Living with Boreal Forest Fires: Anishinaabe Perspectives on Disturbance and Collaborative Forestry Planning, Pikangikum First Nation, Northwestern Ontario.

By

ANDREW MARTIN MILLER

A Thesis
Submitted to the
Faculty of Graduate Studies of the University of Manitoba
In Partial Fulfillment of the Requirements for the
Degree of

Doctor of Philosophy

in

Natural Resources Institute
Clayton H. Riddell Faculty of the Environment, Earth and Resources
University of Manitoba
Winnipeg, Manitoba

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Elder Jake Keejic (1939 - 2006) in a firewood salvage area, gazing into adjoining fire killed trees. Photo: A. Miller 2006.

ABSTRACT

A substantial body of literature documents how Indigenous peoples of North America used fire to manipulate vegetation communities, achieve livelihood goals and create landscape features. Less explored are the sets of knowledge and relationships that have arisen from Indigenous peoples' long associations with fire at different spatial and temporal scales. How do people understand ecological processes such as forest destruction, initiation of succession, reorganization of forest communities that present themselves as part of fire disturbance? How do fire events occurring at varying scales affect livelihood activities? How can this body of knowledge of ecological processes find expression in modern resource management planning? This research explores the understandings and relationships that the elders of one Anishinaabe community, Pikangikum First Nation, in northwestern Ontario, have with boreal forest fire disturbance. This research took place as part of community led forestry planning being undertaken by Pikangikum elders with the assistance of the Ontario Ministry of Natural Resources (OMNR). It is the product of collaborative research between June 2006 and February 2009 employing semi-directive interviews, field trips with elders and trappers and community meetings with elders and Ontario Ministry of Natural Resources employees.

Through this research I recorded:

1. Elders' comparisons between the impacts of forest fire on disturbance and renewal processes with those of clearcut logging;

2. Pikangikum elders' understandings of fire's role within the boreal forest landscape including its impacts on plants, animals, livelihood activities and cultural landscapes of Pikangikum First Nation; and

3. Pikangikum elders' historic and desired forms of engagement with fire.

Elders possess detailed knowledge of the behavior and impacts of fire, its ecological legacies and its effects on Pikangikum livelihood activities. This knowledge incorporates interactions between fire and multiple features (i.e. weather, topography, species, fuels conditions, etc.). Much of the elders' knowledge is parallel to empirical observations of fire's impacts by western trained forest managers.

Pikangikum elders understand the world to consist of networks of interacting beings, many of whom possess the capacity to make choices, or agency. Fire is one such being. This view distinguishes the Anishinaabe worldview from that of Euro-Canadians. The implication of the view of a sentient world of agents is that Pikangikum elders are inclined to maintain relationships in order to ensure forest renewal occurs. Elders indicate a number of factors in clearcut forestry practices that are disrespectful and destructive of the relationships necessary for renewal. These observations can be translated into forestry practices including: leaving soils undisturbed, using fire to remove slash and prepare seedbeds, and allowing natural regeneration to occur from endogenous seed sources.

Pikangikum elders described ways they wish to engage with fire that can be categorized as dialogue, teaching, and practices involving fire. Their interests include:

- Continuing dialogue with OMNR about the role of fire within the Whitefeather Forest Area;
- Extension of OMNR fire suppression to the entire Whitefeather Forest;
- The ability to instruct community youth in the proper way to manage fire on the land;
- The recognition of traditional burning practices as legitimate forms of community led land management;
- The investigation of ways in which elders' knowledge may be employed in developing silvicultural practice; and
- The ability of Pikangikum residents to find employment as firefighters.

This research contributes to literatures surrounding our understandings of social-ecological resilience, traditional ecological knowledge, and cultural landscapes. The understandings which elders have of the processes of ecosystem disturbance and renewal are distinct from those held by western trained scientists because they consider non-human beings as potentially possessing agency. They focus on maintaining relationships and the ability to continue livelihood activities upon the land as a means to determining if a disturbance has the potential to impact the land community's ability to renew itself. The elders provided detailed contributions to our understanding of the impacts of traditional burning practices occurring at site scales for the region of northwestern Ontario. Their description of large scale destructive capacity of forest fires and recovery processes include the actions of non-human beings which contribute to the production of intentionally ordered spaces. This approach alerts us to the potential shortcoming of current definitions of cultural landscapes which consider the legacies of human activities

upon the land. This approach may need to be reassessed in order to capture the agency of non-humans within the full suite of meanings present within a landscape. The elders' ability to see the relevance of their knowledge within the new and novel context of timber harvesting highlights the adaptive nature of traditional ecological knowledge. This study underscores the need for traditional knowledge holders to be able to express their understandings of ecosystem processes and worldviews within collaborative planning of resource developments.

ACKNOWLEDGEMENTS

I owe great thanks firstly to my committee members: advisor, Dr. Iain Davdison-Hunt who consistently directed my attention, generously contributed financially and strategically towards the completion of this program and to my career; co-advisor, Dr. Micheline Manseau, who injected pragmatic and constructive advice relating to management and natural sciences; Dr. Rick Reiwe of the U of M Department of Biological whose familiarity with the ecosystems and peoples of the north allowed him to constantly remind me of details, contexts and precedents of my research; Dr. Nancy Turner of the University of Victoria's School of Environmental Studies whose vast knowledge of ethnobotany and painstaking copy editing of citations were a joyfully accepted; and external examiner, Dr. Eugene S. Hunn from University of Washington's Department of Anthropology who willingly gave his timeout out of his interest and dedication to ethnoecology. To all of you, my sincere gratitude for your contributions.

Secondly, I owe much thanks to my many friends and colleagues and support group within the Natural Resources Institute who contributed references, beers, perspectives, advice, laughter and constant friendship. Also, within the NRI I have to thank Dalia Naguib and Tammy Keedwell whose efforts often go unsung but whose jobs keep us all in travel claims, copier paper and paychecks.

Perhaps most substantially, I owe thanks to the many people of Pikangikum who good naturedly received my presence and willingly endured my questions. Especially I would like to thank Pikangikum elders, Oliver "Ahneebuhn" Hill, Mathew "Oweeguhn" Strang, George B. Strang, Norman Quill, Solomon Turtle, Whitehead Moose, Jake Keejic, James "Weesahkayjahk" Strang, and Larry Pascal who were, while not always easy to track down, always good natured sources of jokes, rabbit stew, wisdom, and wonder. Thanks also to Land Use Coordinator, Paddy Peters, whose translation of words and hours of help in many ways gave this document the depth it has. Thanks also to Charlie Pascal who similarly translated and kept people coming in to the office to meet with me. Thanks also to the hunters and their families who took me out on the land fed me and taught me how to smoke meat, snare rabbits and catch walleye: Eli Keejic, John-Pierre Keejic, Tony Suggashie and Ronald Turtle.

Lastly, I wish to thank my darling wife Shirley Ellen Bartz who has always believed in me, supported me and accompanied me through this long journey.

Thank you all.

Financial contributions to this research were gratefully received from:
Karen Palidwor Memorial Fellowship in Forest and Wildlife Management (March 2009); Oakes-Riewe Aboriginal-Environmental Studies Research Award (October 2007); University of Manitoba Graduate Fellowship (September 2007); International Graduate Student Entrance Scholarship (September 2005); Sustainable Forest Management Network (Davidson-Hunt, PI September 2005-2009), Social Sciences and Humanities

Research Council (Davidson-Hunt, PI September 2005 - 2009), Environment Canada Aboriginal Capacity Building Fund (Whitefeather Forest Management Corporation April 2006-2008).

DEDICATION

For Shirley and Sam

I would also like to dedicate this work to Delia and Brenton Moose and Shayena Suggashie and all the other children in Pikangikum who visited me in the hotel to see if I had bananas and to catch up on what "Sasquatch" was up to.

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CHAPTER 1: INTRODUCTION

1.1 Pikangikum First Nation and knowledge of the importance of forest fire

Since 1996, Pikangikum First Nation (PFN) [pronounced *Pee-CAN-chi-cum*], an Anishinaabe (Ojibwa) community in northwestern Ontario, has engaged with Ontario Ministry of Natural Resources (OMNR) in natural resource management planning for 1.3 million hectares of boreal forest, lakes and, waterways which comprise their traditional territory. Their objective has been to record and integrate traditional values and practices occurring throughout their territory in community-based resource development (Chapeskie et al. 2005; Pikangikum First Nation and OMNR 2006). Among the traditions recorded by the community is the historic use of controlled fires to improve wildlife habitat, prepare garden plots, maintain cabin areas and meet other objectives.

Testimony from early explorers (Glover, 1962; Bigsby, 1969), dendrochronological studies (Dorney and Dorney, 1989; Loope and Anderton, 1998; Anderton, 1999), and autobiographies (Theriault, 1992) allude to Anishinaabe use of fire as a land management tool. Systematic burning of meadows, river edges, lake shores and other areas by indigenous peoples in Alberta increased productivity and biodiversity at the landscape level by creating small patchworks of early successional plant communities within later seral stage communities (Lewis, 1982; Lewis and Ferguson, 1988). These activities created a mosaic of successional communities in what may otherwise have been homogeneous age classes of vegetation. Recent work has documented the historic role of intentional burning in creating indigenous cultural landscapes in northwestern Ontario that offered a variety of resource opportunities (Davidson Hunt, 2003a; 2003b; N. J.

Turner et al. 2003; Roberts, 2005; Berkes and Davidson-Hunt, 2006). However, very little detail exists describing how fire was used and how users understand its effects on the landscape and the ecological processes it entrains.

In addition to the manipulation of landscapes using small scale fire disturbance, the people of Pikangikum historically were exposed to the impacts of large scale forest fires occurring within their territory. Forest fires within the boreal forest have dramatic impacts on vegetation communities and availability of plant and animal resources. While other types of disturbance exist (e.g. flooding and herbivory by beaver, insect outbreaks, wind throwing of trees) and are locally important, it has been argued that forest fires are the largest and most important source of ecological disturbance in the boreal forest (Rowe and Scotter, 1973; Weber and Stocks, 1998). Exposure to the impacts of forest fires presents the possibility that the people of Pikangikum may possess understandings of thier impacts at a variety of spatial and temporal scales which may contribute valuable insights to forest management.

Indigenous peoples, through long associations with their environments, have developed understandings of ecosystem processes that are distinct from those recognized by non-indigenous societies (Lewis, 1982; L. M. Johnson, 2000; Anderson, 2005). Understandings of ecological processes are part of traditional ecological knowledge (TEK), which has been defined as the body of knowledge, practice, and belief concerning the environment and the beings occupying it, which arises through experience, observation and adaptive processes and is passed on through oral tradition (Berkes, 2008). Numerous authors have pointed to the potential of TEK to contribute valuable

understandings for managing natural resources (e.g. Berkes et al. 2000; N. J. Turner et al. 2000; Karjala et al. 2002; Natcher and Hickey, 2002; Berkes, 2008).

One common critique of TEK scholarship, especially from indigenous scholars, is that it tends to remove selected observations from the worldviews in which they were conceived in order to make the information available for scientific purposes outside of the cultural context. In the process, TEK studies tend to change value laden knowledge into objective facts (Roots, 1998; Michon, 2000) - turning "wisdom" into "data" (McGregor, 2000; Witt and Hookimaw-Witt, 2003). This perspective is supported by the observation of a large numbers of TEK studies recording lists of folk taxonomies of plants, animals and environmental features for many cultures from different regions of the world (Hunn, 2007). Fewer studies attempt to provide indigenous interpretations of ecological relationships or processes (notable exceptions include: Lewis, 1982; Lewis and Ferguson, 1988; Alcorn, 1989; Davidson-Hunt, 2005).

The capacity of systems to maintain their structure and function following ecological disturbances has been referred to as ecological resilience (Holling, 1973). Forest species have experienced and adapted to periodic disturbances (e.g. wildfires, floods, insect outbreaks, blowdowns) with frequency, intensity, seasonality and, extent within a range of natural variability (Picket and White, 1976; M. G. Turner et al. 2001). The Canadian boreal forest has evolved with the presence of periodic and at times large scale wild fires which create a mosaic of age classes and successional stages throughout the boreal landscape (Rowe and Scotter, 1973; E. A. Johnson, 1992; Weber and Stocks, 1998).

Recently, Canadian foresters have begun to recognize the importance of fire as a keystone ecological process in the boreal forest (Weber and Stocks, 1998). Forest management policies formerly emphasizing fire suppression have begun to focus on the goal of fire management in response to the recognition that complete fire suppression throughout the Canadian boreal forest is neither economically feasible nor ecologically desirable (Canadian Council of Forest Ministers, 2005). North American foresters increasingly attempt to conduct forest management that emulates aspects of natural disturbance regimes to improve conservation of structure, function and biodiversity of native forests (Hunter, 1993; Attiwell, 1994; Bergeron, 2002; Perera et al. 2004). In the province of Ontario, this principle has been encoded into forestry laws stating that to the extent possible, forest management will incorporate features of natural disturbances to maintain forest structure and function (Statutes of Ontario, 1994). It is widely appreciated that incorporation of natural patterns of disturbance into forest management planning demands a greater understanding of the relationship between human-caused disturbance, including anthropogenic fires, and natural disturbances (Niemelä, 1999; McRae et al. 2001; Perera et al. 2004). However, no attempt has been made to consider TEK perspectives of the interactions between biotic and abiotic features that contribute to forest disturbance and renewal cycles and the production of livelihood values.

1.2 Research purpose

The purpose of this research is to document the knowledge and relationships that elders Pikangikum First Nation have with forest fire and its impact on disturbance and renewal processes.

1.3 Research objectives

The objectives of this research are to document:

1. Differences perceived by Pikangikum elders between the impacts of forest fire and those of clearcut logging on disturbance and the renewal processes they entrain.
2. Pikangikum elders' understandings of fire's role within the boreal forest landscape including its impacts on plants, animals, livelihood activities and cultural landscapes of Pikangikum First Nation; and
3. Pikangikum elders' historic and desired forms of engagement with fire.

1.4 Thesis format

This thesis is organized as a "sandwich thesis" in which the results chapters are presented as manuscripts intended for publication. Guidelines for this approach are presented by University of Manitoba Faculty of Graduate Studies (http://www.umanitoba.ca/faculties/graduate_studies/thesis/guidelines.html). A brief background and statement of the objectives have been presented in this chapter. A more detailed presentation of the literature and theoretical context follows in Chapter 2. Chapter 3 provides an introduction to the community setting where the research occurred, a description of the methodological approach and specific methods employed. As of this date (January 2010) Chapter 6, **Talking about Fire: Pikangikum Elders Guiding Fire Management Dialogue** and Chapter 5, **Agency and Scale in the Creation of**

Aboriginal Cultural Landscapes are under review for publication. Chapter 4, ***Cheeyahwayseg,*** "**Returning as it was**"**: Anishinaabe Perspectives of Disturbance and Renewal Following Forest Fire and Clearcutting** is in preparation for publication. While these are co-authored chapters I am the first author of them all. I anticipate having all three chapters in the review process prior to August 2009.

The final chapter, **Reflections and Conclusions** is intended to tie off the thread that passes through all of these chapters: the knowledge and relationships that Pikangikum elders have with fire and its role as a force of ecological disturbance and social-ecological organization. Chapter 7 will conclude this thesis with a brief reexamination of the principal findings of each chapter and the objectives to which they correspond and potential directions for future work.

1.5. References

Alcorn, J. 1989. Process as resource: the traditional agricultural ideology of Bora and Huastec resource management and its implications for research. p. 63-77. In: D. A. Posey and W. Balée. Resource management in Amazonia: Indigenous folk strategies. New York: Botanical Garden, Bronx.

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

Anderton, J. B.1999. Native American, fire-maintained blueberry patches in the coastal forests of the northern Great Lakes. The Great Lakes Geographer 6(1/2): 29-39.

Attiwell, P. M. 1994. The disturbance of forest ecosystems: the ecological basis for conservative management. Forest Ecology and Management. 63: 247-300.

Bergeron, Y., Leduc, A., Harvey, B.D. & Gauthier, S. 2002. Natural fire regime: a guide for sustainable management of the Canadian boreal forest. Silva Fennica 36(1): 81–95.

Berkes, F. 2008. Sacred Ecology. 2nd Edition. Philadelphia: Taylor and Francis. London.

Berkes, F. and I. Davidson-Hunt 2006. Biodiversity, traditional management systems and cultural landscapes: examples from the boreal forest of Canada. International Social Sciences Journal 87: 35-47.

Berkes, F., J. Colding and C. Folke. 2000. Rediscovery of traditional ecological knowledge as adaptive management. Ecological Applications 10(5):1251-62.

Bigsby, J. J. 1969. The shoe and canoe, or pictures of travel in the Canadas. Illustrative of their scenery and of colonial life; with facts and opinions on emigration, state policy and other points of public interest. Vol. 2 p. 207. Paladin Press New York.

Canadian Council of Forest Ministers. 2005. Canadian wildland fire strategy: a vision for an innovative and integrated approach top managing the risks. Natural Resources Canada. Edmonton, Alberta

Chapeskie A., M. O'Flaherty, A. Peters, N. Quill 2005. The Whitefeather Forest Initiative: Indigenous wisdom guiding a new community forestry opportunity in the boreal forest of Canada. Sharing Indigenous Wisdom: An international dialogue on sustainable development. June 6-10, 2004. College of Menominee Nation. 7-38.

Davidson-Hunt, I. J. 2003 a. Indigenous lands management, cultural landscapes and Anishinaabe People of Shoal Lake, Northwestern Ontario, Canada. Environments 31(1) 21-41.

_____. 2003 b. Journeys plants and dreams: social-ecological resilience, memory and adaptive learning. PhD Thesis. Winnipeg, Canada: University of Manitoba.

Davidson-Hunt, I. and F. Berkes. 2003. Learning as you journey: Anishinaabe perception of social-ecological environments and adaptive learning. Conservation Ecology 8(1): 5. http://www.consecol.org/vol8/iss1/art5 Accessed: May 2006.

Holling, C. S. 1973. Resilience and stability of ecological systems. Annual Review of Ecology and Systematics 4: 1-23.

Hunn, E. 2007. Ethnobiology in four phases. Journal of Ethnobiology 27(1): 1-10.

Hunter, M. L. Jr. 1993. Natural fire regimes as spatial models for managing boreal forests. Biological Conservation. 65: 111-120.

Johnson, E. A. 1992a. Fire and vegetation dynamics: studies from the North American boreal forest. Cambridge University Press.

Johnson, L. M. 2000. "A place that's good," Gitksan landscape perception and ethnoecology. Human Ecology 28(2):301-325.

Karjala, M. K., E. E. Sherry, and S. M. Dewhurst. 2004. Criteria and indicators for sustainable forest planning: a framework for recording Aboriginal resource and social values. Forest Policy and Economics 6(2) 95-110.

Lewis, H. T. 1982. A time for burning. Occasional publications No. 17, Edmonton: Boreal Institute for Northern Studies, University of Alberta.

Lewis, H. T. and T. A. Ferguson. 1988. Yards, corridors and mosaics: how to burn a boreal forest. Human Ecology 16(1): 57-77.

Loope, W. L. and J. B. Anderton. 1998. Human vs. lightning ignition of presettlement surface fires in coastal pine forests of the Upper Great Lakes. American Midland Naturalist 140(2): 206-218.

McGregor, D. 2000. The state of traditional ecological knowledge research in Canada: a critique of current theory and practice. In: R. Laliberte, P. Settee, J. Waldram, R. Innes, B. MacDougall, L. McBain and F. L. Brown eds. Expressions in Canadian Native Studies. Saskatoon: University Extension Press. 436-458.

McRae, D. J., L. C. Duchesne, B. Freedman, T. J. Lynham, and S. Woodley. 2001. Comparisons between wildfire and forest harvesting and their implications in forest management. Environmental Review 9: 223-260.

Michon, G. 2002. Indigenous forestry: how to turn localized knowledge into a relevant forestry science. p. 35-46. In: A. Lawrence ed. Forestry, forest users and research: new ways of learning. Workshop proceedings: Learning from resource users- a paradigm shift in tropical forestry. April 28-29 Vienna, Austria. European Tropical Forestry Research Network. The Netherlands. http://www.etfrn.org/etfrn/workshop/users/etfrn_series_1.pdf Accessed: June 13, 2006.

Natcher, D. C. and C. G. Hickey. 2002. Putting the community back into community-based resource management: a criteria and indicators approach to sustainability. Human Organization 61(4): 350-363.

Niemelä, J. 1999. Management in relation to disturbance in the boreal forest. Forest Ecology and Management 115:127-134.

Perera, A. H., L. J. Buse, M. G. Weber eds. 2004. Emulating natural forest landscape disturbances: concepts and applications. New York: Columbia University Press.

Pikangikum First Nation and OMNR. 2006. Keeping the land: a land use management strategy for the Whitefeather Forest and adjacent areas. http://www.whitefeatherforest.com/pdfs/3.ENGLISH_Draft.Strategy.pdf

Pickett, S. T. and P. S. White, 1985. Natural disturbance and patch dynamics: an Introduction. p. 3-13. In: S.T. Pickett and P. S. White, eds. The ecology of naturaldisturbance and patch dynamics. San Diego, CA: Academic Press.

Roberts, W. 2005. Integrating traditional ecological knowledge and ecological restoration: restoring aboriginal cultural landscapes with Iskatewizaagagen No. 39 Independent First Nation. M. S. Thesis, Natural Resource Management. University of Manitoba. Winnipeg, Manitoba.

Roots, F. 1998. Inclusion of different knowledge systems in research. Terra Borealis 1: 42-49.

Rowe, J. S. and G. W. Scotter, 1973. Fire in the boreal forest. Quaternary Research 3: 444-464.

Statutes of Ontario. 1994. Crown Forest Sustainability Act. Sec. 2.

Theriault, M. 1992. From moose to moccasins: the story of Ka Kita Wa Pa No Kwe. Natural Heritage. Toronto, ON.

Turner, M. G., R. H. Gardner, and R. V. O'Neill. 2001. Landscape ecology in theory and practice**:** pattern and process. New York: Springer.

Turner, N. J. 1999. "Time to burn": traditional use of fire to enhance resource production by aboriginal peoples in British Columbia. p.185-218. *In*: R. Boyd. ed. Indians, fire and the land in the Pacific Northwest. Corvallis, Oregon: Oregon State University Press.

Turner, N. J., M. B. Ignace, and R. Ignace. 2000. Traditional ecological knowledge and wisdom of aboriginal people of British Columbia. Ecological Applications 10(5): 1275-1287.

Turner, N. J., I. J. Davidson-Hunt, M. O'Flaherty, 2003. Living on the edge: ecological and cultural edges as sources of diversity for social-ecological resilience. Human Ecology 31(3):439-461.

Weber, M. G. and B. J. Stocks. 1998. Forest fires and sustainability in the boreal forests of Canada. Ambio 27(7) 545-560.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This investigation can be seen as a work addressing different expressions of traditional ecological knowledge surrounding a specific topic, boreal forest fires and ecological disturbances, and how this knowledge is being incorporated into resource management planning. In this section I briefly present literature dealing with:

1. Trends in traditional ecological knowledge (TEK) scholarship and its treatment of indigenous peoples' knowledge of ecological processes;
2. Boreal forest disturbance and renewal processes as understood by western science;
3. Fire ecology in the boreal forest and its impacts on wildlife and plant communities; and
4. Fire management in the boreal forest from western science and indigenous perspectives.

I conclude this chapter with a brief description of the theoretical contributions that this thesis makes to the areas of traditional ecological knowledge, social-ecological resilience and the role of traditional ecological knowledge in resource management planning.

2.2 TEK: what is it and how is it being used?

Indigenous peoples who have lived in and utilized their local environment for generations have developed unique relationships and knowledge of their environment

through careful practice and observation, communication with others, and through the values and world view they possess. While cases have been made for other terms for this body of knowledge, such as Indigenous Knowledge (McGregor, 2000; Witt and Hookimaw-Witt, 2003) and Local Knowledge (Berkes, 2008), in the proposed research I adopt the use of traditional ecological knowledge (TEK) consisting of: "a cumulative body of knowledge, practice and belief evolving by adaptive processes and handed down through generations by cultural transmission about the relationship of living beings (including humans) with one another and their environment" (Berkes, 2008 p. 8). TEK may be composed of local knowledge of plant and animal species, soils, and ecological dynamics, traditional management system based on appropriate tools and techniques, and social institutions which provide guidelines for how best to use resources. Knowledge exists within an overarching world view which gives meaning to the indigenous institutions and activities and establishes guidelines for sustainable use of resources (Berkes et al. 1995).

TEK has its scholarly roots in the 19th century colonial effort to describe the ways "primitive people" use plants (Clément, 1998, Hunn 2007). This area of research had a principally economic motivation of bringing new food and medicinal plants to benefit the colonial enterprise (Ford, 1978). Dubbed ethnobotany by anthropologist J. P. Harshberger in 1896 (Ford, 1978), it has since refined its focus to encompass the mutual relationship between people (whether indigenous or not) and plants (Davidson-Hunt et al. 2005). The initial interest in plant knowledge and use has expanded to encompass a large range of ethnosciences including human relationships to animals (ethnozoology), soils (ethnopodology), illness and healing (ethnomedicine) and others (Berkes, 2008).

TEK as an area of research has grown largely from anthropological and rural development programs' recognition of the importance of local knowledge in managing natural resources (Brokenshaw et al. 1980; Williams and Baines, 1993; Berkes, 2008; Slikkerveer, 1999). Applied TEK research has sought to harmonize development programs with local systems of knowledge and resource utilization in order to increase the success of rural agriculture, health, and other development programs (Brokenshaw et al. 1980; Sillitoe and Bicker, 2004). TEK has been recognized as enabling various communities to perform adaptive management (Berkes et al. 2000) in which users gain the benefit of generations of accumulated knowledge within a framework that allows adjustment to a changing environment, and thereby affording a measure of resilience (Berkes et al. 1995). Many point to the potential of TEK for supplying the grounds for decentralizing responsibilities for resource management from the state to indigenous communities in what has been called cooperative management, community based management or co-management (Western et al. 1994; Manseau et al. 2005; Spaeder and Feit, 2005). Various laws in Canada have codified the inclusion of TEK into resource development projects (Canadian Environmental Assessment Act, 1996: 2; Usher, 2000).

Despite increased interest in incorporating local knowledge into development and co-management institutions, the general lack of methodological background and the superficiality of inquiry into TEK have compromised the success of these efforts (M. Johnson, 1992; Agrawal, 1995; Posey, 1999; Berkes 2008). Currently, little research reveals TEK of higher taxonomic categories such as vegetation communities or landscape organization. Similarly TEK of ecological processes remains poorly explored. One frequent result has been the decontextualization of practices, in which "wisdom" or

"knowledge" is transformed into "information", which is static but far easier to capture in superficial interviews with knowledgeable informants (McGregor, 2000). TEK, once removed from its original social and environmental contexts becomes far less useful (Chapin, 1988; Agrawal, 1995). There is a great need to ask people what they "know" as opposed to just what they "do" (Michon, 2000).

One critique of TEK as a guide for resource co-management draws attention to the unequal power dynamics that frequently exist between indigenous communities and companies, state development agencies or, international organizations. Indigenous communities frequently are ill prepared to negotiate for fair treatment with these hegemonic institutions (Posey and Dutfield, 1996; Gadgil et al. 2000). Even while communities contribute important information, these outside interests often maintain de facto control of decision-making (Nadasdy, 2005; Spak, 2005). In these instances co-management from an indigenous community's perspective amounts to "indigenous people cooperate while governments manage" (Stevenson 1996 in McGregor 2000).

An additional criticism of TEK is of the very name (Witt and Hookimaw-Witt 2003; McGregor 2004). Being "traditional" carries with it connotations of being associated with the past rather than with the future and gives a sense of stagnation and permanency. Even while Berkes' definition of TEK (Berkes, 2008) provides its ability to adapt to changing conditions, knowledge that is meant to grant co-management and empowerment to communities often becomes restricted to authorized documented versions which are limited by the scope of the study which produced them. It is not through being traditional that indigenous perspectives should be respected (McGregor, 2000; 2004; Witt and Hookimaw-Witt, 2003). Authorizing traditional tools and

practices instead of values and world views from which they are derived freezes indigenous communities in an idealized "traditional" past and denies critical sovereignty and rights to develop (McGregor, 2004; LaRocque, 2001). Through this research I will attempt to contribute a view of how one community has engaged in cooperative resource management planning which utilizes traditional ecological knowledge.

The following section describes western scientific ways of thinking about ecological succession and forest renewal processes and recent efforts to engage with these topics utilizing traditional ecological knowledge. Understanding disturbance and ecological resilience literature helps guide (while not limiting) the "open conversation" (Davidson-Hunt pers. com.) with the community about disturbance and renewal.

2.3 Disturbance ecology and resilience in the boreal forest

Ecologists have only recently begun to incorporate theories of ecosystem dynamism into their thinking about the maintenance of natural communities. In the Western scientific tradition, nature has long been regarded as existing in a state of harmony, in which destruction is balanced by conservative forces which would be maintained if the system was left undisturbed (Wu and Loucks, 1995). Along with this perception came the view that vegetation types naturally tended to reach climax conditions. Disturbances that interrupted the progression to an idealized climax community were viewed as aberrations and somehow exogenous to the natural order (Holling, 1986). Although since the 1920's ecologists have proposed that the balance of nature was in fact a fallacy (Elton, 1930), it was not until the final decades of the 20th century when the theoretical basis for an alternative proposition gained widespread

acceptance (Wu and Loucks, 1995). Recognition of the importance of disruptive events in driving the shape and consistency of ecological communities is one of the major advances in ecological science of the 20th century (Sprugle, 1991; Wu and Loucks, 1995).

Disturbance has been defined as a relatively discrete event that disrupts the structure of an ecosystem, community, or population and changes the resource availability or the physical environment (Pickett and White, 1985). Disturbances can be classified as abiotic (fires, storms, drought, flooding, earthquakes, etc.) or biotic (insect outbreak, exotic species invasion, predation, grazing and browsing by herbivores) (M. G. Turner et al. 2001). These two categories frequently interact in reciprocal ways such as insect outbreaks that occur in trees weakened by drought, fire or windstorm. These stands of beetle-killed trees then tend to be more fire prone.

Understanding disturbances requires consideration of the ecosystem from a perspective of multiple spatial and temporal scales (Wu and Loucks, 1995). From an ecosystem perspective a single tree felled in a windstorm has little impact on the rate of nutrient and water cycling and species diversity of the stand. However, from a smaller scale, for example, the perspective of the understory surrounding the tree or from the perspective of the tree itself, the impact of a tree fall has a much different implication. Human ability to perceive the impacts of ecological disturbance is limited by our short lifespan relative to the lifespan of trees (Sprugel, 1991). What we perceive as stable ecological communities may, at a larger temporal scale, be the result of shifts in species assemblages in conjunction with millennial fluctuations in climate, introduction of exotic species and regional legacies of past disturbance events.

Landscape ecologists frequently describe the disturbances of a given location or habitat type in terms of its disturbance regime; the frequency, timing, intensity, severity, return interval and size of a given disturbance type within a specific landscape or community (Pickett and White, 1985; M. G. Turner et al. 1998) (Figure 2.1). Disturbances can have reciprocal relationships with landscape patterns, creating legacies and influencing ecological succession that remain in the landscape until the next

Table 2.1: Descriptors of a disturbance regime (Adapted from Whelan, 1995; M. G. Turner et al. 1998).

Term	Definition
Frequency	Mean number of events occurring at an average point per time period, or decimal fraction of events per year
Seasonality	Period during the year corresponding to annual changes in climate and plant phenology
Extent	Area disturbed which can be expressed as mean area per event
Intensity	Physical energy of the event per area per time(e.g. heat released per area per time period for a fire or wind speed in a storm)
Severity	Effect of the disturbance event on the organism, community or ecosystem; closely related to intensity, as more intense events are generally more severe
Residuals	Organisms or propagules that survive a disturbance event; biological legacies

disturbance event (M. G. Turner et al. 2001). Forest systems are maintained through interactions of climate, topography, soils and other biophysical constraints (M. G. Turner et al. 2001). Regularly occurring disturbances exert selective pressure on the constituent members of an ecological community and, over the course of millennia, result in adaptations that allow species to persist.

North American forestry, with its roots in the European tradition, has historically treated forests much like agricultural systems emphasizing maximization of tree production (Michon, 2000), and has been particularly slow to concede the role of forest disturbance in maintaining forest systems. According to this model, forest succession historically was conceived of as a two-step process of exploitation and conservation (Clements, 1916 cited in Li, 2000). During the exploitation phase, recently disturbed plots are dominated by pioneer (*r*-selected) species, which, given high abundant resources (light, water, nutrients, etc.) can rapidly colonize and reproduce for a maximum return (Holling, 1986). These pioneer species change the net amount of resources (light, water and nutrients) available for new individuals in a highly competitive environment and contribute structural complexity. Increasing competition for resources and changing biophysical conditions causes a shift from a system dominated by *r*-strategists to one favoring efficient competitors and *K*-strategists as biological capital accumulates during the conservation phase. *K*-strategists are generally specialized, longer lived and slower to reproduce than *r*-strategists.

Holling (1973; 1986) offers a general model for understanding the cyclic interactions regulating the establishment, development and reorganization of ecological systems following disturbance (Figure 2.2). This model contributes phases of release and

reorganization to Clementsian view of ecosystem development. The release phase occurs when the accumulation of natural capital (e.g. biomass, nutrients) becomes increasingly fragile until a stochastic event (e.g. fire, storm, disease) releases the stored nutrients. The biological, physical, and chemical legacies of the previous phase form the basis for reorganization of ecological systems (M. G. Turner et al. 2001). The ability to maintain function and organization in the face of perturbation has been referred to as ecological resilience (Holling 1973; 1986). This has been referred to as a domain of attraction, much like a marble tending to remain in a depression in a planar surface (Holling et al. 2002).

The Y-axis, in Figure 2.2, describes the stored seedbed or capital within the system. For example, a newly burned stand of mixed conifer boreal forest demonstrates high potential with high levels of mineralized nutrients available for seeds present in the seed bank or which arrive through dispersal. As succession proceeds the system gains more species that are increasingly efficient at maintaining stored nutrients (capital) the greater attraction to the release. Holling (1986) describes this tendency as increasing brittleness. Constituent species of this idealized ecosystem model occur and interact across a variety of spatial and temporal scales. For example, insects, leaves and herbaceous plants occur at spatial and temporal scales from less than .01 meters^2 to .1 meter and have durations of between several weeks to a year (Holling and Gunderson, 2002). Herbivores and predators exist at larger spatial and temporal scales as we increase in trophic level. Trees, with lifespans up to more than 100 years are much slower than smaller scale community members. Abiotic environmental features such as fire disturbance (a fast variable) and climate (a slow variable) also interact with community members. It has been suggested that many ecosystems contain critical relationships (i.e.

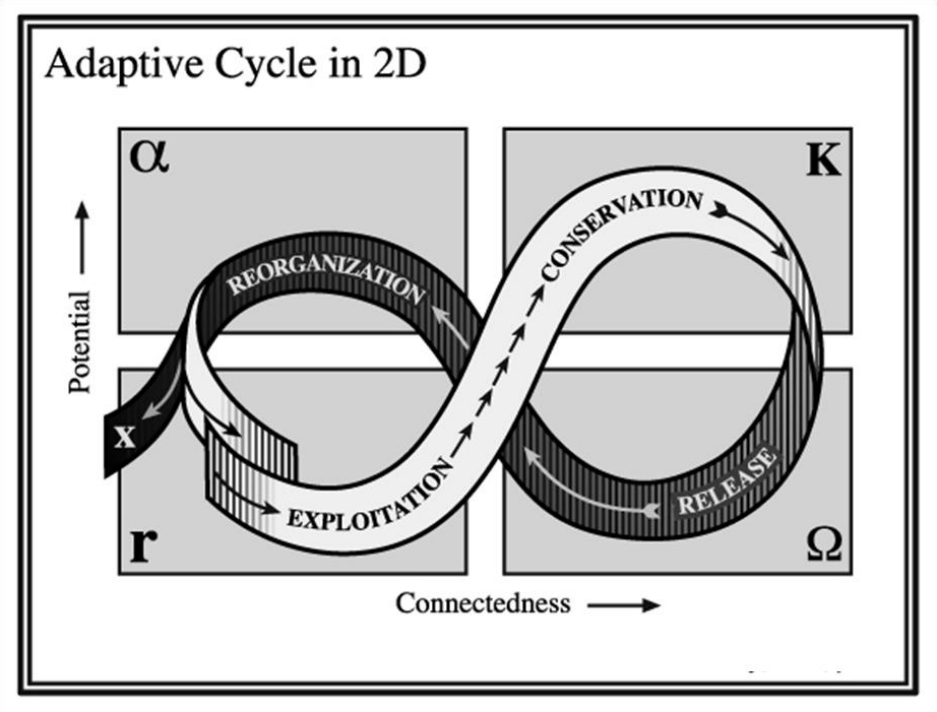

Figure 2.1 Cycle of adaptive renewal. Transitions between (r) exploitation and (K) conservation and between (Ω) - release and (α) reorganization are long relative to the rapid rate of transition from (K) conservation and (Ω) release phases. (Figure adapted from Gunderson and Holling 2002).

keystone species and disturbances) whose presence maintain community structure. Under changing conditions interactions between fast (small scale variables) and slow (larger scale variables) can shift the stabilizing affects of slower variables and move the system to a new domain of attraction.

If a threshold of severity or intensity is surpassed during the release phase (e.g. a large fire consumes all of the potential seed sources), reestablishing the previous community may take much longer or move the system into a new basin of attraction. High intensity forest disturbances can create new domains of attraction. There is relatively weak attraction or connectedness of the elements during the reorganization and exploitation phases. For example, exotic weeds are able to establish themselves and

radically change successional outcomes in highly disturbed sites much more readily than in conserved sites. Ecological systems have the potential for multiple equilibrium states (Gunderson and Holling, 2002). Systems can have high resilience even while they demonstrate low stability (Holling, 1986). This is manifested by the ability of boreal forests to recover from periodic conflagrations resulting in tree deaths spanning tens of thousands of hectares (Weber and Stocks, 1998).

The boreal forest has been described as a system that, while low in biodiversity, maintains complex interactions and dynamics (Ludwig et al. 1997). Wildfire is the most pervasive disturbance type commonly occurring in the boreal forest (Weir et al. 2000) and will be described in detail in the next section (2.4). The following descriptions of the other types of smaller scale disturbance present in the boreal forest give examples of how systems can flip to alternate stable states. Depending on the intensity of the fire, forest openings succeed to either aspen-birch or jack pine. Moose (*Alces alces*) and beaver (*Castor canadensis*) both impact this community and speed its succession to conifer. Beavers build dams which flood low lying areas and consume deciduous trees along boreal waterways. Once poplar (*Poplus*), willow (*Salix*) and birch (*Betula*) are exhausted in an area, beavers abandon a lodge, allowing dams to decay and ponds to drain. Newly drained beaver ponds become meadows which are rapidly colonized by deciduous species. Shade tolerant black spruce become established in the understory of aspen stands and eventually come to dominate. Spruce budworm (*Choristoneura fumiferana*) is a moth species whose larval stage can reach outbreak levels in northern conifer forests resulting in the destruction of

conifer stands across large scales. Conifer stands killed by large spruce budworm outbreaks frequently provide fuel for forest fires. These disturbance types maintain a mosaic of community types and ages within the boreal landscape. Although this investigation will focus principally on TEK of forest fires, interactions between different types of disturbance and organisms may be impossible to disentangle.

Several scholars have attempted to explore indigenous world views of ecological processes such as disturbances and community succession. Investigations into historic pyrotechnology of indigenous groups in boreal forests of northwestern Alberta (Lewis, 1977; 1982; Lewis and Ferguson, 1988) underscore their intentional manipulation of successional stages to increase local abundance of preferred natural resources. As Lewis (1977) points out: although "cultural imagery was distinct from that of scientific paradigms […], Indians understood the *essential* dynamics and relationships involved in fire ecology of the boreal forests," (original emphasis).

Berkes et al. (1998) found that many indigenous peoples recognize an ecological unit equivalent to ecosystems that consists of recognizable biotic and abiotic characteristics, which can assume to multiple equilibrium states in unpredictable and nonlinear ways when disturbed. In response to these potential changes, indigenous peoples have adopted institutions, which manage risk and allow for adaptive change (Winterhalder, 1983; Colding et al. 2003). These authors present indigenous responses to ecological disturbance and succession in terms of knowledge, practices and institutions. No attempt is made to address the beliefs about the process and the world view in which they are embedded (Berkes, 2008).

The relationships which different people have had with fires in forest ecosystems have changed over time and vary widely between different cultures. The following section presents current understandings of the impacts of forest fire on the boreal environment from an ecologist's standpoint. This is followed by a brief review of how Euro-Canadians and indigenous peoples of the boreal have related to forest fires differently at different times in the past.

2.4 Fire ecology in the Canadian boreal forest

Fire is the dominant natural disturbance within the boreal forest in frequency and extent of the land it effects (Weir et al. 2000). Approximately 8,000 fires burn an average of 2.5 million hectares of forested land annually. In high fire years up to 7 million hectares can be impacted (Weber and Stocks, 1998). This section will review literature describing fire as a periodic agent of renewal and destruction in the boreal forest.

Understanding wildland fire involves examination of fire behavior at several scales. At the smallest scale, the chemical reaction of fire is controlled by variations in oxygen, fuel and heat (Pyne et al. 1996). As land area increases, fire behavior is affected by fuel moisture, fuel structure, topography (slope and aspect), wind speed and direction, which impact the temperature of fire and the speed of its spread (Whelan, 1995; Pyne et al. 1996).

Species in the Canadian boreal forest have evolved with, and are adapted to periodic, large scale, intense disturbances (Rowe and Scotter, 1973). Boreal forest ecosystems are conifer-dominated, with a greater shade-intolerant deciduous component

in forest openings and recent disturbances. Many of the dominant species (eg. jack pine [*Pinus banksiana* Lamb.], black spruce [*Picea mariana* Mill.], lodgepole pine [*Pinus contorta* Dougl.] and trembling aspen [*Populus tremuloide*s Michx.]) are fire dependent, requiring fire to open seed bearing cones or to stimulate sprouting from roots (Rowe and Scotter, 1973; Li, 2000). Stand structures vary from closed canopy, with abundant mosses in the understory, to open forest-tundra patches with terrestrial lichen (*Cladonia* spp.).

The complexity of the boreal forest lies in the mosaic of species and age classes brought about in large part by the occurrence of regular disturbance such as individual tree fall, wind storms, insect outbreaks, beaver activity and stand-replacing fires. Fire maintains forest structure and composition by acting as the agent of both stand termination and stand initiation (Rowe and Scotter, 1973; Johnson and Miyanishi, 2001). Fire is a highly variable disturbance agent (E. A. Johnson, 1992). Variations in fuel environments (quantity, moisture and structure), weather conditions (temperature, wind and humidity), and topography produce heterogeneous patterns of dead and live trees.

Fire behavior and impacts depend on complex interactions between physical and climatic variables. Horizontal and vertical fuel loading, its moisture content, air temperature and humidity, wind direction, slope and orientation, stream, lake and wetland edges and other physiographic characteristics all influence fire spread and intensity (E. A. Johnson, 1992). Dense forest stands can experience fire moving rapidly through the canopy while open stands with high organic fuel loads at ground level can experience slow moving intense ground fires that burn all the way to mineral soil. Variations in the structure and composition of fuels result in highly variable impact across the landscape (E. A. Johnson, 1992). Fire intensity is strongly linked with seasonally associated

characteristics such as fuel temperatures and humidity, which in turn influence the successional trajectory (Weber and Flannigan, 1997).

