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National Park
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ANNUAL REPORT OF RESEARCH AND MONITORING IN

WAPUSK NATIONAL PARK

2009-2010

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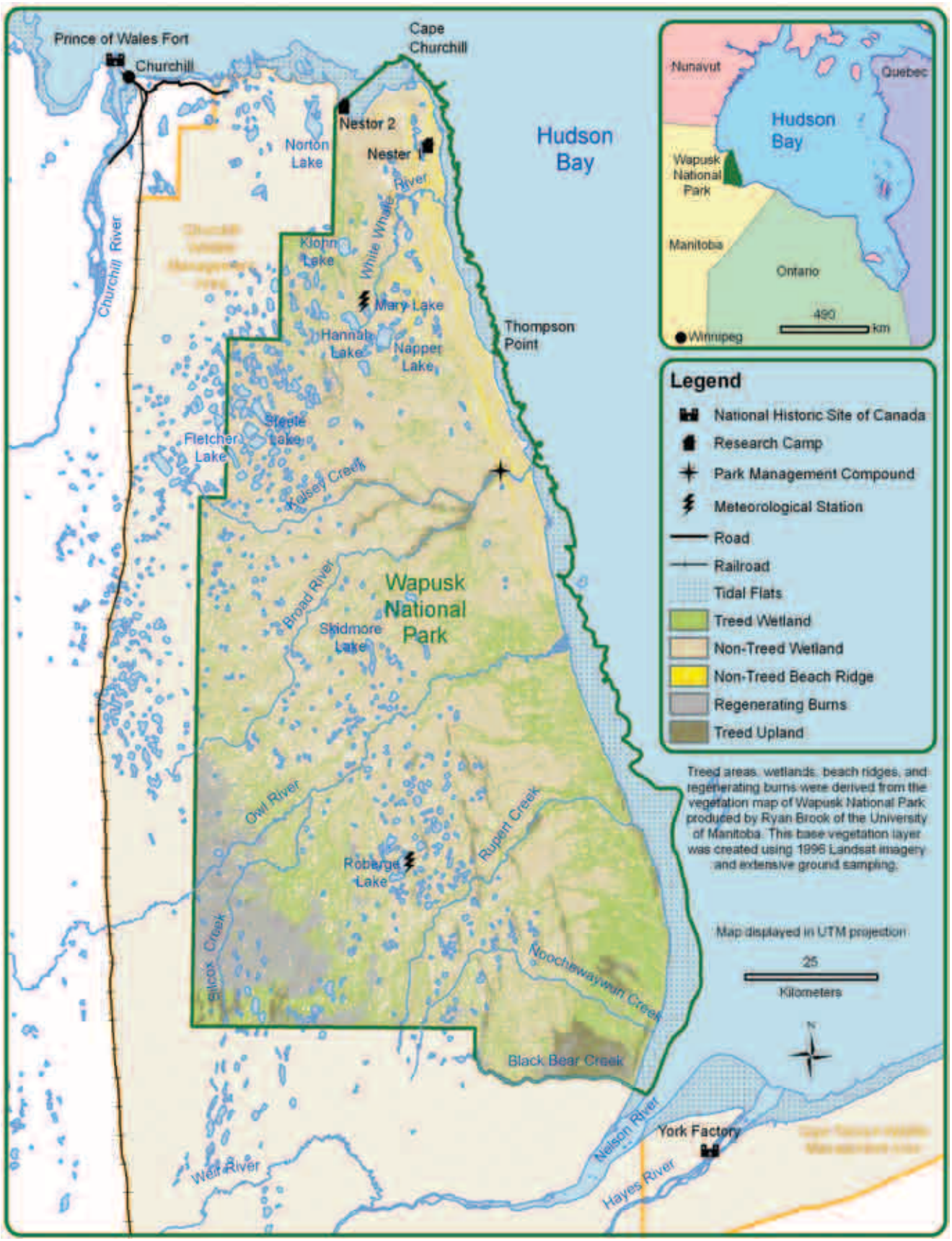
Prince of Wales Fort
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Black Bear Creek
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Nunavut
Quebec
Hudson Bay
Wapusk National Park
Manitoba
Ontario
490
km
Winnipeg
Legend
National Historic Site of Canada
Research Camp
Park Management Compound
Meteorological Station
Road
Railroad
Tidal Flats
Treed Wetland
Non-Treed Wetland
Non-Treed Beach Ridge
Regenerating Burns
Treed Upland
Treed areas, wetlands, beach ridges, and regenerating burns were derived from the vegetation map of Wapusk National Park produced by Ryan Brook of the University of Manitoba. This base vegetation layer was created using 1996 Landsat imagery and extensive ground sampling.
Map displayed in UTM projection
25
Kilometers
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INTRODUCTION

This Annual Report of Research and Monitoring in Wapusk National Park, has been completed on the eve of preparing our first State of the Park Report (SOPR). This milestone requires that researchers will be asked to report the data they collect in terms of trends and status of the organism or research parameters. This analysis will assist in defining the state of Ecological Integrity within the park and will help us identify research and monitoring gaps. Future research and monitoring priorities will be designed around addressing some of these gaps.

In this report we have asked two researchers Dr. Yu Zhang and Dr. Wenjun Chen from Canadian Center for Remote Sensing to report on their research completed in 2009-2010 as part of ParkSpace. This is an externally funded, Parks Canada Agency-led project aimed at developing and delivering remote sensing measures for northern national parks.

The Terrestrial Ecosystem Mapping (TEM) project of Dr. Donald McLennan (Parks Canada) is also part of the ParkSpace project and the additional work completed under this project will address the need to identify ecotypes within the park and to create maps and information products for these ecotypes. One of the important components of ParkSpace is communication and outreach and this includes the development of communication and presentation products using remote sensing. Remote sensing allows landscape measures to be compared across the entire park, and assists in identifying areas of interest for future research.

Monitoring in northern national parks using standard on-site observations is both costly and time consuming given the large areas of these parks and the remote access. Sometimes logistical constraints prohibit return visits at prescribed repeat periods or changes in weather mean prediction of peak monitoring times may be hampered by unforeseen storms. Examples of ParkSpace projects across the north are land-cover change, plant growth and seasonality, permafrost change and changes in wetlands and lakes, ice (sea and lake), glaciers and coastal change are some of the work packages included in this project.

Wapusk National Park will be reporting on some of this work in the SOPR.

This does not mean that ground based research is less important, in fact it forms the backbone of information being used to guide park management goals and decisions. The information provided by all the researchers is important in advancing our knowledge about the park and will continue the long history of research and monitoring activities in the region.

The following summaries were prepared by the researchers to provide an overview of the research in the park. If you wish to learn more about a specific research and monitoring program you should contact the lead researcher.

We hope this report provides a glimpse into the diversity of research and monitoring programs carried out on the ground in Wapusk National Park in 2009-10 as well as research into innovative ways to use satellite imagery to generate remote sensing products to assist in monitoring landscape change over time. We welcome any questions or feedback on this program.

RATIONALE:

There are thousands of shallow freshwater ponds scattered across Wapusk National Park, which make up an important and vital resource for plants and animals that live within the park. Continued climate warming in this region is expected to lead to longer growing seasons, warmer temperatures and thawing of the upper layers of permafrost that surrounds these waterbodies.

This will result in increasing amounts of nutrients entering the ponds. In addition, populations of lesser snow geese have increased dramatically in recent years, expanding their use of freshwater habitats within the park. Consequently, increased quantities of goose feces will also lead to further increases in nutrient loading to freshwater environments. Currently, little is known about the nutrient status of freshwater ecosystems within the Hudson Bay Lowland region, or the potential impacts of increased nutrients on biological communities that live and rely on these aquatic habitats.

ASSESSING THE IMPACTS OF NUTRIENT ENRICHMENT TO FRESHWATER ECOSYSTEMS

OBJECTIVES:

- Determine how increased nutrients (nitrogen, N and phosphorus, P) will influence phytoplankton abundance in lakes and ponds in Wapusk National Park.
- Assess the ability of herbivores to regulate phytoplankton abundance through grazing.
- Assess evolutionary changes in Daphnia populations associated with increased nutrient loading and environmental change in ponds frequented by lesser snow geese.
- Monitor water chemistry and zooplankton community structure each year in 30 lakes/ponds in Wapusk National Park.

METHODS:

- We used seven-day nutrient enrichment bioassays to assess nutrient limitation (to N and P) in phytoplankton communities in 21 lakes/ponds.
- We measured zooplankton grazing rates on phytoplankton using short-term, small-scale experiments in 19 lakes/ponds.
- We retrieved sediment cores from ponds in regions damaged by lesser snow geese. Daphnia resting eggs that were deposited in different decades have been removed from sediments and are being hatched for future experiments to assess changes in environmental tolerances through time.
- Water samples for chemical analyses and zooplankton samples have been collected in 30 lakes each year

YEARS OF DATA COLLECTION:

Year 3 of a 5-year project

PARTNERS:

- Wapusk National Park, Parks Canada
- Queen's University, Summer Work Experience Program
- Polar Continental Shelf Project
- Northern Scientific Training Program, Indian and Northern Affairs Canada
- Natural Sciences and Engineering Research Council of Canada

RESULTS:

- There were a variety of responses to nutrient enrichment: phytoplankton in five (24%) ponds were phosphorus-limited, three (14%) were nitrogen-limited, five (24%) were limited by both phosphorus and nitrogen, and eight (38%) were not limited by either nutrient.
- Zooplankton grazing rates are currently being analyzed.
- Daphnia eggs from sediment cores are being hatched for future experiments.
- We detected high inter-annual variation in water chemistry in lakes/ponds;
  - > Total phosphorus concentration changed an average of 23% (range 7 to 50%), while total nitrogen concentration changed an average of 24% (range 3 to 48%) between years.
  - > Dissolved organic carbon (DOC) concentration changed an average of 21% (range 4 to 55%) between years.
  - > Conductivity changed an average of 25% (range 12 to 43%).

Caribou stream along a beach ridge near Nester 1 research camp, study lake in background and small dried lake in foreground.

Nutrient limitation experiment set up in Nester 1 research camp
Credit: Jon Sweetman, Parks Canada

Zooplankton sample collected from a pond in the park
Credit: Celia Symons, Queen's University

Collecting water samples. Credit: Celia Symons, Queen's University

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RATIONALE:

Major plant communities have been mapped at a landscape level from satellite imagery but detailed information on the structure and composition of these communities is needed to support the development of interpretive material, underpin management decisions regarding human activities within the park and provide a baseline for monitoring the effects of climate change.

BOTANICAL INVENTORY OF WAPUSK NATIONAL PARK

OBJECTIVES:

- Document the flora of the principal plant communities in Wapusk National Park.
- Provide information to support park management decisions.

METHODS:

- Representative plant communities in all sectors of the park are selected from topographic maps and air photos.
- These communities are visited, described, photographed and their species listed.
- Voucher specimens of flowering plants, mosses and lichens are collected and preserved for reference purposes in the Herbarium (WIN) at the University of Manitoba.
- Geographic coordinates of the communities and any rare or endangered species are established using GPS technology.

