and Theberge (2004) concluded that EBM had taken root in Canada being formally reflected in mandates at all levels of government, particularly parks, increasingly in oceans and fisheries management, as well as the private sector. Non-governmental organizations have become active with EBM initiatives internationally (United Nations Environment Programme 2006), and domestically through environmental non-governmental organizations (ENGOS) (Drever 2000; Roburn and Tam Wu 2007). Multi-sector collaboration has taken place (Coast Information Team 2004), an independent scientific panel formed (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995c), and

international multi-stakeholder practitioner networks established (EBM Tools Network: www.ebmtools.org).

First Nations are involved with EBM. It has been suggested that EBM is consistent with First Nations cultural and stewardship values. "Traditional knowledge of sustainable resource use and management is reflected in our intimate relationship with nature and its predictable seasonal cycles and indicators of renewal of life and subsistence" (Brown and Brown [compilers] 2009). The seminal example is the Clayoquot Scientific Panel (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a). The panel spawned other initiatives such as the Coast Information Team, and Turning Point which started in conjunction with the David Suzuki Foundation and is now run by Coastal First Nations, a collective of eight First Nations on British Columbia's North and Central coasts, including Haida Gwaii, working with government, industry, and ENGOS. A growing body of research and literature addresses First Nations with relevance to EBM and forestry (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a; Berkes et al. 2000; Confederated Salish and Kootenai Tribes 2000; Blackstock 2002; Michel and Gayton 2002; Hawley et al. 2004; Hutton 2004; Berkes and Davidson-Hunt 2006; D'Eon 2006a; Lertzman 2006; Sterritt 2007; Natcher [editor] 2008; Stevenson and Natcher [editors] 2009). Much of this research involves community-university collaboration.

Some scholars reject the term "management" in reference to First Nations traditional land use (Lepofsky 2009). Resource management has its origins with industrial society carrying considerable historical and ideological baggage and many Aboriginal people are uncomfortable with such terms implying human superiority and separateness from nature (Notzke 1994). Is it reasonable or ethical to consider Aboriginal people's roles in such Eurocentric institutions? Standard research methods can be ineffective if not hostile to TEK practitioners and what they impart. The very attempt to collect, document, and integrate TEK within scientific management frameworks may be inherently colonial (Nadasdy 1999; Lertzman 2006). Even still, others suggest that EBM describes what has been practised historically in North America. According to Coastal First Nations, and consistent with the Clayoquot Scientific Panel's perspective, EBM "... is a modern term that describes what First Nations have always done: we use our knowledge and wisdom to look after our lands and our communities" (Coastal First Nations 2007). Dr. Richard Atleo, Ahousaht Hereditary Chief Umeek and

Co-Chair of the Clayoquot Scientific Panel, explained that: “ecosystem-based management was a huge part of the ordinary way of life . . . there were enormous management systems of Indigenous peoples throughout the Americas” (pers. comm., February 2010).

First Nations are integral to EBM in Canada. Aboriginal peoples occupy a strategic and inimitable position in Canadian society, particularly where land use and natural resources are concerned. This is due to several factors, the most obvious being their long-standing presence prior to other occupants of North America. Persistent cultural traditions and oral histories, sense of identity and relationship with the land, traditional knowledge and land use give Indigenous peoples a unique sense of belonging and incomparable insight into ecosystems. Their traditional knowledge and management systems provide alternative paradigms commensurate with ecosystem-based approaches that are the leading edge of scientific resource management (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a; Trosper 1998; Lertzman 1999, 2006; Berkes et al. 2000; Turner 2005; Berkes and Davidson-Hunt 2006; Reid et al. [editors] 2006; Berkes 2008; Lertzman 2009). As the original “keepers of the land” (Coastal First Nations 2007), First Nations have a vital leadership role to play.

Compelling legal arguments underscore the role of First Nations in EBM. Aboriginal peoples in Canada have unique collective and treaty rights recognized in the Royal Proclamation of 1763 and enshrined within the Canadian Constitution. Consistent with ideas in natural law are traditional teachings recognizing inherent Aboriginal rights and responsibilities toward the land conferred by the Creator. “Prior occupancy” is a British land-tenure concept adopted in the Canadian legal system and the basis for “Aboriginal title.” This is why the Crown cannot unilaterally extinguish Aboriginal title but only through treaty, which dovetails with ideas of “Aboriginal sovereignty.” From a constitutional perspective, Aboriginal peoples occupy a *sui generis*, or special status, held by no other Canadians. For all the above reasons, along with an increasingly effective ability to exercise the same, First Nations occupy a uniquely strategic position in Canadian society. Ongoing Supreme Court decisions (e.g., Canada, Supreme Court 1990, 1996, 1997, 2004b, 2005, 2006; also see Bergner 2005; Morellato 2008) will see First Nations

participation in land use planning increasingly become the way of life for natural resource issues in Canada.¹

Ecosystem-based management has been addressed within social sciences. The general consensus is that EBM has an understandably natural science orientation, yet is deficient in social science. Social scientists tend to agree with the Ecological Society of America’s *Report on the Scientific Basis of Ecosystem Management* (Christensen et al. 1996) that humans are components of ecosystems while arguing for greater understanding and application of this element. Although natural scientists recognize the human element of ecosystems, social science is often relegated to conflict management, litigation avoidance, education, and political process (Endter-Wada et al. 1998). Social scientists have addressed the importance of human institutions in achieving ecosystem management (Yaffee 1996) as well as legal and public policy considerations (Keiter 1996). While Roe (1995) asserted EM simply “can’t work” without social sciences, Cortner and Moote (1999) argued profound political changes are needed to achieve EBM. Haider and Morford (2004) summarized social science contributions to resource management, describing 10 ways decision makers use social sciences. They predicted social sciences will become increasingly important in EBM, advancing collaboration and cross-fertilization between natural and social sciences. Interdisciplinary collaboration is essential for ecosystem-based resource management and was a notable feature of the Clayoquot Scientific Panel.

Endter-Wada et al. (1998) proposed a conceptual framework for understanding the role of social sciences in EM. They asserted that social science contributions to EM are often misunderstood owing in part to differing paradigmatic and epistemological orientations between the natural and social sciences. They cited Grumbine’s (1994, 1997) influential contributions to EM as a typical example of the “false dichotomy” between the natural and social sciences. Conventional approaches to EM are especially weak on integrating the cultural traditions, social values and meanings that link human populations materially and symbolically with natural resources, thus influencing how humans use ecosystems. They suggested that anthropology and social theory provide needed insight into the nature of human conceptual systems regarding resources, which are highly variable across cultures and stakeholders, helping account for

¹ See also rulings from the British Columbia Court of Appeal (2005, 2008).

uncertainty and complexity in social and ecological systems. In a similar vein, Haider and Morford (2004) asserted that the diversity of worldviews described by social sciences is best understood and investigated with a diversity of research methods. Thus, social sciences contribute to understanding Indigenous knowledge systems, cultures, and methods for relating with science-based forest management approaches.

