Coastal Habitat Comprehensive Research Project

Summary of the project findings

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Eeyou Coastal Habitat Project

What was the research about and how was it done?

The Eeyou Coastal Habitat Comprehensive Research Project overseen by Niskamoon Corporation and a Steering Committee made up of representatives from coastal Cree communities, regional Cree organizations, and Hydro-Québec, has recently completed its mandate. The research aimed to address two questions:

1. *What are the main factors affecting the current state of eelgrass along the eastern coast of James Bay?*
2. *What is the impact of the current state of eelgrass on waterfowl presence and consequently Cree hunting activities?*

The research was completed by a team of university researchers with different specialties working closely with Cree community experts. The research took place all along the coast of Eeyou Istchee, from Rupert Bay to Cape Jones, and involved the Cree First Nations of Chisasibi, Wemindji, Eastmain, and Waskaganish. The research drew upon Cree Knowledge and experience as well as established scientific methods at every stage. Interviews about eelgrass, geese, and hunting were conducted with Cree knowledge holders from Chisasibi, Wemindji, Eastmain, and Waskaganish. Land users guided researchers during sampling of water, sediment, and eelgrass, and provided information for the goose study. The research was coordinated by Ernie Rabbitskin, Geraldine Mark, Norman and Wilfred Cheezo, Gregory Mayappo, Merlin Whiskeychan, and Ernest Moses, with the help of Cree technician Laura Lee Sam. In total, more than 40 land users from 12 traplines helped with the research. Researchers consulted Cree land users and Elders about preliminary results.

This pamphlet was prepared to communicate the overall integrated results of a collaboration between university researchers and Cree land users. Through this collaboration, we researchers have come to understand the importance of Cree culture and knowledge in addressing the above questions. The numerous land users with whom we collaborated taught us the fundamental Cree value of caring for all life, now and for future generations. Knowledge of the land, the water, the geese, the eelgrass, the people, and all their interconnections is the result of experience passed among Cree people across generations. The integrated results represent our scientific work over several years, our conversations with community members and land users, the formal Cree Knowledge project component, and previously published records and syntheses. The results also include our inferences, in which we draw upon the science, the formal knowledge collection, as well as our experiences in the field and with the community, to state what we understand to be the case and to have happened.

As researchers, we do not speak for the Cree, for Hydro Québec, for Niskamoon, or for our universities. We speak for ourselves. We are mostly scientists of European descent, not Cree, so we convey here what we know from our positions as researchers using the methods, conventions and language of our training and disciplines. It is this practice that gives our results credibility in science. However, sometimes we also share here what we understand and believe to be true, as people who have worked in this system alongside Cree partners. We have attempted to be clear when we are referring to conclusions based only on science, and inferences based on our experiences.

We do not always agree on every detail, for many reasons. We cannot speak for every perspective, as we continue to learn and appreciate the complexities of the Cree worldview. The Cree Knowledge we include is what was shared with us during the research and validated with the land users and elders who participated. We believe that we have made every effort to consider Cree Knowledge, values and understandings as much as we can, and we believe we have done our best to build a synthesis grounded in both knowledge systems.

What is the role of eelgrass in the ecosystem?

Scientist and Cree alike acknowledge the importance of healthy eelgrass beds to coastal wildlife such as fish and waterfowl. The Cree have long emphasized the importance of healthy eelgrass in shaping the stopover sites of migratory waterfowl, especially geese. A scientific study in the 1970s described eelgrass beds as flourishing in many sheltered locations along the coast especially north of the Castor River. They provided very important feeding areas for the Canada Goose (short-necks) and the Atlantic Brant during fall migrations. Goose behaviour was predictable and Cree hunters could get enough to feed their families.

Large, dense beds of eelgrass also keep waters clear of sediment. According to the *Migratory Bird Habitat Task Force Report* prepared by Chisasibi, "*A major indicator of healthy eelgrass is aayoshtinuukticj, which means that as soon as the tide recedes the eelgrass settles and calms the water in the area of the eelgrass beds*". Scientists describe how large, dense beds of eelgrass have 'positive feedbacks' in the environment. Water slows down when it enters a dense, healthy eelgrass bed, which allows sediment to settle out of the water, down onto the bottom (seabed). Eelgrass roots help hold the sediment in place on the bottom. When sediment is stabilized on the bottom like this, more sunlight can pass through the water to reach the plants and they can grow better. Thus, healthy eelgrass beds make the environment better for themselves and for other eelgrass beds around them.

What are the environmental factors that *potentially* influence how eelgrass grows?