YEARS OF DATA COLLECTION:

- Year 8 of a 10-year project

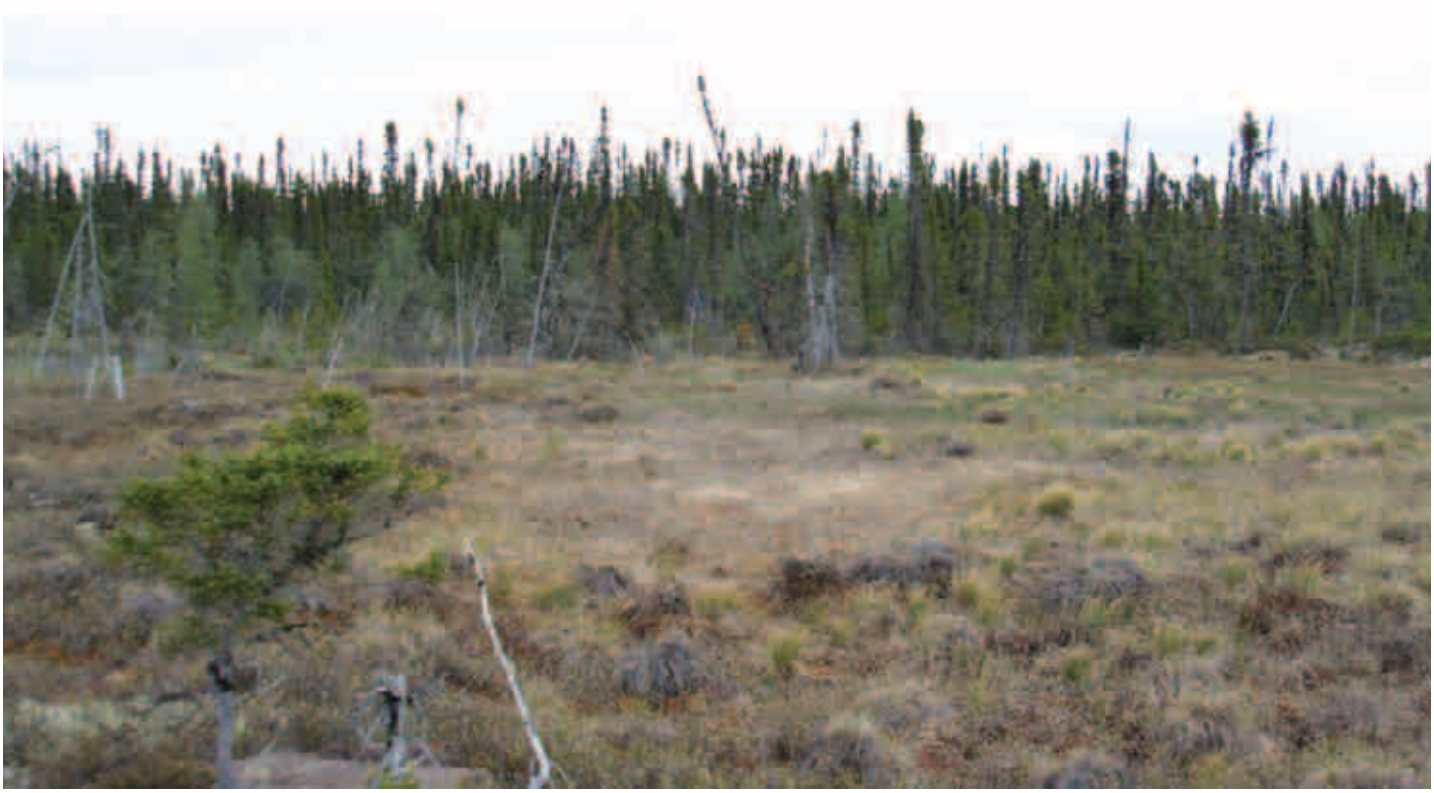
PARTNERS

- Parks Canada
- University of Manitoba

RESULTS:

- Sites were visited in the southwestern portion of the park from Hoot Creek to the southern boundary of the park and west to Roberge Lake.
- Plant communities were described, photographed, and voucher specimens – 300 vascular plants and 523 lichens and bryophytes were collected for deposit at the Herbarium, University of Manitoba (WIN).

A cobble floodplain of the Owl River with a burned treed peat plateau in the background on July 8. Credit: Michele Piercey-Normore.



Fen and forest in the southwestern corner of the park west of Benzino Creek that was visited on July 6. Credit: Michele Piercey-Normore.

Lakeshore of Roberge Lake near the permafrost drilling site on July 11. Credit: Michele Piercey-Normore.

Sandy esker south-southwest of Lee Lake and north of the Owl River showing burned forest and gray soot remaining on the sand on July 7. Credit: Michele Piercey-Normore.

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RATIONALE:

Over the past several decades, there has been documented reductions in sea-ice cover in parts of the Arctic, thinning of multiyear ice in the Polar basin and seasonal ice in Hudson Bay, and changes in dates of sea-ice breakup and freeze-up as a consequence of climate warming. If the Arctic continues to warm as projected, then diminished ice cover and extended ice-free seasons will have profound negative impacts on Polar bears. As a keystone species, Polar bears provide insight into overall health of biodiversity within the Arctic marine ecosystem.

Environment Canada initiated a long-term study of Polar bears in western Hudson Bay in 1980 that has resulted in an ongoing, consistent record from which to examine past, present, and future trends and impacts. The research increases scientific knowledge of population dynamics, furthers understanding of barriers to potential recovery, and aids development and implementation of effective conservation actions.

POPULATION ECOLOGY OF POLAR BEARS IN RELATION TO ENVIRONMENTAL CHANGE

OBJECTIVES:

- Continue ongoing, long-term research on the Western Hudson Bay sub-population to monitor key reproductive parameters and the condition of Polar bears in order to assess impacts of climatic change.
- Obtain information on the distribution, home range, and habitat use of Polar bears out on the sea-ice during the winter and spring through the application of telemetry.

METHODS:

- Polar bears (125 individuals in autumn and 20 family groups in spring) are located and captured from a helicopter using standard immobilization techniques.
- Polar bears are caught and handled in locations that are safe for their overall well-being. During handling procedures, vital signs and responses are monitored.
- Standard measurements are taken from each animal; those captured for the first time are permanently identified by unique numbers applied as both tattoos and ear-tags.
- Blood, hair, fat, and skin samples are collected.
- Radio collars are fitted to a sample of adult females.
- A small mark is placed on the back with a removable paint that wears off over time to ensure that it is not handled more than once in the season.

YEARS OF DATA COLLECTION:

Ongoing project since 1981

PARTNERS:

- Care for the Wild International
- Churchill Northern Studies Centre
- Environment Canada
- Isdell Family Foundation
- Manitoba Conservation
- Parks Canada Agency
- Quark Expeditions
- University of Alberta
- Wildlife Media
- World Wildlife Fund Canada

RESULTS:

- Breakup of sea-ice occurring three weeks earlier in the mid-2000s than in the early 1970s.
- Earlier breakup has resulted in Polar bears having less time to hunt during critical spring hunting period when seals most abundant.
- There is a significant correlation between date of sea-ice breakup and overall condition of Polar bears when they come ashore; earlier breakup results in Polar bears coming ashore with less fat resources.
- Earlier breakup and decline in condition have had negative impacts on litter size, cub mass, age of cubs at weaning, and reduced survival of dependent young, independent juveniles, and older adults.
- The Western Hudson Bay sub-population of Polar bears has declined from 1,200 animals in 1987 to 935 in 2004; climate change likely initiated and contributes to decline.

Young Polar bear on coastal flats, Wapusk National Park, October 2006. Credit: Nick Lunn.

Maternity denning habitat, Wapusk National Park, March 2005. Credit: Greg Thiemann.

Pit dug by Polar bear, coastal beach ridge, Owl River, Wapusk National Park, September 2004. Credit: Nick Lunn.

Abandoned maternity den, Roberge Lake, Wapusk National Park, September 2005. Credit: Nick Lunn.

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RATIONALE:

Wapusk National Park (WNP) is located on the southwestern shores of Hudson Bay, and represents a mixture of two of Canada's most extensive biomes, tundra and boreal forest. It is also the major denning site for the Western Hudson Bay population of Polar bears, and one of Canada's most recently created national parks. In August 2006 and July 2009, trapping and collection of insects was carried out at several sites within the park. The purpose of this sampling was exploratory in nature, with the intent of paving the way for a more intensive faunistic survey of insect biodiversity in the park, together with fundamental ecological research using park sites. A major strategic network of NSERC, the Canadian Pollination Initiative (CANPOLIN) also intends to use WNP, and the Churchill region in general, as a representative subarctic site in its nationwide sampling efforts.

ARTHROPOD FAUNISTICS AND ECOLOGY IN WAPUSK NATIONAL PARK

OBJECTIVES:

- Conduct baseline survey of insect biodiversity within the park.
- Investigate potential ecological research projects (i.e. pollination ecology, biogeography of relict beach ridges) on park lands.

METHODS:

- In 2006, sampling was carried out at Broad River using Malaise trapping, pitfall trapping, and active collecting (netting).
- In 2009, sampling on the west side of the park was carried out at Hoot Creek using Malaise trapping, pitfall trapping, coloured pan traps, and active collecting.
- In 2009, active collecting was carried out at Botany 4 (relict beach ridge).
- In 2009, sampling was carried out in the vicinity of Lee Lake Camp (just outside the park western boundary) using Malaise trapping, pitfall trapping, coloured pan traps, and active collecting.
- Self-contained sampling kits were delivered to Parks Canada staff for use in other locations.

YEARS OF DATA COLLECTION:

- Sampling in 2006 and 2009

PARTNERS:

- Canadian Pollination Initiative Strategic Network (NSERC-CANPOLIN)
- International Polar Year
- Parks Canada

RESULTS:

- In 2006 sampling recovered approximately 120 morpho-species of insects in 51 families from the Broad River sites.
- Sorting of 2009 samples is ongoing. A considerable number of additional species were collected from Hoot Creek and Botany 4.
- Two species of tiger beetles (Cicindelidae) were collected from Botany 4. Tiger beetles were not previously recorded from the Churchill Region, and a manuscript describing this range extension has been submitted. (Woodcock, T.S., P.G. Kevan & R.E. Roughley. Subarctic records and range extensions of two species of tiger beetles (Coleoptera: Cicindelidae) in Churchill and Wapusk National Park, Manitoba, Canada.

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View along the relict beach ridge at Botany 4, located near the southwestern boundary of the Park. Credit: T. Woodcock

Malaise trap near the edge of the riparian forest at Hoot Creek. Credit: T. Woodcock

View from the top of the relict beach ridge at Botany 4. Credit: T. Woodcock

Dr. Peter Kevan sets up a Malaise trap on the tundra near Hoot Creek. Credit: T. Woodcock

RATIONALE:

While classroom learning provides an important basis for understanding ecological processes and the role of humans in the environment, practical hands-on fieldwork is also a critical component of training the next generation of researchers and park managers. The Wildlife and Ethnoecology program provides the opportunity for students to immerse themselves in the Hudson Bay Lowlands Ecosystem and learn from local people. Participants in the program work together as an interdisciplinary team of researchers to produce outcomes that are of real value to natural resource managers and the local community.

UNIVERSITY OF MANITOBA WILDLIFE AND ETHNOECOLOGY FIELD COURSE IN WAPUSK NATIONAL PARK

OBJECTIVES:

- Expose students to the unique ecology, wildlife, human impacts, and challenges of working in Wapusk National Park.
- Develop critical thinking, communication, and practical field research skills.
- Consider the role of protected areas in tourism and conservation and identify ways to use science as a tool to support management.
- Present the results of our research to Parks Canada, Manitoba Conservation, and the broader scientific community through presentations and written reports.

METHODS:

- Students spend one week at Nester 1 camp in Wapusk National Park and one week at the Churchill Northern Studies Centre learning and conducting research.
- Measure permafrost active layer thickness at three fen sites annually and describe associated vegetation cover.
- Sites are sampled and re-sampled to determine species and life form cover to support vegetation mapping and change detection.
- Map the locations of arctic and red fox dens, annually and determine if they are active each year, what species are present in each, and monitor number of entrances, entrance size, and vegetation cover.
- Assess tourism options for Wapusk National Park.
- Students choose individual or group research projects to be conducted on an area of interest.

