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GEOGRAPHY | RESEARCH ARTICLE

Using a community-driven approach to identify local forest and climate change priorities in Teslin, Yukon

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Abstract: The likelihood of addressing the complex environmental, economic, and social/cultural issues associated with local climate change impacts is enhanced when collaborative partnerships with local people are established. Using a community-centered approach in the Teslin region of Canada's Yukon Territory, we utilized our research skills to respond to local needs for information by facilitating both an internal community process to clarify traditional and local knowledge, values, and perceptions on locally identified priorities, while gathering external information to enable local people to make sound decisions. Specifically, we sought to clarify local perceptions surrounding climate change impacts on fire risk and wildlife habitat, and the potential adaptation strategies appropriate and feasible within the Teslin Tlingit Traditional Territory. This paper provides a characterization of the study region and our project team; provides background on the interview and data collection process; presents our key results; and discusses the importance of our findings and charts a way forward for our continued work with the people in the Teslin region. This approach presents an excellent opportunity to help people holistically connect a range of local values, including fire risk mitigation, habitat enhancement, economic development, and enhanced social health.

ABOUT THE AUTHORS

Joleen Timko's research and teaching interests focus broadly on forests and society, and more specifically on rural livelihoods and the role of forests in sustaining these. Her research is situated in tropical and subtropical countries in Sub-Saharan Africa, and with First Nations in Canada's west and northwest. Her research is applied, aims to be policy relevant, and often addresses one or more of the following: poverty, sustainable livelihoods, human health, forest-related conflicts, and rights and tenure. She is the managing director and a co-founder of AFRICAD—the Africa Forests Research Initiative on Conservation and Development (www.africad.ubc.ca). She also offers a massive open online course (MOOC) entitled FRST 222x: Forests and Livelihoods on Edx (www.edx.org). The research reported in this paper reflects Joleen's research interests about the role of society and local knowledge holders in forest management.

PUBLIC INTEREST STATEMENT

We consider a community-centered approach to be one where trained researchers utilize their research skills to respond to local needs for information. We used such an approach in the Teslin region of Canada's Yukon Territory to facilitate both an internal community process to clarify traditional and local knowledge, values, and perceptions on locally identified priorities, while gathering external information to enable local people to make sound resource management decisions. Specifically, we clarified local perceptions surrounding climate change impacts on fire risk and wildlife habitat, and the potential adaptation strategies appropriate and feasible within the Teslin Tlingit Traditional Territory. This approach presents an excellent opportunity to help people to holistically connect the range of local values, including fire risk mitigation, habitat enhancement, economic development, and enhanced social health.

Subjects: Climate Change; Indigenous Peoples; Research Methods in Environmental Studies

Keywords: community-driven research; participatory research; boreal forest; climate change; traditional and local knowledge

1. Introduction

The likelihood of addressing the complex environmental, economic, and social/cultural issues associated with local climate change impacts is enhanced when collaborative partnerships with local people, both indigenous and non-indigenous, are established. While efforts to engage local knowledge holders can be challenging, lessons from the community-centered approaches (both successes and failures) employed around the world indicates these approaches merit further attention. There are several reasons for this. First, Western science-based resource management does not necessarily lead to environmentally and economically sustainable resource management (Davis & Ruddle, 2010). Collaboration with local and indigenous people means that scientific knowledge can be supplemented by place-specific detailed knowledge based on long-term interaction and observation (Berkes, 2008; Berkes & Berkes, 2009; Byg, Theilade, Reinhardt Nielsen, & Friis Lund, 2012; Gadgil, Olsson, Berkes, & Folke, 2003), thereby enhancing the relevance of research with regard to local conditions and issues (Huntington et al., 2006). This is particularly important for projects that aim to contribute to practical adaptation initiatives (Pearce et al., 2009). By working collaboratively with local land users or, in the case of many of Canada's First Nations, land claims or treaty holders, genuine participation in natural resources conservation can result in more feasible and effective management options (Byg et al., 2012; Charnley, Fischer, & Jones, 2007). This place-specific knowledge can be in the form of traditional knowledge, often ascribed to indigenous peoples and defined by Berkes (2008) as a body of culturally transmitted knowledge and beliefs about the relationships of living beings (including humans) with one another and their environment. But place-specific approaches also recognize that new knowledge is created all the time, and this more recent local ecological knowledge includes practices and beliefs regarding ecological relationships (indigenous and non-indigenous) that are gained through extensive personal observation of and interaction with local ecosystems, and shared among local resource users (Charnley et al., 2007).