Eelgrass is a marine plant and like other plants, need nutrients and lots of sunlight during summer to grow tall and spread and to store up energy to survive the winter. They need sediment that their roots can get into, to anchor themselves to the bottom (seabed). With enough light and nutrients, eelgrass form large and dense beds, with long leaves that float on top of the water at low tide.

Where, when, and why did eelgrass decline in James Bay?

La Grande development began to alter river flows in fall 1978 to fill the LG2 reservoir and completed LG1 and LG2A in 1994-1995. In some Chisasibi traplines, Cree land users observed eelgrass beginning to decline in the 1980s and early 1990s, with a major difference in the ecosystem apparent at some locations. Eelgrass biomass monitoring data shows a decrease in the size and density of eelgrass at some of the six Chisasibi sites that were monitored over the 1982-1995 period.

Eelgrass biomass was not monitored in Eastmain and Wemindji. Some Eastmain land users recall localized eelgrass loss south of the Eastmain River after the river was diverted in 1980. Meanwhile, in 1995, Wemindji Cree described flourishing eelgrass in their territory. As described by Cree and various publications, hydroelectric development caused major environmental changes around Chisasibi starting in 1978, including altered flow of La Grande River, erosion of sediment from riverbanks, expansion of the freshwater plume along the coast during winter, and transport of sediment and river debris out into the bay. In contrast, climate change effects such as early ice breakup and warming coastal water temperatures *were not yet evident* in northeastern James Bay during the 1980s and early '90s. ***Therefore, we conclude that changes caused by La Grande development started to affect eelgrass growth in some Chisasibi traplines before the mid-1990s.***

Starting in the late 1990s, an unprecedented, severe loss of eelgrass occurred along eastern James Bay. Cree land users from Chisasibi described seeing uprooted plants and a pronounced decline in eelgrass in deeper waters. Monitoring in Chisasibi in summer 1999 showed that eelgrass biomass at four monitoring stations had decreased 94% to 99% compared to 1995 conditions. When eelgrass abundance was checked elsewhere along the coast, it was found that eelgrass cover also had declined at many other locations compared to the distribution mapped in 1996. Climate change started to strongly affect eastern James Bay during the late 1990s. There were several extremely warm springs, hot, dry summers, and low natural river flows. Following a warm winter in 1998, the sea ice in northeast James Bay broke up almost a month early, and the coastal waters warmed up rapidly in June and July, reaching temperatures well above normal for that period. ***We conclude that the onset of these extreme weather events played a major role in extending the eelgrass decline to Wemindji and Eastmain accelerating the decline that had already started in some Chisasibi traplines.***

What is the current state of the eelgrass and what does this mean for geese?

Currently, the eelgrass is shorter than the 2-m shoots seen in the 1970s-90s. Eelgrass beds are smaller, patchy, and generally only found in shallow waters. Landsat satellite images that were analyzed for the project suggest a decrease in the total area of eelgrass over the period 1988 to 2019. Alongside the changes in eelgrass, short-necked geese are not stopping long in the area and the Brants have become rare. ***We conclude the loss of large, dense, eelgrass beds partly explains changes in goose distribution but the geese also changed their migratory habits in response to changes on the land along the bay (drying, more trees, fewer berries), and in the south (agriculture).*** Feeding habits and hunting have changed all along their migration routes and in their wintering range. Chisasibi and Wemindji Cree also attribute change in goose abundance to changes in local hunting practices and more noise pollution associated with the mechanization of hunting and air traffic in the area. More long-necked geese now undertake molt migrations through east James Bay and may compete for local resources. These changes in goose behaviour and distribution make the geese less predictable and harder to hunt in the fall. Elders are concerned that younger Cree will not see the abundance of geese and waterfowl and experience the traditional fall hunts from a few generations ago.

Why have the eelgrass beds not recovered?

Throughout the study area, one factor that is limiting eelgrass recovery is a lack of light during the growing season. James Bay offshore waters have become murkier (browner) in early summer during the past 25 years associated with variations in natural river discharge. Murky brown water does not let the light pass through to the eelgrass. When eelgrass does not get enough light during the summer, it is smaller, less dense, and not able to survive the winters as well. Low light makes it more difficult for eelgrass to thrive under stressful conditions such as warmer or fresher waters or low nutrient availability.

