Traditional Ecological Knowledge: Applying Principles of Sustainability to Wilderness Resource Management

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Abstract—Traditional ecological knowledge within specific cultural and geographical contexts was explored during an interactive session at the 8th World Wilderness Congress to identify traditional principles of sustainability. Participants analyzed the traditional knowledge contained in ten posters from Canada and Alaska and identified and discussed the traditional principles of sustainability inherent in specific examples. An invited panel discussed the opportunities and challenges of incorporating traditional principles of sustainability in wilderness management. This paper reports on principles of sustainability and associated cultural concepts related to indigenous engagement with homelands and makes suggestions for how to bridge cultural differences when considering traditional principles of sustainability. A co-management relationship was preferred as the most effective strategy for incorporating the traditional expertise of Native peoples into wilderness policy where a wilderness area encompasses the homelands of a surviving indigenous population.

Introduction

Indigenous populations lived on lands now designated as wilderness for thousands of years without significantly altering the core values associated with their use of their homelands. In recent years, there has been an upsurge of interest in the locally specific and cumulative knowledge that Native peoples possess about their homelands—a body of knowledge that has been termed "traditional ecological knowledge" (TEK) or in some cases just "traditional knowledge" or "local knowledge." This interest is mainly based on the desire by governments, and more specifically resource managers, to include local residents in research conducted on their lands. The idea is to incorporate TEK into the management scheme.

The definition and description of traditional ecological knowledge varies in the literature. Some researchers have included aspects such as knowledge transmission over multiple generations and considered the kinship and cultural systems in both the transmission and application of traditional ecological knowledge (Berkes 1999; Nadasdy 1999; Usher 2000). In addition—although it is now evident that many indigenous peoples transformed their environment (Iutzi-Mitchell 1981; Kreck 2000), for example through fire or ameliorating salmon runs—it remains clear that one of the central tenants of TEK is some semblance of sustainability. It appears that each case in the literature where a researcher tries to define TEK comes back to one central tenant—for each group that is being studied, TEK takes on a different form determined by culture and environment and that is why we as anthropologists, who like to define such things as TEK, have a hard time coming up with definitions. Stevenson (1996: 281) says that one of the integral parts of TEK is "specific environmental knowledge." We would add that this has to apply to a specific environment or set of circumstances within the context of a specific culture; and how that culture has both shaped their environment to fit their subsistence needs, and has in turn had their cultural systems shaped by the environment. For each culture to survive, they had to come to an understanding with their environment, and create a semblance of sustainability.

This research sought to explore traditional ecological knowledge within specific cultural and geographical contexts, to identify the core values or principles inherent in how indigenous peoples engaged in a sustainable manner with their homelands. Traditional principles of sustainability are the linkages that allow us to translate models of indigenous "engagement" (Langdon, poster) to Western natural resource management. Indigenous models of engagement evolved in relation to a specific place, but the core principles within these practices can be identified and applied to new situations. Indigenous ways can be translated into management principles by removing the context of the situation and recognizing the core essence of the traditional practice.

There exists a common ground between traditional systems of engagement and modern management. Although the form and semantics may differ substantially, both traditional and contemporary models (1) manage people's activities relating to a resource, (2) have systems of taxonomy, (3) monitor or assess resources, (4) have rules governing appropriate behavior, and (5) have technologies for harvesting resources that evolve with changing needs and opportunities. In addition both systems are fundamentally based on deeply held cultural beliefs.

The process of identifying traditional principles of sustainability within locally specific knowledge requires recognizing the essence within the form—the form being the geographical, species and culturally specific information contained within the traditional knowledge. A traditional principle of sustainability when distilled to its essence could be applied to other locations, cultural contexts and resources. For example, Tlingit traditional halibut hooks, by design, only captured

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mid-sized halibut. By utilizing this technology, Tlingit fishermen avoided harvesting the smallest halibut before they had had a chance to spawn and also the largest, which are generally the most productive breeding females. A principle specific to fisheries management would be to concentrate harvests of long-lived species to the mid-sized fish to maximize the recruitment of young fish into the breeding population and conserve the most productive breeding individuals. A more distilled principle applicable to other species would be to avoid harvesting immature members of a population and the most productive breeding individuals—a principle contradictory to the trophy approach of contemporary hunting and fishing, which encourages the harvest of the larger most successful breeders.