YEARS OF DATA COLLECTION:

- Year 5 of an ongoing project
- Ongoing Project since 2005

PARTNERS:

- Wapusk National Park
- Manitoba Conservation
- Canadian Wildlife Service
- Canada Centre for Remote Sensing

RESULTS:

- From 2005 to 2009, 76 undergraduate and graduate students have visited Wapusk National Park as part of the course and have contributed individual projects and collecting field data for the permafrost active layer and vegetation data sets.
- Sampled >1,400 measures of active layer thickness and documented associated vegetation cover. This year we will be relating these measures to ALOS satellite predictions of active layer thickness.
- Developed a database of vegetation communities and permafrost active layer thickness for a total of >1,300 sites within the Greater Wapusk Ecosystem.

Polar bear monitors are an essential part of the course. Here Nancy Spence keeps a careful eye out for bears. Credit: Ryan Brook.

Students learn about the pre-history of Wapusk at an ancient caribou hunting blind with park interpreter Ian Martens. Credit: Mike Maksymchuk.

Captured frog about to be weighed and measured near Nester 1 camp.
Credit: Sophia Lavergne.

Students sampling permafrost and vegetation cover in a wet poor fen community. Credit: Ryan Brook.

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RATIONALE:

There is a lack of information on the past and present climate in Wapusk National Park. Prior to the start of this project, there were no permanent weather stations within the park. Mid-winter snowpack conditions significantly impact ecological and permafrost characteristics.

PAST/PRESENT CLIMATE – PERMAFROST STATUS: ASSESSED BY GROWTH RINGS, MICROCLIMATE AND SNOWPACK

OBJECTIVES:

- Establish and maintain microclimate monitoring stations.
- Establish snowpack monitoring sites.
- Develop a proxy climate record using annual growth rings of trees and shrubs.

METHODS:

- Install and maintain microclimate recording stations that operate year-round. Sensors measure snow depth, rain, wind speed, wind direction, air temperature, air relative humidity, near surface soil and permafrost temperature.
- Using Adirondack snow core and RAM penetrometer equipment, measure snowpack depth, density, snow water equivalent and hardness.
- Annual growth rings in shrubs and trees can be used to reconstruct past climate and permafrost thaw.

Snow sampling pit, forest-tundra monitoring site, Broad River. Snow depth was >six times that of the nearby beach ridge site.

YEARS OF DATA COLLECTION:

- Year 6 of a multi-year project.

PARTNERS:

- International Polar Year – PPS Arctic Canada, Government of Canada
- University of Alberta
- Churchill Northern Studies Centre
- Earthwatch International
- Parks Canada

RESULTS:

- Two microclimate stations have been established within Wapusk National Park – Mary Lake and Roberge Lake.
- Permanent snowpack monitoring sites have been established in association with the microclimate stations.
- A preliminary dendroclimatology interpretation has been completed based on 220 trees sampled along a transect running through the center of the park in addition to a number of treeline sample sites.

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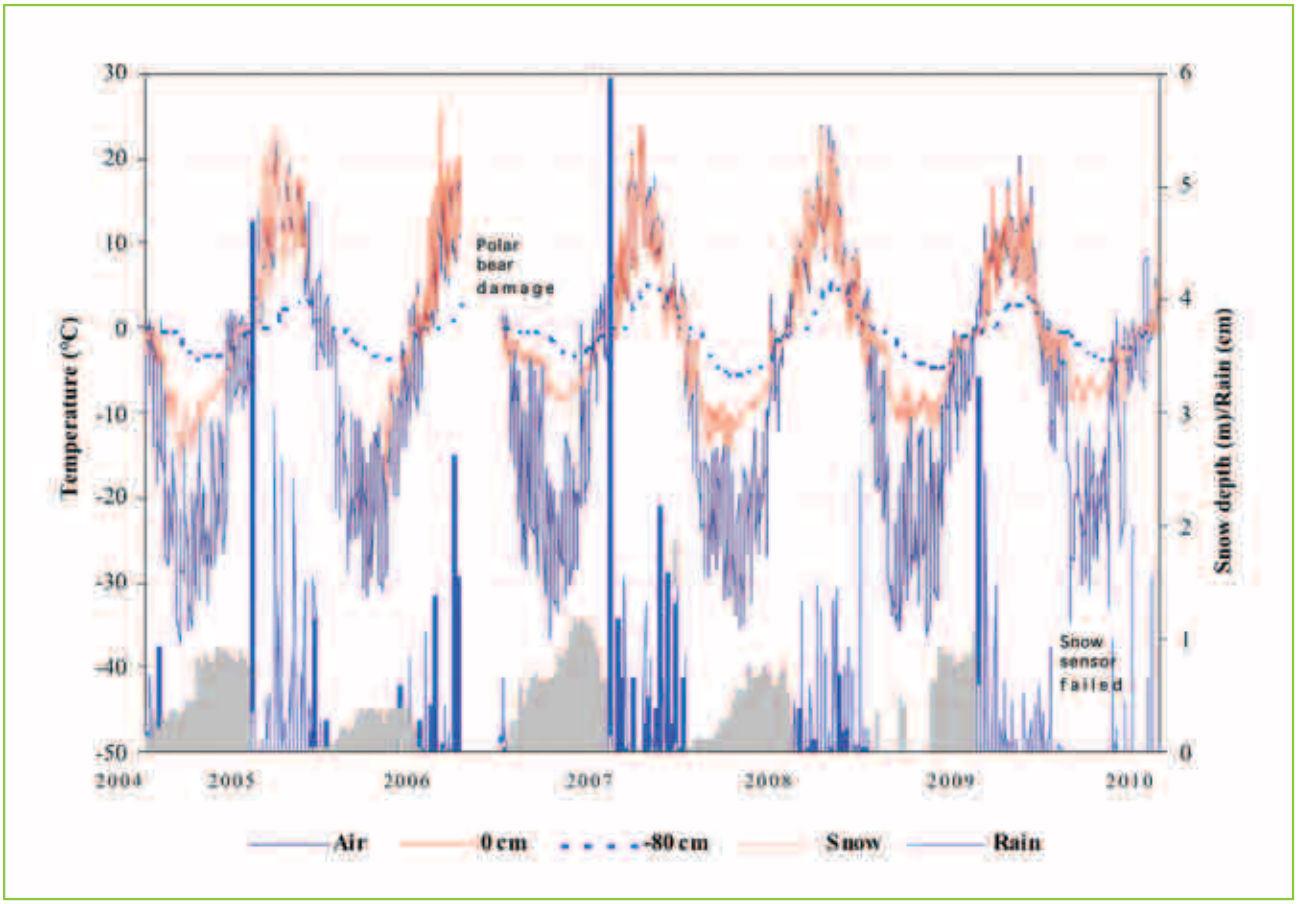
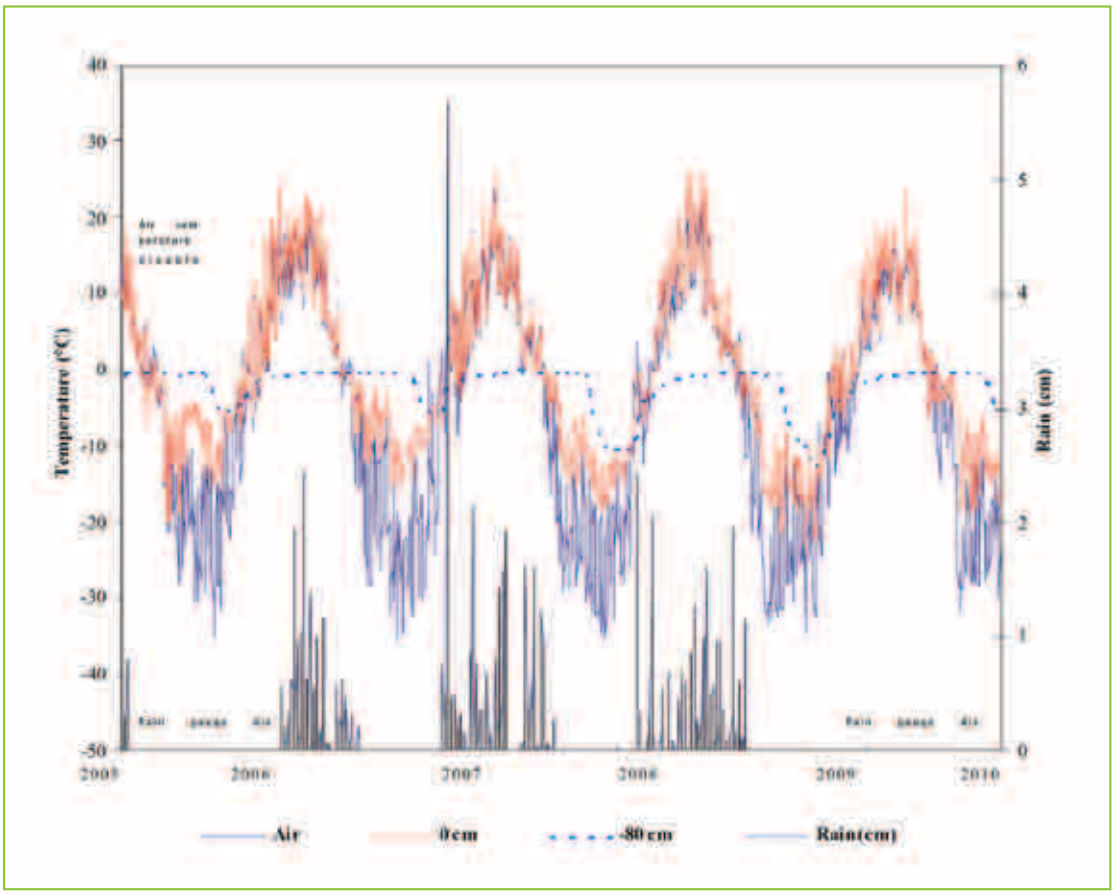


Microclimate record for Mary Lake. Data gaps result from damage inflicted by Polar bear and over the last winter the snow depth sensor failed.



Microclimate of Roberge Lake showing permafrost (<0°C) at 80 cm depth. Rain gauge cable severing continues to be a problem.

RATIONALE:

Traditional knowledge indicates Lesser Snow geese have nested at La Pérouse Bay since at least 1933. We began studying the colony of 2,500 pairs in 1969 and have seen it increase numerically to >50,000 pairs and geographically from 4 km^2 to more than 300 km^2, extending now to at least the Broad River. The goals of this long-term study are to examine the interplay of this keystone herbivore and its habitat, especially in response to increases in goose numbers and climate change.

ECOLOGY AND IMPACT OF LESSER SNOW GEESE

OBJECTIVES:

- Monitor the size and nesting density of snow geese.
- Determine the impact of snow geese on vegetation and other animal species.
- Ascertain the recovery potential of degraded salt and fresh water habitat.
- Examine whether reproductive success changes over time and space and relate this to habitat quality.
- Estimate survival of adult snow geese and determine its dependency on habitat quality.

METHODS:

- Aerial surveys of nesting colony boundaries.
- Monitor permanent nesting plots.
- Score 21 recovery exclosures and associated control plots.
- Perform aerial survey for arctic foxes.
- Aerial photography of brood flocks.
- Standard banding and recapture operation.
- Deploy snow fencing system to monitor habitat protection.

