

**Adaptive Capacity Creation]b`h\Y`GhŒ.` `FYgYUfW\`UbX`
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5dUW\Y`Hf]VYž` 5NŁ`**

by

J]j]UbY` <]dd a Ubb` ; U i Yf

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Requirements for the Degree of
Master of Resource Management

in the
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Faculty of Environment

Project No. 730

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Approval

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The author, whose name appears on the title page of this work, has obtained for the research described in this work, either:

Research ethics approval from the "Office of Human Resources" of the University of Research Ethics

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Indigenous peoples are disproportionately threatened by a changing climate. Research indicates that U.S. Tribes and Canadian Aboriginal Peoples are experiencing detrimental climate change effects. In this context, Indigenous organizations deserve special consideration as community-based pathfinders for collective welfare. I engaged with two Indigenous organizations that share cultural heritage stewardship missions—c@^ÁÛc5K| Á Ü^•^æ!&@Áæ}áÜ^• [~!&^ÁTæ}æ*^ { ^}cÁÔ^}c!^ÁÇÛc5K| ÁPæcâ [}ÉÁÓÔDÁæ}áAc@^ÁØ [!cÁCE]æ&@^Á Heræcæ*^ÁØ [~ }áæcâ [}ÁÇY @âc^ÁT [~ }cæâ}ÁCE]æ&@^ÁV!âà^ÉÁCEZD—to investigate perceptions of climate effects and develop recommendations for organizational support of community adaptive capacity. Research methods included engagement with organizational collaborators, semi-structured interviews with organizational representatives and community members, and organizational documents review. Results indicate that community members are experiencing increase in extreme weather events, changes in water quantity and quality, reductions in long-term water and food security, and reduced access to traditional resources and traditional practices. Results identify diverse opportunities to enable adaptation, most of which are case study-specific. Educational

Dedication

I dedicate this thesis to the wonderful research participants that made it possible. It is challenging to express the degree to which certain interviews influenced me as I listened to them, transcribed them, and read them again and again. I have been gifted with deeper understanding and wisdom than I could ever have attained through study of written content. I hope that this thesis can start to repay them in goodness, although written content falls short.

“There is a goodness within everybody, and if you share that, you share those good feelings with something, it comes back. . . . So, to be in a good mind, in a good heart, in a good spirit, it is what we say. To be all good, all together. Lets'emót: ”— Ernie Victor

5W_bck`YX[Y a Ybhg

I am grateful to have so many people to thank. First and foremost, I would like to thank John Welch for supporting me throughout my Master's degree and for always being attentive to my work. I would also like to thank John Welch and David Schaepe for their time reviewing my thesis and for making it possible for me to engage with the Fort Apache Heritage Foundation and the ̀c5K| Research and Resource Management Centre. I am very grateful to all research participants who shared their time and knowledge with me. Certain participants spent even more time collaborating with this study and familiarizing me with the organizations—a special thanks goes to Krista Beazley, Cheryl Pailzote, Karl Hoerig, Shana Roberts, Tia Halstad, Ernie Victor, and two other participants who preferred not to be named. I would also like to especially thank Rowena Cooya, Sonny McHalsie, and Eddie Gardner as I perceive them as elders who shared their traditional knowledge with me. I would have specific things to give thanks for every participant individually but I will stop here.

I am especially grateful for my partner Ariel for being by my side and for always believing in me. It would have been extremely more challenging to go through this program without his unconditional support and affection. I thank all of my family for being so wonderful. A special thanks to my mother and sister, Rosane and Vanessa Gauer, and to my best friend Laura Jacques, for always being close to me in spite of the geographical distance. I thank my mom as well as my dad, Gabriel Gauer, for their emotional and financial support, without which this Master's degree would not have been possible. I am also grateful for my grandmother Ruth who is nothing short of a role model.

I would also like to thank my amazing cohort who made Canada feel like a home away from home. I could never have imagined I would meet so many special people at once.

I am also grateful for the Pacific Institute for Climate Solutions and Simon Fraser University for funding this project and for the continuing opportunities to learn and to share my research with others.

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AZ	Arizona
BC	British Columbia
CAQDAS	Computer Assisted Qualitative Data Analysis Software
CIER	Centre for Indigenous Environmental Resources
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
DFO	Oceans and Fisheries Canada
DOI	U.S. Department of the Interior
FAHF	Fort Apache Heritage Foundation
FAO	Food and Agriculture Organization of the United Nations
FBC	Fraser Basin Council
FSC	Food, Social, and Ceremonial
INAC	Indigenous and Northern Affairs Canada
IPCC	Intergovernmental Panel on Climate Change
LFFA	Lower Fraser Fisheries Alliance
LMFMS	Lower Mainland Flood Management Strategy
MARRC	Ministry of Aboriginal Relations and Reconciliation
NHL	National Historic Landmark
ORE	Office of Research Ethics
PDO	Pacific Decadal Oscillation
PICS	Pacific Institute for Climate Solutions
PRRO	People of the River Referrals Office
SEA	Strategic Engagement Agreement
SRRMC	Úc5K ÁÜ^•^æ!&@Áæ}áÜ^•[^!&^Á Tæ}æ*^ { ^}cÁÔ^}c!^
SSA	Úc5K ÁÜ^!çâ&^ÁCE*^}&^
STSA	S'ólh Téméxw Stewardship Alliance
SXTA	Úc5K ÁÝ , ^ç , à { ^ç , ÁV!^æc^ÁCE••[&âæcâ[}
TPPR	Tribal Plan and Project Review Panel
WMAT	Wh.0.007 end

Adaptation is further classified as anticipatory or reactive based on the timing of the adaptation in practice, as adaptation to climate change is a continuous process. It is consistent throughout the literature that planned adaptation to climate change holds the potential to reduce adverse effects on a given system through “the use of information about present and future climate change to review the suitability of current and planned practices, policies, and infrastructure

Adaptations als

groups who think of themselves as vulnerable might act as such, thus implementing a self-fulfilling prophecy.

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Human systems' differences in vulnerability and adaptive capacity arise from non-climatic factors, such as socioeconomic inequalities and uneven development processes. Such differences shape differential risks stemming from climate change

ÇP[à|^Á^cÁæ|ÉÁG€F|DÉÁQ}ãâ*^}[~•Á]^[]|^•¹ comprise some of the social groups that are
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- x Historical establishment of Indigenous settlements (e.g., U.S. Indian
{|^•^|çæcî[}•D

frequency and severity of extreme weather events, frequency and severity of forest fires, and loss of keystone species, First Nation resource-dependent and subsistence economies are also projected to

According to the Third National Climate Assessment, key climate impacts to U.S. Native American Tribes include increase in wildfires, diminished access to traditional foods, impacts on crops, changing water availability, permafrost thaw and its

Bennett et al. (2014, 299) state that Native American Tribes due to a number of “adverse social indicators,” such as pervasive poverty on reservations (28.4% poverty rate on reservation homes) lack of running water (20% of

More recently, in the Fourth National Climate Assessment, Jantarasami et al. discuss how climate impacts to tribal lands, water, traditional foods, and resources are threatening Native American subsistence, economies, and health. Health impacts are not only physical, but mental and, according to an Indigenous perspective,

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Adaptation to climate change is a recent field, and scholarship is rapidly expanding. The literature has so far relied on

implemented to a large degree depends on the communities themselves and their awareness and willingness to act, most decision-making guidance regarding adaptation to climate change has followed a rational-linear process that flows directly from assessed impacts and risks to the recommendation of planning and management responses, with less attention to sociocultural perceptions and community contexts (Jain et al., 2008). These approaches have been criticized for not properly addressing the diverse sociocultural contexts and decision-making processes within which climate decisions are made (Smit and Wandel, 2007). Adaptation planning and implementation can benefit from recognition of specific sociocultural contexts. In these considerations, the research design is aligned with a research stream that aims to investigate the ways in which a given system or community experiences changing climatic conditions and the processes of decision-making that guide adaptation actions (Smit et al., 2007).

partial (organization-centered
community— perspectives
and realities.

V@^ÁÛc5K| ÁÜ^•^æ!&@Áæ}áÁÜ^•[~!&^ÁTæ}æ*^ { ^}cÁÔ^}ci^Á(SRRMC or CentredÉÁ based in Chilliwack, BC, is a branch of Stó:| ÁPæcá[]—the political amalgamation of eleven Stó:| ÁØä!•cÁPæcá[]s, which also functions as a service delivery agency through c@^ÁÛc5K| ÁÜ^!çä&^ÁCE*^}&^ÁÇÜÙCED. Seven Ûc5K| ÁØä!•cÁPæcá[]s are represented by another organization, the Stó:| ÁV!ääæ|ÁÔ[~ }&|ÁÇStó:| ÁV!ääT { }

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engage in referral review, the PRRO employs the

The “inseparability of land and thought, of geography and memory,” is reflected in the Ndee word ni’, which has multiple meanings: land, mind, country, and way of thā } \ā } * ÁÇ Y ^|&@ÁG€€JDÉÁ however, increasingly restricted in their access to and sovereignty over their traditional land, as reservation area was subsequently reduced to allow for settler society land exploitation (Welch anāÓ!æ~ &@|āÁG€F€ÉÁ Í FDEÁ