Mason et al. (2012) posit that community-centered approaches are important—respectful partnerships where we learn to listen to one another are needed to move beyond legacies of prejudice and misunderstanding to discover new opportunities for cross-cultural knowledge sharing. Collaborative projects can yield important social benefits, such as increased trust and improved relationships among the partners (Fernandez-Gimenez, Ballard, & Sturtevant, 2008). By engaging with people at the grass roots, the activities that emerge will have the people's "ownership" and participation, be based on trust and therefore have more chance of success (van Aalst, Cannon, & Burton, 2008). In the past, many misinformed and "expert-driven" research projects have caused long-term or negative social and environmental impacts. Such projects have resulted in the term "research" being implicated in the worst excesses of colonialism and has taken on a very negative connotation in the indigenous world's vocabulary—it "conjures up bad memories, it raises a smile that is knowing and distrustful" (Smith, 1999, p. 1). Comparatively, when local people are actively involved in research or projects where their opinions and preferences are considered, final decisions will likely face less resistance and decisions take on greater legitimacy than if people are not involved in the decision-making.

Of course, a critical perspective on participation—and *processes of participation* in particular—is important lest we risk simply valorizing "local" knowledge over other types of knowledge (Mohan & Stokke, 2010). Critiques around participation are not new (Cooke & Kothari, 2001; Goven, 2006; Marris & Rose, 2010; Wynne, 2006, 2007). Some critics claim that participation is used solely to "ward off" any public controversy surrounding scientific/environment management initiatives rather than giving the public any actual role in decisions about research trajectories (Tsouvalis & Waterton, 2012). Others fault the process of participation if genuine public involvement in problem identification by the public is not allowed (Tsouvalis & Waterton, 2012). This often occurs via pre-framing where there is a careful selection of invited participants who are expected to have particular kinds of qualifications, rather than the general and lay public more broadly (Wynne, 2007).

In this paper, we refer to our work as “community-driven research” whereby we utilize our research skills to identify and respond to local needs for information. Specifically, we facilitated both an internal community process to clarify traditional and local knowledge, values, and perceptions on locally identified priorities, and we gathered external information to empower our local partners to make informed decisions. We aimed to help local people in Teslin to holistically connect the range of values held locally, which in this case study region include fire risk mitigation, habitat enhancement, economic development, and enhanced social health. Other terms used to refer to this type of work include indigenous research or indigenous methodologies (Smith, 1999), or participatory research (Fernandez-Gimenez et al., 2008) which is believed to help empower indigenous peoples and community groups (Berkes, 2004). And increasing numbers of researchers now seek to incorporate indigenous research protocols. In response, many indigenous communities and organizations have developed ethical guidelines and policies about research which enable them to assert control over research activities and the knowledge that research produces (Smith, 1999).

Working with local residents has become an increasingly common component of biophysical and social-ecological system research in the Arctic (Huntington et al., 2006). Using a community-driven approach, the authors and project partners set out to understand local perceptions about forest vulnerabilities and to identify community adaptation strategies in relation to climate change impacts in the Teslin region of Canada’s Yukon Territory. Specifically, we sought to develop an understanding of the perceived changes occurring in the boreal forests within the Teslin Tlingit Traditional Territory (TTTT) based on the perspectives of key local knowledge holders from the Teslin region. Boreal forests, such as those surrounding Teslin, cover approximately 17% of the Earth’s land area, and are fundamental in the global carbon and water cycles, and in regulating the global climate (Bhatti et al., 2003). The climate in Canada’s northern boreal forest has undergone dramatic change. Since 1948, the greatest temperature increases in Canada have been in Yukon and the Northwest Territories; mean winter temperatures in the region have increased more than 3°C during that period (Johnston, Price, L’Hirondelle, Fleming, & Ogden, 2010). And while mean global temperature is expected to warm between 1.4 and 5.8°C by 2100, the temperature increase in the boreal region is projected to be more than 40% greater than global trends (Intergovernmental Panel on Climate Change [IPCC], 2001, 2007).

