From Forest Nursery Notes, Winter 2010

23. © Moving from model to application: cultural keystone species and reclamation in Fort McKay, Alberta. Garibaldi, A. Journal of Ethnobiology 29(2):323-338. 2009.

Journal of Ethnobiology 29(2): 323–338 Fall/Winter 2009

MOVING FROM MODEL TO APPLICATION: CULTURAL KEYSTONE SPECIES AND RECLAMATION IN FORT MCKAY, ALBERTA

Ann Garibaldi

Located within the boreal forest of northern Alberta, the Cree, Dene and Métis community of Fort McKay lies at the center of a large-scale oil sands (bitumen) extraction area. For people who view human and environmental health as inextricably linked, the effects of developmental activities, including subsequent restoration or reclamation processes, are experienced on both social and ecological levels. Consequently, for reclamation efforts to be meaningful to local people, they must take into consideration more than ecological functionality and address the linked social factors. This paper assesses the use and value of the Cultural Keystone Species (CKS) model in the community of Fort McKay, Alberta as a mechanism to address social, ecological and spiritual values in regional land reclamation. As salient species with a defining influence on culture, CKS offer a culturally meaningful tether for communities with landscapes in transition. As part of the Fort McKay Traditional Environmental Knowledge Project, a literature review and extensive community interviews identified seven CKS which were used to focus discussions and ultimately recommendations for relevant land reclamation within Fort McKay traditional territory. This community-based collaborative project illuminated environmental, social and policy implications for Fort McKay.

Key words: *applied research, ethnoecology, First Nations, Métis, reclamation.*

Fort McKay está situado en el bosque boreal del norte de Alberta y se encuentra en el medio de una zona muy importante de extracción de arenas de alquitrán o bitumen. Allí conviven gentes de las etnias Cree, Dene y Métis. Como la salud humana y ambiental están íntimamente ligadas, los efectos del desarrollo, incluidos los procesos de restauración y reclamación, se experimentan tanto a nivel social como ecológico. Por ello, para que las reclamaciones tengan sentido para la población local, deben tener en cuenta no solo la funcionalidad ecológica, sino también los aspectos sociales. En este trabajo se examina la utilidad del modelo de las Especies Culturales Clave (ECC) en la comunidad de Fort McKay (Alberta), para poder incluir los valores sociales, ecológicos y espirituales en las reclamaciones de tierra. Las ECC son especies con una gran relevancia cultural y son culturalmente significativas para comunidades con paisajes de transición. Dentro del proyecto "Conocimiento Ambiental Tradicional de Fort Mckay", se ha realizado una revisión bibliográfica y un gran número de entrevistas grupales en las que se identificaron siete ECCs. Estas se emplearon para grupos de discusión y para recomendar reclamaciones adecuadas y relevantes dentro del territorio tradicional de Fort McKay. Este proyecto colaborativo ha tenido importantes implicaciones ambientales, sociales y políticas.

Introduction

Ecologists and anthropologists continue to draw attention to the effects stemming from the magnitude and increasing pace of change occurring in environmental and social spheres (e.g., Berkes 1999; Berkes and Jolly 2001; Edwards 2005; Jolly et al. 2002; Watson et al. 2003). The burgeoning field of

Ann Garibaldi, C.E. Jones and Associates, 11-2042 Mills Rd. West, Sidney, BC, V8L 5X4 CANADA (e-mail: agaribaldi@jonesassoc.com)

ethnoecology has emerged as an excellent forum to explore the relationships between humans and the environment through an interdisciplinary lens. Ethnoecological investigations offer insight into a broad spectrum of issues including conservation (Hunn et al. 2003; Long et al. 2003) and restoration (Anderson and Barbour 2003; Kimmerer 2000). One approach useful for focusing interdisciplinary research efforts in conservation and restoration arenas is to target species that both are foundational to cultures and offer meaningful ecological targets for landscapes requiring reclamation. These "Cultural Keystone Species" (CKS), are culturally salient species that shape the cultural identity of people in a major way, as reflected in the fundamental roles these species have in diet, material, and/or spiritual practices (Garibaldi and Turner 2004). Keystone species may serve a crucial technological function, be an important medicine, hold high spiritual significance, and often serve multiple functions. Keystone species may vary across time and place, even within one community. However, what ultimately defines a CKS is its cultural significance at a given moment and place.

In this paper I assess the use and value of the CKS model in reclamation, highlighting a case study from the community of Fort McKay, Alberta (Figure 1). Establishment of ecological parameters are often given highest priority in conventional reclamation, however increasing attention is being drawn towards reclamation practices that address ecological functionality together with linked social factors (Anderson 2005; Higgs 1997; Higgs 2003; Kimmerer 2000; Senos et al. 2006). Applying the CKS model to land reclamation offers a mechanism to jointly address social, spiritual, and ecological values of people with connections to the modified landscape.

For people who view human and environmental health as inextricably linked, such as the people of Fort McKay, development and subsequent reclamation are experienced on both cultural and ecological levels. Consequently, for reclamation efforts to be meaningful for local people they must take into consideration more than ecological functionality and address the linked social and spiritual factors; the CKS model offers a number of contributions towards this goal. The CKS model provides people with a culturally relevant compass to guide them as they engage in long-term reclamation and land use planning. Reclamation timeframes for mined areas can be extensive, more than 50 years in the case of some oil sands mines, resulting in a loss of access to some or all of this area until reclamation is complete. Through the intentional focus on returning healthy populations of key species to reclaimed areas, the CKS model reinforces the significance of these species to local people.