The current Fort Apache and Theodore Roosevelt School National Historic Šæ}ā { æ! \ÁÇPŠD was originally established in 1870 as a U.S. military facility with the & [] •^}cÁ [-Á] [&æ|ÁCE] æ&@^Á|^æā^! •ÁÇ Y ^|&@ÁG€FJDÉÁQ}ÁFJGGÉÁc@^ÁCE! { ^Áæàæ } ā [] ^āthe post, æ}āÁc@^ÁØ [!cÁCE] æ&@^Á] ! [] ^!c^Á , æ•Ác!æ } •-!;!^āÁc [Ác@^ÁÖ^] æ!c { ^ }cÁ [-ÁQ}c^!ā [!ÁÇÖUQDÁæ } āÁ employed as the site for an Indian school, the Theodore Roosevelt School—which taught children of varied Native American backgrounds while for many decades prohibiting Native languages to be spoken. The Fort Apache buildings and 400 acres of land were finally placed “in perpetual trust” for the T!āà^Áā } ÁFJ Î €ÁÇ Y ^|&@ÁG€FJÉÁ Ĩ ĨDÉÁ

U.S. negligence and mismanagement of the Fort Apache property led the Tribe to file a lawsuit against the federal government for failure to meet fiduciary obligations and to recover damages to the property. In 2003, the Supreme Court found in favour of the Tribe, and in 2007 a settlement created a permanent fund to preserve the property (Welc@ÁG€FJÉÁ Ĩ €DÉÁFort Apache has thus been transformed from a site for the imposition of non-Apache values to an antidote to colonialism and symbol of the Tribe’s legal ç!&c [! ^ÁÇ Y ^|&@Áæ } āÓ!æ~ &@|āÁG€

(FAHF 2015) site from a reminder of colonial subjugation to a center of communal and entrepreneurial activity and a symbol of pride and hope for the White Mountain Apache Tribe.

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The participant organizations are aware that current and projected climate change effects comprise risks to the communities they serve. However, climate change adaptation had not been a specific focus of organizational work prior to this research in engaging in this research project to explore potential synergies between organizational work and community adaptive capacity enhancement. Given these considerations, the primary research objective is:

- x Develop recommendations for the participant organizations to support the communities they serve in adapting to climate change.

As explored in sec 0.(d4 0.00-5.9 (at)6.6 (e)10.5 (cp5004800h(TjEMC /P 515.aaw)3.4 (ar)6 (e t)015

iv. Organizational support of climate adaptation.

Each of these ancillary objectives are explored in semi-structured interviews and developed into content analysis domains. The first ancillary research objective is developed into the content analysis domains termed “observed climatic and environmental changes” and “reported cumulative effects on communities.” Given that most climate change literature is not tailored to communities’ scope and priorities, I decide to focus on community members’ perceptions of climatic and environmental changes to their territories. In this way, I aim to provide the opportunity for community members to present their perspectives and illuminate novel themes that might not have been previously addressed in the literature, as well as to share local and traditional knowledge of changes in climate and their impacts to local

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Research methods included literature searches, collaborative engagement with key research participants/collaborators from the SRRMC and the FAHF, semi-structured interviews, organizational documents review, and qualitative content analysis using QSR International's NVivo 12 software. Research methods and processes are detailed in section 2.1, and data analysis methods are detailed in section 2.2.

Between September 2016 and May 2017, I reviewed literature on the following adaptation to climate change, with an emphasis on North American Indigenous contexts; relevant to the communities served by the SRRMC First Nations FAHF

The purpose of qualitative methodology is to describe and understand, rather than to predict and control. Qualitative methods are unique in that they are more intensive than extensive in their objectives, seek access to a given group's cultural categories and worldviews, and look for complex patterns of interrelationship between multiple research objectives are specific to the participant organizations and associated communities, and that their pursuit requires a degree of access into the groups' perspectives, qualitative methods were deemed the most appropriate research design.

It is important to recognize that the methods employed in this study do not stem share characteristics and can dialogue with qualitative research methodologies, but differ from these in fundamental ways. The most important shared attribute between these research traditions is the relational nature of research—which, in Western-based methodologies, is restricted to the relationships between researchers and participants.

Two fundamental differences between these traditions are rooted in their different language systems and knowledge systems.

methodologies are guided by Indigenous languages and tribal epistemologies. Kovach (2009, 30) states, “knowledge is neither acultural nor apolitical.”

In spite of its Western-based methodology, this study aims to conduct research that is ethically responsible and reciprocal with regard to the participant organizations and the communities they serve. Western research has traced a history of infringing Indigenous communities, which represents “an extension of the Indigenous-settler colonial project.” The relationship between research and community begins with the incorporation of Indigenous ethics review boards into research processes, as well as university ethics review that hold specific considerations regarding Indigenous community research. Additionally, numerous Indigenous research protocols have been developed. Aspects often emphasized by these protocols include the need for community participation in research, research participation consent, and research outcomes that accrue to community benefits.

This study involves collaboration on research processes and outcomes with the participant organizations. Key participants or collaborators comprise research participants involved in a collaborative process to guide the research design, support the development of recommendations for the organizations, review research outcomes, and possibly engage in co-publication.

Between September 2016 and May 2017, John Welch and I engaged with one collaborator from each participant organization to delineate the research design and discuss our proposed methods. John Welch and I developed a research proposal, a participant consent form, and a semi-structured interview guide, which were reviewed by the participant organizations, the White Mountain Apache Tribe’s Tribal Plan and Project

&"%" Data Collection

Data collection involved on-site information compilation and the conduction of twenty-seven semi-structured interviews at

project. The interview guide also allowed for small changes to reflect case study characteristics and terminology. Interviews were, on average, between 1 and 1.5 hours in length.

All participants received a consent form (see Appendix A), which outlined the voluntary nature of participation and provided participants with the choice to consent to participate or to decline participation, as well as to disclose their names or to remain confidential and be given a pseudonym in research outcomes. For the SRRMC case study, participants were given the choice to consent or not that their interview recordings and transcripts be deposited in the SRRMC archive. Participants also had the opportunity to verbally consent to being recorded or not. I used an audio recording device to record all but one interview. Participants were not offered any incentives for their participation.

I conducted thirteen semi-structured interviews for the SRRMC case study. Twelve interviews were located at the SRRMC, in Chilliwack. One interview was conducted in Kwantlen First Nation. Interviews were conducted between July and November of 2017. Of the thirteen participants, eight were internal and five were external. Eight participants were male and five were female. Two internal interviews were mostly focused on obtaining relevant information on the organization. While these provided valuable information for the development of organizational recommendations, they did not contribute as extensively to the analytic categories generated through the use of NVivo. Table 2.1 lists research participants and provides additional details.

Table &-1" GhE. `WUgY`gh i Xm`fYgYUfW\`dUfh]W]dUbhg

Participant	Date	Relation to SRRMC	Affiliation
	July 24, 2017	Staff	Shxw'onamel First

Table &-&" ApaW\Y'WUgY'gh i Xm'fYgYUfW\ 'dUfh]W]dUbhg

Participant	Date	Relation to FAHF	Affiliation
Alexis*	May 30 2017	Confidential	Tribal member
Ali*	May 30 2017	Confidential	Tribal member
Angel*	June 1 2017	Confidential	Tribal member
Avery*	June 1 2017	Confidential	Tribal member
Brenda Pushed Begay	May 31 2017	External	Tribal member
Cheryl Pailzote	May 24 2017		

content analysis are particularly linked to any disciplinary field. This is a reflection of this method's flexibility and lack of specific rules other than suggested content analysis procedures (Bengtsson 2016; Hsieh and Shannon 2005). The choice between different modalities of content analysis depends on one's research goals. The use of content analysis here is inductive and qualitative.

In an inductive content analysis approach, the researcher analyzes the text in order to identify conclusions stemming from it. Conclusions or categories are thus drawn from the data and not predetermined (Elo and Kyngas 2008). Deductive reasoning, on

pertaining to research questions (Bengtsson & Åkerlind). The researcher assigns a code to each meaning unit, creating a coding list.

After the

study are intrinsically based on forms of human communication, there is always the potential for what the participants express and what the researcher understands

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I divide this chapter in six sections. I begin by presenting the results from the domains that comprised the content analysis: observed climatic and environmental changes, reported cumulative effect•Á [} ÁÛc5K| Á& [{ { ~ } ácâ^•ÉÁáâ^} cá-â^â adaptation actions, adaptation opportunities, and organizational roles. The final section summarizes lessons learned from the case study results and drafts recommendations for organizational support of community adaptation. The relationships between domains and research objectives are described in section 1.5.