YEARS OF DATA COLLECTION:

- Ongoing Project since 1969

PARTNERS:

- American Museum of Natural History
- Arctic Goose Joint Venture
- Central and Mississippi Flyway Councils
- Canadian Wildlife Service
- Great White Bear Tours
- US Fish and Wildlife Service
- Wapusk National Park

RESULTS:

- 2009 is the latest year on record and a year of complete reproductive failure.
- The nesting density was only 30% of the stabilized at 4 to 8 nests/hectare.
- The colony boundaries have not expanded further in the Thompson Point region.
- A new colony has not yet started at Rupert Creek.
- After four years, there is substantial recovery in exclosed, degraded freshwater habitat and there is some recovery in exclosed, degraded supratidal marsh.
- During our annual aerial brood survey and banding operations we found no more than 500 adult snow geese. Colour ratio indicates these are likely moult migrants from further south.
- Only 17% of the arctic fox dens on our standard transect were active on 11 August 2009.

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Nesting snow geese suffered 100% depredation in 2009. Credit: RF Rockwell.

Dave Koons and Marine Cusa finish a nest density plot in the blue poles region. Credit: RF Rockwell.

Kit Schnaars and Dave Iles share tea after being stranded by fog on 8 June 2009. Credit: RF Rockwell.

RATIONALE:

As the numbers of Lesser Snow geese in Wapusk National Park have increased, their destructive foraging has degraded local habitat. Since their continued success depends on the quality of the habitat, one might expect their survival and reproductive success to decline. This should limit the population's growth and control the population's size through density-dependent regulation. For that to happen, however, the geese must remain in the degraded areas. Our long-term research at La Pérouse Bay indicates this is not likely.

EXPANSION OF LESSER SNOW GOOSE NESTING IN WAPUSK NATIONAL PARK

OBJECTIVES:

- Establish a route and annually monitor the entire coast of Wapusk National Park and the inland interface of the tundra and boreal forest for nesting Lesser Snow geese.
- Perform a preliminary ground inventory of any location that has more than one nest per hectare.

METHODS:

- Surveys are flown in a Bell 206B Jet Ranger at 30 to 50 m and 100km/hr.
- GPS locations of any nesting Lesser Snow geese are recorded.
- Any area with an apparent density of >1 nest/hectare is circled and may be examined from the ground.
- Areas recorded as having been used are specifically checked.

YEARS OF DATA COLLECTION:

- Ongoing Project since 2005

PARTNERS:

- American Museum of Natural History
- Arctic Goose Joint Venture
- Central and Mississippi Flyway Councils
- Canadian Wildlife Service
- Great White Bear Tours
- US Fish and Wildlife Service
- Wapusk National Park

RESULTS:

- The Thompson Point Lesser Snow goose colony now extends from just south of the White Whale River to just north of the Broad River.
- The highest nesting density occurs at two points – one north and one south of Thompson Point.
- No evidence of nesting was found in the Rupert Creek region but it will be searched again in 2010.
- 5-10 million geese staged south of the Owl River in 2009 owing to weather conditions.
- Serious habitat loss occurred between the Owl River and Goose Creek. Areas in river and creek deltas south of Goose Creek appear to have been spared severe damage but the fate of habitat between them is unknown.

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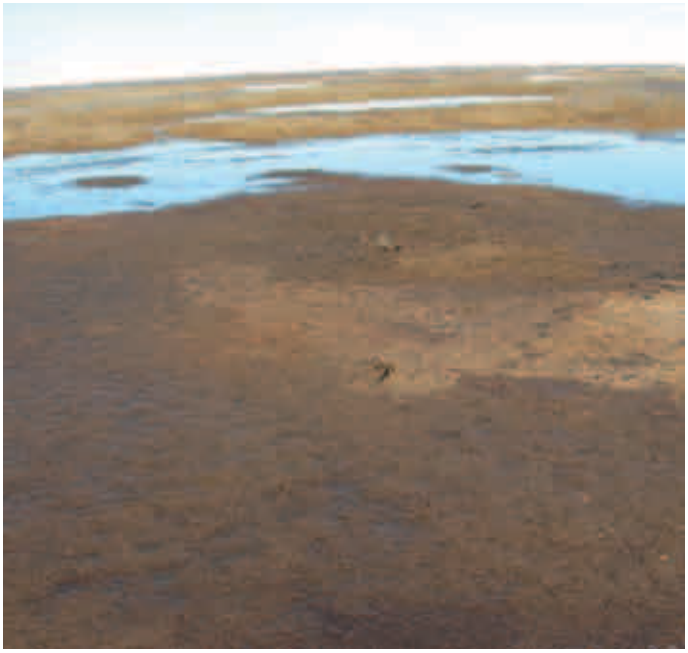
5-10 million geese staged south of the Owl River. Credit: RF Rockwell.



There are areas on the north side of Rupert Creek that have suffered extreme degradation in the recent past. Credit: RF Rockwell.

Expanses of freshwater marsh on the north side of Rupert Creek were spared from destructive foraging by snow and ice and then deep flood waters. Credit: RF Rockwell.

RATIONALE:

Millions of Lesser Snow geese use the east coast of Wapusk National Park for spring staging. In 2001, a large number stayed and nested near Thompson Point. Their offspring consider this "home" and they began a new nesting colony. The destructive foraging of both spring migrants and residents has led to rapid degradation of both coastal and inland, freshwater habitat in the area. We have established a monitoring system for the area and are investigating processes underlying degradation in the freshwater habitat.

HABITAT ASSESSMENT IN THE THOMPSON POINT REGION

OBJECTIVES:

- Establish a habitat classification system integrating effects of foraging.
- Establish and monitor vegetation transects using that system.
- Establish and monitor nesting density of snow geese.
- Determine recovery potential.

METHODS:

- Score the habitat along 5km transects perpendicular to the coast.
- Score nesting density at two sets of transect plots.
- Erect recovery exclosures and mark adjacent control plots.

YEARS OF DATA COLLECTION:

- Year 4 of an ongoing project

PARTNERS:

- American Museum of Natural History
- Arctic Goose Joint Venture
- Central and Mississippi Flyway Councils
- Canadian Wildlife Service
- Great White Bear Tours
- US Fish and Wildlife Service
- Wapusk National Park

RESULTS:

- Less than 30% of the vegetation in the region is intact.
- Nesting colony has expanded both north and south.
- Nesting density remains stable at eight nests/hectare.
- Recovery has begun in two-year-old exclosures but only if they incorporated dead willows.
- New exclosures were erected in an area converted from graminoid cover to a peat barren.
- Snow fencing reduced the shoot pulling by resident snow geese.
- Above ground biomass in the coastal salt marsh is below that necessary to support the growth of snow geese.

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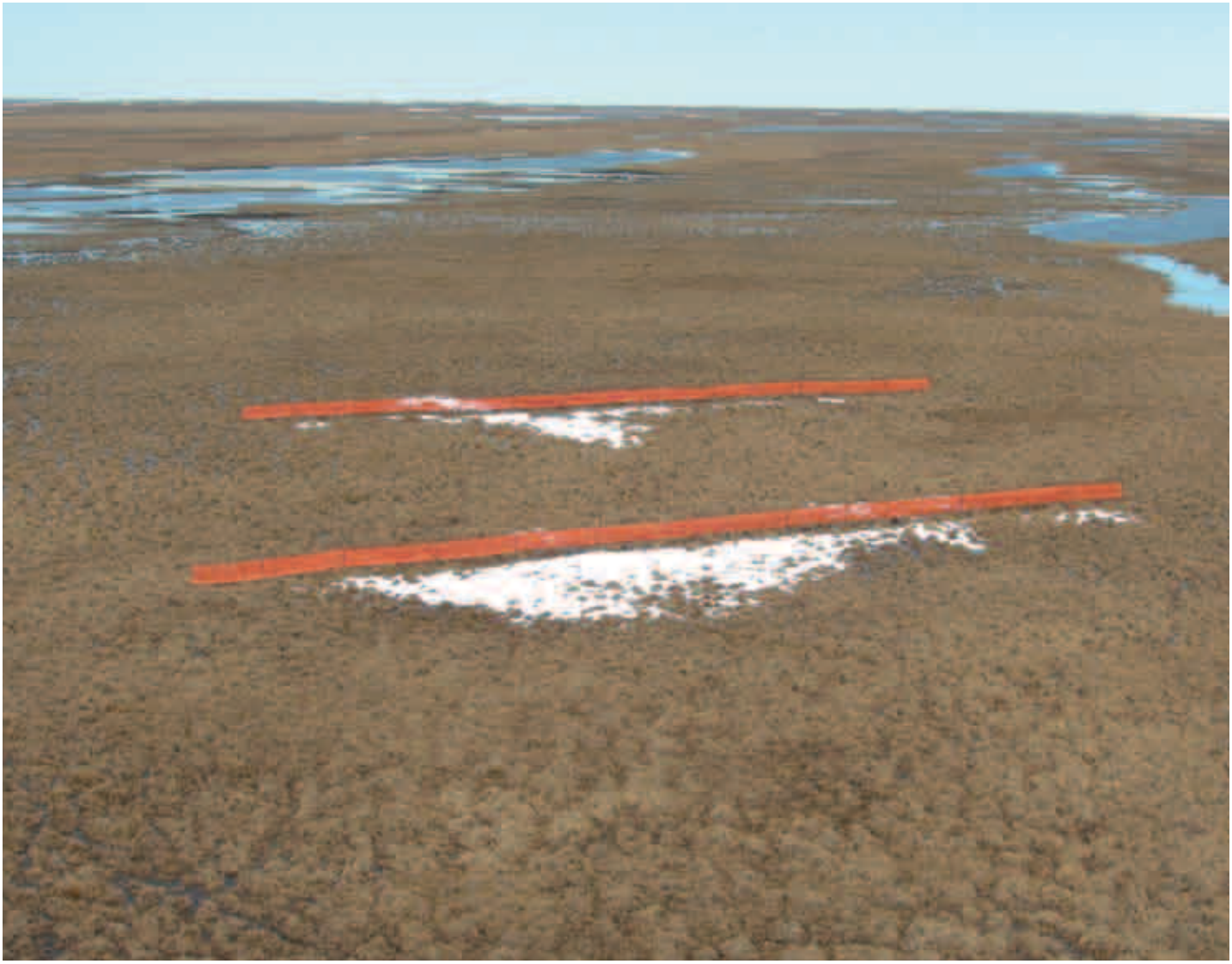


The fence has sustained snow and ice after the rest of the area has melted. Credit: RF Rockwell.

Puccinellia phryganodes has begun recovering near dead willows in this three-year-old exclosure. Credit: RF Rockwell.

No recovery is apparent yet in three-year-old exclosures without dead willows. Credit: RF Rockwell.

RATIONALE:

Polar bears in Western Hudson Bay are already being affected by changing ice and climate conditions and need to be monitored to track population changes over time. During summer when the ice melts, Polar bears are forced ashore in large numbers, where they leave scat (feces) and hair (in beds) as they move across the tundra. Using molecular analyses of scat (collected using a trained dog) and hair we employed an innovative way to estimate abundance, survival, and other population parameters of Polar bears so that no animals needed to be handled or marked. Data are then analyzed using the same mathematics as traditional capture-mark-recapture approaches allowing for direct comparison of results.

With longer ice-free seasons, Polar bears will likely seek alternative foods while on land. By documenting items in scat piles, we can identify past and future shifts in diet, especially in response to changing food supplies.

NON-INVASIVE POLAR BEAR MONITORING IN WESTERN HUDSON BAY

OBJECTIVES:

- Monitor local population size of Polar bears within the sampling area.
- Determine individual and sex-specific movement patterns of Polar bears along the coast of Western Hudson Bay.
- Examine relatedness of Polar bears that gather in large groups along the coast or that den in clusters.
- Establish baseline data on Polar bear diet during the ice-free season to document past and future shifts in response to climate change.