One of the central aims of ethnoecology is to translate environmental knowledge "of the other" into a form understood in the western scientific paradigm (Ellen 2006). Initially the discipline documented culturally and economically important species (e.g., Stevenson 1915). In the 1950s ethnoecology expanded beyond "list-making" and addressed linguistic terminology, classification systems, and the translation of cultural conceptual systems (e.g., Berlin 1992; Conklin 1954). The broadening scope of ethnoecology more recently encompasses traditional environmental knowledge (TEK) research and its intersection with western science (e.g., Hunn et al. 2003; Nadasdy 2003; Usher

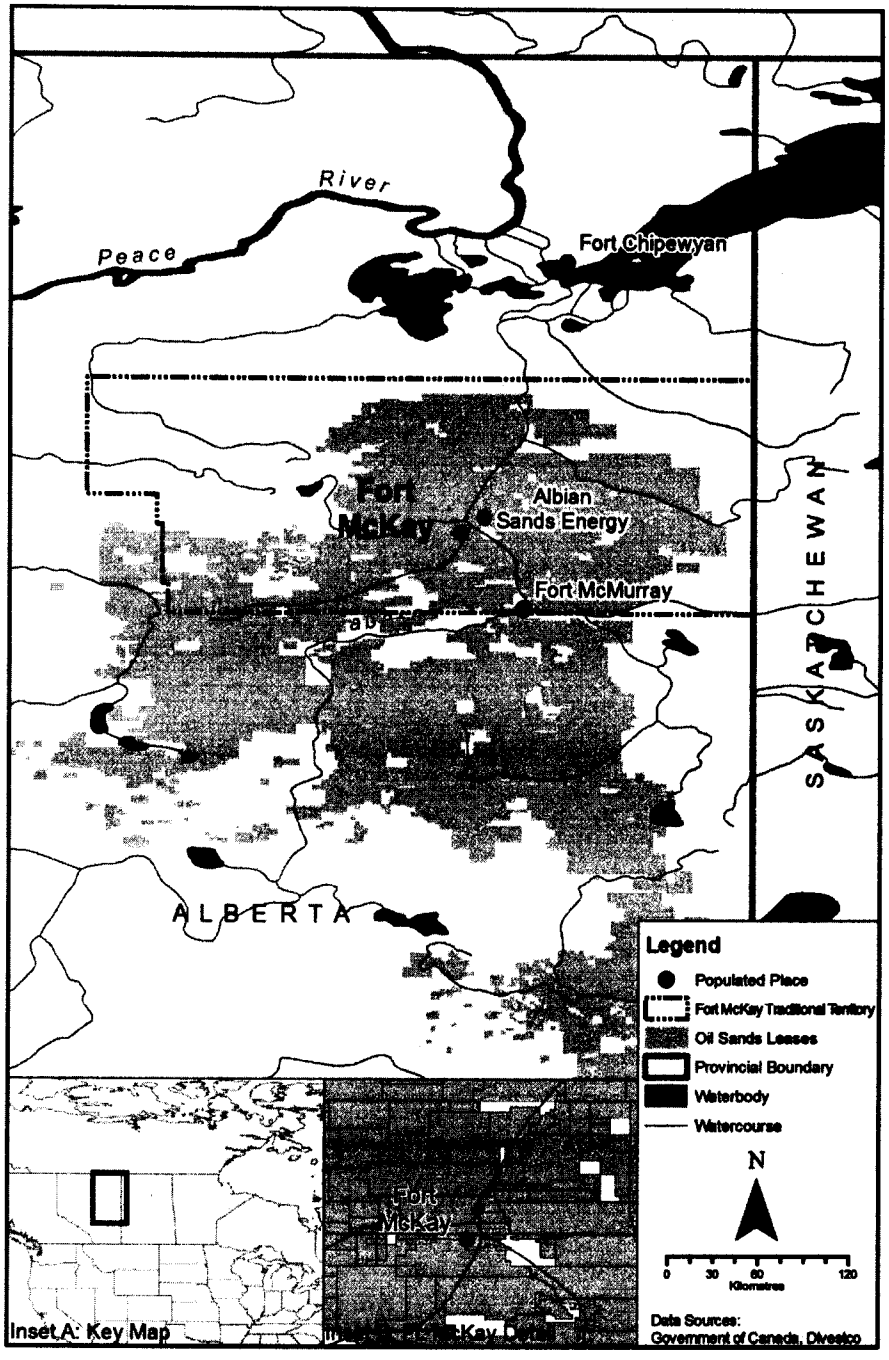

FIGURE 1. Community of Fort McKay located in northeastern Alberta. The dotted box represents Fort McKay's traditional territory and the shaded area represents oil sands lease sites.

2000). Application of the CKS model contributes to the growing research on this most recent endeavor in ethnoecology.

The CKS model provides a context for indigenous communities to use language and symbols that resonate with the community, thereby changing the existing reclamation structure from one that is externally imposed to one that is internally valid and meaningful. Furthermore, because the CKS model directs attention to a finite number of culturally salient and meaningful species, it is fiscally and logistically more manageable than approaches which attempt to address a comprehensive suite of species. Simultaneously, the reclamation or restoration of cultural keystone species and their habitats will support the reclamation of habitat for associated species. Finally, communities who identify with these keystone species have a strong desire to preserve or restore them, which favors project success, and this, in turn provides a way to bring people into the reclamation process. This paper describes the application of the CKS model in the community of Fort McKay, in Northern Alberta.

