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Wapusk News

The Carbon Copy

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For peat's sake

Located on the shores of Hudson Bay, Wapusk National Park protects a plethora of diverse plants, animals and ecosystems, categorised into six unique ecosystems. These ecosystems, each with their own set of defining characteristics, are critical habitats that are home to polar bear dens, caribou herds, thousands of birds, and even more arctic animals.

Some of these ecosystems also contain up to two to three metres of peat, a spongy, soil-like substance made up of partially decayed organic matter, mostly from lichens and Sphagnum moss, in a water-logged environment. Peatlands cover almost one third of the park and have built up over thousands of years, resulting in an ecosystem that supports various plants and animals of Wapusk.

While peat may look like regular dirt to the untrained eye, the vast peatlands are a powerhouse for carbon sequestration. Carbon sequestration is the process of absorbing and storing carbon dioxide from the atmosphere. When an ecosystem releases more carbon than it absorbs, it's called a carbon source. When an ecosystem absorbs more carbon than it releases, it's a carbon sink.

While they only covers 3% of the Earth's land, peatlands across the world hold one-third of its soil carbon, making them one of the most important carbon sinks in the world. Not only does peat hold more than its fair share of carbon by quantity, it also holds it longer than other soils. Boreal peatlands, such as those found in Wapusk, can hold carbon for up to 10,000 years, while boreal forests only hold carbon for up to 500 years.

Photo: Parks Canada

By protecting Wapusk's peatlands, we ensure that these carbon stores stay put, and are not released into the atmosphere, where they would otherwise become a source of greenhouse gas and contribute to climate change.

Parks and protected areas in Canada are part of a "natural climate solution" to climate change, as healthy ecosystems help nature and people adapt to climate change. These places conserve biodiversity, protect ecosystem processes, connect landscapes, take up and store carbon and build knowledge and understanding. By protecting areas such as Wapusk National Park, Parks Canada plays an important role in helping to address impacts of climate change by protecting and restoring healthy, resilient ecosystems and contributing to the recovery of species at risk.

Wapusk National Park covers 11,475 square kilometres in the area of the Hudson-James Bay Lowlands, a vast, low-lying plain on the western shores of Hudson Bay. Permafrost (permanently frozen ground) underlies this subarctic region and is topped by North America's most extensive mantle of peat. Water in the form of lakes, bogs, fens, streams and rivers cover half of the land's surface.

Wapusk National Park's location, in the transition zone between boreal forest and arctic tundra, results in a diverse range of habitats. The coastal area is marked by salt marshes, dunes, beaches and an extensive intertidal zone that spans up to 10 kilometres between low and high tide marks. West of this coastal area are the wide-open spaces of the tundra made up of raised beach ridges, sedge meadows, peatlands and tundra ponds. In the southwestern portion of the park, a patchy landscape of weather worn spruce, tamarack and willow make up the northern boreal forests.

People are keepers of the land

Management of the park is aided by a ten-member Management Board. The Board advises the Minister on the planning, management and operation of the park, and is made up of representatives of the Government of Canada; Province of Manitoba; Town of Churchill; Fox Lake Cree Nation; and York Factory First Nation. Inuit and Dene representatives participate in board meetings as observers.

Carbon Counting

By monitoring carbon sequestration and carbon loss, scientists can monitor how changes affect the climate, ecosystems and more.

Research and monitoring programs are important tools that can be used to gain an understanding of ecological resources and processes in the park. Each year, researchers from all over the country, and beyond, take to the lands, ice and waters of Wapusk National Park to learn more about its iconic wildlife, fascinating flora, and unique ecology. These are just a few examples of the important research done inside the park during the 2024/25 research season.


Photo: Michelle Garneau

Parks Canada

Hudson–James Bay Lowlands biodiversity conservation and sequestration initiative

Led by Alison Cassidy

The goal of this research is to advance the understanding of how much carbon is stored and removed from the atmosphere by terrestrial and coastal ecosystems in the Hudson-James Bay Lowlands area. Co-developed by the leadership of the Mushkegowuk Council, Weenusk First Nation, and Wapusk National Park, this project also blends knowledge systems and provides training. Results will contribute information towards the potential establishment of new national marine conservation areas in this region as well as for potential conservation and restoration actions in Wapusk.