I strive to describe the content analysis based solely on participants' semi-structured interview responses. I allow for more researcher subjectivity in section 3.6, where I fu-17.4 (u-17.4n^)/6.6 (628 Td[(s)20.6 (on]3]TJ0-.3 (628 Td36.2.6(vÞ.8 b.2.6(vz6 (655 .5 (þa48Cs)n

quantitative analysis

Warmer Fraser River temperatures are also perceived to be related to decline in snowfall, and to exert detrimental effects on salmonids and other species:

T

Because of its “unique conditions” for salmon preservation, the Fraser canyon has been a site for the practice of wind-dried salmon since time immemorial (Butler
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othe!ÁØã!•cÁPæcã[}•DÁãã^cÁ~ }cã|Ác@^Ác, ^}cã^c@Á&^}c~!~ÉÁ, @^}Á* [ç^!} { ^}cæ|Á-ã•@^!ã^•Á
!^*~|æcã[}•Áã^*æ}Ác[Áã!æ•cã&æ||^+Á!^ã~&^ÁÛc5K| Á]æ:cã&ã]æcã[}Áã}Á, ã}ãÁã!^ã} *ÁçÓ~c|^!ÁFJJÌÉÁ
FDÉÁDecline in salmon populations is one factor that is currently leading to restrict

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summer conditions as leading to increased threats of wildfires in British Columbia. BC wildfires, depending on their location, can lead to lower air quality in the Fraser Valley:

In the summer and fall, seems to be much drier, the threats of forest fires are increasing now. . . . We recently had our valley filled up with smoke because of fires in Harrison River in this summer already. (Eddie Gardner,]^!•ÉÁ&[{ { ÉD

Õ|[àæ|Á&|ã { æc^Á&@æ} *^Áã}&!^æ•^Á!ã•\Á[-Á-|[[áã} *Áã}ÁÛc5K| Á&[{ { ~}ãcã^•KÁ

Flooding is a real fear, real worry on many of the reserves. . . . The communities that are at risk for flooding want to build up dikes and protect their areas. (Shana Roberts,]^!•ÉÁ&[{ { ÉD

Úæ!cã&ã]æ}c•Á[à•^!ç^Áã&^Á•c[! { •Ác[Áà^Á|^æãã} *Ác[Á] [, ^!Á[~cæ*^•Áã}ÁÛc5K| Á

communities (Carrielynn Victor, pers. c[{ { ÈLÁVæ^|[!ÉÁ]^!•ÉÁ&[{ { ÈÉÁR~|^ÁG|ÉÁG€FÏDÈ One participant observes an apparent combination of ice storms and rain-on-snow events:

But the rain on ice on snow event seems like a new. . . . When this freezing rain comes down and forms ice blocks around an entire tree, and then it pours rain, because it warms up so fast that the trees crack under the pressure, it is strange to me. (Carrielynn Victor,]^!•ÉÁ&[{ { ÉD

Úæ!cã&ã]æ}c•Áæ!^Áæ|•[Á[à•^!çã} *ÁæÁ!^&^}cÁã}&!^æ•^Áã}Áã}•^&c•Áã}ÁÛc5K| Á

communities:

One of the things that is really prevalent this year is the number of bugs. There are more horseflies, lots of mosquitoes and lots of wasps. And the mosquitoes, for one of the communities, they are like, “We can’t even go outside. We go outside for two minutes and we are covered in mosquitoes.” (Shana Roberts,]^!•ÉÁ&[{ { ÉD

Table 3-3" =bWfYUgYX'f]g_g

Impact	Number of references
Insect proliferation	3
Increased risk of floods	3
Increased threats of wildfires	2
Lower air quality due to wildfires	2
Ice storms	2
Rain on snow events	1

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Table 3.4 depicts observed changes in local climate and seasonal patterns. Warmer and drier summer conditions are mentioned in interview excerpts in the last two sections. These impacts are not further detailed by participants.

Ôæ!iâ|^ } }ÁXâ&c[!ÁÇ] ^!•ÉÁ&[{ { ÉDÁ^ç }|æâ}•Á@[, Á•^æ•[}æ|Á , â}â•Áæ!^Á•@â-câ} *Áæ} âÁ à^&[{ â} *Á|^••Á] ^!•î•c^} cÁâ}Ác@^âiÁ [&& ~!i^} &^ÉÁæ} âÁ@[, Ác@^•^Á] @^} [{ ^}æÁ!^|æc^Ác [ÁÛc5K| Á culture. She also perceives the weather to be less predictable in general:

The weather often is more unpredictable. . . . The wind is a little different

patterns exert on \dot{U}_{c5k} communities. Of these traditional resources, impacts to salmonids play a central role in the effects identified in this study.

Table 3-) " FYdcfhYX'YZZYWhg'cb'Wc''YWh]jY'GhE.' 'Wc a a i b]hm'UbX'UZZYWhYX' X]a Ybg]cbg

Impacts to Fraser River salmon populations	Impacts to traditional resources	Other impacts
Depriving "Salmon People" of salmon	Traditional foods scarcity	Environmental changes hinder cultural practices
Less access to fishing	Reduced 6 W y Obéing H O O	Changes in seasonal indicators affect timing of ceremonies
Lower incomes for fishers	Resources less available for traditional uses	Reduced air quality
Changes to First Salmon Ceremony	Decline in intergenerational knowledge transfer	More frequent power outages
	Effects on people Shxwelí and on spiritual connections	

= a dUWhg'hc' : fUgYf'F]jYf'gU` a cb'dcd i`Uh]cbg

This section describes reported effects stemming from decline in salmonid population des652 306.;207]ETQq246 306.6 140.521 65 (e)10.5 (f)6.6 (f)2.6 (n)10.5 (g)6 -0 0 9.96 956 (t)1069

of ancestral skeletal remains. Such studies reveal that marine protein traditionally comprised about 90% of *Úc5K|* diet (Smith 2001, 120DÉÁQcÁâ•Á~ }&|^æ!Á , @æcÁ@^æ|c@Á^~^&c•Á could stem from lack of salmon in *Úc5K|* diet:

We are fish people. We have always been fish people. What happens when there is no fish, w

It is incredible to see that [lack of fish] happen. I don't know what we do because we are river Indians, you know, we are all fishermen and we all live on the river and the river has always been our food source for thousands of years now. (Joseph Öx)ã~!æ}âÉÁ]^!•ÉÁ&[{ { ÉDÁÁ

There has also been a decline in the practice of wind-dried salmon, as the dry rack season is restricted due to conservation purposes:

It has been the same for ten, fifteen years now, I think. I think it was about three or four years ago . . . [that] quite a few elders as far as I know missed out on the dry rack opening because they only gave four days. So it has been like that way for a while, it is mainly because of . . . concern for the Stuart run. And that is the fish that is running right at that time, when the dry rack is opened. (Sonny McHalsieÉÁ]^!•ÉÁ&[{ { ÉD 0207/15/107701091 (our)6 (day)1.3 (nc)13 (e)1

the re-enactment of an Sxwóxwiyám that tells the story behind the annual return of salmonids to Yale. According to this Sxwóxwiyám, men that were transformed into birds, together with Ó^æç^!Áæ}áÁÜæcÁÇT [~ •^É!á^] ^ } áã } *Á [} Ác@^ÁÇ^!•ã [} DÉÁ&æ] c~!^áÁc@^Á• [& \ ^ ^ Á baby from the ocean, threw its diapers in different places, and brought the sockeye baby up to Yale (McHalsie 2007, 90–91DÉÁ

Because of this Sxwóxwiyám, people conduct the annual First Salmon Ceremony, so that the bones of the first salmon are returned to the water. The ceremony involves collective sharing of the first caught salmon, saying of prayers to the salmon people, and return of salmon bones to the river by one of the chiefs, one spiritual person, one elder, and one youth (McHalsie 2007, 91DÉÁÒääã^ÁÕæ!á } ^!ÁÇ] ^!•ÉÁ& [{ { ÉDÁ-~!c@^!Á describes the First Salmon Ceremony as follows:

Because we relate to salmon as our relatives, we acknowledge them every year. . . . The most powerful way we do that is through ceremony, we have our salmon songs. And they say that every year in the spring time, when the first salmon comes, the fisherman that catches the first salmon, they need to bring that salmon into the longhouse, and invite as many people as possible to come and share the salmon. . . . And offer the remains of the salmon back into the water, with the message that we thank the salmon people, we thank the salmon spirit for continuing the cycle. And the old ones always told us that if we ever stopped doing that, we would have no more salmon.

Changes in timing and abundance of salmon returns alter community members'

salmon populations “definitely affects us in regard to our food fisheries and how we sustain ourselves in the winter months by catching what comes in the summer.”

Substituting store-bought foods for wild salmon constitutes an added expense that can be financially challenging for households. Additionally, stronger reliance on such foods implicates being vulnerable to market fluctuations, to climate change effects on global food production, and to Western society and its potential crises (Clarence Pennier, pers. comm.; Carrielynn Victor, pers. comm.) Overall, food security is decreased by traditional food scarcity.

Store-bought foods are also replacing traditional foods in ceremonies. This is an undesired change to traditional practices and ceremonies and is viewed upon as a negative situation:

When we are doing these ceremonies now, you might get one or two fish if you are lucky. . . . And then you might have to feed your community something else besides fish. So again, it is part of the tradition that is being lost. And it is a pretty sad day when you can't feed your community what we are used to traditionally. (Murray Ned)

Sharing traditional foods in ceremonies also comprises a form of connection to resources and to ancestors' spirits. Therefore, lack of traditional foods incorporation into

My community . . . whenever we have our ceremonies in the spring and the fall. . . . We feed our ancestors' spirits, because we come from the sturgeon, or close relation to the sturgeon, we have to serve sturgeon at those ceremonies. Because we feed our ancestors with burned food in the fire, and so we always make sure.

Resources less available for traditional uses

Decreased availability of traditional resources in the territory, as well as changes in their geographical distribution and seasonal availability, restrict community members' access to these resources. Restricted access limits the use of these resources in gatherings and ceremonies, for their medicinal properties, and for other traditional uses. Participants express concern regarding potential climate change effects on resources that are needed for specific ceremonies:

. . . If we need certain trees for certain ceremonies, how do these ceremonies change? (Carrielynn Victor)

Decline in intergenerational knowledge transfer

Decreased access to traditional resources consequently reduces access to the teachings associated with these resources. It is more difficult for community members to teach younger generations when resources or the cultural practices associated with them are less accessible (Carrielynn Victor). This constitutes a threat to traditional knowledge developed over thousands of years of connections with resources:

Because if we can't practice fishery . . . we can't pass on the knowledge and the education to the next generation. So there could be a lost form of traditional practices. . . . There is an interest in fishing but it is not as strong as it once was because there is not as much of the resources to go out and practice the fishery. (Muriel)

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As described in Sxwóxwiyám, certain traditional resources were originated from

Effects on people's Shxwelí (life force) and on spiritual connections

It is through discussed cultural practices (e.g., fishing, hunting, plants *æc@^!â} *DÁ that the Úc5K| connect with resources in a spiritual and reciprocal way. As Ernie Victor Ç]^!•ÉÁ& [{ { ÈDÁ^ç]|æâ} •ÉÁc@^•Á!^|æcâ []•@â] •ÁÇadÁâ}Ç [|Ç^ÁæÁ!^•] [] •ââ|äc^Ác [connect shared by both parties, ÇääDÁ need to be maintained through time such as any other type of relationship, æ} äÁÇääDÁæ~^&cÁ []^q•Á life force and integrity:

Spiritual impacts, you need to be engaged with something in order to be spiritually connected. . . . You have a responsibility to connect. The resource expects you to be there and is planning on providing for you, and has made that commitment. Now, as humans, if you are not there, you miss that connection. Therefore, you are unable to work with your own life force and gain support from that resource to support your life force. So, if you miss that, you miss a part of you.

