Dawson Climate Change Adaptation Project
Final Project Report

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Prepared for:

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ACKNOWLEDGEMENTS

This project would not have been possible without the help and participation of numerous people; it is to a large extent the product of the people of Dawson City. Although I was the coordinator of this project, the Plan is the work of a team lead by Ryan Hennessey, and before him Lewis Rifkin of the Northern Climate ExChange (NCE); both of these gentlemen were ably backstopped by Jen Turner and Lacia Kinnear, past and present Coordinators of the NCE. The IPY CAVIAR project was invaluable in providing hard information about what makes a community resilient or weak. This Plan could never have reflected the issues and needs of the community of Dawson without the guidance and contributions of the Local advisory Committee- Renee Mayes, Gerry Couture, John Lenart, Norm Carlson, Jim Regimbal, Mark Wickham and Jim Taggart. I need to thank the enthusiasm and dedication of those who are leading the projects that arose from this Plan: Caili Steel, Mark Wickham, Chris Clarke and Jake Duncan. It is gratifying and wonderful that without exception these remarkable individuals are continuing their projects beyond the official end date of the Project.

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ABSTRACT

Following the successful application by the Northern Climate ExChange (NCE) to the Northern Strategy Trust for Adaptation Planning in three Yukon Communities, Dawson was selected as the first community to attempt this level of adaptation planning. Sebastian Jones was hired as the local coordinator; he led a local advisory committee (LAC) that gave direction to the Plan. The Adaptation Plan was developed through a series of local workshops, validated by a technical committee, which identified the impacts of climate change to the Dawson area, how it is vulnerable to these impacts and what would be the best ways to live with and take advantage of these changes. An unusual and valuable aspect of this project was the setting aside of $120,000 with which to fund projects to implement the Plan. Five projects that worked towards implementing the recommendations were funded through the project. The projects improved the community's ability to provide its own food, reduced its dependence on imported food and fuel and increased its ability to adapt into the future. The project ended on June 30th 2010. This report will focus primarily on the implementation projects

INTRODUCTION

The geographic location of Dawson City means that it is going to experience some of the most dramatic warming of anywhere in North America. According to the Pacific Climate Impacts Consortium, by the 2050's (2041-2070) the winters in Dawson could warm by up to 6 degrees and the summers by up to 3 degrees. Precipitation will likely increase, but there is less certainty around precipitation projections; however any increase will likely take place in winter.
The physical setting of the community means that it is particularly vulnerable to four main threats:

Melting permafrost: Dawson sits within the discontinuous permafrost zone and measurements show that the ice rich substrate of Dawson is between one and point three degrees below freezing. Melting permafrost may have a significant impact on the built infrastructure of Dawson.

Flooding: Dawson is on a floodplain at the confluence of the Yukon and Klondike Rivers and has flooded several times in the past, most recently in 1979. A dike was built in 1984 to mitigate this threat, but it is likely that a severe flood that overwhelms the present dike may occur in the future. Although the recent thinking by the Yukon Government hydrologist is that climate change may not increase the threat to downtown Dawson, some outlying areas will be at increased risk.

Forest fires: Dawson sits in the boreal forest which naturally burns, in this area at fifty to two hundred year intervals. In 2004, Dawson was under evacuation alert because of forest fires nearby and the heavy smoke caused breathing difficulty for some community members. According to Wildland Fire Management, climate warming will produce longer and warmer dry spells and more thunderstorms and thus more intense fire seasons.

Isolation: Dawson is also vulnerable because it is far from sources of food and fossil fuels, and the infrastructure that enables the steady flow of supplies is also vulnerable to climate change. The impacts of climate change in the rest of the world will mean that agriculture will be challenged and the future supply of food is uncertain. Modern agriculture is heavily dependent on abundant supplies of cheap fossil fuels. This supply will be constrained in future, further exacerbating the production and distribution of food.

The serendipitous timing of the International Polar Year (IPY), gave the project the resources of a project run by Frank Duerden of Ryerson University (CAVIAR) which examined the vulnerability of arctic communities to climate change. This project provided characteristics of communities that are more adaptable and these characteristics informed the criteria of the projects chosen to implement the Plan.