Current work is focused on bringing together and analyzing results from the first two sampling seasons and planning work for the last season in 2025. So far, sampling has been conducted in various locations in and along La Perouse Bay and in peatland areas of the park and also along the Hayes and Nelson rivers near York Factory National Historic Site. Sampling activities included vegetation surveys and mapping, collecting soil cores in various types of thawed and frozen ground, collecting water chemistry and volume measurements, measuring permafrost characteristics, and the collection of landscape imagery using drones and remote sensing. Lab work has included the analysis of soil properties and will also focus on the calculation of carbon accumulation rates and total carbon volume.


Photo: Kaushik Gupta

University of Manitoba

Assessing land to ocean carbon delivery at the northern extent of the Hudson Bay Lowlands

Led by Dr. Tim Papakyriakou

This project contributes to the understanding of carbon cycling and transport in the continuous permafrost zone of Hudson Bay. Rivers and streams from peat uplands in the interior, where permafrost is common, transform and transport carbon to estuarine and coastal wetlands systems. These areas store carbon in sediments and vegetation; which may provide a source of carbon to the marine system of Hudson Bay.

In July 2024, water samples were collected at nine river and lake stations within Wapusk National Park. These samples will provide a baseline for organic and inorganic properties. Further analysis will focus on understanding carbon and nutrient loads in rivers and streams throughout the park, particularly the Owl and Broad Rivers, and the flow of these components from rivers-to-coast-to-sea.

The seawater transport of carbon is a major carbon loss for the terrestrial peatland system. This project aims to measure that loss to better understand the carbon cycle in the Hudson Bay area.


Photo: Parks Canada

Lakes and Landscapes

Made up of six unique ecosystems, Wapusk spans from forest to fen. These ecosystems include more than just plants and animals and the monitoring of nonliving elements of the landscape, such as water and permafrost, are an important area of research for scientists.


Photo: S. Oliver

Université de Sherbrooke

Reconstructing lake and peatland dynamics during the industrial era in Wapusk National Park near Churchill, Manitoba

Led by Dr. Frédéric Bouchard

Previous studies have documented a reduction of water levels in lakes, including the drying up of lakes in the Wapusk/Churchill area. However, it is not known if these events are new since the pre-Industrial period. This project seeks to understand if permafrost thaw and variations in water flow patterns, caused by recent climate warming, have resulted in these changes. It also examines if there is an increase in the transfer of carbon from terrestrial to aquatic ecosystems.

In August 2024, a series of ponds and lakes and their sediments were sampled in Wapusk National Park. Sampling spanned the Coastal Fen in the Northeast, through the Interior Peat Plateau, to the Boreal Spruce Forest in the Southwest. Lake water was surveyed for physical properties such as temperature, conductivity, dissolved oxygen, and pH. Water samples were collected to be analyzed for physico-chemical properties. This includes nutrients, dissolved organic carbon, and stable isotope tracers. Lake sediment cores were collected and will be dated to cover the last few centuries. To help describe recent trends, these reconstructions will also be compared to aerial photographs and satellite images.

This research takes place in collaboration with:

- Laure Gandois and Maialen Barret (Centre de recherche sur la biodiversité et l'environnement, France)
- Sylvain Ferrant (Centre d'études spatiales de la biosphère, France)
- Julien Arsenaul and Lucile Cosyn-Wexsteen (Dept. of Applied Geomatics, Université de Sherbrooke)
- Michelle Garneau and Tiina Kolari (Dept. of Geography, UQAM)


Photo: Tabatha Rahman

PhD candidate Konstantin Ozeritskiy holding an ice-rich permafrost core.

Université Laval

Ice-wedge distribution, development, and impacts on landscape evolution in the Barrens of the Hudson Bay Lowlands, Northern Manitoba

Led by Tabatha Rahman

The Barrens of Northern Manitoba is home to some of Canada's southernmost continuous permafrost and wedge ice - a type of ground ice that forms during particularly cold winters. The Barrens' wedge ice is predicted to melt with continued climate warming, which will have negative impacts on the crucial Hudson Bay Railway and vital polar bear denning habitat. However, our ability to predict and mitigate risks associated with permafrost thaw is limited because the volume and distribution of the wedge ice are unknown. This research seeks to determine wedge-ice volume, distribution, and impacts on landscape evolution in the Barrens (mostly treeless peatlands in the Wapusk area).