These changes have already translated into perceived vulnerabilities in boreal forests among residents in the Teslin region. In particular, a widely held perception appears to be that there is an increased risk of wildfire. Extreme fire years in the boreal forest are common (Weber & Stocks, 1998), with forest fire regimes (encompassing fire intensity, frequency, seasonality, size, type (crown vs. surface), and severity (depth of burn)) acting as an organizing force of boreal forest landscapes (Weber & Flannigan, 1997). Yet, forest fires are highly associated with climate (Weber & Flannigan, 1997), and recent fire statistics seem to indicate that fire occurrence is increasing in the Canadian boreal forest (Weber & Stocks, 1998). An important step in climate change mitigation and adaptation will be to examine the ways that climate change risks manifest themselves in particular social localities as certain groups and communities may be at greater risk due to their geographic location in a region of high climate sensitivity and/or because of economic, political, and cultural characteristics (Davidson, Williamson, & Parkins, 2003). Thus, exploring the perceptions and implications of fire risk and the potential adaptation strategies considered appropriate and feasible within the TTTT was the primary community-identified objective for this project. Knowledge gained through this process would then be used in subsequent local decision-making processes to be undertaken in the region. This paper provides a characterization of the study region—the Teslin region in southern Yukon, and our project team; provides background on the interview and data collection process; presents our key results; and discusses the importance of our findings and charts a way forward for our continued work with the people in the Teslin region.