Thirty Nine recommendations were made in the Plan, seventeen for immediate implementation and the rest for implementation by 2020. It was hoped that the Plan would be “mainstreamed” by the responsible governments; that the Plan would help guide every day and strategic decision making by the Municipal, First Nation and Territorial governments. Although the Advisory Committee had representatives from the Municipality and the First Nation, the Plan has not yet been adopted as a guiding document, as was, for example, the Integrated Community Sustainability Plan (ICSP). Nonetheless, several recommendations have already been taken up. These actions, combined with the effects of the implementation projects, have increased Dawson’s ability to adapt to climate change.

METHODS

$120,000 was initially made available for projects through funding by the Northern Strategy Trust. The LAC decided to set aside $30,000 to fund the position of “Implementation Officer” within the Conservation Klondike Society (CKS). This decision was made because of a recommendation from the Dawson Community Climate Change Action Plan from 2005/06 (http://www.taiga.net/nce/resources/yukon/dawson_forum_report.pdf) which asked that the work of planning for and reacting to climate change continue in Dawson City. The initial call for proposals (see Appendix A) was issued on August 7th 2009. The call included a conceptual proposal form which was to be completed and returned by August 20th. On August 25th, the proposals were reviewed by the LAC. Seven proposals were received; four were accepted for a total expenditure of $89,000. The successful proponents were invited to submit detailed proposals, details of the proposals were discussed and contracts signed. The LAC was a panel of seven local people chosen to cover significant drivers of the community- the municipal and first nation administrations, the mining, fishing, trapping and agricultural communities and the environmental community. For a list of panellists, please see Appendix B. The LAC was chaired by Sebastian Jones and was mandated to ensure the Plan reflected local priorities. The LAC set the parameters for Implementation projects, reviewed the proposals and selected the projects. Sebastian supervised the projects.

RESULTS AND DISCUSSION

There were 39 recommendations in the adaptation plan and brought forward through community input, screened by the LAC and vetted by a technical advisory body comprised of experts brought together by the NCE. The call for projects reflected the recommendations. Some of the vulnerabilities are beyond the capacity of community members or individuals, some are the purview of governments and the funding, while most useful, was limited. Several recommendations, particularly Emergency Planning, Flood vulnerability and permafrost monitoring were taken up outside of the funding call. A full list of the recommendations with those already implemented is to be found in Appendix C. Reflecting the priorities articulated in the Adaptation Plan, two of the proposals addressed the sustainability of the food supply, one a strategy to increase energy security and one to improve the capacity of local people to *participate in a knowledge economy*.

Community Cold Storage and Greenhouse

This project was inspired by the feedback received during the development of the Plan regarding climate change vulnerability and food security.

Dawson is blessed with the most fertile soil and the best climate for agriculture in Yukon, and at times has produced considerable quantities of its own food. In recent years however, starting when the highways were built and many people moved to the new capital of Whitehorse, farms closed, farmers retired and, most importantly, the cost of imported food plummeted to the point where it became unattractive economically to take up farming as a profession. There are presently only two farms that could be considered commercially viable operating near Dawson. When, in the course of developing the Plan, these farmers were asked what it would take to increase agricultural production, the response surprised me: Although there is room for more farms, and a desperate need for young people to take up farming, the primary constraint on the present farmer's production is the lack of desire by local consumers. It appears that many shoppers prefer to buy

shrink wrapped lettuce from California to fresh local produce, despite the costs being similar or even cheaper for the local produce. The other constraint on the production of local food was more expected- the growing season is short and storage options are limited.

This information drove the project and the themes were addressed as follows.