Results indicate that 88% of the Barrens' wedge ice is located on peat plateaus, on which the Hudson Bay Railway was built and polar bears build dens. Wedge ice represents 5.58% of the upper 2 m of permafrost in the Barrens' peat plateaus. These ice wedges are located at the top of the permafrost, making them susceptible to permafrost thaw. Permafrost in regions with a thick peat cover (≥ 1m) appears to be resilient to climate warming and fires.

Animal Action

The furry and feathered inhabitants of Wapusk are important indicators of a healthy and resilient ecosystem and monitoring them is part of protecting the ecological integrity of the park.

There's so much more to learn!

Read all research summaries through the QR code below, or visit ***parks.canada.ca/wapusk***

University of Manitoba

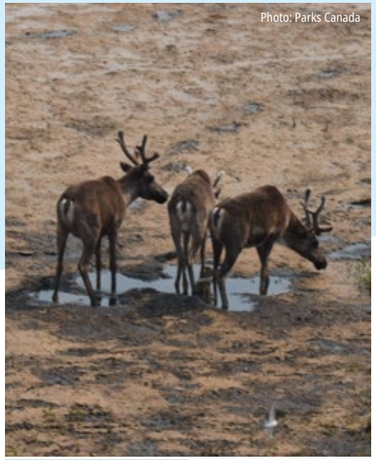
Examining fox interactions and movements at tundra-taiga transition

Led by Dr. James Roth

The expansion of red foxes (Vulpes vulpes) into areas that used to be occupied by Arctic foxes (Vulpes lagopus) can threaten the survival of Arctic fox populations. This project uses location information from satellite collars attached to both species of foxes to better understand this threat. The location information shows how foxes use the landscape in and around Wapusk National Park.

In April 2024, 4 foxes were captured in the park: 3 red foxes and 1 Arctic fox. All foxes were found at dens near the Nester One research station. Satellite collars were put on the red foxes; however, the Arctic fox was not collared due to its small size. A total of 7 foxes from 2023 and 2024 remained in the study area during the targeted reproductive period of April 1 to August 31. All other foxes with active collars travelled away from the project area during this time.

Predators such as foxes play an important role in Arctic and sub-Arctic food webs. Changes in the numbers and types of predators and in how they use ecosystems may also impact other species. A warming environment may also increase the range of species into new territories like the Arctic tundra. Understanding the interactions between these two species might help understand why species normally found in the boreal forest may be found in more northern tundra ecosystems and how that might affect ecosystems in the park.



Parks Canada

Candid Caribou – Documenting migratory habitat use for caribou in Wapusk National Park

Led by Russell Turner

This research uses a network of trail cameras to monitor wildlife in Wapusk. The cameras are placed along the eastern edge of the park from Cape Churchill to Broad River. They are deployed running north to south and equally divided into Fen and Beach Ridge habitat. The goals are to document when and where caribou are throughout the year and to identify which habitat caribou prefer on their summer range.

After three years of image collections, 687,616 images have been captured for data analysis. The images, paired with Indigenous and local knowledge, documented how raised gravel beach ridges are important migration routes for caribou accessing their calving grounds.

In 2020 and 2021, Parks Canada organised the Beyond Borders Caribou Workshop series. The workshops provided a forum for knowledge exchange, creating a space to weave together Western science and Indigenous knowledge systems as equals, co-developing strategies to sustain healthy caribou herds in Northern Manitoba. One outcome of the workshop series was the establishment of this project. Utilizing non-invasive trail cameras is an excellent tool for collecting data and monitoring wildlife populations in remote settings. It also aligns with Parks Canada's mandate and research priorities to better understand the ecology of Wapusk National Park.