Fire mineralizes and recycles nutrients from the downed litter and woody debris that are otherwise slow to break down. Intense burns uncover mineral soil that many seedlings need to germinate (MacLean et al. 1983). Chemical changes to soils following fires include increased nitrogen levels (a limiting factor in plant growth) and increased soil pH. Fires create canopy gaps allowing shade-intolerant seedlings a chance to germinate. Areas which lose tree cover due to fire, experience an earlier thaw in the spring because of direct exposure to solar radiation and decreased albedo from snow cover (Rowe and Scotter, 1973). As a result, burned sites have a longer growing season than forest interior sites. Fires also create large amounts of coarse woody debris as standing dead trees fall with age. Standing dead trees and coarse woody debris are important habitat features for plants and animals.

Animal species also respond to the vegetation mosaics created by fire. Studies in an Alaskan boreal forest found that herbaceous forage abundance went from 436.5 lbs/acre (79.16 kg/ha) in the year following fire to 22 lbs/acre (3.98 kg/ha) 25 years following fire (Wolf, 1979). Hunter (1990) reports that white-tailed deer (*Odocoileus virginianus*), and moose populations increase with improved browse created in newly formed forest openings and decrease locally as succession proceeds. New browse created by fires may improve populations of fur-bearing predators by increasing populations of rabbits, voles, and other prey species (Natcher, 2004). Increased productivity of berry patches in early and mid successional forests following fires (10-30 years post fire) are

linked to increased weight and survivorship of black bear (*Ursus americanus*) mother and cubs (Fisher and Wilkinson, 2005; Nelson et al. 2008).

Where fire intensity, measured by maximum temperature attained (Frelich and Reich, 1998), is high, organic layers of soil may be completely consumed revealing mineral soil. Some plant species cannot survive in sites where fire frequency is more regular than the age of reproductive maturity (Li, 2000). Unburned patches act as refuges from which species later recolonize burnt patches. Stands originating from fire in the boreal typically are near uniformly aged post-burn cohort which rapidly germinates in what can be nutrient rich mineral soil (E. A. Johnson, 1992). In the absence of fire, species succession proceeds until shade-tolerant species out-compete early successional, fire-adapted ones. Although rate of fire return (the time between fire events at the same location) is highly variable, many sites in the boreal forest experience stand replacing fires every 60 to 120 years (Weir et al. 2000).

2.5 Euro-Canadian and Indigenous cultural relations with fire

This research focuses on indigenous Canadian people's knowledge, use and world view surrounding fire as a resource management tool. In part, it is the differences between these relationships and those maintained by Euro Canadians that make this an interesting endeavor. This section provides a brief outline of the historic precedents that have contributed to Euro-Canadian relationships to wildfire. The second part of this section reviews what is known about how indigenous Canadians, with specific attention to those living in the boreal forest, have used fire as a management tool.

2.5.1 Changing European conceptions of forest fire

As Pyne's (1992; 1995) surveys of cultural history of fire underscore, relationships with fire are markedly different between cultures and over the course of time. This section describes the historic trends of non-indigenous Canadian society towards an ethic of fire, from stages of pioneer exploitation to one increasingly recognizing its important ecological role in maintaining sustainable use of forests.

Canadian society has passed through a number of different paradigms regarding how forest resources are conceived and utilized (Kimmins, 1995). These paradigms have a direct relation to how the presence of fire in the boreal has been perceived and managed. In the earliest colonial period, the abundance of resources led to a casual treatment of forest lands. During what Kimmins (1995) refers to as the exploitation stage of resource use, settlers in eastern Canada sought the most valued resources (e.g. minerals, furs, white pine) and then moved on once these were locally exhausted. Forests were often regarded as an obstacle and intentionally set afire to aid the expansion of agriculture (Pyne, 1982). Large scale fires initially increased in many regions as the resource frontier expanded (Pyne 1982; N. J. Turner, 1999; Gulig, 2002). Conflagrations were fueled by accumulations of logging slash and the casual use of fire during high risk fire weather, leading to the loss of hundreds of lives in eastern Canada as early as the 1820s (e.g. the Miramichi fire of New Brunswick).

Although fire suppression began with government support in the mid 19th century it was constrained by lack of technology for detection and transportation for mobilization of fire crews and to give them access to forest fires until the early 20th century (Pyne, 1982). Local scarcities of forest resources prompted a shift to a paradigm of

administration forestry (Kimmins, 1995). Forest resources were regarded as an enduring source of wealth if they could be rationally and systematically administered for long term timber production. Fires were suppressed by increasingly sophisticated and technologically specialized local and provincial fire fighting teams (Pyne et al. 1996). Resources were spent at the national level to develop tools for predicting fire risk (Canadian Forest Fire Danger Rating System and others) (Lee et al. 2002), detection (spotter planes and satellite monitoring), and suppression. These included air tankers capable of delivering thousands of gallons of fire retardant, and the training and maintenance thousands of fire fighters annually (Pyne et al. 1996).

Research on forest ecology through the 1970s began to reveal the necessity of fire in maintaining many forest systems in Canada including the boreal forest (Heinselman, 1973; Rowe and Scotter 1973; Wein and MacLean, 1983). As public demand for forest managers to recognize non-commodity resources such as wildlife, aesthetic values, wilderness, sites of spiritual and cultural significance, and water supplies has led to a final shift to what Kimmins (1995) refers to as social forestry. These complex and often competing demands and mounting costs of suppression, reaching nearly 1 billion Canadian dollars in 2003 (Canadian Council of Forest Ministers, 2005), has caused a reevaluation of the goals of 100% fire suppression in Canada. Today, provinces balance the economic loss of fire with proportional efforts to limit fire losses to forest resources while taking advantage of the ecological benefits of fire when deemed economically and socially acceptable (Pyne 1996; Canadian Council of Forest Ministers, 2005). The province of Ontario has adopted legislation that requires forestry to "within the limits of

silvicultural requirements, emulate natural disturbances and landscape patterns" for the long term health and vigor of Crown forests (Statutes of Ontario, 1994).

The goals of conserving forest biological diversity and maintaining ecosystem functions has led foresters to incorporate the frequency, size and arrangement of natural disturbances into forestry operations (Hunter, 1993; Attiwell, 1994; Bergeron and Harvey, 1997; Bergeron et al. 2002). As timber harvesting increasingly replaces wildfire as the dominant source of landscape disturbance in the Canadian boreal forest, the need for harvesting methods that do not exceed the resilience of species adapted to fire disturbance becomes more necessary (Niemelä, 1999; Kuuluvainen, 2001). Emulating natural forest disturbances requires that natural disturbance regimes be understood (Perera and Buse, 2004) as they vary dramatically across environmental conditions and forest types.

Although harvest patterns can mimic patterns of fire, harvesting is not capable of reproducing the full suite of physical and chemical changes to a forest created by stand-replacing burns (McRae et al. 2001). Intense fires reduce the depth of organic debris, often revealing mineral soil enriched with nitrogenous ash which provides a seed bed for early successional plants. This produces a vegetation community distinct from harvesting alone (Johnston and Elliott, 1996). Harvest sites frequently require mechanical ripping to expose mineral soil for tree seed germination. Forestry does not leave standing burnt trees but removes most of the boles. This results in fewer wildlife snags and less coarse woody material than are produced by wildfires. Increasing use of fire in controlled burns for site preparation, risk reduction, increasing species diversity and decreasing

undesirable species (Whelan, 1995) is occurring but prejudices and a reluctance to use fire persists.

2.5.2 Indigenous peoples of the Canadian boreal forest and their use of fire

Long association with the environments of this continent and subsistence resource use places indigenous relationships to fire management in contrast to those held by non-indigenous settler cultures. Recognizing this long tradition of fire use by indigenous people challenges the "pristine wilderness" myth of North America (Gomez-Pompa and Kaus, 1982) and presents a new paradigm for resource managers (Anderson and Barbour, 2003).

The idea of ecosystems being modified by human use of controlled fire has caught on only gradually since initial analysis was first proposed (Sauer, 1944; Stewart, 1953; 1955). Regional analyses of indigenous fire use for the northeastern United States (Day, 1953; Russell, 1983; Cronon, 1988), the American Great Basin and plains (Stewart, 2001), the Rocky Mountains (Barrett and Arno, 1982), California (Lewis, 1993; Blackburn and Anderson, 1993; Anderson, 1996; 2005), the Pacific Northwest (Boyd, 1999; Deur and Turner, 2005), the boreal forest (Lutz, 1959; Lewis, 1977; 1982; Lewis and Ferguson, 1988) have coalesced to produce an image of widespread intentional manipulation of environments using controlled fire. Recognition of historic indigenous pyrotechnology has led some to question whether in fact any "natural" vegetation communities exist (Pyne, 1982; Williams, 2000a). The number and scope of publications documenting historic use of landscape burning has grown dramatically (Williams, 2001). The following is a brief overview of some of the characteristics that seem common

features in indigenous fire management with special attention to what is known of boreal forest dwellers. Examples of literature referring to traditional burning practices of the Anishinaabe are used to exemplify these features.

Stewart (1953) aptly identifies fire as the first great force for shaping ecosystems employed by man. Remains of Pleistocene megafauna in large kill sites at the bases of cliffs and boxed canyons suggest that fire may have been used by early North American hunters in large game drives (Sauer, 1944; Barsh and Maylor 2003). It has been suggested that fire use by early North Americans was responsible for maintaining the central grasslands of North American plains in a treeless condition (Stewart, 1951; 1955). These theories give an indication of the antiquity of the uses of fire as a vegetation management tool. While fire scholars and a growing body of literature support the notion that most terrestrial vegetation communities have been altered by the human use of fire (Pyne, 1995), practices remain difficult to substantiate (Williams, 2000a).

Fire has been employed by people for a wide variety of purposes including: warfare, signaling, tree felling, pest management, range management, clearing agricultural fields, maintaining open travel corridors, creating fuel breaks around camps and villages to protect from catastrophic fires and increasing productivity of berry patches, shoot and sucker development for basketry (Williams, 2000b). Although it is expected that different communities and cultures applied different techniques to manipulate different species compositions under different climatic conditions, Boyd (1999) points to surprising cross-cultural consistency in the observed patterns of indigenous burning. This suggests either that optimal patterns existed for maximizing the

benefits of resource utilization, or that similar practices were culturally transmitted from common origins.

One of the principal uses of fire appears to be the maintenance of highly productive early successional vegetation (Lewis, 1977; 1982). These plant communities yielded seeds (Anderson, 2005), roots and other underground storage organs (N. J. Turner, 1999), and berries (Anderton, 1999; L. M. Johnson, 2000) for direct consumption as well as provided habitat for grazing deer, moose, rabbits, bear and other important animal resources (Lewis, 1977). Manipulation of environments with fire has been indicated as one of the probable sources of agriculture (Stewart, 1951; Bean and Lawton, 1993; Lewis, 1993). Many agricultural crops are early successional *r*-selected species capable of rapidly exploiting available resources (Lewis, 1982). Alcorn (1989) suggests that Central and South American slash and burn farmers conceive of ecological succession and management processes as a unified series of interconnected options rather than an arrangement of inputs and structures to be managed piecemeal.

Indigenous fires, like modern management burns, were set at strategic locations with specific goals in mind, at specific times of year when the appropriate climatic conditions were correct (E. A. Johnson, 1992; Johnson-Gottesfeld, 1994; N. J. Turner, 1999). It has been suggested that these methods reflected a deep understanding of environments and conditions at specific locations rather than being based upon abstract universal principles of fire behavior (Lewis, 1982; Kimmerer, 2000).

Traditional fire use differed from lightning caused fires in its seasonality, frequency, size and fire behavior. Lewis (1982) points out that while many desirable characteristics can be attained from natural burns, the placement of natural burns may not

be as convenient in space or in time for resource users. Frequently lightning fires come late in the growing season and result in destruction of fruits, seeds and other valuable resources. By comparison, intentionally set early season burns frequently coincide with climatic conditions (lower temperatures and high fuel humidity) that are easier to control (E. A. Johnson, 1992). Without the technology available to modern firefighters, indigenous fire users relied more heavily on the choice of placement and timing for burns as methods for control.

Fire was frequently an important part of the cyclic round of seasonal subsistence activities. Social organization and community participation frequently played a role in determining the success of burning activities. Examples of the social context of fire include deer fire drives (Boyd, 1999), meadow maintenance (Lewis, 1982), and grasshopper collection (Stewart, 2001). Current Australian Aboriginal burning practices provide good examples of the social organization of recognized authorities and procedures required to successfully burn (Yibarbuk, et al. 2001; Verran, 2002). Fire likely held an important place in the ethical occupation of indigenous homelands. Numerous accounts exist of elderly indigenous people returning to areas previously managed using fire and decrying the state of neglect and overgrowth (N. J. Turner, 1999; Lewis, 1977; 1982). Aboriginal Australians regard fire use as a sign of proper occupation and central to the creation of cultural landscapes rather than just a means of acquiring valuable resources (Anderson, 1999). A review of the international forest systems managed by indigenous burning practices indicated that cessation of long established anthropogenic fire regimes was associated with changes in species and genetic diversity,

cultural diversity and traditional knowledge and ecosystem structure and function (Jackson and Moore, 1998).

Little published information is available describing the use of fire by the Anishinaabe (c.f. Davidson-Hunt 2003a). While differences certainly exist between the practices of the Anishinaabe in northwestern Ontario and those of Cree, Beaver and Slavey peoples in northwestern Alberta documented by Lewis (1977; 1982) and Lewis and Ferguson (1988), their work provides a picture of practices and purposes for which hunter and gatherers in the boreal forest burned. Some burning purposes appear relatively new, including the historical use of fire by the Anishinaabe to open garden plots for cultivating crops such as potatoes which were introduced by European settlers (Dunning, 1959; Roberts, 2005). Many patterns appear consistent with the limited reports of Anishinaabe burning practices available from historical accounts (Bigsby, 1969; Cleland, 1992), diaries (Theriault, 1992) and ethnoecological investigations (Davidson-Hunt, 2003a; Berkes and Davidson-Hunt, 2006) and are detailed below.

Early successional communities provided habitat for a variety of useful species such as blueberries (*Vaccinum* spp.), bulbs, grasses, moose, deer, elk (*Cervus elaphus*) and beaver (*Castor canadiensis*) that contributed to indigenous subsistence activities (Lewis, 1977). By mimicking natural fire disturbance under controlled conditions, boreal peoples influenced the arrangement of early successional habitats on the landscape thereby reducing the difficulty of obtaining preferred plant and animal resources (Lewis, 1977; 1982; Lewis and Ferguson, 1988). Although some reports exist of burning in late fall, most burning began in early spring when low air temperatures and high humidity created shorter flame lengths and lower fuel temperatures made fires easier to control (E.

A. Johnson, 1992). Fire activities were focused in openings along meadow, lake and stream edges where dry dead grasses provided enough fuel to carry a fire yet where unmelted snow under tree cover provided a fire break, preventing the fire from getting out of control. Trees in this ecotone might be scorched and with successive years of burning, these grassy margins would widen, thereby increasing browse available for deer, elk, moose and wood bison (*Bison bison athabascae*). Without these repeated fires, saplings invaded forest openings and eventually caused them to become second-growth forest. Burns were not conducted every year, but only as frequently as necessary to maintain desired landscape characteristics (open trails and portages, fuel breaks around camp sites) and early successional species. Little record exists alluding to boreal peoples setting fire in densely forested upland areas or during the summer lightning season when the fire danger would have been at its peak (Lewis, 1982; L. M. Johnson, 1992). Because it did not extend over the entire landscape, selected burn sites contributed to the increased heterogeneity of habitat types and age classes. In the words of one of Lewis's informants: "it is better to have all kinds of places not all the same" (Lewis, 1977 p. 38).

The traditional burning practices described above are products of accumulated knowledge and experience acquired in specific places within specific social contexts. At one time, burning was the correct way to maintain productive traplines and moose yards (Lewis and Ferguson, 1988). Changes in the social and political landscapes of the Canadian boreal forest (e.g. reduction in trapping economies with the collapse of the fur markets; changing modes of transportation; encroachment of industrial forestry into First Nation's territories; imposition of laws and management by the state forbidding the use of fire) have led to the abandonment of many of these practices. The offer of seasonal

employment as firefighters has been evident in Pikangikum at least since the 1950s (Dunning, 1959). In addition to protecting forest resources, firefighting contributes to an individual's community prestige (Natcher, 2004).

Current debate over fire management within forest and land management communities (e.g. Bergeron et al. 2002) suggests that there may be room for fires such as those once set by boreal hunter and gatherers within modern management systems (Anderson and Barbour, 2003). One of the goals of the present research is to further document how traditional knowledge can be applied to achieve new objectives.

Summary of research contributions

This research will contribute in three ways to existing literatures surrounding traditional ecological knowledge, social-ecological resilience and the use of traditional ecological knowledge in resource management planning. First, I explore the traditional ecological knowledge related to boreal forest fires possessed by the Anishinaabe people of Pikangikum First Nation northwestern Ontario. As previously mentioned, there is a relative dearth of descriptions within the indigenous pyrotechnology literature for the Anishinaabe people. This study endeavors to discuss more than local practices of land management using fire. In it I present terminology employed by experienced fire users which help them determine the use of fire and lasting impacts upon the physical and social landscape. It is my hope that this approach will allow for the expression which people of Pikangikum have of processes embodied in the fire-land-society complex rather than the functionalist approach common in many ethnoecological descriptions of aboriginal fire practices.

Secondly, through this research I contribute to the field of social-ecological resilience by providing a glimpse of how the Anishinaabe people of Pikangikum view the organization, disturbance and re-establishment of their forest environment. Although numerous examples exist in the resilience literature of how small scale societies incorporate features conferring the ability to adapt and reorganize in the face of environmental uncertainty, little effort has been expended to describe how these people think about the driving forces of change. Because social-ecological resilience studies arise from western scientific approaches to ecology and engineering (Holling and Gunderson 2002) we should expect cultures not of the western philosophical tradition to have distinct views of how the processes function. By exploring some of the aspects of non-western worldviews of the Anishinaabe regarding disturbance and renewal events I offer a sophisticated and distinct system for describing the governing processes behind what resilience scholars seek to understand. To my knowledge, this is the first example of a cross-cultural critique of the processes of disturbance and renewal.

Finally, this research shows the work of one indigenous community to find room for their knowledge and values within cooperative resource management planning. This can be seen as a case study following the model described by Davidson-Hunt and O'Flaherty (2006). I report on the efforts by community knowledge holders, resource managers and academics to find solutions for fire and resource management that incorporate values and knowledges from multiple sources. This responds to the criticisms of aboriginal scholars who fear that indigenous knowledge is being appropriated and redeployed by scholars without the consent of knowledge holders, as well as their observation that indigenous peoples need to be allowed to adapt their

knowledge to new conditions and opportunities if it is to retain its relevance to their lives. I suggest that this model may mark a shift in the direction that traditional ecological knowledge studies need to take in order to maintain its ethical and practical standing in an environment where aboriginal peoples are increasing their voice and control in research.

2.6 References

Agrawal, A. 1995. Dismantling the divide between indigenous and scientific knowledge. Development and Change 26: 413-39.

Alcorn, J. 1989. Process as resource: the traditional agricultural ideology of Bora and Huastec resource management and its implications for research. p. 63-77. In: D. A. Posey and W. Balée. Resource management in Amazonia: Indigenous folk strategies. New York: Botanical Garden, Bronx.

Anderson, K. 1996. Tending the wilderness. Restoration and Management Notes 14(2): 154-166.

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

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

Anderton, J. B.1999. Native American, fire-maintained blueberry patches in the coastal forests of the northern Great Lakes. The Great Lakes Geographer 6(1/2): 29-39.

Attiwell, P. M. 1994. The disturbance of forest ecosystems: the ecological basis for conservative management. Forest Ecology and Management 63: 247-300.

Barrett, S. and S. Arno. 1982. Indian fires in the northern Rockies: ethnohistory and ecology. Forestry 80(10): 647-651.

Barsh, R. H. and C. Marlor. 2003. Driving bison and Blackfoot science. Human Ecology. 31(4): 571-593.

Bean L. J. and H. W. Lawton. 1993. Some explanations for the rise of cultural complexity in Native California with comments on proto-agriculture and agriculture. In: T. C. Blackburn and K. Anderson, eds. Before the wilderness: environmental management by Native Californians. Ballena Press. Menlo Park, CA. 27-54.

Bergeron, Y., Leduc, A., Harvey, B.D. & Gauthier, S. 2002. Natural fire regime: a guide for sustainable management of the Canadian boreal forest. Silva Fennica 36(1): 81–95.

Bergeron, Y. and B. Harvey 1997. Basing silviculture on natural ecosystem dynamics: an approach applied to the southern boreal mixedwood forest of Quebec. Forest Ecology and Management 92: 235-242.

Berkes, F. 2008. Sacred Ecology: Traditional ecological knowledge and resource management. Philadelphia: Taylor and Francis.

Berkes, F., C. Folke, and M. Gadgil. 1995. Traditional ecological knowledge, biodiversity, resilience, and sustainability. In: C. A. Perrings, K. G. Maler, C. Folke, C. S. Holling, and B. O. Jansson eds. Biodiversity Conservation. Kluewer Academic Publishers.

Berkes, F. M. Kislalioglu, C. Folke, and M. Gadgil. 1998. Exploring the basic ecological unit: ecosystem-like concepts in traditional societies. Ecosystems 1:409-415.

Berkes, F., J. Colding and C. Folke. 2000. Rediscovery of traditional ecological knowledge as adaptive management. Ecological Applications 10(5):1251-62.

Berkes, F. and I. Davidson-Hunt 2006. Biodiversity, traditional management systems and cultural landscapes: examples from the boreal forest of Canada. International Social Sciences Journal 87: 35-47.

Bigsby, J. J. 1969. The shoe and canoe, or pictures of travel in the Canadas. Illustrative of their scenery and of colonial life; with facts and opinions on emigration, state policy and other points of public interest. Vol. 2 p. 207. Paladin Press New York.

Blackburn, T. C. and K. Anderson. 1993. Introduction: managing the domesticated environment. P. 15-26. In: T. C. Blackburn and K. Anderson eds. Before the wilderness: environmental management by Native Californians. Menlo Park, California: Ballena Press.

Boyd, R. ed. 1999. Indians, fire and the land in the Pacific Northwest. Corvallis, Oregon: University of Oregon Press.

Brokenshaw, D., D. M. Warren, and O. Werner eds. 1980. Indigenous knowledge systems and development. Lanham: University Press of America.

Canadian Council of Forest Ministers. 2005. Canadian wildland fire strategy: a vision for an innovative and integrated approach top managing the risks. Natural Resources Canada. Edmonton, Alberta

Canadian Environmental Assessment Act 1996. Reference guide on physical and cultural heritage resources. Ottawa: Minister of Supply and Services Canada. April 1996. ISBN: 0-662-24599-7.

Chapin, M. 1988. The seduction of models: chinampa agriculture in Mexico. Grassroots Development 12(1): 8-17.

Cleland, E. C. 1992. Rites of conquest: the history and culture of Michigan's Native Americans. Ann Arbor: University of Michigan Press. p. 268.

Clément, D. 1998. The historical foundations of ethnobiology (1860-1899). Journal of Ethnobiology 18(2): 161-187.

Clements, F. E. 1916. Plant succession: an analysis of the development of vegetation. Publication No. 242. Washington D. C. Carnegie Institute.

Colding, J. T. Elmqvist, and P. Olsson. 2003. Living with disturbance: building resilience in social-ecological systems. p. 163-185. In: Navigating social-ecological systems: building resilience for complexity and change. Cambridge: UK. Cambridge University Press.

Cronon, W. 1983. Changes in the land: Indians, colonists and the ecology of new England. New York: Hill and Wang.

Davidson-Hunt, I. J. 2003. Journeys plants and dreams: social-ecological resilience, memory and adaptive learning. PhD Thesis. Winnipeg, Canada: University of Manitoba.

Davidson-Hunt, I. J., P. Jack, E. Mandamin, B. Wapioke. 2005. Iskatewizaagegan (Shoal Lake) knowledge: an Anishinaabe (Ojibway) ethnobotany of northwestern Ontario. Journal of Ethnobotany 25(2): 189-227.

Day, G. M. 1953. The Indian as an ecological factor in the northeastern forest. Ecology 34(2): 329-346.

Duer, D. and N. J. Turner 2005. Keeping it living: traditions of plant use and cultivation on the northwest coast of North America. Vancouver: University of Washington Press.

Dunning, R. W. 1959. Social and economic change among the Northern Ojibwa. Toronto: University of Toronto Press.

Elton, C. 1930. Animal ecology and evolution. Oxford, UK: Oxford University Press. p. 15.

Ford, R. I. 1978. Ethnobotany: historical diversity and synthesis. In: R. I. Ford ed. The nature and status of ethnobotany. Anthropological Papers No. 67. Museum of Anthropology, University of Michigan. 33-49.

Frelich, L. E. and P. B. Reich. 1998. Disturbance severity and threshold responses in the boreal forest. Conservation and Society 2(2) article 7. http://www.consecol.org/vol2/iss2/art7.

Gadgil, M. V., P. R. Seshagiri-Rao, G. Utkarsh, P. Parmod, A. Chhatre, and members of the People's Biodiversity Initiative. 2000. New meanings for old knowledge: the People's Biodiversity Registers Program. Ecological Applications 10(5): 1307-1317.

Gomez-Pompa, A., A. Kaus. 1992. Taming the Wilderness Myth. BioScience 42(4): 271-279.

Gulig, A. G. 2002. "Determined to burn off the entire country": prospectors, caribou, and the Denesuliné. American Indian Quarterly 26(3): 335-359.

Gunderson, L. H. and C. S. 2002. Holling Resilience and adaptive cycles. 25-62. In: L. H. Gunderson and C. S. Holling eds. Panarchy: understanding transformations in human and natural systems. Washington, D. C.: Island Press.

Heinselman, M. L., 1973. Fire in virgin forests of the Boundary Waters Canoe Area, Minnesota. Quaternary Research. 3: 329-382.

Holling, C. S. 1973. Resilience and stability of ecological systems. Annual Review of Ecology and Systematics. 4: 1-23.

_____. 1986. The resilience of terrestrial ecosystems: local surprise and global change. p. 292-320. In: W. C. Clark and R. E. Munn eds. Sustainable development of the biosphere. New York: Cambridge University Press.

Holling, C. S. and L. H. Gunderson, 2002. Resilience and adaptive cycles. In: L. H. Gunderson and C. S. Holling eds. Panarchy: understanding transformations in human and natural systems. Washington, Island Press. 25-62.

Holling, C. S., L. H. Gunderson, D. Ludwig. 2002. In a quest for a theory of adaptive change. p.3-24. In: L. H. Gunderson and C. S. Holling. eds. Panarchy:

understanding transformations in human and natural systems. Washington: Island Press.
Hunn, E. 2007. Ethnobiology in four phases. Journal of Ethnobiology 27(1):1-10.
Hunter, M. L. Jr. 1990. Wildlife, forestry, and forestry: principals of managing forests for biological diversity. New Jersey: Prentice Hall Career and Technology.
Hunter, M. L. Jr. 1993. Natural fire regimes as spatial models for managing boreal forests. Biological Conservation 65: 111-120.
Jackson, W. J. and P. F. Moore 1998. The role of indigenous use of fire in forest management and conservation. Proceedings: International Seminar on Cultivating Forest: Alternative Forest Management and Techniques for Community Forestry. Bangkok, Thailand 1998.
Johnson, E. A. 1992. Fire and vegetation dynamics: studies from the North American boreal forest. Cambridge University Press.
Johnson, E.A. and K. Miyanishi. 2001. Forest Fires: Behavior and Ecological Effects. San Diego, Academic Press.
Johnson, M. ed. 1992. Lore: capturing traditional ecological knowledge. Hay River, NWT: Dene Cultural Institute and the International Development Research. Centre
Johnson, L. M. 2000. "A place that's good," Gitksan landscape perception and ethnoecology. Human Ecology 28(2):301-325.
Johnson-Gottesfeld, L. M. 1994. Aboriginal burning for vegetation management in northwestern British Columbia. Human Ecology 22(2): 171-188.
Johnston, M. H. and J. A. Elliott. 1996. Impacts of logging and wildfire on an upland black spruce community in northwestern Ontario. Environmental Monitoring and Assessment 39: 283-297.
Kimmins, J. P. H. 1995. Sustainable development in Canadian forestry in the face of changing paradigms. Forestry Chronicle 7(1): 33-40.
Kimmerer, R. W. 2000. Native knowledge for native ecosystems. Journal of Forestry 98(8): 4-9.
Kuuluvainen, T. 2002. Introduction – disturbance dynamics in the boreal forests: defining the ecological basis of restoration and management of biodiversity. Silva Fennica 36(1): 5-11.
LaRocque, E. 2001. From the land to the classroom: broadening epistemology. Jill Oakes ed. Pushing the margins: Native and northern studies. Native Studies Press. University of Manitoba. 62-75.
Lee, B. S. M. E. Alexander, B. C. Hawkes, T. J. Lynham, B. J. Stocks, P. Englefield. 2002. Information systems in support of wildland fire management decision making in Canada. Computers and Electronics in Agriculture 37: 185-198.
Lewis, H. T. 1977 Maskuta: the ecology of Indian fires in northern Alberta. The Western Canadian Journal of Anthropology 7(1): 15-52.
_____. 1982. A time for burning. Occasional publications No. 17, Edmonton: Boreal Institute for Northern Studies, University of Alberta.
_____. 1993. Patterns of Indian burning in California: ecology and ethnohistory. p. 55-116. In: T. C. Blackburn and K. Anderson eds. Before the wilderness: environmental management by Native Californians. Menlo Park, CA: Ballena Press Publications.

Lewis, H. T. and T. A. Ferguson. 1988. Yards, corridors and mosaics: how to burn a boreal forest. Human Ecology 16(1): 57-77.

Li, C. 2000. Fire regimes and their simulation with reference to Ontario. In: A. H. Perera, D. L. Euler and I. D. Thompson eds. Ecology of a managed terrestrial landscape: patterns and processes of forest landscapes in Ontario. Vancouver: UBC Press. 115-140.

Ludwig, D., B. Walker, and C. S. Holling. 1997. Sustainability, stability, and resilience. Conservation Ecology [online]**1**(1): 7. http://www.consecol.org/vol1/iss1/art7/.

Lutz, H. A. 1959. Aboriginal man and white man as historical causes of fires in the boreal forest, with particular reference to Alaska. Yale University School of Forestry Bulletin No. 65.

Manseau, M., B. Parlee, G. B. Ayles 2005. A place for traditional ecological knowledge in resource management. p 141-164. In: F. Berkes, R. Huebert, H. Fast, M. Manseau, A. Diduck, eds. Breaking Ice: renewable resource and ocean management in the Canadian north. Alberta, University of Calgary Press.

McGregor, D. 2000. The state of traditional ecological knowledge research in Canada: a critique of current theory and practice. In: R. Laliberte, P. Settee, J. Waldram, R. Innes, B. MacDougall, L. McBain and F. L. Brown eds. Expressions in Canadian Native Studies. Saskatoon: University Extension Press. 436-458.

McGregor, D. 2004. Coming full circle: Indigenous knowledge, environment and our future. American Indian Quarterly 28 (3 and 4) 385-410.

McRae, D. J., L. C. Duchesne, B. Freedman, T. J. Lynham, and S. Woodley. 2001. Comparisons between wildfire and forest harvesting and their implications in forest management. Environmental Review 9: 223-260.

Michon, G. 2000. Indigenous forestry: how to turn localized knowledge into a relevant forestry science. p. 35-46. In: A. Lawrence ed. Forestry, forest users and research: new ways of learning. Workshop proceedings: Learning from resource users- a paradigm shift in tropical forestry. April 28-29 Vienna, Austria. European Tropical Forestry Research Network. The Netherlands. http://www.etfrn.org/etfrn/workshop/users/etfrn_series_1.pdf Accessed: June 13, 2006.

Nadasdy, P. 2005. The anti-politics of TEK: institutionalization of co-management discourse and practice. Anthropologica 47(2): 215-232.

Natcher, D. C. 2004. Implications of fire policy on native land use in the Yukon Flats, Alaska. Human Ecology 32(4): 421-441.

Nelson,J. L. E. S. Zavaleta, and F. S. Chapin. 2008. Boreal Fire Effects on Subsistence Resources in Alaska and Adjacent Canada. Ecosystems 11: 156-171.

Niemelä, J. 1999. Management in relation to disturbance in the boreal forest. Forest Ecology and Management 115:127-134.

Perera, A. and L. Buse. 2004. Emulating natural disturbance in forest management: as overview. In: A. Perera, L. J. Buse, and M. G. Weber 2004 eds. Emulating natural forest landscape disturbance: concepts and applications. New York: Columbia University Press.

Pickett, S. T. and P. S. White, 1985. Natural disturbance and patch dynamics: an Introduction. p. 3-13. In: S.T. Pickett and P. S. White, eds. The ecology of naturaldisturbance and patch dynamics. San Diego, CA: Academic Press.

Posey, D. A. 1999. Introduction: culture and nature – the inextricable link. p. 3-18. In: D. A. Posey. ed. Cultural and spiritual values of biodiversity. United Nations Environmental Program. London: Intermediate Press.

Posey, D. A. and G. Dutfield. 1996. Beyond intellectual property rights: toward traditional resource rights for indigenous people and local communities. Ottawa, Canada: International Development Research Centre.

Pyne, S. 1982. Fire in America: a cultural history of wildland and rural fire. Seattle, WA: University of Washington Press.

_____. 1995. World fire: the culture of fire on Earth. Seattle, WA: University of Washington Press.

Pyne, S. J., P. L. Andrews, R. D. Laven. 1996. Introduction to wildland fire 2nd ed. New York: John Wiley and Sons.

Rowe, J. S. and G. W. Scotter, 1973. Fire in the boreal forest. Quaternary Research 3: 444-464.

Roberts, W. 2005. Integrating traditional ecological knowledge and ecological restoration: restoring aboriginal cultural landscapes with Iskatewizaagagen No. 39 Independent First Nation. M. S. Thesis, Natural Resource Management. University of Manitoba. Winnipeg, Manitoba.

Russell, E. W. B. 1983. Indian-set fires in the forests of northeastern United States. Ecology 64(1): 78-88.

Sauer, C. 1944. A geographic sketch of early man in America. Geographical Review 34(4): 529-73.

Sillitoe, P. and A. Bicker 2004. Introduction: hunting for theory, gathering ideology. p. 1-19. *In*: A. Bicker, P. Sillitoe, and J. Pottier eds. 2004. Development and local knowledge: new approaches to issues in natural resources management, conservation and agriculture. London: Routledge.

Slikkerveer, L. J. 1999. Ethnoscience, 'TEK' and its application to conservation. P.169-177. In: Posey, D. A. ed. Cultural and spiritual values of biodiversity. United Nations Environmental Program. London: Intermediate Press.

Spaeder, J. J. And H. A. Feit. 2005. Co-management and indigenous communities: barriers and bridges to decentralized management – introduction. Anthropologica 47(2): 147-154.

Spak, S. 2005. The position of indigenous knowledge in Canadian co-management organizations. Anthropologica 47(2):

Sprugel, D. G. 1991. Disturbance, equilibrium, and environmental variability: what is 'natural' vegetation in a changing environment? Biological Conservation 58: (1-18).

Statutes of Ontario. 1994. Crown Forest Sustainability Act. Sec. 2.

Stewart, O. 1953. Why the great plains are treeless. Colorado Quarterly 2(1): 40-50.

_____. 1955. Fire as the first great force employed by man. p. 115-133. In: W. L. Thomas. Man's role in changing the face of the Earth. Chicago: Chicago University Press.

_____. 2001 Forgotten fires: Native Americans and the transient wilderness. Norman, OK. University of Oklahoma Press.

Theriault, M. 1992. From moose to moccasins: the story of Ka Kita Wa Pa No Kwe. Natural Heritage. Toronto, ON.

Turner, M. G., W. L. Baker, C. J. Peterson, R. K. Peet. 1998 Factors influencing succession: lessons from large, infrequent natural disturbances. Ecosystems 1(6) 511-523.

Turner, M. G., R. H. Gardner, and R. V. O'Neill. 2001. Landscape ecology in theory and practice**:** pattern and process. New York: Springer.

Turner, N. J. 1999. "Time to burn": traditional use of fire to enhance resource production by aboriginal peoples in British Columbia. p.185-218. *In*: R. Boyd. ed. Indians, fire and the land in the Pacific Northwest. Corvallis, Oregon: Oregon State University Press.

Usher 2000. Traditional ecological knowledge in environmental assessment and management. Arctic 53: 183-93.

Verran, H. 2002. A postcolonial moment in science studies: alternative firing regimes of environmental scientists and Aboriginal landowners. Social Studies of Science 32(5/6): 729-762.

Weber, M. G. and B. J. Stocks. 1998. Forest fires and sustainability in the boreal forests of Canada. Ambio 27(7) 545-560.

Wein, R. W. and D. A. MacLean. eds.1983. The role of fire in northern circumpolar ecosystems. New York: John Wiley and Sons.

Weir, J. M. H., E. A. Johnson, and K. Miyanishi. 2000. Fire frequency and the spatial age mosaic of the mixed-wood boreal forest in western Canada. Canadian Ecological Applications 10: 1162-1177.

Western, D., R. M. Wright, S. C. Strum eds.1994. Natural connections: perspectives in community based conservation. Island Press.

Whelan, R. J. 1995. The ecology of fire. Cambridge, UK: Cambridge University Press.

Williams, G. W. 2000a. Aboriginal use of fire: are there any "natural" plant communities? p. 179-213. In: C. E. Kay and R. T. Simons eds. Wilderness and political ecology: aboriginal influences and the original state of nature. Salt Lake City, UT: University of Utah Press.

_____. 2000b. Introduction to aboriginal fire use in North America. Fire Management Today 60 (3): 8-12.

_____. 2001. References on the American Indian use of fire in ecosystems. Pp. 107 (www.blm.gov/heritage/docum/Fire/ Bibliography%20-%20Indian%20Use%20of%20Fire.pdf.) Accessed: July 1, 2009.

Williams, N. M. and G. Baines eds. 1993. Traditional ecological knowledge: wisdom for sustainable development. Canberra, Australia: Australia National University

Winterhalder, B. 1983. Boreal foraging strategies. In: Steegman, T. A. Jr. ed. Forest adaptations: the Northern Algonquins. New York: Plenum Press. 201-241.

Witt, N. and J. Hookimaw-Witt. 2003. Pinpinayhaytosowin [the way we do things]: a definition of traditional ecological knowledge (TEK) in the context of mining development on the lands of the Attawapiskat First Nation and its effects on the design of research for a TEK study. Canadian Journal of Native Studies 23(2) 361-390.

Wolf, R. J. 1979. Moose habitat and forest succession on the Tanana River Floodplain and the Yukon-Tanana Upland, USDA Forest Service Institute of Northern Forestry, Fairbanks, AK.

Wu, J. and O. L. Loucks. 1995. From the balance of nature to heirarchical patch dynamics: a paradigm shift in ecology. The Quarterly Review in Biology 70(4): 439-466.

Yibarbuk, D., P. J. Whitehead, J. Russell-Smith, D. Jackson, and C. Godjuwa. 2001. Fire ecology and Aboriginal land management in central Arnhem Land, northern Australia: a tradition of ecosystem management. Journal of Biogeography 28: 325-343.

CHAPTER 3:

RESEARCH SETTING, APPROACH AND METHODOLOGY

3.1 Introduction

The purpose of this research was to explore knowledge of forest fire disturbance and renewal cycles held by the elders of Pikangikum First Nation. I chose wildfire as the focus of the study because of fire's pervasiveness and influence upon the boreal landscape and current interest within the community of Pikangikum to explore their knowledge of fire. In this chapter I present a brief description of the study location and community context, and present my research approach and methods for data collection and analysis.

3.2 Research setting

3.2.1 Pikangikum First Nation, Ontario

Pikangikum First Nation is a remote Anishinaabe [Ojibwa] community of approximately 2,400 people located in northwestern Ontario on the shores of Pikangikum Lake and the Berens River (Figure 3.1). The community is linked to Red Lake, the closest town, approximately 100 km to the southwest, by an ice road which is open during the winter months roughly from December to March. During the season of open water, approximately between April and November, Pikangikum is accessible by boat. A small landing strip also accesses the community. The Pikangikum First Nation was settled under treaties 9 and 5 and occupies 18 square km of federal reserve land (INAC, 2008),

however, their traditional territory spans more than 12,000 square km. Pikangikum families began settling in the community's current location in the 1940s for longer

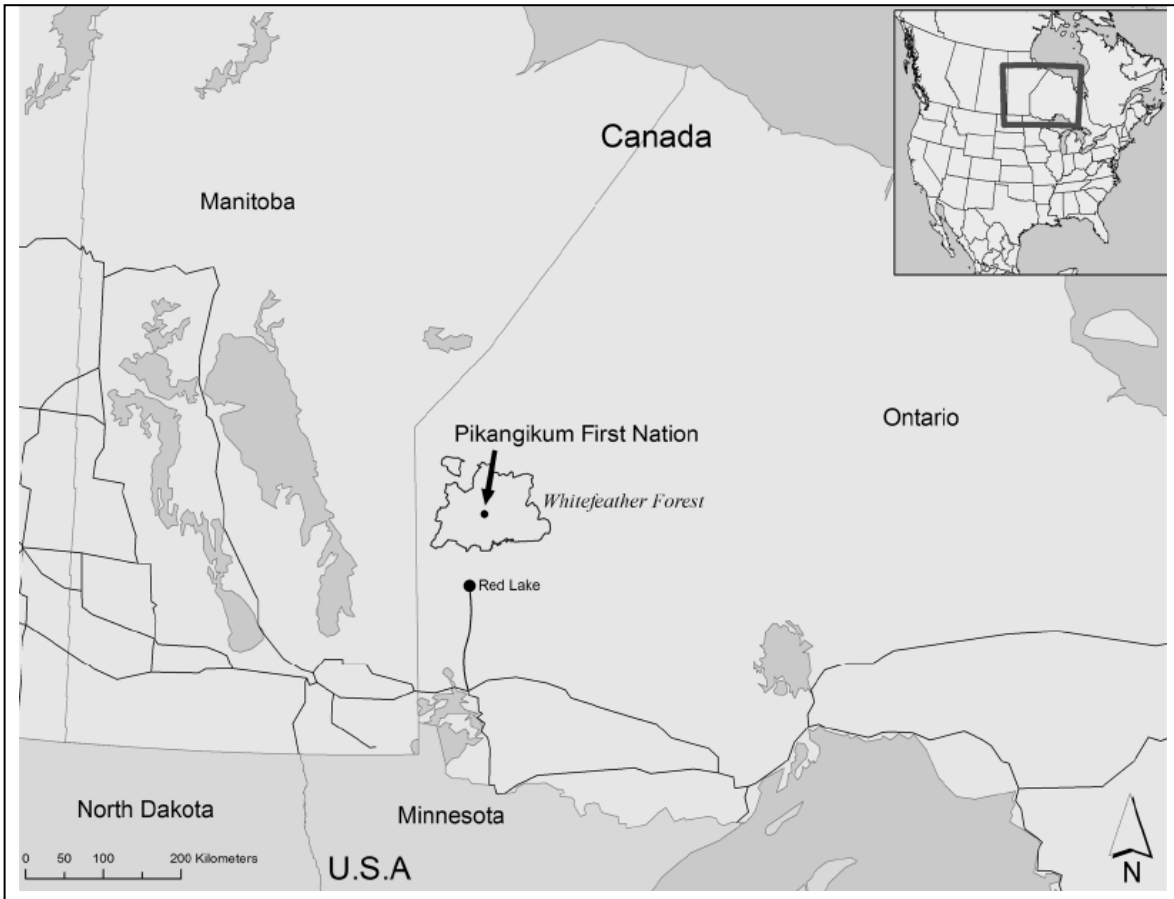

Figure 3.1 Pikangikum First Nation and the Whitefeather Forest (S. Keobouasone)

periods of time in the community in order to access education, health care and government child benefits. The collapse of the fur trade in the 1980s and the decline in commercial fishing, reduced many families' ability to spend prolonged periods in the bush, and left the community reliant on government transfers and service-based employment (Chapeskie et al 2004; O'Flaherty et al. 2008). Today, many families continue to gain substantial amounts of food from subsistence activities including snaring

of small game, moose and duck hunting, and fishing. Although all houses have access to diesel generated electricity many continue to rely on wood burning stoves for heating,

Photo 3.1. Elder Norman Quill skinning a beaver at his trapline cabin on Zeller Lake during a fall moose hunt September 2007. Note Norman's grandson with a pellet gun watching the butchering of the moose that had been killed that morning. He is learning how to be a hunter by stalking birds around camp.

requiring families to cut wood from the surrounding forest throughout the winter months. Today individuals and family groups continue to travel to their family trapline areas, but these seasonal journeys must be coordinated with wage labor and school schedules.