Western science and TEK are based in fundamentally different worldviews with their own philosophy, institutions, and methods. One could hardly develop an understanding and appreciation for science without some basic insight into its methods and philosophy. Similarly, without basic familiarity and training one's understanding and appreciation for TEK is impaired. Understanding the discourse between these cultural paradigms and their contributions to EBM requires familiarity with these traditions including areas of convergence and divergence. One challenge is that although the tenets and procedures of TWS can be learned at a university, the philosophy and practices of TEK are not readily available to those with formal science training. Such abilities are acquired through deep cultural immersion and training over time, often in remote locations. Scientists are increasingly aware of TEK and the management capabilities of its practitioners. Yet researchers are less familiar with the cultural protocols that guide the transmission of TEK, its philosophical foundations, and the social institutions through which it is transmitted and verified (Lertzman 2003, 2006). The following section reviews key areas of epistemological convergence and divergence between TEK and TWS with an emphasis on the social, cultural, and methodological features of TEK systems. Developing an understanding of divergence helps cultivate appreciation for convergence.

Traditional ecological knowledge systems and Western science: An overview

Many have addressed TEK, its related concepts and management applications in various contexts (Freeman 1985, 1992; Traditional Knowledge Working Group 1991; Berkes 1993, 2008; Assembly of First Nations and

Inuit Circumpolar Conference 1994; Robinson et al. 1994; Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a; Cruikshank 1998; Duerden and Kuhn 1998; Grenier 1998; Kassam and Graham 1999; Lertzman 1999, 2003, 2006; Nadasdy 1999; Turner 1999, 2001; Battiste and Henderson 2000; Berkes et al. 2000; Cajete 2000; Emery 2000; Turner et al. 2000; Tuhiwai Smith 2001; Sherry and Myers 2002; Atleo 2004; Hawley et al. 2004; Moller et al. 2004; Lertzman and Vredenburg 2005; Berkes and Davidson-Hunt 2006; Reid et al. [editors] 2006; Turner and Berkes 2006; Lepofsky 2009; Lertzman 2009). My orientation to these materials is a systems approach with philosophical, methodological, and social dimensions. After some background review, this will be presented as an analytical framework for the Clayoquot Scientific Panel.

Supplemented by comparative philosophy, anthropology, and ecological sustainability, my understanding of traditional knowledge is primarily through experience.² My teachers have been Indigenous professors trained within their own cultures. I use theoretical materials with currency in the sustainability literature to draw from these experiences and contribute hopefully in a respectful manner. Neither TWS nor TEK represent monolithic institutions. Generalities and bifurcations that foster division between traditions are not usually helpful and tend to oversimplify. It must also be stated that the entire discussion occurs unavoidably within a historical context. Several hundred years of colonialism have left an indelible impact on TEK practitioners and their communities. These influences pose philosophical, socio-economic, political, and institutional barriers for bridging TEK and TWS in a manner respectful to the practitioners and teachings of both traditions (Nadasdy 1999; Battiste and Henderson 2000; Tuhiwai Smith 2001; Lertzman 2003; Hawley et al. 2004).

There is no universally accepted definition of TEK (Berkes 1993), nor is it a uniform concept across Indigenous peoples (Battiste and Henderson 2000). First Nations scholars Battiste and Henderson (2000) suggested that attempts to define TEK are inherently colonial, based on a Eurocentric need to categorize and control. They see Indigenous knowledge as a mode or component of ecological order; its great diversity is a

² This includes some 25 years experience in various First Nations communities, largely in western Canada, to a lesser extent in eastern Canada, the United States, and the Amazon. Periods of community and wilderness immersion, participation in traditional land use, social and ceremonial activities, have privileged me with long-term relationships and family adoptions. I am deeply grateful to the elders and traditional people who have guided, challenged, and supported me in ways not readily available within my own cultural and educational background.

reflection of ecological diversity. Rather than seeking to define, it thus seems more fruitful to develop one's understanding and appreciation. This is a challenge for Western scholars as the means to do so is experiential and community-specific, gained through cultural immersion and direct experience over time. Linguistic diversity attests to the great variety of First Nations cultures, with 11 original language families in Canada. Shared philosophical principles may also exist. Dr. Richard Atleo, Ahousaht Hereditary Chief and Co-Chair of the Clayoquot Scientific Panel, explained that a "uniformity of worldview between widely non-communicating peoples" can be seen, "which reflects not only the Nuu-Chah-Nulth worldview and philosophy, but also principles which are transportable and can be applied in many areas" (pers. comm. in Lertzman 1996:20). Before considering this further, some theory of knowledge must be addressed.

"Epistemology" refers to theory of knowledge—the study of the origins, limits, and meaning of knowledge. It addresses "how we know what we know" (see Landesman 1997; Audi 1998). Western science and TEK are examples of what anthropologist S.J. Tambiah (1990) referred to as "different orderings of reality." These distinct philosophical orientations are based on different assumptions about the nature of the universe offering alternative understandings and values to the ecosystems humans inhabit.³ Thus, cultures can share ecosystems bringing different interpretations and meaning to them. These philosophical differences between TEK and TWS bring greater veracity to agreements between their practitioners. To appreciate the common ground, it is necessary to understand the divergence.

Both TEK and TWS describe empirical experience, yet their interpretations are based on different assumptions about the nature of the world. Often described as "rational empiricism," TWS addresses phenomena that can be measured in time and space and generally does not recognize that which is outside. Traditional ecological knowledge addresses this empirical realm and also brings to bear an understanding of that which is not measurable in time and space. Because aspects of TEK are outside the realm of science, gaps exist in recognizing some of its central features. Occidental scholars may acknowledge the spiritual

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character of TEK, often describing it as "holistic" in nature, yet such descriptions tend to be vague. The standard epistemological account for TEK is trial and error over time (e.g., Grenier 1998). Although empirical observation and deduction are important elements of TEK, these only provide a partial account among other vital means of generating traditional knowledge (Lertzman 1999; Lertzman and Vredenburg 2005). Such incomplete accounts identify knowledge outcomes but not all the means through which TEK is generated.

Addressing the "different origins and common goals" of scientific and traditional knowledge, the Clayoquot Scientific Panel noted people can acquire knowledge in different ways yet reach identical conclusions:

... consider traditional medicinal knowledge: it is acquired through the rigours and methodology of a vision quest, in which persons isolate themselves and undergo fasting, cleansing, and other ritual activities to receive inspiration and medical knowledge from supernatural powers. Although the methodology of the vision quest is unfamiliar to the modern medical community, the knowledge gained often coincides with that of modern medical scientists, acquired by wholly different methods (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:16).