2. Methods

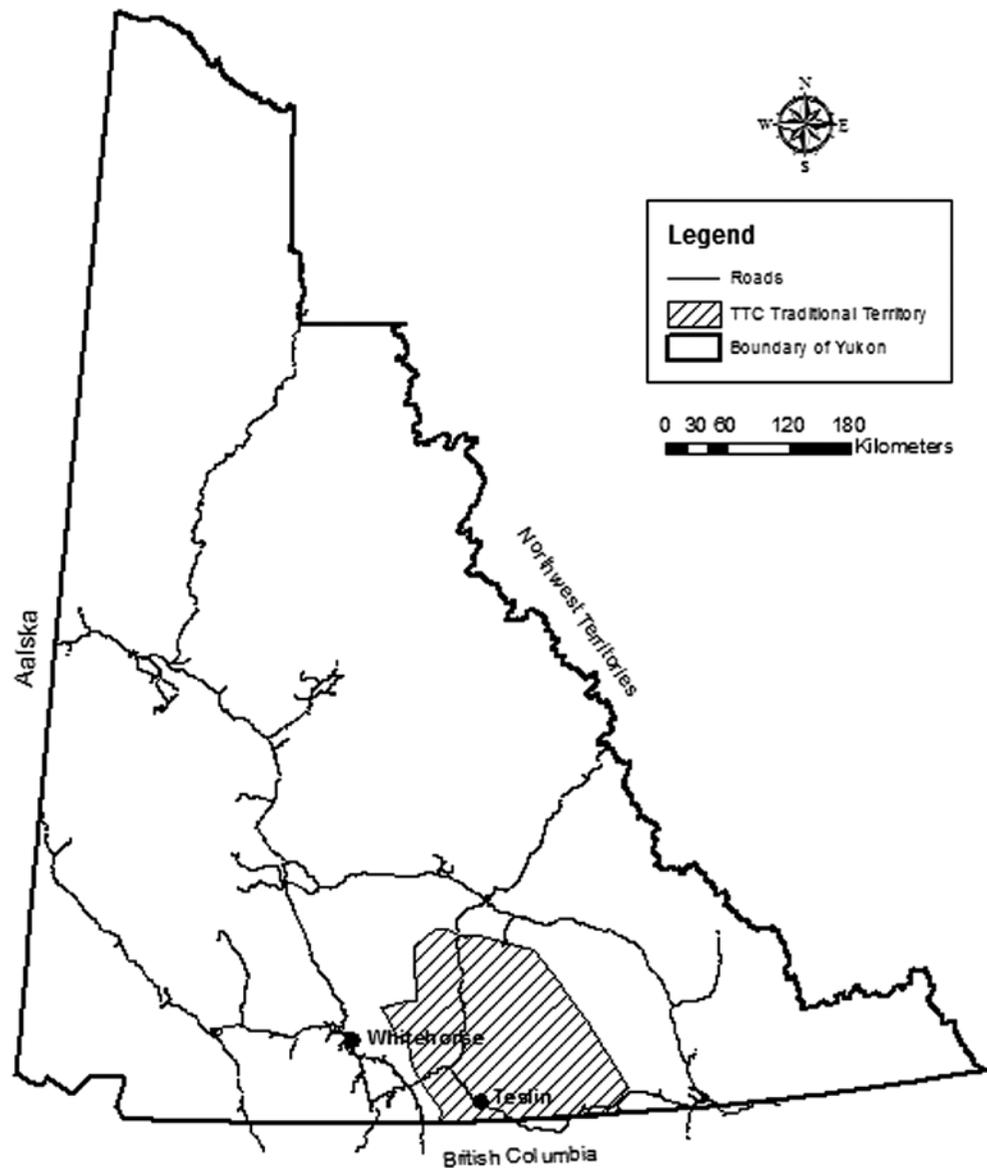
2.1. Site characterization

The Village of Teslin (VOT) is an incorporated municipality within the traditional territory of the Teslin Tlingit First Nation (Figure 1), and houses the majority of Teslin Tlingit Council's (TTC) government offices. Teslin is located along the Alaska Highway in the Southern Lakes ecoregion of Canada's Yukon Territory, and is characterized by boreal forest and bordered by the waters of Nisutlin Bay and Teslin Lake. The population of Teslin is approximately 450, and is approximately 65% Tlingit and 35% non-Tlingit. The majority of local residents are employed by the TTC, VOT, or Yukon Government (YG).

2.2. Project team and partnership building

Ecological and human dimensions research increasingly involves interdisciplinary collaborative projects that engage investigators from different academic disciplines and governmental and non-governmental agencies in partnership with community members who have their own experiences and systems of knowing (Sillitoe, 2004). The conceptualization of this project evolved from a 2009–2010

Figure 1. Map of Canada's Yukon Territory showing the location of the VOT within the TTTT.



study looking at the general theme of local forest vulnerabilities and community adaptation. During that project the research participants [including university researchers, members of the Teslin Renewable Resources Council (TRRC), and YG Forest Management Branch scientists] identified unintended disconnects between researcher-identified priorities and the perceived needs within the community. The ensuing dialogue formed around the question “How do we ensure that research is relevant to community needs, translated in useful language and content, and realistic in a given context?”.

The current four-year project, within which this study is a part, reflects an extensive process of community engagement and consultation aimed at re-envisioning the project. During 2012, communications between various members of the project team (including UNBC researchers, TRRC members, and YG scientists), other Teslin leaders, and land management staff clarified that any project undertaken would require a holistic, integrated focus were it to be of use to the community. The TRRC was therefore formally adopted as the project advisory committee. This decision, based on numerous recommendations from community leadership and land management staff, reflected a natural project link given their mandate under the Teslin Tlingit Final Agreement (1993). Renewable Resources Councils (RRCs) have been established in each Yukon First Nation’s Traditional Territory as a primary instrument for that territory’s local renewable resources management. The TRRC is comprised of 10 members consisting of one nominee from each of the five clans of the TTC and five nominees of the Minister of Environment for the Yukon. RRCs are responsible for ensuring public involvement in the development of its decisions and its recommendations, and for making recommendations to the Minister, the affected Yukon First Nation, the Board, and the Sub-Committee on any matter related to the conservation of fish and wildlife (Teslin Tlingit Final Agreement, 1993).

During the ensuing consultations throughout 2012 and into the early months of 2013, research partners (both TRRC and non-TRRC community members) stressed that increasing forest fire risk—an important topic to local residents given their proximity to vast stretches of boreal forest—would be an integrative theme connecting many of the other values considered important locally (including habitat conservation, economic development, and enhancing social wellness), and it would be one topic on which information gathering was warranted. This in itself was interesting given that in some North American indigenous cultures, it is inappropriate to speak about “sentient forces” such as fire lest speaking about them causes a fire to do exactly what the speaker has said (Huntington et al., 2006). In early 2013, the research team adopted the recommendation of the TRRC that the direction of the project should specifically incorporate local concerns about forest fire risk and related forest change within a climate change context. This enquiry would then ideally yield information to inform subsequent research priorities regarding community adaptation strategies.

2.3. Interviews

For this study, a type of non-probability sampling called purposive sampling was appropriate as it aims to select a sample on the basis of the researcher’s own knowledge of the population, the purpose of the study, and which individuals or groups will be most useful or representative (Babbie & Benaquisto, 2010). We were specifically interested in interviewing as many people as possible that are or were active on the land, and who would have knowledge about forests and forest fire risk. Specifically we were interested in speaking to people about past forest fires, forest changes and changes to wild game populations, trapping, berry picking, and medicinal plants. Thus, we used expert sampling to select our respondents in a non-random manner based on their expertise on the phenomenon being studied (Bhattacharjee, 2012; Trochim & Donnelly, 2008).