Initiation and Goals of the Fort McKay TEK Project

Bitumen (oil sand) extraction is presently having profound cultural, environmental and economic impacts on Indigenous communities of Northern Alberta (Figure 1). Bitumen, a tar-like substance bound together with clay, sand and water, was formerly used as a sealant for boats and other materials by regional Indigenous peoples (Garvin 2005). As the second largest oil reserve in the world (second only to Saudi Arabia), 175 billion barrels of proven recoverable oil (bitumen), underlie the boreal forest in northeast Alberta (Energy Resources Conservation Board 2008). Cumulative land disturbance from active mines, approved mines and mines in the application process, total over 191,000 ha (Grant et al. 2008). Oil sands production yielded an average of 1.3 million barrels of bitumen per day in 2007, a rate expected to more than double by 2015 (Alberta Energy 2008; Energy Resources Conservation Board 2008).

At the heart of oil sands development lies the traditional territory of Fort McKay, a community comprised of Cree, Dene, and Métis people (Figure 1). Not only is the footprint of today's oil sand development immense, but the pace of growth is increasing and with it there is a rising urgency to establish a meaningful collaborative approach that encompasses community concerns and values. However, conventional reclamation projects undertaken by most regional developers fall short of the people of Fort McKay's reclamation goals. For example, one of the more difficult values to address is spirituality, a powerful element of land experience and knowledge for the people of Fort McKay. The ability to maintain spiritual connection to the land is a strong community motivator for participation in reclamation activities.

To more fully address the ecological and social processes of land reclamation including culturally important spiritual components, the Fort McKay Industry Relations Corporation (IRC) with support by Albian Sands Energy, Inc. (Albian Sands) initiated the *Fort McKay-Albian Sands Energy TEK Project: Integration of Traditional Environmental Knowledge in Land Reclamation* (TEK Project). From the onset, this project was created under guidance from the Fort McKay IRC director

and environment coordinator with strong input from 14 community elders selected by the Fort McKay IRC. Working closely with the First Nation and Métis leaders from these communities, the Fort McKay IRC, staffed by community members as well as non-indigenous people with close ties to the community, addresses and promotes community concerns related to regional development through three key directives–culture, environment, and community development. Albian Sands Energy, Inc., a regional oil sands developer whose lease is five kilometers east of the hamlet of Fort McKay (Figure 1), provided financial and technical support for the project. Reclamation recommendations from this TEK project have been implemented on the Albian Sands Energy lease site; however it is the intention of the Fort McKay IRC that information derived from this process will ultimately be applied to other disturbed sites in their traditional territory.

In this paper, I use the Fort McKay example to explore the utility of the CKS model in the context of community-based land use planning. First, I discuss in greater detail the concept of the CKS model and its application in social-ecological reclamation. I then describe the dramatic landscape and cultural changes currently taking place in Fort McKay and the appropriateness of the application of the CKS model in this context. I conclude with a discussion about the successes and challenges of applying the CKS model in a reclamation context on a portion of Fort McKay's traditional lands. Fort McKay IRC staff and I found that the CKS model is an effective approach to translate cultural information in a manner understandable to western scientists, to help community members to connect to the landscape in transition, and to promote good use of fiscal and logistical resources. However, the scale of reclamation that will be taking place on Fort McKay's traditional lands makes some community-based recommendations difficult to implement. As well, spirituality–an important component of the CKS model–proved challenging to address.

The Cultural Keystone Species Model

As a concept that continues to hold much interest in conservation ecology and related disciplines, researchers have explored the relevance of keystone species' roles in the food chain, implications of bottom-up versus top-down system effects on keystone designation, and the classification of highly interactive yet abundant species (see Kotliar 2000; Menge and Freidenburg 2001; Paine 1966, 1969; Power et al. 1996; Soulé et al. 2003). In addition to discussions about what is and what is not a keystone, there are vigorous debates about appropriate conceptual applications (see Khanina 1998; Mills et al. 1993; Power et al. 1996). Concerns have been expressed that broadening the use of keystone species, including the more recent linkage with the CKS model (see Garibaldi and Turner 2004), may misrepresent or even weaken the concept (Davic 2002; Piraino and Fanelli 1999). As will be discussed in the next section, the CKS model is a separate concept from ecological keystone species (*sensu* Paine 1966, 1969) but holds metaphorical congruity with it. The CKS model is not intended as an expansion of the original definition but rather as a social model informed and influenced by ecological theory. Areas of convergence and divergence between these two concepts are discussed in detail in Garibaldi and Turner (2004).

Throughout the world, people strongly identify with plants and animal species on which they depend for cultural and economic reasons. Bison for plains tribes of the United States, baleen whale for the Inuit, cedar and salmon for people on the Northwest coast of North America are just a few examples of such relationships. These species, CKS, comprise more than food or sources of raw materials. They permeate a culture's stories, spiritual practices, and language and daily practice. They are often associated with resource management activities that inform social practice, environmental philosophies, cultural history, and art (Moller et al. 2004). Just as ecologists have long recognized that some species, by virtue of the key roles they play in the overall structure and functioning of an ecosystem are essential to its integrity, certain plants and animals feature prominently in language, ceremonies, and narratives of Indigenous peoples. Others have noted the influential role particular species have in cultural dynamics (see Cristancho and Vining 2004; Nabhan and Carr 1994).