A second traditional principle of sustainability—inherent in the design of the Tlingit halibut hooks—is that the conservation of immature and large breeding females is accomplished through the design of the harvest technology, rather than dependent on regulatory restrictions. The Tlingit halibut hooks were highly sophisticated technologies in that they allowed for an efficient harvest while eliminating the potential mortality that results from catch and release policies. The second principle—when distilled to the basic premise, making it applicable to other situations beyond halibut harvests—is to incorporate conservation strategies into the design of harvest technologies.

The following excerpt from Newton and Moss (2005: 30) provides an example of the complexity and multiple traditional principles of sustainability that can be contained in one context specific quote, in this case relating to Tlingit forestry practices:

> The Tlingit believed within the tree was a spirit of good luck—as a man chopped, the spirit of good luck moved. Only by chopping to the end of each branch tip can a man have good luck. All were carried home and used. If a man was caught taking a tree from the special areas, he was punished by the house chief and the council, by taking from him all his hunting equipment (Lydia George, Village of Angoon, 1983).

The following principles might be discerned from the quote:

- Do not waste any parts of the tree.
- Good luck resulted from correct action.
- Certain areas were off-limits from harvesting.
- Punishment involved the confiscation of hunting equipment.
- Judgments were made by community leaders.

The previous statements might be further distilled from the original context and reworded as the following traditional principles of sustainability:

- Utilize all parts of a resource.
- Provide high incentive for correct action.
- Protect special areas from harvest.
- If rules are broken, punish the perpetrator by taking something of great value.
- Justice is to be administered by respected members of the community, preferably someone known and respected by the perpetrator.

In developing a session on traditional principles of sustainability for the 8th World Wilderness Congress, the authors sought to explore the diversity and commonality of traditional principles of sustainability from various contexts and consider multiple viewpoints concerning core principles within examples of traditional knowledge. This paper reports on the interactive poster session followed by a panel response—held during the 8th World Wilderness Congress in Anchorage, Alaska—with the stated purpose to (1) share knowledge concerning traditional resource management and sustainable use of wild resources from various regions, and (2) develop a list of principles utilized by various indigenous cultures worldwide for managing their traditional harvests and maintaining wilderness use areas.

Methods

On October 4, 2005, the authors facilitated a three-and-a-half-hour session concerning the identification and application of traditional principles of sustainability for wilderness management. The forum—a poster session, focused discussion groups and a panel discussion—was used to generate ideas and dialogue concerning the identification, application, opportunities, and challenges involved in identifying and applying traditional principles of sustainability in contemporary management situations. In order to encourage a plethora of ideas, researchers conducting TEK research worldwide were invited to submit posters. The call for posters was posted on the 8th World Wilderness Congress website. Individual contacts were also made by the authors/facilitators to potential contributors.

Participants were invited to submit abstracts for a poster, detailing concepts and practices that reflect the traditional ecological knowledge or local knowledge of groups with whom they work. The call for posters encouraged participants to address resource management considerations on their posters, such as (1) taxonomy practices and ideas, (2) cultural beliefs concerning resources, (3) monitoring and recording of harvests and uses, (4) regulations and management of resources, (5) harvest methods, and (6) harvest technology relating to "conservation" measures. Ten posters were submitted for the session, all from Alaska or Canada.