A variety of intuitive, somatic, and other spiritual modalities are vital for generating TEK including: singing, drumming, dancing, dreaming, fasting, praying, purifying, healing, periods of isolation, ceremony, and ritual. These TEK systems are holistic because they synthesize empirical observation and deduction with

³ Along with epistemological, there are also cosmological and ontological differences. Taken together epistemology, cosmology, and ontology provide a useful cross-cultural heuristic to depict how systems of meaning are organized within differing cultural paradigms. See Lertzman (1999) for elaboration and application of this approach to the Clayoquot Scientific Panel.

other ways of knowing. Traditional knowledge brings understanding of that which cannot be measured in time and space to foster meaning and value for that which can.

Ecological knowledge can thus be gained through different experience. The Clayoquot Panel noted the following three major distinctions between TEK and TWS.

1. TEK is “profoundly spiritual . . . The Creator made all things one”; this explanatory approach was abandoned during the Renaissance for an impersonal “inter-subjectively testable” method.
2. TEK adopts the “fundamental principle that all things are related and interconnected.”
3. The recipient of TEK “is an integral part of the system” while the researcher of scientific ecological knowledge “is deemed to perform best when attempting to behave objectively as a dispassionate observer” (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:16).

Scientific knowledge is based on separation of the knower from the known, whereas traditional knowledge is based on relatedness. According to Tamba (1990), these two ordering systems are founded respectively on principles of “causality” and “participation.” According to Tewa professor Dr. Gregory Cajete (2000), understanding empirical relationships is not enough; one must nurture these relationships. This spiritual ecology posits a unity of ecosystems and components including humans (Lertzman 1999, 2006; Cajete 2000; Atleo 2004). Fact is not separate from value; knowledge is inseparable from ethics of traditional land use practices and management systems (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a; Lertzman and Vredenburg 2005; Berkes 2008).

“Traditional ecological knowledge” can be a problematic term. The word “traditional” lends a stagnant character to something dynamic, adaptive, and lived. Focusing on “knowledge” places attention on the outcome of a whole complex system of relationships and institutions with shared beliefs and values mediated by practices and protocols of oral tradition. Knowledge is important; more so are the people and lifeways that generate it. Several common themes were gleaned from a literature review of TEK (Lertzman 1999), including:

- a spatial aspect (i.e., geographically located);
- a temporal nature with long time frames in oral history;
- a socially mediated aspect (i.e., transmitted through social institutions); and
- a culturally situated nature (i.e., functions within a larger cultural and philosophical context).

Another, less prevalent aspect in the literature, is the methodological element of TEK. This refers to the traditional protocols that govern how TEK is accessed, verified, and transmitted. Boiling down these elements and building on concepts in the sustainability literature, “traditional ecological knowledge systems” refer to the social relations and institutions (“social capital”; adapted from Coleman 1990 and Putnam 1993) founded on shared beliefs, philosophy, and values (“cultural capital”; adapted from Berkes and Folke 1994) mediated by the practices and protocols (“methods”) of oral tradition in given ecocultural regions developed over long periods of time (Lertzman 1999).⁴ All are necessary elements of TEK. If any one aspect is circumvented, the integrity of the system, its members, and their knowledge are compromised.

Methods play a vital role in TEK systems and our case study. Some may not think of such cultural practices as “methods” in the scientific sense. In oral traditions, however, knowledge and its transmission are guided through the rigour of strict rules of protocol that, although different between nations, are generally replicable within language areas (Lertzman 1999, 2003). These protocols are the methods of TEK and, along with the consultation among its experts, are analogous to scientific method and peer review. Protocol ensures that knowledge is generated and transmitted with veracity in a manner consistent with the philosophy, institutions, and practices of oral tradition in a given community. These methods are acquired cultural skills requiring ongoing mentoring and instruction, often involving arduous intellectual and even physical training. Some of these competencies can be passed interculturally, forming the basis of what I refer to as “cultural literacy” (Lertzman 1996, 2003; Lertzman and Vredenburg 2005). Without a working knowledge of its methods, TEK research

⁴ Coleman described social capital as “social structural resources.” I define it as the organizational resources of relationships, trust, and institutions on which communities are based. Berkes and Folke (1994) suggested that cultural capital determines how a society uses natural capital and modifies it to create human capital. Cultural capital can thus be seen as an interface between natural and social capital. I use cultural capital to refer to the shared resources of philosophy, values, knowledge, and practices on which communities are based.

and application lack rigour and credibility. Breach of propriety is a grave concern to the communities and family members of TEK practitioners, making research collaboration more difficult (Lertzman 2002). Proprietary issues have been addressed by Indigenous and other scholars (Lertzman 1996, 2003; Grenier 1998; Battiste and Henderson 2000).

The TEK of a given First Nation and that of TWS are derived from equally valid and authoritative traditions. Each has its own philosophical foundations, communities of respected experts, and methods of validation. I am less interested in attempts to “integrate” TEK into scientific management. There may be important data; however, standard research methods often run contrary to TEK protocols. Even with good intentions such efforts recreate colonial relationships (Cruikshank 1998; Nadasdy 1999). Maori scholar Tuhiwai-Smith (2001) suggested that research is inextricably linked to colonialism and one of the “dirtiest words” in the Indigenous world’s vocabulary. Nlaka’pamux cultural educator Terry Aleck described:

We’ve had tons of professors and researchers come into our communities and divulge information and we don’t see nothing from it . . . A lot of the elders have voiced that they’ve really felt invaded upon; researcher after researcher has come into the community . . . they research us to death, and then boom they’re gone . . . (pers. comm. in Lertzman 1999:181).

Not only is this ineffective, it is disrespectful. I am interested in authentic cultural exchange. Instead of integrating TEK, I suggest “bridging” may be a more effective idea (Lertzman 1999, 2006; Lertzman and Vredenburg 2005). A major work by the Millennium Ecosystem Assessment extensively addresses the bridging of knowledge systems (Reid et al. [editors] 2006). Ecosystem-based management is likely the best current management paradigm to foster a bridgehead of understanding (to use Tumbiah’s [1990] term) between TEK systems and TWS. We can now turn to a case study in which significant aspects of this were arguably achieved, where substantive dialogue among respected practitioners created a shared space between traditions bringing the best of two cultural worlds to bear on the challenges of EBM.

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Case study: The Clayoquot Scientific Panel

This case study examines the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound as an example of bridging traditional knowledge and Western science in ecosystem-based management. Of particular interest is the discourse between elders and scientists and how they achieved consensus. I will explicate the model that emerged through the Panel’s work and draw lessons for EBM. Research for the case study involved interviews with key panel members, review of government press releases and background information provided to Panel members, and detailed examination of panel reports, particularly Report No. 3: *First Nations’ Perspectives Relating to Forest Practices in Clayoquot Sound* (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a).