Úc5K| people's life force (

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This section describes reported effects that are not linked to impacts to traditional resources.

power outages risk losing game meat and other traditional foods that are harvested and preserved to last throughout seasons (Taylor, pers. comm. DEÁÁ

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Ùc5K| Á&[{ { ~}ác^Á { ^ { à^!•Áæ!^Áââ^} cá-^â} *Á^}Çä! [] { ^}cæ|Á&@æ} *^•Áæ} áÁæâæ] cá} *Á

First Nations in the lower Fraser River and develops projects to mitigate harm to salmonids. The LFFA is currently working on the Lower Fraser Climate Adapt project to support communities in adapting to climate change effects to Aboriginal fisheries, with a

particular, has

Forests) further confirmed and set precedent for the Crown's duty to consult (Isaac and S) [çÁG€€HDĚ

In response to evolutions in Aboriginal case law, the province of British Columbia published the Provincial Policy for Consultation with First Nations in 2002, which was updated in 2010 (Brady 2014; MARR, n.d. DEÁV@a•Á []ã&^Áã•Á []^!æcã []æ|ã: ^áÁc@! [~ * @Ác@^Á Crown's referral process ç T [!^|æc [ÁG€€Ì DEÁ The Province of BC has also entered into Ûc5K| Ác@æc^*ã&ÁÖ} *æ*^ { ^} cÁCE*!^^ { ^} c•ÁÇÛÖCE•DÁ with a number of First Nations to establish consultation and accommodation procedures that are agreed upon by all parties (MARR, }ÉãÉDEÁÛãçc^^} ÁÛc5K| Ác@ã!•cÁPæcã [] • have developed a common Strategic Engagement Agreement with the Province (Ûc5K| Ác@ã!•cÁPæcã [] •Áæ} áÁc the Province of British Columbia 2016D.

However, there are instances in which less than meaningful consultation still presents a challenge for Ûc5K| governance over the use and management of their traditional lands and resources (Stephen McGlenn, pers. com { ÉD. Additionally, consideration of climate mitigation and adaptation needs are not being explicitly taken into account in the Crown's decision-making process:

Resource development in general. . . . A lot of forestry and mining happening without the consent of First Nations. . . . So when a new development comes through, how does climate change inform those decisions the government is making to approve those activities? I don't see æÁ [] çÁ [] ~Ác@æcÉÇÛc^ [] @^} Á T & Ö | ^ } } ÉÁ] ^! • ÉÁ & [{ { ÉD

This hinders Stó:l| people's ability to protect culturally significant resources and traditional use areas from current and future impacts. Conversely, recognition of Aboriginal rights and title should enable the Ûc5K| to meaningfully engage in decision-making regarding the current and future management of their traditional territories:

The big issues are how do we get the government to accept us as managers of our land. . . . The Crown has a duty to consult and to accommodate our interests. . . . If the Ûc5K| are owners of this territory, then we need to be making decisions on how we are going to look after it better than it is being done now. ÇÖ|æ|^} & ^ÁÛ^} } á^!ÉÁ] ^! • ÉÁ & [{ { ÉD

Ûc5K| people's stewardship of S'ólh Téméxw is paramount to the protection of resources essential to the Ûc5K| . Being ancestrally connected to resources, the Ûc5K| hold significant potential to guide resource management, sustainable development, and adaptation strategies in ways that mitigate harm to resources that are being threatened

by climate change effects and other sources of cumulative impacts (Clarence Pennier,
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What we can do is change how humans practice development along the
Fraser River. . . . We have an attachment to the

can address gaps in climate literacy and curb climate denial that is still present in
& [{ { ~ } á cã ^ • Á Ç T æ ! ^ c c æ Á Ó ^ * ^ ! É Á] ^ ! • É Á & [{ { É L Á V í æ Á P æ | • c æ á É Á] ^ ! • É Á & [{ { É D. According to
Shana Roberts (] ^ ! • É Á & [{ { É D

future research could include “an inventory of those [berry picking] places so that more people could rely on those berries and return back to picking those berries. . . . Picking herbs too . . . an inventory on those different plants, what has the effect been on those plants?” Identification of traditional use areas and assessment of traditional plants health and availability would be important not only to understand climate change effects to these resources, but also to facilitate community members’ connections with them (Sonny McHalsie, pers. comm.)

SRRMC’s technical capacity is described as a particularly valuable asset for communities

The SRRMC functions as a bridge among U.S. communities, given that it works with and for all U.S. communities, independently of political affiliations. The Centre can facilitate that independent communities add to collective U.S. conversations: “We always need to be mindful of those organizations reaching out to the independent bands. . . . There should be still an open door at least reaching out to one another to

Lastly, adaptation planning with and for *Uc5K|* communities—planning based on communities’ values and interests—is an initiative that was starting to be pursued by the SRRMC at the time of data collection (Taylor,]^!•EÁ&[{ { ÉD. The SRRMC has the needed capacity to access adaptation funding and to support communities in adaptation planning. Through the Centre’s networks and diverse expertise, it can also support communities in preparing for the following step of implementation and its funding, which is more difficult for communities to navigate given lack of government funding for implementation (Shana Roberts, pers. comm.; Taylor, pers. comm.D.

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This section summarizes the results described in this chapter as the bases for {^& [{ { ^}ãæcã [}•Á- [!Ác@^Áà^cc^! { ^}cÁ[-ÁÛc5K| Á&[mmunities in a changing climate and, more specifically, for action by SRRMC to support Ûc5K| Á&[mmunities in this regard. Recommendations to the collective Ûc5K| Á&[mmunity should be taken as partial suggestions, given that research methods were developed from an organizational viewpoint, did not delve into specificities of Ûc5K| communities, and therefore cannot represent the complexity and diversity of Ûc5K| Firrtti, g0Haf Cjzfi0É0a]0c0F%-i\$12E""&aj&\$nÉY%ä?h

harm mitigation and adaptation purposes. The SRRMC also houses technical capacity to support communities with traditional resources research, monitoring, and adaptation needs. Such support could include traditional plant and medicine inventories, resource, resource change, and resource use mapping, applications of traditional stewardship for adaptation purposes, among others.

This study also indicates that traditional foods are especially relevant to health and well-being. Diversification of food sources through increase in store-bought foods seems to be the most prevalent adaptation action specific to traditional foods scarcity. As addressed in section 3.2, this exerts adverse and financial security. An additional identified adaptation action is the sharing of traditional foods with extended family, which can act as a food security network. I would c@~•Á!^&[{ { ^}áÁc@æcÁÙc5K| Á&[{ { ~}áçá^•Áæ}áÁ[rganizations plan for future food security and adverse effects of traditional foods scarcity. The SRRMC holds capacity to further mainstream food security.

been made explicit throughout

its activities. In this way, the Centre also serves

available scientific data, and/or climate projections—however, I am not certain which of these layers would be feasible. It might be more feasible to develop a pilot baseline or cumulative effects study for one specific traditional resource that is the focus of abundant data, or for one specific traditional use area.

Regarding policy development, mapping of traditional resource use could be further added to the S'ólh Téméxw Use Plan, the S'ólh Téméxw Use Plan Policy (SRRMC 2011). The S'ólh Téméxw Use Plan Version 11 includes information on traditional resource use and habitat in the Canyon Heritage Area and Subalpine Park zones. Additional zones could delineate traditional use zones and/or sensitive habitat for traditional resources of particular importance—e.g., Fraser River salmon. Having this information integrated into the plan would facilitate protection of resources that are facing cumulative impacts. These zones could

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I divide this chapter in six sections. I begin by presenting the results from the domains that comprised the content analysis: observed climatic and environmental changes, reported cumulative effects on the tribal community, identified adaptation actions, adaptation opportunities, and organizational roles. The final section summarizes lessons learned from the case study results and drafts recommendations for organizational support of community adaptation. The relationships between domains and research objectives are described in section 1.5.

I strive to describe the content analysis based solely on participants' semi-structured interview responses. I allow for more researcher subjectivity in section 4.6, where I further analyze the links between the different domains and what conclusions and recommendations can be derived therefrom.

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This domain refers to changes that participants have observed in the climate and natural environment of their traditional territories and which they deem possibly caused by global climate change. I refer to these changes as "impacts," as they are d7 0 Td(Tj-0.Tc 0.013 Tw5

quantitative analysis, given that data collection methods were qualitative and participants were not systematically questioned about each impact.