The Cultural Context of Reclamation

In this paper, I draw upon current discussions within the field of restoration, specifically the concepts that have broadened the meaning of restoration beyond the singular focus on ecological integrity to one that encompasses cultural fidelity (Apostol and Sinclair 2006; Higgs 2003). This broadened framework encompasses the concepts of "ecological-cultural restoration" (Senos et al. 2006), "reinhabitation" (Mills 1995), "biocultural restoration" (Janzen 1988), "restoration as a performing act" (Jordan 2003), and even Gary Nabhan's "re-storying the landscape" (Nabhan 1991, 1997). The main thrust behind these concepts is that restoration can support ecological parameters such as system function, stability, and integrity, while simultaneously renewing and supporting the cultural beliefs and practices that are integrated with the landscape and species being restored. Progressively, restorationists and land managers are promoting re-establishment of traditional landscape-use activities where changing management policies and the like have forced cessation of those practices (Anderson 2005; Anderson and Barbour 2003). Focal restoration, put forth by Eric Higgs (2003), adds another dimension to the linked association between ecological and cultural systems by drawing our gaze to the intentionality of restoration. With this focus, pre-existing values and beliefs are considered through a current lens allowing new expressions of these values and beliefs to emerge. It is the focal restoration promoted by Higgs that has direct relevance to the reclamation of Fort McKay traditional lands. The CKS model draws us closer to the meaningful inclusion of traditional ecological knowledge in reclamation desired by people of Fort McKay by addressing a more holistic suite of values, inclusive of both social and ecological considerations.

The People and Land of Fort McKay

In the boreal forest of northern Alberta, expansive peatlands (or muskegs), interweave upland coniferous and deciduous forest. Indeed, these culturally valued wetlands cover roughly half of the pre-industrially disturbed landscape

in the region. Muskeg areas are invaluable as reliable sources for water, travel corridors, medicine, material and food, and these areas continue to hold high value for both people and animals in Fort McKay's traditional territory (Figure 1). Regionally, animals such as caribou, moose, bear, fisher, and beavers as well as plants such as sphagnum moss, berries, birch, poplar and spruce have supported many generations of Indigenous people. The large Athabasca and Clearwater Rivers provide supplies of fish such as perch, pickerel, whitefish, and jackfish. In the 1600 and 1700s, European interest in this area grew due to the expanding fur trade. Forts were established and Indigenous people began to change their hunting, trapping and land use patterns to take advantage of increased trade opportunities (Athabasca Chipewyan First Nation 2003). Today, government and industrial interest in the vast stores of bitumen contained in the oil sands drives one of the largest changes impacting regional Indigenous people.

Substantial oil sands mining began in the area in 1964 when the Great Canadian Oil Sands (now Suncor Energy) began development (Alberta Energy 2008). At present there are 13 operating or proposed oil sands projects (mines and SAG-D) within an approximately 50-kilometer radius of Fort McKay (Alberta Energy 2008). The vast majority of the operations fall along the Athabasca River corridor (Figure 1)-an area highly valued by regional Indigenous people-with existing and proposed mines less than 15 kilometers from the hamlet of Fort McKay (see CNRL 2002; Deer Creek Energy 2006; Shell Canada 2005). This means that development and associated reclamation activity are literally in the community's backyard.

In many instances, the impacts of these oil sands projects are so extensive that the known cultural landscape no longer exists. As a result, people will have to participate in developing a connection with their "new" landscape as it undergoes continual transformations. For instance, at times the construction will begin at the water table thus instituting a new hydrologic regime, terrain, and vegetation cover than previously existed in that location. The dramatically imposed landscape changes will modify long-existing hunting and gathering patterns and severely compromise the ability of Fort McKay's people to share traditional environmental knowledge. This, of course, places an enormous emotional strain on the community as they renegotiate their long-established social, cultural, spiritual and physical structure. As residents attribute both specific health concerns (e.g., asthma) and indirect impacts on health and well being (e.g., stress and cultural disconnect from landscape) with mine related development, community members continually emphasize the necessity of reclamation practices that ensure healthy sustainable populations of culturally important species to maintain their cultural heritage–now and for future generations.

Methods

Five primary steps were involved in determining which species held the greatest cultural importance within the Fort McKay community and thus could be classified as CKS. First, informal conversations with community members and Fort McKay IRC staff allowed me to build trust with community members while

TABLE 1. Evolution of the Identification of CKS and Core Value of Each CKS for Fort McKay.

Preliminary CKS for Fort McKay	Final CKS for Fort McKay	Core values as a CKS
Moose	Moose	Food, technology
Mountain cranberry	Mountain cranberry	Food, medicine
	Bog cranberry	Food, medicine
	Lowbush cranberry	Food, medicine
	Blueberry (multiple species)	Food
Ratroot	Ratroot	Medicine
	Beaver	Ecosystem function, technology

also identifying a preliminary set of CKS that would be verified in later stages of the project. Next, Fort McKay IRC staff selected 14 elders to participate in semi-structured interviews with elders representing Dene, Cree, and Métis people, to validate the preliminary CKS and explore the underlying importance and current relevance of those and other species to their communities. Concurrently while conducting interviews, I completed the third step, which was reviewing published and unpublished reference material documenting the species of significance to the community (Garibaldi 2006).

Once interviews and literature reviews were complete, I assessed the preliminary list (and ultimately an expanded list) of cultural keystone species using an Index of Identified Cultural Influence (ICI), a quantitative indicator that employs a series of questions to determine a species' "keystone-ness" (Garibaldi and Turner 2004). The ICI was used during the project when a species appeared to have potential as a CKS to provide a quantitative measure that could be interpreted relative to the scores for other species. As a final step, I evaluated all of the information gathered during interviews, literature reviews, and the ICI evaluation process and proposed a final list of CKS which was verified with all project participants to ensure that I interpreted and applied the information accurately. As the ICI is a quantitative research tool not an absolute determiner of a CKS, the final validation of species with community members is essential. Fort McKay community members reviewed and consented to the project findings prior to finalizing the results.