The topography of the Whitefeather Forest is a gently rolling landscape of the Precambrian Canadian Shield. The forest is interspersed with numerous lakes, rivers and wetlands making travel during the warm months difficult without motorboats. Forest

species, including jack pine (*Pinus banksiana* Lamb.) in sandy or thin soils, black spruce (*Picea mariana* (Mill.) BSP) in wetter areas along with trembling aspen (*Populus tremuloide*s Michx.) and birch (*Betula papyrifera* Marsh.) in heavier soils and along waterways, are adapted to periodic catastrophic fire regime that typifies the boreal forest (Rowe and Scotter, 1973).

The Whitefeather Forest has abundant terrestrial and aquatic wildlife including woodland caribou (*Rangifer tarandus caribou*), moose (*Alces alces*), black bear (*Ursus americanus*), wolf (*Canis lupus*), otter (*Lontra canadensis*), beaver (*Castor canadensis*), lynx (*Lynx canadensis*) and marten (*Martes americana*); migratory songbirds, waterfowl, bald eagles (*Haliaeetus leucocephalus*) and other birds of prey; fish, such as sturgeon (*Acipenser fulvescens*), pickerel (*Sander vitreus*), northern pike (*Esox lucius*), trout (*Salvelinus namaycush*), sucker (*Catostomus commersonii*) and whitefish (*Coregonus clupeaformis*). Important food plants include wild rice (*Zizania palustris*) and blueberries (*Vaccinium* spp). Jack pine and poplar continue to be important for fuel. Black spruce provides important building materials for cabins.

The extreme climate of the boreal region has a great impact on human and wildlife movements and activities. Night time temperatures are below 0ºC for seven consecutive months with lows of -45ºC occurring in January and February. Travel during this period over trails through the bush and frozen waterways is facilitated by snow machines. During the summer high temperatures can reach 35ºC. Mosquitoes and biting flies make travel in the bush difficult and encourage people to be more active around open water.

3.2.2 The Whitefeather Forest Initiative

In the early 1990s, Pikangikum elders began to consider new land-based economic renewal activities, including forestry, tourism recreation and dedicated protected areas that could continue to provide their youth with land-based livelihood opportunities (Pikangikum First Nation and OMNR, 2006). They approached the Ontario Ministry of Natural Resources (OMNR) in 1997 to enter into dialogue about the potential to receive their support for community led forestry (Chapeskie, 2002). The Whitefeather Forest Management Corporation (WFMC) was established in 1998 under the elders' guidance to develop these opportunities in their traditional territory. To support Pikangikum and respond to other First Nation communities interested in developing forestry opportunities, the government of Ontario launched the Northern Boreal Initiative (NBI) in 2000. The NBI is a provincial policy which supports First Nations' community-based land use planning north of the 51st parallel, the limit of the licensed forestry management units in Ontario (OMNR, 2002).

The WFMC entered into partnership with the OMNR to develop the land use strategy for the Whitefeather Forest, as well as with three neighboring First Nations, to develop a World Heritage Site nomination. In 2003 they also entered into partnership with a coalition of environmental groups – the Partnership for Public Lands. Between 2003 and 2006, Pikangikum Elders, land stewards, and OMNR staff worked towards the development of the "***Cheekahnahwaydahmungk Keetahkeemeenaan*** - Keeping the Land: A Land Use Strategy for the Whitefeather Forest and Adjacent Areas" (Pikangikum First Nation and OMNR, 2006). The Land Use Strategy was signed by the Chief of Pikangikum and the Ontario Minister of Natural Resources in June of 2006 and

represents the new land use policy direction for the Whitefeather Forest. As of this writing (Nov 2009) WFMC and OMNR are continuing to work together to acquire Environmental Assessment Coverage for commercial forestry in the Whitefeather Forest.

3.2.3 Whitefeather Forest Cooperative Research Agreement

The research relationship that I maintained with the community and informants during this project was established in a research cooperative agreement between research collaborators from Pikangikum First Nation and the University of Manitoba (http://www.whitefeatherforest.com/wp-content/uploads/2008/08/wfrc_agreement.pdf Accessed: May 9, 2009). This agreement was established in 2004. Its intent was to establish the Whitefeather Forest Management Corporation as the lead organization for research occurring within the community, set priorities for investigation and establish a formal process for research behavior within the community (Figure 3.2). Project development began with informal research discussions between Dr. Davidson-Hunt and WFMC president Alex Peters during Fall, 2005. In February 2006 I introduced myself and provided an outline of my project goals to Mr. Peters during a community visit. Following this visit, Mr. Peters began informally checking with community elders to see if they would be willing to support my research. I made a formal proposal at a community meeting attended by the WFMC elders advisory group in June 2006. They were willing and eager to begin research at this point and appointed several elders to begin work with me. From this point on I worked mainly through the WFMC Land Use Coordinators, Paddy Peters and Charlie Pascal who contacted elders and acted as translators for interviews. The WFMC Land Use Coordinator and President also had the

authority to direct WFMC Researchers to assist me with interviews, production of maps and translations. A WFMC Elder Liaison also helped by communicating with potential participants, explaining the project objectives and encouraging their participation. Elders who agreed to be interviewed would come to the WFMC office to be interviewed individually or in groups. Monetary compensation of collaborators for interviews and trips was determined as part of the WFRC process.

Although this process at times seemed like a cumbersome research protocol, it had several important functions. First, and most important, it gave me access to often

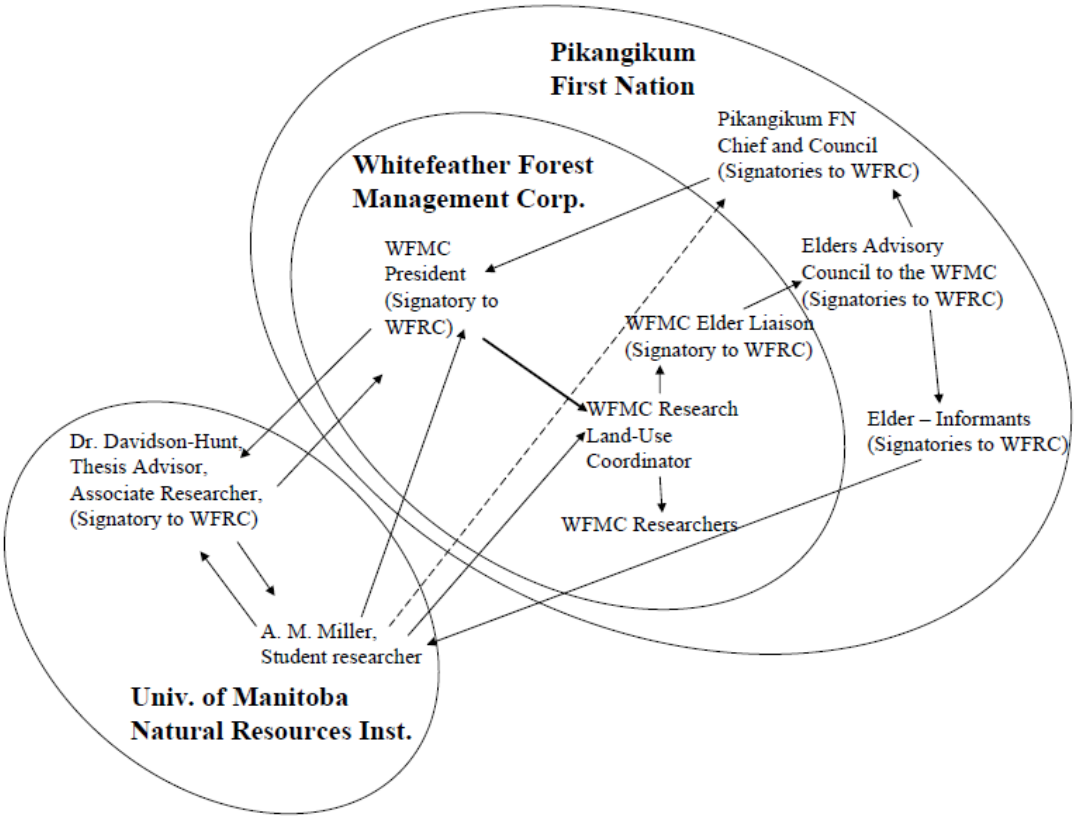

Figure 3.2. This research was conducted under the Whitefeather Forest Research Cooperative Agreement (WFRC), which helped structure how I interacted with community elders and community institutions during my research. Lines in this diagram represent flows of information and formal and informal influence.

monolingual elders. The social standing of the WFMC Land Use Coordinator was important in encouraging elders to come to interviews in the WFMC offices. Second, it gave to my research the air of legitimacy by working under the auspices of a community based research organization which most elders supported. Third, the process provided a means for elders to control the level and timing of their engagement with the research process. Being sensitive to how this process worked was an important lesson in roles of authority and community and cultural norms.

Throughout this research I worked predominantly with male elders and the hunters whom they identified as being qualified to assist me in my explorations of ecological disturbance and its significance to livelihood activities and forestry planning. I viewed this as appropriate within the goals of describing knowledge of forest fires and disturbance relevant to co-management planning, as the elders are the group within Pikangikum who currently contribute to planning efforts within the Whitefeather Forest Planning Initiative. Male elders appeared to me to be the ones who were venturing onto the land most regularly to hunt and also had experience as forest fire fighters from which to draw. This focus has the admitted disadvantage of failing to record possibly distinct kinds of knowledge of fire and ecological disturbance that may exist with women elders or how it is being transmitted to younger generations of current day young people within the community.

3.3 Methodological approach

I adopted a qualitative research approach defined as, "an inquiry process of understanding a social or human problem, based on building a complex, holistic picture,

formed with words, reporting detailed views of informants, and conducted in a natural setting" (Creswell, 2003 p. 7). Following Creswell (2007) I employed a combination of case study and phenomenological approaches to investigate how the people of Pikangikum understand the process of ecological disturbances and their historical experiences interacting with it and the Ontario Ministry of Natural Resources. Thus, I selected Pikangikum First Nation and elders' and trappers' experiences and knowledges of the social and ecological impacts fire as the bounded system (Stake, 2005) from which my understanding of fire and its impacts was to emerge. I used an ethnoecological framework (Toledo, 2002) in which I attempted to incorporate elements of taxonomic or cognitive categories, worldview and practices of informants to create a picture of how people viewed these phenomena.

I explored these topics through:

1. Semi-directive interviews with individual and groups of elders and trappers;
2. Field visits and walking interviews;
3. Community meetings and interviews with government resource managers.

3.3.1 Semi-directive interviews

In total, I interviewed 30 different elders and trappers in 43 separate sessions between June 2006 and February 2008. Semi-directive interviews were based around broad topics (e.g. "How do you understand fire to have been used by your elders on the trapline?") which progressively narrowed over the course of the interview (e.g. "What were the signs that your father watched for that told him it was time to burn the

marshes?"). During this process I relied on my translator to provide me with a translation of the content of the elders' statements and to alert me to particularly meaningful Anishinaabe terms and phrases used to express their understandings of the subject. These included creating Anishinaabe taxonomies of natural features and processes (Hunn 1993). Narratives and stories also proved to be important sources of information. These are preserved in many places in the text of the thesis to provide a feel for how people dealt with the subject of investigation.

In all, 27 out of the 30 people interviewed were men ranging from 35 to 94 years old. Only three women were interviewed. This gender bias in the interviews was not intentional, but reflects the opinions of the elders themselves of who they recognized as knowledgeable in the area that I was interested in. Several times women would come with their husbands to be interviewed or would be present during interviews conducted in bush camps. Although they often had comments about their husband's testimony they never contradicted their husbands (except in a joking manner) and seemed to be in agreement that their husbands knew more about fire on the land than they did. The possibility of gendered knowledge relating to fire was not further considered as part of this thesis.

Interviews frequently generated questions which caused the interviewee to demure from responding (e.g. events occurring on another person's trapline, reference to a story that another person could tell with greater ease). Other times, an elder would suggest that I gather several other elders in order to pose my question to the group. In this way, the sequence of elders and the structure of interviews was somewhat directed by participants. Interviews also generated questions that slowly arose through journaling

and reflection which I discussed with the Land Use Coordinator and Elder Liaison to help clarify my thinking about either how I was asking the question or what the elder may have meant. I recalled many elders for second and third interviews.

3.3.2 Field visits and walking interviews

Field interviews allowed me to accompany elders and trappers into the bush frequently to visit specific sites and discuss specific topics (e.g. visit a marsh which the informant and his grandson had burned several years previously to discuss their methods and the results). In total I conducted 12 such field trips spanning 30 days. Most of these trips involved traveling by boat from Pikangikum to remote fishing or trapping camps that we used as base camps. Several of these trips involved taking float planes to remote family traplines. The day trips frequently were undertaken at my initiation, trips of longer duration were ones where I was allowed to accompany my principal informant and his family on trips they had already planned. These trips allowed me to collect participant observation data as well as through walking surveys (DeLeon and Cohen, 2005). Activities on the traplines included hunting of moose, beaver and caribou, trapping of marten and snaring snowshoe hares and beaver. All of these animals have seasonal preferences for different successional communities. This allowed me to inquire about animal natural history, observe hunting practices, and ask hunters what was involved in their success getting them.

One important area in this study was a trapline that spanned the southern boundary of the Whitefeather Forest and the Trout Lake forest to the south. Portions of this trapline had been logged beginning in the mid 1970s giving the trappers who used

this area a clear picture of what logging practices and their impacts were. I made four trips to the Nungesser trapline and spent a total of 12 days accompanying trappers and elders. This allowed us to directly examine the result of logging and discuss social and ecological changes that had occurred since its initiation.

3.3.3 Community meetings and interviews with government employees

Community meetings that contributed to this research took two forms: meetings that were part of the Whitefeather Forest Initiative and planning process and those which were called specifically to address my research topics. WFI meetings frequently were attended by the Elders Advisory Group, WFMC Researchers, and members tasked with achieving specific goals within the WFI (e.g. preparing documents for Environmental Assessment) and OMNR partners. These meetings were held in the community café or school and were attended by between 10 and 40 elders, WFMC staff members and up to five OMNR employees. They were most often announced over the community radio the day prior or the morning of the meeting and generally lasted from 10 am to 3 pm. They were conducted in Anishinaabe and facilitated by the WFMC Land Use Coordinator who acted as chair and translator between the attending elders and visitors and non-Anishinaabe researchers. Although these meetings frequently had other focuses than those directly related to my research, they were sites where elders spoke about their values, experiences and practices related to land uses. As a result they were sources of much valuable contextual information. These meetings were principally held to exchange information and updates about the WFI, OMNR projects and to present results from my and other research taking place in the community under the WFRC. Individuals who

were experts in specific regions of the Whitefeather Forest or holders of specific information (e.g. Who knows about marten hunting? Who will be going to Barton Lake this fall?) were frequently identified for later interviews during these meetings. OMNR partners in the WFI planning process came from Parks Canada, Fire Branch and District Offices in Red Lake. I attended a total of seven of these meetings over the course of my research, although more than this number was held.

From Spring 2007 to February 2009 I called four meetings primarily to discuss my research. Three of these meetings included OMNR representatives from Fire and Forestry Branches. These meetings were principally intended as information exchanges and to verify findings. I presented my results in narrative or through graphics using Power Point, which the elders were then invited to discuss and modify.

These meetings frequently were a good place to renew my awareness of my place within the WFI – as a researcher serving the community elders' desire to create economic opportunities for their young people within the framework of customary rights and practices. At times the elders sternly lectured researchers or WFMC research members about elders' expectations for them. These meetings were also times that were very relaxed and informal. They provided me with my greatest opportunity to listen to the Anishinaabe language being spoken by speakers with complete mastery of the nuance and oral tradition of their language. These meetings allowed me periodically to adjust my approaches to my topic to remain relevant to those goals – their goals.

3.4 Working with translators

I was dependent upon WFMC translators for much of my work with elders many of whom were monolingual Anishinaabe speakers or nearly so. Translators were briefed on the purpose of the study and asked to give their input into effective interview procedures and questions (Borchgrevink, 2003). Following interviews, translators were debriefed to verify initial notes, capture main ideas, and identify relevant new vocabulary words in Anishinaabe. Throughout the study, I re-examined the questions and the approach being taken with the help of the translators in order to refresh their memory of the study purpose and to adapt our methods as we learn what works and what does not. I was greatly assisted by elders' interest in making themselves understood in areas they considered important to the goals of the Whitefeather Forest Initiative.

3.5 Data management and analysis

During my time in the field I maintained field notebooks, including daily logs, jottings and field notes (Bernard, 2006). I recorded (unless instructed not to) all interviews with informants and community meetings as MP3 files using an Edirol R- 09 audio recorder. These recordings were transcribed into Microsoft Word. Transcripts and field notes were entered coded using NVivo to identify themes and key words. Recordings, transcripts and photos were archived in the Whitefeather Forest Management Corporation Office in Pikangikum.

Research results were verified with individual authorities, in small groups and in community meeting settings. Frequently this was accomplished through the production

of many of the figures found in the chapters. These were presented to elders who then commented on their accuracy and on related issues. Community meetings provided the elders an opportunity to speak as a group about their feelings towards the research and were the source of much of my understanding of the context of the elders' experiences with fire and interactions with OMNR.

3.6. Personal background and approach

Probably the most understated yet important tools of all social science investigations are the characteristics and background that individual researchers bring to their area of research. The set of experiences and personal outlooks unique to each researcher contribute important elements to formation of research questions, chosen methodologies, data collection and research products and outcomes and thus merit some reflexivity. Before presenting the actual work and results of my research I would like to reflect a little on where I come from academically and as a person working with Indigenous knowledge holders and their communities.

My first formal academic training came through a Bachelor of Arts degree from the Department of Geography from the University of Texas at Austin. Deep concerns about strong destructive environmental changes and the need for conservation moved me from attempts at Biology and Ecology degrees to one in Cultural Geography. This degree offered a well rounded look at the landscape of actors and elements involved in environmental and conservation issues. Over the next 16 years I found employment in seasonal wildlife technician jobs across the Western United States. These jobs allowed me to pursue my interests in wildlife diversity and its conservation. However, while they

allowed me to interact with wild things and places, conservation measures I was supporting always seemed like triage – emergency measures given grudgingly to keep a species from disappearing.

In 1998 I found the opportunity to visit the Sierra Tarahumara in southwestern Chihuahua, Mexico, through friends working in a non-governmental conservation and human rights organization working in Indigenous Rarámuri (Tarahumara) and Ódame (Tepehuan) communities of that region. The mix of vibrant biological and cultural diversity and the struggle of indigenous communities for rights was so compelling that I became involved in ornithological (Miller and Chambers, 2007) and ethnoecological research in a proposed protected natural area inhabited by an Rarámuri community, the Ejido of Pino Gordo, for the next five years. My work with community leaders and young people to document local biodiversity in an endangered ecosystem and community knowledge of its use and importance to their lives led to a Masters of Science degree in the department of Forestry at Northern Arizona University (Miller, 2003). While my research contributed to filling gaps in westerner's knowledge about the increasing impacts of unrestrained logging on avifauna and the knowledge of people of the Sierra Tarahumara, the people with whom I worked were little affected by it. As one of my Rarámuri collaborators, Pedro Peña Ramos told me (years before the research took place), "We know all about the birds. We know them all." As far as the impacts that logging had on forest birds and the impacts on the lives of his people, Pedro knew far more than I could hope to record in my study.

Through my close associations and friendships with members of several Rarámuri communities I gained a deep appreciation for the detail and knowledge and the

distinctness of relationships which these communities maintained with their environment. Additionally, I realized the need for people to find meaningful engagement with the development processes. Without this engagement material and spiritual poverty retain a hold on peoples' lives and aspirations despite the best intentions of outside do-gooders. One of the great sources of satisfaction I have in presenting the following work is that it was created through collaboration with the people it endeavors to understand in a manner that hopefully has enriched their thinking about the problems that they confront and may lead to economic and cultural renewal.

3.7 References

Bernard, H. R. 2006. Research methods in anthropology: qualitative and quantitative approaches. 4th edition. Altamira Press.

Borchgrevink, A. 2003. Silencing language: of anthropologists and interpreters. Ethnography 4(1) 95 – 121.

De Leon, J. P. and J. H. Cohen. 2005. Object and walking probes in ethnographic interviewing. Field Methods 17(2): 200-204.

Creswell, J. W. 1994. Research design: qualitative and quantitative approaches. Toronto, Canada: Sage Publications.

Creswell, J. W. 2007. Qualitative inquiry and research design: choosing from among five approaches. 2nd edition. Sage Publications.

Chapeskie, A. 2002. Pikangikum at the Crossroads – Youth Leadership and the Whitefeather Forest Initiative. MakingWaves, 13(2): 33-36

Chapeskie, A. J., M. O'Flaherty, A. Peters, and N. Quill. 2004. The Whitefeather Forest Initiative: Indigenous wisdom guiding a new community forestry opportunity in the Boreal Forest of Canada. In conference proceedings: *Sharing Indigenous Wisdom: An International Dialogue on Sustainable Development*, 6-11 June 2004, Green Bay, Wisconsin, United States, pp. 1–29.

Hunn E. 1993. The ethnobiological foundation for traditional ecological knowledge. In: N. M. Williams and G. Baines eds. Traditional ecological knowledge: wisdom for sustainable development. Canberra, Australia: Australia National University. p. 16-20.

INAC 2008. Pikangikum - First Nations profile. [online] http://pse5-esd5.ainc-inac.gc.ca/FNP/Main/Search/FNMain.aspx?BAND_NUMBER=208&lang=e. Accessed: May 2008.

Miller, A. M. 2003. Birds of a harvested Pine-oak forest Chihuahua, Mexico: Biological and ethnoecological warning signs. Master's Thesis, School of Forestry, Northern Arizona University. Flagstaff, Arizona. 131 pp.

Miller, A. M., and C. L. Chambers. 2007. Birds of harvested and unharvested Pine-Oak forests, Chihuahua, Mexico. The Southwestern Naturalist. 52(2): 271-283.

Pikangikum First Nation and OMNR. 2006. Keeping the Land - Land Use Strategy. http://www.whitefeatherforest.com/wp-content/uploads/2008/08/land-use-strategy.pdf. Accessed: May 14, 2009.

O'Flaherty, R. M., I. J. Davidson-Hunt, and M. Manseau. 2008. Indigenous knowledge and values in planning for sustainable forestry: Pikangikum First Nation and the Whitefeather Forest Initiative. *Ecology and Society* 13(1): 6. [online] URL: http://www.ecologyandsociety.org/vol13/iss1/art6/

OMNR, 2002. Northern Boreal Initiative - Community-based land use planning approach. [online] http://www.web2.mnr.gov.on.ca/mnr/nbi2002/

Rowe, J. S. and G. W. Scotter, 1973. Fire in the boreal forest. *Quaternary Research,* 3: 444-464.

Stake, R. E. 2005. Qualitative case studies. In: N. K. Denzin and Y. S. Lincoln eds. The Sage handbook of qualitative research. 3rd edition. 443- 466. Thousand Oaks, CA. Sage.

Toledo, V. M. 2002. Ethnoecology: a conceptual framework for the study of indigenous knowledge systems. In: J. R. Stepp, F. S. Wyndham and R. S. Zarger (eds.) Ethnobiology and biocultural diversity. Proceedings of the Seventh International Congress of Ethnobiology. Athens, Georgia. 511-522.

CHAPTER 4:

CHEEYAHWAYSEG, "RETURNING AS IT WAS": ANISHINAABE PERSPECTIVES OF DISTURBANCE AND RENEWAL FOLLOWING FOREST FIRE AND CLEARCUTTING

4.1. Abstract

Resilience scholars have examined many cultures to show aspects of adaptive renewal but little effort has been expended on understanding how disturbance and renewal is understood in non-western worldviews. This study presents Anishinaabe [Ojibway] views of forest fire and clearcut logging occurring in the boreal forest of Pikangikum First Nation, northwestern Ontario. We present empirical and theoretical understandings co-produced with Pikangikum elders of these disturbance types collected over a four year collaborative research process. These results have applied contributions for community led forestry co-management planning and offer novel understandings of adaptive change. Many beings within their landscape (including plants, animals, rocks, forest fire) possess agency, the ability to individually express free will. The elders perceive that if reciprocal relationships are maintained within the network of beings in their landscape, renewal will be maintained as part of the Creator's Plan. This plan allows for humans to respectfully use plants and animals who ask only to be allowed to fulfill their own needs in the manner they see fit. Restraining or attempting to control other beings is insulting to them and will lead to their loss. Elders identify impacts to soils, creation of plantations and use of herbicides in current forestry practices as having negative impacts on forest renewal and maintenance of the traditional Anishinaabe way of life. While many of the empirical

observations of Pikangikum elders are validated by provincial resource managers the differences between their respective worldviews present substantial challenges to resource co-management and will require concerted efforts to resolve.

> *When I look at these man made clear cutting areas, the way that they clear cut the land and the way that all the debris is on the land, they put a lot of tracks, a lot of holes on the land. They gather all the debris and they set these on fire. Outside these debris areas you can see all the land that they have destroyed. Where all the heavy machinery has made tracks on the land, it's awful to look at. When you look over at where that fire was, you see that everything is in harmony there*.
>
> Oliver Hill, Interview August 24, 2006.
>
> Translated by Paddy Peters

4.2. Introduction

The way a culture cognitively structures the world provides a framework through which its members are able to interact with their environment. Within the western scientific tradition, a dominant way the world is acted upon is through the Cartesian distinction between nature and culture, which posits that humans are in a unique position to manage nature. Many conventional resource models assume that outcomes of management will be predictable in so far as scientific practices are built upon accurate models of the systems they describe (Levin, 1999). The recognition of linkages between social-ecological systems (Berkes and Folke, 1998) and the potential for surprises arising from interactions across scales, emergent properties and synergism (Holling et al. 2002) is becoming more widespread through scholarship in resilience and adaptive change. However, theorists of adaptive change remain rooted in dichotomous relations between humanity and nature. The human capacity to perceive time, act with self interest against

future conditions, and to communicate complex concepts through symbolic means (e.g. words) are taken as evidence that organization of human societies is distinct from the means by which natural systems organize (Westley et al. 2002). Consequently, humans are in the unique position of being able to exercise agency, through individual acts of free will and transformative capacity (Giddens, 1979). Human and natural systems are organized separately, within nested scales of organization that are linked through the application of knowledge (Berkes et al. 2003 p. 22; Berkes and Folke, 2002 p. 124). The origins of the separation of society and nature have been explored in anthropological (Ingold, 2000) and resilience literatures (Davidson-Hunt and Berkes, 2003a) but remain an inherited epistemological frame. It is indisputable that societies that employ the culture-nature divide have delivered benefits to its members (e.g. improved health care, food supply, material comfort, etc.). However, it cannot be taken for granted that this position is universally accepted and is without implications for co-management arrangements between science-based management systems and peoples employing traditional knowledge for whom the divide between nature and culture is not recognized.

Adaptive change scholars have found that indigenous peoples' societies and resource management systems hold great potential to contribute to understandings of social-ecological resilience. Similarities between the back-loop of adaptive change model consisting of exploitation, accumulation, release and re-initiation (Holling, 1986) and those encoded in traditional ecological knowledge have been recognized in the livelihood activities of cultures from around the world (Berkes and Folke, 2002). Cycles of birth-death-rebirth are found in many world religions and are encoded in annual cycles of livelihood activities (Alcorn and Toledo, 1998; Berkes et al. 2003). Others have explored

the means by which traditional societies cope with surprises (Colding et al. 2003). However, little effort has been expended to explore how indigenous people understand cycles of adaptive change. How do the views of peoples whose worldview is not based on the western dichotomy of nature and culture reflect against the propositions of resilience?

The boreal forest of northern Canada is an ecosystem in which periodic high intensity forest fire is a key driver of ecosystem disturbance and renewal. Fire maintains ecosystem structure and composition by creating a landscape mosaic of even-aged forest stands, influencing the distribution of fire dependent species, and maintaining nutrient recycling (Rowe and Scotter, 1973). It is an ecosystem with a high capacity to recover from historic disturbances of insect outbreaks and forest fires (Chapin et al. 2004a). While fires historically influenced the largest portion of the boreal forest, fire suppression coupled with forest management for industrial timber production are increasing the relative influence of forestry on the ecosystem dynamics (Kuuluvainen, 2002). Understanding the impacts that natural disturbances and those created by various forest harvesting techniques have on regeneration has become an area of great interest. Foresters enacting recent shifts in silvicultural strategies, seek to incorporate characteristics of natural disturbances such as size, arrangement, frequency, and biophysical legacies of affected areas into forestry practices in order to improve sustainability (e.g. Bergeron et al. 2001; Perrera et al. 2004).

The Canadian north is home to many indigenous peoples, many of whom continue to maintain strong links to the land through livelihood practices and cultural ties. The diverse resource practices and understandings of these peoples offer potential

sources of innovation for sustainable resource management practices that support and maintain social-ecological resilience (Chapin et al. 2004b). One such opportunity exists in the Anishinaabe [Ojibway] community of Pikangikum First Nation in northwestern Ontario. Since 1996, Pikangikum has been in the process of land management planning that will allow community led economic renewal projects within 1.3 million hectares of their traditional territory (Pikangikum First Nation and OMNR, 2006). While forestry is among the projects being contemplated, many participating elders look with disfavor on the impacts of clearcut forestry that they have witnessed to the south of them. Pikangikum residents' familiarity with the impacts of forest fire disturbance and current clearcut forestry practices places them in a unique position of being able to describe these two disturbance types from the Anishinaabe cultural perspectives.

In this paper we present Pikangikum elders' empirical knowledge and theoretical understandings of forest fire and clearcut forestry within their territory. It arises from collaborative research conducted between June 2005 and February 2008 and consists of the elders' observations and thoughts on forest disturbance and renewal processes in these two scenarios. While the empirical knowledge consists of personal or community experiences of "what" is happening, theoretical knowledge presents aspects of the Pikangikum Anishinaabe worldview and ontology describing "why" it is happening. Our goal is to provide insight into how disturbances and recovery cycles impact local livelihoods. These may indicate community values and insights to help guide forest co-management planning. In the quotation that begins this paper, elder Oliver Hill notices "harmony" in a recovering fire area but destruction in a clearcut area. Our task in this paper is to inquire as to the origins of this perceived "harmony" and whether it is

conceivable from the elders' perspectives that they be conserved within silvicultural practice. Additionally, the elders' knowledge of destruction and renewal arising as it does from their Anishinaabe worldview offers the opportunity to reflect upon resilience theory as a cultural construct arising from the western scientific worldview. How do Anishinaabe people who are not heirs to the western-scientific philosophical tradition conceive of cycles of disturbance and adaptive renewal?

This paper begins with a brief review of the role of forest fires in the boreal forest and the impacts of current forestry practices in northwestern Ontario. This is followed by an introduction to the community of Pikangikum First Nation and our research methodology. Our results present a theoretical framework for forest renewal processes which was co-produced with the elders (Davidson-Hunt and O'Flaherty, 2007). This provides a backdrop against which the elders' empirical observations of forest fire and clearcut logging and their impacts on social institutions can be more clearly appreciated. This is followed by a discussion of some of the parallels and contrasts between western scientific knowledge and Pikangikum understandings of fires and logging and the implications for forest management.

4.2.1. Ecological legacies of forest fire and logging in the Canadian boreal forest

Forest biota and community assemblages are adapted to specific types and rates of disturbance. In the Canadian boreal forest, which encompasses 315 million hectares from Newfoundland to Alaska, the most important disturbance influencing ecosystem composition, structure and function is periodic stand replacing fires (Weber and Stocks,

1998). Although not as species rich as ecosystems immediately to the south, complexity of the boreal forest lies in the mosaic of species and age classes brought about in large part by periodic stand-replacing fires (Rowe and Scotter, 1973). Fire regimes, including fire intensity, severity, frequency, and extent are influenced by local topography, water bodies, climate and vegetation (Johnson, 1992). Plant species do not persist in sites where fire frequency is more regular than the age of reproductive maturity; conversely, areas that experience prolonged fire suppression often suffer from reduced productivity, disease and insect damage and a shift from fire adapted species to shade tolerant late successional species (Li, 2000). Forest stands may vary from a closed canopy with abundant mosses in the understory to open forest-tundra patches with expanses of terrestrial lichen (*Cladina* spp). Many of the dominant species (e.g. jack pine [*Pinus banksiana* Lamb.], black spruce [*Picea mariana* Mill.], poplar [*Populus tremuloide*s Michx.]) are fire dependent, requiring fire to prepare a seed bed, open seed bearing cones, open forest canopies and stimulate sprouting from surviving underground roots (Whittle et al. 1997). Jack pine and black spruce stands in northwestern Ontario typically experience high intensity stand replacing fires on the order of every 50-150 years (Thompson, 2000). By 200 or more years without fire, balsam fir (*Abies balsamea* L. Mill.) may become the dominant species in stands where deep organic soils have accumulated (Thompson, 2000).

Forest fire makes available nutrients from the downed litter and woody debris that are otherwise slow to break down due to the many months of sub-zero temperatures. Intense burns consume organic soils exposing mineral soil that many seedlings need to germinate (MacLean et al. 1983). Fires create canopy gaps allowing shade-intolerant

seedlings a chance to germinate. Areas which lose tree cover due to fire experience a longer growing season because snow melts in open areas faster and allows soils to warm faster than those in shaded forest interiors where snow persists longer (Rowe and Scotter, 1973).

Animal species also respond to the vegetation mosaics created by boreal forest fires. Herbaceous forage rapidly increases in the years immediately after fires followed by a gradual decline in abundance over several decades (Wolf, 1979). Herbivores such as white-tailed deer (*Odocoileus virginianus*) and moose (*Alces alces*) increase with improved browse created in newly formed forest openings and decrease locally as succession proceeds (Hunter, 1990). The abundance of snowshoe hares (*Lepus americanus*) can increase as much as two orders of magnitude following forest fires, making them the most abundant herbivore biomass in the community (Keith et al. 1977). These fluctuations are in part driven by the availability of food linked to forest fires and concurrent predation pressures (Krebs et al. 1995). Many species within boreal forest food webs, including coyote, lynx, spruce grouse, ptarmigan, raven, great horned owl (Boutin et al. 1995) and a variety of duck species (Brooks et al. 2005), are significantly linked to cyclic fluctuations in hare abundance. Woodland caribou (*Rangifer tarandus caribou*), which depend on terrestrial and arboreal lichen found in late seral stage forests for winter food, rely on periodic fires to reinitiate forest succession (Klein, 1982). Fire may reduce the amount of habitat available for caribou for several decades, but also removes bryophytes which otherwise out compete lichens (Klein, 1982). Fires create important habitat features for many invertebrates (McCullough et al. 2004), birds (Stuart-Smith et al. 2002) and mammals (Fisher and Wilkinson, 2005).

4.2.2. Principles of emulation forestry

Forestry is a practice which has changed over time in response to social and economic pressures and expanding ecological knowledge. In the Canadian boreal forest, clearcutting, the removal of nearly all standing biomass from a site, is the method of choice for economic reasons (Kimmins, 2004). It has recently been suggested that forest harvest strategies based on the characteristics of disturbance can contribute to biodiversity conservation, the preservation of the forest evolutionary environment and ecosystem function (Hunter, 1993; Attiwell, 1994). This approach has been called emulation (Perera et al. 2004) or disturbance-based forestry (North and Keeton, 2008). This shift in understanding has resulted in policies that attempt to legislate the incorporation of natural disturbance features in forest harvest strategies (Crown Sustainable Forest Act, 1994). Some features of forest fires such as arrangement, frequency, heterogeneity and shape can be emulated; others are not so easily reproduced. Fire is a chemical process that converts living trees to charcoal, ash and dead boles which release their stored nutrients as they decompose, converts deep organic soils and other fuels to their gas and mineral constituents and exposes underlying mineral soils. Clearcutting is a mechanical process which removes nutrients stored in the harvested boles, produces large amounts of fine fuels in the form of limbs and tops, leaves organic soils largely intact and fails to provide the pulse of nutrients available following a fire (McRae et al. 2005). Organic soils are not a suitable germination substrate for many boreal species. Jack pines and black spruce require contact with mineral soil in order to successfully root (Thomas and Wein, 1983). Additionally, logistical and social constraints prevent emulation forestry from reproducing the fire events which have the

largest ecological and evolutionary impact, those which affect tens of thousands of hectares. As a result emulation forestry is constrained to create clustered small to mid-sized clearcuts over several years rather than the large disturbances which are the historic norm (Bergeron et al. 2001).

Foresters have a number of practices that they employ to ameliorate these shortcomings and to facilitate site regeneration. In order to prepare sites for replanting foresters often need to deal with large quantities of slash. In Ontario limbs and tops are consolidated in piles or windrows on the edges of roads or landings (David New, OMNR Red Lake Forest District Forester, pers. com. 2007). Organic soils are often bulldozed or plowed using a tractor drawn disk in order to expose mineral soil. Under the right climatic conditions this organic material can be burned in the fall to recover the area for planting. Fall burning has the advantage over other seasons because embers are unlikely to over winter and break out the following spring. Slash consolidation and disking have a negative impact on the seed bed occurring on a harvested site (Nguyen et al. 2001). Foresters replant prepared sites with selected species and genotypes in order to promote regeneration of species with a high value for future forest harvests. These are often arranged in row plantations to facilitated even spacing and future ease of harvest (David New OMNR Red Lake Forest District Forester, pers. comm. 2007). In order to limit competition for nutrients in the newly planted site foresters can apply herbicide spray, which selectively inhibits photosynthesis in deciduous trees such as poplar and birch. Future timber harvests are typically subject to fire suppression in order to protect future revenue.

4.3. Setting, Methodology and Procedures

Pikangikum First Nation is a remote reserve community in northwestern Ontario. The 18 km² community is accessible by snow road during the winter months, by boat during the months of open water or by small plane to the community airstrip. Indian and Northern Affairs Canada places the Pikangikum population at just over 2,000 (INAC, 2008) although community population estimates approach 2,400. Many residents speak their native Anishinaabe language as their first language (Ningawance, 1996). Many elders who grew up on the land gained a first hand knowledge of forest fires from a variety of sources, including: observations of the impacts of fire over time on family traplines, as seasonal fire fighters and by conducting traditional controlled burns (Miller et al. 2008). Although the collapse of the fur prices in the mid 1980s has reduced trapping activity on the land, the forest, lake and wetlands surrounding the community continues to be managed in the family trapline system established in the 1930s (Berkes et al. 2009). Many continue to pursue fishing, moose and waterfowl hunting, beaver and muskrat trapping, and plant collection as important contributions to their livelihoods.

This research is the product of longstanding collaborative relationship between Pikangikum First Nation and University of Manitoba researchers (Davidson-Hunt and O'Flaherty, 2007). It endeavors to support the elders' goal of creating a forestry program that reflects Pikangikum values and understanding of their local ecosystem. Since 1996, Pikangikum elders have engaged in a community initiated land management planning undertaken in cooperation with Ontario Ministry of Natural Resources (OMNR). This planning effort intends to maintain customary stewardship responsibilities and livelihood activities, and provides for the orderly development of the 1.3 million hectare

Whitefeather Forest Planning Area of the Pikangikum's traditional territory. Forestry is among the land uses being contemplated. Prior to the commencement of forestry planning, forest fires were suppressed only when they approached the community of Pikangikum or threatened private property (Randy Crampton, OMNR Red Lake Forest District Fire Manager pers. com., 2007).

We discussed our research proposal with the elders in a community meeting in Spring 2006. During this meeting they appointed willing experts from among their number to describe their experiences with fire and clearcutting. Among these were the late elder and head trapper Jake Kejick and his family. Their trapline overlaps the Whitefeather Forest Area southern boundary with the Trout Lake Forest, which has been subject to logging since the mid 1970s. Between August 2006 and Spring 2008 we made four trips for a total of 11 days during Summer, Winter and Spring with Mr. Kejcik, his sons and helpers onto the land. During this time we conducted collaborative surveys for woodland caribou calving areas with OMNR, hunted moose, set traps for marten, snared rabbits and trapped beaver. We visited clearcut and unlogged areas and a recent forest fire area that was being commercially harvested for fire wood by outsiders. We discussed changes to plant and animal communities and the land that they had observed since the commencement of logging and asked trappers to theorize about their causes.

Elders pass on their knowledge through a combination of storytelling and encouraging learning-by-doing by progressively expanding opportunities for young people to acquire new skills based on preferences and abilities (Davidson-Hunt and Berkes, 2003b). As a result our data collection consisted of recording traditional stories, accounts of elders' personal experiences on the land and participant observation. We

adopted an ethnoecological phenomenological framework, in which the elders' understandings of the environment emerged from local taxonomy, worldview and practices (Toledo, 2002). We conducted a total of 50 interviews with 30 elders between Spring 2007 through Winter 2008. We presented our understandings of aspects of the elders' worldview and their perceptions of fire forest and clearcutting processes periodically in small groups and in a total of four community meetings between Spring 2007 and Fall 2008. Their experience with this style of dialogue with outsiders gained through the forestry planning process made this an effective technique. While the format and forum for this article are within the western academic tradition, our results combine Anishinaabe concepts and aspects of worldview offered by Pikangikum elders synthesized into diagrams and text and later verified for content in small group and community group settings. Translation of the often monolingual Algonquian-speaking elders into English was provided by experienced Whitefeather Forest Management Corporation (WFMC) researchers. Quotes within this paper are transcriptions of these simultaneous translations. Recordings and transcripts of interviews were archived with the WFMC in Pikangikum.

4.4. Results

4.4.1. Theoretical framework for forest disturbance and renewal

According to the elders the Creator (***Keechee manidoo***) is responsible for the community of beings and forest in which the people of Pikangikum live. This community is composed of animals, plants, environmental features and processes that possess agency and maintain reciprocal relationships with other community members.

Renewal within this network of beings is facilitated through the Creator's Plan (***Keechee manidoo oohnuhcheekayween***), in which all beings are provided with the things that they need in order to live well.

Illustration of these principles is demonstrated by Pikangikum elders' understanding of lighting caused fires (***beenaysee eshkotay*** Thunderbird fire). These fires are considered to be alive (***auyuhshuhwuhtuhn***). Plants, animals, rocks, standing snags, water and other features of the environment are all considered by the elders as living things which possess agency - the ability to make choices (Giddens, 1979) (Appendix 2). Elders point out that fire possesses a number of characteristics that qualify it for this living status. Fire is constantly in motion. It transforms its environment and the fuels it is burning in somewhat predictable yet ultimately unique ways. Fire can behave willfully and at times resists all efforts to suppress or even predict its movements until it begins to move. Fire rests at night and is active during the day. At times it can move very fast, sometimes transporting itself a long ways off through airborne embers. Lastly fire can generate its own weather system consisting of in-drawn winds and large thunderhead type clouds that contain lightning (Tom Quill interview February 19, 2007). Although forest fires are potentially very dangerous and destructive they are also understood as being part of the Creator's plan.