- Perception of imported produce as superior: Encourage and support local people to grow their own food through workshops and the community garden plots. This will help change perceptions and the desire for fresh food will grow and the unmet demand will be met by the commercial farmers.
- Short growing seasons: Augment the popular community garden plots with a community greenhouse. This will not be complete before the end of the Adaptation Project, but land has been secured and plans for construction are well advanced. The support and encouragement of the Tr'ondëk Hwëch'in Elder's Council has been vital to this project; during consultations earlier in the planning process, the Elders spoke of the history we have of extensive greenhouses in Dawson and how we no longer have any. This has been communicated the Tr'ondëk Hwëch'in Government and has resulted in settlement land being made available for this project.
- Cold Storage: Although the growing season in Dawson is relatively brief, the long days of summer make it far more productive than might be expected by those used to more southern conditions. This means that a large quantity of food becomes available at once, far more than can be consumed. Historically, this was addressed by keeping many vegetables in root cellars dug into the ground. These structures have largely vanished from the built landscape of Dawson. The project has conducted research into designs and needs for these. Feedback from local producers encouraged us to concentrate on production and consumption of produce rather than

storage. In addition, the Canadian Food Inspection Agency requires a high level of sophistication for refrigeration of produce. However, the Tr'ondëk Hwëch'in project will explore community cold storage once the greenhouse phase is more complete.

Selective Fishing

Salmon have sustained human life in the Yukon River watershed since the first people arrived here thousands of years ago. In communities scattered along the river and its tributaries, people would gather as the salmon migrated past, to harvest one of the best sources of protein and fat available. Until about 40 years ago, the amount of fish harvested broadly matched the ability of the fish to reproduce. However starting about 1970, catches of Chinook salmon about doubled and for a couple of generations, this appeared to still be sustainable, but trouble was brewing: Salmon have been managed to what is called "abundance", i.e. a certain number of fish need to spawn each year to keep the fish population healthy. However, the number of fish required to keep the population healthy not considering human fishing, and the population managed for does not consider the *quality* of the fish that get to spawn i.e. if the target is to have 50,000 salmon spawn, and this target is met, there is no consideration given to whether or not this is population that can actually thrive, so if 50,000 small male salmon spawn.

In theory this should satisfy the managers, despite overall challenges in ensuring a viable result. Unfortunately, when the salmon enter the river they are a mixture of males and females, large and small, younger and older. By the time the fish reach the spawning grounds up to 2,000 miles upstream, most of the females are gone and almost none of the largest and oldest fish are left. What has happened?

In a word, fishing has been **selective.** Harvesters along the river have been trying to catch the most useful, most valuable fish and if they are allowed to catch

a certain number of fish, they catch the fish with the most weight and value. 50 fish each weighing 50 lbs will clearly be more useful than 50 fish weighing 10 lbs. A consensus is developing around this situation on the Yukon River; in Alaska, the Board of Fish[1] is implementing net regulations to begin to address the issue. This project is about a Yukon solution. It is a method that allows for a fishery while ensuring a viable population gets to spawn.

It involves constructing fish wheels that will scoop fish from the river, depositing them gently into a holding pen in the river until the fisher decides on their fate- will they be set free to spawn or will they be retained and harvested? The assumption is that there will be policies that have size and sex preferences. Jake is taking the lessons learned in using fish wheels over the years and designing and building wheels that will cause the least harm to the fish, and developing ideas that managers can use to encourage fishers to fish selectively.

Electric Vehicle

It is debatable precisely when the demand for fossil fuels will exceed production, but many studies indicate we are very close to that time. When this happens, it is likely that the price of liquid fuels will jump and this will have many consequences for Dawson, not to mention the rest of the world. In addition, global warming is primarily the result of burning fossil fuels.

Dawson is at the end of a long road along which most of our supplies come. A constraint in availability of fuel will mean that these supplies will become much more expensive. For this reason, food security has been a focus of our Adaptation Plan. However, even if we manage to substitute locally produced for imported foods, energy security will remain critical. It was decided to experiment with building an electric vehicle in Dawson because electricity is relatively cheap and available in the community and across Yukon.