Results: the CKS of Fort McKay

By applying the five steps, the initial list of CKS was expanded from three to seven (Table 1). I found that there were few literature sources that provide details of traditional plant use and values surrounding plant and animal harvesting, and thus conducting interviews was an especially important component of the project. As well, interviews ensured current species value drives the identification of CKS. Involvement of community members in identifying key species may be the best test for identifying fundamental species to their identity and cultural survival (see Garibaldi and Turner 2004). Given the intention of applying the CKS model toward reclamation planning of their traditional territory, it was

essential that community members asserted a strong influence over the selection of species they deem culturally significant.

The initial set of three species with high cultural significance for Fort McKay were moose (*Alces alces*) and mountain cranberry or lingonberry (*Vaccinium vitis-idaea* L.), both extremely significant food sources, as well as ratroot or sweetflag (*Acorus americanus* (Raf.) Raf.), a highly valued medicinal plant. As a result of interviews, the literature review and the use of the ICI, the working list of CKS was expanded to include bog cranberry (*Oycoccus oxycoccus* (L.) MacM.), lowbush cranberry (*Viburnum edule* (Michx.) Raf.), multiple species of blueberries that are culturally recognized as one group (*Vaccinium myrtilloides* Michx., *V. uliginosum* L., and *V. caespitosum* Michx.), and beaver (*Castor canadensis*). The final list of CKS is comprised of moose, mountain cranberry, bog cranberry, lowbush cranberry, blueberry, ratroot, and beaver.

Before applying the ICI assessment to species with potential as a cultural keystone, I modified the ICI to ensure that the questions were relevant within the Fort McKay cultural context (see Table 2 for full list of questions used in the ICI). Three elements that indicate cultural keystone species were particularly significant for all identified CKS in Fort McKay (Table 2): (a) intensity or multiplicity of use, (d) persistence in cultural change, and (e) level of unique position in the community. As there are very few available recorded narratives for the community, the criteria (c) narrative, ceremonies or symbolism was not relevant and therefore not included in the ICI ranking of CKS in Fort McKay. As well, most people were reluctant to share creation stories during TEK Project interviews.

I used the ICI to assist in ranking the original list of three species as well as the additional post-interview taxa and then verified findings through additional interviews. An example of a species considered, but not ultimately included as a CKS is mint (*Mentha arvensis* L.). When checked against the ICI, mint received a score of 11 (a=2, 1; b= 3; c= N/A; d= 2; e=3; f=0). This score suggests that while the species may hold value to the community, it is not a keystone (see Table 2 for comparison with scores to CKS). Relative to other species it does not strongly influence cultural identity. This and similar findings were verified with community participants.

The inclusion of beaver as CKS reflects the community's recognition of beaver's importance not only in diet, medicine, and material and/or spiritual practices, but also for its ecological value. The significance of beaver indicates the practical views of community members regarding their environment and the value they place on species function. Beaver activity is a preferred agent of change particularly when juxtaposed with the dramatic manipulation of the land by industrial development. Their activity is viewed as essential for shaping the land; the health and functionality of the land is essential for sustainability of Fort McKay culture.

Reclaiming the Process: Implications of the Cultural Keystone Species for Reclamation of Fort McKay Traditional Territory

The TEK Project has influenced the way both the community and Albian Sands engage with reclamation. Lessons learned from this process will help

TABLE 2. Index of Identified Cultural Influence (ICI) for Fort McKay Cultural Keystone Species.

Elements that indicate a cultural keystone species	ICI Rating for Fort McKay CKS*			
	Moose[1,2,4,5]	Beaver [2,3, 5]	Ratroot [1,2, 5]	Cranberry and blueberry [1,2, 3,5]
(a) Intensity, type and multiplicity of use				
– Is the species used intensively (routinely, and/or in large quantities)?	5	2	5	5
– Does the species have multiple uses?	5	5	0	4
(b) Naming and terminology in a language, including use as seasonal or phenological indicators, names of months or seasons, place names				
– Does the language incorporate names and specialized vocabulary relating to the species?	5	4	4	4
(c) Role in narrative, ceremonies, or symbolism				
– Is it prominently featured in narratives and/or ceremonies, dances, songs, or as a major crest, totem, or symbol?	n/a	n/a	n/a	n/a
(d) Persistence and memory of use in relationship to cultural change				
– Is the species ubiquitous in the collective cultural consciousness and frequently discussed?	5	5	5	5
(e) Level of unique position in culture (i.e. it is difficult to replace with other available native species?)	5	5	5	5
(f) Extent to which it provides opportunities for resource acquisition from beyond the territory				
– Is it used as a trade item for other groups?	5	3	5	4
Total Score (ICI rating) out of 30	30	24	24	27

* Rating system follows Garibaldi and Turner 2004: 5 = yes, very high; 4 = yes, high; 3 = yes, moderate; 2 = yes, low; 1 = yes, though very low or infrequent; 0 = no, not used. The highest possible ranking is 30; the closer the total is to 30, the higher its probability as CKS.

Sources: [1]Fort McKay First Nations 1996[1994], [2]Petro-Canada 2005, [3]FMES 1997, [4]TEK Project interviews, unpublished material, [5]Tanner et al. 2001.

direct and inform how Fort McKay participates in reclamation activities on other portions of their traditional territory while offering guidance to other regional developers for addressing cultural values in reclamation on their leases. Furthermore, the findings from this project offer insight for reclamation with other communities. I have identified four key "successes" and two challenges from this process.