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Table 4.1 depicts impacts related to increase in local climate aridification, including impacts to the Tribe's rivers and water supply. Participants consistently report decline in snowfall in the reservation and the multiple ways it affects the Tribe and its members. Participants relate decline in snowfall to increase in temperatures, as well as to observed warmer and shorter winters:

It seems like the rainfall and the snowfall have become less and the temperatures have gone up a lot. And the winters, it seems like they were longer. I remember years ago, the ski resort would be open until May. And now we are lucky if we get a snowfall in December and we are open until

When I was younger . . . we could play in the snow, we could slide in the snow for maybe a week at a time. But now . . . it seems like it is just a dusting of snow, it is never cold enough for it to actually stay. My nieces

plants and medicines within the reservation (Ali, pers. comm.; Leeann Lacapa, pers. comm.)

“When we were growing up, I never heard of forest fires. I think since the last ten years it pretty much kind of came out. Every summer we have to deal with forest fires.”

Gwendena Lee-Öæc^ , [[âÁÇ] ^! •ÉÁ& [{ { ÉDÁ^ø] |æâ} •Ác@^Á& [}] ^&câ [} Áà^c , ^^ } Álocal climate aridification and increase in wildfire frequency and severity:

Because we have had no snowfall and limited rain, and that then affects the fire weather activity here, because it is more dry. And our trees have a moisture content level that we measure. . . . And the past three years, that reading has dropped to where the inside of the trees are like as dry as a cracker, just dry. So when you have . . . a fire, it is just like lighting a match and everything is just burning up.

Wildfires are also correlated to increase in flooding in the reservation: “And then once the rains come after things get burnt, because the soil, the roots have been affected. . . . If you get rain now, you now have a flood problem, because there is nothing holding the water and the people then get affected with flooding.” (Gwendena Lee-Öæc^ , [[âÉÁ] ^! •ÉÁ& [{ { ÉD

Increase in wildfire frequency indicates that the whole reservation is increasingly likely to experience wildfire events. Participants are concerned about the possibility of a future wildfire in the Wilderness area, which has not been subjected to forest management and is especially vulnerable to harmful wildfire effects (Angel, pers. comm., June 1,

Table 4-3" -bWfYUgYX'fig048-126 Tc [ETw 110 -0108 (w3 (111 430 24 -00 627 447)31 re61def 5

Impact	Number of references
More frequent wildfires	8
More risk of wildfire Mt. Bald Wilderness	3
More frequent floods	2
More beetle infestations	2

Table 4-4 7`]a UhY`UbX`gYUgcbU``dUhhYfbg

Impact	Number of references
Changes in seasonal patterns	6
Less predictable weather	4
Warmer temperatures (year-round)	5
Warmer winters	2
Shorter winters	2

("&" FYdcfhYX`7 i a i`Uh]jY`9ZZYWhg`cb`h\Y`Hf]VU``7 c a a i b]hm

Reported cumulative effects on the tribal community comprise the effects that participants report as deriving from the climatic and environmental changes described in section 4.1. To a lesser extent, some participants also mention ways in which the tribal community may be affected in the future, given current climatic trends and knowledge of projected climate change effects.

I display these effects according to four categories: effects specific to wildfires, impacts to traditional practices, threats to long-term water supply, and other impacts to economic development. The two latter categories are merged into “other impacts” in table 4.5. All effects listed in the first category are exclusively driven by wildfires or by threats of wildfires. This categorization highlights the central role that wildfires and their increasing frequency and intensity occupy when discussing climate effects in the White Mountain Apache Tribe.

During the analysis, it became clear that certain effects are impacting the tribal community in multiple ways. I address this by further categorizing the themes that surface in participants’ discourses into eight affected dimensions: safety, water security, food security, financial security, health, cultural identity, cultural practices, and spiritual connections. As shown in table 4.5, the effects are in this way cross-referenced with these eight dimensions. One could argue that all of these dimensions are interrel.

The reported effects are linked to these dimensions based on information disclosed by research participants. For example, even though any impact to food security would potentially have an adverse financial effect on households, this link is only categorized where explicitly mentioned by participants. Neither the listed effects nor the identified dimensions intend to be exhaustive. Not all of the identified impacts in section 4.1. were fully investigated in their consequences to the tribal community.

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area borders the Apache-Sitgreaves National Forests and prohibits activities that are perceived as a disturbance to this pristine state (USDA, n.d.)

Participants share their concern that a wildfire might significantly harm this area of the Tribe (Angel, pers. comm.; Cheryl Pailzote, pers. comm.; Gwendena Lee-

ceremonies, most notably the Sunrise Dance Ceremony (also termed Girls' Puberty Ceremony) (Basso 1970, 53) section describes how traditional practices are being affected by change in climate.

Less productive and more costly farming

Reduced rainfall, reduced snowfall and runoff, and increase in floods are affecting farming activities. Floods wash out roads that lead to rural properties and hinder access to the properties (Avery, pers. comm., June 1, 2017) precipitation and soil moisture lower farming productivity and feasibility, especially for certain crops:

It has impacted how we plant, what we plant. . . . It depends on how good of a winter you have had, and that determines kind of what you are going to be able to plant. . . . When you don't get the rains in the spring and your corn doesn't grow, then you have to plan for that too. (Leeann Lacapa, pers. comm.)

Changes in seasonal patterns are making the correct timing of farming less predictable: "Winter starts late and hangs around later into the spring. . . . I have heard a lot of farmers upset, I am not sure if the almanac can actually predict winter planting correctly anymore."

Changes in seasonal patterns are also affecting fruit-bearing trees and reducing fruit productivity: "We have fruit trees and I notice that on certain years, with the weather warming up on February and March, they start blooming, and come April, May, a cold snap comes in . . . and that freezes the trees, and they don't produce as many fruits as

It is not uncommon for tribal members to completely stop farming their fields (Avery, pers. comm.; Gwendena Lee-Öæ^, [[äÉÁ] ^! •ÉÁ & [{ { ÉD. CEÇ^! ^ÁÇ] ^! •ÉÁ & [{ { ÉDÁ indicates that farming practice varies within the Tribe, as the Cibecue community seems to have a bigger portion of tribal members engaged in farming. Climatic impacts are reducing farming feasibility, but other factors might also be leading t(uni)2.6 (t)6.6 (y)8.8411>6.62educiãÑiãV

crops. . . . For the past seven years or so, the water runoff, there is not

Less access to fishing

The reasons for this reduced availability are uncertain, but reduced precipitation and soil moisture are possible drivers. Tribal members are needing to travel to other tribal peoples to acquire certain resources (Ali, pers. comm.).

Traditional plants are also necessary for their medicinal uses and for the conduction of ceremonies. Traditional resources that are necessary for ceremonies are not available. The effects to such resources would thus hinder Apache ceremonial and spiritual practices. The aggregated effects of these impacts may, in time, further reduce the range of Apache ritual activities and discourage cultural transmission and perpetuation:

If some of those plants and herbs that are used in ceremony stop growing because it is not cold or wet enough, that has a direct impact on what do you use as a replacement or a supplement. Or does that ceremony just stop happening and cease to be, and what does that mean for us as a people, who rely heavily on ceremony for everything. . . . I don't know that there are alternatives because these are ceremonies that have been happening forever, if you ask Apache people, we have been doing this since the beginning of time, we don't substitute, you know, there is not a

and we barely made it through the end of March. That being said, we got snow two weeks ah

2018 about the specificities and success of White Mountain Apache forest management. Forest management involving forest thinning, selective timber harvest, and prescribed and controlled burns has resulted in tribal forests that are lower in fuel density. These techniques render tribal forests less suitable for the spread of wildfires,

same issue is currently reoccurring

Table 4-6" =XYbh]Z]YX'UXUdhUh]cb'UWh]cbg

Addressed areas	Adaptation actions
Wildfires	Wildfire public communication Evacuation preparedness Forest management and prescribed burnings Preventative measures for wildfires Mount Baldy area management
Water supply	Increase in groundwater wells Monitoring wells & long groundwater planning Water rights settlement Dam development for long water supply
Food security	Diversification of food sources Community farming
Traditional resources	Adaptation of cultural practices to environmental change
Economic development	Diversification of ski resort attractions

(" (" 5XUdhUh]cb'Cddcfh i b]h]Yg'

Adaptation opportunities are understood here as actions that enable community adaptation (Klein et al. 2014) [!Ác@æcÁ•~]] [!cÁ& [{ { ~}ác^Áæáæ]cáç^Á&æ]æ&ác^.

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Climate change awareness has been identified as an adaptation enabler that is & []•i•c^}cÁæ&! [••Áââ~^!^}cÁ& []c^çc•ÁçS|^â}Á^cÁæ|ÉÉÁçÉF I DÉ In this case study, participants report that a relevant portion of the tribal population is not sufficiently informed about global climate change (Gwendena Lee-Gatewood, pers. comm.; Leeann Lacapa, pers. & [{ { ÉD. Older generations are described as especially little informed about climate change. Certain communities within the Tribe are also particularly isolated from external information: "Some of the communities are secluded, people don't really get around, they are lacking the news maybe." (Gwendena Lee-Öæc^ , [[âÉÁ] ^!•ÉÁ& [{ { ÉDÁThose who are informed do not necessarily make the connection between global climate change and local climate effects:

To hear about climate change, the first thing we think of is in Alaska, the ice is melting, that type, we don't see it at our level. How it is impacting us. So it would be good to educate our people, at our level this is what we are seeing. . . . So, I think that is what is holding the Tribe back. (Brenda Pusher-Ó^*æ^ÉÁ] ^!•ÉÁ& [{ { ÉD

Becoming informed about climate change and about the impacts at the tribal scope is the first step for a bigger portion of tribal members to be proactive in adaptation efforts: “The people need to start being part of that change, helping incorporate it. But without education, without being told what it is about, I think they will be like, ‘That is someone else’s problem.’ ” (Gwendena Lee-O’Reilly, [[âÉÁ] ^! •ÉÁ& [{ { ÈD

