Forest Authority
Cree First Nation of Waswanipi

Fish Monitoring at Théodat Lake – Survey of the Walleye Population.

Context

The Cree First Nation of Waswanipi (CFNW) is located in the Nord-du-Québec administrative region. More specifically, Waswanipi is located at the 49th parallel and is part of *the Eeyou Istchee* territory (meaning "land of the people" in Cree). *Eeyou Istchee* includes over 400,000 km^2 of traditional territory, divided into more than 300 traplines or traditional family hunting and trapping grounds. These traplines are places where traditional activities (including hunting, fishing and trapping) are practised, under the supervision of a tallyman (in charge of the family trapline).("The Grand Council of the Crees (*Eeyou Istchee*)," n.d.). Sixty-two (62) traplines are associated with the Waswanipi community, from east of Senneterre in the south to northeast of Evans Lake in the north.

The territory is mainly located in the boreal zone, where closed boreal forest dominates. Fire is the main natural disturbance and greatly influences the composition and structure of these forests. In the summer of 2023, Waswanipi experienced its largest forest fires. A total of 696,855 ha of forest were affected by fire. Waswanipi has experienced forest fires over the past 10 years, but the last major fires were in 2013. Insect epidemics and windthrow are other possible natural disturbances, but to a lesser extent. For example, the survey conducted in early summer 2023, before the forest fires, showed that insect damage was moderate and rather localized in the southern sector. Trees were slightly defoliated and dried out.

The Waswanipi area is also affected by several anthropic disturbances. The most important is undoubtedly the forestry industry, with the development of a considerable road network. Before 1976, logging in the area was limited. Since then, logging has grown considerably in the James Bay Cree territory, particularly in the more southerly areas of Waswanipi, Oujé-Bougoumou and south of Mistissini. A few mining companies are also present on the territory, as are power transmission lines.

Fish is at the heart of the Cree's diet. It is one of the main traditional food for the Cree and contributes to food security, an important aspect in this region. Fishing represents more than a way to gather food. It also is a way to connect with the land. It is important for the Cree to spend time on the territory, and give and receive from nature. It is part of the Cree culture and Cree identity. It is also a way to perpetuate traditional knowledge from one generation to the other. Cree traditional food with high-protein content includes fish. Species like whitefish, pike, trout and walleye are popular, nutritious and contain many vitamins and healthy fats (good for the heart and for preventing related diseases). Moreover, this source of food provided by the nature contributes in addressing the food security issue, an important concern in the northern communities, with expensive store-bought products. It also contributes to a healthier population as store-bought products are often processed, with high sugar content. This is why it is important to monitor fish populations and their health status, to be able to preserve them.

Walleye biology

Walleye (*Sander vitreus*) is a freshwater perciform fish found on about half the Québec's area, from James Bay in the North all the way to the South of the province. It is found in not too deep, cool (between 13 and

21 °C) and turbid waters. It has an excellent night vision due to a pigment layer in the eye that reflects the light, but therefore, is sensitive to bright lights and must avoid them. Spawning occurs in the spring from April to June (in the James Bay area, it is mostly between the beginning of May and mid-June). It usually selects spawning grounds with clean substrate composed of gravel in shallow areas with oxygenated waters. Sexual maturity is reached between 2 and 8 years old and its growth is slow in the northern areas, about 85mm/year.

Study area

Théodat Lake is located on traplines W05, W05A and W05B. It is about 125 km North of Waswanipi in the Broadback River watershed flowing west in the James Bay. It is 20,1 km long and at the largest, 8 km wide. It is considered to be a site where there are very few disturbances which is becoming rare on Waswanipi territory. However, there have been forest fires in the vicinity. There is also an active outfitting camp on W05B trapline.

The aim of the project is to sample the walleye population in Théodat Lake in order to set the baseline or a reference level (since there was no other study done in this lake) to monitor any changes in the fish health or population. It would also serve as a baseline to other lakes in the region in terms of contaminants as this area is considered undisturbed. In order to do that, two main aspects need to be studied:

1. Describe the health status of the walleye (contaminants, but also beneficial elements to human's health).
2. Describe the walleye's population (age structure, sex ratio, condition, growth, length and weight monitoring in relation to fishing methods, reproductive health).

Analyses of various chemical element would be done, some of which can be contaminants and negative for human health. Routinely, 5 elements are quantified in the meat and in the eggs. Mercury, cadmium, arsenic and lead are important to quantify as they can negatively impact human health. Selenium is also quantified, but this element as beneficial properties to human health. For example, it has been found to have a structural and enzymatic role as well as being important for the good functioning of the immune system. Moreover, a deficiency in selenium can alter the mood.

This survey would also serve as a baseline to monitor any changes in the fish health or in the population. At the moment, we know nothing about those two components. Therefore, if there are any changes near this lake, setting a reference level will allows us to see potential impacts of potential disturbances (natural or anthropic). Also, if we repeat this survey in the future, we are going to be able to evaluate if the population changes with time. It can also serve as a baseline for metal content in the region as it is an undisturbed area.