Project Successes

Both Albian Sands staff and Fort McKay community members have indicated that focusing on CKS has facilitated more meaningful on-going communication. For each of the regional operating developers the Fort McKay IRC has established an Elder Advisory Group comprising 8 to 10 elders whose trap lines overlap or are adjacent to the lease sites. The Elder Advisory Group for Albian Sands annually selects a CKS as a focus for meeting discussions and company reclamation research for the year. If the Advisory Group has an interest in a unique aspect of CKS reclamation, such as water quality and availability, the meetings will target that interest. During meetings and field visits, Albian Sands discusses what is being done to address a particular aspect of reclamation for the CKS. Advisory Group members provide feedback on the reclamation as it occurs, and this act ultimately fosters a new relationship with these reclaimed areas.

One of the key advantages of the CKS model is its effectiveness at translating cultural landscape information in way that is understandable to Western researchers, an often difficult and confusing task (Agrawal 1995; Huntington 2000; Nadasdy 2003). Spending more time focusing on species relevant to community members has encouraged the community to share its traditional knowledge with direct implications for reclamation. For example, project interviews revealed that many Fort McKay community members recognize two forms of ratroot, one preferred, and each with different growing conditions. Albian Sands staff discussed this finding with community members and has recently initiated research on ratroot morphology and associated growing conditions. Ultimately, reclamation will be focused on the preferred form of this species.

CKS have offered a relatable linkage that people can visualize and discuss between the current state of the developed landscape and the long-term goals for the land following reclamation. Lengthy reclamation timelines confound the difficulty of people to maintain (or form) connections with areas that are undergoing reclamation. Even with the newly promoted progressive reclamation (reclaiming mined areas "as-you-go"), the evidence and benefits of reclaimed sites is beyond the lifetime of many people in the community. While the CKS model does not ameliorate the longevity of the process, it does offer a culturally relevant linkage to the transitioning landscape. For example, reclaiming moose habitat begins with terrain shaping and soil placement. These actions do not result in a landscape that resembles moose habitat on undisturbed sites. It has been difficult for community members to relate to the disturbed land and see how this will ultimately become familiar habitat. At present, community members are brought to these sites where a dialogue is initiated between the community and industry. Industry explains the process of reclamation and how

it will result in habitat for a CKS (e.g., moose) and community members are invited to share their perspectives on requirements for moose habitat. As a result of this on-site dialogue, community members influence the execution of the reclamation process.

Another outcome of targeting CKS in the reclamation process is a more effective use of fiscal and logistical resources while encouraging culturally relevant reclamation. Not only are the key plant species included in reclamation design, but ecologically associated species for the CKS are also included. For example, the Fort McKay community has shared information with researchers about the importance of species such as red willow (*Cornus stolonifera* Michx.) for moose browse and, as a result, Albian Sands includes this species, among others, in their reclamation design. As well, opportunities now exist for Fort McKay community members to be involved in collecting local seeds for eventual planting in reclaimed areas.

Project Challenges

Two key challenges became apparent when using the CKS model as an approach for the reclamation of Fort McKay traditional lands. First, the scale of the oil sands disturbance and subsequent reclamation is so immense that some community recommendations for reclaiming CKS habitat may be impractical. For example, a suggestion by some elders to relocate, rather than replant, certain CKS may be feasible for a couple of acres. However, the scale of oil sands mine leases is thousands of hectares–too large of an area for such labor-intensive techniques. Further confounding the issue is the survivability of salvaged plants prior to replanting and a lack of available (reclaimed) space to transplant them to in a timely manner, while the seeds and seedlings are still viable. So while the CKS model does still offer benefits for reclamation on a large scale, there are challenges that may be best addressed on a situational basis.

Second, one of the most elusive goals of the project was to address spirituality in the process of reclamation. Spirituality is a component of CKS, but challenging to address. People's spirituality does not exist in a locatable place, but rather in experience and physical movement on the land. Therefore, identifying locations or mechanisms to engage in continual renewal of cultural practices on the land is essential for cultural sustainability. Due to the scale of disturbance on the Fort McKay's traditional territory, maintaining sites for continuous cultural connection is quite difficult. In response, Fort McKay IRC has initiated a process to select locations for protection from development and will work with companies (and the government) to implement these recommendations. So while the discussions involving CKS reinforced the significance of spirituality in the community, what is required for its support is availability of spatial locations for people to maintain cultural practices while development occurs.

Conclusion

The research approach selected for this project was in response to clear directives given by Fort McKay community members to address reclamation

efforts in a manner meaningful for the community. This means taking into consideration ecological functionality and linked social and spiritual factors. The emphasis on these aspects of culture within Fort McKay permits community members to share information they feel is valuable, in their own terms, and in their own language.

Based on the Fort McKay TEK project, I offer the following recommendations for the application of the CKS model in other cultural and ecological settings. First, allocate appropriate time and resources for a collaborative adaptive process with participating communities. Understanding the unique context of the community will support a stronger more effective course of action. As with other community-based research, perhaps the best indicator of the utility of this model is the responses from the community members themselves. This process was not only initiated by the community, it also engaged community members and was directed by existing cultural values.

Second, emphasize the concept of process in social-ecological reclamation. Just as restoring the structure and function of land to a targeted end-use requires a long-term commitment to a process (e.g., monitoring, evaluation, corrective measures) so too does the supporting of social mechanisms, community engagement, in reclamation. Success is then viewed as a series of actions that positively affect the trajectory of a long-term goal. In the case of Fort McKay, many findings of the project that have been implemented will be reviewed and evaluated for their long-term effectiveness. They will subsequently be further supported, and modified, if necessary, or expanded upon as more discussion takes place. Re-engagement with the landscape is a practice, and use of the CKS model is an aid to support that process.

The CKS model presented here is based on the assumption that reclamation, restoration and related actions must occur in a collaborative arena between affected communities and regional developers. This involves an honest willingness to explore community values and draws on the insight and experience and of all individuals with connection to the landscape. The CKS provide one model for accomplishing this goal.