Ù^â}^• { âc@Áæ } âÁ Tæcc@^ , •ÁÇG€FFÉÁ ÍGDÁ- [~ } âÁæÁ•â { â|æ!Áàæ!îâ^!Áæ { [] * ÁØâ! •cÁ Nations in Canada—what they term “not a local problem.” The authors state that community members frequently perceive climate change as a global rather than a local problem and often miss connections between global climate change and local issues. Community members’ reasoning then follows that, if climate change is a “geographically r

Dfc a ch]cb'cZ' 5dUW\Y'Wi`hi fY UbX'\Yf]hU[Y

Apache way of life has profoundly changed since the establishment of the Fort Apache Reservation in the late 1800s ÇÓæ•• [ÁFJ ĩ€D. Historical changes include but are not limited to decline in Apache language usage, loss of traditional knowledge, disruption of Apache way of life, loss of land and traditional resources, decline in Apache values Ç^É*ÉÉÁ!^•]^&cÁ- [iÁ }æc~ !^DÉ changes to the connection with nature, and disconnection to Apache cultural identity (Angel, pers. comm.; Cline Griggs, pers. comm.; Gwendena Lee-Öæc^, [[âÉÁ]^!•ÉÁ& [{ ÈDÉÁ Contact with Western culture still exerts an ongoing, analogous effect of Apache linguistic and cultural disruption (Cline Griggs, pers. comm.; Welch and Riley 2001DÉÁ Participants express a decline in Apache identity in the reservation, which exerts detrimental effects on tribal members:

The most important thing is that our people are losing their heritage here. The way we used to live, respecting the land. And if you lose your Apache

exemplifies how the connection to ancestors and pride in Apache heritage can increase youth adaptive capacity and morale:

I sit them [students] down and say, . . . “What does the word impossible say to you?”, and they are like, “I can’t do it.” I say, “You can’t do it and you can do it. Both of them are true. Which one are you going to be? . . . Your ancestors, they endured, they were strong. . . . You shouldn’t have that just going to give up attitude, because that is not what our ancestors were about. You are here to learn, and once you learn, you are going to help your people again.”

Disconnection between Apache people and their culture and natural environment is also directly related to change in climate according to traditional Apache explanations.

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we need to start with the pollution that they are doing. . . . We are destroying ourselves, if we keep doing that. . . . We need to re-educate how important and valuable the land

Lastly, promotion of Apache culture involves the perpetuation of traditional knowledge that is valuable for tribal climate adaptation:

The way fire works, the way his grandfather told him, that it does this complete circle, so in order for that process to finish itself, this part has to someday burn. . . . But if we don't prepare ourselves and prepare the land,

educator treat a9oo d]TJ26.261 0 (g)3.5ntsgo2 (o (.4.91024]]TJ72 }0.-G d[(B)lend

generations' development. CE|áÁÇ|^!•ÉÁ&[{ { ÉDÁ^ø]|æi}s how a feeling of lack of purpose

Making Fort Apache into a community center. . . . A central park where

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This section summarizes the results described in this chapter as the bases for recommendations for the betterment of the tribal community in a changing climate and, more specifically, for the ways in which the Foundation can support the tribal community in this regard. Recommendations to the tribal community should be taken as partial suggestions, given that research methods were developed from an organizational viewpoint, did not delve into specificities of sub-communities within the Tribe, and therefore cannot represent the diversity of tribal views.

As a natural progression from the presentation of participants' responses, this final section allows for more researcher subjectivity, interpretations, and suggestions as a complement to the information derived from the interviews. I structure the section to address the effects and associated adaptation actions and their interconnections to organizational roles.

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As described and listed in section 4.3, identified adaptation actions mainly address wildfire and water supply effects. Hence, initiatives targeted at remaining clusters of climate effects would fill in adaptation gaps in the tribal community.

Traditional food security is being imperiled by multiple effects on traditional practices, including on farming, cattle herding, subsistence hunting, and fishing. These impacts are concerning given that community members rely on such practices for their food security. The tribal community would be more prepared to adapt to these effects if tribal members discuss these issues and plan for food security and traditional food enhancement as a collective. This could involve planning and implementation of, for example, more community greenhouse or farming projects (such as 1 G p H % t, the i Ú^ []|^•ÁØæ! { D, changes in farming practices to cope with decreased rainfall and runoff, incentives for tribal member farming initiatives, or use of public spaces for community gardens. As a developing community centre, Fort Apache could become a space to promote needed collective discussions to shape visions of tribal futures.

Participants indicate that needed traditional resources for dances, ceremonies, and medicinal purposes are possibly being impacted by drier weather conditions and are becoming less available or unavailable within the reservation (Ali, pers. comm.; Leeann Š&æ]æÉÁ] ^!•ÉÁ& [{ { ÈLÁÜ [, ^}æÁÔ [[^æÉÁ] ^!•ÉÁ& [{ { ÈD. Development of traditional resource monitoring would be an important first step in protecting these resources and in understanding the effect of climatic changes upon their availability. Additionally, integration of traditional resources topics into local climate and environmental education is essential for tribal members to be aware of changes to their availability and to exercise stewardship. This is particularly important, as participants deem that tribal members are often not perceiving the connection between climatic changes and decreased availability of traditional resources ÇŠ^æ} }ÁŠ&æ]æÉÁ] ^!•ÉÁ& [{ { ÈLÁÜ [&@^| ^ÁŠ&æ]æÉÁ] ^!•ÉÁ& [{ { ÈDÉÁ

Regarding the Foundation's roles, I recommend that a potential climate education project incorporate learning about traditional resources that are needed for specific Apache ceremonies, their climatic and environmental specificities, as well as stewardship concepts and practices. If a climate education project were incorporated as a recurring activity with an experiential learning component, it could also provide hands-on capacity for traditional resource monitoring. A related possibility would be for the Foundation to promote traditional resource stewardship in the Fort Apache property, such as through development of traditional plants inventories within the property.

Mount Baldy is especially relevant to the tribal community for its spiritual significance, ecological importance as habitat for traditional resources, and contribution to the Tribe's water supply. Increase in the frequency of wildfires in the reservation raises concerns about wildfire threats to the Wilderness area (Angel, pers. comm.; Cheryl Pailzote, pers. comm.; Gwendena Lee-Gatewood, pers. comm.; Rochelle Lacapa, pers. & [{ { ÈDÈ Given participants' emphasis on the negative effects that a wildfire in this area would exert on the Tribe, I would recommend that addressing this particular threat be a priority. Participants express that forest management is needed in the area to reduce wildfire severity and potential. If the Foundation decides to take on the role of an interdepartmental facilitator, this would be an important target for cooperation.

Table 4.7 summarizes conclusions and proposed recommendations for the tribal community and

The Foundation could strengthen this adaptation opportunity through a climate education role. Participants report climate education projects focused on youth and awareness campaigns in Fort Apache as two possibilities that would fulfil this role. An ideal climate education project is described by participants as one that is focused on youth, is able to attract youth's attention and to better connect them to the local natural environment, and that integrates climate and environmental education, Apache cultural education, and Apache language usage.

Regarding a climate education project for youth, participants provide a plurality of ideas and considerations for the summertime, when students are not in school, to offer shorter educational sessions on this topic, with a focus on emergency preparedness so that youth is informed.

services, such as movie theaters (Ali, pers. comm.; Krista Beazley, pers. comm.). Promotion of nature-centered activities, such as trails and bird-watching, are also being explored. Educational opportunities would improve youth health and well-being, as well as connection to local environments.

The Foundation is moving from an emphasis on heritage tourism and towards the adaptive reuse of Fort Apache's buildings and grounds as a community centre for the Tribe and the community. It is still unclear whether the Foundation will continue to focus on heritage tourism. Future roles and initiatives are dependent on funding and personnel resources (Krista Beazley, pers. comm.).

Given the reported importance of culture and heritage promotion to adaptive capacity enhancement, I would recommend that the Foundation continue to target its roles and initiatives to this end. This includes current aims to integrate cultural components into community centre development as well as ongoing support of the Tribe's Cultural Center and Museum. The Foundation should leverage its position as site manager to give preference to tenants that invest in or promote cultural activities and language perpetuation. Fort Apache holds the potential to develop into not only an important space for visitors and tribal members to learn about the Tribe's past, but a place where Apache cultural perpetuation, recreation, opportunities for well-being and networking, and collective dialogues guide the tribal community into a sustainable tribal future.

Tourism and economic development

Developing the Tribe's economic and tourism opportunities is essential for the Tribe to overcome its socioeconomic difficulties, which are lowering tribal adaptive capacity (Gwendena Lee-O'Neil, pers. comm.). A more economically diverse and financially independent Tribe would be less vulnerable to financial effects of climatic changes, as well as more financially able to plan and implement needed adaptations (Brenda Pusher-Begay, pers. comm.; Cheryl Pailzote, pers. comm.).

The Foundation is promoting this adaptation opportunity by investing in Fort Apache's tourism and economic development potential. The Foundation expresses that the Foundation has a portfolio of ideas to attract funding to the Foundation and to use this funding to generate tourism and income. Fort Apache's development as a community centre can in itself attract tourism and businesses to Fort Apache. A suggestion suitable to Fort Apache's tourism experience enhancement is site beautification (Alexis, pers. comm.; Avery, pers.