Parks Canada

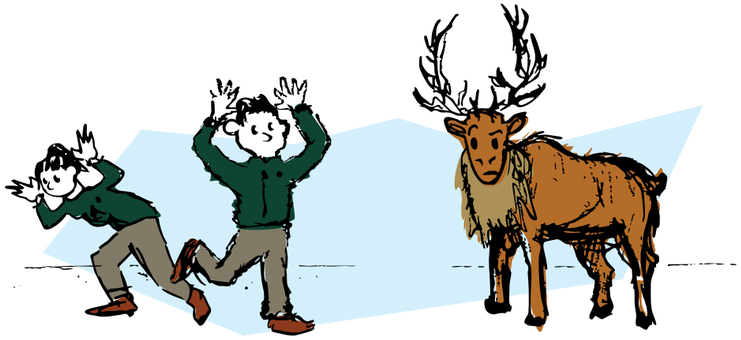
Finventory – An eDNA fisheries inventory for Wapusk National Park

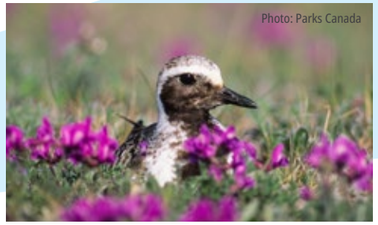
Led by LeeAnn Fishback

Wapusk National Park protects landscapes and ecosystems of the Hudson Bay Lowlands. Thousands of freshwater ponds, lakes, rivers, and creeks cover this landscape. Traditional and local knowledge have confirmed 10 fish species at 8 different locations but there remains a gap in knowledge surrounding the extent and structure of the fish community.

The goal of this project is to complete a detailed inventory of fish species in the park using eDNA techniques, achieved by completing eDNA sampling of the largest lakes and major river and creek systems within the park. Monitoring fish communities is vital to the assessment of overall ecological health of the aquatic systems and terrestrial life they support.

In 2024, Parks Canada completed fish community assessments along the major river and creek systems within the park: White Whale River, Thompson Creek, Broad River, Owl River, Rupert Creek. Results from a pilot study in 2023 and the findings from 2024 will inform future sampling efforts and target locations to address remaining gaps in knowledge about fish assemblages and diversity within the park.





Parks Canada

Eyes on the skies – arctic shorebird monitoring in Wapusk National Park

Led by Jesse Shirton

Shorebirds that breed in the Arctic are currently experiencing population declines. There are significant knowledge gaps about shorebird migration patterns. However, research shows that Wapusk National Park's shoreline is critical to more than a dozen shorebird species during their migrations.

In 2022, Parks Canada deployed two MOTUS (Motus Wildlife Tracking System) towers in Wapusk National Park and one at York Factory National Historic Site. These towers support the designation of the park's coastline as a shorebird conservation area. In addition to these MOTUS towers, Dr. Erica Nol from Trent University has one seasonal MOTUS tower deployed at Nester 1 research camp. Since deployment, the towers have detected 7 different species, including the endangered Red Knot.

This project provides Parks Canada with a better understanding of how Arctic-breeding shorebirds are using Wapusk National Park during their spring and fall migrations. Tracking data collected by the MOTUS towers is available on www.motus.org. It includes data for birds in Dr. Nol's project, as well as birds of other national and international MOTUS projects.

Parks Canada

Wapusk snow goose breeding survey – mapping colonies and estimating abundance

Led by Russell Turner

For many years, Wapusk National Park has grappled with the adverse impacts of an over-abundant snow goose population. The threat posed by Snow Geese to the park's ecological integrity, mainly through their destructive feeding habits that irreversibly alter the landscape, has become increasingly evident. There is a lack of information about the current distribution and population size of the breeding Snow Goose population within the park. Data from other research suggests that nesting density has decreased as habitat conditions change. As their habitat conditions worsen, the geese disperse to other parts of the park.

In response to these concerns, an aerial survey was conducted in 2024 at the northern portion of the park where the geese are most common. The aim of the survey was to photograph the geese nesting in these areas. Currently, the thousands of photos from the survey are being sorted and referenced to their location on the landscape. Parks Canada staff will then count the nests in the photos to get an updated breeding populating estimate for the park.