METHODS:

- Perform molecular analyses of hair (from beds and dens) and scat (collected using a trained dog) to generate DNA fingerprints for individual Polar bears.
- Use traditional mark-recapture and rarefaction analytic approaches to estimate abundance and survival of Polar bears using DNA fingerprints from samples.
- Use spatial coordinates, DNA fingerprints and sex-specific markers to track movement patterns of bears while on land.
- Use both nuclear and mitochondrial DNA to examine relatedness of bears from hair collected from clusters of beds or dens to infer genetic structuring across the landscape.
- Identify and quantify both vegetation and animal items in Polar bear scat piles; compare data with previous studies to document foraging shifts that may have occurred in the last 40 years, perhaps due to climate change.

YEARS OF DATA COLLECTION:

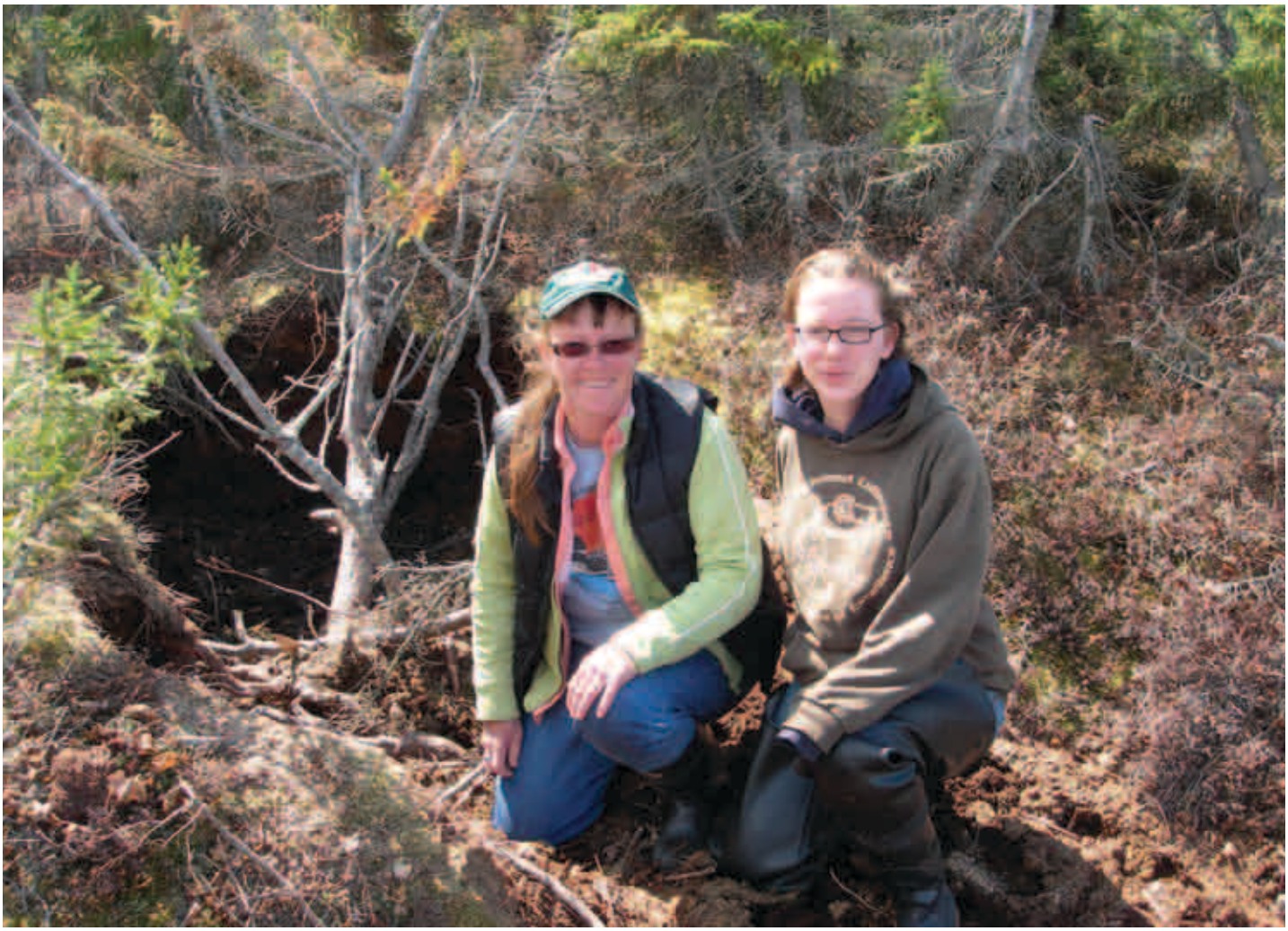
- Year 3 of an ongoing project.

PARTNERS:

- American Museum of Natural History (AMNH)
- Arctic Institute of North America
- Churchill Northern Studies Centre
- City University of New York
- Great White Bear Tours
- Manitoba Conservation – Sustainable Development Innovations Fund

RESULTS:

- We collected hair from 23 dens.
- We collected a total of 356 hair samples from coastal day beds between the Ontario Manitoba border and Churchill.
- Polar bear DNA has been successfully amplified from both spring and summer scat samples; further genetic analyses are currently ongoing.
- >642 scat piles were analyzed for diet. Results will be presented at the September Wildlife Society meeting and the paper submitted shortly thereafter.
- The first paper from this project completed: Rockwell, RF and LJ Gormezano 2009. The early bear gets the goose: climate change, Polar bears and Lesser Snow geese in western Hudson Bay. Polar Biology 32:539-547. It has resulted in numerous media interviews and commentaries.
- We participated in the annual Manitoba aerial Polar bear count in August with Daryll Hedman.



Kit Schaars and Shannon Refvik helped pick hairs from Polar bear dens at Hannah lake. Credit: RF Rockwell.

Daryll Hedman, Jon Talon and Linda Gormezano collect hair in a coastal day bed. Credit: RF Rockwell.

Polar bears this year were in good shape. Credit: RF Rockwell.

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RATIONALE:

Common eiders at La Pérouse Bay have been monitored for nearly 40 years. Typical of the species, they display a boom or bust pattern of reproductive success with years of high success punctuated by years of complete failure. Among the predators responsible are Polar bears with flooding being the primary non-biological cause of failure. Both Polar bear arrival (and depredation) and spring flooding will be increasingly affected by global climate change. Part of this project aims to monitor success of the colony closely.

The second part of this project is to develop projection models that examine the effects of such boom and bust reproductive success on the population's dynamics. One specific question to be addressed is what frequency and pattern of catastrophic failures can the population sustain without declining or being extirpated.

THE ECOLOGY AND POPULATION DYNAMICS OF COMMON EIDERS AT LA PÉROUSE BAY

OBJECTIVES:

- Monitor local population size of common eiders for nesting density, reproductive success and both juvenile and adult survival.
- Determine the pattern and frequency of depredation events by predator.
- Develop a population model incorporating catastrophic events.

METHODS:

- Visit and map nests in the Mast River and Wawao Creek systems near the La Pérouse Bay Research Station (Nestor 2).
- Use egg candling to determine the nesting phenology.
- Monitor the nests regularly and estimate daily failure rates.
- Capture females on their nests and band them or record band numbers of those previously marked.
- Generate population projection models using MATLAB.

YEARS OF DATA COLLECTION:

- Year 1 of an ongoing project.

PARTNERS:

- American Museum of Natural History (AMNH)
- Utah State University
- Great White Bear Tours

RESULTS:

- We found and mapped a total of 65 nests in the latest year on record.
- Extreme depredation primarily by wolves and eagles destroyed all but three nests by late July.
- Three females were successfully trapped, banded and released.

Common eider pairs are strikingly beautiful. Credit: RF Rockwell.

Dave Koons and Dave Iles prepare to trap and band a female eider at her nest. Credit: Stephen Peterson.

A hatchling and a star-pipped egg in an eider nest. Credit: Stephen Peterson.

Dave Koons searches an island in the Mast River for eider nests. Credit: Stephen Peterson.

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RATIONALE:

The Hudson Bay Lowland borders Hudson Bay from Churchill, Manitoba to southern James Bay, Ontario and comprises the most extensive region of thick peatland soils in Canada. Permafrost occurs in the northern part of the Lowland including in Wapusk National Park and has a subtle but important influence on the wildlife and hydrology.

Permafrost containing ice maintains the elevation of peat plateaus which provide denning habitat for Polar bears and winter forage for caribou. The peat plateaus also slow the runoff of water in streams, thus helping to maintain water levels in the adjacent fen. Disappearance of permafrost would compromise these functions.

IMPACTS OF PERMAFROST THAW ON THE ECOLOGY OF WAPUSK NATIONAL PARK

OBJECTIVES:

- The primary objective is to determine how much permafrost will thaw if the climate becomes warmer.
- If permafrost does thaw, how will the landforms in Wapusk National Park be affected? Will peat plateaus subside because of melting ice and turn into fens?
- How quickly will all of these changes take place?

METHODS:

- To predict how permafrost will respond to a warming of the climate, it is necessary to know the relationship between the air and ground temperature.
- To do this, bore holes for measuring ground temperature to depths ≤10 m were located along two transects in the Park (Figure 1). Different land cover types (fen, peat plateau, shallow water, and snowdrift) were selected. Summer air temperatures have been shown to warm inland and so these transects will show the influence of this warming on permafrost.
- Change in ground temperature over the year is compared with weather station data. This relationship is then used to predict how the ground will respond to warmer air temperatures.
- These thermistor cable measurements will also be used to check the accuracy of a mathematical prediction model that will be used to predict ground temperatures throughout the park.

YEARS OF DATA COLLECTION:

- Year 3 of a 4-year project

PARTNERS:

- Canada Center for Remote Sensing
- Churchill Northern Studies Center
- Parks Canada

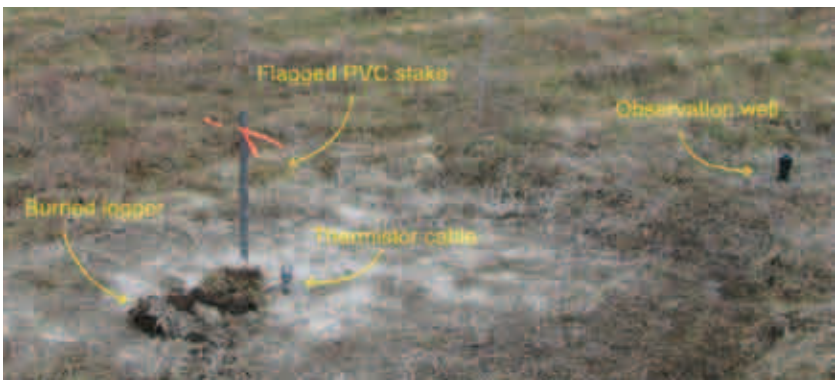
RESULTS:

- Up to two years of ground temperature measurements are available from the northern transect sites. The thermistor cable measurements suggest that only peat plateaus and fens near the coast have well-established permafrost. Permafrost is absent at peat plateau margins where snowdrifts approximately 1.5m thick accumulate to insulate the ground. Deep active layers (~3m) may occur in areas where there is shallow water (10-30cm) and an unvegetated, rocky ground surface or pond bottom.
- Peat plateau edges appear to have no permafrost and may be places where thawing is presently underway. If the climate becomes warmer, this is a location where thawing will start or accelerate if it is already happening. The temperature predictions indicate that the peat plateaus are very resistant to thaw but that thawing will take place at the plateau edges because of the insulating effect of snow in the winter.