The Scientific Panel for Sustainable Forest Practices in Clayoquot Sound was formed by the government of British Columbia based on recommendations from the Commission on Resources and Environment. Its mandate was to develop “world class” standards for sustainable forest management in Clayoquot Sound’s old-growth, temperate rainforests (Figure 1) drawing on scientific and traditional knowledge. The Panel included scientists from various fields and four Nuu-Chah-Nulth members. Full consensus on all recommendations was achieved where previous attempts at land use planning had failed. Its context was one of the most hotly contested environmental conflicts that brought industry to a halt through the largest non-violent civil disobedience in Canada’s history.

Historical background and policy context

The Nuu-Chah-Nulth are a collection of some 15 First Nations with shared language, system of governance based on hereditary chiefs, and history going back thousands of years. Their territory consists of lush coastal temperate rainforests on Vancouver Island’s west coast with marine ecosystems of high biodiversity. Vast natural resources sustained a rich, complex lifestyle with a culture famous for its carvings, ocean-going vessels, and elaborate ceremonial life. This natural capital was stewarded through a storehouse of social and cultural wealth enabling long-term socio-ecological sustainability. The material wealth and political power of these coastal forest peoples was recognized by Europeans and contributed to initial terms of reference for Canada’s political and economic relations with First Nations. As with most

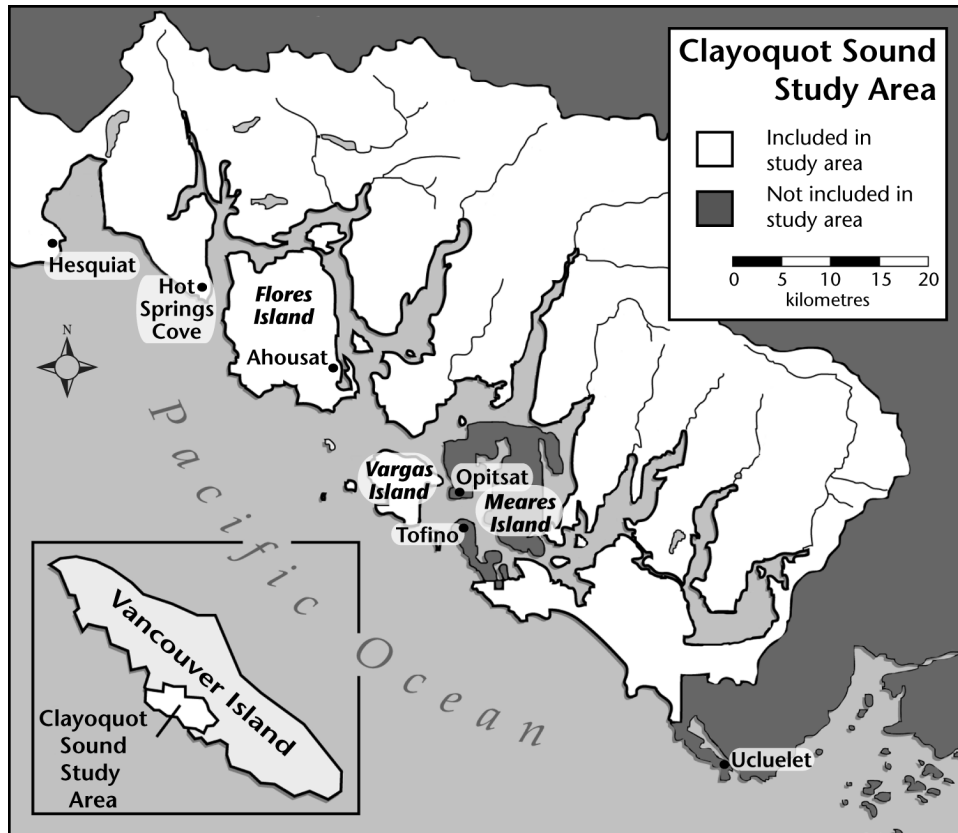


FIGURE 1. Map of Clayoquot Sound study area.

of British Columbia, the Nuu-Chah-Nulth signed no treaty with the Crown, thus their Aboriginal title was not extinguished. This is sobering when considering disputes between environmentalists and forest companies over old-growth coastal temperate rainforest. An Interim Measures Agreement was signed between Nuu-Chah-Nulth *HawiiH* (hereditary chiefs) and the Province of British Columbia close to commencement of the Scientific Panel's work.

Amid ongoing roadblocks and demonstrations against clearcut logging in Clayoquot Sound's old-growth forests, strong reactions from industry workers, voices of concern from various actors in the private and public sector in the face of growing international scrutiny, the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound was announced by the Premier of British Columbia in October of 1993. The 19-member panel consisted of 15 internationally recognized scientists from British Columbia and Washington State representing various fields including biodiversity, ethnobotany, forest harvest planning,

silvicultural systems, hydrology, soils, fisheries, wildlife, roads and engineering, worker safety, recreation, and tourism. The Nuu-Chah-Nulth Tribal Council designated four experts in traditional knowledge, history, language, culture, and resource use including three elders and a hereditary chief as co-chair. The Panel was charged with developing world-class standards for sustainable forest management combining traditional and scientific knowledge consistent with international precedents in the *Convention on Biological Diversity*, *Agenda 21*, and *Guiding Principles on Forests* to meet forest stewardship standards for Clayoquot Sound's designation as a United Nations Biosphere Reserve.

Findings

How did the Clayoquot Scientific Panel achieve success given the cultural/philosophical differences of its members and professional diversity of their scientific backgrounds in a context of local and international scrutiny, government and industry demands with political pressure from various interest groups? I address

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this question using the TEK-system framework presented above to analyze the discourse between the Panel's Nuu-Chah-Nulth elders and scientists. Findings are detailed below.

Working with traditional ecological knowledge methods: The Nuu-Chah-Nulth inclusive process

The primary finding is adoption of Nuu-Chah-Nulth traditional protocols by the Panel as the basis for their work. On the initiative of Nuu-Chah-Nulth members, the Panel's first decision was to adopt the Nuu-Chah-Nulth inclusive process for discussion and sharing to reach agreement. Use of this traditional protocol was set as a pre-condition for Nuu-Chah-Nulth participation and became the basis of the Panel's planning and decision-making processes. Panel members interviewed all indicated that adoption of these methods enabled the Panel to build cohesion, overcome great challenges, and achieve consensus.

In a government press release announcing this development, Co-Chair Dr. Richard Atleo (Hereditary Ahousaht Chief Umeeek) offered the following.

While the relationship between indigenous and non-indigenous peoples over the past 500 years was characterized by misunderstanding and a lack of mutual respect, the protocol of the Scientific Panel is characterized by mutual respect, reciprocal inclusivity, and a shared commitment of working towards the common goal of an environmentally healthy planet (Province of British Columbia 1994).