Suggestions include planting trees and maintaining the central field (Alexis,

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be on board with that same vision and mission (Rochelle Lacapa, pers. & [{ { ÈDÈ

Some ways that a stewardship mission could be explicitly directed to climate adaptation include partnering with the Tribe's Hydrology and Water Resources department c [ÁÇàDÁã {]|^ { ^}cÁ, æc^!Áã^ { æ}áÁ { æ}æ*^ { ^}cÁc@! [oughout Fort Apache, and ÇãäDÁãã^}cã-^Á-~!c@^!Á [] [!c~}ãcá^•Ác [Á]! [c^&cÁc!ããæ|Á, æc^!Á• [~!&^•Áæ}áÁ, æc^!Á~æ|ãc^Áwithin the site. Focusing on water stewardship would be especially suitable given long-term climate change effects to water supply, as well as Apache respect for and value of water. Identifying Fort Apache zones that comprise traditional plant habitat or that would be suitable for traditional plant habitat, and protecting these zones for this function, is an additional possibility. As Rochelle LacapæÇ]^!•ÉÁ& [{ { ÈDÁdiscerns, integrating stewardship into site planning and policy is a more long-term impactful initiative than any discrete projects that the Foundation could spouse or fund:

To me it is creating the tapestry of Fort Apache and these are all the fibers

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This research project involved engagement with two North American Indigenous-owned organizations that share cultural stewardship missions—

Participants express their understanding of certain impacts as the result of cumulative effects, of which global climate change is one stressor—either a scientifically attributed (Cramer et al. 2014) or a self-reported (Cramer et al. 2014) stressor, depending on the particular impact. Thus, this study further indicates the importance of understanding the impacts of climate change along and in interaction with other stressors, and of addressing the cumulative nature of effects in adaptation decision-making (Murray, Agbayani et al. 2014). This is especially the case for observed impacts to traditional resources. Participants consider these likely to be partially driven by climate change effects. That being said, changes in animal availability and behavior, changes in animal and plant phenology, and decreased traditional resource health and abundance are factors identified as climate impacts affecting North American Indigenous communities in other studies (Bennett et al. 2014; Murray et al. 2014).

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detrimental effects on

include the Apache Sunrise Dance Ceremony, which is dependent upon cattail pollen (McHalsie 2007, 90–JFD). There might not exist substitutes for these and other needed ceremonial elements, so it is unclear if and how ceremonies would be conducted if needed resources became unavailable within given territories (Carrielynn Victor, pers. comm.; CIER 2006a; Rochelle Lacapa, pers. comm.). Ceremonies are significant in maintaining cultural identities—one Apache participant deems this issue an important part of who White Mountain Apaches are “as a people.” Therefore, it is imperative to protect local populations that comprise needed resources so that ceremonies are maintained for generations to come.

A second threat to cultural identity stems from decline in populations of resources that are themselves foundational to a people’s cultural identity—Garibaldi and Turner (2002) describe these cultural keystone species as “resources that are so important to the cultural identity of a community that their loss would be devastating.” (Garibaldi and Turner 2002, 107) For example, the Fraser River salmon is an important resource for the White Mountain Apaches (Gardner, pers. comm.; Murray Ned, pers. comm.). Disappearance of salmon from the territory is described as a “disastrous” possibility by one participant, who states that “as the salmon goes, so do we.”

Another layer of effects stems from traditional resources frequently constituting

Health

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Research participants in both case studies explain connections with other-than-human beings as reciprocal relationships that need to be maintained through time and that depend upon people's respect of these beings as equals. Such relationships are thus based on respect and !^&â]! [&ac^ÂÇCEc|^ [ÁG€FFDÉÁIt is through stewardship and cultural practices that the Úc5K| connect spiritually with traditional resources in a reciprocal way (McHalsie 2007, 108DÈ When access to these practices is restricted, community members become less able to experience and maintain these spiritual connections. Threats to the conduction of ceremonies are likewise threats to spiritual connections and religious practices that are dependent on &^!^ { [] ^ÂÇÜ [&@^|^ÁŠæ&æ] æÉÁ] ^! •ÉÁ& [{ { ÈDÈ

Úc5K| Áresearch participants emphasize how resources such as salmon and c!æââcâ [] æ|Á] |æ } c •Áæ!^Á& [{ { âcc^âÁc [Ác@^Á!^&â]! [&æ|Á& [] } ^&câ [] Áæ } áÁc [Á]! [Çâââ } * Á- [!ÁÚc5K| Á people, and can therefore step away from this commitment if the relationship is not reciprocal (Carrielynn Victor, pers. comm.; Eddie Gardner, pers. comm.; Ernie Victor, pers. co { { ÈDÉÁU } ^Á [-Ác@^Á , æ^ •Áâ } Á , @â&@Ác@^ÁÚc5K| Á^ç]!^ ••Ác@^â!Á *!æcâc~ â^Á- [!Ác@^Á salmon's provision of resources is through the annual First Salmon Ceremony (McHalsie 2007, 90—JFDÉÁCE •Á^ç]! [!^âÁâ } Á •^&câ [] ÁHÉG, changes in timing of salmonid returns and !^•c!â&c^âÁæ&&^••Ác [Á-â •@â } * Á&æ } Áâ [] Á^Ác@^ÁÚc5K| Á-! [{ Á&æ&@â } *Ác@^Áæ&c~ æ|Á-â! •cÁ •æ [[] ÉÁ which might negatively affect t@â •Á& [] } ^&câ [] ÁÇÖ! } â^ÁXâ&c [!ÉÁ] ^! •ÉÁ& [{ { ÈDÉÁ

Apache research participants emphasize the negative effects of loss of respect for nature and for its seasonal cycles. Not only natural resources, but also natural phenomena such as rainfall and seasons, possess the agency to cease their support for Apaches if they are not shown respect and gratitude (Rowena Cooya, pers. comm.; see also Basso 1996DÉÁV @^Ác!æââcâ [] æ|ÁCE] æ&@^Á^ç] |æ } æcâ [] Á- [!Á&|â { æcâ&Á&@æ } * ^Ác@~ •Áâ } Ç [|Ç^Á nature's reaction to Apache deviation from following rules of proper conduct with other-than-human beings (Cline Griggs, pers. comm.; Leeann Lacapa, pers. comm.DÉÁÜ^ •] ^&cÁ of seasonal cycles for the timing of cultural practices can be equally important in maintaining spiritual relationships (Cline Grig * •ÉÁ] ^! •ÉÁ& [{ { ÈDÈ

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affected. Sonny T&Pæ|•â^ÁÇ] ^!•ÉÁ& [{ { ÉDÁ^ç }|æä} • how the connection to family line ancestors through •c^ , æ!â•@â]Á [-Ác@^â!Ác!æââcâ [}æ]Á~ •^Áæ!^æ•Áâ•Á&!~ &æ|Á- [!ÁÛc5K| Á] ^ []|^q•Á Shxwelí. Hence, restrictions in access to fishing and to ancestral fishing grounds can significantly affect community members' connections and own life force.

Sonny McHal•â^ÁÇ] ^!•ÉÁ& [{ { ÉDÁæ}•[Á^ç]!^••^• a correlation between traditional foods scarcity and restrictions to spiritual connections. Burning of traditional foods in constitutes a means to feed ancestor spirits. The foods that feed ancestors must also share connections with them—Sonny McHalsiâ^ÁÇ] ^!•ÉÁ& [{ { ÉDÁ!^~^!• to the burning of sturgeon in his community, because they “come from the sturgeon, or close relation to the sturgeon.”

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As climatic changes decrease access to cultural practices, it becomes more difficult to teach these practices to younger generations. Given that traditional knowledge often needs to be experienced, Teen tDíDXR#(4p(5@Pq'1ÖaT1íPBUÖ&"xá)&Z.íR#6^].í.í9autG\Ö) q'í'ÉqR-

disconnected to Indigenous calendars and associated traditional knowledge (Carrielynn Victor, pers. comm.). One Apache participant mentions the disconnection between ceremonies and seasonal cycles as a factor that is “confusing mother nature” and leading to climatic changes.

It is important to note that loss of traditional knowledge is not only a detriment to Indigenous communities, but also to the pool of collective knowledge that societies can draw from to cope with novel challenges, including climate change (Berkes 2012; Turner and). Protection of Indigenous traditional practices and resources is imperative to the maintenance of contemporary society’s cultural and epistemic diversity.

9 Impacts of Extreme Weather Events

Impacts of increase in extreme weather events comprise yet another relevant theme surrounding climate change effects to North American Indigenous communities (Bennett et al. 2014; CIER 2008;). Impacts of extreme weather events are reported by participants in both case studies, especially in the Apache case study. Increase in wildfire events has exerted effects on the tribal community’s cultural practices, tourism, recreation, and economic development (Cheryl Pailzote, pers. comm.; Gwendena Lee-Gatewood, pers. comm.; Krista Beazley, pers. comm.; Shannon Tsosie, pers. comm.). Financial losses to the Tribe include sawmill closures following the Rodeo-Chediski fire (Keller 2001). Repeated evacuations on the Tribe and the seasonal risk of having to submit to such evacuations are experienced by tribal members as a source of fear and anxiety, and as a threat to their personal safety (Alexis, pers. comm.; Gwendena Lee-Gatewood, pers. comm.).

The increase in wildfire risk to the Tribe’s Wilderness area is a critical issue. This portion of the Tribe is sacred to the White Mountain Apache (Angel,) and also provides habitat for traditional plants and medicines, including resources needed for tribal water supply (). Participants express their concern that, due to increased risk of wildfires and lack of forest management in the area, a wildfire might significantly affect this area in the future, with

detrimental effects to long-term water supply (Cheryl Pailzote, pers. comm.; Gwendena Lee-Gatewood, pers. comm.)