> *The Creator has a match and that match is the Thunderbird. He brings that match to the land when the forest gets too old and can't grow anymore. So the Thunderbird comes to earth. After the forest is burnt new growth starts. Animals get tired of eating old food. Just like you and me. The Creator knows that animals need new food. The fire there brings fresh food to eat. As an example: rabbit* [sic - snowshoe hare] *favors new growth area. When you look at rabbit I think it is like a food chain for animals. Rabbits have three litters a summer. Fox, lynx, marten all depend on rabbit. The Creator has to care for all animals so he sends*

Thunderbird to earth to make food for rabbit. We like to eat rabbit too. So he burns for us too.

The late elder, Whitehead Moose, community meeting June 10, 2006

This quote reveals a number of important features of the network of relationships in which humans and animals exist. First, the Creator and the Thunderbird care for all beings on the land, among whom humans are only one. It demonstrates the elders' recognition of post-fire communities as highly productive systems. Early successional species such as rabbits are abundant, presenting opportunities for predators including humans to successfully hunt them. The statement that animals have preferences for certain kinds of food, get tired of others and that the Creator is not just burning for animals but also so that people can find what they need, all suggest that there is less moral distance between humans and animals then westerners imagine. Both humans and animals are cared for by the Creator.

Within the Creator's Plan, plants and animals are able to make choices about the way that they fulfill their own needs. Plants are perceived to grow where they find conditions to their liking. Animals move according to their desires which are ultimately unknowable to humans. Interference with the ability of animals to move across the land, find food, encounter mates and raise their families (O'Flaherty et al. 2008) is interference with the Creator's plan of allowing each being to meet their needs as they see fit.

Everything on the land, plants and animals has a mind. Maybe you call it instinct. Fish have that too. Many times we think that animals are just animals. That's not true. They know where to find things to eat. They think.

Oliver Hill, Community meeting July 20, 2006

> *The caribou were given life to live on the land by the Creator; the Creator's plan has been initiated. We cannot give the caribou what they want to eat. We cannot tell the caribou where to live. Only the Creator can do this. Even though we create boundaries on maps, we create all kinds of maps and boundaries, saying where the caribou are and where the caribou will eat, we don't know what the Creator's plan is.* Charlie Peters (O'Flaherty et al. 2008)

An example of animals' ability to think was told to us by elder Oliver Hill. Mr. Hill's father had once been hunting moose when he encountered a moose bedded down in thick brush. Although he was able to get quite close because of the covering sound of the wind in the trees he could not get a clear shot. Not willing to get too close to a potentially dangerous animal, Mr. Hill's father used trickery. "A moose can tell the difference between a limb broken by the wind and one broken by a man. My father tricked that moose by breaking a limb. It stood up and my father was able to shoot him," (interview September 12, 2006). The ability to distinguish between a branch broken by a man and one broken by the wind demonstrated for Mr. Hill that moose are able to think; knowing this and being able to fool a moose into exposing itself demonstrated Mr. Hill's father's skill as a hunter.

Pikangikum elders do not agree that "the ability to adopt forward-looking behavior is a definitive feature of human systems" nor that other beings are incapable of giving or receiving abstract complex communication (Westley et al. 2002). Beaver (***ahmik***) and muskrat (***waasheshk***) anticipate harsh weather by stockpiling more poplar limbs (***ahmik oomeechum***) outside of lodges and larger vegetation mats to serve as winter food. Ravens (*Corvus corax*, ***kaakaake***) and human hunters cooperatively hunt through communications between the raven and the hunter. A barrel-roll in mid-flight by a raven indicates that it is over a moose. Pikangikum hunter, John-Pierre Kejick said that

a raven doing this is, “taking off its meat pack. It helps you find a moose because it knows it will eat. ” We witnessed ravens perform this behavior twice during moose hunts; both times the barrel rolling raven was over a bedded or wounded moose (A. Miller unpublished field notes, February 20, 2007). A hunter leaves offal from the butchered moose to thank the raven for helping him find it. Elder Gideon Peters related a story told to him by his father of black bear (*Ursus americanus* ***makwa***) being able to start forest fire by lifting up rocks and slamming them down to produce sparks. “They do this because they know there will be berries there and it will get to eat. What do you think of that? ” [1] (Community meeting, March 6, 2007). Moose, birds and other animals all have their own ways of communicating with members of their own kind. With practice, humans are able to understand these communications in the same way Anishinaabe and ***Wahmedekooshe*** (white people) have to practice to understand each other's ways of speaking.

Ojibwa scholar Basil Johnston (1976) describes the Creator as making the world out of earth, water, wind and fire. These were endowed with “the breathe of life” and work through the "Great Law" for the good of all life. Although no Pikangikum elder framed their description of renewal as depending on these four elements, their role in cleansing, renewing and providing strength to living things became obvious through interviews and field investigations (Table 4.1). For example, we asked the late elder Whitehead Moose (interview September 21, 2006) to relate, “the teachings that he had about fire, and the processes that destroy forests and start them growing again”. Although although our request was intended to elicit descriptions of fire's role in renewal

[1] Humorously, other elders said they didn't think OMNR would believe Mr. Peter's story. They joked that OMNR believes in Smokey the Bear, a bear who wears pants and a hat and tells people to put out fire. While they are clear Smokey is a fictitious character, a bear who doesn't like forest fire is clearly ridiculous.

Table 4.1. The role of water, wind, the land and fire in forest renewal with supporting quotes by Pikangikum Elders.

Element	Theme	Elder's statements
Water	Sign of life	This place is healthy [*ohneesheesheen*]. The moss is wet. It shows it is alive. Oliver Hill, October 4, 2006. (See also Shearer et al. 2009)
	Produces new growth	The rain comes to give growth upon the earth. It produces new growth on the ground, all the new plants. Whitehead Moose, September 9, 2006.
	Cleanses animals	So coming back in the early spring, with the early spring rain, the crow washes its mouth. I believe the reason the crow does all this is to get rid of all the contaminants – the filth from its body down south. Whitehead Moose, September 9, 2006.
Wind	Purifies plants and people	The wind blows the dust off people and the trees and keeps them from getting sick. Whitehead Moose, September 9, 2006.
	Cleanses the water	If the water always stayed the same, if the wind never moved the water, it would become stale. The moving of the water it helps every living creature in the water. Whitehead Moose, September 9, 2006.
	Essential for life	If there was no wind there would be no life. Whitehead Moose, September 9, 2006.
Land	Source of life	Life comes into the roots from the land. Jake Kejick, August 28, 2006. The animals and everything that I have eaten from the land has molded me, it has shaped me. I believe every Aboriginal person has been molded in this way. Whitehead Moose (O'Flaherty et al. 2008)
Fire	Cleanses the land	When I went there a couple of years ago, it looks different. It felt fresh. It felt refreshing. Larry Pascal, January 29, 2008.
	Death and Rebirth	Fire can also destroy and the reason why it destroys is to make things alive. Solomon Turtle, May 17, 2007. I was amazed by what I have seen on the land. The way everything was reborn with fire. Oliver Hill, August 9, 2006.

processes, Mr. Moose responded by describing the role of water, wind as well as fire in forest renewal (Appendix 4.1).

There is no equivalent term for "resource management" in the language of Pikangikum. The concept denotes an understanding and degree of control that elders find inappropriate for the relationship between humans and other beings. Part of the Creator's Plan is the respectful use of resources as demonstrated by the performance of acts that show prey animals that the sacrifice of their life has been respectfully received (Figure 4.2). If these traditions are maintained then animals will return. According to Whitehead Moose (Community meeting October 10, 2006) use of animal resources creates balance (***cheemeenooseg***) from which ecosystem health and abundance arise. As an example, he cites his 25 year experience as a commercial fisherman on Moore Lake. During his first few years fishing he caught many large pickerel (*Sander vitreus*) whose flesh was not good to eat. Through prolonged use, younger individuals became more abundant. Failure to use resources often leads to their diminished abundance. The elders say if the Creator's gifts are taken for granted they will be withdrawn. Whitehead suspected that because there is no longer use of this lake there are fewer fish than when he was using it. This perception by Pikangikum residents of the lack of use leading to reduced abundance has been documented for woodland caribou (O'Flaherty et al. 2006), snowshoe hare and beaver. Berkes (1998) documented similar attitudes among the James Bay Cree and their management of beaver. Animals that do not actively participate in the reciprocal give and take between predators and prey are punished for their stinginess. Overholt et al.

(1982) relate an Ojibway story recorded in the 1930s in which a young moose chooses to scoff at the advice of his elders and fails to give himself to the human hunters. While his relatives give of themselves and are renewed the young moose flees in an attempt to escape his death. As a result he suffers terribly as a result of his stinginess.

Non-humans are capable of being stewards in the same way that humans are. Their decisions can result either in maintenance of resources or in their degradation. For example, as previously noted, snowshoe hares are an important food source to many predators including marten, fisher, lynx and fox. By taking snowshoe hares these

Table 4.2. Traditions which demonstrate respectful use and help maintain future abundance. (Source: Miller, Unpublished field notes).

Species	Respectful treatment contributing to renewal
Moose	The moose's beard (bell) is hung from a willow.
Beaver	Guts and bones are returned to the lake.
Woodland caribou	Leave the guts and bones somewhere open where scavenging birds can get to it. The lake ice is ***kwaykwayshay***'s (grey jay's) plate.
Grouse, duck, goose	A wing is hung from a willow.
Fish	Catch-and-release fishing is disrespectful. You take every fish you catch. Bones and guts are placed on shore or ice for gulls, eagles or other scavengers.

predators ensure that there are more in the future. Failure to do so leads to declines in hare abundance when the hares run out of food due to unchecked populations. Equally, predators can reduce prey populations by being immoderate in their use. Elders perceive

neither outcome as inevitable but instead are dependent on the decisions that individual predators make in relation to specific populations of snowshoe hares.

Interruption of the renewal process and species extinction are regarded with confusion and disbelief by many elders. Within community discussions of species covered under provincial wildlife legislation and the federal Species at Risk Act with OMNR, many see the threat of species extinction as a means of outsiders attempting to impose control on Pikangikum residents' ability to hunt and trap guaranteed by aboriginal treaty rights. Outside of this context elders express their disbelief in the concept of species extinction. "I don't believe in that [extinction]. There is no such word as that. I was taught by my grandparents about the cycle of life (***gahgeesheebashkahmeegaak*)** in which animals have babies, but never that." Elder Lucy Strang (Community meeting April 8, 2008). This view is complicated by three animals that today's elders say disappeared in their grandparent's time: a bird, the ***oo'oo***, and two mammals, the ***pahngwahshahshk***, a saber-toothed muskrat and the ***oohzuhweeseebeequayweeyahtik***, a small caribou that has a yellow tear pattern on its face. According to Hallowell and Brown (1992) the Berens River which runs through Pikangikum, was once named the Pigeon River where it flows into Lake Winnipeg for the extinct passenger pigeon (*Ectopistes migratorius*) which were once seasonally abundant. While this is the only species documented to have historically disappeared from northwestern Ontario, elders are unwilling (unable?) to confirm that this is the species that their grandparents called the ***oo'oo***.

4.4.2. Empirical knowledge of disturbance and renewal: fires and logging

The most obvious scale of renewal elders recognize is the annual cycle of the seasons. The Pikangikum calendar is composed of months named for observations in animal and plant cycles of growth, death and return (Figure 1). The eight seasons of the year are not astronomically fixed but begin and end with observable stages in the cycles of animal and plant development and ambient conditions. The Pikangikum word ***gahgeesheebashkahmeegaak***, literally "something that keeps going around", corresponds to the idea of cyclic changes and applies to the yearly cycle, the return of migrant birds, and changes in animal abundance (See also Davidson-Hunt and Berkes 2003b). For animals this cycle consists of two processes: ***angook*** "animals becoming scarce" and ***patenook***, "animals becoming abundant". Elders have described cycles for many animals including beaver, rabbit, pileated woodpecker, moose, marten and woodland caribou. These cycles occur at seasonal scales but may also be linked to changes in habitat over many years. Elder George B. Strang related that woodland caribou were following a cycle on his trapline that was initiated by the destruction of the forest there 60 years ago and are only now returning to this area in completion of their cycle (O'Flaherty, 2006).

Annual climatic extremes of the boreal forest shift resource availability and the needs which animals and people must satisfy. Both people and animals adjust their activities to take advantage of seasonal resource abundances. Resource abundance also corresponds to specific stages of ecological succession. In order to find a desired good, a

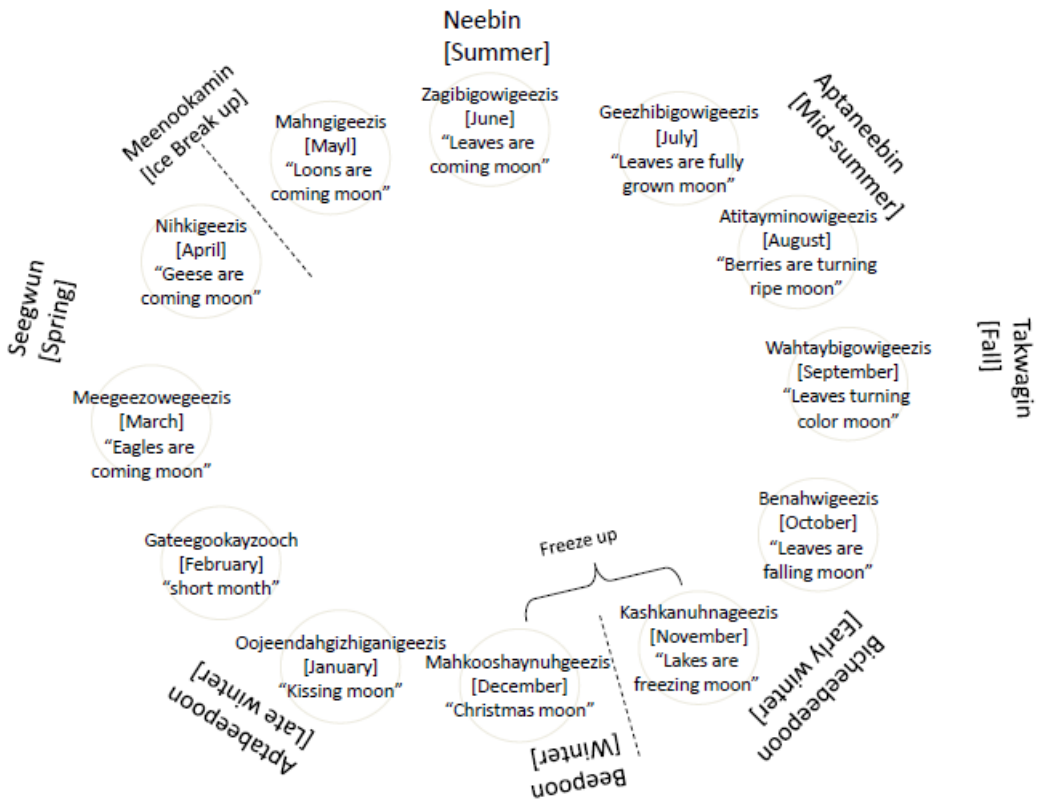

Figure 4.1. The Pikangikum annual cycle is composed of eight seasons whose lengths vary depending on the passage of different observable environmental phenomena.

resource user has to know the right season to the right location which may shift over time as succession proceeds (Berkes and Davidson-Hunt, 2006). Elders know the annual cycles of many plants and animals based on their own annual schedule of activities within their trapline areas. For example, moose browse in early successional poplar and willow from early until late winter seasons (***Bicheepeeboon*** through ***Aptabeeboon***). In the spring (***Seegwun***), moose are found in dense black spruce stands where they rub against trees and eat spruce needles to help them get rid of the ticks (*Dermacentor albipictus*) that plague them. Hunters can pursue moose at this time because, although ice crusts that

form at this time of year will support a hunter in snowshoes, it is not sufficient to support moose who cut their shins on the ice crusts and are unwilling to run far. Some moose lose a lot of hair at this time because of the ticks and are only finally cured when they are able to bathe in curative open water (Appendix 4.1). In summer (***Neebin***), moose can be found in bays and streams where they feed on aquatic plants. Knowing where these plants occur helps direct hunters to these locations when traveling. People are disinclined to go deep into the bush during summer time because of mosquitoes and other biting insects; they perceive moose as similar in this regard. In the fall (***Takwagin***), male moose are found along the shore lines of lakes where they bugle to attract mates.

4.4.3. Succession following forest fire

Forest fires and clearcutting have distinct impacts upon the resource availability and access that people and animals enjoy. The following sections describe the impacts of forest fire and clearcut logging on succession and the availability of resources for animals and people.

Many resource collection activities including hunting, trapping, firewood cutting and plant collecting for food and medicine are linked to particular successional stages (Miller and Davidson-Hunt, in press). As a result Pikangikum residents pay careful attention to the changes that proceed from forest fire disturbance (Figure 4.2.). Several elders expressed incredulity at the transformative changes wrought by fire in their traplines and the unfolding processes of renewal taking place immediately following forest fires (Appendix 4.2.). Elders believe that although the intensity of fire can impact

the speed of recovery over time forests will return to an expected condition, that it will return to the way it was before (***cheegeewayseg***).

Elders recognize ash (***pingway***), that remains on a site following a fire as an important feature of burned areas because of the fertility it offers to new plant growth (Appendix 4.3.). Downed woody debris protects the ash from wind and rain that otherwise carries it away. Within weeks new growth can begin to appear within burned areas. The first species to appear are poplar and willow. This new growth is understood to come from underground roots. Elders explain that the potential for all species to grow in a site is contained in the soil. They understand the concept of serotonous cones from jack pines and other conifers opening following a fire but this seed by itself is not the source of new trees. In order for a tree to grow the seed has to like the conditions. If soil conditions are acceptable they germinate. This allows the life force and strength that lie in the soil to enter the root and make a plant grow (Appendix 4.4). Poplar (***ahzahdeeg***) and willow (*Salix* spp. ***weegobeeg***) can grow over a meter in height from surviving underground roots in the same year as a fire. Jack pines also begin to germinate within the first year.

> *If you open up the earth you will see what the Creator made in the earth. The roots are there preserved. You will see many roots. Fat roots, long thin ones. The fire burns through and consumes all the roots that were in the deep soil and left the roots that were below and these are the plants that came up. The fire comes and opens the ground for the roots to grow. The soil contains all the plants that can grow in an area. The blueberries, the jack pines all the plants are there waiting for the conditions to be right to grow.* ***Tuhpusseepuhkoon*** *–the plants in the understory are there waiting.*
>
> Norman Quill Interview October 30, 2006

Some animals begin to reoccupy a burned site almost immediately. Moose and snowshoe hare will begin to return to a burned location even while there is still smoke rising in order to eat smoked leaves and charred wood whose flavor they like. Bears also enter burnt areas in order to turn over logs and rocks for the insects that may be underneath. Other animals become displaced by fire. Small animals like mice and voles are believed to be unable to outrun a fire and are thought to die in the heat and smoke. Caribou are unable to cross recently burned areas because of woody debris and cease using them as winter feeding areas because of the destruction of lichen. Others, such as the ***oteshkahnay manijoosh***, the "long antlered bug" (Family: Cerambycidae) increase rapidly in recent burn areas. Their presence is an indicator to elders that the fire is truly out; elders with fire fighting experience claim that OMNR learned of this relationship from them and now use it to prioritize fire mop-up areas. Forest entomologists recognize that males and females of many Cerambycidae are attracted to the volatile oils released by trees damaged by fire where they mate and oviposit into the phloem of dead or weakened trees (Allison et al. 2004). The larvae of ***oteshkahnay manijoosh***, known as ***noosah***, "the loud noise eater of wood" attract ***maymay***, pileated woodpeckers (*Dendrocopus pileatus*) and other woodpeckers. Woodpeckers become abundant in the newly burned areas because of the high density of insect larvae food and standing dead wood that provide suitable nesting locations.

Hunters and trappers are constantly monitoring animal movements within their traplines. Fires disrupt the locations where animals den, forage and shelter and result in human hunters having to change the areas where they seek them. A lot of trapping activity is concentrated during the winter and spring months when the coats of fur bearing

animals are thick enough to sell. Hunters note that fire areas have little to offer animals as demonstrated by the lack of tracks in the snow in these areas. Hares begin to increase in areas where they find jack pine seedlings for winter food as well as shelter from severe cold and wind. These areas are frequently islands of unburned habitat surrounded by large burns. Elders note that snowshoe hares begin to increase in one locale and after several years spill outwards from this core area. Many animals use these habitat islands as refuges in the years following a fire (Appendix 4.3) and these become good areas for hunters seeking hares, furbearers and moose. As noted in the quotation by Whitehead Moose, snowshoe hares are important to a wide variety of species. As fur bearers begin to travel in search of hares wise trappers monitor hare populations around islands in recent burns; these not only will supply them with winter meat but they are also areas where fur bearers come for their primary winter prey. Hares may remain present where the jack pine understory remains dense (***etapashgaantagag***). Once this begins to die back through a combination of self pruning, winter browsing of low limbs by hares and succession, hares no longer find an area suitable.

Hill tops in burn areas can offer good vantage points from which to spot moose during the fall and spring when deciduous trees have lost their leaves and browsing moose are visible from a distance. One hunter reported 11 moose being taken in a single fall by him and his helpers on his recently burned trapline (L. Pascal interview January 29, 2008). As new trees grow taller, this strategy becomes less effective as the views become blocked by regenerating trees.

Plants grow where they find conditions to their liking. Where soils are sandy and well drained (***mitawunk***) jack pine will regenerate. Blueberries (***meenan***) grow in rocky

areas. Poplar and other deciduous trees grow in clayey soils (***wahbeegoon***) and nearer to water. Black spruce regenerates where dark poorly drained soils (***mahkahteywahkamik***). Regeneration can be very dense (***sagakwa***) in new forests (***oshkapokeetaywon***). Feather moss (***ahsahkahmik***) begins to cover the ground in dense forests, increasing the moisture retained in the understory. This moisture tells elders that the land is healthy and alive. Where moss grows, black soil begins to increase in depth. As stand moisture and soil characteristics begin to change over time the plants that find it to their liking may also shift. As conditions gradually begin to change, new plants begin to find it suitable, while others no longer finding it to their liking begin to die. Balsam fir may begin to grow in areas where black soil becomes very deep and mature poplar stop growing, increasingly get infected with fungi (***wahzheshkwaytoo***) and die out. Elders recognize that the danger of catastrophic fire increases as forests age because organic soils accumulate that are prone to drying out in the summer and acting as a fuel bed for any lightning strike (***puhkeenun***) in the area.

Resources available in forest stands change over time as succession proceeds. Many elders regard old forests as not useful for producing good food for people or for animals. Moose and beaver who eat early successional poplar may not find small diameter trees within reach in old forests. Marten and fisher den and raise young in tree cavities found in old stands. Often they are adjacent to recent forest disturbances which allow marten to find snowshoe hares and other small animals in the early successional vegetation. Male moose with large antler racks are unable to walk through stands with dense mature trees. Downed logs that are too high (***shepaqweshiinoog***) and wind felled trees (***bagkwansh***) prevent caribou and moose from traveling through an area.

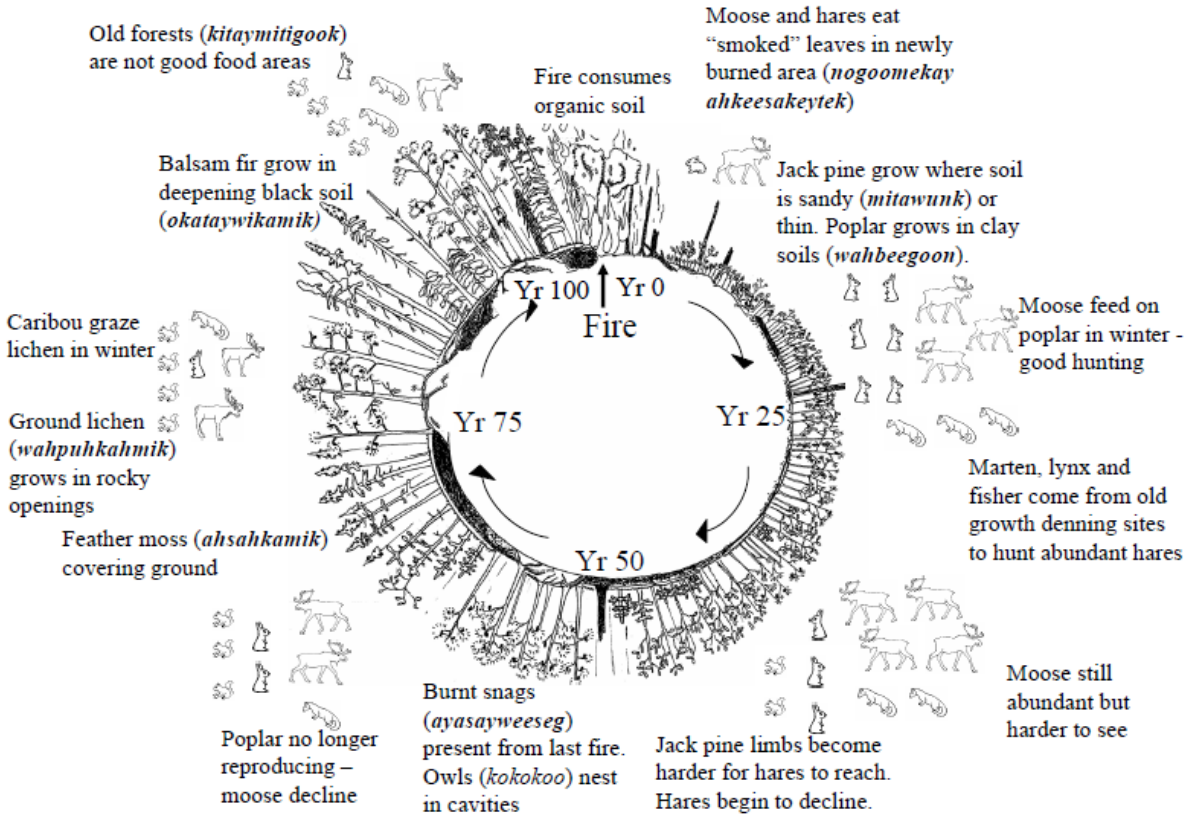

Figure 4.2. Stages of recovery, relative abundance of wildlife species and resource use opportunities noted by Pikangikum elders in the recovery of a hypothetical site from fire over 100 years.

4.4.4. Succession following clearcut forestry

Clearcut logging (***pashkogaheegaywin***), "cutting everything off the land", has been practiced in the Trout Lake Forest District immediately south of the Whitefeather Forest Area since the mid 1970s. This area overlaps with only a single trapline from Pikangikum. Prior to our first field visit, the late head trapper of this area, elder Jake Kejick, described in a community meeting the impacts of clearcut logging as arising out of three practices.

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> *There are four things they do.* [First] *they destroy the ground up to 3 feet underground. They scrape the earth-there's nothing there after the cut. It lies dormant for about 10 years. After ten years you start to see life. When you see a fire, it is about a month and you see it come back. The land comes back to life. When you walk through a clear cut area you need special shoes because all the sticks and roots are broken and they would go through your shoes. Second, the trees they plant are all in rows. This does not make a place that animals want to live in. Thirdly, they spray the land. This makes the poplar trees yellow and dried out. There are blueberries in those areas, but I don't enjoy eating them. They don't taste the same.* [Fourth] *the machines they use leave a lot of oil and contamination.*
>
> Elder Jake Kejick community meeting July 10, 2006.

These themes were accepted and supported by other elders at the meeting through their own observations of this region. These practices of soil disturbance, establishment of plantation forests and contamination give rise to many of the social and ecological impacts which Pikangikum people experience.

The tearing that elders refer to arises from the trenching and disking that are part of mechanical site preparation. Disturbing rocks and soil demonstrates a failure to show respect (***cheepuhpeenootuhmun***) and carries the potential for repercussions (Appendix 4.2). Other objections to soil disturbance come from elders who recognize that mixing of layers of black soil, sand, gravel and clay within the soil is destruction of intentionally created order. While elders are unable to say exactly what each of these layers contributes to the growth of specific plants, their presence is perceived as purposeful, therefore destroying this organization within the soil is bad. As mentioned by Mr. Kejick, trenching and disking create areas that are difficult for people to move around. This is also true for animals. As one hunter pointed out, a beaver couldn't be expected to cross ground that had been churned up by disking in order to harvest poplar. Elder George Strang notes only a bear will go there. "They eat anything." Because of their

associations with garbage at the town dump bears have a reputation of being an unclean animal.

There is no ash in clearcuts to contribute to soil fertility and regrowth. Soil disturbance increases erosion because the soil is unprotected by woody debris. As hunter Eli Kejick (interview August 22, 2006) notes:

> *Ash fertilizes and so it comes back faster. Logging doesn't fertilize… Because there is no fertilizer and the land is turned over it tends to just dry out and blow away rather than re-grow.* [Clearcuts] *cause washouts.*

The dry surface of the ground is perceived as a sign of the ill health of clearcuts, and was described by different hunters as ***manahdin***, "not healthy" or ***gahbeeday***, "baked or burnt". Further evidence for the unhealthiness of clearcut areas comes from the observation that unless they are replanted years may pass and still regeneration is sparse relative to a burned area. Elders humorously compare slash piles to giant beaver lodges. Slash piles that have been burned are slow to regenerate; many years later they are still only growing fireweed (***zheengobeeseewaskoon***).

Elders recognize plantation forests with trees planted in rows as failing to reproduce the forests that they replace in several features. First, elders point out that opening a hole in the soil with a shovel compacts the earth on either side of the blade that leads to poor root development and weaker trees. A tree does not naturally come from above, but rather arises from within the soil. This is a critical difference that they say affects the health of the tree. Elders point out infections by stem boring insects and yellowed needles in many jack pines that have been planted in former clearcuts. Plantation conifers often have bent stems because they are unsupported by other dense

seedlings like naturally regenerating forests. Without this support young conifers bend under the weight of winter snow and grow crooked. Jack pines in plantations are exposed to summer heat and their cones begin to open. This causes multiple stems to grow in small islands. This "doubling" (and even "triple") eventually must be thinned and piled by foresters.

> *If they don't do that, many trees will die when the wind blows them and they rub together and break limbs. They will have to do it again because those trees will keep putting out seeds*.
>
> John-Pierre Kejick, February 20, 2007
> Miller unpublished field notes

This is considered a waste and a poor use of trees. Uniform rows of jack pines do not allow for the growth of understory vegetation that snowshoe hares use for find shelter and are difficult to travel through for both humans and moose. Thus, plantations are less useful for hunting, trapping and traveling than naturally regenerating forests.

Elders identify two sources of contamination that retard the regrowth of clearcut areas: spilled diesel and oils from harvesting equipment and the intentional spraying of herbicides. Elders and others observe that brush in clearcuts, roadsides and power pole corridors is treated with herbicides applied by foresters. As a result poplars, birches and blueberry bushes are yellow, unhealthy or dead in these areas. The elder Jake Kejick said he did not feel good eating the berries from these areas. Others state that they do not feel good about eating moose and other animals from clearcut areas that have been sprayed. Because moose can travel far from clear cuts some hunters are unsure that animals taken anywhere near clearcuts might not be contaminated. "We don't know where these animals go." While no harmful effects have been documented either from diesel or

herbicide treatments, this perception underscores the aesthetic impacts of logging on bush food. According to elders these contaminants make plants and animals sick. They report that snowshoe hares in clearcuts can have white cysts in their livers and body cavities that are not seen elsewhere in Pikangikum. In February 2007 a parasitologist at the University of Manitoba identified the cysts as the larval stage of a tapeworm, *Taenia picsiformis* (L. C. Graham University of Manitoba Associate Professor pers. com. 2007). This tape worm has a two-phase life cycle. The larval stage of this tapeworm attaches itself to the liver and body cavity of hares. The adult form is found in canids such as wolves, coyotes and domestic dogs who consume the larvae. The cycle is completed when hares eat vegetation contaminated with eggs spread in canid feces. While these parasites do not infect humans their presence makes the meat of infected hares undesireable.

In the same way that many Pikangikum residents mistrust the food that comes from clearcut areas, they feel that animals feel the same way. According to others woodland caribou won't enter clearcuts unless they are being chased by wolves. Many observe that many animals, including hares, squirrels, mice and small birds all seem to avoid clearcut areas. As elder George B. Strang says, "You can't expect them to be there. Their homes were destroyed. You wouldn't live in a place where your home was destroyed. They are frightened" (interview Feb 7, 2008).

Hunters from the Nungesser trapline express their feelings of unease at trying to use forests following timber harvests because of perceived changes in the ownership of trees that are replanted by humans. Jake Kejick commented that he was not sure who the trees belong to now. His impression was that the original forest was made by the Creator

and was therefore intended for the people of Pikangikum to use. In contrast the post-harvest plantation forest had been created by men who now have ownership of the trees. "I have to look over my shoulder now. They might be mad at what I do here," (Miller, unpublished field notes August 29, 2006). This perception of transfer of control from the Creator to humans is echoed in a quote by elder Oliver Hill:

> *The reason why I bring contrast between these two areas, the Thunderbird fire area and also the clear cutting area: the clearcutting area is man made. Man is working the land and is trying to recreate the land into its original state. They can never do that. They have already dishonored the land. They can't really bring it back together to its original state. When you look over there where the fire was, that was created by the Thunderbird, it was the Creator that was in charge, the one to bring it back to its original state. Everything is growing the way that it was. Man has not gone over there to try and make the land go back to its original state. This is why I am speaking on these two areas. Man will never get the original plants – bring back the land to its original state the way that the Creator is working.*
>
> Oliver Hill, interview August 24, 2006

Other elders are more conservative in their assessment of whether the land where cutting, disking and replanting have occurred can return to health. Many wish to wait and see before making statements about the quality of forest following clearcutting. This attitude of talking only about things that they have actually experienced is typical for elders who place high value direct experience as the source of authority (Davidson-Hunt and Berkes 2003b; O'Flaherty et al. 2008).

An additional difference between clearcut areas and forest fire is the ease of access by outsiders on forest roads. Several trappers expressed their dismay that increased traffic of hunters and recreational fishermen within their trapline was scaring away animals or taking away game that otherwise would go to them. The increase in

outside users increases game and fish officers who are policing outside users. The renewal of life as it presents itself for use by the people of Pikangikum is perceived to suffer in clearcuts. While Pikangikum residents have treaty rights to hunt and fish within their territory they feel harassed by fish and game officers who they perceive as watching them.

> *That guy came up and was asking* [a young hunter] *what he was doing here. He took my gun from him to smell it to see if it had been fired. He shouldn't be doing that. We are on our land. This is his family trapline.*
>
> Paddy Peters, August 28, 2006

Areas where clearcutting occurs are perceived as places where the Creator's Plan for how the people of Pikangikum should live ("the Anishinaabe way of life", ***Anishinaabe amahtahzeewin***) is subverted by the rules of management imposed by others.

4.5. Discussion

It is not our claim that the Anishinaabe way of knowing forest cycles is more accurate or superior to the western scientific manner. Rather, we assert that the elders of Pikangikum have knowledge of ecological processes that are the unique products of their culture and history, are distinct from those held by western scientists and have relevance to resource management planning within their territory. All peoples have their own systems of science (Feyerabend, 1987) that construct internally consistent models of the world that systematically draw deductive conclusions based on previous experience and contingent upon ongoing observation (Scott, 1996). A society may become ungrounded when their way of understanding the world loses its ability to meaningfully describe the

events that they see taking place around them (Westley et al. 2002). Ethno-historian, C. Martin (1982) describes the combination of the arrival of new diseases and unrestricted market hunting contributed to the over-hunting of game and furbearers and the collapse of Algonquian societies in 18th and 19th century eastern Canada. The perceived failure of animals to restrain diseases, over which they were understood to control, plus new economic incentives, contributed to the breakdown of reciprocal relationships between hunter and hunted and resulted in the willful destruction of animal populations by Abenaki, Mi'kmaq, Cree and Ojibwa hunters.

While specific observations Pikangikum elders offer are contingent upon their individual experiences, their knowledge of patterns of plant and soil associations, trophic reorganization, and annual movements and habits of animals incorporate multiple spatial and temporal scales. The empirical basis for their understandings of forest disturbance has been appreciated by OMNR personnel involved in the forest co-management planning effort. "There is no question; they know how this process [forest fire disturbance] works" (David New OMNR forester Red Lake District, community meeting March 17, 2007). Foresters have been impressed by the accuracy of associations and sequence of vegetation following fire disturbance (Figure 4.2). Observations of the relationships between organisms of different trophic levels and successional contexts are particularly impressive. For instance, the relationship between the tapeworm *T. pisiformis* found in snowshoe hares and coyotes was investigated by Freeman et al. (1961). Of its canid hosts, coyotes were the almost exclusive host to *T. pisiformis* in northwestern Ontario. The authors conclude this indicates that hares and rabbits comprise a greater proportion of coyote diet than either cervids or small mammals which

host different tapeworm species. Coyotes are relative new comers to northern Ontario and may still be expanding their range northward since their arrival in the 19th century (I. Thompson pers. com 2009). While the elders misidentify the presence of cysts as being associated with spraying of herbicides and other contaminants in new tree plantations they may have correctly identified the association of *T. pisiformis* with a specific type of disturbance, clearcutting.

Elders' understandings of renewal processes cross both temporal and spatial scales. Elders' knowledge of where to successfully find desired game species encompasses seasonal animal movements across habitats in different successional stages found across the landscape. Some areas, such as islands of unburned forest within a larger burn recover useful species faster and thus become foci of hunting activities in the years immediately following a fire. While elders have the expectation that forests will eventually return as they were, complete with all tree and animal species present prior to a disturbance, this is acknowledge as a long process.

Many of the elders' observations reflect understandings of forest dynamics shared by adaptive-renewal cycle in resilience theory (Holling and Gunderson, 2002). For example, they recognize that increasing depth of organic soils in aging forest stands leads to an increased risk of catastrophic forest fire. This corresponds to adaptive change theory's observation that increasing biological capital leads to increasingly brittle linkages that eventually result in a system release (Holling and Gunderson, 2002). Elders recognize that the severity of disturbance affects the period of time to recovery. Undisturbed mineral soil, islands of unburned forest, and presence of conifer cones within a disturbance contribute to the biological memory and “put the breaks on the

release phase" (Berkes and Folke, 2002) and contribute biological memory in the form of seed sources and surviving underground roots. Elders also note the disruption of the relationships between soil, plants and animals introduced by the process of clearcut logging, disking and replanting is sufficient to shift forest recovery to a new stability domain which many doubt will ever recover to its original state.

The elders' perspective of why the cycle of disturbance and renewal functions stands in contrast to that proposed by western scientists. In their view it occurs because of the agency and reciprocal relationships between the many beings (e.g. plants, animals, rocks, rivers, forest fires, etc.) that compose the boreal forest environment. Pikangikum elders indicate that other beings make choices in part based on how they are treated but ultimately their objectives are unknowable. All forest community members pursue the gifts of the Creator and lead their lives in the manner they see fit. Interfering with these processes and flows of energy, carry moral and physical consequences. Respect and restraint are central to how one approaches them because it is impossible to know what may result in the withholding of gifts. The Creator is not against logging per se. The Creator's plan provides for all beings, including the people of Pikangikum, to live well where they were placed on the Earth. So long as other beings are able to pursue their own needs and the interactions between wind, water, the land and fire remain unimpeded, renewal will continue within the boreal forest. The appropriate role of resource harvesters is to take what is needed but to not attempt to constrain how other beings make their living on the land. This is beyond the appropriate bounds of responsibility for humans.

While the need to account for sentient animals, plants and other beings within management decision making may be difficult for managers to justify using western science-based decision-making, how different is this metaphor from what is suggested by resilience theory? Resilience theory suggests that maintaining the capacity for self-organization, the freedom to move across landscape, meet potential mates, built in inefficiency and incomplete resource utilization so that system can withstand shocks, reorganize, respond to disturbances. Biogeochemical processes cannot be exposed to changes outside the norms of the system without threat to system integrity. It has been shown that Inuit peoples of northern Canada have distinct ways of relating to the passage of time that renders standard methodologies of discussion climate change via imagined scenarios of possible outcomes an inappropriate activity (Natcher et al. 2007). We suggest that research into the possible outcomes of renewal cycles with peoples who hold culturally distinct views of how these cycles of disturbance and renewal function may encounter similar obstacles based on culturally specific epistemologies. In co-management arrangements mutual understanding of potentially different understandings of how and why renewal occurs would be beneficial to both potential management parties.

4.6. Conclusions

Within their statements about renewal following fire and the capacity for clearcut areas to recover are a number of statements which can express ways in which forestry as directed by the elders may take a different approach than that currently being practiced elsewhere. First, they wish for the Anishinaabe way of life (***Anishinaabe***

amahtahzeewin) to continue uninterrupted. This will require that they maintain good relationships with the Creator and the other beings who live on the land. Elders have expressed their interest in using controlled burning in clearcut areas to remove slash, prepare seedbeds and open seed cones. Elders would like to leave slash distributed within clearcuts rather than bulldozed into windrows and conduct controlled burns in the spring (Miller et al. in review [Ch. 5]). One elder described this as "bringing back the forest using the Creator's process" of burning (Solomon Turtle, community meeting June 25, 2007). This method will need to be negotiated and tested before it is acceptable to either OMNR or elders within the community and is made available for widespread use. Access by outsiders and hunting on their traditional territories will need to remain restricted. Roads will need to be controlled in order to restrict access to remote areas in the years following clearcutting.

Forest management between Pikangikum First Nation and OMNR is now at a critical stage. Although the principles and objectives created by the elders in the land use plan (Pikangikum First Nation and OMNR, 2006) have been accepted by community and provincial resource management leadership, operationalizing Anishinaabe values and knowledge challenge established patterns of forest management. There is essential agreement between Pikangikum elders and OMNR of each others' empirical observations related to forest disturbance. Challenges arise from the fact that the community of Pikangikum and OMNR do not share worldviews that provide the basis for action. OMNR does not acknowledge the primacy of maintaining good relationships with other beings as Pikangikum elders insist. Conversely, Pikangikum elders do not recognize the community of beings in which they live as something that can be managed by OMNR.

Knowledge that is acquired through personal contact and experience with the land and from respected authorities is valued in Anishinaabe culture (Davidson-Hunt and Berkes, 2003a). It may be argued that as livelihoods change the knowledge that is produced will also change. Pikangikum First Nation recognizes in the Land Use Plan that its "strength lies in our Ojibway way of life retaining our way of doing things" while exploring new economic opportunities (Pikangikum First Nation and OMNR, 2006). Technical and economic challenges to Pikangikum elders' vision of renewal within a new forestry context have yet to be fully explored. Humans can attempt to work with processes that occur within the Creator's plan. The way forward will consist of actively making space for Anishinaabe epistemologies in this process along side western scientific management way of generating and validating knowledge to be used for management decision making. This will require great political will on the part of provincial and federal managers.

4.7. References

Alcorn, J. B. and V. M. Toldeo. 1998. Resilient resource management in Mexico's forest ecosystems: the contribution of property rights. In: F. Berkes and C. Folke eds. Linking social and ecological systems: management practices and social mechanisms for building resilience. Cambridge University Press. 216-249.

Allison, J. D., J. H. Borden, S. J. Seybold. 2004. A review of the chemical ecology of the Cerambycidae (Coleoptera). Chemoecology 14:123–150

Attiwell, P. M. 1994. The disturbance of forest ecosystems: the ecological basis for conservative management. Forest Ecology and Management 63:247-300.

Bergeron, Y., A. Leduc, B. D. Harvey, and S. Gauthier. 2001.Natural fire regime: a guide for sustainable management of the Canadian boreal forest. Silva Fennica 36(1): 81-95.

Berkes, F. 1998. Indigenous knowledge and resource management systems in the Canadian north. In: F. Berkes and C. Folke eds. Linking social and ecological systems: management practices and social mechanisms for building resilience. Cambridge University Press. p. 98-128.

Berkes F. and C. Folke eds. 1998. Linking social and ecological systems: management practices and social mechanisms for building resilience. Cambridge University Press.

Berkes, F. and I. Davidson-Hunt, 2006. Biodiversity, Traditional Management Systems and Cultural Landscapes: Examples from the Boreal Forest of Canada. International Social Science Journal 187: 35-47.