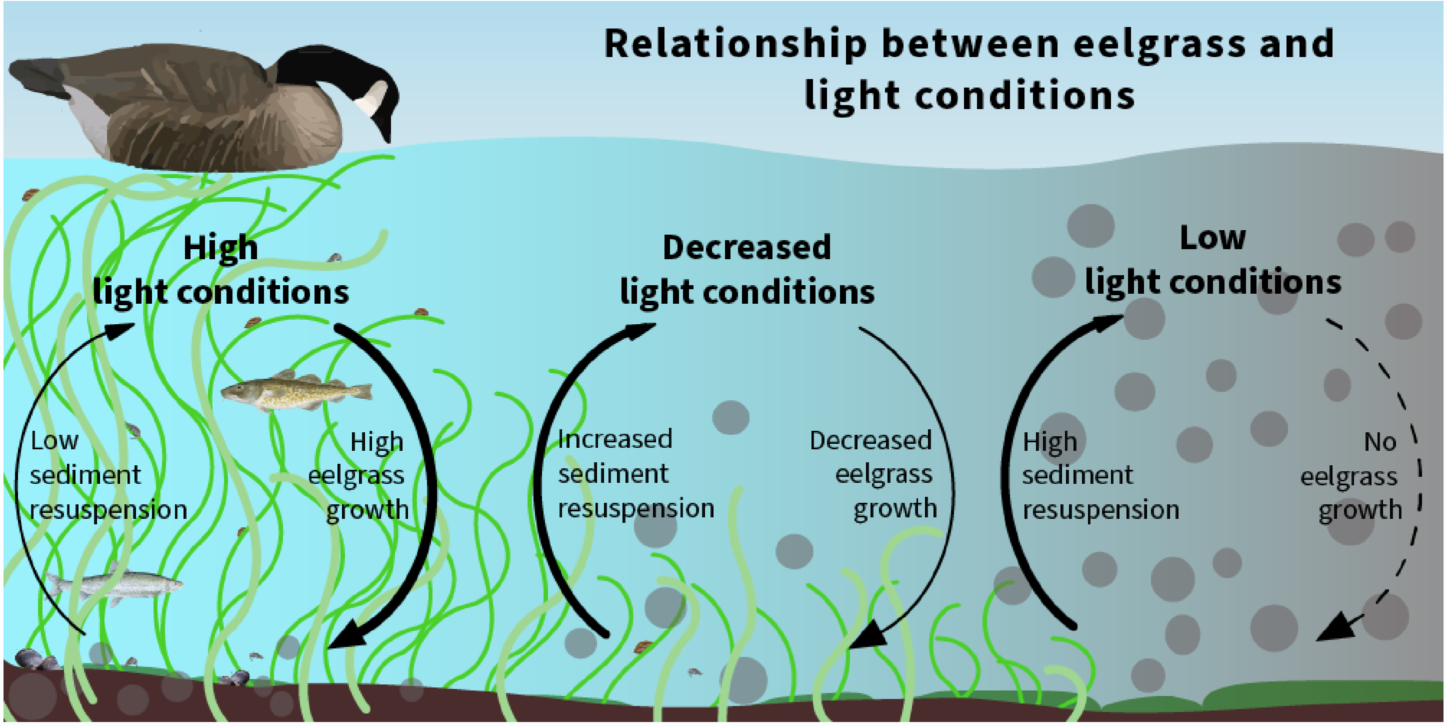
A second factor impeding eelgrass recovery is the feedback effect from losing so much eelgrass during the declines. The feedbacks would have begun in Chisasibi when the early eelgrass decline began. All along the coast, wherever large, dense eelgrass beds were lost, sediments that used to be stabilized on the bottom are now stirred up by waves. The sediment in the water blocks light. Also, some areas where the soft sediments were washed away now have a hard bottom (seabed). If the eelgrass cannot get their roots anchored well into the sediment, they have difficulties getting nutrients, and they could be washed away by currents and waves.

Near the La Grande River, there is a third factor possibly impeding eelgrass recovery. The research showed that eelgrass biomass at some beds is negatively affected by high discharge and warmer spring water temperatures. The exact causes were not determined. However, it is well known that low salinity (less than 5-10) impedes eelgrass growth.

What will the future bring?

Although murkier (browner) water and other factors work against eelgrass recovery, many areas still have eelgrass, it is still there and still growing, and still providing habitat for fish and birds. However, it is a critical time for the eelgrass. If human activities disturb the coastal habitat further, or if climate change makes inland areas more susceptible to fires and erosion, the health of the eelgrass could decline further, or it could disappear from more areas along the coast.

The figure illustrates how healthy eelgrass have *positive feedbacks* that improve the local environment. By calming the waters and keeping sediment resuspension low, healthy eelgrass creates high light conditions and helps more eelgrass grow. If eelgrass have become sparse or absent, high sediment resuspension leads to low light conditions and makes it hard for eelgrass to grow.