Results will be used to understanding the current ecological footprint of these migratory birds and to predict potential changes in their numbers over time. This information will be used to address both current and long-term conservation and management efforts in Wapusk National Park.

Photo: Chloé Warret Rodrigues

Peat, patience and partners

a tale of northern fieldwork

When the going gets tough, the tough bundle up and head to the subarctic. But why would anyone willingly brave -40°C conditions for winter fieldwork? The thirst for knowledge and the pursuit of collaboration, of course!

In late March 2025, a small contingent of researchers spent a frigid day in the elements to collect frozen peat samples. The group consisted of Parks Canada personnel, a post-doctoral researcher from Université du Québec à Montréal (UQAM) and Land Guardians from the Seal River Watershed Alliance.

As time with researchers and Land Guardians was limited, a site at nearby Twin Lakes, just outside the park, was chosen. The location, accessed by snowmobiles, provided the perfect platform to dig snow pits and learn proper drilling procedure. Once familiar with the procedure, team members took turns collecting frozen peat cores.

Patience and the ability to pivot are the name of the travel game in the North. While distances appear to be "close," hopping in the car is not an option.

Alison Cassidy, ecosystem scientist with the Climate and Conservation Science team (CliCS) of Parks Canada, says the local travel knowledge provided by Wapusk National Park staff was a "game changer".

Some of the extracted cores were packaged and sent to the laboratory at UQAM for lab analyses. Remaining samples were taken to Parks Canada's Churchill office to provide a rare opportunity for the collection team and other Resource Conservation staff from Wapusk National Park to see what usually lies beneath the surface. At the Visitor Centre in Churchill, these core samples have been shared with hundreds of visitors during public presentations.

"You can't do fieldwork in the North without logistical challenges," offers Parks Canada ecosystem scientist Russell Turner.

"There are no roads, no trails and no easy access to the park," adds Russell. "We often find people down south don't understand why we have to use other modes of transportation like helicopters and snowmobiles."

"We were able to access a study location and collect samples that can't be retrieved in the summer as the soil is too wet," Alison explains. "Winter travel allowed us to sample important locations that were previously missing from our work. Seeing the area snow-covered allowed us to better understand the ecosystems we usually only see during the growing season."

"We were able to explore the different layers of the peat cores," adds Alison.

Photo: Parks Canada

"Most of the time this is done in the lab, so this was a nice change. We were able to identify wetland plants in the deeper layers of the peat and experiment with the water retention of mosses."

This research is one of many ways staff at Wapusk National Park and CliCS collaborate with Indigenous partners, including Seal River Watershed Alliance Land Guardians.

Analyzing how much carbon is being stored in frozen peat cores contributes to Parks Canada's understanding of the current condition of carbon sequestration in the peatlands of Wapusk.

Parks Canada and Indigenous Peoples are partners in conserving natural heritage

Land Guardians are community conservation leaders who, through application of their skills, knowledge and experience, help protect one of the planet's largest ecologically intact watersheds and honour their cultural heritage.

The Seal River Watershed is the ancestral territory of many Indigenous Nations, including Barren Lands First Nation, Northlands Denesuline First Nation, O-Pipon-Na-Piwin Cree Nation and Sayisi Dene First Nation.

Whether collecting data, touching frozen peat, learning wilderness first-aid in the park or seeing polar bears for the first time, there are countless ways to work together with the Land Guardians.

"These are the experiences they're asking for, and we're being creative in how we do that. It's about working together. That's what makes the work so successful and rewarding," says Russell.

Photos: Parks Canada

A day in the life

of lake hydrology

For the Wapusk Resource Conservation team, no two days are ever the same. During the summer research season, the team may find themselves working on new projects or picking up where they left off the year before. The mix of new and old means there's never a dull moment!

For Emily Hunt, Resource Management Technician, the best part about working for Parks Canada is spending time in Wapusk National Park doing fieldwork. There's nothing better than projects like lake hydrology sampling to get your feet wet — not literally, thankfully — with help from some heavy-duty rubber boots.

Overflowing with data

Hydrology is the science that studies the properties and the movement of water; and in Wapusk National Park, with more than 10,000 shallow lakes, there's a lot of water to study. Some of these lakes are thermokarst lakes, bodies of water are created by the thawing of ice-rich permafrost and are the habitat for hundreds of species of plants and animals.