Berkes F. , I. Davidson-Hunt, N. Deutsch, C. Burlando, A. Miller, C. Peters, P. Peters, R. Preston, J. Robson, M. Strang, A. Tanner, L. Trapper, R. Trosper, and J. Turner. 2009. Institutions for Algonquian Land Use: Change, Continuity, and Implications for Forest Management In: M.G. Stevenson and D. Natcher, eds. Changing the Culture of Forestry in Canada: Engaging Canada's Aboriginal Peoples in Sustainable Forest Management. Canadian Circumpolar Institute Press, Edmonton. 19-34.

Berkes, F., J. Colding, and C. Folke. 2003. Introduction. In: F. Berkes, J. Colding and C. Folke eds. Navigating social – ecological systems: building resilience for complexity and change. Cambridge University Press. Cambridge. p. 1-29.

Berkes, F. and C. Folke. 2002. Back to the future: ecosystem dynamics and local knowledge. In: L. H. Gunderson and C. S. Holling (eds). Panarchy: understanding transformations in human and natural systems. Island Press. Washington, D. C. 121-147.

Boutin, S., C. J. Krebs, R. Boonstra, M. R. T. Dale, S. J. Hannon, K. Martin, A. R. E. Sinclair, J. N. M. Smith, R. Tirkington, M. Blower, A. Byrom, F. I. Doyle, C. Doyle, D. Hik, L. Hofer, A. Hubbs, T. Karels, D. L. Murray, V. Nams, M. O'Donoghue, C. Rohner, and S. Schweiger. 1995. Population change in the vertebrate community during a snowshoe hare cycle in Canada's boreal forest. Oikos 74: 69-80.

Brook, R. W., D. C. Duncan, J. E. Hines, S. Carrière, and R. G. Clark. 2005.Effects of small mammal cycles on productivity of boreal ducks. Wildlife Biology 11(1):3-11.

Chapin, F. S. III, T. V. Callaghan, Y. Bergeron, M. Fukuda, J. F. Johnstone, G. Juday, and S. A. Zimov 2004a. Global Change and the Boreal Forest: Thresholds, Shifting States or Gradual Change? Ambio 33(6): 361-365.

Chapin, F.S. III, G. Peterson, F. Berkes, T. V. Callaghan, P. Angelstam, M. Apps, C. Beier, Y. Bereron, A. S. Crépin, K. Danell, T. Elmqvuist, C. Folke, B. Forbes, N. Fresco, G. Juday, J. Niemelä, A. Shvidenko, and G. Whiteman. 2004b. Resilience and vulnerability of northern regions to social and environmental change. Ambio 33(6): 344-349.

Colding, J. T. Elmqvist and P. Olson 2003. Living with disturbance: building resilience in social ecological systems. In: F. Berkes, J. Colding and C. Folke (eds). Navigating social-ecological systems: building resilience for complexity and change. Cambridge University Press. Cambridge ,UK. 163-186.

Crown Sustainable Forestry Act 1994.

Davidson-Hunt, I. J. 2003. Indigenous lands management, cultural landscapes and Anishinaabe People of Shoal Lake, Northwestern Ontario, Canada. Environments 31(1): 21-41.

Davidson-Hunt, I. J. and F. Berkes. 2003a. Nature and society through the lens of resilience: toward a human-in-ecosystem perspective. In: F. Berkes, J. Colding, and C. Folke eds. Navigating Social-Ecological systems: building resilience for complexity and change. Cambridge University Press. Cambridge, UK. p. 53-82.

Davidson-Hunt, I. and F. Berkes. 2003b. Learning as you journey: Anishnaabe perception of social-ecological environments and adaptive learning. Conservation Ecology 8(1):5. [online] URL: http://www.consecol.org/vol8/iss1/art5

Davidson-Hunt, I. J. and O'Flaherty, R. M. 2007. Researchers, Indigenous Peoples, and Place-Based Learning Communities. Society & Natural Resources 20:4,291 — 305.

Feyerabend, P. 1987. Farwell to reason. Verso, London.

Fisher, J. T. and L. Wilkinson. 2005. The response of mammals to forest fire and timber harvest in the North American boreal forest. Mammal Review 35(1): 51-81.

Freeman, R. S., A. Adorjan and D. H. Pimlott 1961. Cestodes of wolves, coyotes and coyote-dog hybrids in Ontario. Canadian Journal of Zoology. 39: 527-532.

Giddens, A. 1979. Central problems in Social Theory: Action, Structure and Contradiction in Social Analysis. London: Macmillan.

Hallowell, I. A. and J. S. H. Brown. 1992. Ojibwa of Berens River, Manitoba: ethnography into history.

Holling, C. S., L. Gunderson, and D. Ludwig. 2002. In a quest a theory of adaptive change. In: L. H. Gunderson and C. S. Holling eds. Panarchy: understanding transformations in human and natural systems. Island Press: Washington. 3-24.

Hunter, M. L. Jr. 1990. Wildlife, forestry, and forestry: principals of managing forests for biological diversity. New Jersey: Prentice Hall Career and Technology.

_____. 1993. Natural fire regimes as spatial models for managing boreal forest. Biological Conservations 65: 115-120.

INAC 2008. Pikangikum - First Nations profile. [online] http://pse5-esd5.ainc-inac.gc.ca/FNP/Main/Search/FNRegPopulation.aspx?BAND_NUMBER=208&lang=eng Accessed: March 5, 2009.

Ingold, T. 2000. The perception of the environment: essays in livelihood, dwelling and skill. Routledge. London. 40-60.

Johnston, B. 1976. Ojibway heritage. University of Nebraska Press. Lincoln NB. Pp. 12-13.

Johnson, E. A. 1992. Fire and Vegetation Dynamics: Studies from the North American Boreal Forest. Cambridge University Press.

Kimmins, 2004. Emulating natural forest disturbance: what does this mean? In: Perrera, A. H., Buse, L. J. and Weber, M. G. eds. Emulating Natural Forest Landscape Disturbances. New York: Columbia University Press.

Klein, D.R. 1982. Fire, lichens, and caribou. Journal of Range Management 35: 390-395.

Krebs 2001 et al. What drives the 10-year cycle of snowshoe hares? Bioscience 51(1): 25-35.

Kuuluvainen, T. 2002. Disturbance dynamics in boreal forests: defining the ecological basis of restoration and management of biodiversity. Silva Fennica 36(1): 5-11.

Levin, S. Fragile dominion: complexity and the commons. Perseus Publishing. Cambridge, MA.

Li, C. 2000. Fire regimes and their simulation with reference to Ontario. In: Ecology of a managed landscape: patterns and processes of forested landscapes in Ontario. 115-140.

Martin, C. 1982. Keepers of the Game: Indian-Animal Relationships and the Fur Trade. University of California Press.

McRae, D. J., L. C. Duchesne, B. Freedman, T. J. Lynham and S. Woodley 2001. Comparisons between wildfire and forest harvesting and their implications in forest management. Environmental Review 9: 223-260.

McCullough, D. G., R. A. Werner, and D. Neumann. 1998. Fire and insects in northern and boreal forest ecosystems of North America. Annual Review of Entomology 43: 107-127.

Miller, A. M. and I. Davidson-Hunt. *In press.* Agency and Scale in the creation of aboriginal cultural landscapes. Human Ecology XX

Miller, A. M., Iain J. Davidson-Hunt, Paddy Peters and the Elders of Pikangikum *In review*. Talking about fire: Pikangikum First Nation Elders guiding fire management dialogue. Canadian Journal of Forest Research XX

Miller, A. M., I. J. Davidson-Hunt and R. M. O'flaherty 2008. Pikangikum First Nation and forest fire management: old and new knowledge of fire. Sustainable Forest Management Network Research Note Series RN 37.

Natcher, D. C., O. Huntington, H. Huntington, F. S. Chapin III, S. F. Trainor, and L. DeWilde. 2007. Notions of Time and Sentience: Methodological Considerations for Arctic Climate Change Research. Arctic Anthropology 44(2): 113–126.

Nguyen-Xuan, T., Y. Bergeron, D. Simard, J. W. Fyles, and D. Paré2001. The importance of forest floor disturbance in the early regeneration patterns of the boreal forest of western and central Quebec: a wildfire versus logging comparison Canadian Journal of Forest Research 30: 1353-1364.

Ningewance, Patricia M. (Waabibizhikiikwe). 1993. Dreaming in a Strange Language: A Report on the Native Language Development Project, Sioux Lookout District, 1992-93. Unpublished report. Sioux Lookout District First Nations and The Slate Falls District Area School Board, Sioux Lookout, Ontario.

North, M. P. and W. S. Keeton. 2008. Emulating natural disturbance regimes: an emerging approach for sustainable forest management. In: R. Lafortezza, G. Sanesi, J. Chen and T. R. Crow eds. Patterns and processes in forest landscapes: multiple use and sustainable management. Springer Netherlands. 341-372

O'Flaherty, R. M., I. Davidson-Hunt and M. Manseau, 2006. Keeping woodland caribou (ahtik) in the Whitefeather Forest. Sustainable Forest Management Network Research Note Series. RN – 27. University of Alberta, Edmonton.

O'Flaherty, R., I. J. Davidson-Hunt, and M. Manseau. 2008. Indigenous knowledge and values in planning for sustainable forestry: Pikangikum First Nation and the Whitefeather Forest Initiative. Ecology and Society 13(1): 6. [online] URL: http://www.ecologyandsociety.org/vol13/iss1/art6/

O'Flaherty, R. M., I. Davidson-Hunt and A. M. Miller. 2009. Anishinaabe Forest Management Values for the Whitefeather Forest, Pikangikum First Nation, Ontario: An Ethno-Ecological Perspective. In: M.G. Stevenson and D. Natcher, eds. Changing the Culture of Forestry in Canada: Engaging Canada's Aboriginal

Peoples in Sustainable Forest Management. Canadian Circumpolar Institute Press, Edmonton. 19-34.

Overholt, T. W., J. B. Caldicott, W. Jones. 1982. Clothed-in-fur, and other tales: an introduction to an Ojibwa world view. University Press of America.

Perrera, A. H., L. J. Buse, and M. G. Weber, eds. 2005. Emulating Natural Forest Landscape Disturbances. New York: Columbia University Press.

Pikangikum First Nation and OMNR 2006. Land use strategy for the Whitefeather Forest Area and adjacent areas. http://www.whitefeatherforest.com/wp-content/uploads/2008/08/land-use-strategy.pdf. Accessed: March 13, 2009.

Rowe, J. S. and Scotter, G. W. 1973. Fire in the boreal forest. Quaternary Research 3: 444-464.

Scott, C. 1996. Science for the west, myth for the rest?: the case of James Bay Cree knowledge construction. In: L. Nader ed. Naked science: anthropological inquiry into boundaries, power and knowledge. Routledge: New York. 69-86.

Shearer, J., P. Peters, and I. J. Davidson-Hunt. 2009. Co-producing a Whitefeather Forest cultural landscape. In: M.G. Stevenson and D. Natcher, eds. Changing the Culture of Forestry in Canada: Engaging Canada's Aboriginal Peoples in Sustainable Forest Management. Canadian Circumpolar Institute Press, Edmonton. 63-84.

Stuart-Smith, K., I. T. Adams, and K. W. Larsen. 2002. Songbird communities in a pyrogenic habitat mosaic. International Journal of Wildland Fire 11(1): 75-84.

Thomas, P. A. and R. W. Wiens 1983. Postfire establishment of jack pine and black spruce from seed on organic soil seedbeds. In: Wein, R.W., Riewe, R.R. and Mathven, J.R., eds. Resources and dynamics of the Boreal zones, Proceedings of a conference held at Thunder Bay, Ontario, August 1982, Aculis, Ottawa. 281-293.

Thompson, I. D. 2000. Forest vegetation of Ontario: factors influencing landscape change. In: A. H. Perera, D. L. Euler, and I. D. Thompson eds. Ecology of a managed landscape: patterns and processes of forested landscapes in Ontario. University of British Columbia Press. 30-53.

Toledo, V. M. 2002. Ethnoecology: a conceptual framework for the study of indigenous knowledge systems. In: J. R. Stepp, F. S. Wyndham and R. S. Zarger (eds.) Ethnobiology and biocultural diversity. Proceedings of the Seventh International Congress of Ethnobiology. Athens, Georgia. 511-522.

Weber, M. G. and B. J. Stocks 1998. Forest fires and sustainability in the boreal forests of Canada. Ambio 27(7): 545-550.

Weir, J. M. H., E. A. Johnson, and K. Miyanishi. 2000. Fire frequency and the spatial age mosaic of the mixed-wood boreal forest in western Canada. Canadian Ecological Applications 10: 1162-1177.

Westley, F, S. R. Carpenter, W. A. Brock, C. S. Holling, L. H. Gunderson. 2002. Why systems of people and nature are not just social and ecological systems. In: L. H. Gunderson and C. S. Holling eds. Panarchy: understanding transformations in human and natural systems. Island Press. Washington D. C. 103-120.

Whittle, C. A., L. C. Duchesne and T. Needham. 1997. The importance of buried seeds and vegetative propagation in the development of postfire plant communities. Environmental Review 5:79-87.

Wolf, R. J. 1979. Moose habitat and forest succession on the Tanana River Floodplain and the Yukon-Tanana Upland, USDA Forest Service Institute of Northern Forestry, Fairbanks, AK.

Appendix 4.1. Interview with Whitehead Moose September 21, 2006. Translated by Paddy Peters.

Q - *I'd like to hear about the teachings that he has about fires and the processes that destroy forests and start them growing again.*

WM - *I'll start off in this interview by talking about the rain. That will be the first thing that I'll talk about. The rain is important. On a rainy day when the thunder is not with the rain, not in the rain, it just rains. The reason for that is that the rain comes to water the earth. To give growth upon the earth. Rain helps the earth. It produces new growth on the ground, all the new plants. When you see it early in the morning the buds on the trees or the new growth on the forest floor, by mid-day you'll see those buds blooming on the forest floor. That's how the rain works on the earth. All growth is helped by the rain.*

In regards to the thunder, the thunder comes from the sky. The thunderbird makes a loud noise. With the noise comes, the fire which is the lightning comes down from the sky and sometimes the fire strikes a tree in the forest and this creates a forest fire. The thunderbird with the fire creates a fire in the woods. This is all part of the Creator's plan. The Creator gives the fire to the thunderbird to help renew the forest floor and also to renew the trees. I see it like this.

Here we have a small animal which is the rabbit. The rabbit is part of the thunderbird fire cycle. Even though this is just a little creature, an insignificant animal, he plays an important role. The rabbit is hunted by the fox, is hunted by the lynx, the fisher. The rabbit breeds three times in the summertime. It has three litters. So the rabbit is playing an important role in this fire cycle. Our people also feed on the rabbit.

So I'll give you another example – the crow. We have the crow – another small creature. The crow arrives early in the springtime to the forest. I am talking again about how important the rain is. The rain also helps the crow. Our people say that when it rains and you have the early spring rain and you have the crows out there calling. The reason for that is they are washing their mouth. And the reason why they are washing their mouth is they have to do that. They have to do that after a long journey from the south. Rain is good. It is good to get wet in the rain that comes from the sky.

So with this story about the crow doing the mouth with the rain – we don't know what it was like down there - down in the south for the winter. We don't know what took place down there or what the condition was down there, where the crow spent the winter. So coming back in the early spring, with the early spring rain, the crow washes its mouth. I believe the reason the crow does all this is to get rid of all the contaminants – the filth from its body down south. That is my understanding of why the crow calls with the early spring rains. It's telling me that the conditions down south are quite different from the conditions up north.

I'd like to speak about the wind now. The wind becomes forceful at times when it becomes windy. The reason for that is that the wind moves the trees. On windy days you can see the trees swaying back and forth. The reason for this is the wind acts as a cleanser to the trees. There are particles that gather on the trees on the branches of every tree and the wind comes along and blows those particles or dirt off. The Ojibwa term is ***miimegwanash****. You translate that – you see the sun? The rays of the sun? You see all these particles in the light there, eh? That's what* ***miimiigwanash*** *means?*

Q *– That's like the dust in the air?*
WM *– Yes. So this is what the wind does, it comes along and blows these away. I guess another example I can use, is that you see our roads here are very dusty. When a vehicle drives on the road you see it brings up dust. So what the wind does, what its job is, is to cleanse. Even the wind helps our breathing. If there was no wind there would be no light. The further you go up into the sky, there is no wind up there. So you can't breathe up there. So people who go way up there past the wind they have to be helped to breathe by machinery just to keep them alive. So with* ***miimiigwanash****, people can get sick from there. So when we were young kids inside a cabin, in the morning after a meal, our parents would tell us to go outside and play because* ***miimiigwanash*** *would get a hold of you and make you sick. All those particles - you have to go out and be refreshed. "Go outside and play and that you'll be cleansed", they told us.*

The wind is very helpful in every area. The wind also helps the water. It moves the water. If the water always stayed the same, if the wind never moved the water, it would become stale. The moving of the water it helps every living creature in the water. The fish, this is where the fish get their health from. It helps us people too – we like to spend time in the water too. And also the animals on the land. The moose. When I talk about the moose, it helps cleanses the moose, the moose's fur. The moose has ticks in the early spring time and since there is no water the moose can only rub, rub its body on the young trees to try and get rid of the ticks but instead of getting rid of the ticks they rub off their fur. If you see blotches on the moose, it's from too much rubbing on the trees. When the water comes, when it melts, the moose likes to go into the water. This way it helps the moose get rid of the ticks that are on its fur.

Appendix 4.2. Interview with Elder Mathew Strang March 1, 2007. Translated by Paddy Peters.

Q: *I'm trying to review some of the ideas that Norman Quill gave me and I was hoping you could give me a second opinion on what some of the phrases mean. Paddy and I were just talking about* ***auyuhshuhwuhtuhn*** *which I understand to mean that all things have a will to exist in a certain way. I am wondering how this relates to* ***cheeyahweesaag. Cheeyahwaysaag,*** *that's the word that Norman gave me to mean that things want to return to a certain condition after they are disturbed. He said that many times a fire could burn a place and it would return to how it was. But sometimes this* ***cheeyahweesaag*** *is disturbed and it does not. Can you tell me how you understand these ideas?*

PP - [translating]:

MS:

PP [trans.]: *All things have life. A stick – White people would describe it as dead, a piece of wood, sand, water. All have life which I call* ***auhyuhshuhwuhtuhn****. Everything is alive because everything is connected to the Creator. Even the dead tree across the road is alive. For example* ***auhwaycheekay****, a dead head, a log in the water is actually alive. For this reason you never point at it. Deadheads are connected to the weather conditions. It will bring bad weather, a storm. You have to respect the dead head. You don't drive your boat too close to it or create waves. You don't want to cause it any undue stress. Another example is* ***peetay****, the white foam on the water that can be seen on the shoreline. You are not supposed to touch that. It is an indicator. If it leaves the shore and drifts onto the water it means it is a calm day and the water will be calm.* ***Auhyuhshuhwuhtuhn*** *refers to us all.*

As for ***cheeyahweesaag****, it means to look the same as the original. In a clearcut area, what the Whiteman is doing is breaking the ground this term should not apply. Everything is broken up and destroyed, the plants the roots, etc. Fire will destroy the top but eventually everything will go back the way it was in the original. Clearcutting actually wounds the* ***ahkee*** *severely. It is wounded to the point that that area will never be the same as it was originally.* ***Cheeyahweesaag*** *would not apply here.*

Q - *If I understand you correctly it does not apply because people who are doing that have not taken into account the* ***auhyuhshuhwuhtuhn****. It has not been respected.*

PP -

MS -

PP - [trans.] *That is absolutely correct. Rocks and stones have to be left in their proper place. Bulldozing after a clearcut moves them all. See that hydro pole across the road? That also has* ***auhyuhshuhwuhtuhn****. It was once a tree and was taken off the land and made for this purpose into the pole. One day, maybe it will be replaced when it is too old and maybe it will be put to some other use – maybe fire wood. That will turn the pole into ashes that will go back onto the land to reenter the cycle. Another example is the leaves that grow on the trees during the summer. When they fall off in the fall they go to the ground and reenter the cycle by sustaining the* ***ahkee.*** *I don't believe the theory that leaves die. This chair here is another example. It is made of wood and metal. It is a chair here and now, but it is…it possesses* ***auhyuhshuhwuhtuhn.***

Q - *Let me ask, do some things require that we show greater awareness of* ***auhyuhshuhwuhtuhn*** *than others? Say for instance do rocks and lakes require more respect than a chair or a power pole*?
PP - [trans.]
MS -
PP - [trans.] *There is a balance for all things, but the teaching that I received when I was young was that it was wrong to go into the deep forest and disturb rocks and trees for no reason. When I was young, the area across the lake had been burned and we used to go over there to collect blueberries. The women would collect berries and we boys would go up the stream where we found a cliff. We made a game of taking big rocks and throwing them off the cliff. We got in a lot of trouble about that from those women. They said that those rocks one day would surprise us by getting even with us*.
Q - *So then constructing a driveway at your house out of gravel is not showing disrespect to the rocks, while going into the forest and digging around or cutting down trees is*?
PP - *That's right.*
MS - ***Cheepuhpeenootuhmun*** *is failure to show respect.*
PP – *It is not being disrespectful, it's more that you are not being mindful, you are not being aware.*
MS -
PP - [trans.] *When I go into the woods and I want to make a pot of tea I cut a small green tree to hold up my tea pot over the fire. I cut the tree for a reason. That is why it is there – for me to use it like that. Afterwards I will leave it and it will maybe go back into the* ***ahkee****. Or maybe the following year I'll return and find the stick that is now dried out and I'll break it up and burn it in my fire making ashes. I have not disrespected the tree. I used it for a reason and that is part of why the tree is there. These things happen for a reason. But if I go and I shoot a duck and I don't intend to eat the duck then I have insulted it by showing* ***cheepuhpeenootuhmun****. I have wasted that duck.*

Appendix 4.3. Elders describing their reactions to forest fires within their traplines
Oliver Hill Interview August 24, 2006. Translated by Paddy Peters.

I want to talk a little bit about fire. I was thinking about this last night, even when I woke up sometimes, I was thinking about this. I wanted to be ready for this interview - the questions that you were looking for to be answered about on the subject of fire. I thought about those that are clearcutting the land, all these White people that are clearcutting the land - that are cutting down the trees in the forest.

Some years ago we did a lot of hunting on the west side of Pikangikum, there. There's a lot of burnt area in that area. We went there when everything was burnt and there were no trees growing back on the land yet. Everything was burnt even those trees that were lying on the forest floor were burnt. Where the fire had gone through there was nothing but bare rock on the land. What I was thinking about last night was that where the fire had gone through there was ashes, ashes on the land. A fire goes through and leaves ashes. I truly believe that the ashes play an important role. Where the fire has gone through these ashes regenerate the same forest that was there.

Some of those areas where the fire had gone through - there were trees still standing there, eh? Mature pine trees. And in that same area this is the same type of tree that is growing back on the land. Trees that were there before the fire came through.

I'm just totally fascinated by that forest fire area where we think the fire destroyed the land. Yet there is a rebirth there. And the ashes that were on the land after that fire, everything was engulfed by that fire. Even the cones were burnt up by the fire. And yet somehow the growth on the land came back. I believe it was from the ashes, that were left after the fire. That is where the rebirth begins.

So, I see that fire plays an important role on the land. When we hunted the land when we walked the land everything was just burnt. Burnt! Just the ashes were left, you could see the pure sand, the soil was burnt, the rocks. I'm just fascinated by that and that over the years it has grown back up. Once again the forest is growing. I was really amazed by that. I know that this is part of the reason why we are doing this Whitefeather planning - because of this knowledge that our people possess about the land. We are going to use this knowledge to preserve the land that we live on. To have this knowledge will be very helpful for our planning.

If you go over here behind these trees on the other side of the lake, that's a new forest over there. Years ago everything was burnt. So there is new forest that is growing over there. Man never helped we never helped that forest, it just grew back.

Elder Larry Pascal, interview January 29, 2008. Translated by Charlie Pascal.

"*What I noticed about after the fire it burnt deep into ground, into the soil. That's what I noticed. Even in the swamp areas, **mushkeeg**. It went deep into the swamp. The **mushkeegs** are gone. That's what I noticed about it. Because we went there after the fire. I went after the fire to look. I went with my father at that time and walked around in the bush. I noticed that even in **mushkeegs**, in swampy areas it all burnt to where you could just see sand. It burnt deep into the ground. I remembered what my father told me about fire. After everything was burnt, he told me all the plants that grow before the fire*

are old plants and new plants would come out of those areas. New plants would grow. And I believe, when I think about it, that he was right and I'm beginning to see a lot of that… A lot of fresh plants. New plants are growing and all the old plants burnt… And last fall I talked to my family about this. Before there were no little jack pines, ***okikensuhk****… And now I have a lot of those… After the fire he says that he noticed that there was no wildlife in the area after the fire. And even after the snow fall when you see tracks, there was no tracks* [in that area]. *No beaver no marten or anything like that. And I asked around why the reason was and I was told that they have no food to eat in those areas – in the burnt areas. And I noticed that in the area that wasn't burnt you would notice that that's where they would go. That's where the animals went. That's what I was told. That's the area they would go. Because in the burnt areas they don't have anything to eat. Even the caribou and marten. I was told that where the caribou and those areas when they were trapped that's where they would go. And I noticed that in the winter."*

Elder Norman Quill October 30, 2006. Translated by Paddy Peters.

There is a change of what originally grew in that area before the fire came. A fire comes along and changes that area, eh? Different trees begin to grow in that same area. Other species. For instance at Sampson Lake before the fire came along, before on the east side of Sampson Lake there was a lot of pine trees in that area. There was also a lot of ***sheengoobeeg, sheengoobeeg*** *that's the balsam fir, and a lot spruce. So he gives four descriptions here.* ***Aahoohshayteenang*** *is an area, a high ridge area where there's sand. A sand area. This is where pine trees only grow in that area.* ***Aahoohshayteenang****.* ***Sheepaaquayaag*** *that means an open clear area.* ***Sheepaaquayaag*** *is another area where the* ***sheenkoobeeg*** *grow.* ***Aatuhpuhskaameegag*** *[PP] is another word is a low area where there is balsam or black spruce grow in that area.* ***Aaeeshpuhkahmeegag*** *is another word for a high area. This is another term for where the pine tree grows, another term for a high area. So the term, I think I got the term* ***cheeyuhwaysaag****. It means that… that you… knowing that originally that something had been in place and that something came along and disturbed that, eh? So you want that same thing that original land to be there even though something comes along and disturbs that. That's your…what you have in your mind. But that doesn't happen, eh? That doesn't happen. Because that fire came along and disturbed and changed it, eh?*

CHAPTER 5:

AGENCY AND SCALE IN THE CREATION OF ABORIGINAL CULTURAL LANDSCAPES[2]

5.1 Abstract:

In this study we examine the role of fire in the construction of Anishinaabe cultural landscapes in the boreal forest of northwestern Ontario. Much recent literature explores controlled burning practices used by people of different cultures to manipulate vegetation communities within sites or small scales. Because humans have only recently been able to suppress fires occurring at larger scales these studies focus on activities occurring at the scale of sites as making the greatest contribution to creating cultural landscapes. Through our work with elders of Pikangikum First Nation we examined Anishinaabe knowledge and relationships to fire occurring across spatial and temporal scales. Their detailed knowledge of the impacts of fire on plant and animal communities contributes to how people move across and use their environment and is not restricted to small temporal or spatial scales. Pikangikum residents perceive forest fires as beings which possesses agency and who intentionally create order in landscapes. The possibility of non-human agents having a role in the creation of meaningful spaces prompts us to call for a reassessment both of the scale of inquiry and the nature of cultural landscapes. This notion suggests that cultural landscapes are more than the physical remains of the sum of human activities.

[2] A version of this chapter was accepted for publication in Human Ecology as a co-authored manuscript by Andrew M. Miller and Dr. Iain J. Davidson-Hunt.

5.2 Introduction

American cultural geographer Carl O. Sauer (1889 – 1975) introduced the concept of cultural landscapes to foreground the role of humans in shaping landscapes (1925; 1927). "The cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the area is the medium, the cultural landscape is the result," (Sauer 1925: 343). His approach emphasized the "centrality of the material and observable record of humans" in shaping biophysical structures of landscapes (Agnew et al. 1996, 240). Through extensive documentation of the ways humans shaped landscapes Sauer realized that cultural landscapes are fashioned in many ways that include one's own labor and directing others' labor in association with a variety of materials and technologies. Sauer's work opened up an interest in how human agency fashions landscapes.

Due to his work in this area Sauer is often seen as the progenitor of a long lineage of scholars who continue to study the material and observable record of human impacts on landscapes. Much of this work has continued to focus on built structures such as terraces, irrigation systems and earthen works and other signs of agricultural activities (Birks et al. 1988). Other scholars pursued Sauer's interests in revealing and documenting the ways by which humans impact the biological organisms, populations and communities that form the structures of a landscape (Anderson, 2005). Conceived in these terms the cultural landscape, or anthropogenic landscape as some prefer, becomes a mosaic of cultured resource patches and travel routes linking such patches (Davidson-Hunt and Berkes, 2003; Anderson, 2005; Trusler and Johnson, 2008). The patches and routes made up of physical structures, organisms, populations and communities created through human agency set within a natural milieu.

We have found this material approach useful in our work in documenting the structures and exchange dynamics of Anishinaabe cultural landscapes (Davidson-Hunt, 2003; Turner et al. 2003). However, in our recent research undertaken with Pikangikum Anishinaabe we found that the basic framework of counter-posing cultured patches and routes against a natural milieu to be problematic (Anderson, 2005: 3). Our Anishinaabe colleagues did not agree with our basic proposition that the only agency that is expressed in fashioning the landscape is that of humans. Rather, they proposed that the landscape is fashioned through a variety of different actors each expressing their own agency and as a result leaving a material record. The patches and routes fashioned by the Anishinaabe reside alongside others' patches and reside as part of a milieu created by actors who create larger sized patches.

In this paper we focus on a particular technology, fire, which has been a long standing (Sauer, 1925; Stewart, 1951; Lewis, 1993) and recent (Pyne, 1995; Boyd, 1999; Anderson, 2005) interest of scholars studying how human agency modifies landscapes. In this journal alone [*Human Ecology*] recent work has documented how humans have modified landscapes through fire, for example, in northern Canada (Lewis and Ferguson, 1988); Australia (Russell-Smith et al. 2005); Indonesia (Russell-Smith et al. 2007); Africa (Laris, 2002); Brazil (Mistry et al. 2005); and the Mediterranean (Blondel, 2006). Much of this work, following Sauer's lead, has been to utilize the material and observable record to demonstrate that most societies occupied and modified their landscapes. This work has been important for those societies in a colonial context in order to demonstrate their claims to territory (Stewart, 2002) and recently such practices have been suggested as the basis for sustainable resource management systems (Anderson, 2005). However,

in all cases we examined the research has continued to focus on human agency and cultural landscapes as a mosaic of human-modified organisms and patches within a natural milieu.

Whereas most authors simply do not consider non-human initiated fires some firmly position space influenced by natural fires as outside of cultural space. Anderson (2005: 3) suggests that "…there were some places that had little or no intervention from native peoples and these would qualify as true wilderness." Lewis and Ferguson (1988) recognize that human-modified patches, or what they call a pattern of yards and corridors exist alongside a forest patterned by natural fires. As important as these works have been for the recognition of the ability of Indigenous peoples to manage their territories this perspective reaffirms the dualistic natural and cultural division present within geography, biology and anthropology (Wiley, 2007: 154-5) and obscures our understanding of cultural landscapes as they are conceived by people residing in them who may not divide nature and culture so sharply.

We suggest that a Pikangikum cultural landscape is more than the sum of human-modified patches and travel routes alongside a forest patterned by natural fires. Our approach to cultural landscapes is more akin to that of Ingold (2000: 189) who suggests that we "…move beyond the sterile opposition between the naturalistic view of the landscape as a neutral, external backdrop to human activities, and the culturalistic view that every landscape is a particular cognitive or symbolic ordering of space." Our goal is a more holistic understanding of cultural landscapes informed by our Anishinaabe colleagues and other scholars who suggest that cultural landscapes are both material and symbolic and include a society's unique worldview, ontology, history, institutions,

practices and the networks of relationships between human and nonhuman beings (Buggey, 2004; Hierro and Surrallés, 2005).

In order to situate our research it is necessary to consider briefly two key concepts related to cultural landscapes, namely, agency and scale. We define agency following Giddens (1979) as the capacity to make choices. Scholars who have worked with the Anishinaabe (Hallowell, 1960; Black, 1977), other Algonquin peoples (Martin, 1982), circumpolar peoples (Ingold, 2000) and in our own work with the people of Iskateewizaagegan and Pikangikum (Davidson-Hunt et al. 2005) have suggested that for many people the range of actors who exhibit agency in shaping the environment exceeds that of human actors. In fact, for many peoples of the sub-arctic, humans are only one of many societies composed of actors who exhibit agency both as individuals and collectively. Who are the potential actors who may shape the landscape? For the Ojibway, the term Anishinaabe refers to humans who are situated in a place, territory or a landscape and can be applied to all such human societies; it is often translated as 'the people'. Along with the Anishinaabe are other societies who also exhibit agency and which in his work Hallowell coined the term "*other-than-human peoples*" (Hallowell, 1960). Starting from this first order proposition of the Anishinaabe requires that we begin by asking: who are the actors who fashion a landscape in any given place through fire?

In the work on cultural landscapes, scale emerges out of a Cartesian understanding of space and time in which both can be reduced to a common metric, the former to a cadastral grid and the latter to a temporal perspective that posits a point of origin and a linear progression of time from that point forward. In this sense, if scale is

mapped on an axis of space and time the origin would represent something small in size and of short duration. Larger scale events could become larger in space, time or both. In the study of cultural landscapes this idea of scale has been utilized to distinguish human practices that might be considered to be small in scale, such as the pruning of a branch, to those of a larger scale, the burning of a meadow (Anderson, 2002). Landscapes, in this perspective, are considered to be a large scale unit made up of a mosaic of smaller scale units, often called patches, that together form a human-modified landscape.

In the boreal forest this perspective on scale has influenced much of the work on understanding the use of fire by humans to shape the boreal forest in Canada. Extensive documentation exists that Canadian aboriginal peoples historically utilized controlled fires at smaller scales, in carefully chosen locations and under selected climatic conditions to achieve specific changes to vegetation communities. Through controlled burning, small and large game species, berry patches, and other important plant resources and landscape features (portages, campgrounds, etc.) could be found more dependably at these locations (Lewis, 1982; Lewis and Fergusson, 1988). The cumulative effect of these practices created a variably-scaled mosaic of successional communities offering increased species diversity at the landscape level to serve as resources over time (Lewis, 1982; Lewis and Ferguson, 1988; Davidson-Hunt and Berkes, 2003; Berkes and Davidson-Hunt, 2006). As is common to work elsewhere on this topic how indigenous people think about fire occurring at larger scales has not been considered outside of recent work on fire policy (Miller et al. *in review* [Chapter 6]; Natcher, 2004). In this paper we recognize that scale is problematic but find that through its use we can focus on our principal question of whether an Anishinaabe cultural landscape is a mosaic of

patches within a natural milieu, or, is the whole landscape cultural and fashioned by a variety of actors acting throughout the range of scales? It provides a framing that allows us to avoid the prevalent dichotomy of natural versus anthropogenic fire found in this literature.

In this paper we examine cognitive and symbolic understandings and everyday practices related to fire as it occurs at a variety of scales shared with us by our Anishinaabe collaborators. Many of their quotes are included within the text. We conclude with our thoughts on how an Anishinaabe ethnoecology of fire shifts our understanding of the material and observable record of cultural landscapes.

5.3 Setting and Methodology

5.3.1 Pikangikum First Nation

Pikangikum First Nation is an Anishinaabe community in northwestern Ontario (Figure 1). Also known as Northern Ojibwa, the Anishinaabe (as they call themselves) are members of the Algonquian language group (Brown and Wilson, 2004). Pikangikum has an officially recognized population of 2,185 people living on an 80 hectare reserve (INAC, 2006) and lies north of the 51st parallel which marks the northern limit of forestry in the province of Ontario. Historically, this has also been the northern limit of intensive fire suppression by the Ministry of Natural Resources. Pikangikum is accessible by a 50 km ice road during the winter, by boat after ice break-up in mid-April, or by floatplane and small commercial planes arriving at a community airstrip. Members of the community seasonally pursue a variety of livelihood activities including hunting of

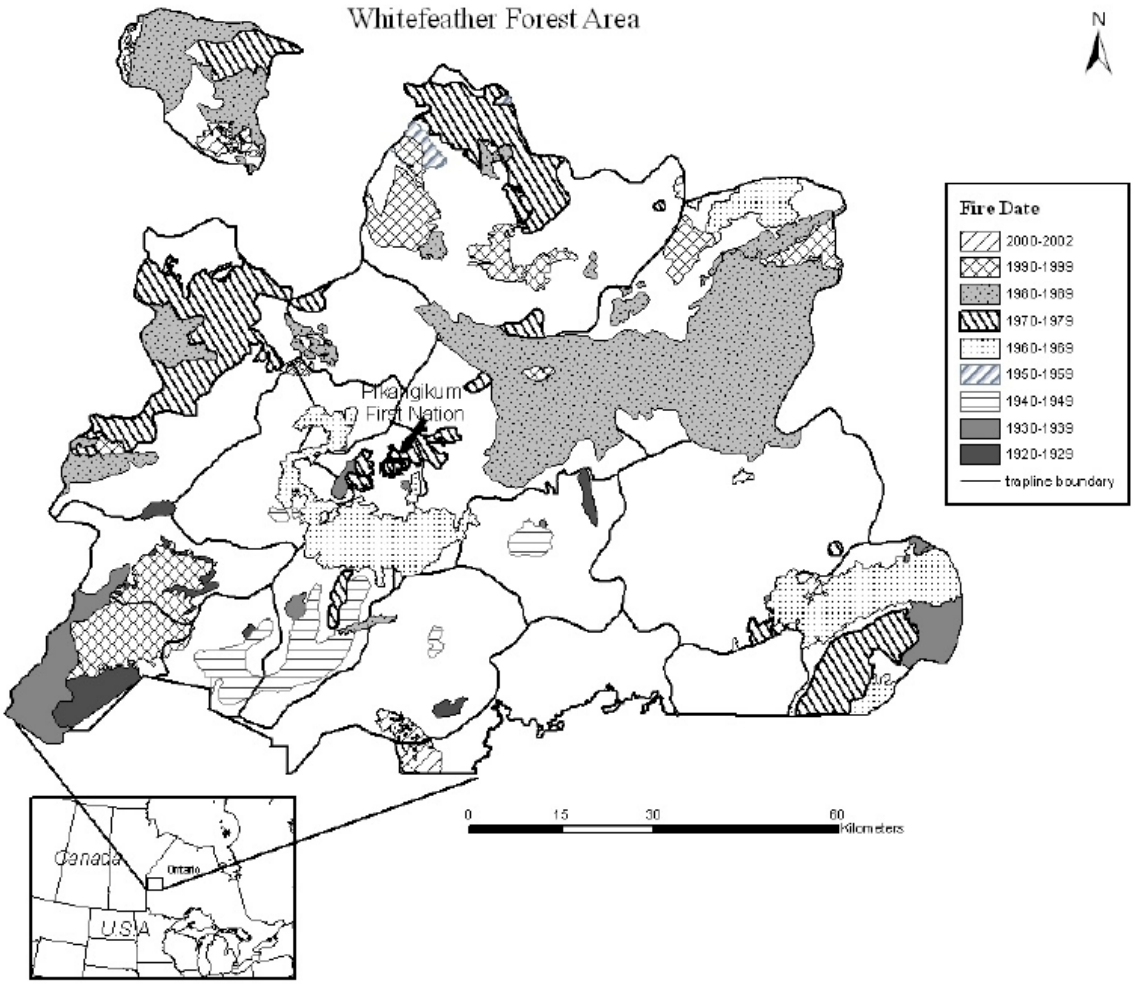

Figure 5.1. The traditional territory of Pikangikum First Nation, Ontario is comprised of a mosaic of stands of varying age since catastrophic fires.

waterfowl, small game and moose (*Alces alces*), trapping of furbearers, fishing and collecting non-timber forest products. Many of these activities take place on family traplines. Eighteen traplines constitute a portion of the traditional territory of the people of Pikangikum and make up 1.2 million hectares of the Whitefeather Forest Planning Area (WFPA) (Pikangikum First Nation and Ministry of Natural Resources, 2006).

5.3.2. The Whitefeather Forest

Forests within the WFPA are conifer dominated, with greater presence of shade-intolerant deciduous species in forest openings and areas recently disturbed by wind throw, insects, annual flooding or forest fire. Many of the dominant species (e.g. jack pine [*Pinus banksiana* Lamb.], black spruce [*Picea mariana* Mill.], and trembling aspen [*Populus tremuloide*s Michx.]) are fire-dependent, requiring intense heat to open seed bearing cones or to stimulate sprouting from roots (Li, 2000; Rowe and Scotter, 1973). Lakes, streams and muskegs (wetlands) compose a substantial part of the overall landscape. Water bodies serve as avenues for travel by boat and barriers for terrestrial travel during the warm months. Temperatures are below freezing for six months each year and can reach -35° C during the coldest months. Travel is facilitated by snow machines on a network of forest trails and frozen waterways during this time of year.

5.3.3. The Boreal Forest and Fire

The boreal forest of northwestern Canada has historically been subject to two varieties of fire: those caused by lightning and those caused by human activity. Each form of fire has distinct spatial and temporal characteristics and ecological impacts. At the large scale, lightning caused fire is a keystone ecological process within the Canadian boreal forest (Weber and Stocks, 1998). Forest fires produce biochemical legacies including the mineralization of nutrients, changes to soil pH and rates of heat exchange by changing the albedo of an area (Whalen, 1995). Physical legacies of fire include the death of large numbers of plants, altered habitats and resources available to animals, consumption of organic soils, creation of forest openings, seed release and the sprouting of underground

roots by fire-dependent species (Rowe and Scotter, 1973). Most lightning generated fires in the boreal forest are less than 0.1 hectare, due to their tendency to extinguish themselves in accompanying rain and fire suppression. Fires larger than 200 hectares make up less than 3% of the total number of fires, yet constitute 95% of total acreage burned (Canadian Forest Service, 2005). Many regions of the boreal forest have a fire return interval of between 60-100 years (Weir, 2000).

5.3.4. Methodological Orientation

The initiative for this research emerged out of a long-standing collaboration with Pikangikum to consider how their knowledge can be applied to the management of the Whitefeather Forest, a 1.2 million hectare portion of the traditional territory of Pikangikum First Nation residents. It is the result of collaborative research undertaken with community elders and senior trappers of Pikangikum between June 2006 and August 2008 under the Whitefeather Forest Initiative Cooperative Research Agreement, which established standards of research between the Whitefeather Forest Management Corporation (WFMC) and the University of Manitoba. This community-led initiative seeks to bring community economic opportunity and cultural renewal through the development of natural resource opportunities in a manner compatible with customary stewardship activities, livelihoods and values (Pikangikum First Nation and Ministry of Natural Resources, 2006). Following this process, community elders reviewed our project proposal in the context of its contribution to the Whitefeather Forest Initiative. Our research is intended to provide community elders an opportunity to present their knowledge of fire's importance within the Whitefeather Forest landscape, and its

contribution to Pikangikum customary activities and livelihoods in a land-use planning context.

Elders recommended participants from among their number and other trappers to interview and lead field investigations with researchers. Between June 2006 and May 2008 we conducted a total of 43 interviews with 30 elders. Elders also accompanied us on 12 field trips spanning 30 days to areas recovering from fire and sites of historic burning activities. Interviews were recorded, transcribed and coded for analysis of key themes related to understandings of fire and its impact on the land and community. WFMC employees acted as translators for unstructured interviews with Anishinaabe speaking elders. Results were presented and verified by the elders in a community meeting with OMNR in February 2007 and again in a focus group meeting in March 2007. Recorded interviews and other documentation were archived in the WFMC research office in Pikangikum First Nation.