The project team met in early June 2013 in Teslin to identify those local respondents who were considered to be the key knowledge holders about forest (and to a large extent, environmental) change throughout the Teslin region. An original list of potential interview respondents was generated, and this list evolved somewhat over the course of the field season (June and July 2013). The potential respondents who were recommended included Tlingit and non-Tlingit community members who were active on the land as hunters, firewood cutters, trappers, medicinal plant collectors, and berry pickers, among others.

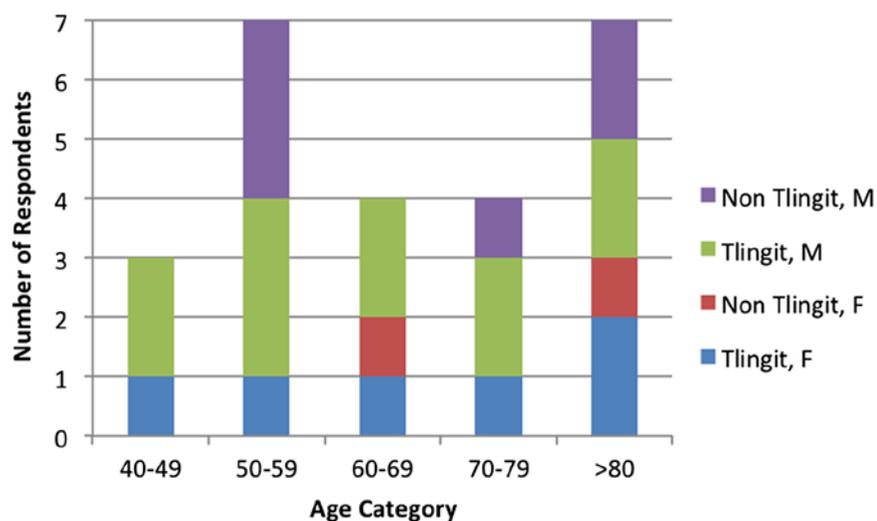
Ethics approval on the interview protocol and methods were obtained in May 2013 from the University of Northern British Columbia’s *Research Ethics Board*. However, as researchers we must accept that our research boards may not necessarily have the same views about appropriate research objectives and methods as community members. What may be perceived as culturally acceptable in an academic or professional culture may not be locally acceptable, and researchers should work with local people on developing the research foci, objectives, and methods to ensure that the research is being undertaken in a locally acceptable fashion (Pearce et al., 2009). While the TTC had not yet established a formal *Traditional Knowledge Policy* at the time of the research initiation, the project team worked closely with members of the TTC’s Heritage Department to ensure the interview protocol and methods fit within their draft policy. Likewise, the TRRC’s feedback on the protocol was sought.

The data were obtained from semi-structured interviews completed in June and July 2013 with 25 respondents who were considered key knowledge holders. In total, 17 of the interviews were with respondents of Tlingit descent, while 8 were with non-Tlingit residents living in the Teslin region or having recently moved to Whitehorse from the Teslin region (incidentally, this reflected the ratio of Tlingit/non-Tlingit residents in the Teslin region). Two of the non-Tlingit respondents were elder men married to Tlingit women who had lived in the region for most of their lives. Thirteen of the Tlingit respondents were over the age of 65, the age at which a person is considered an elder by the TTC. Figure 2 depicts a characterization of the interview respondents according to age, gender, and First Nation status.

Interviews were exploratory in nature and were intended to provide insight into local perceptions of forest fire risk and forest change. Most of the interviews were carried out with only one interview respondent at a time; however, several small group interviews occurred where a few (maximum three) respondents were interviewed together. Each interview lasted about one hour, and all interviews were recorded with a digital voice recorder. Interviews were conducted in English at a time and location deemed safe and convenient to the respondents. Interview respondents were paid an honorarium to acknowledge their time commitment to the study.