This common goal required individual Panel members to commit to working together using the Nuu-Chah-Nulth inclusive process. Development of such a protocol was not part of the government's initial

directive, yet was hailed as a major accomplishment and enabled the Panel to develop a clearly articulated and inclusive philosophy for its work (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a).

The process used by the Panel was based on what Dr. Atleo learned "in my grandfathers' chiefly council" described as "everyone having a right to speak, to be heard and be understood." This is a "very arduous approach . . . if we don't understand that person then we clarify, not to agree but understand." Thus, "we could have disagreement but in a constructive way" (R. Atleo, pers. comm., February 2010). Interviews with Panel members revealed this traditional approach fostered cohesion under circumstances of internal stress and external pressure. When asked how consensus was achieved, Panel ethnobotanist, Dr. Nancy Turner, shared the following:

We used the Nuu-Chah-Nulth protocols for working together, we agreed on that right to begin with and part of that protocol was that we all solemnly committed ourselves, not only to listening . . . to what other people said and believe, but in trying to understand . . . in really trying . . . that's one step further than just listening . . . and listening, in itself, is one step further than many people will go (pers. comm. in Lertzman 1999:221).

Under the guidance of the elders and Chief Atleo, the protocol was used to facilitate a complex synthesis of various scientific, technical, political, economic, ethical, spiritual, and historical considerations.

According to the Panel's third report, the Nuu-Chah-Nulth inclusive process:

- Calls for each Panel member to exercise patience, flexibility, tolerance, endurance, and faith in a process and task surrounded by conflict and turmoil.
- Is characterized by a demonstrable and inclusive respect for individuals, for different values, and for data founded in both science and traditional knowledge.
- Created an atmosphere encouraging open discussion and the pursuit of consensus (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:5).

The above alludes to what Panel members confirmed, that the tasks faced by the Panel were challenging, at times contentious, even overwhelming. Thus, members would return to their commitment and using the protocol work through the issue at hand.

Dr. Turner described the experience in the following way:

... there were times when people were ready almost to give up and that we could never really come to any kind of agreement and we always at that point would go back to the original protocol, think it through, listen more carefully, talk about it, discuss it ... then find a way of getting around whatever problem that was ... (pers. comm. in Lertzman 1999:221).

Panel members confirmed that adopting the Nuu-Chah-Nulth protocol was the means to how consensus was achieved. Not only did this facilitate cross-cultural communication and understanding between elders and scientists, it facilitated consensus among the scientists. These findings were verified again in follow-up interviews with Panel members conducted 15 years after completion of the Panel's work. (R. Atleo, pers. comm., February 2010; N. Turner, pers. comm., February 2010; K. Lertzman, pers. comm., February 2010)

The Nuu-Chah-Nulth traditional protocol was fundamental to the Panel's success—TEK methods were the pivotal feature of a planning process that facilitated consensus interculturally, enabling the work of a multidisciplinary scientific body. In contemporary "management speak," we might refer to this as an "inclusive management model with participatory planning and consensus decision making" (Lertzman 2006). The overall approach is more than any one individual element (Trospen 2009). This has been a way of life for the Nuu-Chah-Nulth grounded in cultural teachings and training with generations of experience. An atypical way to write policy, it was clearly the most effective strategy for this complex exercise in EBM.

Hishuk ish ts'awalk: Respecting cultural teachings and spiritual philosophy

The next key finding relates to cultural capital. This highlights Nuu-Chah-Nulth spiritual philosophy and cultural teachings, respect for which was a central pillar of the Panel's work. Nuu-Chah-Nulth TEK, spiritual philosophy, and cultural teachings were not merely recognized out of courtesy: "Nuu-Chah-Nulth concepts and philosophies are integral to the work of the Clayoquot Scientific Panel" (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:5). Central features of Nuu-Chah-Nulth worldview became foundational concepts and guiding

principles in the Panel's work. These include the sacredness of and respect for all things embodied in the Nuu-Chah-Nulth axiom *hishuk ish ts'awalk*⁵ describing the official character of EBM adopted by the Panel.

The Panel's treatment "merely hints" at the "enormous scale of spiritual practices incorporated into the social and economic fabric of traditional Nuu-Chah-Nulth societies" (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:22). All things physical are derived from the spiritual; therefore, success in the physical is contingent upon an effective relationship and communication with the spiritual. This spiritual relationship requires intact ecosystems and is a profound source of identity:

Our ancestors still live with us in these forests where we encounter our spiritual values, our powerful healing medicines which were gifts of the Creator, the forests that are our very sustenance for everyday living, are also being blessed by our ancestors. The natural setting needs to remain stable (Roy Haiyupis, quoted in Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:ix).

The spiritual and the ecological correlate directly. "Even allowing for a passage through the valley [e.g., a road] would certainly destroy something of the spiritual treasure and quality that is there" (Roy Haiyupis, quoted in Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:23). Thus, diminishing the ecological diminishes the spiritual. The spirit of nature may be its greatest resource.

While ecological and spiritual value are equated, spiritually powerful areas often have great economic value. This can lead to conflict. "Direct conflict may arise between the economic interests of forestry and the need to preserve areas for their sacred values" (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:22). Panel members stressed that sacredness is not limited to just a specific place or locale. It includes whole species and habitats. "All entities used as resources (such as a tree, bear, deer or salmon) are to be treated as gifts from the Creator" (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:6). Thus, the entire Clayoquot Valley is a sacred place of worship. "Nature suggests with all its might that this is the central cathedral for meditation and cleansing . . ." (Roy Haiyupis, quoted in Scientific Panel for Sustainable Forest Practices in

⁵ Richard Atleo (Atleo 2004) has addressed this concept in detail.

Clayoquot Sound 1995a:23). These spiritual teachings are expressed profoundly in the Panel's recommendations relating to "Sacred Areas."

In discussing Sacred Areas, the Panel states: "land is spiritual." Sacred areas are pivotal to Nuu-Chah-Nulth culture and connection to the land is the foundation of spiritual identity. "In the same way that they see themselves as part of the land, they see the sacredness of the land extending beyond individual sacred sites" (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:68). Cultural heritage sites, the only type of area protected by legislation, with their emphasis on physical and written evidence "denies the many sites whose significance and existence is communicated by oral traditions" (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:26). The Panel thus recommended integrating physical sites into a broader model of cultural importance with sacred, historic areas and subsistence use. All three Panel members recently interviewed mentioned this as a topic deserving greater attention. Richard Atleo particularly pointed out the convergence of "sacred" with "ecosystem retention" (pers. comm., February 2010).