Participants in the

I choose

to relatives seven generations past and forward. It implies a “higher consciousness” of how one’s conduct, words, and behaviours may affect seven generations ahead (Eddie

In conclusion, I do not apply the theoretical distinction between coping mechanisms and adaptive strategies since it contradicts participants’ perceptions of their adaptation efforts. I deem it useful, however, to distinguish those adaptations that are presently or potentially maladaptive. Maladaptation is defined in the IPCC Fifth Assessment Report (AR5) as actions or inaction that may increase the risk of negative climate effects, increase vulnerability to climate change, or lower well-being (Noble et al. 2009). Maladaptation is defined as actions or inaction that decrease a given system’s adaptive capacity and lead to lower adaptation pathways.

Coping with traditional food scarcity by relying on store-bought food sources would be one example of maladaptation in this study. The case studies and literature point that, although this is often needed, it can result in negative health and financial effects for community members (CIER 2006). Maladaptation can further disconnect community members from engaging in traditional subsistence practices, which form an integral part of cultural practice. Given that promotion of Indigenous culture was described as an adaptation opportunity in both case studies, I additionally propose that any adaptation that significantly disconnects Indigenous communities from their traditional environments and practices is potentially maladaptive, albeit sometime

rights and These elements relate to the current British Columbian context of fragmentation into numerous Indian Bands and reserves which comprise a small fraction of original territory, with the land issue still being disputed given historical lack of treaty-making (Carlson 1997a), and consultation processes not being consistently perceived as meaningful (Baker and McLelland 2003; Booth and Skelton 2011; Marsden

Apache research participants stress the need for localized climate education, promotion of Apache culture, and economic development—especially development that propels youth health and well-being—in order to effectively adapt to a changing climate. These elements relate to identified factors increasing tribal vulnerability, most prominently lack of climate awareness, recent decrease in governmental funding, and high unemployment rates and associated socioeconomic problems that negatively affect the tribal community, with particular negative effects on youth development (see section

I delve into the identified adaptation opportunity that is applicable to both case studies: promotion of Indigenous culture. I deem that overlap on this adaptation opportunity indicates that other Indigenous communities are also likely to benefit and increase community adaptive capacity through actions geared towards the revitalization and perpetuation of their cultural practices and traditions.

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Many research participants emphasize the negative effects that colonialism has had on their communities and that are experienced to this day by community members. Full consideration of communities' colonial pasts and presents extends the study scope; hence, this topic is only addressed as it relates to adaptive capacity in participants' responses.

The Centre for Indigenous Environmental Resources and the University of British Columbia's joint research engaging with four First Nations communities across Canada led to the publication of a report on climate risks and adaptive capacity (Sydney Smith and Matthews 2011). This report partially attributes disconnection to traditional ways of

life, cultural practices, and traditional knowledge to the residential school system and its effects. However, it also indicates that this disconnection is widening as younger generations become more integrated into Western culture and technology (Sydney Smith and Matthews 2011). This is similar to the White Mountain Apache context, as intergenerational gaps and loss of Apache ways are concerning a portion of tribal members. Cultural erosion lowers community resilience, social cohesion, and health, so can cultural identity and connection with the land increase community and household capacity. The authors also indicate that elders (and their traditional knowledge) comprise the “building blocks” of efforts towards adaptive capacity building (Sydney Smith and Matthews 2011, Gí Dá).

Research participants similarly indicate that promotion of Indigenous culture is paramount to boosting community adaptive capacity. Promotion of culture enhances adaptive capacity in a number of ways. Primarily, it is integral to counteracting the negative effects of colonialism and maintaining community members’ cultural identities (Kirmayer et al. 2011). The theme of disconnection to one’s culture and identity is emphasized by Apache participants. Some participants describe how this disconnection can negatively affect individual adaptive capacity: “If you lose your Apache identity, you don’t have anything.” (Angel, 2011). Connections to ancestors hold potential to increase community members’ adaptive capacity and morale, even when facing increased individual, household, or community vulnerability (Gwendena Lee-Gatewood, 2011).

Secondly, the revitalization of connections to land and resources enables community members to perceive changes in their local environments and to adapt to the dissemination of traditional knowledge that can provide communities with a deeper understanding of environmental changes and spur novel adaptation solutions (Tc6.6 (w6.6 (hei3 (ev)and s)2 an)0.5

Lastly, the promotion of cultural practices that connect community members to traditional territory and resources is paramount in many Indigenous worldviews to reaching climate solutions. Research on climate change perceptions suggests similarities among Indigenous and traditional peoples of widely different cultures and geographies—from Eastern Tibetan villagers to Indigenous Bolivian farmers—in

Promotion of Indigenous culture can also facilitate adaptation dialogues between Indigenous and non-Indigenous parties, especially cultural education that promotes understanding of Indigenous perspectives, values, and protocols.

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This study indicates that the participant organizations are supporting community adaptation and fostering community adaptive capacity. Participants indicate that the

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In spite of organizational differences, educational services and information dissemination, cultural perpetuation services, and cooperation facilitation emerged as adaptive capacity promoting roles in both case studies. Both case studies indicate that communities are experiencing some degree of lack of climate change awareness, disruption in cultural practices and traditional knowledge stemming from colonial histories, and lack of sufficient cooperation among community decision-makers. Engagement with participants suggests that these and other factors constraining community adaptation can be overcome through promotion of identified adaptation opportunities and organizational roles. Organizational potential to mainstream climate adaptation into capacity creation and policy development comprises another element common to both case studies.

Findings from both organizations suggest that these services and areas of action may be especially beneficial for Indigenous organizations and projects aiming at community adaptive capacity enhancement. Hence, I would recommend that these services be especially targeted to Indigenous organizations and projects aiming at community adaptive capacity enhancement.

Downing and Cuerrier 2011; Kuhnlein et al. 2004; Receveur, Boulay, and Kuhnlein 2011). Hence, this study also indicates that planning for food security and traditional foods scarcity comprise important topics for Indigenous adaptation planning.

Participants indicate a lack in awareness of climate change contribution to local effects, especially regarding effects on traditional resources and practices. These can be overshadowed by a series of more pressing issues within communities, including local socioeconomic problems, more acute and emergent climate effects (e.g., increase in temperature, decrease in precipitation, etc.) and loss of traditional resources.

Localized climate education that focuses on connections between global climate change and local effects to cultural practices and promotes positive change through traditional territory stewardship emerged as an advised solution (Gwendena Lee-Gatewood, pers. comm.; Leeann Lacapa, pers. comm.; R. J. G. ...).

This study identifies diverse opportunities to enable adaptation and increase community adaptive capacity. Promotion of Indigenous culture is identified as an adaptation opportunity in both case studies and is beneficial for Indigenous community adaptive capacity at large. That being said, elements identified as adaptation enablers appear to be context-specific, as there was little overlap between case studies. Community input may be particularly valuable in identifying community-specific adaptation enablers.

Academic engagement with participant Indigenous organizations demonstrates their potential to support the communities they serve in adapting to a changing climate, as these organizations uniquely combine capacity and expertise with cultural values and community knowledge. Participants express that the organizations are presently supporting community adaptive capacity, and indicate varied possibilities to further enhance this support. Prominent services and roles that promote adaptive capacity include climate education and information dissemination, cultural perpetuation services, cumulative effects studies, direct support of communities in adaptation planning efforts, and intra- and intercommunity networking and cooperation building for adaptation dialogues. Organizational potential to boost and mobilise climate awareness and adaptation into capacity creation and policy is identified as a focus for further examination in both case studies.

These findings indicate that oth

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Have you noticed change in weather or in the natural environment within your traditional territory/tribal reservation over time?

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2. Viviane will ask you to record the interview. You can agree or not to this request. You will not be obligated to answer any questions you do not wish to. Additional questions or information that you would like to contribute with will be gladly received.
3. If further information is needed, you might be invited to additional individual or group interviews. You will be asked at the end of the interview if you consent to being contacted again in case further information is needed. Even if you consent to being contacted, you may refuse to participate at any time.
4. Viviane will be available to answer any questions you have about the research, and discuss any possible concerns.

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Viviane will ask your permission to record the audio of the interview using an electronic recorder. Afterwards she will transcribe the relevant sections, and then erase the audio file in order to maintain confidentiality. Interviews will be transcribed into encrypted digital documents. Viviane will be the only person with access to audio recordings and transcripts of interviews, unless you consent that your recordings and transcripts be placed in the Úc5K| ÁCE!&@âç^•É

Interview responses may be referenced or quoted in Viviane's graduate research project and/or in academic journal articles. A pseudonym will be used unless you consent to disclose your identity.

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We do not think there is anything in this study that could harm you or constitute a risk for you. You do not have to answer any questions that you do not want to or do not feel comfortable with.

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You may not benefit directly by participating in this study. However, by participating, you will help advance knowledge that is expected to benefit the participant organizations and the communities they serve in preparing for climate change effects.

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Your confidentiality will be respected. Information that discloses your identity will not be released without your consent. All study documents and data will be stored electronically on encrypted and password-protected documents. Viviane will be the only person to have access to data collection material, unless you consent that your recordings and transcripts be placed in the Úc5K| ÁCE!&@âç^•É

We provide an option for your name to be associated to your research responses in the consent section of this document. If you do not want your name to be disclosed, you will be given a pseudonym in the transcription of your interview, and your name and other identifiable characteristics will not be mentioned in any reports or publications.

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If you are invited to and agree to participate in a group interview, only limited confidentiality can be offered. Viviane will encourage participants not to discuss the content of the group interview to people outside the group, but cannot have certainty that

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Your signature below indicates that you consent to have your name disclosed in the outcomes of this

Signature

Date MM/DD/YYYY

Printed Name of the Participant signing above.

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Your signature below indicates that you consent that copies of your interview recording