Since these lakes have a high surface-area-to-volume ratio, they are very sensitive to changes in the environment. Monitoring how the lakes react to changes in the environment helps inform the team on how the park as a whole might respond to climate change.

Getting the whole picture

Wapusk covers three different ecozones: boreal forest, peat plateau and coastal fen, each with their own unique characteristics that will react differently to changes in the environment. To get the best picture without sampling all 10,000 lakes, the team collects water samples from 16 lakes spread across all three ecozones.

Samples are taken from the lakes three times a year: shortly after the ice melts in June, during the peak summer heat in July and again in September, shortly before the ice freezes. The samples are then sent to our lab colleagues to be analysed, which gives us information about the composition of the lakes in different seasons. This project has been running since 2010, so we have a great picture of the lakes in Wapusk.

Fieldwork fun

Like most trips into Wapusk, it all begins with a helicopter ride where Emily and the pilot will use satellite imagery to determine which of the many lakes is the right one for sampling (ensuring we are sampling the same lake in each season, ever year). After they touch down, there are four main jobs to dive into.

One person collects a water sample in a 30-millilitre bottle, rinsing it three times and then filling it to the brim and capping it under water. This gives them the best quality water sample with no air bubbles.

The second job is taking water measurements using a YSI multimeter, which records the pH, conductivity, temperature of the water, air temperature, and finally, a water depth measurement at the spot the sample was collected.

Team member three is the scribe, making note of all the measurements, weather conditions, shoreline erosion, any flooding or drying up, aquatic and terrestrial vegetation, the colour, clarity, and sediment of the pond, and any evidence of geese or other wildlife.

The fourth and final team member is the polar bear guard, watching to make sure the rest of the team is safe while they're knee-deep in research.

Rinse and repeat

This whole process takes about four minutes, then they're back in the helicopter and off to the next lake. The team repeats this at all 16 ponds, making sure the process is the same every time. After a long day at the lake, they head back to Churchill, put the samples in the fridge, and head home safely to prepare for their next day in the field.

Photos: Parks Canada

Wildfire

a force of nature's regeneration in Wapusk

Wapusk is a place of change. Crossing the landscape, you can see it transition from boreal forest in the southwest, through peatlands in its centre, towards coastal ridges and fens in the northeast. Through the seasons you'll see it turn from a snow-covered expanse to a rich, plant-filled panorama, teaming with life. Another way that the park changes every year is the cycle of growth caused by naturally occurring wildfires.

Fire is a natural and normal part of many ecosystems, including the boreal forest. It plays an important role in the creation of habitat for many plants, animals, and insects.

The park experiences wildfires on average 1.2 times per year, some years with low or no fires while other years see several significant burns. In 2025, Wapusk had three natural wildfires.

In areas of the park affected by wildfires, mostly in the southwest boreal forest, you can see fresh plant growth following the natural disturbance. As areas recover from natural wildfires, their growth cycle is visibly different than unaffected areas. These fires support diversity in plant species and maturity of the flora, help stop the spread of diseases, invasive plants and insects and return nutrients to the soil.

Natural wildfires can also cause significant harm to the ecosystems in the park by destabilizing permafrost integrity, destroying tree cover and lichen that caribou depend on, and affecting stability of polar bear maternity dens.

Wildfires can rapidly release carbon dioxide into the atmosphere, changing the balance that determines whether an area is a carbon sink or a carbon source.

Building a better understanding of the benefits and challenges of wildfires is crucial to the monitoring of the ecological integrity of the park. This past year, Parks Canada studied 61 years of data to learn about the frequency, location and behaviour of natural wildfires in Wapusk. This information will be used in fire management planning, to support protection of values at risk in the park and will help to prioritize distribution of resources and future studies.

We want to hear from you!

Parks Canada and the Wapusk Management Board would appreciate any comments about this issue of Wapusk News, or suggestions for future issues.

Please send your feedback to **manitoba@pc.gc.ca**, visit the Parks Canada Visitor Centre in Churchill or call **204-675-8863**.