The session began with a short introduction to the concepts of "traditional ecological knowledge" and "traditional principles of sustainability," including the examples provided above. Following the introductory comments, participants had 40 minutes to study the posters and were given worksheets to fill in each of the poster's author(s), poster title, traditional principles expressed in the poster, and examples of each principle. Following the poster session, participants sat with one of four groups, discussed the posters, and then a spokesperson from each group reported their findings to all the participants. Each group had a predetermined facilitator either from the Alaska Department of Fish and Game, Division of Subsistence or the National Park Service. Participation and choice of group were self-selected. Group size varied between about 8 to 12 people with a total participation of about 45 people.

Following the poster session and group reports, three panelists were invited to discuss what they learned from the poster session and give ideas from their work on traditional principles of sustainability. These panelists included a resource manager and Tlingit person, Adrienne Fleck of Lake Clark National Park and Preserve, Wilson Justin, a

tribal administrator and Athabaskan person from the Copper River Basin, and Dr. Stephen J. Langdon, professor of anthropology at the University of Alaska, Anchorage. Dr. Langdon chose to have a Tlingit elder who was in attendance, Elaine Abraham, speak in his place. Dr. Langdon then gave a brief summation of the session.

Results

Three of the groups focused their discussion on the worksheet, identifying principles from the posters; one of these groups then diverged into a discussion on other considerations of incorporating and considering TEK. The fourth group ignored the original intent and engaged in an energized discussion about traditional ecological knowledge, its use and application in natural resource management. The results reported here summarize the traditional principles identified by one or more groups. Not all groups cited the poster that was the source of the principle, as some posters related similar principles of sustainability in different geographical and cultural contexts. The results are organized under the following topics: (1) cultural beliefs and values, (2) monitoring and assessment, (3) regulations and management, and (4) harvest methods and technologies. In addition, comments from the panelists who summarized the poster session are included below.

Cultural Beliefs and Values

Most of the posters expressed "respect" as a highly significant cultural value for practicing sustainability (for example: Holen; Ramos and Mason; Ratner, posters). Other, almost universal values include sharing and taking only what you need and not wasting. All resources are considered sentient and as such people are considered to be in a spiritual relationship with the land and sea and the resources they harvest, a relationship that continues even after death of a plant or animal. For example, in Tlingit and Athabaskan cosmology animals and plants are aware of how they are being treated (Brock; Holen; Ramos and Mason; Ratner, posters). The spirit is believed to continue after death and continues to be aware of the care taken with its body. Respectful behavior includes maintaining respectful speech. Thornton (poster) described the offering of dog salmon eggs to the berry spirits by the Tlingit of Glacier Bay. Plants and animals are recognized as individuals rather than averaged into a population. As such, connectivity and communication are emphasized versus the emphasis on controlling resources of Western resource management. Wilson Justin (poster) highlighted the nature of indigenous languages and tradition, which require a person to ask permission to walk on someone else's grounds or take a life.

One of the posters (La Vine and McCabe, poster) expressed the Yupik belief, "if you don't use a resource; it will go away," suggesting the need to maintain a continuous reciprocal relationship between humans and other species in a localized ecological setting. Balancing human activities with what the land and sea can afford to provide is a common traditional theme and was expressed by one Tlingit elder in the Brock poster as "don't break the plate."

The panel discussion following the poster session emphasized the inappropriateness of the term "wilderness." Elaine Abraham (panelist) said that the Tlingit translation for "wild" was "crazy" and as such, wilderness translates as "crazy land." What is designated as "wilderness" by park managers is considered "homelands" by indigenous peoples. The "ecological" in TEK is also offensive to Native people, according to the panelists, because ecology is a Western science concept and traditional knowledge is more holistic than the term TEK implies.

Monitoring and Assessment

Monitoring and assessment of resources is traditionally accomplished through long-term observations and detailed knowledge of homelands, passed down from generation to generation. Detailed observations of life cycles and physiology are made and characteristics of individual stocks are recognized (Moncrieff, Wiswar and Crane; Ramos and Mason; Ratner, posters). In-season monitoring assures an appropriate level and timing of harvests (for example, Tlingit salmon harvests; Ramos and Mason; Ratner, posters).