The convergence of EBM with traditional Nuu-Chah-Nulth philosophy on the Panel is exemplified in the concept *hishuk ish ts'awalk*. Meaning "Everything is One," it embodies the sacredness and respect for all life describing the approach to EBM recommended by the Panel. Roy Haiyupis explained:

Nothing is isolated from other aspects of life surrounding it and within it. This concept is the basis for the respect for nature that our people live with, and also contributes to the value system that promoted the need to be thrifty, not to be wasteful, and to be totally conscious of your actual needs . . . ideas and practices of over-exploitation are deplorable to our people [and] outside our realm of values (Roy Haiyupis, quoted in Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:6).

These Nuu-Chah-Nulth teachings instill a profound sense of oneness with humans and ecosystems. This is philosophically consistent with EBM, which also holds axiomatic the interconnected nature of ecosystems, including humans, as a guide for human behaviour.

The Panel's adoption of *ts'awalk* represented a "paradigmatic shift" (Atleo 2004:125) contributing to a new type of EBM (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a). Commensurability

of ecosystems provided the shared mental and material space for a common ground between TEK and TWS. Here, both TEK and TWS are ecosystem-based paradigms. Consequently, the Panel became one of the few scientific bodies lending credence not only to the empirical outcomes of TEK but also to the different ways in which it is generated beyond those recognized by TWS. They recognized that, whereas science removes the knowledge recipient to be a dispassionate observer, TEK regards humans as integral to ecosystems. Furthermore, TEK does not depart from its holistic view. Their major epistemological conclusion is that TEK provides for TWS an "external, independently derived reference standard" (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:17). Thus, bridging TEK systems and TWS strengthens mutual understanding of ecosystems, advancing ecosystem-based paradigms.

Hahuulhi and ecosystem co-management

The next major finding addresses Nuu-Chah-Nulth traditional social institutions. *Hahuulhi* is the traditional stewardship system of lands, waters, and resources governed by Nuu-Chah-Nulth hereditary chiefs—*HawiiH*. Resource use by First Nations in Clayoquot Sound is framed historically by *hishuk ish ts'awalk* and *hahuulhi* setting up the current basis for co-management:

Hahuulhi, the Nuu-Chah-Nulth system of hereditary ownership and control of traditional territories represents a long history of resource use and management in Clayoquot Sound, and provides a basis for Nuu-Chah-Nulth participation in co-managing the area and its resources (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:vii).

Nuu-Chah-Nulth exercised "plenary authority over their own territories" (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:8) before the arrival of Europeans, with clear boundaries between territories of different nations. The boundaries of all various resource use sites were known and owned by individual chiefs. These boundaries and resources were formally recounted and reinforced through protocols in feasts and other gatherings. "All the lands, waterways, shorelines, and offshore islands and waters, even relatively remote areas far inland" came under the *hahuulhi* system of ownership and stewardship (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:8).

Hahuulhi embodies Nuu-Chah-Nulth stewardship concepts and sustainable resource practices enacted at the community level. According to Roy Haiyupis, hereditary

chiefs have the responsibility to steward the forests, land, and sea within their *hahuulhi* including tribal members.

Embedded within the ha hoolthie initiated from his [the chief's] rights to, and ownership of tribal territories, lies the key to the social and cultural practices, tribal membership and property ownership, economical, environmental and resources controls to promote effective enhancement levels to sustain life for the tribe today and for generations to come (Roy Haiyupis, quoted in Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:9).

Hahuulhi is the traditional institution of resource stewardship. This property model is an effective blend of ownership, community obligation, and ecological sustainability. It assures ecological and community accountability based on the obligations of the chief's hereditary rights and responsibilities. Through hereditary ownership, the chief is obliged to steward his *hahuulhi* on behalf of the community and ecosystem. "Maintenance and enhancement of the natural food chain to sustain tribal members is a spiritual responsibility that extends to all people" (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:67). *Hahuulhi* thus provides an institutional link between natural and social capital with governance for stewarding both.

Therefore, as stated in recommendation 7 of Report 3, "Hahuulhi: Traditional System for Ecosystem Management", *hahuulhi* provides a framework for co-managing Clayoquot Sound:

In consultation with the co-chairs of the Nuu-Chah-Nulth Tribal Council, hahuulhi, the traditional system for ecosystem management, must be recognized in ecosystem management processes in Clayoquot Sound; Hahuulhi will be used in determining ecosystem management within traditional boundary lines (Scientific Panel for Sustainable Forest Practices in Clayoquot Sound 1995a:51).

Recognition of *hahuulhi* as a form of EBM reflects an opportunity for social learning and institutional models. The report's second and third recommendations also address co-management. Recognizing equality of the Province of British Columbia and Nuu-Chah-Nulth as partners in co-management, these recommendations are consistent with the Interim Measures Agreement between Nuu-Chah-Nulth chiefs and the Crown. The Panel

endorsed co-management as a means for drawing TEK, values, and decision-making capabilities into EBM.

Cultural literacy: Personal learning/professional skills

The final major finding relates to cross-cultural skills and the Nuu-Chah-Nulth inclusive process. The Panel reached a full consensus, yet success was not a forgone conclusion. It came through intense discourse and sustained effort. Panel members struggled with the content, the process, their associates, and themselves. Chief Atleo commended his Co-Chair, Dr. Fred Bunnell, saying the Report was "going through the fire for both of us." At the outset, Chief Atleo had been skeptical:

. . . my opening comment at the first meeting was that I didn't expect the process to succeed because we'd never been able to sit down at the table in our history and over time make it work. I said, "we've always been betrayed . . . so why should we be successful here?" (pers. comm. in Lertzman 1999:223).

Dr. Atleo described the early stages of the Panel's work in the following manner:

. . . there was a lot of misunderstanding, lack of communication . . . we used the same English language, but often, when you have people from two different cultures using the same language, it's usual I think, to have misunderstanding (pers. comm. in Lertzman 1999:245).

Panel members went through a series of developments culminating in the outlook displayed in their reports. Chief Atleo portrayed the Panel as going through a paradigm shift. He commented that the Panel changed greatly, ". . . they went through a literally transformational process . . . a paradigm shift and we (Nuu-Chah-Nulth) helped them . . . It was a group process" (pers. comm. in Lertzman 1999:248). This was a demanding developmental process. Members were personally affected and professionally stretched by the process; they had to learn new skills.