Acknowledgements

The paper is dedicated to the elders and community members of Fort McKay who have, and continue to, generously share their knowledge of the land and their relationship to it including: Andrew Boucher, Rena Boucher, Mary Bouchier, Gary Cooper, Flora Grandjambe, James Grandjambe, Wilfred Grandjambe, Celina Harpe, Dorothy McDonald, Fred McDonald, Victoria McDonald, Francis Orr, Walter Orr, Elsie Rolland, Elizabeth Stokes, Mary Tourangeau, and Clara Wilson. I offer special thanks to Cecelia Fitzpatrick, Lisa Schaldemose, Jean L'Hommecourt (Fort McKay IRC), Carol Jones (C.E. Jones and Associates) and Ryan Stohmann for map production (Jacques Whitford- AXYS). Strong support from Darrel Martindale, Ainslie Campbell, and Fred Kuzmic of Albian Sands Energy, Inc. was greatly appreciated. I also offer thanks to Dana Lepofsky, Nancy Turner and two anonymous reviewers who provided insightful feedback on earlier drafts of this manuscript.

References Cited

Agrawal, A.
1995 Dismantling the divide between indigenous and scientific knowledge. *Development and Change* 26:413–439.

Alberta Energy.
2008 *Mining in Alberta.* Available at: http://www.energy.gov.ab.ca/minerals/1084.asp (verified 30 August 2009).

Anderson, K.
2005 *Tending the wild: Native American knowledge and the management of California's natural resources.* University of California Press, Berkeley.

Anderson, K. and M. Barbour.
2003 Simulated indigenous management: a new model for ecological restoration in national parks. *Ecological Restoration* 21(4):269–277.

Apostol, D. and M. Sinclair, editors.
2006 *Restoring the Pacific Northwest: the art and science of ecological restoration in Canada.* Society for Ecological Restoration International and Island Press, Washington.

Athabasca Chipewyan First Nation.
2003 *Footprints on the land: Tracing the path of the Athabasca Chipewyan First Nation.* Athabasca Chipewyan First Nation, Fort Chipewyan.

Berkes, F.
1999 *Sacred Ecology: Traditional Ecological Knowledge and Resource Management.* Taylor & Francis, Philadelphia.

Berkes, F. and D. Jolly.
2001 Adapting to climate change: Social-ecological resilience in a Canadian western arctic community. *Conservation Ecology* 5(2):18. Available at: http://www.consecol.org/vol5/iss2/art18 (verified 30 August 2009).

Berlin, Brent.
1992 *Ethnobiological classification: principles of categorization of plants and animals in traditional societies.* Princeton University Press, Princeton.

Canadian Natural Resources, Ltd. (CNRL).
2002 *Application for the Horizon Oil Sands Project.* Submitted to the Alberta Energy and Utilities Board and Alberta Environment. June 2002.

Conklin, H.C.
1954 The Relation of Hanunóo Culture to the Plant World. Ph.D. thesis (Anthropology), Yale University, New Haven.

Cristancho, S. and J. Vining.
2004 Culturally defined keystone species. *Human Ecology Review* 11(2): 153–164.

Davic, R.D.
2002 Herbivores as keystone predators. *Conservation Ecology* 6(2):r8. Available at: http://www.consecol.org/vol6/iss2/resp8 (verified 30 August 2009).

Deer Creek Energy, Ltd.
2006 *Application for the Joslyn North Mine Project.* Submitted to Alberta Energy and Utilities Board and Alberta Environment. February 2006.

Edwards, V.
2005 Managing the commons: Conservation of biodiversity, thematic introduction. In *Managing the commons: Conservation of biodiversity,* eds. L. Merino and J. Robson, pp. 15–20. Instituto Nacional de Ecologia, Mexico City.

Ellen, Roy.
2006 Introduction. In *Ethnobiology and the Science of Humankind, Journal of the Royal Anthropological Institute, Special Issue, No. 1,* ed. Roy Ellen, pp. 1–22. Wiley Blackwell, Toronto.

Energy Resources Conservation Board.
2008 *Oil Sands.* Available at: http://www.ercb.ca/portal/server.pt?open=512&objID=249&PageID=0&cached=true&mode=2 (verified 1 September 2009).

Fort McKay Environment Services (FMES).
1997 *A survey of the consumptive use of traditional resources in the community of Fort McKay.* Report to Syncrude Canada Ltd., Fort McKay, Alberta.

Fort McKay First Nations.
1996[1994] *There is still survival out there: A traditional land use and occupancy Study of the Fort McKay First Nations,* 2nd Edition. The Arctic Institute of North America, Calgary.

Garibaldi, A.
2006 *Fort McKay-Albian Sands Energy, Inc. TEK project: Integration of traditional environmental knowledge in land reclamation.* Report to Albian Sands Energy, Inc. and the Fort McKay Industry Relations Corporation from Garibaldi

Heritage and Environmental Consulting.

Garibaldi, A. and N. Turner.
2004 Cultural keystone species: implications for ecological conservation and restoration. *Ecology and Society* 9(3):1. Available at: URL: http://www.ecologyandsociety.org/vol9/iss3/art1 (verified 1 September 2009).

Garvin, T.
2005 *Carving Faces, Carving Lives: People of the Boreal Forest*. Heritage Community Foundation, Edmonton.

Grant, J., D. Woynillowicz, and S. Dyer.
2008 *Fact or Fiction: Oil Sands Reclamation*. The Pembina Institute, Calgary.

Higgs, E.
2003 *Nature by design: People, natural process, and ecological restoration*. MIT Press, Cambridge.
1997 What is good ecological restoration? *Conservation Biology* 11(2): 338–348.