Each interview was comprised of a characterization of the respondent and their forest resource use. The semi-structured interview questions probed the depth and breadth of each respondent’s knowledge about the main topics. The interview schedule consisted of questions inquiring about the respondent’s knowledge and perceptions about: the type of forest in the TTTT regions they are familiar with, if and how the forests in those regions have changed, indications of forest fire activities in those areas, changes in wildlife, changes in weather patterns in the region, and knowledge of traditional burning that had been/is being practiced by the Teslin Tlingit First Nation. While our focus was

Figure 2. A characterization of the interview respondents by age, gender, and First Nations status.



on the entire TTTT, given the sheer size of the territory most respondents usually referred to only the few regions they were most familiar with. An open house was hosted in Teslin by the project team in November 2013 to present the results back to Teslin area residents and to provide an opportunity for clarification, verification, feedback, and comments.

2.4. Data analysis

Voice recordings of each interview were transcribed as soon as possible after the completion of the interview into individual Microsoft Word documents. The data analysis software NVIVO 8 was then used to store interview transcripts for qualitative thematic content analysis (*sensu* Creswell, 2003) and coding according to the main themes. More nuanced subcodes within each theme enabled us to assess the interview data at a finer resolution. For instance, the broad theme of “forest fire” consisted of a number of more nuanced subcodes including fire history, local perceptions about controlled burning and fire risk, regional forest fire sign, and knowledge of traditional burning.

3. Results

The purpose of this study was to develop an understanding of the changes occurring in the forests of the TTTT as perceived by key local knowledge holders from the Teslin region. It is almost impossible to overemphasize the value of the natural environment to people in Teslin. Our respondents were all active on the land—hunting, collecting berries and medicinal plants, trapping, fishing, and hiking. Several respondents commented about the importance of living in an area that was surrounded by such pristine wilderness, and the importance of getting out on the land often. Respondents genuinely felt their health benefited from eating foods from the forest and rivers, as the meat from the land is “clean” compared to store bought meat, and that many of the berries, plants, pitches and gums have important medicinal qualities. The remainder of this section presents the results associated with the main themes: changes in forests and wildlife, forest fires, support for forestry interventions that could reduce fire risk, and changing weather patterns.

3.1. Changes in forests, wildlife, and game animals

Moose is what we survive on here in Teslin ... it's what you think about—the water, beaver, moose, caribou, and berries. (Tlingit woman, elder)

Respondents were asked if and how the forest had been changing in the areas they are most familiar with. Two-thirds of the respondents referred to the forests generally as being: overgrown, mature, bushy, dense, thick, and as “having lots of brush”. Several respondents noted that the “evergreens are not coming back”, or that the conifers have been replaced by deciduous trees, especially willows. About one-third of respondents thought there were not really any changes in the forest areas they frequented.

Regarding perceived changes to wildlife, respondents were explicitly asked about new species that have been seen recently that they did not used to see, and species they used to see but that are rarely or never seen anymore. Respondents commented that new species are being seen now or are being seen more frequently than they used to, including cougar (*Puma concolor*), American crow (*Corvus brachyrhynchos*), Eurasian collared dove (*Streptopelia decaocto*), Great Blue Heron (*Ardea herodias*), Greater White-fronted Goose (*Anser albifrons*), and Snow Goose (*Chen caerulescens*). Conversely, species that used to be seen but are rarely or never seen anymore, or are seen in such low numbers as to be concerning, include swallows and songbirds generally, Coyote (*Canis latrans*), Red Fox (*Vulpes vulpes*), Snowshoe Hare (*Lepus americanus*), ptarmigan, Woodland Caribou (*Rangifer tarandus caribou*), and moose (*Alces alces*). Brown-headed cowbirds (*Molothrus ater*) were mentioned by one respondent as a species that is now being seen in greater numbers who also believed it to be a new species to the region, while another respondent commented that cowbirds used to be seen in great numbers in the 1960s but were seen in only smaller numbers at present. While not a new species to the region, wolves were a popular topic of discussion by many respondents, with

several claiming that wolf populations were increasing as wolves were seen in greater numbers in the winter. A few respondents emphasized the need to bring back predator (specifically wolf) control programs.

Moose is incredibly important to people in Teslin and many respondents commented about the cultural importance of sharing or “gifting” moose meat to family and elders. Two Tlingit women commented in the following ways about the importance of moose and wild game meat: “It’s our survival, our way of living” and “What’s Tlingit going to do without dry meat? We have to have dry meat.” Given the importance of wild game to the Teslin Tlingit, more investigation into local perceptions about caribou and moose populations is warranted. It was unclear from the responses whether caribou were easier or harder to find. Likewise with moose, arguably the most important wild game food for the Tlingit, it was unclear whether their populations were increasing or decreasing. Of those who provided a response about moose, more than half noted that moose were more difficult to find or that there were less of them, while about a third thought that moose populations were in good shape and the animals were easy to find.