The ability to communicate effectively outside one's culture of origin can be referred to as "cultural literacy" (Lertzman 2003). These skills are acquired through experience and can challenge one's perceptions. Such learning occurs at a personal level yet has professional application. Two Panel members had already developed such cross-cultural competence; thus, Drs. Atleo and Turner played a crucial role.⁶ Nancy Turner was the only non-native member to sit on the Panel's cultural

⁶ Trosper (2009) suggested that Co-Chair Dr. Fred Bunnell may have been open to the inclusive process as result of his association with the Religious Society of Friends.

subcommittee. Chief Atleo referred to her training, through years of work with elders as an ethnobotanist, as a “necessary part of the group” (pers. comm. in Lertzman 1999:223). Dr. Turner spoke similarly of the role played by Chief Atleo. Nancy Turner offered the following insight into the learning required for this kind of work:

... I have learned that you never dismiss what people tell you ... it may be at a different spiritual level, but for those people it's absolutely real. Whether you believe it or have experienced it yourself, you have to appreciate that ... just as much a reality as any of our (scientific) realities ... we have to have faith in other people, and in their integrity ... they're not trying to pull the wool over our eyes when they tell us things ... we have to respect what they say and the knowledge that they bring ... (pers. comm. in Lertzman 1999:247).

Drawing on his background as hereditary chief, Richard Atleo provided similar insights derived from the teachings on which the Nuu-Chah-Nulth inclusive process is based:

... [someone] makes a statement which we can not understand, but who are we to judge and to say that the statement is stupid, perhaps the Creator has put these words into his mouth; we don't know. Perhaps he sees a reality that we can't see, which is just as real as ours, or maybe more real ... so we wonder about it, it's a mystery ... it's a question then of faith; this gentleman has made a statement which we don't understand and we're not going to jump on him and call him stupid ... we will respect what he says ... (pers. comm. in Lertzman 1999:226).

These quotes depict where the two ends of the cultural bridge met. Because of their characters, years of training, and experience, Drs. Atleo and Turner had acquired and honed their abilities to communicate effectively between cultures. Both had developed cultural literacy and were functionally bi-cultural before the Panel's work began. Other Panel members developed such skills to varying degrees over time (Lertzman 1999). As efforts progressed, scientists learned to work within the Nuu-Chah-Nulth protocols. They acquired these new skills and were able to function increasingly effectively between cultures. Similarly, elders developed understanding and appreciation for how scientists communicated and valued their work. The learning was both ways. This indicates the nature of professional skills required for bridging cultures of TEK and TWS in EBM.

The Panel process resulted in increased respect and understanding for traditional ecological knowledge among government, industry, and non-native community members.

Discussion

Implementation of the Panel's recommendations was outside of its mandate and therefore beyond the primary scope of this paper. There has been comparatively little research on the topic. Shaw (2002) offered critical discussion on the Panel and implementation challenges associated with the Central Regional Board, the body responsible for implementing Panel recommendations. Spiro (2003) examined early implementation concluding that First Nations participation in planning and management improved through the Board with increased cross-cultural understanding and better relationships of First Nations with industry, local communities, and government; however, equal partnership was not achieved as statutory authority resides with the provincial government. Government still seems to reduce TEK into data bits that fit easily into the planning process rather than working in a holistic manner, which would require institutional change outside the Panel's scope. Nevertheless, the process resulted in increased respect and understanding for TEK among government, industry, and non-native community members (Spiro 2003).

Butt and McMillan (2009) examined implementation from an industry perspective conceding the Panel's ecological success yet questioning it economically. Although the Panel led to more ecologically sustainable forest management, they argued that the process was cumbersome with increased costs, numerous delays, and a reduction of the allowable annual cut exacerbating deteriorating economic conditions in the forest industry. Iisaak, the Nuu-Chah-Nulth-owned company started as a Weyerhaeuser joint venture with logging licences for Clayoquot Sound, has recently run afoul of environmental groups. Proposed cutting in pristine watersheds, a measure seen as critical to Iisaak's economic viability, is at issue (Yakabuski 2008). The Tofino Council has asked Iisaak not to pursue this strategy (Douziech 2009). Iisaak recently

ran into further difficulties with suspension of their Forest Stewardship Council certification. Aspects of non-compliance cited relate to stakeholder issues and disagreements with ENGOs over harvesting in undeveloped watersheds. Major non-compliance addressed protocol development with First Nations citing the concern of Isaak consulting only with elected councils despite direction that *HawiiH* be involved with adequate time frames (Wedeles and Flood 2010).

These challenges highlight the socio-economic and political context of EBM in local and First Nations communities. In recent follow-up interviews with Panel members, Dr. Ken Lertzman suggested:

It would have been better if we'd spent more time making recommendations about implementation . . . I think we expected we'd be more involved in the implementation process . . . we might have expected we would have even re-convened 5 years later and if we had known we weren't going to I think we would have made more recommendations in this regard . . . (pers. comm., February 2010).

He considered it a “flaw” that broader social issues were not part of the Panel’s terms of reference, causing problems for implementation. Although Panel members recognized the critical importance, there was not the requisite expertise. “It would have really been neat to think about sustainability issues in general . . . if allowable cut drops by a certain amount then what do you do?” (K. Lertzman, pers. comm., February 2010). It has been suggested the Panel reconvene. Some Panel members, Nuuchahnulth, community groups, and ENGOs have recently expressed interest to review implementation of Clayoquot Panel recommendations.

Richard Atleo maintains that the Panel “continues in the front lines of relevance” in efforts to bridge TEK and TWS (pers. comm., February 2010). Ken Lertzman sees the Panel’s contribution to silvicultural science as revolutionary yet “the First Nations material is by far the most significant” (pers. comm. in Lertzman 1999:208). He later added, “the somewhat less revolutionary aspects were easy to pick up on; the really revolutionary ones are a lot harder” (pers. comm., July 2006). With the central role of TEK practitioners in planning and decision making, its emphasis on traditional methods, respect and active use of traditional philosophy and social institutions, the Clayoquot Panel provided a

blueprint for bridging TEK and Western science in EBM. Given that TEK retention, traditions, and protocol vary significantly across regions, along with notable traditional and contemporary differences, applying this model to other areas will require case-specific research.

Other efforts since the Clayoquot Panel present relevant perspectives contributing to theory and practice for bridging TEK and TWS (Coast Information Team 2004; Moller et al. 2004; Berkes and Davidson-Hunt 2006; Reid et al. [editors] 2006; Coastal First Nations 2007; Davidson-Hunt and O’Flaherty 2007). Many of these are in the boreal forest (Lertzman 2006; Stevenson and Natcher [editors] 2009). Comparative analysis with the Clayoquot Panel would be worthwhile raising questions of applicability to other regions and industries. For example, the boreal forest is Canada’s largest forest ecosystem containing about a quarter of the world’s remaining original forests. Home to many of Canada’s Indigenous peoples, it is a region of global significance and responsibility providing ecological services and climate function with high biodiversity, massive carbon stores, hydrological resources, migratory bird habitat, and endangered species such as woodland caribou (Global Forest Watch Canada 2000; Gysbors and Lee 2003; Schneider and Dyer 2006). It is also the location of one of the world’s largest oil deposits. Forest fragmentation, biodiversity impacts, pollution, and cumulative effects (Schneider and Dyer 2006) along with downstream toxicities (Kelly et al. 2009) have led to ecological and human health concerns. Although some First Nations are involved with industry, others oppose oil sands leading to court cases and involvement with ENGOs who have publicized issues internationally.⁷