Rules or regulations for harvests are embedded in cultural values: don't waste, respect the resource, share the harvest, don't take more than you need. For example, Tlingit seal hunting is self-regulated and self-limited by these strong cultural values (Brock, poster). Resources with limited abundance, such as Tlingit sockeye salmon streams and important berry patches, were allocated to kinship groups (Ramos and Mason; Ratner; Thornton, posters). "Ownership" implied long-term stewardship and emphasized communal property rights. For example, Tlingit clan leaders were responsible for monitoring the abundance and timing of salmon, decisions about when and how much to harvest occurred in-season; as opposed to preset dates of hunting or fishing seasons. Rules about when to start were based on natural observations and indicators rather than set by calendar dates. Harvests were community focused through the strong cultural value of sharing and reciprocity—"what you give is what you get."

In his comments during the panel discussion, Wilson Justin (panelist) related how his clan was the guardians of a herd of well-known caribou in his country; caribou that managers of the Wrangell-St. Elias National Park (NPS) in Alaska's Copper River Basin did not know existed. This herd of caribou belongs to the Naltsiine people (Kari 1990), the Sky Clan also known as the medicine people. Justin's clan, the Ałts'e' tnaey, or One-way Clan (Kari 1990), have been the guardians of this herd for centuries. They protect the herd from outsiders and only the medicine people are allowed to harvest them. Recently, NPS managers have "discovered" the herd and are now discussing how to best manage these newly found caribou. The Atna' Athabaskan of the Copper River Basin, and Justin's Ałts'e' tnaey clan in particular, find this insulting because they have been guarding this herd for centuries. It was an obligation to monitor the herd and create a relationship with the caribou to in turn maintain their obligations to the medicine people. Now, they are being pushed aside so that the herd can be managed by outsiders.

Regulations and Management

Knowledge and harvest rules are expressed in the form of mythic charters rather than through regulation booklets (Langdon; Ramos and Mason, posters). Elaine Abraham stressed that the raven myths of the Tlingit people are about "now." Larry Merculieff (of the Bering Sea Council of Elders) in his talk on Sunday evening at the 8th World Wilderness Congress said that "before time" in a myth means before concepts of past or future, in other words, the present moment.

The cultural value of "not wasting" is translated as "use all parts of a resource." Although, there are laws in Alaska against wanton waste, unlike traditional principles of sustainability where "not wasting" would mean using every part, these laws really mean using a majority of the meat. For example, in Klawock, Alaska, Tlingit salmon harvesters scraped the backbone after filleting a fish to make fish hash or smoked the backbones (Ratner, poster). Sport fishermen routinely discard the meat left on the salmon backbones, a practice seen as wasteful by traditional Tlingit standards. Likewise, a Tlingit elder in Klawock found the non-retention of king salmon in the Pacific Salmon Treaty to be a wasteful practice, requiring purse seiners to discard king salmon that died in the net.

A Dena'ina Athabaskan elder of Nondalton said "They [sport fishermen] just fish and release. When they release the fish, the fish die. You are not supposed to do that you know." When relating rules about harvesting large land mammals, two Nondalton residents relate, "They utilized everything from the animals, the bones they used to make tools out of. [You are] supposed to never leave the bones laying around anywhere, you put it back in the water, don't leave bones where people walk…because they feel, that their spirits, it could change your luck if you did not take care of the animal properly, your luck would change and next time you went hunting you might not get that animal because you did not properly take care of it, you treat that animal respectfully" (Holen, poster). One thing to note here is that this relates not only to regulation and management of the resource but to cultural beliefs and values; you cannot separate the two. The poster also noted that bones from salmon were thrown back in the water after the harvest. As one elder of this community noted, "The trout have to eat too."