3.2. Forest fires: signs, risks, impacts, and traditional burning

Most of the respondents agreed that there are clear signs of previous forest fires throughout the TTTT. These types of sign include fire scars on trees, burned stumps, and standing or fallen burnt trees. About a third of the respondents perceived that the forest fire risk is increasing either because of hotter and drier weather patterns, because the forest is older and denser and there is more fuel, or a combination of the two. Several respondents commented that forest fires generally played a positive role in maintaining the ecological balance in the forest (“some areas need to burn”), while the majority believed that fire has a positive impact on moose browse species. None of the respondents commented that fire had a negative impact on moose browse species. In terms of how fire benefits moose, comments included: “sure fire can be good ... more food for the moose” (Tlingit elder, woman); and “habitat recreation of moose ... if you get a good fire things grow back” (Tlingit elder, woman). Finally, the majority of respondents had no knowledge about traditional burning practices by the Teslin Tlingit and did not think they deliberately burned forest patches to create habitat. However, three respondents had heard of the practice of deliberately burning the forest as a way to “make moose faster” (Tlingit elder; man) and believed this practice may have been used in times past.

3.3. Support for forestry interventions

Respondents were asked if they would support some form of forestry intervention that could reduce forest fire risk. Suggested interventions were thinning and controlled burning. The majority of respondents expressed support for interventions, with an equal number expressing support for thinning as for controlled burns, with several more expressing clear support for both of these intervention types. Several respondents linked the territory’s previous fire suppression policies and practices to the current forest state of being overgrown and dense, as indicated by the words of this Non-Tlingit man: “they didn’t allow things to naturally burn when they should have. And so you get over-mature forests, which then are way more susceptible to the fire”. Supporters for controlled burning often noted the link between fires and the creation of important moose browse species, as indicated by the following: “with a controlled burn you could mitigate forest fire damage. It thins it out, puts a different species in it because the willows and poplars and stuff will grow back first, so, they don’t burn good. And it also increases moose habitat” (Tlingit man).

3.4. Changing weather patterns

Nearly all respondents made some comment about changing weather patterns in the region. Winds, in particular, appear to be changing; however the direction of their change is unclear. Some respondents noted that they believe there are more northeasterly winds now, whereas others think there are more west winds. In general, respondents perceive there to be more wind over the last 5–6 years than there was before that, and that 2012 in particular was a very windy year. Many respondents also commented about changes in weather patterns overall, such as “our patterns of weather are

certainly different now” (Non-Tlingit elder, woman), and it is “pretty hard to predict the weather now” (Tlingit elder, man). Others commented that the Nisutlin River does not freeze like it used to (such as the ice may not be as thick); winters are not as cold or may be as cold but not for as long as they used to be; summers are not as hot; now there are cooler and wetter summers; and there is not enough rain.

4. Discussion and conclusion

All of the respondents in our study emphasized the importance of Teslin’s natural environment to them, and the interviews particularly highlighted concerns about perceived changes to the forests, wildlife, and fire risk in the region. In the study region, forests appear to be overgrown, bushier, denser, or thicker; many new species are being seen while some species that used to be seen are rarely or never seen anymore; there are clear signs of previous forest fires seen throughout the TTTT; and weather patterns in the region appear to be changing. Many of these same changes have been reported by indigenous people across British Columbia (Turner & Clifton, 2009). Our results also demonstrate that the majority of respondents support forest interventions that could reduce the perceived forest fire risk, with an equal number expressing support for controlled burns as for thinning, with several more expressing clear support for both of these intervention types.