Our work is rooted in a qualitative and phenomenological ethnoecological approach. Ethnoecology arises from a broader field of the ethnosciences rooted in cognitive anthropology and interested in *emic* understandings of the rules or what Bernard calls the grammars of cultures (Bernard, 1988: 226). Due to its cognitive roots much of this work has focused on a society's specific taxonomies for domains like kinship or of organisms like plants (ethnobotany) (Davidson-Hunt et al. 2005) and birds (ethno-ornithology) (Diamond and Bishop, 1999) or other phenomena like soils (ethnopedology) (Barrera-Bassols and Zink, 2003). One approach to ethnoecology is to then look at how a society understands the relationships between organisms they encounter in their environment (Clément 1998).

Over time the focus of ethnoecology has moved beyond a narrow cognitive and linguistic scope to an approach that considers an *emic* understanding of a specific phenomenon, like fire, through an integrated framework that probes symbolic, cognitive and the everyday practices related to the phenomenon (Toledo, 2000). Posey (et al. 1984) also pushed ethnoecology towards an applied approach so that the research was not just of scholarly interest but also provided knowledge that could support autochthonous approaches for local development (Beaucage et al. 1997). In taking an ethnoecological methodological orientation we focused not just on the linkage between the observable material record and burning practices but also the symbolic and cognitive dimensions of fire and related practices from the perspective of the Pikangikum Anishinaabe

5.4. Fire, Agency and Landscapes

Understanding relationships between Pikangikum people and fire requires an introduction to aspects of the Anishinaabe worldview, taxonomy and practices (Toledo, 2002). The people of Pikangikum recognize that they have stewardship responsibilities to care for the land given to them by the Creator for their survival and caretaking (Pikangikum First Nation and Ministry of Natural Resources, 2006). The landscape they inhabit is also occupied by beings who possess a moral order similar to humans, with the ability to think, make decisions and pursue their own agendas (Hallowell, 1960). Among these beings are water, rocks, animals, and beings from myths and stories. One of the hallmarks of members of this category of "other-than-human persons" (Hallowell, 1960) is the ability to transform themselves or the environment (Quote 5.4.1 a.) and the ability to respond in unpredictable, capricious, or "willful ways" (Hallowell, 1960).

Fire (***eshkotay***) is considered by the elders of Pikangikum to possess a number of characteristics which indicate its status as a living sentient being. Among these reasons is fire's ability to grow rapidly when weather conditions are right and to resist all efforts by people to put them out. In these circumstances fire eventually "decides to go out". Under extreme conditions a large fire can create clouds of smoke that contain lightning (Quote 5.4.1 b.) Fire is understood as belonging to one of three categories identified by Pikangikum elders: thunderbird fire (***beenesay eshkotay***) or lightning and the forest fires it starts; Anishinaabe fire (***Anishinaabe eshkotay***) or fires started and controlled by indigenous people; and Whiteman's fire (***Wahmedekooshe eshkotay***) also referred to as "the other fire" (***muhyaukee eshkotay***), electricity. Although it is seen as being similar in nature to thunderbird fire, this third type of fire will not be addressed in this paper. All fire types have the dual characteristics of being both a source of life and potentially a source of great destruction. Fire is a gift of the Creator.

Climate extremes in northern Ontario are such that human life simply would not be possible without fire for heating, cooking, smoking meat and fish, and hide preparation. This intimate knowledge of fire is born of peoples' utter dependence on it for their survival in either a controlled context or as it occurs within the landscape. The periodic occurrence of catastrophic forest fires affecting up to tens of thousands of hectares demands that Pikangikum residents maintain a respectful relationship with fire (Quote 5.4.1 c.). A person demonstrates respect by understanding the behavior of fire in different circumstances, its impacts and tailoring their actions accordingly.

Thunderbirds are powerful beings who dwell on mountain tops and in thunderclouds and are associated with specific sites within the landscape. They are the

subject of many stories within the Pikangikum oral tradition. Thunderbirds are born in nests located on islands or hill tops where geologic formations consisting of heaps of rounded stones occur. According to oral tradition, long ago there were no trees on the land, so thunderbirds constructed their nests of rocks. These features are locations of power and are treated respectfully. Young thunderbirds arise from these nests in the early summer. Among the stories told about thunderbirds are several in which humans marry thunderbirds (Appendix 5.1). Although potentially dangerous, thunderbirds are generally beneficial for their role in renewing forest growth and for protecting their human relatives from horned serpents who live underground (***meshekenaybegook***). Were it not for the lightning wielding thunderbirds, these serpents would surface and destroy the Anishinaabeg (Quote 5.4.1 d.). Anishinaabe communities in the Great Lakes region also recognize the conflict between the thunderbirds and their counterparts the horned serpent or as it is also known, the water lynx (***meshebishew***) (Johnston, 1976; Smith, 1995). Elders point to the sounds of frequent thunder in the early summer as an indication that older thunderbirds are teaching the younger ones how to use their bolts of lightning. Thunderbirds are related to all birds but have a special affinity to solitary sandpiper (*Tringa solitaria*, ***chedooae***), common nighthawk (*Chordeiles minor*, ***payskik***), swallow (Family: Hirundinidae***, shashawahnepesee***), belted kingfisher (*Ceryle alcyon*, ***ookeshkemahnesee***) and kestrel (*Falco sparvarius*, ***pepekooshaense***). Hallowell (Brown and Gray 2009) further identifies white pelicans and hawks as being allied or protected by thunderbirds. Mistreating these animals, destroying their nests or eggs will cause thunder to sound, a sign that the thunderbirds have been angered and may seek revenge upon the offender.

5.4.1 Text box. Anishinaabe ethnoecology of fire. The following quotes by Pikangikum elders illustrate aspects of Anishinaabe ethnoecology of fire and its role in creating their cultural landscape.

Quote 5.4.1 a. *See that hydro pole across the road?…It was once a tree and was taken off the land and made for this purpose into the pole. One day, maybe it will be replaced when it is too old and maybe it will be put to some other use – maybe fire wood. That will turn the pole into ashes that will go back onto the land to reenter the cycle. Another example is the leaves that grow on the trees during the summer. When they fall off in the fall they go to the ground and reenter the cycle by sustaining the* ***ahkee*** *(the earth). I don't believe the theory that leaves die.*
Mathew Strang March 17, 2008

Quote 5.4.1 b. *Fire retires in the evening – it rests at night and flares up during the day – beginning around 10 am. It is active. Even on a calm day fire can make its own wind – this is not actually a wind – the wind is within the fire. More evidence that fire is alive is that it can spread itself by sending balls of fire ahead. It can jump ahead with these. Several times I have seen the cloud of smoke from the fire become a thunderbird cloud – a cloud with lightning within it.* Tom Quill February 19, 2007

Quote 5.4.1 c. *I don't really know where this* ***muhyaukee eeshkootay*** [the other fire] *comes from. But I tell you, I pray every morning and one of the first things that I am thankful for is the fire. I thank the Creator for the fire that he gave us. It is still helping me to survive. Fire is used for means of survival. Survival for life. If you respect fire, the fire will be good to you. It will keep you warm cold days. Keep you warm. But you also have to have respect and be careful with the fire. You have to use it wisely. If you use it wisely it will keep you. If not, it will burn all of your possessions…Fire can destroy and the reason why it destroys is to make things alive…And the other thing that I am thankful for is the water. Water is also important. It is a sacred element. You know when we eat, it nourishes our bodies. We get strength and good health. So fire does the same thing. It helps us physically. It strengthens our health.*
Solomon Turtle March 17, 2007

Quote 5.4.1 d. *So this is what the Thunderbird does: it makes a lot of thunder. A lot of noise in the sky. A lot of thunder because these creatures under the ground want to come up to the surface. The Thunderbird's job is to keep these creatures under the ground so that they won't come on top of the ground. They are large serpents…. So the Thunderbird also acts as a protector for the land. For the people too. If these serpents…if the Thunderbird failed to…if these creatures came out of the ground they would destroy us. Destroy the people.* Oliver Hill August 29, 2006

Quote 5.4.1 e. *The Creator has a match and that match is the thunderbird. He brings that match to the land when the forest gets too old and can't grow anymore. So the thunderbird comes to earth. After the forest is burnt new growth starts. Animals get tired of eating old food. Just like you and me. The Creator knows that animals need new food. The fire there is fresh food to eat.* Whitehead Moose July 20, 2006

Quote 5.4.1 f. *If you see thunder coming from the east and you see lightning strike on the west side then that is telling you that the world is almost at the end. That's what the elders were saying.* Tom Quill January 29, 2008

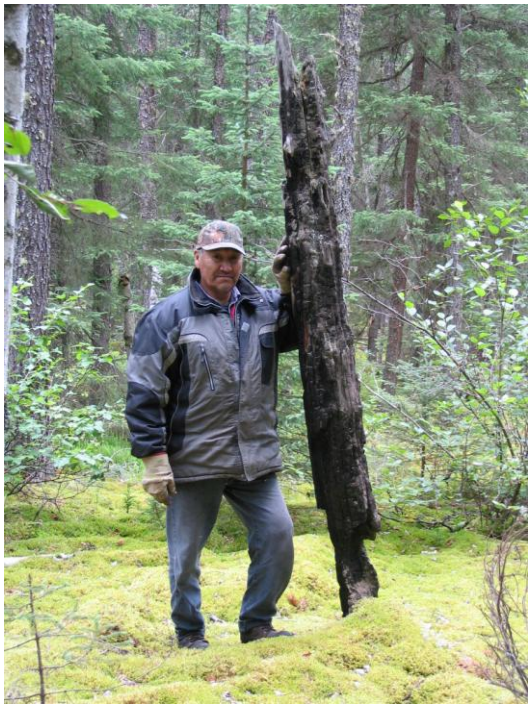

Photo 5.1. Elder Jake Kejick with a burnt snag a remnant of a forest fire predating the current mature stand, an *ayasayweesuhk*. (Photo: L. Gerrish OMNR).

Pikangikum elders with whom we consulted in 2007 view thunderbirds as the Creator's means of lighting fires[3] and thus creating renewal of vegetation communities in the land for the good of all (Quote 5.4.1 e.) (Figure 5.2). Elders report that by offering tobacco or singing special songs they could appease the thunderbirds and cause approaching storms to pass around the supplicant. The path that thunderbird storms take is always from the west or southwest to the east or northeast. Elders say it was foretold that if thunderbird storms travel from east to west it signifies that the end of the world is

[3] This view runs counter to the perspective recorded in Hallowell's ethnographic notes of Anishinaabe people along the Berens River in the 1930's (Brown and Gray 2009). Hallowell states, "*the Saulteaux* [Anishinaabe] *resist the notion advanced by the whites, particularly by the men of the Forestry Service, that lighting causes forest fires…Pinesi would not do that,*" (Brown and Gray 2009: 189). Brown suggests that the elders we interviewed in this study have perhaps integrated the "traditional" understandings of lightning recorded by Hallowell with the perspectives of foresters, fire managers and ecologists with whom they have come into contact since the time of Hallowell (pers. com. Jan 12, 2010). Ultimately the current authors are unable to judge Hallowell's interpretation of statements made by his informants. Similarly, we are unaware of how modern elders would interpret this seeming contradiction.

coming soon (Quote 5.4.1 f.). Thunderbirds migrate south with the other birds during the winter months, making thunderstorms during this period unusual occurrences.

Other ecological legacies of forest fires are reflected in stories. For example, the adventures of two Anishinaabe folk-heroes, Ayasay and his son, is fraught with many

Figure 5.2. ***Beenaysee eshkotay*** **– Thunderbird fire, comes from the thunderbirds' eyes and strikes whatever it is looking at. Renewal begins with the roots that remain underground.**

encounters with evil beings whom they must defeat. It culminates in a fire, which purifies the world so that the world can begin again (Oliver Hill and Mathew Strang, unpublished interview November 24, 2008). Following this fire Ayasay and his son are wandering through a burnt landscape when they encounter a willow (***weegobeen***) sprouting out of the ash. A little further on they encounter a jack pine (***okik***). These two

plant species dominate early community succession following a burn. This creation story is also recalled within the Anishinaabe word for a burnt tree (***ayasayweesuhk***), which contains Ayasay's name. Burnt snags can remain standing for many years even as forest succession is reinitiated by a catastrophic fire. Burnt snags which predate stand initiation are reminders of the regenerative power of fire as it is described in the story of Ayasay and his son (Photo 5.1).

5.5 Living with Fire

Successfully collecting plant and animal resources requires a landscape user to know where and when to find them (Davidson-Hunt and Berkes, 2003). Much of the total species diversity of the boreal forest is associated with forest patches in different stages of successional development because of varying ages since the last disturbance (Rowe and Scotter, 1973). The seasonal fluctuations of the climate also have a dramatic impact on the availability and location of different resources. Waterways and wetlands become frozen over in winter and re-open in the spring. Animals and people change how and where they move across the land in order to access the resources they need, find shelter and avoid biting insects that make summer life in the bush difficult. In this section we describe a sample of bodies of knowledge possessed by Pikangikum resource users that are related to the presence of fire on the land. Each of these areas requires a number of related bodies of knowledge of processes that have spatial and temporal variations (Figure 5.2). These knowledge areas demonstrate the interconnections with their land that contributes to the creation of cultural landscapes.

Fire has many different direct livelihood applications including heating, cooking and smoking meat, fish and hides. Many of these uses continue to be important for livelihood activities and survival. Knowledge of tree species and wood condition that are necessary to produce the desired effects of heat and smoke is required for these activities.

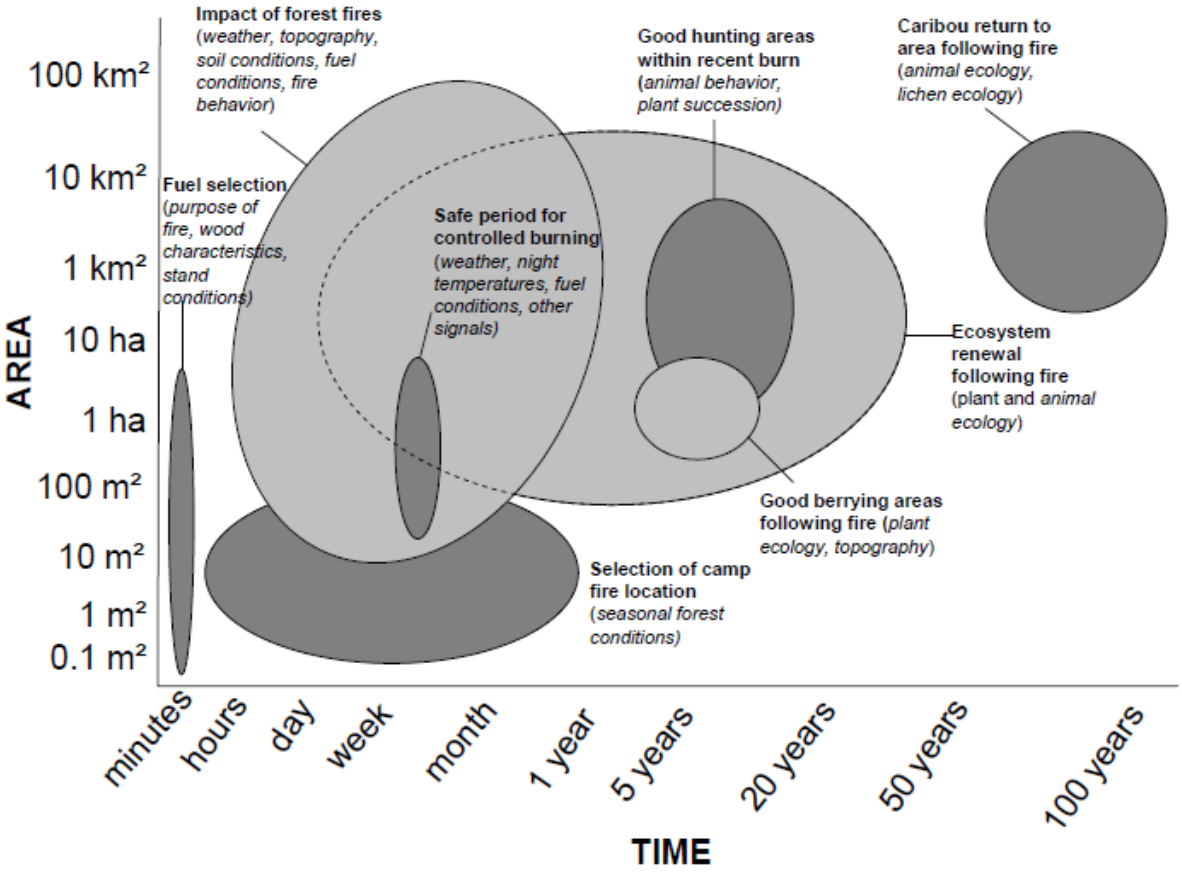

Figure 5.3. Spatial and temporal dimensions of knowledge related to fire use and its impacts held by Anishinaabe elders, and the areas of expertise they require.

As with many plant resources finding the right species requires the user to know where it can be found within a mosaic of disturbance patches in the landscape. Most people in Pikangikum utilize only standing dead trees rather than cutting green trees and

waiting for them to season. Recently burned areas are good places to find standing dead trees. Jack pine (***okik***) is the preferred fuel wood because of its high heat potential. Black spruce (***gahwandug***) produces many sparks and thick smoke that may cause a chimney fire. Trees which have been hit by lightning (***benaysee paginanatik***) are not used as firewood because it is believed that doing so angers the thunderbird that created it. If burned, the thunderbird will beat its wings causing the weather to warm (***gizhangay***). Poplar (***ahzahdeeg***) must be dry and almost crumbling (***peekwahtoosuhg***) before it is used to smoke meat, fish and hides (Photo 5.2). Newly dead poplar is referred

Photo 5.2. Steven Turtle showing an old woodpecker excavation in a piece of poplar that is *peekwahtoosuhg,* so dry it is almost crumbling. This wood is used to smoke meat (background) and cure hides. Photo: A. Miller.

to as ***kuhpuhpuhkeenay***. This name contains the root word for grasshopper (***puhpuhkeenay***) which reminds people of its tendency to shoot dangerous sparks like a leaping grasshopper.

Historically, households had a fire-keeper (***ehkowindaymahwach eshkotay***) whose duty was to maintain the fire within the hearth so that it would not need to be rekindled every morning. As an example of the depth of knowledge and intimate knowledge of the correct fuel selection, one elder described how, as a youth, he kept the family fire smoldering through the night by using black spruce cones that were infected by a cone boring insect (Quote 5.5.1 a.). Many houses in Pikangikum continue to rely on firewood as the primary source of heat. Householders must keep track of where suitable firewood is available, in order to keep a sufficient supply of fire wood for heating.

Because of demand for wood cutters have to travel several kilometers by snowmobile several times a week to wood cutting areas. Having a large wood pile through the winter for one's family and being able to provide it to elders, garners a person social status as a good provider. Different areas of the landscape are safer than others for constructing camp fires. Fires lit in areas with deep organic soils can escape control by smoldering below the surface of the ground. Once underground, fires become hard to detect and put out (Quote 5.5.1 b.). Underground fires can flare up when the weather warms and fuel dries out. Campfire site selection is somewhat relaxed during winter months when the ground is frozen and snow is deep. After the spring thaw when humidity is low, campfires are placed on bedrock or shore lines where water is on hand to suppress escaped fire (Quote 5.5.1 c.). Dense conifer stands with low-hanging dead

branches are particularly dangerous places to light campfires. Fires are never lit in these areas.

Fire behavior is linked to weather, topography, soil type and fuel conditions. Although relatively few fires reach large size, fire can burn down into deep organic soil, smolder through the winter, and reemerge in the spring after the duff dries out. The path that a fire takes is always from the west to the east following prevailing winds. Water bodies such as lakes and wetland areas frequently act as barriers to the spread of fire. However, wetlands can dry out sufficiently to burn and wind or updrafts from rising heat from a fire can carry burning debris aloft over lakes to ignite fuel on the opposite shore.

Elders describe fire behaviors observed under different forest conditions and suggest appropriate ways of dealing with these situations (Table 5.1). Elders with fire fighting experience describe their practice of keeping track of the closest body of water in case they needed to escape a flare up or a change in wind direction. Fires started by carelessness are reputed to be more destructive because they get occur when conditions are dangerous fires. In contrast, thunderbirds fires frequently extinguish themselves with rain that accompanies them. People are especially sensitive to fires started by visitors to tourist camps within their territory.

Forest fires pose a threat to a number of valuable resources and infrastructure that supports their use. The threat of fire around one's trapline cabin can be a cause of great stress for trappers. Trapline cabins contain trail radios, hunting and trapping gear, clothing, bedding, boat caches, are vulnerable to loss by fire and are costly to replace. Cabins are typically are constructed on large lakes using mature black spruce trees. Trees can be floated in to the cabin site in case of its destruction, but in cases of large fires this

Table 5.1. Pikangikum elders recognize several named fire behaviors which are best confronted with different suppression strategies.

Fire type	Anishinaabe term	Description	Action
Crown fire	***Keesheeyahkeetaah***	Fire moving rapidly through the tops of trees. Very dangerous.	Impossible to fight with hand tools. Escape.
Underground smoldering fire	***nooswuhkeekay auhnuhmuhguhmeeg***	Slow moving - Difficult to detect. Frequently occurs when fire gets into roots of large balsam fir.	Fire fighter needs to feel under the ground with bare or gloved hand. Requires "a good sniffer" - one who can smell new smoke several days after fire has stopped active burn.
Fire burning up a hill	***aaheekkuhmuhcheewayauh keetaak***	Moves fast	It's not safe to fight an up hill moving fire from above.
Fire burning down hill	***neesuhcheewee yuhkeetay***	Slow	Usually burns itself out.
Fire burning on level ground	***keetuhqwaag auhkee***	Usually can be contained	Can be fought using hand tools. Clear vegetation and organic soil.

may not be possible. Flying in lumber by float plane or bringing it in by snowmobile to stockpile for spring construction is very expensive. Trails and portages that access different parts of the trapline are also impacted by fire. Trees killed by fires begin to fall and block trails and portages several years after the fire. Travel by boat can also become more dangerous because of increased numbers of dead trees in waterways.

Fires can force trappers to temporarily reorient their use of their trapline while specific resources recover from the fire. This is especially true for trapping of fur bearing animals such as American marten (*Martes americana*, ***wabishayshee***), fisher (*M. pennanti*, ***oojeek***) and lynx (*Lynx canadensis*, ***bishiew***), which are associated with mature forests. In response to a fire, a trapper must shift his use to a different part of his own trapline,

5.5.1. Text Box. Quotes from Pikangikum elders describing their knowledge of fuels, placement of camp fires and different purposes for which controlled burns were set.

Quote 5.5.1 a. *But these cones had to be very particular. They can't be hard, eh. There's a little bug that goes into these, a worm, into these cones. These cones are open but the inside these cones because of that bug getting inside, it's all soft inside there. So these are the kind of cones that we had to use to put into the ash. And so in the morning when we wanted to get the fire started we would just stir that up. This is the way that our people were fire keepers*.
Norman Quill, April 27, 2007

Quote 5.5.1 b. *One of the things we have to tell our young people is when they are out in the bush is to make their fires on rock, not on soil. Deep soils* (***noosowakahmeegeeteg***) *can catch fire. If you do put your fire in that area, you really need to put that out, really soak it with water. Eventually it will spread if you miss a burning coal by a whisker. You really have to soak the moss.* Oliver Hill January 29, 2008

Quote 5.5.1 c. *This kind of camp fire with the rocks all around it, our people would not build a fire like that. They would only build fires where it was safe. That's the White hunters doing that. Our way was to build fires on a big rock – near the water. Never someplace where the fire might go into the ground. We were always very careful with fire. We have a clean record. We would build a fire by the shoreline*. Mathew Strang June 12, 2006

Quote 5.5.1 d. *I see that fire plays an important role on the land. When we hunted the land, when we walked that place* [a recently burned area] *everything was just burnt. Burnt! Just the ashes were left, you could see the pure sand, the soil was burnt, the rocks. I'm just fascinated by that and that over the years it has grown back up. Once again the forest is growing. The trees that were there are coming back. I was really amazed by that*. Oliver Hill August 24, 2006

Quote 5.5.1 e. ***Pishashkooseewuhseekaag*** *…was to burn the old grass so that new grass would grow. As a young boy I would see my father perform this, perform this burning the old grass. He usually did it in the early spring when the ice was still on the lake.* ***Emijayskwaak*** *- clear ice. It was the time when the ducks were back, when they were hunting ducks. That was the time…The real reason was to burn the old grass out. The reason why he wanted that grass to grow was so that he could use that grass to put into his potato pits.* Norman Quill October 30, 2007.

Quote 5.5.1 f. *Long grass. Tall ones. That's why they burned. To walk there. The ground was too bumpy, hilly. That's why they burnt the tall grass.* ***Eshpashkooseewahseekah***. *So that they could see where to step.* Solomon Turtle October 23, 2006.

Quote 5.5.1 g. *It was not for nothing that we lit fires. We always did it for a purpose. It was always very serious.* Oliver Hill April 13, 2007

Quote 5.5.1 h. *We did this as we were traveling only when the ice was still on the lake. Where ever we were traveling and we saw that it would be useful to the land if we burned. Our people received this teaching to burn certain places from the Creator. They knew it as part of our culture.* Charlie Peters October 5, 2006

switch activities to exploit different resources, negotiate with another trapper for the use of his area or forego trapping. Relearning how to get around one's trapline and where valuable species are active following a fire takes time and effort.

Although forests appear destroyed and the deep organic duff layer consumed by a fire, experience tells elders that these locations will recover to their previous condition given time. Elders believe that the land will regenerate in an area that was burned to the same conditions as before a fire (Quotes 5.5.1 d.). Ash (***pingway***) left by a fire is fertilizer that prompts vigorous new growth (***meenogeen***) of plants. Downed woody debris protects delicate soils from blowing or washing away following a fire. The process of an area returning to pre-fire conditions may take more than half a century. Elders are familiar with the process and features occurring at different points throughout this cycle (Miller and Davidson-Hunt, *in press*).

Historically indigenous peoples in the boreal forest set fires in the spring and fall when temperatures and fuel conditions created easily controlled burn. These fires were qualitatively different than lightning fires which occur when weather and fuel conditions may increase fire behavior rates (Johnson, 1992; Whalen, 1995). Controlled burning in Pikangikum was largely stopped by provincial forest managers in the 1950s, although many elders witnessed or participated in controlled burns in their youth. The last recorded controlled fire was set in 1996 by elder and head trapper, Oliver Hill and his grandson. Fire is still used by community members to clear rubbish and dead grasses and annuals from around peoples' houses in the community in the spring time. The most common purposes for setting fires were to clear dead plants and refuse around cabins, to clear and prepare garden areas, to create habitat areas for muskrats and ducks, to maintain

river travel corridors, and to promote growth of grasses for winter storage pits and dog beds (Quotes 5.5.1 e, 5.5.1 f.). Relative to naturally occurring wildfires, these burning practices affected a small portion of the overall landscape (Figure 5.3). Fires were set with specific goals in mind (Quote 5.5.1 g) although they often achieved several goals (e.g. moose ***moos***) were often attracted to willow on the edges of burnt muskrat marshes). Most elders indicated the proper season for burning was the late spring between March and April when the ice just begins to break up (***ameenokamin***), however, others state that fires could also be set in the fall if the proper signals were observed. Signals for spring burning include: a change in the color of lake ice from cloudy to clear as it begins to melt, small streams beginning to flow again and when daytime temperatures are warm while nighttime temperatures continue to fall below freezing. These signals occur only in a narrow window of several days to several weeks. In order to take advantage of them, trappers need to be moving across their land monitoring conditions across the areas the wish to burn (Quote 5.5.1 h.).

Another key to successful burning is the weather and wind direction. Fires were set in the late afternoon on a warm day with little wind or wind that was blowing in the direction of open water. These precautions were taken so that sparks would not be blown into the bush and thus threaten the homes and food of other animals. Elders timed burns in the afternoon so that the cold nighttime temperatures would slow the rate of ignition and spread of the fire. During this time of year shaded areas are slower to warm up than

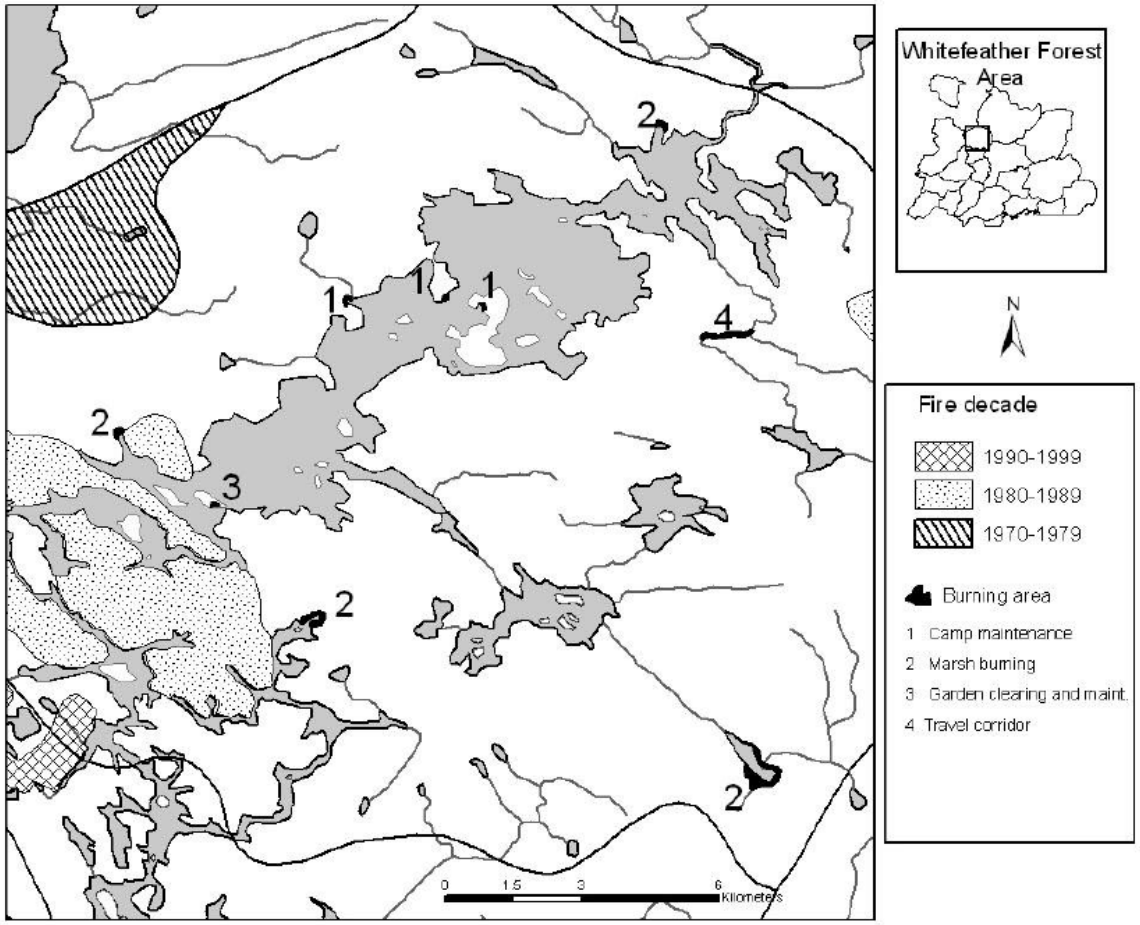

Figure 5.4. Controlled burns conducted for a variety of purposes within a single trapline between 1940 and 1970.

areas in direct sunlight such as were targeted for burning (Lewis, 1982; Lewis and Fergusson, 1988).

Stand replacing fires can kill trees and other plants over large areas, thus impacting food, shelter, travel corridors and other resources available for many animal species (Fisher and Wilkinson, 2005). Even before fires are completely extinguished however animals begin to reoccupy areas that have been burned. Moose and rabbits appear in burnt areas while smoke is still rising to eat smoked leaves and char bark because "they like the taste". Bears turn over rocks and tear apart logs that have been

partially burnt to reveal ants. According to elders, the regrowth stimulated by fires is good for many animal species which they prefer for food. Moose and snowshoe hare reach higher abundance in burns and adjacent areas than occurred prior to the fire. This is taken as evidence that the Creator is caring for the people and for the other animals by periodically sending thunderbirds to renew the land (Quote 5.4.1 e.).

Within several months after a fire, poplar resprouts from underground roots and can reach more than a meter in height. Moose are attracted to this fresh growth that they eat in the fall and over the winter. During the fall moose hunt, hunters stake out areas along the edges of burned areas where moose are more common or find hill tops that provide a clear vista from which to spot game from a long way off. As new trees grow moose become progressively more difficult to view from a distance even though the number of moose may not actually decline. As a result moose hunting may decline after fifteen years or so in these areas. Snowshoe hares (***wahboos***, *Lepus americana*) eat young jack pines, which grow rapidly in fire areas. They continue to be a favorite bush food and are trapped in snares along trail edges especially in the winter, spring and fall seasons. Snowshoe hares are recognized as the basis for food chain reorganization by serving as food for fur bearing predators. (Quote 5.5.2 a.). During months with snow-cover trappers look for tracks of marten and other fur bearers as they move around their trapline. Areas where rabbit tracks are common receive extra attention to see if predators are making use of them. The disappearance of rabbits from snares is a sign that predators are also present and signal a trapper to set his marten traps in that area.

Blueberries (***meenan,*** *Vaccinum* spp.) are a favorite food. Although blueberry plants may not be visible in a site before it is burned, elders state that berries and many

Text box 5.3. Quotes from Pikangikum elders addressing their knowledge of ecosystem renewal and the impacts of climate change on the role of fire in the environment.

Quote 5.5.2 a. *Rabbit favors new growth area. When you look at rabbit I think it is like a food chain for animals. Rabbits have three litters a summer. Fox, lynx, marten all depend on rabbit. The Creator has to care for all animals so he sends thunderbird to earth to make food for rabbit. We like to eat rabbit too. So he burns for us too.*
Whitehead Moose July 20, 2006

Quote 5.5.2 b. *Where fire comes to rock area, blueberries come after the fire and feed a lot of animals. We eat blueberries too. Fire makes good food areas. Mature forest cannot make good food areas.* Whitehead Moose July 20, 2006

Quote 5.5.2 c. *There were caribou around in that area for many years but a fire drove them away. Now they are coming back because after many years their food is growing again. So you see the caribou is part of the thunderbird cycle too*.
George B. Strang March 1, 2008

Quote 5.5.2 d. *Have you noticed that every summer that it's different? Every summer with these storms in our area. Like last summer I noticed a storm that was different from any other storm that I have noticed in our area. There was continuous noise on the south side. It sounded like the thunderbirds. It seems to me that we have the thunderbirds are different every summer and we don't know what they will bring. We don't know what the future holds.* George M. Suggashie December 18, 2007

Quote 5.5.2 e. *And what we were taught from our great grandfather or grandfather is that if the thunder comes from the north to the south then the world is not going to exist for much longer. Or if you hear the thunder that come from the north that's what we were taught. And that's what he always remembers is that thunder always comes from the west. And now he is beginning to notice that the thunder is starting to come from the northwest or even from the south west going up. These were one of the things that we were taught by our elders that the world is getting close to the end. And I guess that's the reason that the thunder is real to us or to the Anishinaabe*. Oliver Hill January 29, 2008

other plants arise from roots which are present in the earth (***ahkee***) which protects them from the destructive forces of fire. They report that good crops of blueberries are present

around rocky areas three years after a fire and may last as long as ten years. Berries become ripe in August (***Atitayminowigeezis***, "berries coming ripe month"). Some elders report traveling half a day from camp sites in order to harvest berries from prime collecting areas, which had burned several years earlier. Berries following fires are also utilized by many animals including bears, game birds and foxes (Quote 5.5.2 b.). Only one elder reported improving berrying sites as an intended outcome of controlled burning. This stands in contrast to reports of other peoples of the boreal forest (e.g. Lewis, 1982; Lewis and Ferguson, 1999; Natcher et al. 2007).

Black bears (***makwah***, *Ursus americana*) are frequently found in berry patches following fires. Several elders express the opinion that bears are capable of starting fires by scraping their claws against rocks to throw a spark. Bears do this because they know that berries will grow after a fire and be available as food. This statement is a clear expression of the view that bears are sentient and capable of starting fires in order to improve availability of forest resources.

Woodland caribou (***ahtik***, *Rangifer tarandus*) are a threatened species in the province of Ontario. Elders regard them as requiring many of the same things that human beings need: freedom to roam widely and find partners, forest homes in which to live and raise their family, and the ability to take what they need from the land to survive (O'Flaherty et al. 2006). Woodland caribou are wide ranging species whose winter food consists of terrestrial lichens (***wahpuhkahmik,*** *Cladina* spp., reindeer lichen and ***wuhkoonuhk,*** rock tripe) and arboreal lichens (***weesuhpaynjahk,*** *Bryoria* spp. horse hair) (O'Flaherty et al. 2006). Caribou require a range of habitats over the course of the year, including winter feeding areas with abundant lichen, early spring and fall travel corridors

and spring-summer calving areas on islands and in mushkeg areas. Large fires can either destroy these areas or fragment them and making them inaccessible by causing their trails to disappear. Elders and hunters have observed that following fires, caribou are often absent for prolonged periods of up to five or six decades but have always returned (Quote 5.5.2 c.).

5.6. Discussion and concluding comments

Despite the historic inability of Pikangikum residents to fully control large forest fires, it should be evident from the preceding research that large fires have indeed contributed to the creation of Pikangikum cultural landscapes. It is the perception of Pikangikum residents that landscape patterns of succession are created through the intentional actions of the thunderbirds. These spaces are viewed as ordered places, created by the thunderbirds so human beings and other members of the land community can successfully make a living. They are not neutral spaces bereft of human values and meaning, surrounded by more meaningful places which humans manage and travel through. There is no such neutral place within the Pikangikum landscape. Our research provides an empirical illustration of the claim made by ethnographers that indigenous concepts of territory may not match competing worldviews which define indigenous territories as bounded spaces and resources (Hierro and Surrallés, 2005). Cultural landscapes arise from the continually renegotiated interaction of human and non-human beings that are understood to be present within a specific place by a specific people. As such, the cultural landscape concept is an important tool that indigenous peoples are

employing to re-establish their relationships to territory, to the beings that inhabit it (Hierro and Surralles, 2005), and as our research suggests, to the ecological processes which contribute to its composition and structure.

The study of indigenous peoples' land management practices and their importance to the maintenance of sites should continue to be priorities in areas where they are poorly understood. However, the depth of knowledge of fire demonstrated by Pikangikum residents should alert us to the importance of expanding the scale of inquiry to more fully encompass the ecological processes present within an area as they are understood by research communities. As this work also demonstrates, the possibility of non-humans possessing agency may merit considered when undertaking cross-cultural research or planning collaborative management.

Indigenous cultural landscapes can lead to novel resource management approaches (Davidson-Hunt, 2003; Young et al. 2003) but require that indigenous land management institutions (rules in use) and organizations be able to express their values in the shaping of management decisions affecting their territories. Currently Pikangikum First Nation and OMNR are engaged in a dialogue that will contribute to determining the future role of fire within the Whitefeather Forest landscape (Miller et al. 2008; Miller et al. *in press*). New economic activities such as commercial forestry may realign Pikangikum interactions with fire and other beings in their landscape. As timber harvests become possible it is likely that increased fire suppression of merchantable stands may be supported by Pikangikum residents. These potential changes should not be regarded as implicitly being in conflict with the maintenance of an Anishinaabe cultural landscape. Pikangikum elders have expressed their desire to have relationships with fire on their

own terms in expressions of their own values. Nor should it be assumed that the relationships to fire and the spaces it impacts which Pikangikum residents would choose are identical to those expressed by non-Anishinaabe Canadian society.

5.7. Acknowledgements

Funding for this project was provided by Sustainable Forest Management Network (Davidson-Hunt, PI), Social Sciences and Humanities Research Council (Davidson-Hunt, PI), a grant from Environment Canada, Aboriginal Capacity Building Fund 2006 – 2007 (Whitefeather Forest Management Corp.) and a University of Manitoba Graduate Fellowship (Miller). The authors owe a debt of gratitude to the people of Pikangikum. Among them elders Oliver Hill, Whitehead Moose, Norman Quill, Tom Quill, George B. Strang, Mathew Strang, and Solomon Turtle stand out for their participation in field trips and numerous interviews. Members of the Whitefeather Forest Management Corporation, Marcella Keejik, Charlie Pascal, Paddy Peters, Reggie Peters, and Murray Quill provided translations and technical assistance.

5.9. References

Agnew, John A., David N. Livingstone, and Alisdair Rogers. 1996. *Human Geography: An Essential Anthology*. Blackwell Publishing, Oxford.

Anderson, M. K. and M. G. Barbour. 2003. Simulated Indigenous management: a new model for ecological restoration in National Parks. Ecological Restoration 21(4): 269-277.

Barrera-Bassols, N. and J. A. Zink 2003. Ethnopedology: a worldwide view on the soil knowledge of local people. Geoderma. 111(3-4): 171-195.

Beaucage, P. and the Taller de Tradicion Oral del CEPEC. 1997. Integrating innovation: the traditional Nahua coffee-orchard (Sierra Norte de Puebla, Mexico). Journal of Ethnobiology 17 (1): 45-67.

Berkes, F. and I. J. Davidson-Hunt 2006. Biodiversity, traditional management systems and cultural landscapes: examples from the boreal forest of Canada. International Social Science Journal. 187: 35-47.

Birks, H. H., H. J. B. Birks, P. E. Kaland, D. Moe. eds. 1988. The cultural landscape: past, present and future. Cambridge University Press.

Black, M.B. 1977. Ojibwa taxonomy and percept ambiguity. *Ethos* 5:90-118.

Blondel, J. 2006. The 'design' of Mediterranean landscapes: a millennial story of humans and ecological systems during the historic period. Human Ecology. 34(5): 713-729.

Boyd, R. ed. 1999. Indians, fire and the land in the Pacific Northwest. Oregon State University Press.

Brown, J. S. H. and S. Gray. 2009. Memories, myths and dreams of an Ojibwe leader, William Berens, as told to A. Irving Hallowell. McGill-Queen's University Press.

Brown, J. S. H. and C. R. Wilson. 2004. The Northern Algonquians: a regional overview. In: B. Morrison and C. R. Wilson. (eds.). Native peoples: the Canadian experience. 3rd ed. McClelland and Stewart, Toronto.

Buggey, S. 2004. An approach to Aboriginal cultural landscapes in Canada. In: I. Krupnik, R. Mason and T Horton, eds. Northern ethnographic landscapes: perspectives from the circumpolar nations. Arctic Studies Center, National Museum of Natural History, Smithsonian Institution. Washington, D.C. pp.17-44.

Clément, D. 1998. The historical foundations of ethnobiology (1860–1899). Journal of Ethnobiology 18:161–187.

Davidson-Hunt, I. J. 2003. Indigenous lands management, cultural landscapes and Anishinaabe people of Shoal Lake Northwestern Ontario, Canada. Environments 31(1): 21-40.

Davidson-Hunt, I. J. and F. Berkes 2003. Learning as you journey: Anishinaabe perceptions of social ecological environments and adaptive learning. Conservation Ecology 8(1):5. URL: http:www.consecol.org/vol8iss1/art5

Diamond, J. and K. D. Bishop. 1999. Ethno-ornithology of the Ketengban people, Indonesian New Guinea. In: D. Medin and S. Atran, eds. Cambridge, Mass.: MIT. 17-46.

Giddens, A. 1979. Central problems in social theory: action, structure and contradiction in social analysis. London: Macmillan.