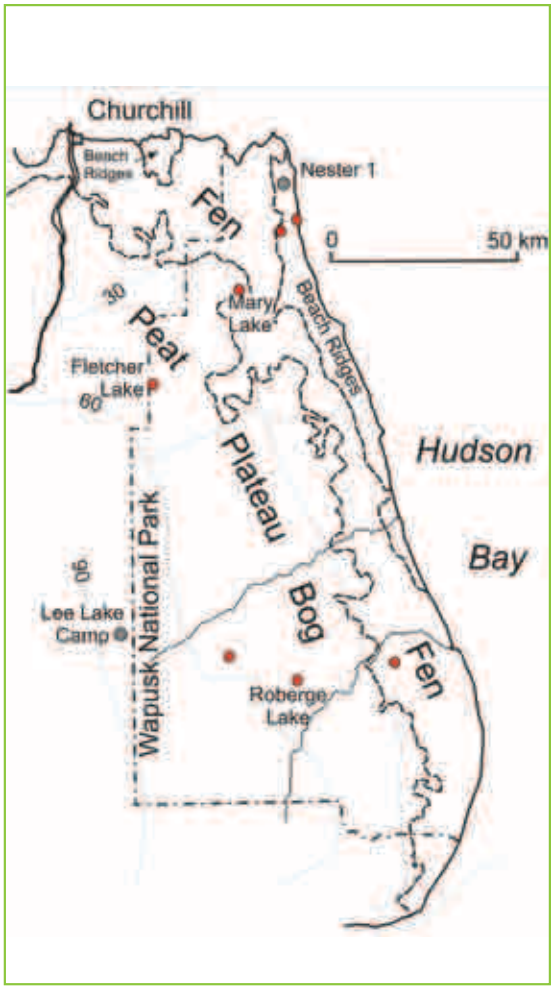
Thawed and collapsing peat bank by Fletcher Lake. Credit: Larry Dyke.

Lightweight diamond drill used for installing thermistor cables. Credit: Wendy Sladen.

Drill core showing ice lenses in mineral soil found below peat in a peat plateau. Scale in centimetres and inches. Credit: Wendy Sladen.



Typical installation set up. This particular site is a fen site. Credit: Wendy Sladen.



Location of thermistor cable sites, denoted by red circles. Note sites oriented as two inland transects, one in the north, the other in the south of the Park. Credit: Larry Dyke and Wendy Sladen.

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RATIONALE:

In the Arctic, plants are generally low-growing and sparse, yet they provide many important ecosystem services. For example, plants provide food to wildlife such as caribou and birds, and human use through berry picking. The presence of dense lichen mats and deep soil organic layers could effectively prevent the deepening of active layer under a warming climate. This ecotype is important to provide stable denning sites for Polar bears in Wapusk National Park. Monitoring plant productivity and phenology is thus of great importance, especially when the arctic ecosystems are increasingly under the stressors of climate change and development. This study was initiated to fulfill this monitoring need, as a part of the ParkSpace project.

MONITORING ARCTIC PLANT GROWTH AND SEASONALITY USING REMOTE SENSING

OBJECTIVES:

- To develop an operational protocol for monitoring changes in plant growth and phenology in northern national parks using satellite remote sensing.
- To demonstrate the application of the protocol by producing initial monitoring results for four selected northern national parks: Wapusk, Ivvavik, Torngat Mountains, and Sirmilik.
- To incorporate these monitoring results into the State of Park reports as appropriate.

METHODS:

- Measure foliage biomass values at a number of sites, with each site being larger than 90-m by 90-m and having a relatively homogeneous plant cover. At each site, plants in five or more 1-m by 1-m plots are harvested and analysed.
- Establish relationships between foliage biomass measurements and Landsat-derived vegetation indices, and ensure they are spatially accurate and from the same time period as the imagery.
- Up-scale the 30-m Landsat-based relationships to 1-km Advanced Very High Resolution Radiometer (AVHRR) scale, in order to quantify foliage productivity as well as to date the beginning and end of growing season.
- Apply the relationships to the AVHRR time series for estimating foliage productivity and phenology.
- Validate, estimate error propagation, and analyze trends.

YEARS OF DATA COLLECTION:

- Year 3 of a 4-year project

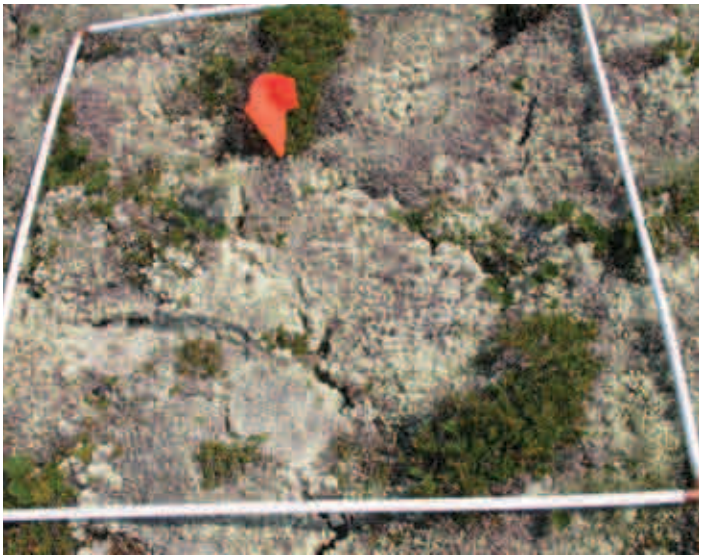
PARTNERS:

- Canada Centre for Remote Sensing, Natural Resources Canada
- Parks Canada Agency
- Canadian Space Agency

RESULTS:

- Field measurements of green leaf material collected in summer 2007, showed that lichen peat plateau bog and sphagnum moss bog had lowest vascular foliage biomass (< 30 g m-2), followed by beach ridge (< 30 g m-2), sedge fen (15~65 g m-2), and shrub fen (20~220 g m-2).
- Statistically significant relationships were found between foliage biomass and Landsat-based (or AVHRR-based) simple ratio.
- The linear trend of park-wide values of mean peak foliage biomass showed ~0.9 g m-2 year-1 increase during 1985–2006. At the decade level, value in 2000s was 31% and 6% higher than that in 1980s and 1990s, respectively.
- The linear analysis also showed ~0.9 day year-1 increase in the growing season length, from 121 to 139 days during 1985 and 2006. The length in 2000s was 13 and 2 days longer than that in 1980s and 1990s, respectively.
- Field observations show arctic plants leafing out 1–7 days after the snow melted. The snow free date observed at a climate station thus can be used to validate the remotely-sensed results. As shown in Figure 1, excellent agreement was found.

A biomass measurement site located within the Wapusk National Park. Credit: Junhua Li.



Above ground and root biomass are harvested from a 1-m by 1-m plot and late analyzed in a laboratory. Credit: Junhua Li.

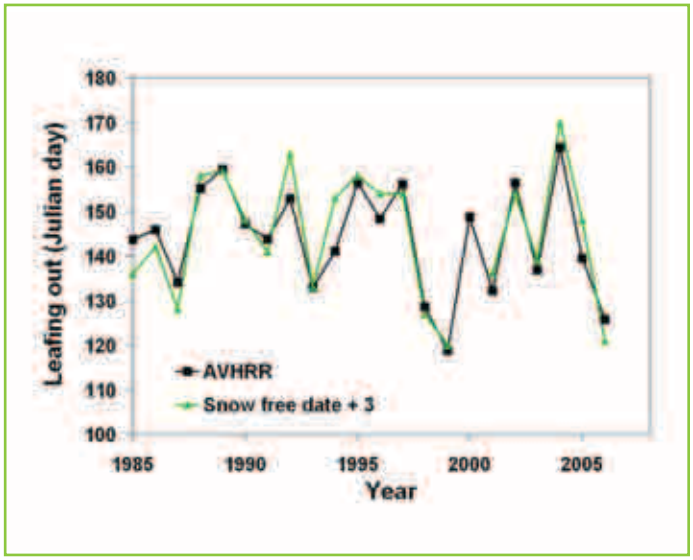


Figure 1 – Validation of the remote sensing detected starting date of growing season against the date of snow free + 3 days at the Churchill climate station.

Dr. Junhua Li sorted plants into species, separated leaves and stems, and then weighed and recorded their biomass values before taking samples for obtaining oven dry weights. Credit: Yu Zhang.

Wapusk National Park supports other wildlife such as caribou, which forage on plants. Credit: Junhua Li.

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RATIONALE:

Permafrost is an important factor shaping the landscape, hydrology, and ecosystems in Wapusk National Park. Climate warming induced permafrost thaw could have significant impacts. In this study, we modelled and mapped permafrost conditions in Wapusk National Park based on the input data developed from remote sensing information and ground observations. The goal of this study is to map the distribution of permafrost in the park at the landscape scale, and to develop an approach to monitor changes of permafrost conditions.

MODELLING AND MAPPING PERMAFROST IN WAPUSK NATIONAL PARK

OBJECTIVES:

- Testing the feasibility of mapping permafrost at landscape scale.
- Mapping permafrost distribution and its changes in Wapusk National Park.
- Developing an approach for monitoring and reporting changes in permafrost conditions in the park.

METHODS:

- Field data measuring active-layer thickness, land cover types and vegetation composition and cover have been collected in the park.
- Ground temperature has been observed at different sites in the park.
- A permafrost model has been improved and tested
- The input data for the model have been developed based on satellite images and ground observations.
- Permafrost distribution and its changes in Wapusk National Park are modelled and mapped.

YEARS OF DATA COLLECTION:

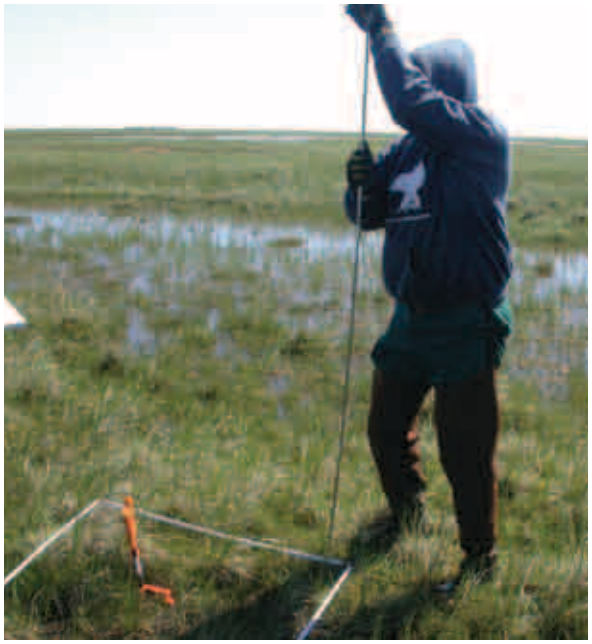
- Year 3 of a 4-year project

PARTNERS:

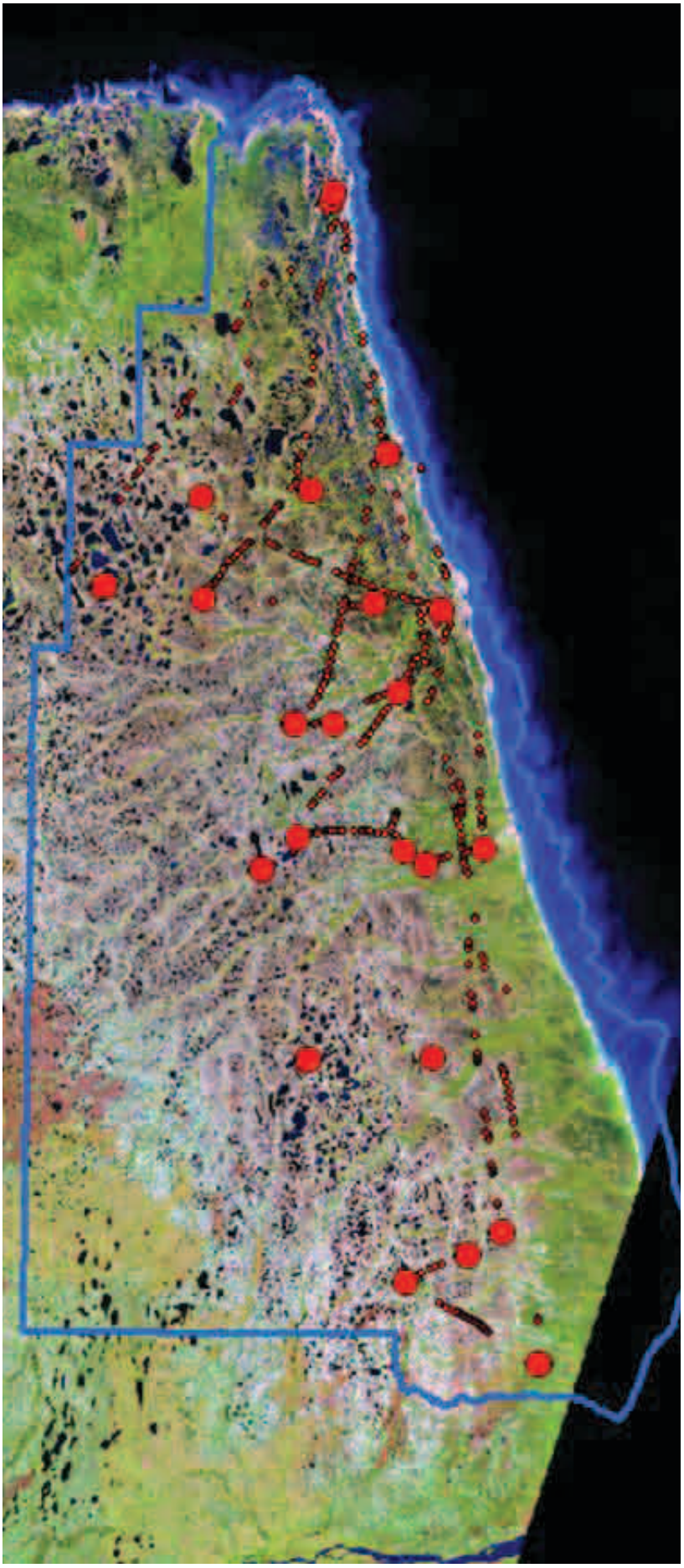
- Canada Centre for Remote Sensing
- Geological Survey of Canada
- Parks Canada Agency
- Canadian Space Agency
- University of Alberta
- University of Saskatchewan

RESULTS:

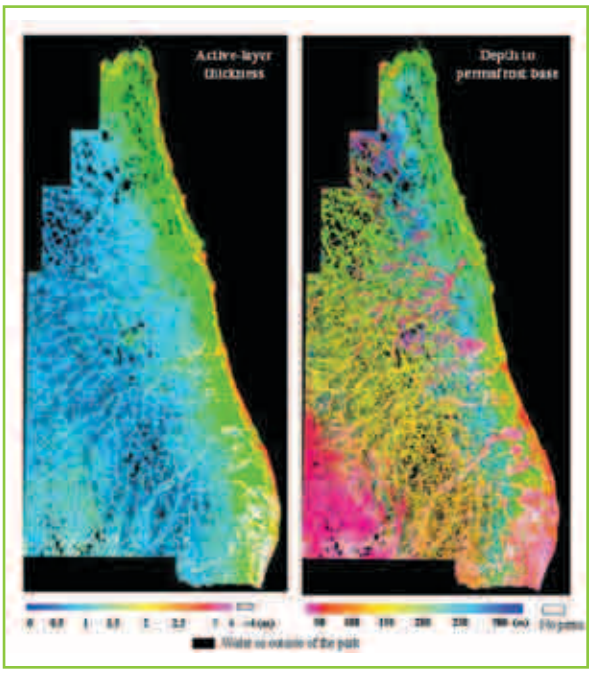
- Permafrost has been mapped at landscape scale for Wapusk National Park.
- Active-layer becomes shallower from coast to inland, mainly due to changes in peat thickness and land cover types.
- Permafrost becomes thinner from north to south due to the combined effects of climate gradient and vegetation difference, especially with the transition from tundra to boreal forest.
- Due to climate change in recent decades active-layer becomes deeper in most of the park and permafrost disappeared in some southern parts of the park.
- Some of the results will be presented to the 6th Canadian Permafrost Conference this year.



Probing active-layer thickness. Credit: Junhua Li.



Observation sites in 2007. Credit: Junhua Li.



Mapped active-layer thickness and depth to permafrost base in 2000. Credit: Yu Zhang.

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RATIONALE:

The annual "ice-out" survey is completed by Manitoba Conservation each year along the Hudson Bay coast to establish baseline data of Polar bears while they are coming off the ice onto land during ice free periods. The time that Polar bears come off the ice and the length of time while on land is critical to the physical condition of the bear prior to returning to the ice in late fall.

COASTAL "ICE-OUT" SURVEY FOR POLAR BEAR MANAGEMENT BY MANITOBA CONSERVATION

OBJECTIVES:

- To determine the date that Polar bears come off the ice and on to land.
- To determine the number and distribution of Polar bears along the Hudson Bay coastline.
- To compare the distribution of Polar bears in late July to the distribution in early September. Surveys are planned for early November to further understand the movement and distribution of the western Hudson Bay sub-population of Polar bears.
- This survey can also give Manitoba Conservation an indication of the health and fat condition of the Polar bears as they come off the ice and on to land.
- Results of the "Ice-Out" survey and the September survey are presented each year at the Polar Bear Technical Committee meeting.

METHODS:

- The "Ice-Out" survey flight line is flown exactly to that of the September survey which has been flown since the mid 1970's. The starting point of both surveys is at Churchill, the end point is the Ontario border.
- This survey is conducted by a front navigator/recorder and 2 spotters in the back of the helicopter. All personnel in the helicopter act as spotters. The helicopter has always been a Bell 206B Jet Ranger.
- The survey line is approximately 300m inland off of the high tide mark of the coastline. Observations are made on both sides of the helicopter.

YEARS OF DATA COLLECTION:

- Ongoing project for September survey since 1970s
- "Ice-Out" survey since 2005

PARTNERS:

- Polar Bears International
- Manitoba Conservation

RESULTS:

- A total of 101 Polar bears were observed between Churchill and Ontario during the 2009 "Ice-Out" Survey.
- Most of the Polar bears, (77%) were counted between Churchill and Marsh Point.

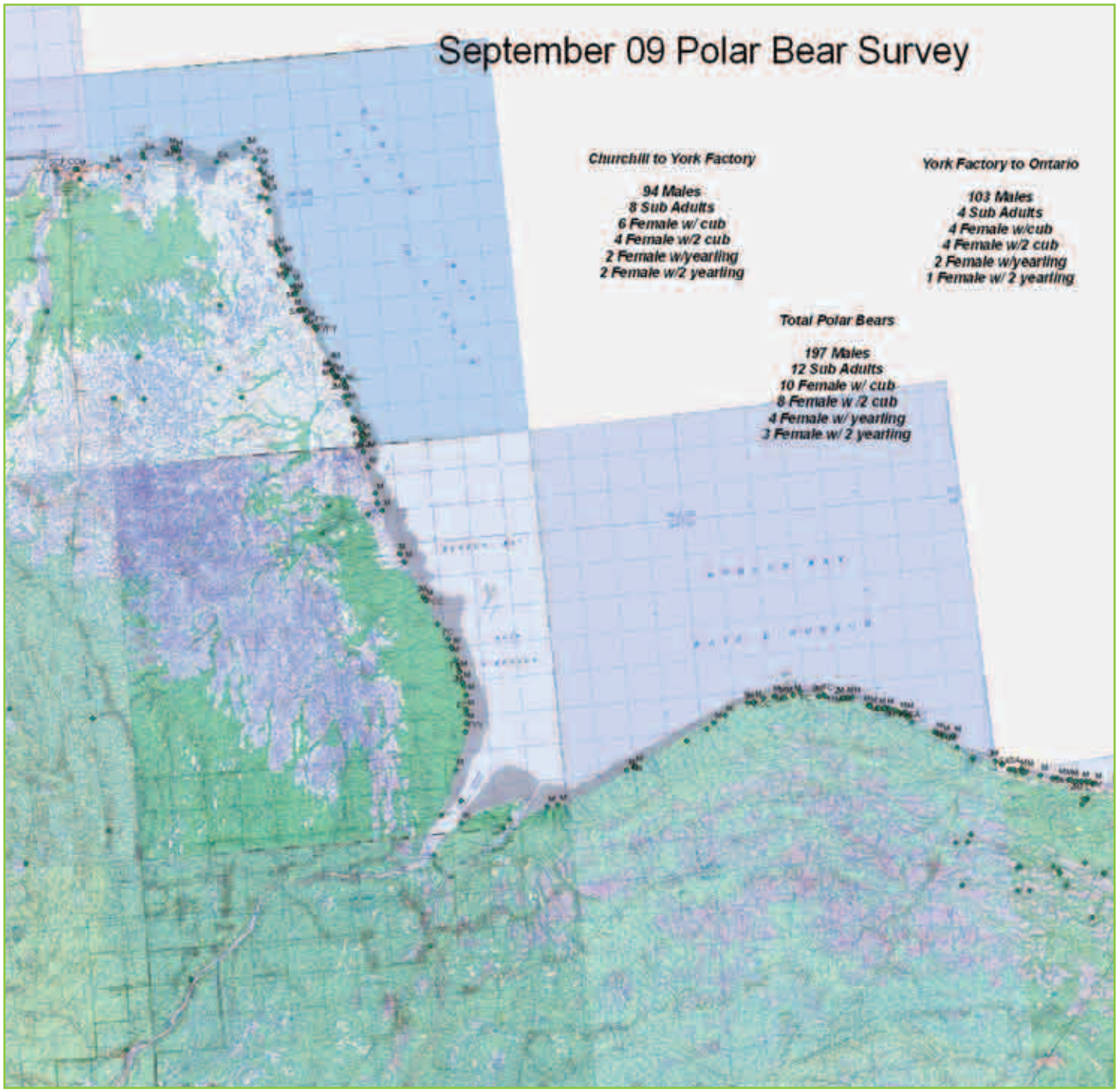

Figure 1 – September 2009 Polar Bear Survey.

Two bears near Broad River, Wapusk National Park. Credit: Daryll Hedman.

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RATIONALE:

Eastern Prairie Population (EPP) Canada geese breed in northern Manitoba and migrate to wintering areas historically as far south as Louisiana and Texas. As part of the management of this population, annual information on population size, productivity, and survival has been used to set harvest strategies and hunting season lengths and bag limits in both the U.S. and Canada through the Mississippi Flyway Council. Since the late 1960s and early 1970s, annual information-gathering activities include aerial breeding ground surveys, estimating nest density and reproductive performance at Cape Churchill, and banding flightless geese in late summer.

MISSISSIPPI FLYWAY EASTERN PRAIRIE POPULATION (EPP) CANADA GOOSE MONITORING

OBJECTIVES:

- Estimate trend in breeding population size of EPP Canada geese using spring aerial survey.
- Estimate breeding density and productivity of EPP Canada geese in high-density breeding habitat in coastal tundra near Cape Churchill (Nester 1).
- Band flightless EPP Canada geese on their breeding grounds in northern Manitoba to provide data to estimate survival.
- Collect information on spring phenology, other breeding birds, frogs, and habitat conditions.

METHODS:

- Using a fixed-wing survey plane, repeat transects established in the early 1970s to count nesting EPP Canada geese throughout their breeding range.
- Using extensive searches of the Nester 1 study area (Figure 1), estimate breeding density, nest survival, clutch size, and hatching success of breeding EPP Canada geese.
- Using a helicopter and drive nets, capture and band approximately 2,000 – 2,500 EPP Canada geese in mid-to-late summer during the period when they are flightless.
- Record local spring conditions, conduct standardized breeding bird surveys, record frog activity and breeding locations, and qualitatively assess habitat conditions.