While the broad scope of this exploratory study enabled us to begin to understand local priorities regarding climate change and changes in the forests within the TTTT, we acknowledge two important limitations to the study design. First, interviews were exploratory in nature; they were not intended to be inferential, but rather to provide insight into the issue of forest change as perceived by local knowledge holders. Therefore, we have deliberately been careful to not attach numeric quantities to comments made by respondents, as these would only indicate the minimum level of support anyway. For example, it was unclear from the responses whether caribou and moose were easier or harder to find, and this could be due to the fact that these were not discrete questions that were asked consistently across interviews. Instead, through the transcript analysis and coding process, we inferred from the comments how respondents perceived these populations. It is possible that with a more focused inquiry into this particular topic, we would find that TEK was revealing a much finer-scale resolution of population dynamics where these populations were increasing in some areas while decreasing in others. Likewise, just because a respondent did not clearly indicate support for an intervention does not mean that they don’t support it, and vice versa. This is particularly important in regard to a respondent’s knowledge about Teslin Tlingit traditional burning practices. While most of our respondents did not think the Tlingit historically burned forest patches in order to deliberately achieve certain goals such as creating moose habitat, several respondents had heard of this activity. Given the nuances inherent in important discussions about traditional use, least of all for establishing a timeline of historical use, we caution that the data presented here about traditional burning should only be used to outline more clearly a detailed investigation into this topic.

Second, we also acknowledge that some of the results, particularly those pertaining to support for the prescribed burning intervention, may have differed somewhat had the interviews been conducted at another time of year, such as in the winter. This is because June and July 2013, the two months when interviews were conducted, were extremely hot, dry, and windy, likely reminding residents living in Teslin’s heavily forested areas of the very real risks of potential forest fires under such conditions. As well, a house fire that destroyed a local residence in Teslin in July 2013 could have further reminded latter interview respondents of the threat of fires. Understandably then, the thought of any fire—even a prescribed burn that was conducted carefully at the appropriate time of year such as during a cool, wet spring—would have been unpalatable.

In spite of these potential shortcomings, this study has nevertheless clarified that knowledge holders in the Teslin region: (1) report clear signs of previous forest fires throughout the study region, (2) are concerned that the risk of a catastrophic wildfire occurring is increasing along with observed forest and climate changes in the Teslin region, and (3) clearly support forest interventions that could reduce forest fire risk, particularly if they simultaneously increase moose browse species. The

interview data is consistent with general Western science projections for the region that fire occurrence is expected to continue to increase (Weber & Stocks, 1998). If changes in the forests do reflect fundamental changes in climate, and given that changes in climate are projected to continue (Weber & Flannigan, 1997), it is important that local people understand the potential vulnerabilities in the coming decades so they can better articulate support for possible interventions to address these vulnerabilities. Interventions such as prescribed burning must reconcile the trade-offs between the benefits that fire as a necessary natural disturbance brings with the very real risks that fire poses (Zaksek & Arvai, 2004).

The need to balance potential interventions that have very real risks demand that, at least to some extent, local perspectives are taken into account during natural resource management decision-making. At the same time, a participatory approach must respect people's priorities (van Aalst et al., 2008). Our study helps to clarify local priorities in this domain, and the observations and perspectives obtained through the interviews described in this paper are important to include in discussions and considerations of climate change (*sensu* Turner & Clifton, 2009). Scientific models require knowledge and information commonly not available to them but available through local knowledge holders. Both qualitative and scientific knowledge is required in order to form a holistic interpretation of complex systems especially under changing conditions (Kalland, 2000). The local and indigenous knowledge that has been documented here can supplement and/or enhance the scientific knowledge on these topics (Berkes, 2008; Berkes & Berkes, 2009), particularly around complex systems and their changing weather patterns, species arrivals or disappearances, and wild game populations. In Teslin, we accept that any management interventions will require local support and buy-in. We therefore move forward with the understanding that there is support for some form of forest-related intervention, but that more work is required to refine what this/these could look like. The challenge for our project now is to better articulate interventions that can broadly reduce forest fire risk, while simultaneously incorporating other local values around moose and local employment specifically.

As a next step, we will facilitate a small, working group (about 6–10 community members) in Teslin to clarify the threat of wildfires to the community and surroundings, and to make recommendations regarding management options to reduce fire risk. This group will primarily function as a “community learning group” to support informed decision-making in the community related to wild-fire risk reduction, and to support increased public awareness of the issues/management options related to fire risk mitigation and community development. Such a community-driven approach presents an excellent opportunity to help people understand the potential and broad benefits of strategically and holistically connecting the range of local values, including fire risk mitigation, habitat enhancement, economic development, and enhanced social health. By being rooted with the people in the community, this process aims to foster their active participation and provide the basis for them to discover their own means of solving their difficulties (van Aalst et al., 2008). The working group's activities should also provide a useful framework for future learning and decision-making related to these issues at larger scales (outside the community).

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