Hallowell, A. I. 1960. Ojibwa ontology, behavior and world view. In: S. Diamond ed. Culture in history: essays in honor of Paul Radin. Columbia University Press. 19-52.

Hierro P. G. and A. Surrallés 2005. Introduction. In: A. Surrallés and P. G. Hierro (eds). The land within: Indigenous territories and the perception of the environment. IWGIA. Copenhagen.

INAC (Indian and Northern Affairs Canada). 2006. General Information: Registered Population: Pikangikum. URL:

http://sdiprod2.inac.gc.ca/FNProfiles/FNProfilesK._GeneralInformation.asp?BAND_NUMBER=208&BAND_NAME=Pikangikum (Accessed October 2, 2007).

Johnson, E. A. 1992. Fire and vegetation dynamics: studies from the North American boreal forest. Cambridge University Press.

Laris, P. 2002. Burning the seasonal mosaic: preventative burning strategies in the wooded savanna of southern Mali. Human Ecology. 30(2): 155-186.

Lewis, H. T. 1982. A time for burning. Occasional publications No. 17, Edmonton: Boreal Institute for Northern Studies, University of Alberta.

Lewis, H. T. and T. A. Ferguson. 1988. Yards, corridors and mosaics: how to burn a boreal forest. Human Ecology 16(1): 57-77.

Lewis, H. T. 1993. Patterns of Indian burning in California: ecology and ethnohistory. In: T. C. Blackburn and K. Anderson eds. Before the wilderness: environmental management by Native Californians. Ballena Press: Menlo Park, CA. 55-116.

Li, C. 2000. Fire regimes and their simulation with reference to Ontario. In: A. H. Perera, D. L. Euler and I. D. Thompson eds. Ecology of a managed terrestrial landscape: patterns and processes of forest landscapes in Ontario. Vancouver: UBC Press. 115-140.

Martin, C. 1982. Keepers of the game: Indian-animal relations in the fur trade. University of California Press. Berekley.

Miller, A. M. and I. J. Davidson-Hunt. In review. Talking about fire: Pikangikum First Nation elders guiding dialogue about fire management. Canadian Journal of Forest Research.

Miller, A. M., I. J. Davidson-Hunt, M. O'Flaherty. 2008. Pikangikum First Nation and Forest Fire Management: old and new knowledge of fire. Sustainable Forest Management Network. Research Note Series 37. 5 pp.

Mistry, J., A. Berardi, V. Andrade, T. Krahô, P. K. and O. Leonardos 2005 Indigenous Fire Management in the *cerrado* of Brazil: The Case of the Krahô of Tocantíns. Human Ecology 33(3): 365-386.

Natcher, D. C. 2004. Implications of Fire Policy on Native Land Use in the Yukon Flats, Alaska. Human Ecology 24 (4) 421-441.

Natcher D. C., M. Calef, O. Huntington, S. Trainor, H. P. Huntington, L. DeWilde, S. Rupp, F. S. Chapin III. 2007. Factors contributing to the cultural and spatial variability of landscape burning by native peoples of interior Alaska. Ecology and Society 12(1): 7 http://www.ecologyandsociety.org/vol12/iss1/art7/. Accessed: August 2008.

O'Flaherty, R. M., I. J. Davidson-Hunt, A. M. Miller. 2009. Anishinaabe stewardship values for sustainable forest management of the Whitefeather Forest, Pikangikum First Nation, Ontario. In: M. G. Stevenson and D. C. Natcher eds. Changing the culture of forestry in Canada. CCI Press and the Sustainable Forest Management Network. Edmonton, Alberta.

O'Flaherty, R. M., I. Davidson-Hunt, M. Manseau 2006. Keeping woodland caribou (Ahtik) in the Whitefeather Forest. SFM Network Research Note Series No. 17. Sustainable Forest Management Network. http://www.sfmnetwork.ca/docs/e/E27%20Caribou%20in%20the%20Whitefeather%20forest.pdf. Accessed: June 2008.

Ontario Woodland Caribou Recovery Team. 2008. Woodland Caribou (*Rangifer tarandus caribou*) (Forest-dwelling, Boreal Population) in Ontario. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. 93 pp..

Phillips, A. 2002. Management Guidelines for IUCN Category V Protected Areas: Protected landscapes and seascapes. IUCN. Best Practice Protected Area Series No. 9.

Pikangikum First Nation and Ministry of Natural Resources 2006. Keeping the Land [Cheekahnahwaydahmungk Keetahkeemeenaan] A Land Use Strategy for the Whitefeather Forest and Adjacent Areas. http://www.whitefeatherforest.com/pdfs/land-use-strategy.pdf July 2008.

Pyne, S. J. 1995. World fire: the culture of fire on Earth. University of Washington Press. Seattle.

Rowe, J. S. and G. W. Scotter, 1973. Fire in the boreal forest. Quaternary Research 3: 444-464.

Russell-Smith, J., D. Lucas, M. Gapindi, B. Gunbunuka, N. Kapirigi, G. Namingum, K. Lucas, P. Giuliani and G. Chaloupka 1997. Western Arnhem Land, monsoonal northern Australia: notes for prehistory, lessons for the future. Human Ecology. 25(2): 159-195.

Russell-Smith, J., S. Djoeroemana, J. Maan and P. Pandanga. 2007. Rural livelihoods and burning practices in savanna landscapes of Nusa Tenggara Timur, Eastern Indonesia. Human Ecology. 35(3): 345-359.

Sauer, C. O. 1927. Recent developments in cultural geography. Recent Developments in the Social Sciences. Philadelphia: J.B. Lippincott. 154-212.

Sauer, C.O. 1925. The morphology of landscape. University of California Publications in Geography 2(2):19-54.

Smith, T. 1995. The island of the Anishnaabeg: thunderers and water monsters in the traditional Ojibwe life-world. Moscow, Idaho : University of Idaho Press.

Stewart, O. 2002. Forgotten fires: Native Americans and the transient wilderness. University of Oklahoma Press. Norman.

Toledo, V. M. 2002. Ethnoecology: a conceptual framework for the study of indigenous knowledge systems. In: J. R. Stepp, F. S. Wyndham and R. S. Zarger (eds.) Ethnobiology and biocultural diversity. Proceedings of the Seventh International Congress of Ethnobiology. Athens, Georgia. 511-522.

Trusler, S. and L. M. Johnson. 2008. "Berry patch" as a kind of place – the ethnoecology of black huckleberry in northwestern Canada. Human Ecology 36:553 – 568.

Weber, M. G. and B. J. Stocks 1998. Forest fires and sustainability in the boreal forests of Canada. Ambio 27 (7): 545-550.

Weir, J. M. H., E. A. Johnson, and K. Miyanishi. 2000. Fire frequency and the spatial age mosaic of the mixed-wood boreal forest in western Canada. Canadian Ecological Applications 10: 1162-1177.

Whalen, R.J. 1995. The Ecology of Fire. Cambridge University Press. Cambridge.

Williams, G. W. 2000. Aboriginal use of fire: are there any "natural" plant communities? In: C. E. Kay and R. T. Simons eds. Wilderness and political ecology: aboriginal influences and the original state of nature. Salt lake City, UT: University of Utah Press. 179-213.

Wylie, J. W. 2007. Landscape. Routledge. London.

Appendix 5.1. An Anishinaabe man marries a thunderbird woman, as told by Oliver Hill, August 29, 2006. Translated by Paddy Peters.

So one of the other teachings that we were told is that there were no legends to be told during the summertime. One of the legends is…where there were seven brothers. The oldest brother's name was Oocheyinjik. So out of this, man came with the theory of the Thunderbird.

Just to get a piece of a story, of a long story of these seven brothers. They all went out hunting one day and in the evening they came back to the camp, to their camp, and someone had come to the camp to set up and to clean up their camp and to put a new set of bough inside their teepees in their lodgings someone had come and cleaned up.

So, the story goes that they wanted to know who this person was who came to their camp to fix up their camp for them so they had a great meeting and so Oocheyinjik would wait in the camp to see who this person was who came to clean up this camp. He waited all day and no body came. They all took turns in the coming days but nobody ever came to the camp.

So as the story goes, finally the youngest brother was his turn to wait for this person in the camp – he waited all day until the evening. He heard someone coming to the camp. That person came and he heard this person come and drop wood on the ground, eh? That person left the camp and came back a second time and dropped more wood on the ground, eh? So after the second time, knowing that the person's presence the second time, finally that person came into the teepee where the youngest brother was waiting. So as soon as the person entered the teepee where he was, he was amazed to see the most beautiful girl standing there. The most beautiful girl… And right away the young girl fixed the bough floor, put new boughs on the floor of the teepee. And right away, this young girl wanted him. Just like Mathew wants these women, eh? This young girl wanted this young man, eh? She wanted to marry this young man right away. So they slept together.

So this beautiful girl told the youngest brother what to say when his brothers came home. "Take off your moccasins and your mitts and give them to me. I will dry them for you." So his brothers came home and this brother told them to take off their moccasins and their mitts and this young girl will dry them. And that's what they did. But the oldest brother, Oocheyinjik was not there. He came later, eh? When he arrived he was told to take off his moccasins and mitts and give them to this girl. But he refused that. He was suspicious. He didn't want to do that, eh? Because at the same time, he envied his brother – that his brother had a beautiful girl.

So the story goes, in the morning they all left to go hunting again. But the oldest brother, with suspicions, only went a short way and returned back to the camp to spy on this girl. This girl was working inside…just outside the teepee, there. So this oldest brother took out his bow, took out his arrow and shot at the girl. He wanted to kill her because of his

envy. Because his brother had a nice woman with all her nice long hair. So when the youngest brother came home he could not find his wife. So he went out looking for her. Eventually he found blood on the snow and her tracks. He followed the tracks. And wherever the tracks went this is where the young man went. It's a long story, but while he was tracking his wife there were different animals that helped him on the way. Eventually he met up with a squirrel and the squirrel told him that the direction you are going is going to be very very hard. You're going to have to go to this very high high mountain. This is where the squirrel told him he would have to go, to look for his…to look for your wife.

So this long story, just to cut it short, the man climbed the mountain. And on the top of the mountain he came to a village, on the mountain, eh? So before he entered the village he left his weapons behind. So he went into the village and found his wife laying inside a teepee because she was wounded from that arrow. So that evening the men of that village came back from their hunt. And that young man was inside the teepee with his wife and suddenly he heard this loud thunder. And he wondered where this thunder was coming from. But little did he know that this woman that he was with was a Thunderbird woman that this woman belonged to this Thunderbird people, this Thunderbird village. So this young woman, this Thunderbird girl, her father was a Thunderbird man, eh? And the reason why the loud noise was that they knew that this young man had left something behind which was his weapons. The reason why the father-in-law made all this loud noise was because he was afraid of the weapons of this young man.

So this young man lived with his wife in that village. So whatever was brought to him, whatever the Thunderbirds ate, this is what was fed to him. Snakes, whatever that the Thunderbirds ate this is what he had to eat. So one day he went out hunting and he found some blue water on the rock, eh? So he took some of this blue water and smeared it all over his body. So when he got home his father-in-law noticed this blue color all over his body. And his father-in-law right away knew why he had this blue color on his body. Because he had found a bear, an underground bear. An underground bear is one of those creatures that lived under the ground. A large bear. So they all went to this area where he found this blue, blue liquid on the rock. This is where the underground bear was. So they used a small hawk to survey that area there for this bear. And all these Thunderbirds surrounded that area making all these loud noises to scare up the bear. So one of the old Thunderbird's son apparently saw this bear. The young son had sharp talons and grabbed the bear on the side, in the rib area. And his talons got stuck, stuck into the bear. And he couldn't pull out his talons. And the bear went under the ground and took this young Thunderbird with him under the ground. And the young Thunderbird was never seen again.

So the story goes that the young son, that old Thunderbird's son was taken under the ground by the large bear creature. So the youngest son who came to marry into the Thunderbird people somehow seen a very large crack into the earth. And he could see way down way deep under the earth and could see way down lightning coming from under the ground way in the distance way down under the ground. And he knew that it was the old Thunderbird's son that had been pulled under the ground. So the story goes

that this young man rescued that young man, they say, his brother-in-law eh? And brought him back up to the old Thunderbird. And the old thunderbird was really happy to see his son again. And he told this young man that I'm going to pay you. I'm going to pay you. I got six more daughters I want you to take as a payment. I want you to take my daughters with you when you go back for your other brothers that are over there. Let your brothers marry my daughters, eh? And so he went back to his brothers and brought all these girls with him eh? And all his brothers were married. Even that oldest brother was very happy to finally have a woman.

So that's where I'll cut my story off.

CHAPTER 6: **TALKING ABOUT FIRE: PIKANGIKUM FIRST NATION ELDERS GUIDING FIRE MANAGEMENT DIALOGUE**[4]

Photo 6.1 Pikangikum elder Oliver Hill and grandson Howard Owen at *Beezhoo Zahgeeguhnins* (Lynx Lake), an area they burned last in 2003. "We've gotten a lot of food from this area. We have to respect it." October 4, 2006. (Photo: A. Miller)

6.1 Abstract

This paper examines how customary knowledge of fire held by elders in Pikangikum First Nation, Ontario is transformed and applied in a dialogue about fire management in the Whitefeather Forest. Through collaborative research strategies including interviews, visits to historic fire sites, and community meetings with Ontario Ministry of Natural Resources (OMNR), we documented elders' knowledge of fire behaviour, forest

[4] As of April 28, 2009 a version of this chapter co-authored by Andrew M. Miller, Iain Davidson-Hunt, Paddy Peters and the Elders and trappers of Pikangikum First Nation[2] is under review for publication with the Canadian Journal of Forest Research.

[2] Elders and trappers of Pikangikum First Nation are: Oliver Hill, Ely Kejick, Jake Kejick, John-Pierre Kejick, Whitehead Moose, Peter Paishk, Charlie Peters, Jimmy Peters, Jake Quill, Norman Quill, Peter Quill, Tom Quill, Lucy Strang, Mathew Strang, Robert Strang, Timmy Strang, William Strang, Alec Suggashie, Tony Suggashie, and Solomon Turtle.

disturbance and renewal cycles, historic traditional controlled burning practices, and perspectives on current fire management policies. Elders applied their knowledge of fire to the development of six future directions for fire management in the Whitefeather Forest that can be summarized in three themes: the need for continuing dialogue with OMNR; extending traditional teachings of fire safety to community youth; and, recognition of the community's ability to practice fire use for traditional burning and developing silvicultural methods based on traditional teachings.

"Patience. Patience. They are just lighting the match to light the fire in their mind. They have the knowledge."

Paddy Peters, remarking on elders' consideration of key findings summarizing research on potential role of fire in Whitefeather Forest Planning Area.

6.2 Introduction

Great attention has been given to recording the knowledge indigenous peoples possess of their environments. This body of knowledge, labeled traditional ecological knowledge (Berkes, 1999), indigenous knowledge (McGregor, 2004), or local knowledge (Sillitoe and Bicker, 2004) has been indicated as a source of valuable information for development (Brokenshaw et al. 1980; Sillitoe and Bicker, 2004), community-based management, or co-management, and resource management in general (Spaeder and Feit, 2005; Berkes 2008). However, indigenous scholars and others have pointed out unequal power relations are often present when indigenous people's knowledge is used in these contexts. While communities contribute important information, outside interests often maintain control of decision-making (Nadasdy, 2005; 2004); "co-management is the process whereby 'we cooperate and you manage'" (cited in McGregor, 2000). Others

state that by accepting the term "traditional" indigenous ways of knowing are threatened with stagnation and deprive indigenous people of the right to adapt (McGregor, 2004).

This paper presents a case study of how elders of Pikangikum First Nation engaged in the documentation of their knowledge and through the process participated in the transformation of this knowledge to address current resource management concerns. This approach draws upon recent literature regarding planning forums and place-based learning community (Healey, 1997; Davidson-Hunt and O'Flaherty, 2007). A research approach structured with these ideas in mind focuses on:

> *supporting people in responding to their own needs, developing a capacity to generate their own research projects, creating and supportive relationships with other actors through the building of dynamic process for the coproduction of relevant knowledge.* (Davidson-Hunt and O'Flaherty, 2007: 295)

Our paper begins with a brief overview of the literature regarding indigenous fire knowledge and practices as well as the specific case we discuss in this paper; namely, Pikangikum First Nation and the Forest Initiative. We then present the methods that were used in the research approach and organize our discussion of the research findings under six future directions identified for fire management in the Whitefeather Forest.

6.3 Indigenous fire management

It has become increasingly accepted that indigenous peoples managed vegetation communities across North America through selective controlled burning (Williams,

2000a). Fire was utilized across many ecosystems for purposes as varied as: tree felling; managing pests; improving forage for prey species; clearing agricultural fields; maintaining open travel corridors; creating fuel breaks around camps and villages; increasing productivity of berry patches and root crops; producing basketry material; and warfare (Williams 2000a; Stewart et al. 2002). It has been documented that these practices diminished due to processes of colonization that included European occupancy, the imposition of state fire management regimes and the demographic collapse of Indigenous populations (Cronon, 1983; Kimmerer and Lake, 2001). Ethnoecologists, anthropologists, historians, and ecologists have worked with historical documents, biophysical remains, and with surviving practitioners and Elders to refine regional pictures of the methods and the scales of burning practices.

This renewed interest in human uses of fire in shaping landscapes is often traced to the work of Carl Sauer (1947) and Omar Stewart (1955; 2001). Since that time, research has documented the specific linkages between indigenous burning practices and vegetation in California (Anderson, 2006), the Pacific Northwest (Boyd 1999; Deur and Turner 2005), the boreal forest (Lewis and Ferguson, 1988; Davidson-Hunt, 2003), as well as a broader North American overview (Pyne, 1997). Much of the focus in previous research was in reconstructing fire practices and fire ecologies for such regions. This was a necessary step to correct the colonial perspective of indigenous lands as a wilderness, or "terra nullius", and thereby free to take up and occupy (Cronon, 1983; Richardson, 1993). Recent interest has turned to the potential of rediscovering such practices for contemporary land management in parks (Williams, 2000b; Anderson and Barbour, 2003). This research has begun to bring about a renewed respect for indigenous burning

practices and an openess to the role such knowledge may play in contemporary resource management (Berkes and Davidson-Hunt, 2006). Through this half-century documentation of indigenous people's knowledge of and practices employing fire, it now seems that resource managers are willing to include these findings in their fire management strategies. However, indigenous peoples may be more concerned with their participation in the setting of priorities and directions for fire management within their territories.

6.4 Pikangikum First Nation and the Whitefeather Forest

First Nations in Canada are increasingly reassuming responsibilities for resource management in their traditional territories. One example of this trend is the Whitefeather Forest Intiative of Pikangikum First Nation in northwestern Ontario (www.whitefeatherforest.com). Pikangikum First Nation (Figure 6.1) is an Anishinaabe [Ojibwa] community of approximately 2,300 people in northwestern Ontario. The community is noted for its high retention of the Anishinaabe language. It is geographcially isolated, accessible by plane or boat during the summer months and 80 km of winter road after freeze-up. Although it has been deeply affected by the collapse of the fur and commercial fishing economies, traditional subsistence activities including berry picking, fishing and hunting waterfowl and moose continue to contribute to many family economies.

Pikangikum is located in the boreal forest which is composed of tree species that have evolved with and are adapted to periodic, large scale fire disturbances which open seed bearing cones or stimulate sprouting from roots (Rowe and Scotter, 1973; Li, 2000).

These include jack pine (*Pinus banksiana* Lamb.) in sandy soils and low ridges, black spruce (*Picea mariana* Mill.) in lower, wetter areas along with trembling aspen (*Populus tremuloide*s Michx.) and birch (*Betula papyrifera* Marsh.) in heavier soils and along waterways.

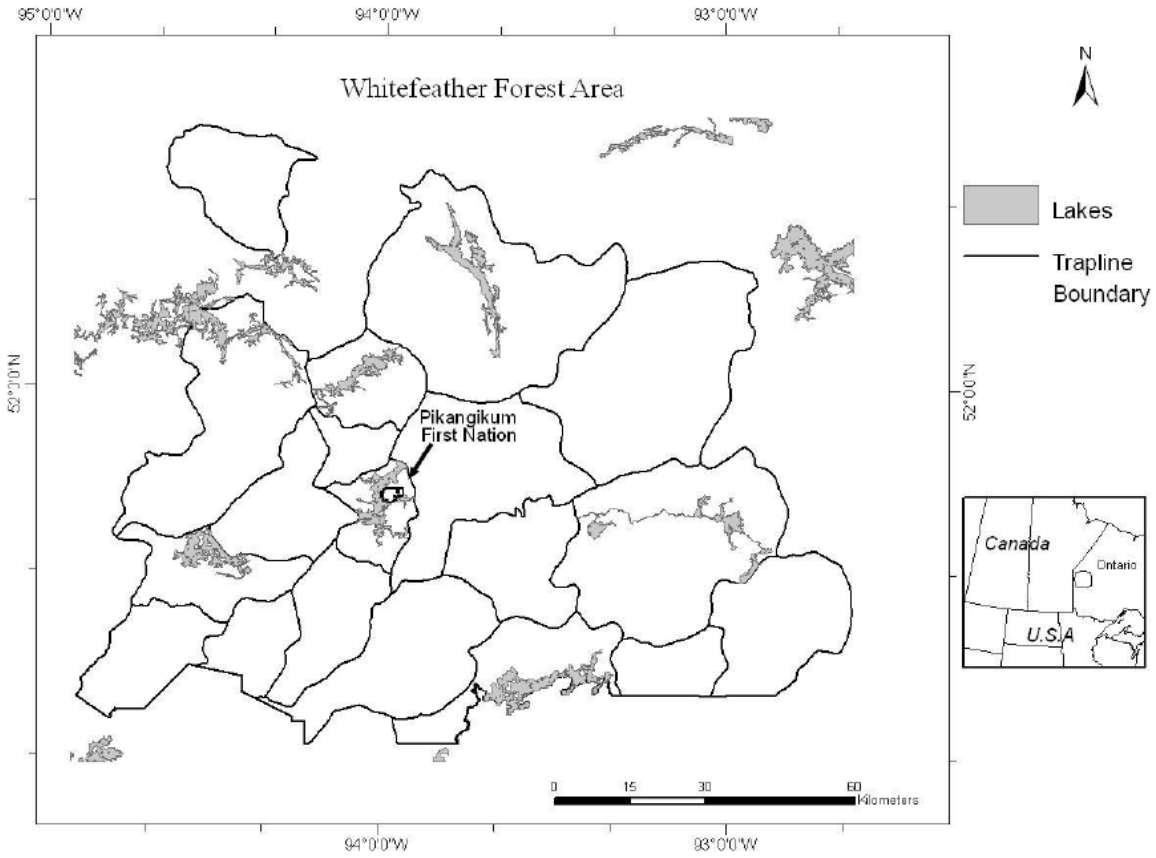

Figure 6.1. Whitefeather Forest Project Area contains 1.3 million hectares of boreal forest, streams, and lakes in northwestern Ontario. Pikangikum First Nation is planning forestry based on customary stewardship, livelihood activities, and teachings of land processes. (Murray Quill and Sones Keobouasone).

In the 1970's the forests in the traditonal territories of Pikangikum were considered for commercial forestry operations. However, the people of Pikangikum opposed this northward movement of commericial forestry. In the 1990's the community

began negotiating with Ontario Ministry of Natural Resources (OMNR) to obtain a sustainable forest licence so that they could lead forest management and guide development within their traditional territory (Chapeskie et al. 2005). This resulted in the development of the Northern Boreal Initiative (http://www.mnr.gov.on.ca/MNR/nbi/C-LUP-English_opt.pdf) which is a policy of the Ontario government. This policy enabled First Nation communities to take the lead in developing land-use strategies for their traditonal territory for an area roughly defined as north of the 51st parallel, the northern limit of environmental assessment coverage for commercial forestry in Ontario.

Pikangikum First Nation undertook a community-based land-use planning process with the OMNR for the Whitefeather Forest, a 1.3 million hectare area of boreal forest. It was undertaken through the initiative and vision of elders whose objectives were to maintain customary stewardship responsibilities, customary activities, and orderly development of the Whitefeather Forest for community economic renewal. This led to the signing of the Whitefeather Forest Land-use Strategy by the Chief of Pikangikum and the Ontario Minister of Natural Resources (Pikangikum First Nation and OMNR, 2006 www.whitefeatherforest.com).

6.5 Fire Management and the Whitefeather Forest

The land-use strategy has provided Pikangikum and the OMNR with a framework in which they will engage in dialogue to reach consensus on the implementation of decisions within the Whitefeather Forest. One area of fire management was recognized in the land-use strategy as requiring more dialgoue. As part of this planning process, Pikangikum elders and OMNR had begun to exchange knowledge regarding the behavior

of fire, its impacts on the land and current fire suppression policies for the Whitefeather Forest. The land-use strategy forum created a climate in which elders felt comfortable to share their knowledge of historic controlled burning traditions with the OMNR. However, the format of the forum did not allow sufficient dialogue for elders to understand OMNR perspectives and vice versa.

Historically, fire management policy in Canada has been developed by the provinces. It is committed to controlling threats to life, property, and merchantable timber resources posed by fire through a policy of aggressive fire suppression (OMNR, 2004). Increasingly however, resource managers have recognized fire as an essential ecosystem process in the boreal forest that must be integrated into forestry planning, not just extinguished (Rowe and Scotter, 1973; Johnson, 1992). Forest management is undergoing a shift from fire exclusion policies to a more nuanced fire management strategy that seeks to minimize risk to communities, property, resources, and other values while maximizing the ecological benefits of fire (Canadian Council of Forest Ministries, 2005).

Among the ecological benefits that forest and land managers seek are management of a full range of vegetation communities, successional stages, and accompanying animal populations (Kimmins, 1995). Woodland caribou (*Tarandus rangifer caribou*), a species recognized as threatened under both the federal Species at Risk Act and within the province of Ontario, is of increasing management concern to Ontario land managers. Woodland caribou rely on large home ranges and late seral stage forests for the lichens which comprise their primary winter foods. Forestry as currently practiced in many parts of southern Ontario is thought to have created conditions that

have contributed to its decline (OWCRT 2005, pp. 30). Although fire may reduce the amount of habitat available for caribou for several decades, fire also removes bryophytes which otherwise out-compete lichens (Klein 1982). Following logging, forest stands dominated by pine frequently become repopulated with a greater abundance of mixed hardwood species which are able to resprout from underground roots but are less suitable for caribou.

The development of a fire management strategy for the Whitefeather Forest is occurring at a time when the dominant paradigm of resource managers is changing from one of complete fire suppression to one in which tolerance to fire in the landscape is being considered. However, once again, the perspective of First Nations has had little voice in this dialogue. For example, while the Ontario Woodland Caribou Recovery Strategy (OWCRT 2005 pp. 10-11, 20-21) suggests that large fires north of the 51st parallel could play a role in conserving woodland caribou habitat, no one asked First Nations who live in the area if they think that is a good idea. So, we now turn to the dialogue that we held with Pikangikum elders regarding their knowledge of fire in the Whitefeather Forest and the role they consider that it could play in future management strategies. Before turning to the directions they would like to see fire management take in the future we briefly turn to how the dialogue was undertaken.

6.6 Methods

The dialogue with elders began by discussing the project with community elders during a workshop in February 2006. Elders identified who they thought should be

involved in the research and one of those, the late Jake Keesic, agreed to begin fieldwork with the research team. Fieldwork began by working with Jake and his trapline helpers to collect information on traditional fire use and fire ecology between June 2006 and April 2007. This work continued with other elders and trappers in historic sites of traditional burning and areas recovering from fire. Interviews and focus groups were also held with individuals and groups of elders and trappers in the community to discuss specific topics. The dialgoue was expanded when community elders exchanged knowledge of fire ecology as well as past and potential uses for fire with OMNR officials (with the help of translator) during community meetings held as part of the Environmental Assessment planning process for the Whitefeather Forest. The research team then convened a two-day community meeting with OMNR in February 2007 to specifically exchange knowledge between Pikangikum elders and the OMNR. The meeting was dedicated to a discussion of OMNR fire policy, historic practices of fire use by community members and an exchange of fire knowledge held by both. Key directions for fire management in the Whitefeather Forest were then developed from interviews, field visits, and community meetings. These directions were presented to seven community elders recognized as knowledgeable about fire and to land managers of the Whitefeather Forest Management Corporation in March 2007. We now turn to present the result of this dialogue process.

6.7 Results - Directions For Fire Management In The Whitefeather Forest

The intent of this research project was not just to find out what elders know about fire but to engage them in a dialogue about the directions they would like to see fire

management take in the future within their territory. In this section we have organized what emerged from the dialogue into six directions which have been further grouped into three themes: dialogue, teachings, and practices. Elders, as will be noted below, speak much more holistically about fire than this presentation indicates. However, for the purposes of the Whitefeather Forest Management Corporation and facilitating communication with the OMNR, it is helpful to translate these directions into English and provide a structure that is more accessible to people from outside the community.

6.7.1 Dialogue –

6.7.1 a. *Elders desire dialogue and collaboration with the OMNR to develop a fire management strategy for the WFPA.*

Elders regard fire as a living thing. In support of this designation, they draw attention to the fact that fire is capable of growth seemingly under its own power, the observation that fire rests at night and is most active in the day, and that large fires can create their own wind from air drawn into the fire by rising heat. In extreme circumstances clouds of smoke from fires can become thunderheads with lightning. Fires can advance rapidly when burning spruce cones are carried aloft by updrafts and carried, sometimes, miles ahead of the fire front.

Some fires are the result of the actions of Thunderbirds (***beenaysee***[5]), giant bird-like beings that are present from the beginning of the thunderstorm season in early May

[5] No standardized orthography for the Anishinaabe language exists. Many of the terms included in this report have variations in pronunciation between speakers and thereby differences in spellings are common. The spellings offered here are those recommended by the people of Pikangikum as those best representing the way they speak and were provided by co-author and Land Use Coordinator, P. Peters.

until freeze-up in October. They inhabit thunderclouds and the blink of their eye results in bolts of lightning that strike whatever they are looking at. While the renewing aspect of Thunderbird fire on the land is seen largely as a positive thing, they can also be threatening. By offering tobacco to oncoming lightning storms elders relate that Thunderbirds were appeased and would pass over without harming people and their homes.

Fire has the dual characteristics of being a source of life and renewal for the land, and having the potential to destroy life, property, and land values. Although in the short term fires are seen as destructive, killing trees and converting deep organic soils to ash, it has been observed that burned areas have the tendency to regrow over time to the vegetation communities occurring on the site before the fire. This ability to regenerate is attributed to the presence of subsoil roots that are undisturbed by fire. As the late elder Whitehead Moose explained, lightning fires are part of the Creator's cycle of renewal that provides humans and animals with new growth and abundant "new food":

> *The creator has a match and that match is the Thunderbird. He brings that match to the land when the forest gets too old and can't grow anymore. So the Thunderbird comes to earth. After the forest is burnt new growth starts. Animals get tired of eating old food. Just like you and me. The creator knows that animals need new food. With the fire there is fresh food to eat. As an example: rabbit favours new growth area. When you look at rabbit I think it is like a food chain for animals. Rabbits have three litters a summer. Fox, lynx, marten all depend on rabbit. The Creator has to care for all animals so he sends Thunderbird to earth to make food for rabbit. We like to eat rabbit too. So he burns for us too. Where fire comes to a rock area blueberries come after the fire.* [That] *feeds a lot of animals. We eat blueberries too. Fire makes good food areas. Mature forest cannot make good food areas.* […] *People held fire as sacred.*
>
> Elder Whitehead Moose, Community Meeting. July 10, 2006.

People in Pikangikum maintain knowledge of many different kinds of fire, their behaviours and impacts on forest renewal. Elders have described and named fires that

burn under the soil surface, those that burn the ground surface, burn up and down hill, crown fires and superficial surface burns. They describe how many of these fires are effectively suppressed and act as signals for fire fighters that tell them that a fire is becoming dangerously out of control. In addition, elders describe the many contributions that recently burned places make to livelihood activities such as places to collect berries, hunt moose, and cut fire wood.

It became apparent from comments made during the Community / MNR Fire Meeting that the Whitefeather Forest is viewed by state land managers as an opportunity to maintain forest values by conducting more extensive prescribed burning as part of landscape management. It is perceived by managers that the landscapes of the Whitefeather Forest are largely unencumbered by the values, including private property, human lives, and forestry interests, that trigger aggressive suppression and restrain prescribed burning in the south. One of the significant outcomes of this project is the statement by elders that this is not the case. The Whitefeather Forest is considered a cultural landscape by its residents. It is a landscape that has been heavily influenced over generations by interactions with the Anishinaabe people of Pikangikum. It is the site of customary resource uses that are dispersed.

If woodland caribou habitat requires a “free to burn” policy within the dedicated protected areas of the Whitefeather Forest and Woodland Caribou Provincial Park, as suggested in OMNR documents and during meetings, then there is more dialogue that is required. Elders are not convinced, at this time, that the forces of nature should be allowed to "run free" if it threatens values and people in the Whitefeather Forest. At the site scale, elders are willing to enter dialogue to consider how fire can be utilized and

remain interested to hear why people now want to burn when they were told not to burn for so long. The need to utilize fire as a way to prevent conversion from pine to poplar dominated stands, following logging on medium textured soils, is a clear application of elders knowledge working with scientific knowledge to generate a solution to a new problem. Avoiding stand conversion from pine to poplar stands is one of the key challenges for forestry in maintaining woodland caribou habitat.

Integrating the understandings, livelihood linkages, and the values that these landscapes represent to the people of Pikangikum into fire management planning will require continued dialogue between the community and OMNR. Both Pikangikum elders and the OMNR expressed an interest in continuing this dialogue as they work together to develop a fire management strategy for the Whitefeather Forest.

6.7.1 b. Elders desire fire suppression be extended to the entire WFPA landscape

Prior to the beginning of the forestry planning, fires were extinguished within the WFPA only when they reached within 16km radius of the community, when they threatened tourist lodges, or trapline cabins. These reflect the values expressed by OMNR that trigger fire suppression: threats to life, property, and forestry licenses (Canadian Council of Forest Ministries 2005). With the beginning of forestry planning, and the recognition of the potential value of future wood supplies, fire suppression was extended to below the 11th baseline, the southern half of the WFPA. The OMNR has stated that this is due, in part, to the limited range of forward attack helicopters within the WFPA. However, this remains a point of contention and elders remained dissatisfied

with this explanation for the partial coverage of the Whitefeather Forest. They feel that their safety and interests in forestry and trapline values are not being protected despite the establishment of a fire base within their territory at Bac Lake.

> *So what you are saying is …you wanted to put out any fires in this area [in the intensive fire suppression zone south of Pikangikum] because there was more value, in your eyes than there was up here* [around Pikangikum]. *There were people here and there were also people up there* [further north in Poplar Hill FN]. *That means that within your policy you were willing for us to be* ***gayboohnaamohzooh****, subdued by smoke and fire.* [S]*everal years ago there was a fire right here in the community. There was a forest fire that came right at our door step. Nobody came to our community. Nobody came to airlift the community. Nobody came to assist us that time. I seen, elder Jake Quill's dad fight the fire right outside his house. I'm bewildered because we were not seen in the same way not as valuable as those others to the south. We were left here to die. That's how I see that. The policy had no reflection on us whatsoever.*
>
> Elder Oliver Hill, Community / MNR meeting. April 6, 2007

> [W]*hen I look at that map where you have different regions of fire, you have that green area within the Red Lake area. We have our area within the Bac Lake* [the Bac Lake Fire Base]. *Are not our values the same as those values in the Red Lake area? We are planning for our area. Should not our values be protected? Our future investments? We have to look at that. We have a lot of timber out there that we are planning to use in the near future.*
>
> Elder Sam Quill, Community / MNR meeting. March 6, 2007

6.7.2 Teachings - *Elders desire community-based research and education programs to document and transmit their customary pyrotechnology.*

Respect for fire, an element that makes life possible in the north, and the necessity to abide by rules for its safe use, pervades all discussions of fire. Controlled use of fire is necessary for providing warmth in winters that routinely reach -40°C. Fire is also used for cooking, hide preparation, smoking and preserving fish and meat, and tool production since time immemorial. Young people are taught that once snow is gone from the forest

interior, fires should be built on rock outcrops beside the water. This minimizes the danger of fire burning into the dense organic soil and escaping control. It also places the fire right next to water to douse it when no longer needed or if it begins to get out of control. Other lessons include recognition of fuels that do not throw sparks, soil types that are effective for suppressing fire, and making fires no larger than necessary to accomplish the desired task.

When asked if they were interested in reclaiming traditional controlled landscape burning practices, elders said that in the past it was done for a purpose, mainly to create a more abundant food supply and provide access to valuable muskrat furs. This was never an activity lightly undertaken. Current demand for furs and traditional foods does not justify traditional burning. However, elders state that burning is part of their customary custodial responsibilities which are central to the Land Use Strategy and may be exercised again if they should deem it appropriate (PFN and OMNR, 2006).

> *Customary land uses include traditional pursuits by treaty and Aboriginal rights, (including but not limited to trapping, hunting, fishing) and other historical livelihood activities. …Customary land uses will be protected maintaining the landscape features of the Whitefeather Forest, including especially its character as a remote northern boreal forest which is home to a an abundance of plant and animal life*[…].
>
> Sec. 5.1 Customary Land Uses, Keeping the Land (PFN and OMNR 2006 www.whitefeatherforest.com)

Stewardship is also of critical importance in the land use strategy. Pikangikum people regard maintaining their relationship with the land as a sacred obligation to care for the gifts of the Creator. If it becomes clear to them that the health of the land would be maintained by resuming burning practices, they wish to be able to do so.

6.7.3 Practices

6.7.3 a. Elders desire recognition of the use of customary fires within the WFPA.

The people of Pikangikum have a long history of utilizing fire as a land management tool to improve the abundance of selected resources and create other landscape values. These controlled fires were once widespread and practiced by knowledgeable trappers within the traplines where they pursued trapping and provisioning activities. Fires were set in a variety of contexts including grassy margins around streams and lakes, garden sites, cabin areas, travel corridors, peninsulas and islands. Fires were set when weather conditions and other important signs indicated that burning would result in a low fire intensity with a minimal risk of escape.

Most fires were set in the spring just before break up which occurs anytime from mid to late April depending upon the year. During this time ice is still present on the lakes, small streams begin to flow and snow melts in grassy open areas. While grassy openings are dry on the surface the surrounding bush and forests are still wet enough to resist burning. Night time temperatures during this period continue to fall below 0˚C. While surface soils thaw during the day they refreeze at night. Wind is also an important consideration. Ideally, the wind should be calm or in the direction of open water so that the sparks from burning grass will be carried out over the water. Fires should not be set when the wind is blowing toward the bush. Fires are set in the afternoon at the peak of

Figure 6.2. Traditional burning of grassy openings along the margins of lakes and rivers (*peeshaskooseewuhseekay*) benefited ducks and muskrats by providing new grass for food. These animals were important food sources and valuable furs (Mario Peters 2007.)

the day's heat but when there are only a few hours remaining before the temperatures drop and the strength of fire behaviour diminishes. Elders did not recall a fire escaping control when this system was followed.

When fires are set around the grassy margins around streams this practice is termed ***peeshashkooseewuhseekaag*** [pl.]. These fires were set to remove dead grass from the previous year. The ash from these fires fertilized as well as darkened the ground surface so that it warmed more rapidly to produce a more productive ***meenoonihtaawigan***, a beautiful birth. Ducks and muskrats benefit by the new growth of several named varieties of grass which they use for nesting and food (Figure 6.2). By

making these areas more attractive for ducks and muskrats they became more predictable producers of food and valuable furs. In the late summer people would return to these areas to harvest tall grass which would be dried for use as insulation in winter dog houses and potato storage pits.

> ***Peeshashkooseewuhseekaay*** [sin.] […] *was to burn the old grass so that new grass would grow. As a young boy I would see my father perform this, perform this burning the old grass. He usually did it in the early spring when the ice was still on the lake.* ***Emijayskwaak*** *- clear ice. It was the time when the ducks were back, when they were hunting ducks. That was the time. The real reason was to burn the old grass out. To burn the old year-before-grass –* ***keteymushkoosee.***
>
> Elder Norman Quill, Interview. October 30, 2006.

Fire is also used to burn brush from new areas to make potato gardens and to clear debris from sites used in previous years to prepare them for planting. Fire is also used to clean up around cabins. Garbage and organic debris is raked from around cabins and in gardens into piles and lit following the guidelines outlined above. Springtime burning around cabins both on the traplines and in communities clears living and working spaces of brush and refuse, produces grass for aesthetic reasons and, limits fire hazards.

Elders report that by the 1940's they began to be afraid of laws banning the use of fire that were put in place by the "Fire Bosses" (Department of Lands and Forests, the precursor to OMNR). Fines amounting to the cost of suppression and imprisonment for the duration of the fire season (April to October) were threatened for those caught starting fires. This is a source of bitterness among some elders. Today, those younger than 30 years old have little knowledge of former fire practices. One reason the elders were interested in entering dialogue with the OMNR about fire management was they wanted to know if the OMNR was now ready to respect the customary use of fire by Pikangikum people within the Whitefeather Forest. They realize that their generation is the last who

has direct experience with the practice of customary fire and if they are to pass it on to the youth an understanding with the OMNR will have to occur fast.

6.7.3 b. A role for Indigenous Knowledge of fire disturbance in silvicultural techniques should be investigated

Elders recognize a number of logging practices which are incompatible with regenerating healthy forests similar to the ones that they are replacing. These include gathering slash into piles for burning, disturbing the soil by scarifying the organic soil layer to reveal mineral soil for replanting, the use of heavy equipment, and replanting of pines in a plantation style. The signs of poor health of the stands generated following these practices include: soil which is dry and appears baked; the lack of moss and lichen in regenerating forests; a broken and churned surface which prevents animals from moving through it; and, trees which appear sick. They suggest that these techniques are in part responsible for the decline of woodland caribou in forests currently licensed for commercial forestry by the province.

Elders explained several principles of regeneration that occur following forest fire. By leaving slash spread out and conducting a low temperature burn in the spring, they suggest that moss and lichen (both signs of soil health) will regenerate, organic material will be consumed, and new growth stimulated. Closely monitored, low-intensity surface-burning of spread slash in the spring can be used to produce a burn to renew jack pine forests without resorting to mechanical techniques that fail to reproduce caribou habitat.

> *If burning practices are controlled it will not be allowed to destroy an area. Fire should be used to create life, to cleanse an area. Fire is not permitted to burn into the ground and destroy the ground. We will use* ***peesuhkeeseekuhtaag*** *– a top fire. Also we will monitor it* ***muhkeehcheecheekuhtaag*** *– "work as you go"* […]. *So if we take care as we go* ***muhkeehcheecheekuhtaag*** *the effects can be controlled so that there is a beneficial burn.*
>
> Elder Solomon Turtle, Interview. April 17, 2007

The historic example of using fire to stimulate growth of grass used to insulate potatoes in storage pits demonstrates the adaptation of existing knowledge to novel contexts to create new opportunities. Although potatoes were a new crop introduced to the region through European contact the knowledge of grasses' responses to burning is suggested by the existance of detailed terminology for different grasses, and burning practices. Elders recognize that they will need to find new silvicultural burning techniques and are willing to carefully work with others to find the ones that will work for the new land uses they are proposing. However, they have no doubt that such new practices will be rooted in their knowledge and will emerge through their guidance.

6.7.3 c. Members of Pikangikum First Nation should make up a greater portion of the Fire Crews and Crew Bosses active in the WFPA.

Fighting fires was an important source of seasonal income for Pikangikum community members since the 1950s. Many elders have decades of experience fighting fires and take pride in their accomplishments. Elders attributed the effectiveness of Pikangikum fire-fighters to their knowledge of fire behaviour, suppression techniques inherited from teachings and experience, and their hard work ethic. In spite of their technological advantages, most fire fighters today, whether from Pikangikum or not, are

less effective because they do not demonstrate these abilities. Hiring practices for fire fighters began to change in early 1990s when OMNR instituted new training requirements which made it more difficult for Pikangikum residents to qualify for positions. The loss of income from fire fighting jobs is also a sore point with community elders.