Harvest Methods and Technologies

Strategies for times of low abundance included shifting effort to other species or locations; harvesting only males, or avoiding the taking of pregnant females (seals); and emergency closures based on in-season monitoring (Brock; Holen; Ramos and Mason; Ratner, posters). Harvest technologies allow for selective harvest or have built-in conservation strategies—for example, the traditional Tlingit intertidal weirs and traps only harvested salmon on certain stages of the outgoing tide, effectively "closing" a fishery on every flood tide (Langdon; Ratner, poster). Gaffs, spears and clubs allowed harvesters to selectively harvest male salmon (Ratner, poster). The sophistication of the Tlingit fishing technologies—such as the halibut hooks, gaffs and spears, and intertidal traps—was that the harvest methods achieved conservation of fishing stocks without sacrificing efficiency. The Tlingit technology supported conservation strategies by allowing for selective harvests, only capturing certain segments of the population or only functioning during part of a day (Ramos and Mason; Ratner, posters). Salmon genetic diversity was maintained by spreading out harvests over the entire salmon run.

Tlingit people practiced habitat enhancement and in some cases, predator control. Salmon eggs or mature salmon were moved from a productive stream to a failing stream (Ratner, poster), habitat was manipulated to maximize berry production (Thornton, poster) and Dolly Varden char and merganser ducks were harvested to reduce their predation on salmon fry (Langdon and Austin, 2006).

Several of the posters and panelists expressed the importance of cultural specificity and empowering indigenous people with decision-making authority (for example, Burwell; Meek, posters). One panelist (Justin) said that it was okay to use traditional knowledge in Western management, but not to circulate it back to traditional people afterwards. In his words, the transmission of traditional knowledge is a "one way street." The implication is that Western wilderness managers bend the knowledge to fit their perceptions and situations in ways foreign to the original meaning.

Discussion

The distillation of traditional principles of sustainability from the original geographical and cultural context requires overcoming both traditional and Western scientific cultural taboos and as such is a creative problem solving process incorporating both vertical thinking (rational reasoning) and lateral thinking. Lateral thinking requires thinking "outside the box," a process on which there may be multiple correct answers. The lateral thinking process, as described by De Bono (1970), is a generative thinking process distinct from vertical rational thinking, in that information does not need to be true at every step in order to be correct or useful in solving a problem.

As previously mentioned, the identification of core principles of sustainability removes the inherent principle from its original culturally and geographically specific context—an act considered taboo by most proponents of TEK (Justin; Langdon, panelists) (Nadasdy 1999). Where indigenous societies live adjacent or within wilderness boundaries; it makes better sense to retain the site-specific knowledge and apply it within a co-management context. But where this is not possible, the recognition of traditional principles of sustainability could provide guidance for wilderness management and a theoretical foundation and practical understanding to support effective communication in co-management collaborations.

There are, however, Western science cultural taboos that directly contradict indigenous ways of knowing. To consider practical applications of indigenous engagement with homelands without acknowledging the spiritual basis and cultural values underpinning the principles would ignore the holistic foundation of the principles and overlook a central principle that sustainable practices be incorporated into cultural values. The absence of spirituality in resource management is considered by some Native people to be a major shortcoming of Western society and the "borrowing"

of indigenous wisdom without acknowledging the spiritual relationships with non-human life can be considered inappropriate and offensive (Cyrus Peck Jr., Tlingit elder, personal communication). The spiritual connection to homeland and the process of attributing human characteristics to all non-human life—and everything is considered to be alive—is central to indigenous perception of nature and relationships with homelands; however, the Western scientific belief structure strictly forbids the inclusion of spirituality and anthropomorphism.

Western science tends to define "reality" based on the ability to measure or quantify a perception and "truth" is discerned by a rational, vertical thinking process where each step of the process must be true to prove a hypothesis and support a theory. The mythic charter of indigenous science is based on lateral thinking where the actual events don't have to occur in physical waking reality, as long as the resulting knowledge is "true."