Obvious differences between forestry in Clayoquot Sound and bitumen extraction in the boreal forest include the non-renewable nature of petroleum. Yet the marked parallels have made national press (VanderKlippe 2010). Thus, industry proponents in Alberta’s oil sands have expressed interest in learning from British Columbia’s forestry conflicts, particularly Clayoquot Sound, and their applicability to issues emerging in the boreal forest (Dr. David Layzell, Director, Institute for Sustainable Energy, Environment and Economy, pers. comm., March 2010). One transferable lesson would be the establishment of a multidisciplinary panel of independent scientific experts

⁷ See, for example, “Canada’s Avatar Sands” by Sierra Club, Greenpeace, World Wildlife Fund, and several First Nations with some 50 NGOs in Hollywood’s *Variety* magazine.

and local First Nations TEK practitioners to examine bitumen operations and the associated impacts from an ecosystem-based perspective.

This article has highlighted the Panel's momentous insight that TEK provides for TWS an external, independently derived reference standard. Adopting such a perspective is a profound shift in thought. It provides a basis for the Panel's conviction that drawing on TEK and TWS ensures sustainable ecosystem management. Replicating this requires such efforts to be grounded in the methods of both traditions. These bi-cultural standards necessitate practitioners to develop skills of cultural literacy. Applying the Panel model elsewhere must also acknowledge what such a body is not. The Panel demonstrated respectful sharing of decision making, drawing equally from scientific and TEK traditions to foster EBM. It was not designed to address large-scale power and socio-economic imbalances resulting from colonialism or unresolved land claim and treaty issues.

Conclusions

Key lessons emerge from the Clayoquot Scientific Panel model. The methods of TEK are a necessary vehicle for working with its practitioners and their knowledge to ensure rigour and integrity. These skills are learned through experience with appropriate cultural teachers. In their absence, TEK research is methodologically and ethically weak. A traditional approach, such as the Nuu-Chah-Nulth inclusive process, has a robust capacity to form and sustain group solidarity in the midst of complex and challenging, if not overwhelming, tasks. Although these methods can be labour intensive and time consuming, they offer powerful applications for participatory planning and consensus-based decision making with intercultural and intracultural utility to facilitate EBM. The spiritual philosophy and cultural teachings of TEK are its foundation and cannot be divorced from its application. Such wisdom helps provide a spiritual context to the broader philosophical terrain of ecosystem sciences and ethics of EBM, inspiring an ecological sense of identity and behaviour. The social institutions of TEK present strategic opportunities and human resources for ecosystem co-management. They also offer alternative institutional models for EBM. Lessons of the Clayoquot Scientific Panel have implications for other regions and industries, yet further case-specific

Authentic cross-cultural learning challenges one's perceptions—it causes us to rethink our ideas and actions, and to move beyond our “cultural box,” bringing back new insights and innovations.

research is needed to replicate these findings. The boreal forest is indicated as an important emerging zone of relevance.

Ken Lertzman (2009; pers. comm., July 2006) related the story of Clayoquot Panel elder, Roy Haiyupis, responding to concerns raised by scientists over environmentally destructive forest practices occurring in First Nations communities. The elder noted it was also easy to find similar examples of destructive forestry guided by the scientific tradition. He remarked that we are not here to represent the worst, but the “best of our traditions.” The Scientific Panel for Sustainable Forest Practices in Clayoquot Sound provided a blueprint for bridging traditions of TEK and TWS in EBM. Founded on different philosophical teachings and employing differing methods, TEK and TWS represent parallel complementary knowledge systems. They are equally valid and authoritative cultural traditions informing our understanding of ecosystems and how to behave within them. The philosophical and methodological differences of TEK and Western science strengthen the veracity of their agreements. By their nature, such agreements must be grounded equally in the methods of both traditions, establishing a basis for bi-cultural standards. Social sciences can play a supportive role in helping to understand and advance such cross-cultural discourse.

Ecosystem-based management entails a paradigm shift for industrial society in the perception of humanity's place within ecosystems. Its implementation requires new theory and practice for planning and management, legislation and policy, education, political process, and public consultation with collaborative interdisciplinary research in the natural and social sciences. Significant changes in our economic activities will be required. Although daunting, this highlights a great contribution of deep intercultural dialogue. Authentic cross-cultural learning challenges one's perceptions—it causes us to rethink our ideas and actions, and to go beyond

⁸ For a fascinating account, see the Young and Goulet (editors, 1994) collected works, *Being Changed by Cross-Cultural Encounters: The Anthropology of Extraordinary Experience*.

our “cultural box,” bringing back new insights and innovations.⁸ Dialogue with the cultural experts of TEK represents a strategic opportunity for EBM practitioners offering vital philosophical resources, process skills, and institutional models. This contributes to spaces shared between cultures and the shift toward ecosystem-based paradigms within the cultural mainstream, the best of two worlds.

Acknowledgements

With respect, admiration, and gratitude, I would like to acknowledge three wise and kind elders who truly represent the best of their traditions: Dr. Richard Atleo (Chief Umeek), Dr. Nancy Turner, and Dr. Ken Lertzman.

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ARTICLE RECEIVED: November 27, 2006

ARTICLE ACCEPTED: April 23, 2010



Production of this article was funded, in part, by the British Columbia Ministry of Forests and Range through the Forest Investment Account–Forest Science Program.

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Test Your Knowledge . . .

Best of two worlds: Traditional ecological knowledge and Western science in ecosystem-based management

How well can you recall some of the main messages in the preceding Discussion Paper?

Test your knowledge by answering the following questions. Answers are at the bottom of the page.

1. Which of the following are problems that have been associated with trying to “integrate” TEK into Western science-based resource management?
 - A) Reductionist scientific techniques may be contrary to the philosophy and methods of traditional knowledge
 - B) It can be disrespectful and hurtful to traditional knowledge practitioners and regarded as a form of cultural misappropriation
 - C) Much of the meaning and value of traditional knowledge can be compromised and the data may be less accurate
 - D) Relationships and opportunities for future research may be compromised
 - E) All the above

2. “Epistemology” refers to:
 - A) The study of the origins, limits, and meaning of knowledge
 - B) The study of cross-cultural research methods
 - C) The theory of knowledge
 - D) A and C
 - E) B and C

3. *Hishuk ish ts’awalk* embodies:
 - A) The sacredness and respect for all things
 - B) The traditional Nuu-Chah-Nulth axiom meaning “everything is one”
 - C) The character of ecosystem-based management adopted by the Clayoquot Scientific Panel
 - D) All of the above
 - E) None of the above

ANSWERS

1. E 2. D 3. D