In view of the *importance* of healthy coastal ecosystems for fish and wildlife, Cree lifestyles, and globally, understanding and protecting these ecosystems is going to be important for the long term. Because eelgrass has persisted through major environmental changes in the past, perhaps it can recover, but much depends on future coastal management *and* how the climate varies in the coming years. The coastal habitat of Eeyou Istchee is large and complex. Some eelgrass beds may be more impacted by coastal development and others by climate change and in places these stressors may interact. This research was the first to seek a comprehensive understanding of environmental changes and impacts in the coastal habitat of Eeyou Istchee. Unanswered questions remain, particularly about what could facilitate eelgrass recovery and a return to productive fall goose hunts. Nevertheless, a lot of progress was made in documenting the properties of the habitat known so well to Cree land users. We hope the results will contribute to future Cree-led monitoring and management.

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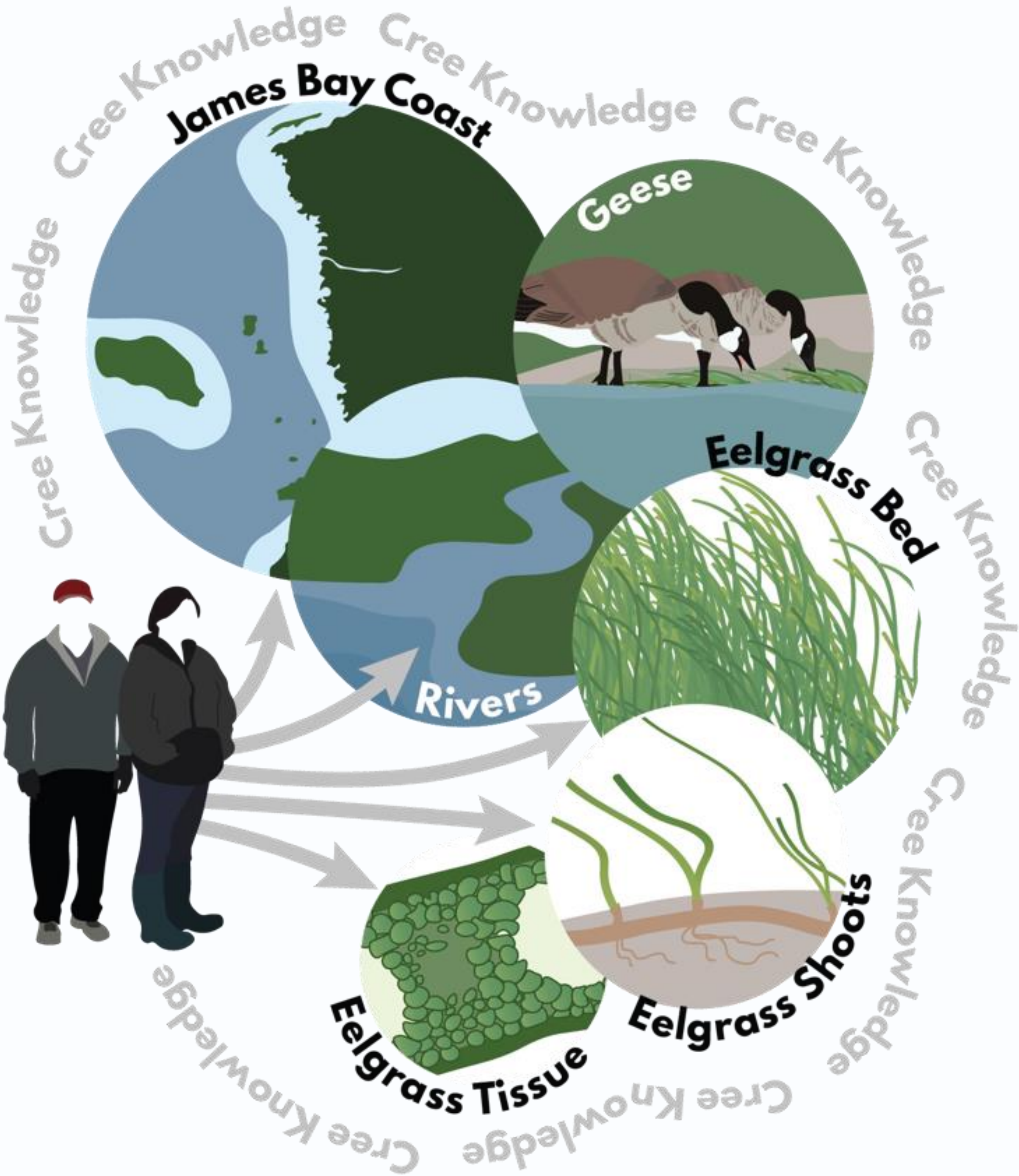
Cree Knowledge
James Bay Coast
Geese
Eelgrass Bed
Rivers
Eelgrass Shoots
Eelgrass Tissue