The different cultural ways of coding reality, including the black and white thinking of Western society—a hypothesis is either true or false—contrasts with the simultaneous acceptance of both mythological and scientific explanations by traditional societies. The simultaneous acceptance of multiple perceptions of reality might be compared to viewing a landscape through the windows of a house. The front and back windows give very different perceptual views, but both are accurate and in combination give a more complete understanding of the environment in which the house is sited. Western science has examples in which black and white thinking is supplanted by multiple perceptions such as in the statement, "light is both a particle and a wave." Accepting simultaneous perceptions of reality, as long as the belief serves to sustain or support a balanced relationship between human activities and core wilderness values, would encourage cross-cultural understanding without negating the central tenants of Western science. Lateral thinking provides a vehicle for identification and application of traditional principles of sustainability and could help facilitate co-management opportunities.

Conclusion

This paper reported on an introductory effort to identify traditional principles of sustainability and consider their application in wilderness management. To further this effort, a resolution concerning the identification of traditional principles of sustainability was passed by the 8th World Wilderness Congress, which resolved that the IUCN wilderness task force should identify traditional principles of sustainability and explore their relevance and application to wilderness resource management.

When a wilderness area encompasses the homelands of a surviving indigenous population, a co-management relationship is preferred as the most effective strategy for incorporating the traditional expertise of local indigenous peoples into wilderness policy. As stressed by Wilson Justin (panelist) in the panel discussion, the traditional system must not be integrated into the Western management scheme. It must be respected for what it is and a co-management situation where each of the actors has a place at the table is preferable. It must be recognized that indigenous groups have been and should remain the guardians of the resources they currently, as in the past, depend on for subsistence–resources they have created a reciprocal relationship with, founded on mutual respect. In situations where indigenous groups exist, either with or without co-management opportunities, the identification of traditional principles of sustainability could provide natural resource managers and students with a conceptual framework in which to understand and consider the traditional knowledge of indigenous populations.

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Panelists and Posters Cited

Panelists

Stephen J. Langdon, Professor of Anthropology, University of Alaska, Anchorage

Adrienne Fleek, Management Assistant, Lake Clark National Park and Preserve

Wilson Justin, Vice President, Mount Sanford Tribal Consortium

Elaine Abraham, Tlingit Elder and Chair, Alaska Native Science Commission

Poster Participants

Kristi Benson, TK Coordinator, Gwich'in Social and Cultural Institute and Catherine Lambert, Wildlife Biologist. Incorporating Traditional and Local Knowledge in the Development of a Management Plan for Dall's sheep in the Gwich'in Settlement Area.

Matthew Brock, Division of Subsistence, Alaska Department of Fish and Game. Tsaa Aani (Seal Country).

Michael Burwell, Minerals Management Service, U.S. Department of the Interior. Western Science & Traditional Ecological Knowledge: Consensus or Conflict?

Davin L. Holen, Division of Subsistence, Alaska Department of Fish and Game. Local Knowledge of Environmental Change and

Sustainable Subsistence Practices in the Kvichak Watershed of Southwest Alaska.

Robbin La Vine, Bristol Bay Native Association, and Sarah McCabe, Bureau of Land Management. Elder's Traditional Ecological Knowledge of 20th Century Ecosystems and Fish Population Changes in the Kuskokwim Bay Region.

Chanda Meek, University of Alaska, Fairbanks. The Political Influence of TEK in Co-management Regimes.

Catherine F. Moncrieff, David Wiswar, and Penelope Crane. Phenotypic Characterization of Chinook Salmon in the Yukon River Subsistence Harvest.

Judith Ramos, Yakutat Tlingit Tribe, and Rachel Mason, National Park Service. Traditional Ecological Knowledge of Tlingit People Concerning the Sockeye Salmon Fishery of the Dry Bay Area.

Nancy Ratner, Division of Subsistence, Alaska Department of Fish and Game. Traditional Principles of Sustainable Salmon Harvests from Prince of Wales Island, Alaska.

Thomas F. Thornton, Visiting Associate Professor, Department of Anthropology, Trinity College. Tlingit Knowledge and Conservation of Berries: A Case Study from Glacier Bay National Park.