[1] http://www.sf.adfg.state.ak.us/FedAidPDFs/RIR.3A.2009.05.pdf page 107

Electric vehicles are being developed by other entities around the world, but all have in common the defect of being very expensive and very complicated. To create a simplified and local solution, the Conservation Klondike Society (CKS) salvaged an old light duty pick up truck, replaced the old engine with an electric motor and placed some batteries in the back and drive away for under $20,000. This vehicle is used for the day to day operations of the Society, collecting recyclables in Dawson and transport back and forth to the landfill.

Dawson Climate Change & Science Centre

The CAVIAR project showed us that resilient communities need to be, amongst other traits, communities with a high level of education and knowledge. For this reason, a project to explore the feasibility of developing a science centre in Dawson was launched. A science Centre in Dawson could build a higher level of knowledge and education by partnering with visiting scientists - supplying researchers with field assistants and local knowledge, acting as a repository of locally produced scientific knowledge, potentially hosting a Scientist In Residence, and providing a lab facility for both scientists and local students who are pursuing a science education.

We also investigated the needs of researchers, and exploration of possible partners. Potential partners for this project that came to the fore included the Yukon College, Friends of Dempster who are pursuing similar aims, albeit from a different slant, and Yukon Government which is considering its options regarding a request from the local placer mining community to build a paleontological museum that could serve as a Beringia Centre North.

The final direction that was pursued came directly from the first recommendation of the Adaptation Plan- *“Maintain or develop research and monitoring to observe change and evaluate possible climate change impacts and responses.”* We have found that developing an ecological monitoring program in Dawson will fulfill the

CAVIAR recommendation and mesh perfectly with the direction the Plan will take after June 2010.

Implementation Officer

As previously described, the LAC decided to allocate a portion of the Implementation Fund directly to the CKS to carry on the work of Adaptation past June 30th 2010. The board of CKS decided to orient this work, aside from obtaining additional funds, towards setting up an ecological monitoring network in Dawson. This will begin with a workshop in July 2010. The network will incorporate the many and diverse monitoring initiatives that take place already. Most of these are completely volunteer and run by amateur scientists: the trappers, fishers, birders and dog mushers who live and work here. There are trappers who have recorded every furbearer they have caught for 50 years, along with the snow and weather conditions, birders who record the arrival time of their favourite birds, others who record the blooming date of several key plants. A famous example is the records kept by the Ice Pool in Dawson, currently operated by the IODE charity as a fund raiser which has a consistent way of measuring the time and date of break up on the Yukon at Dawson, with records that go back to 1896. Some of these efforts are semi organised through initiatives such as Plant Watch, run by Environment Canada, but much of this information remains uncollected and thus unavailable to researchers. Sometimes this produces inaccurate results, other times unneeded extra work is involved.

CONCLUSIONS

These projects are making a real difference to Dawson. The EV project has attracted international attention and is inspiring residents to convert more vehicles. At least one community greenhouse will be built, and it makes a nice complement to the community garden, which is reducing the amount of food that is imported and increases the possibilities to do more. New fish wheels and sustainable fishing policies are now available; it is difficult to imagine that we shall not now get serious about sustainable fishing. A coordinated ecological monitoring network is taking form that will bring together those who are presently engaged in some form of ecological monitoring with those who are still at the interest stage and ensuring the results are formatted and made generally available.

APPENDICIES

Appendix A

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DAWSON CLIMATE CHANGE ADAPTATION PROJECT
CALL FOR PROPOSALS

The Dawson Climate Change Adaptation Plan has been engaged over the past 18 months in developing ways for the residents of Dawson City, in the traditional territory of the Tr'ondëk Hwëch'in, to live with and to take advantage of the changes that are anticipated over the next half century as a result of man-made climate change.
A draft plan has been completed: http://www.taiga.net/nce/adaptation/dawson.html and the final stage of the project will be to implement the plan.