Hunn, E., D. Johnson, P. Russell, and T. Thornton.
2003 Huna Tlingit environmental knowledge, conservation, and the management of a "wilderness" park. *Current Anthropology* 44:79–103.

Huntington, H.
2000 Using traditional ecological knowledge in science: Methods and applications. *Ecological Applications* 10(5):1270–1274.

Janzen, D.H.
1988 Tropical ecological and biocultural restoration. *Science* 239:243–244.

Jolly, D., F. Berkes, J. Castleden, T. Nichols, and the Community of Sachs Harbour.
2002 We can't predict the weather like we used to: Inuvialuit observations of climate change, Sachs Harbour, western Canadian Arctic. In *The Earth Is Faster Now: Indigenous Observations of Arctic Environmental Change*, eds. I. Krupnik and D. Jolly, pp. 93–125. Arctic Research Consortium of the U.S., Fairbanks.

Jordan, W.R., III.
2003 *The sunflower forest: Ecological restoration and the new communion with nature*. University of California Press, Berkeley.

Khanina, L.
1998 Determining keystone species. *Conservation Ecology* 2(2):r2. Available at: http://www.consecol.org/Journal/vol2/iss2/resp2 (verified 1 September 2009).

Kimmerer, R.
2000 Native knowledge for native ecosystems. *Journal of Forestry* 98(8): 4–9.

Kotliar, N.B.
2000 Application of new keystone – species concept to prairie dogs: how well does it work? *Conservation Biology* 14(6):1715–1721.

Long, J., A. Tecle, and B. Burnette.
2003 Cultural foundations for ecological restoration on the White Mountain Apache Reservation. *Ecology and Society* 8(1):4. Available at: http://www.ecologyandsociety.org/vol8/iss1/art4/ (verified 1 September 2009).

Menge, B.A. and T.L. Freidenburg.
2001 Keystone species. In *Encyclopedia of Biodiversity, Volume 3*, ed. S.A. Levin, pp. 613–631. Academic Press, San Diego.

Mills, L.S., M.E. Soule, and D.F. Doak.
1993 The keystone species concept in ecology and conservation. *Bioscience* 43(4):219–224.

Mills, S.
1995 *In service of the wild: restoring and reinhabiting damaged land*. Beacon Press, Boston.

Moller, H., F. Berkes, P. Lyver, and M. Kislalioglu.
2004 Combining science and traditional ecological knowledge: monitoring populations for co-management. *Ecology and Society* 9(3):2. Available at: http://www.ecologyandsociety.org/vol9/iss3/art2 (verified 1 September 2009).

Nabhan, G.P.
1997 *Cultures of Habitat: On Nature, Culture, and Story*. Counterpoint, Washington.
1991 Restoring and re-storying the landscape. *Restoration and Management Notes* 9(1):3–4.

Nabhan, G.P. and J.L. Carr, editors.
1994 *Ironwood: an ecological and cultural keystone of the Sonoran Desert*. Occasional Papers in Conservation Biology, No. 1., Conservation International, University of Chicago Press, Chicago.

Nadasdy, P.
2003 *Hunters and bureaucrats: power, knowledge, and aboriginal-state relations*

in the Southwest Yukon. University of British Columbia Press, Vancouver.

Paine, R.
1969 A note on trophic complexity and community stability. *The American Naturalist* 103:91–93.
1966 Food web complexity and species diversity. *The American Naturalist* 10: 65–75.

Petro-Canada.
2005 *Traditional Land Use Study, Amendment Application – MacKay River Expansion*. Submitted to Alberta Energy and Utilities Board and Alberta Environment. November 2005.

Piraino, S. and G. Fanelli.
1999 Keystone species: what are we talking about? *Conservation Ecology* 3(1):r4. Available at: http://www.consecol.org/vol3/iss1/resp4/ (verified at 1 September 2009).

Power, M.E., D. Tilman, J.A. Estes, B.A. Menge, W.J. Bond, L.S. Mills, G. Daily, J.C. Castilla, J. Jubchenco, and R.T. Paine.
1996 Challenges in the quest for keystones. *Bioscience* 46(8):609–620.

Senos, R., F.K. Lake, N. Turner, and D. Martinez.
2006 Traditional ecological knowledge and restoration practice. In *Restoring the Pacific Northwest: the art and science of ecological restoration in Canada*, eds. D. Apostol and M. Sinclair, pp. 393–426. Society for Ecological Restoration International and Island Press, Washington.

Shell Canada Ltd.
2005 *Application for Approval of the Muskeg River Mine Expansion Project*. Submitted to Alberta Energy and Utilities Board and Alberta Environment. April 2005.

Soulé, M.E., J.A. Estes, J. Berger, and C.M. del Rios.
2003 Ecological effectiveness: conservation goals for interactive species. *Conservation Biology* 17(5):1238–1250.

Stevenson, M.C.
1915 Ethnobotany of the Zuni Indians. *Bureau of American Ethnology Annual Report 30, 31102*. Government Printing Office, Washington, D.C.

Tanner, J., M. Gates, and B. Ganter.
2001 *Some effects of oil Sands development on the traditional economy of Fort McKay*. Fort McKay Industry Relations Corporation, Fort McKay.

Usher, P.J.
2000 Traditional ecological knowledge in environmental assessment and management. *Arctic* 53(2):183–193.

Watson, A., L. Alessa, and B. Glaspell.
2003 The relationship between traditional ecological knowledge, evolving cultures, and wilderness protection in the circumpolar north. *Conservation Ecology* 8(1):2. Available at: http://www.ecologyandsociety.org/vol8/iss1/art2/ (verified 1 September 2009).