> *MNR fights fire using their training and that limits their understanding and way they put their abilities to work. Anishinaabe are different. They have knowledge of fire and used it. We did not quit until the fire was out. MNR people would not fight as long, but would quit at the end of the day – before the fire was out. We wouldn't quit after 8 hours.*
>
> Elder and Former Fire Crew Boss Tom Quill Elder, Interview February 19, 2007.

Elders would like to extend their knowledge of fire behavior and suppression techniques to help train a new generation of fire fighters from Pikangikum. If burning is to be used as a fire management tool than these people may become involved in helping to minimize risks.

6.8 CONCLUSIONS

The Whitefeather Forest Initiative has created a unique forum in Ontario in which a First Nation is working directly with provincial resource managers to consider resource management directions for a 1.3 million ha area of the boreal forest. This context has allowed the research team to move beyond a process of documenting knowledge to one of applying knowledge to contemporary questions being considered by the First Nation for new land uses. In this paper the focus of the research has been fire management.

Most previous literature regarding indigenous knowledge and practices related to fire has focused on how fire was used to manage vegetation or how the material and documentary record of fire use by Indigenous peoples challenged the doctrine of *terra nullis*. Recently, this information has been used instrumentally as a source of knowledge to "rediscover" fire as a form of vegetation management. Our research confirms the importance of the fire practices in managing vegetation but also brings up two other issues which have not been discussed in the literature. Pikangikum elders also contributed to discussions about fire and large scale patterns of vegetation as well as the directions they would like to see fire management take in the future.

Pikangikum elders' knowledge of fire was applicable to two levels in regards to the spatial scale of fire management[6]. The knowledge and practice of customary fire use was located at the site level. Elders were very knowledgeable about how to utilize fire to manage some vegetation communities as indicated earlier through low intensity spring burning. By applying this knowledge they were able to obtain many values that were related to their livelihood and lifeways on the trapline. Pikangikum lifeways have changed in the time since customary controlled burning practices were suppressed. However, this knowledge and practice would be very appropriate for guiding development of fire to manage vegetation for contemporary purposes.

[6] We define levels and scales following Cash et al. (2006) in which 'scale' is considered spatial, temporal or analytical dimension and 'level' is considered the unit of analysis occurring at different positions within a scale. For further discussion of scale and levels in the context of Pikangikum First Nation see O'Flaherty et al. (2008).

The elders can guide the Whitefeather Forest Management Corporation (WFMC), the community owned land management corporation of Pikangikum First Nation, as they begin to consider new practices for their sustainable forest license and dedicated protected areas. WFMC will be able to work with elders to consider how to use fire for silviculture in order to maintain conifers on the landscape and how to manage patches of vegetation for specific purposes. At the site level, the appropriateness of controlled burning is determined by through an application process that accounts for burn complexity, general fuel type and description, topography, social values, burning objectives, timing, and desired results (OMNR, 2008). Elders' knowledge includes such considerations and they have expressed their willingness to guide the development of new, site specific, fire management practices.

At the landscape scale, elders talked more about Thunderbird fire and the way this type of fire behaves on the landscape. One of the more interesting outcomes of the dialogue was the concern of Pikangikum elders that they were being treated differently than people to the south. While they recognized that fire has a role to play in regeneration, an unresolved dilemma is the elders' perception that they have different fire suppression policies than people in the south. This clearly will require more dialogue to resolve to create shared understandings and resolve policy differences. This was somewhat nuanced as they did recognize a difference between Thunderbird fires and prescribed, or accidental, fires lit by people. However, the main concern was around the timing of fires. Our understanding is that both Thunderbird and human-caused fires should be put out when they occur in the heat of summer. While elders recognize that fire is important to renew the land, they also see the potential of such fires to cause much

harm. So, they question why the OMNR would allow a fire to burn, since summer fires are impossible to put out if they grow large and can result in extensive damage to Pikangikum values and put human lives at risk. How do we reconcile the understanding of fire as a force of renewal for the boreal forest and the desire to suppress all large fires? It appears, to us that Pikangikum elders are still making up their minds about the relationship they wish to have with fire within the landscape. They appear to be considering the options and implications of different strategies and the possibility that the OMNR may provide them with the same policy of suppression as southerners. This emphasizes that indigenous knowledge, separated from the people who hold that knowledge, can lead us to management decisions that may differ from those we may make when we undertake dialogue with the knowledge holders.

In this research elders engaged both the researcher team and the OMNR through an extended period of dialogue. This allowed the team to record detailed knowledge about fire practices and fire behaviour at the site and landscape-scales. More importantly, however, the application of knowledge through dialogue provided a forum for elders to guide new directions for fire management in the Whitefeather Forest. Fire managers make decisions about which areas are permitted to burn, set zones of protection that are aggressively defended, and who can participate in the use of and suppression of fire. These decisions have large social and economic impacts on the life of northern communities. We are reminded of the assertion by indigenous scholars (McGregor, 2004) that indigenous knowledge is inextricably linked to the rights of indigenous people to make choices, to preserve and recreate knowledge through continuing engagement and practice on the land.

6.9 ACKNOWLEDGEMENTS

Funding for this research was provided by the Sustainable Forest Management Network (Davidson-Hunt, PI), Social Sciences and Humanities Research Council (Davidson-Hunt, PI), Environment Canada Aboriginal Capacity Building Fund (WFMC), and University of Manitoba Graduate Fellowship (Miller). Members of the Whitefeather Forest Management Corporation, Reggie Peters, Murray Quill, Marlene Quill and elder Alec Suggashie also contributed their time and efforts. Thanks to the Chief and Council of Pikangikum First Nation and leadership of the Whitefeather Forest Management Corporation, Alex Peters, Paddy Peters, and Charlie Pascal. Thanks and admiration is due to the elders of Pikangikum who endured hours of questions with the hopes that this work may contribute to the future of their community. This paper is dedicated to the memory of the late elders Jake Kejick and Whitehead Moose.

6.10 References

Anderson, M. K. 2006. Tending the wild: Native American knowledge and the management of California's natural resources. University of California Press. Berkley, CA.

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

Berkes, F. 1999. Sacred Ecology: Traditional ecological knowledge and resource management. Philadelphia: Taylor and Francis.

Berkes, F. and I.J. Davidson-Hunt. 2006. Biodiversity, traditional management systems, and cultural landscapes: examples from the boreal forest of Canada. International Social Science Journal 187:35-47.

Boyd, R. ed. 1999a. Indians, fire and the land in the Pacific Northwest. Oregon State University Press, Corvallis OR.

Brokenshaw, D., D. M. Warren, and O. Werner eds. 1980. Indigenous knowledge systems and development. Lanham: University Press of America.

Canadian Council of Forest Ministries 2005. Canadian wildland fire strategy declaration. http://www.ccfm.org/pdf/Declaration_E_web.pdf [Accessed: April, 20 2009].

Cash, D. W. W. N. Adger, F. Berkes, P. Garden, L. Lebel, P. Olsson, L. Pritchard, O. Young. Scale and cross-scale dynamics: governance and information in a multilevel world. Ecology and Society 11(2):8 [online] URL: http://www.ecologyandsociety.org/vol11/iss2/art8/. [Accessed: April 20, 2009.]

Chapeskie, A. J., M. O'Flaherty, A. Peters, and N. Quill. 2005. The Whitefeather Forest Initiative: Indigenous wisdom guiding new community forestry opportunities in the boreal forest of Canada. Proceedings Sharing Indigenous Wisdom: An International Dialogue on Sustainable Development. Inaugural Conference Green Bay, WI June 6-10 2004. pp.7-37.

Cronon, W. 1983. Changes in the land: Indians, colonists and the ecology of New England. Hill and Wang. New York.

Davidson-Hunt, I. J. 2003. Indigenous lands management, cultural landscapes and Anishinaabe people of Shoal Lake, northwestern Ontario. Environments 31(1): 21-41.

Davidson-Hunt, I. J. and M. O'Flaherty. 2007. Researchers, Indigenous peoples and place-based learning communities. Society and Natural Resources. 20: 291-305.

Deur, D. and N. J. Turner eds. 2005. Keeping it living: traditions of plant use and cultivation on the northwest coast of North America. UBC Press, Vancouver.

Healey, P. 1997. Collaborative Planning: Shaping Places in Fragmented Societies. Vancouver, UBC Press.

Johnson, E. A. 1992. Fire and vegetation dynamics: studies from the North American boreal forest. Cambridge University Press.

Kimmerer R. W. and F. K. Lake. 2001. Maintaining the mosaic: the role of Indigenous burning in land management. Journal of Forestry 99(11): 36-41.

Kimmins, J. P. 1995. Sustainable development in Canadian forestry in the face of changing paradigms. The Forestry Chronicle 71(1): 33-40.

Klein, D.R. 1982. Fire, lichens, and caribou. Journal of Range Management, 35: 390-395.

Lewis, H. T. and T. A. Ferguson. 1988. Yards, corridors and mosaics: how to burn a boreal forest. Human Ecology 16(1): 57-77.

Li, C. 2000. Fire regimes and their simulation with reference to Ontario. *In* A. H. Perera, D. L. Euler and I. D. Thompson eds. Ecology of a managed terrestrial landscape: patterns and processes of forest landscapes in Ontario. Vancouver: UBC Press. 115-140.

McGregor, D. 2000. The state of traditional ecological knowledge research in Canada: a critique of current theory and practice. In: R. F. Laliberte, P. Settee, J. B. Wadram, R. Innes, B. Macdougall, L. McBain, and F. L. Barran (eds.) Expressions in Canadian Native Studies. University of Saskatchewan Extension Press, Saskatoon. 436-458.

McGregor, D. 2004. Coming full circle: Indigenous knowledge, environment and our future. American Indian Quarterly. 28 (3 and 4) 385-410.

Nadasdy, P. 2004. Hunters and bureaucrats: power, knowledge, and aboriginal-state relations in the southwest Yukon. University of British Columbia Press,

Nadasdy, P. 2005. The anti-politics of TEK: institutionalization of co-management discourse and practice. Anthropologica 47(2): 215-232.

O'Flaherty, R. M., I. J. Davidson-Hunt, M. Manseau. 2008. Indigenous knowledge and values in planning for sustainable forestry: Pikangikum First Nation and the Whitefeather Forest Initiative. Ecology and Society 13(1): 6 [online] URL: http://www.ecologyandcosiety.org/vol13/iss1/art6/ [Accessed: April 20, 2009.]

OMNR 2004. Forest fire management strategy for Ontario. Ontario Ministry of Natural Resouces, Queen's Printer for Ontario, Toronto. 64 p.

OMNR 2008. Prescribed burn manual. AFFMB Publication No. POO443. http://www.mnr.gov.on.ca/197301.pdf. Accessed: April 20, 2009.

Ontario Woodland Caribou Recovery Team (OWCRT) 2005. Draft recovery strategy for forest-dwelling woodland caribou (*Rangifer tarandus caribou*) in Ontario. Species at Risk Unit. Biodiversity Section, Fish and Wildlife Branch, Ontario Ministry of Natural Resources, Peterbourough, Ontario.

Pikangikum First Nation and Ministry of Natural Resources 2006. Keeping the Land [Cheekahnahwaydahmungk Keetahkeemeenaan] A Land Use Strategy for the Whitefeather Forest and Adjacent Areas. http://www.whitefeatherforest.com/pdfs/land-use-strategy.pdf Accessed: [April 20,2009.]

Pyne, S. J. 1997. Fire in America: a cultural history of wildland fire and rural fires. University of Washington Press. Seattle.

Richardson, B. 1993. People of terra nullius: betrayal and rebirth in aboriginal Canada. Douglas and McIntyre. Vancouver.

Rowe, J. S. and G. W. Scotter, 1973. Fire in the boreal forest. Quaternary Research 3: 444-464.

Sauer, C. O. 1947. Early relations of man to plants. Geographic Review 37(1): 1-25.

Sillitoe, P. and A. Bicker 2004. Introduction: hunting for theory, gathering ideology. p. 1-19. *In* A. Bicker, P. Sillitoe, and J. Pottier eds. Development and local knowledge: new approaches to issues in natural resources management, conservation and agriculture. London: Routledge.

Spaeder, J. J. And H. A. Feit. 2005. Co-management and indigenous communities: barriers and bridges to decentralized management – introduction. Anthropologica 47(2): 147-154.

Stewart, 1955. Fire as the first great force employed by man. *In* W. L. Thomas ed. Man's role in changing the face of the earth. University of Chicago Press, IL. pp. 115-133.

Stewart, O. C. 2002. Forgotten Fires: Native American and the transient wilderness. H. T. Lewis and K. Anderson eds. University of Oklahoma Press.

Williams, G. W. 2000a. Aboriginal use of fire: are there any "natural "plant communities? *In* C. E. Kay and R. T. Simons eds. Wilderness and political ecology: aboriginal influences and the original state of nature. Salt lake City, UT: University of Utah Press. pp. 179 - 213.

Williams, G. W. 2000b Reintroducing Indian-type fire: implications for land managers. Fire Management Today. 60(3) 40-48.

CHAPTER 7.
REFLECTIONS AND CONCLUSIONS.

7.1 Introduction

The purpose of this research was to document traditional knowledge (including knowledge-practice-belief) (Berkes 2008) held by the indigenous Anishinaabe community of Pikangikum, Ontario, Canada of the influence that different disturbances have on forest renewal cycles. The specific research objectives were to document:

1. Differences perceived by Pikangikum elders between the impacts of forest fire on disturbance and renewal processes and those of clearcut logging.
2. Pikangikum elders' understandings of fire's role within the boreal forest landscape including its impacts on plants, animals, livelihood activities and cultural landscapes of Pikangikum First Nation; and
3. Pikangikum elders' historic and desired forms of engagement with fire.

These objectives roughly correspond and contribute to three sets of literature: traditional ecological knowledge related to use of fire to modify landscapes (e.g. Boyd, 1999), the production of cultural landscapes (e.g. Buggey, 2003), and adaptive renewal within social - ecological resilience literature (e.g. Gunderson and Holling, 2002). This chapter provides an overview of my research findings in terms of the overall goal of my project and presents the principal findings and discusses the applied and theoretical contributions to these bodies of literature. These are summarized in (Figure 7.1) with greater detail for these contributions in subsequent sections. I conclude with a brief discussion of opportunities for future research.

7.2. Objective 1. Pikangikum elders' perceptions of the impacts of forest fire and those of clearcut logging on disturbance and renewal processes.

Chapter 4 describes Pikangikum elders' empirical and theoretical understandings of forest renewal arising from forest fire and from clearcut forestry. This research revealed that Pikangikum elders' knowledge of the impacts of fire and logging include effects to soil, plants and animals over time scales ranging from days to decades following the disturbances. Their observations are similar to those of western science-based land managers in many respects. Many of the elders' understandings arose from observations of impacts that these disturbances had on the potential for subsistence activities. These included the potential for a disturbed area to permit the hunting and trapping of moose, caribou, snowshoe hare and fur-bearers and collecting berries and other plants.

The perceived agency of non-human beings and understandings of interrelationships within the landscape is central to how and why different disturbances result in different successional outcomes. The attribution of agency of non-human beings by the elders marks an important distinction from provincial managers. This theme is repeated in the exploration of cultural landscapes in Chapter 5 and as the basis for policy directions in Chapter 6. In the elders' view, forests fail to be renewed following clearcut logging in part because of the failure of respect that the practice represents. As elder Mathew Strang stated(Appendix 4.2 p.119), this failure to give respect arises from lack of awareness of the living potential within all beings. Many beings are not even acknowledged as living by those with a western worldview. If relationships with soils, plants and animals are impaired renewal will not take place. Sources of disrespect include plowing of soils and logging slash into windrows, planting of trees in rows for

Table 7.1 Summary of chapter objectives, findings and contributions.

Objective	Finding	Applied contribution	Theoretical contribution
1. Differences perceived by Pikangikum elders between the impacts of forest fire and those of clearcut logging on disturbance and renewal processes	1. Elders have detailed knowledge of disturbance/ renewal cycle at multiple spatial and temporal scales 2. Empirical observations of disturbance/renewal cycle very similar to western science 3. Agency of other beings is central to theoretical reasons for renewal. This is very different from western science	Elders identify three aspects of clearcut forestry that interfere with forest renewal. 1. Plowing up soil and debris following harvest. 2. Planting trees in rows 3. Using herbicides to control deciduous growth. These are areas where adaptations may need to be sought in order to suit local values.	The importance of agency of non-human beings in renewal processes is central difference btw Pikangikum views and those of western science based decision makers. The potential of non-human agency is poorly recognized in social/ecological resilience literature.
2. Document elders' understandings of fire's role within the boreal forest landscape including its impacts on plants, animals, livelihood activities and cultural landscapes	1. Knowledge of fire crosses temporal and spatial scales and involves many bodies of expertise 2. Fire and lightning are understood as living beings 3. Fire is seen as the source of renewal within Pikangikum landscape	Detailed knowledge of Pikangikum traditional burning practices. Possible applications in mgmt Many customary livelihood activities depend on different stages of succession that originate in fire. Fire management planning will need to account for these	Human relationships to fire are not just at the scale of sites. This is poorly represented in literature. Humans are not the only ones making cultural landscapes. Other beings have a role in creating meaningful spaces.
3. Pikangikum elders' historic and desired forms of engagement with fire	Elders' knowledge arises from variety of sources including: 1. Traditional fires set for livelihood activities 2. Observation of impacts of fire upon the land 3. Employment as provincial fire fighters	Elders provide six directions in three areas where their would like to use their knowledge of fire: **I. Dialogue** 1. More dialogue with OMNR needed regarding fire mgmt in WFMA 2. Elders want fire suppression of all of WFMA **II. Teaching** 3. Elders want to be able to instruct young people in traditional use of fire **III. Practice** 4. Traditional burning should be recognized by OMNR 5. Should investigate potential of elders' knowledge for use in silviculture 6. Access to employment as fire fighters should be re-made available	Elders wish to reengage with fire in ways that would maintain 'traditional' as well as create new knowledge. Underscores that knowledge is created through practice.

stand regeneration and using herbicides to control competition between regenerating deciduous trees with plantation conifers. Elders resist the idea that they can "manage" ecosystems. The notion they might be able to control plant and animal beings who have their own objectives and may resent interference, strikes the elders as inappropriate and arrogant.

Within the resilience literature, surprises in adaptive-renewal cycles are attributed to system complexity and characteristics of non-linearity, uncertainty, emergence, scale and (Berkes, Colding and Folke, 2003: 5). The capacity of systems to self-organize makes predictability of the outcomes of system disturbances uncertain. Following the elders' perspectives presented in Chapter 4, we propose that to these system characteristics we may also need to consider the possibility that organisms have choices that they exercise in relation to the way they are treated. In other words, we should shift our attention to the maintenance of relationships with community members rather than attempting to manage the net impact of actions on existing social-ecological systems. This represents a simpler approach to management than the inherent complexity in attempting to direct social-ecological systems (Berkes et al. 2003). The elders believe that they will know that their forestry is sustainable if they are able to maintain customary uses of forest resources including hunting, trapping and plant collection in areas where forestry has occurred. Being able to do so would indicate that the networks of relationships that connect the people of Pikangikum and plant and animal beings remain intact. This holistic approach to forest management increases the ability for elders to inject their values into resource management planning. It may also present economic and

technical challenges that will need to be overcome in order to achieve the economic renewal goals of the Whitefeather Initiative.

7.3. Objective 2. Document elders' understandings of fire's role within the boreal forest landscape including its impacts on plants, animals, livelihood activities and cultural landscapes

In Chapter 5, I presented Pikangikum elders' knowledge of the intersection between fire's impacts on Pikangikum livelihood activities and the creation of the cultural landscapes. This included a detailed description of signals for appropriately using controlled burns to achieve a variety of goals including creating openings for living spaces and gardens, maintaining travel routes and improving habitat for game animals. Indigenous burning practices from other regions of the Canadian boreal forest have received detailed attention (e.g. Lewis, 1982; Lewis and Ferguson, 1988; Johnson, 1999). Aspects of practices in northwestern Ontario have been explored elsewhere (Berkes and Davidson-Hunt, 2003; Williams, 2005; Davidson-Hunt, 2006). This research provides a depth of detail of traditional burning practices, including Anishinaabe vocabulary for the taxonomy of different controlled burn types, settings, signals and control mechanisms not previously been presented. The detailed and multifaceted knowledge Pikangikum elders have of fire behavior and its impacts on landscapes and livelihoods is testimony to its importance to the maintenance of human life and the regulation of ecosystem function in the boreal forest. The importance of fires occurring at larger scales, outside of human control, is particularly evident in a fire dependent system such as the Canadian boreal forest.

Expanding the scope of my investigation to include Anishinaabe taxonomy, worldview and practices related to fire reveals a dimension of traditional pyrotechnology that has been poorly explored in the scholarly literature. Whereas much scholarship has recorded the practices and impacts of fire use, my research provides a view of fire as it is understood to occur at both small and large scales. In addition, my research gave voice to *emic* perspectives of the people of Pikangikum of what fire means to them. The result of these novel approaches is the description of fire as a living, sentient being which possesses agency. Fire is thus revealed as a member of a network of sentient beings including plants, animals and spirit beings that actively take part in the creation and maintenance of the Pikangikum cultural landscape. This network of inter-relationships between humans and their environment (Buggey, 2004) and the shared responsibility for the creation of cultural landscapes is a feature that separates Indigenous cultural landscapes from Euro-Canadian cultural landscapes.

This research illustrates the claim made by ethnographers that indigenous concepts of territory do not match competing worldviews which define indigenous territories as bounded spaces and resources (Hierro and Surrallés, 2005). Indigenous cultural landscapes are more like a stage where cosmology, narrative and place intersect. The cultural landscape concept refers less to a static place; it is more of a process of remembering, re-imagining and re-creation within a spatial context. Pikangikum First Nation recognizes the Whitefeather Forest Area as part of its cultural landscape within their land use strategy (Pikangikum First Nation and MNR, 2006). This does not, however, preempt the possibility of new activities including commercial forestry from

being practiced within the cultural landscape so long as the important relationships between the people of Pikangikum and their environment remain intact.

7.4. Objective 3 – Pikangikum elders' historic and desired forms of engagement with fire.

Pikangikum residents are very much aware of the importance of fire as a tool that makes life possible for humans as well as its role as a powerful force that shapes the landscape in which they live. Because many elders discussed fire outside of the context of its use as a tool to manipulate vegetation and landscapes it became clear that I needed to widen the scope of my discussion of knowledge of fire. I attempted to form a framework for expressing elders' knowledge based on what they told me about fire. This broadened the results to include domestic uses of fire, Pikangikum taxonomy of fire as well as knowledge of fire which arose from elders' experiences as fire fighters from the 1960s to the 1990s. In addition to allowing me the opportunity to expand the knowledge-practice-belief framework that composes traditional ecological knowledge (Berkes, 2008), this flexibility allowed the elders to create explicit messages for managers about how the community of Pikangikum wishes to engage with fire and use their knowledge in future fire management planning. Community elders and OMNR participated in two meetings (February and March, 2007) in which the results from this study were presented and discussed. During these meetings it became clear that much of what the community sought was recognition of their right to express their values and authority within their territory.

The attitude of elders at first appears somewhat ambivalent regarding the suppression of fire within their territory. Fire is described as a creative force producing valuable resources and restoring productivity to the forest community. Whitehead Moose described fire as sacred to the Anishinaabe and the ***beenaysee eshkotay***, the Thunderbird fire, as being part of the Creator's plan for sustaining balance within the landscape (Chapter 5, p. 84-5). At the same time, elders clearly asked OMNR during community meetings to extend the same level of fire suppression to the Whitefeather Forest as is afforded to areas to the south (Chapter 6, p. 174-5). They further wish to have employment opportunities for young people in suppressing fire within their territory. How can these two perspectives be reconciled?

Although these perspectives appear to represent a contradiction they embody several important principals. The elders of Pikangikum understand themselves to be very much a part of land community - not separate or superior to other community members. They believe that the Creator is looking out for them and wishes for them to live well. As Charlie Peters (Chapter 5, p.144) states, the use of fire as a land management tool was part of the Anishinaabe way of life and their cultural patrimony. They consider themselves the stewards of the land on which they live (Pikangikum First Nation and OMNR 2006) and wish to be able to burn if they come to see that its use would benefit their land. However, it is the elders' perspective that the future of their community lies in developing economic opportunities in the forest. These opportunities currently include making use of the valuable timber on their land. Since they do not have the technical ability to suppress large fires, they want OMNR's commitment to help them protect this future source of economic development. Elders recognize that future management

activities must occur within a landscape of inter-relationships that leave space for the livelihoods for both the people of Pikangikum, animals and other beings (Chapter 4). Indeed, the ability of humans and animals to continue to pursue their customary ways of being on the land is an important signal that balance is being maintained between resource use and restraint.

Elders clearly desire to have influence on determining the purposes and methods used to manage fire within their territory. The assumption that because Pikangikum residents once used controlled burning for livelihood and stewardship activities there should be little difficulty in reintroducing controlled burns for new purposes is clearly false. As elder Oliver Hill stated, "It is not for nothing that we burned. We always had a good reason." Because views of the very nature of fire held by Pikangikum elders and resource managers is so different (a sentient being whose agency provides a source of life versus a chemical reaction with important ecological function) it is clearly important that dialogue and common terms of reference be thoroughly explored. During an early community meeting (Feb 2007) OMNR attendees voiced the possibility of controlled burning using their techniques to achieve caribou management and other provincial goals. In separate conversations with OMNR officials they expressed interest in collaborating with elders to conduct traditional controlled burns to manage selected sites provided they met with established prescribed burning guidelines. These examples demonstrate a willingness on the part of OMNR to allow Pikangikum residents to engage with fire. However, it is less clear that OMNR is willing (or legally able) to relinquish control of the purposes for which fire is employed or the methods by which it is managed.

This research revealed a degree of resentment on the part of Pikangikum residents that legislation privatizing the training of fire fighters had impacted their access to important jobs as seasonal fire fighters. Participation in community meetings where these concerns were aired and the publication of a short research note on these results (Miller et al. 2008) contributed to OMNR's awareness of this perceived inequity. According to OMNR Fire Communication Specialist Dave Cleaveley, this work has:

> *…complimented the efforts of the Red Lake Fire Management staff to engage in discussion and consultation in a number of different areas such as prescribed burning and employment opportunities. The MNR is very interested in having open discussions with the community of Pikangikum about employment opportunities both on and off the reserve. The MNR is open to discussions on both suppression and non suppression roles and looks forward to community input on fire activities in the surrounding area*.
>
> (pers. com. May 10, 2009).

7.5. Directions for future research

Chapter 6 concludes with a list of six areas which the elders wish to pursue in regards to their use of fire within the Whitefeather Forest (Figure 7.1). All of these have elements suggest a role for future community supported research. As Rassmussen et al. (2007) note, involvement of indigenous communities in local wildland fire management has the potential to contribute to local economies and ecosystems, result in cultural and social benefits, and contribute additional knowledge to management practices. While this potential has been recognized by others (Natcher and Hickey, 2003; Lake, 2004) little analysis of the policy shifts that would need to occur in order to facilitate greater participation of indigenous management interests has occurred. Local, regional and national policies and their historic and modern intersections with indigenous practices

and desires for engagement with fire could be examined to help facilitate a greater role for indigenous communities and their knowledges.

Pikangikum elders don't currently see the need to resume traditional burning of wetlands as they once did. They have however, expressed the interest in having their practice and methods recognized as a legitimate means to manage their trapline. Several times over the course of this project different OMNR employees expressed their enthusiasm for the possibility of participating in and documenting this practice. Finding the means for both Pikangikum elders and OMNR fire managers to be comfortable with the use of fire following Pikangikum guidelines for practice is perhaps outside the realm of research that an outsider could hope to achieve. While individual OMNR employees have expressed their opinions that a traditional spring burning of a marsh would be a relatively low risk, official policy may not permit the traditional method of opportunistically burning as they once did; today prescribed burning requires permits to burn and suppression crews to be on hand (Dave Cleaveley pers. com. February 2009). Without interest in traditional burning there would be little point in undertaking more research into practices and their impacts. Extending research in this arena is best considered as a subset to the above research into dialogue and policy impacts with OMNR.

One area where the elders' knowledge of fire may find expression is in research related to silvicultural practices. Bringing knowledge that has arisen in part from experience burning grass around cabins and marshes in the early spring to a new application, setting, timing and objectives would be challenging. Traditional marsh burning typically occurred in the spring as temperatures rose above freezing and snow

disappeared from open areas, leaving light fuels. Fires set under these conditions quickly consumed light fuels and extinguished themselves, creating vigorous new growth of grass in the burnt areas. Forestry in contrast, produces different sorts of fuels that pose different challenges to burning. Woody debris produced from topping and limbing trees during logging operations and dense organic soils both burn very differently than light fuels created by dead grasses.

> *You cannot burn these high fuel load areas in the spring of the year. There will be snow under the slash. As well, once these areas do get started then they will burn all summer and have a high probability of escape. Burning in the fall is much less risky as the days are shorter temps are cooler and snow is coming. Burning grass along a river in the spring makes sense...this doesn't*
>
> Dave Cleaveley, pers com March 9, 2009.

There is a clear need to initiate experimental plots employing both elders' and OMNR's knowledge and values under a range of conditions while limiting the danger of fire escapes so that the results of both can be made visible as practice. This will require financial, institutional and community support. This process would present a number of biological and social questions to be answered. What is the level of satisfaction of the OMNR and Pikangikum elders with the results generated through this process? What are the likely legacies that they predict as arising from these treatments? Could these treatments be translated into practices that are acceptable by the managerial and Anishinaabe cultures?

Pikangikum elders have said throughout the process of forestry planning that they wish to employ their values and their knowledge to find means to harvest forests "differently" (Pikangikum First Nation and Ontario Ministry of Natural Resources,

2006). Mutual appreciation of the knowledge and values that each partner in the Whitefeather Forest Initiative brings with them is essential to the forest management planning process. It is my hope that this thesis has a future in helping achieve that shared understanding.

Nadasdy (2005) draws attention to the potential shortcomings of co-management using traditional ecological knowledge as it assumes that the problems of development are essentially technical in nature rather than being political. Finding space for Pikanigkum First Nation to practice forestry "differently" will require finding political as well as technical solutions. There are areas in which co-production of knowledge (*sensu* Davidson-Hunt and O'Flaherty 2006) is occurring. Elders are coming to understand the vocabulary and framework of planning used by the OMNR; OMNR is gaining an appreciation of the values and empirical knowledge that the elders possess and how they relate to forestry planning. There continues to be a potential for OMNR and Pikangikum First Nation to work more closely together to combine their knowledge in the creation of experimental plots employing a combination of criteria and manipulations to test the effectiveness of the elders' knowledge of fire under controlled conditions. Similarly, the elders' values related to land health could be used to guide the application of OMNR controlled burning procedures. Other similar scenarios which capitalize on distinct knowledge, values and resources of both partners could be devised.

Potential limitations also clearly exist. Spanning the distance between the elders' and OMNR's conceptions of the ethical standing of plants and animals and thereby the entire endeavor of "management" is clearly more problematic (Ch 4, Ch 5). Creating a forestry which permits both Anishinaabe and scientific management systems of

understanding the nature of the world may not be possible. Can reconciliation between the Creator's Plan, which intends respect for fellow species and ethics of non-interference and the legal environmental standards of scientific management that do not consider respect for other animals and plants valid criteria for management be found? The distinct ontologies of these systems, one which attempts to maintain good relationships within a system in which humans are embedded as its motivation, and the other to limit environmental impacts which occur outside of the human social universe, is a political not a technical problem (*sensu* Nadasdy 2005).

A number of institutional constraints within OMNR also currently restrict the possible use of some techniques or practices by the elders. For example, the OMNR's mandate to manage risks may conflict with the understanding of the spring time as the appropriate time to conduct controlled burns (Ch 5 and Ch 6), preceding as it does the hottest time of the year when an unextinguished ember may cause a fire to break out. There is currently a great deal of good will between the members of the Red Lake OMNR and the elders on the Whitefeather Forest Management elder's advisory group. However, there is only so much they are permitted to do within the contexts of the community of Red Lake, the institutional and legal frameworks in which OMNR has to operate. It remains an open question whether Pikangikum First Nation will be empowered to utilize the sophisticated knowledge of natural disturbances and the values which ultimately give them meaning. Continuing dialogue between the community and the OMNR (Ch 6) provides Pikangikum elders the opportunity to express their understandings and values and to come to grips with the very different relationships and values related to ecological

disturbance possessed by the dominant society. To a large degree, these may be just as surprising and unexamined as the values and relationships described in this research.

7. 6. References

Berkes, F. 2008. Sacred Ecology. 2nd edition. Routledge. New York.

Berkes, F. and I.J. Davidson-Hunt. 2006. Biodiversity, traditional management systems, and cultural landscapes: examples from the boreal forest of Canada. International Social Science Journal 187:35-47.

Buggey, S. 2004. An approach to aboriginal cultural landscapes in Canada. In: I. Krupnik, R. Mason, and T. Horton. eds. Northern ethnographic landscapes: perspectives from circumpolar nations. Smithsonian Institution, Washington, D. C. 17-44.

Davidson-Hunt, I. J. 2003. Indigenous lands management, cultural landscapes and Anishinaabe People of Shoal Lake, Northwestern Ontario, Canada. Environments 31(1) 21-41.

Davidson-Hunt, I. and F. Berkes. 2003 Learning as you journey: Anishinaabe perception of social-ecological environments and adaptive learning. Conservation Ecology 8(1): 5. http://www.consecol.org/vol8/iss1/art5.

Davidson-Hunt, I. J. and O'Flaherty, R. M. 2007. Researchers, Indigenous Peoples, and Place-Based Learning Communities. Society & Natural Resources 20:4,291 - 305.

Gunderson, L. H. and C. S. Holling eds. 2002. Panarchy: understanding transformations in human and natural systems. Island Press: Washington.

Homer-Dixon, T. 2006. The upside of down: catastrophe, creativity, and the renewal of civilization. Washington, DC: Island Press.

Johnson, L. M. 1999. Aboriginal burning for landscape management in northwest British Columbia. In: Boyd, R. ed. Indians, fire and the land in the Pacific Northwest. Oregon State University Press. 238-254.

Lake, F. K. 2004. The integration of traditional ecological knowledge and fire ecology to restore and conserve riparian zone biodiversity in the Klamath-Siskiyou eco-region. PhD dissertation, Environmental Sciences Program, Oregon State University, Corvallis.

Lewis, H. T. and T. A. Ferguson. 1988. Yards, corridors and mosaics: how to burn a boreal forest. Human Ecology 16(1): 57-77.

Lewis, H. T. 1982. A time for burning. Occasional publications No. 17, Edmonton: Boreal Institute for Northern Studies, University of Alberta.

Miller, A. M., I. J. Davidson-Hunt, M. O'Flaherty 2008. Pikangikum First Nation and Forest Fire Management: old and new knowledge of fire. Sustainable Forest Management Network Research Note Series. RN 37. pp5.

Nadasdy, P. 2005. The anti-politics of TEK: the institutionalization of co-management discourse and practice. Anthropologica: 47 (2): 215-232.

Natcher, D. C. and C. G. Hickey. 2003. Putting the community back into community based resource management: a criteria and indicators approach to sustainability. Human Organization. 61(4): 350-363.

Pikangikum First Nation and Ontario Ministry of Natural Resources 2006. Keeping the Land [Cheekahnahwaydahmungk Keetahkeemeenaan] A Land Use Strategy for the Whitefeather Forest and Adjacent Areas. http://www.whitefeatherforest.com/pdfs/land-use-strategy.pdf May 10,2009.

Rasmussen, K., M. Hibbard, K. Lynn, Wildland Fire Management as Conservation-Based Development: An Opportunity for Reservation Communities? Society & Natural Resources. 20(6): 497-510.

Roberts, W. J. 2005. Integrating traditional ecological knowledge and ecological restoration: restoring aboriginal cultural landscapes in Iskatewizaagegan First Nation No. 9. Master's Thesis, Natural Resource Institute. University of Manitoba.

GLOSSARY. Anishinaabe terms used in this thesis.

While the following terms have been recorded from collaborators in Pikangikum First Nation and transcribed with the help of Whitefeather Forest Researchers, they have not been confirmed through community processes that would verify their exact meanings and spellings in Roman orthography or permit their spelling in Algonquin syllabics. These definitions should be considered tentative.

Plants, Animals and other beings			
Ojibwe name	**English**	**Latin**	**Page in text**
ahmik	beaver	*Castor canadensis*	77
ahmik oomeechum	beaver food – poplar limbs stored in the mud for winter food		78
ahsahkahmik	feather moss		90
ahtik	woodland caribou	*Rangifer tarandus*	143
oohzuhweeseebeequayweeyahtik	small caribou that has a yellow tear pattern on its face, no longer known to inhabit the Whitefeather Forest		83
ahzahdeeg	poplar	*Populus tremuloides*	87
beenaysee	thunderbird		Ch 4,5, Fig. 5.2
bishiew	lynx	*Lynx canadensis*	138
chedooae	solitary sandpiper	*Tringa solitaria*	128
kaakaake	common ravens	*Corvus corax*	78
Keechee manidoo	Creator		75
Keechee manidoo oohnuhcheekayween	Creator's Plan		75
kwaykwayshay	grey jay	*Perisoreus canadensis*	82
makwa	black bear	*Ursus americana*	78

Ojibwe name	English	Latin	Page in text
maymay	pileated woodpeckers	*Dendrocopus pileatus*	88
meenan	Blueberries	*Vaccinium* spp.	89
meshebishew	the water lynx		128
meshekenaybegook	horned serpents who live underground and are hunted by the thunderbirds		128
okik	jack pine	*Pinus banksiana* (Lamb.)	114
okikensuhk	little jack pines		114
oojeek	fisher	*Martes pennanti*	138
ookeshkemahnesee	belted kingfisher	*Ceryle alcyon*	128
oo'oo	unknown bird thought to have disappeared from region of McGiniss Lake		83
oteshkahnay manijoosh	long antlered bug	Family: *Cerambycidae*	88
noosah	the loud noise eater of wood, larval stage of wood boring insect		88
pahngwahshahshk	a saber-toothed muskrat previously found around McGinnis Lake		83
payskik	common nighthawk	*Chordeiles minor*	128
pepekooshaense	kestrel	*Falco sparvarius*	128
shashawahnepesee	swallow	Family: *Hirundinidae*	128
waasheshk	muskrat	*Ondatra zibethicus*	78
wabishayshee	American marten	*Martes americana*	138

wahboos	snowshoe hares, "rabbit"	*Lepus americana*	141
Ojibwe name	**English**	**Latin**	**Page in text**
wahmedekooshe	white people		78
wahpuhkahmik	reindeer lichen	*Cladina spp.*	144
wahzheshkwaytoo	fungi - bracket fungi		90
weegobeeg	willow	*Salix* spp.	87
weesuhpaynjahk	horse hair	*Bryoria spp.*	144
wuhkoonuhk	rock tripe		144
zheengobeeseewaskoon	fireweed	*Epilobium angustifolium* L.	93
Ecological features processes or descriptions			
Ojibwe name (as used in Pikangikum)	**English**		**Page in text**
aaheekkuhmuhcheewayauh keetaak	fire burning up a hill		136
aahoohshayteenang	is an area, a high ridge area where there's sand.		114
aatuhpuhskaameegag	a low area where there is balsam or black spruce grow in that area.		114
ahkee	the land; earth; a type of sphagnum moss		111
ameenokamin	break up		139
Anishinaabe amahtahzeewin	the Anishinaabe way of life		97
pingway	ash		87
auhwaycheekay	a dead head, a partially submerged log		111
auyuhshuhwuhtuhn	alive		75,111
ayasayweesuhk	burnt snag		130
bagkwansh	wind felled trees		90
benaysee paginanatik	trees which have been hit by lightning		132

Ojibwe name	English	Latin	Page in text
cheegeewayseg	expected condition, that it will return to the way it was before		87, 111
cheemeenooseg	balance		79
cheepuhpeenootuhmun	failure to show respect		91
ehkowindaymahwach eshkotay	households had a fire-keeper		133
emijayskwaak	clear ice found in the spring time		137
eshkotay	fire		127
Anishinaabe eshkotay	Anishinaabe fire or fires started and controlled by indigenous people		127
beenesay eshkotay	thunderbird fire or lightning and the forest fires it starts		127
muhyaukee eshkotay	the other fire, electricity		127
Wahmedekooshe eshkotay	Whiteman's fire, electricity		127
eshpashkooseewahseekah	burning tall river or lake side grass to make it easier to travel		137
etapashgaantagag	jack pine understory remains dense		89
gahbeeday	baked or burnt		93
gahgeesheebashkahmeegaak	cycle of life, “something that keeps going around”		82, 83
angook	animals becoming scarce		8
patenook	animals becoming abundant		83
gayboohnaamohzooh	subdued by smoke and fire		168
gizhangay	the thunderbird will beat its wings causing the weather to warm		132
keesheeyahkeetaah	crown fire		136
keetuhqwaag ahkee	fire burning on level ground		136

Ojibwe name	English	Latin	Page in text
keteymushkoosee	to burn the old year-before-grass		172
kuhpuhpuhkeenay	newly dead poplar is referred to as		132
mahkahteywahkamik	dark poorly drained soils		90
manahdin	not healthy		93
meenogeen	vigorous new growth		138
meenoonihtaawigan	a beautiful birth		171
mitawunk	soils are sandy and well drained		89
muhkeehcheecheekuhtaag	work as you go		174
mushkeeg	swamp area		113
neesuhcheewee yuhkeetay	fire burning down a hill		136
noosowakahmeegeeteg	deep soils can catch fire		137
nooswuhkeekay auhnuhmuhguhmeeg	underground smoldering fire		136
ohneesheesheen	healthy		81
oshkapokeetaywon	new forest		90
pashkogaheegaywin	clearcut logging, “cutting everything off the land”		91
peekwahtoosuhg	dry and almost crumbling before it is used to smoke meat, fish and hides		132
peesuhkeeseekuhtaag	fire is not permitted to burn into the ground and destroy the ground; "a surface fire"		174
pingway	ash		138
pishashkooseewuhseekaag	Spring burning the old grass so that new grass would grow		137
puhkeenun	lightning strike		90
puhpuhkeenay	this name contains the root word for grasshopper		132
sagakwa	dense forest		90
sheengoobeeg	evergreen bough (balsam fir, spruce, jack pine		114
sheepaaquayaag	an open clear area		114

Ojibwe name	English	Latin	Page in text
shepaqweshiinoog	downed logs that are too high		90
tuhpusseepuhkoon	plants in the understory		87
wahbeegoon	clayey soils		90
Seasons	**English**		**Page in text**
Seegwun	Spring		85
Aptabeepoon	late winter		85
Beepoon	Winter		85
Bicheebeepoon	early winter		85
Meenookamin	ice break-up		85
Neebin	Summer		85
Aptaneebin	late summer		85
Takwagin	Fall		85
Moons	**Translation**	**Month**	**Page in text**
Oojeendahgishanigeezis	Kissing moon	January	85
Gateegookayzooch	Short month	February	85
Meegeezowegeezis	Eagles are coming moon	March	85
Nihkigeezis	Geese are coming moon	April	85
Mahngigeezis	Loons are coming moon	May	85
Zagibigowigeezis	Leaves are coming moon	June	85
Geezhibigowigeezis	Leaves are fully grown	July	85
Atitayminowigeezis	Berries are turning ripe moon	August	85
Wahtaybigowigeezis	Leaves are turning color moon	September	85
Benahwigeezis	Leaves are falling moon	October	85
Kashanuhnageezis	Lakes a freezing moon	November	85
Mahkooshaynuhgeezis	Christmas Moon	December	85