Project Schedule:
Step 1 – August 7th: Advertise the "Call for Proposals"
Step 2 – August 20th: Deadline for submission of CPs.
Step 3 – August 28th Selected proponents asked to submit detailed proposals
Step 4 – September 11th: Projects selected, applicants notified

There is a total of up to $90,000 available, ideally to be used as seed money, to be divided between several projects that fall into the following categories:

- Adapting to melting permafrost
- Enhancing community viability and food security
- Increasing energy independence
- Safeguarding transportation
- Gathering and sharing information
- Adapting to changes in flora and fauna
- Any other project that will address the criteria below

Desirable project characteristics:

- Reduce the carbon footprint of the community or have a minimal footprint.
- Leverage other funders
- Attract partners
- Can be built upon later
- Provide local employment
- Tie into / build upon existing plans
- Increase local resilience
- Use local resources and materials

Appendix B

Local Advisory Committee

Members	Affiliation
Renee Mayes	Tr'ondëk Hwëch'in Government Land Use Coordinator
Norm Carlson	City of Dawson Public Works Manager
Jim Taggart	Klondike Conservation Society, President
Mark Wickham	Chair, Klondike Visitors Association
Jim Regimbal	City of Dawson Fire Chief
John Lenart	Chair, Yukon Agriculture Association.
Gerry Couture	Mining and Fishing and Water

Appendix C

Recommendations from the Plan; those already adopted highlighted with responsible parties noted

Key to Abbreviations:

AP= Adaptation Plan

FD= Frank Duerden

JC= Jim Coates

KATTS= Klondike Active Transportation and Trails Society

THFN= Tr'ondëk Hwëch'in First Nation

WDSLAP= West Dawson Sunnydale Local Area Plan

YRCFA= Yukon River Commercial Fishing Association

Adaptations Recommended for Immediate Implementation

Maintain or develop research and monitoring to observe change and evaluate possible climate change impacts and responses. (A P)

Integrate climate change assessment into rural planning processes.

Update the Emergency Measures Ordinance (EMO) to reflect possible climate change vulnerabilities. (Dawson EMO)

Investigate need to raise the existing level of the dyke. Determine who is responsible for the work. (F D)

Investigate flood proofing of sewage facility.

A detailed permafrost assessment is required which could build on/update the assessment completed by EBA in the 1970's. (JC)

Continue highway vulnerability assessment and action planning (e.g. build on experiences in and around Beaver Creek, YT).

Complete the hydro-geological testing of the Quigley Solid Waste Facility.

Designate fiscal responsibility for remediation of abandoned waste disposal sites.

Explore the feasibility of technologies that will conserve the permafrost. (JC)

Continue weed pull programs (CKS).

Communicate to present and future generations the need to respect for fish and

wildlife. (THFN)

Diversify economy by supporting emerging markets.

Use local materials when implementing projects.

Update/Implement the OCP recommendations relating to Recreation, Parks and Open Space (Section A.5.5).

Advertise local produce (AP).

Explore food storage (AP).

Adaptations Recommended for Implementation by 2020

Implement preparedness education to respond to potential climate change related emergencies.

Ensure resources necessary to repair damage within plan boundary are available.

Develop education programs to assist residents in making sound decisions when coping with or preparing for climate induced changes in the community.

Re-establish experimental farms (e.g. Swede Creek) and investigate local agricultural options/alternatives.

Develop and/or release information about possible flooding (FD).

Investigate the potential of drought and its impacts on the Dawson region.

Create emergency storm shelter systems within the community.

Construct helicopter pad for emergencies as needed.

Change road materials - use stronger materials.

Monitor the area for changes in water quality (THFN, A P).

Complete a risk assessment that also inventories abandoned dump sites in the Dawson area.

Incorporate flexible regulations and policies into rural land use planning (WDSLAP).

Explore feasibility of fish hatchery (THFN, YRCFA).

Ensure that climate change is incorporated into forestry management plans.

Study how small animals toward the bottom of the food chain react to climate change.

Ensure building codes are congruent with the expectations of a changing climate.

Re-brand community marketing strategy to offset long distance aspect of travel (e.g. slogans such as “You’ve come so far to get here; stay a little longer”).

Emphasize grassroots culture/unique events (e.g. music festival)

Explore/expand existing trail network. (KATTS)

Coordinate ski-hill expansion with EMO implementation.

Revisit local features (convert firebreaks to trails).

Investigate possible markets for surplus (if necessary).(KATTS)