YEARS OF DATA COLLECTION:

- Operational aerial surveys since 1972
- Breeding density and productivity at Nester 1 since 1976
- EPP breeding grounds banding since 1968

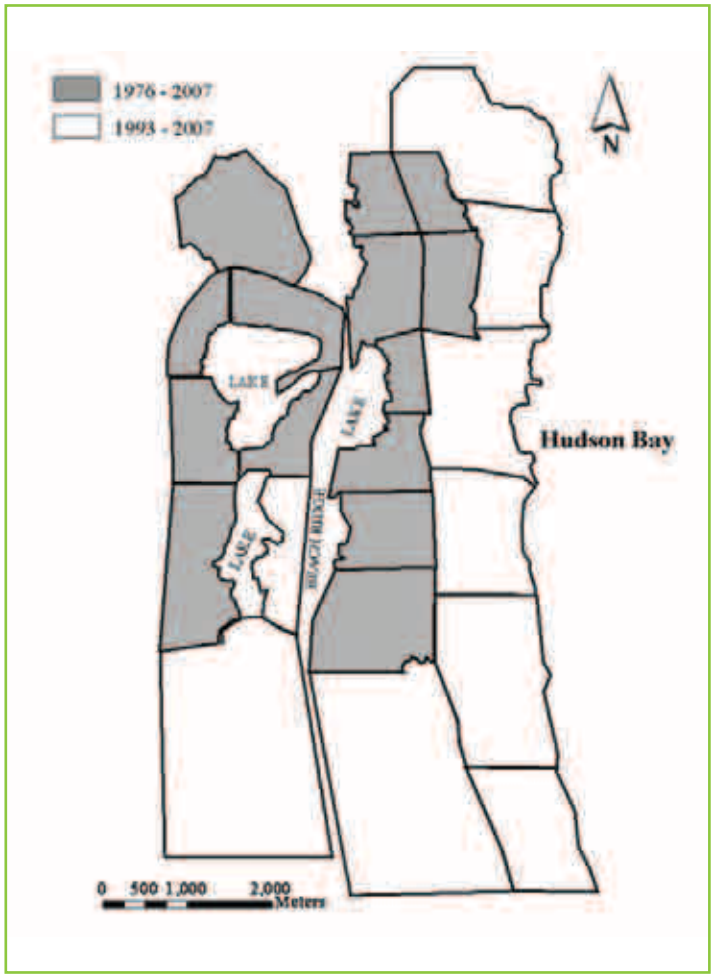
PARTNERS:

EPP Canada goose monitoring is supported through the Mississippi Flyway Council, whose representatives on the EPP Canada Goose Committee include the U.S. Fish and Wildlife Service, Canadian Wildlife Service, Manitoba Conservation, Minnesota Department of Natural Resources, Iowa Department of Natural Resources, Missouri Department of Conservation, Arkansas Game and Fish Commission, and Illinois Department of Natural Resources. The U.S. Geological Survey (Wisconsin Cooperative Wildlife Research Unit and the Minnesota Cooperative Fish and Wildlife Research Unit) have been responsible for Nestor One breeding density and productivity monitoring.

RESULTS:

- Trend in breeding population size of EPP Canada geese is currently stationary.
- Nest density of breeding EPP Canada geese at Nester 1 decreased from the late 1960s and early 1970s to the 1990s, and currently is stationary at relatively low density.
- 2,000 – 2,500 EPP Canada geese are banded annually to estimate survival, which is used in management and setting harvest regulations.
- Breeding bird surveys suggest changes in species abundance related to habitat changes resulting from goose herbivory.

Canada goose nest. Credit: David E. Andersen.



EPP helicopter drive. Credit: Vicki Trim.

Checking nest fate. Credit: Murray Gillespie.

EPP helicopter drive. Credit: Vicki Trim.

Canada goose nest. Credit: David E. Andersen.

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RATIONALE:

This project attempts to identify the different terrestrial ecosystems ('ecotypes') that occur in Wapusk NP, and to interpret the ecological processes that control their distribution. The structure and species composition of terrestrial vegetation changes across the Wapusk NP landscape in response to a range of interacting ecological factors that include regional- and local-scale climatic variation, soil ice processes, micro-scale elevation differences, frequency and duration of soil flooding, depth and persistence of winter snow, exposure to wind, as well as soil texture and composition. Historical factors such as severity and time since fire, as well as caribou and goose foraging have also significantly affected ecosystem composition and structure in some areas. The work is a management tool that will provide a baseline condition of the park and can be used to monitor ongoing ecosystem change, backcast historical changes, and model how the park may change in the future as a result of climate warming. In the shorter term, management interpretations can be made for the ecotypes identified. For example, interpretations of their value as wildlife habitat or susceptibility to vehicle traffic can be developed for each ecotype and displayed as maps.

MAPPING AND INTERPRETING TERRESTRIAL ECOSYSTEMS IN WAPUSK NATIONAL PARK

OBJECTIVES:

- Identify and describe park ecotypes and describe key ecosystem processes.
- Develop interpretations for the ecotypes in terms of key park management issues.
- Provide an ecotype map that shows their present spatial distributions.
- Construct interpretative maps for caribou habitat and goose damage areas.

METHODS:

- Collect and interpret relevant background reports and publications on park terrestrial ecosystems, landforms and permafrost, and related research.
- Gather available satellite imagery (SPOT 5, Landsat, Radarsat-2 and Quickbird).
- Conduct field sampling and develop a model to link to satellite imagery.
- Develop the ecotype map linking ground observations to the satellite imagery.

YEARS OF DATA COLLECTION:

- Year 2 of a 2-year project

PARTNERS:

- Parks Canada National Office
- Wapusk National Park
- Canadian Centre for Remote Sensing

RESULTS:

- A preliminary ecotype map for the park was completed in March 2010 (Figure 1).
- Extensive areas altered by heavy snow goose grazing have been identified and described on the ground (Photo 4) and will be mapped as a final product.
- An updated fire history map was also developed (Photo 1).
- An updated list of vascular plant species, with an analysis of invasives, rare and endangered vascular plant species has been developed that includes work from this project and for all previous surveys in and around the park.

Draft ecotype map of south coast area of the park developed from SPOT5 imagery.

Brendan McEwan measuring the active layer depth in a recently burned area. Credit: Donald McLennan.

Brendan McEwan and Sergei Ponomarenko sample a Coastal Meadow Ecotype. Credit: Donald McLennan.

Riparian Willow Tall Shrub Ecotype. Credit: Donald McLennan.

Seaside alkaligrass colonizing bare peats exposed by snow goose overgrazing. Credit: Donald McLennan.

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RATIONALE:

Eastern Prairie Population (EPP) Canada geese nest in the Hudson Bay Lowlands of Northern Manitoba and traditionally wintered in Arkansas and Missouri, although their winter distribution has shifted northward in recent years. EPP geese form an important part of the Canada goose harvest in Manitoba, Minnesota, Iowa, and Missouri and consequently their population status has been closely monitored by provincial, state, federal and university cooperators for more than four decades. Part of this monitoring effort is directed at banding flightless adults and pre-fledged young. Recoveries of banded individuals permits estimation of annual harvest rates of each age class, and provides information about harvest distribution throughout the Mississippi Flyway, both of which are used to set hunting regulations in Canada and the U.S.

EASTERN PRAIRIE POPULATION (EPP) CANADA GOOSE BANDING

OBJECTIVES:

- To band groups of breeding Canada geese (with a relatively even distribution) between the mouths of the Hayes River and Churchill River, Manitoba.
- To achieve a banding target of 1,500 adults and 1,500 goslings.

METHODS:

- Locate groups of productive flightless adults (i.e., with goslings).
- Drive flightless geese into nets using a helicopter and positioned personnel.
- Separate adults and goslings (two pens).
- Determine age, sex, presence of brood patch (adult females), and measure skull length (to separate EPP Canada geese from molt-migrate giant Canada geese).
- Release banded goslings and adults together.

YEARS OF DATA COLLECTION:

- Ongoing EPP breeding ground banding since 1968.

PARTNERS:

- Mississippi Flyway Council
- Canadian Wildlife Service
- Parks Canada
- Manitoba Conservation
- Numerous US state agencies

RESULTS:

- 1344 adults and 161 goslings banded in 16 drives in 2009 (Figure 1).
- Banding dates were July 30 and 31, August 2 and 6–8 inclusive.
- Very few goslings were observed throughout the EPP range due to poor production in 2009.
- Greatest numbers of young were seen near the town of Churchill, on the flats of the Churchill River.
- Crew lost four days of work out of a scheduled 10 days of banding due to helicopter break-down.
- Despite this lost time, the banding goal for adults was nearly met and even with extra time, the goal for goslings would never have been reached due to the lack of production.

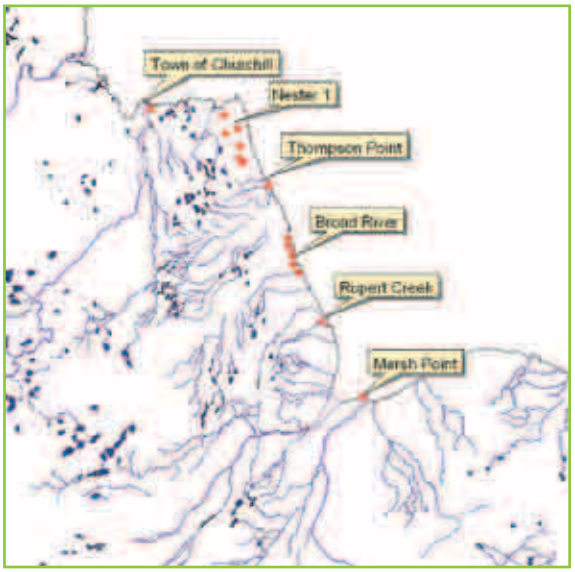

Figure 1 – "Distribution of EPP banding drives in 2009."
Credit: Frank Baldwin/Manitoba Conservation.

Looking from the outside in. Credit: Frank Baldwin/Manitoba Conservation.

Closing up the pen after a successful drive. Credit:Frank Baldwin/Manitoba Conservation.

Releasing a group of adults amongst the mosquitoes. Credit: Vicki Trim/Manitoba Conservation.

Seaside alkaligrass colonizing bare peats exposed by snow goose overgrazing. Photo: Donald McLennan.

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RATIONALE:

The active layer is defined as ground above the permafrost table that freezes in the winter and thaws during the summer. The depth of thaw is variable and dependent on thermal properties of the substrate, air temperature and amount and type of vegetation cover. This unfrozen ground (active layer) is the growing zone for plants but it also conducts water and nutrients through the surface area. The depth of the active layer influences the type of vegetation community growing on it and in turn is influenced by this vegetation cover. As air temperatures warm, the temperature warms in the active layer and it deepens, this in turn influences the water level.

MONITORING WATER LEVEL AND ACTIVE LAYER DEPTH IN WAPUSK NATIONAL PARK USING IN-SITU DATA LOGGERS

OBJECTIVES:

- To record temperature and water level data at wells within 5m of the permafrost wells at unique community types.
- To compare these measures of water level and temperature to both precipitation and air temperature to determine trends over time.
- To measure permafrost depth at start and end of logging season.

METHODS:

- Four observation wells (approximately 80cm deep) were installed along the White Whale River permafrost transect and at the Mary Lake site in July 2008 by Larry Dyke and Wendy Sladen.
- In June 2009, four HOBO U20 water level loggers were deployed at the observation wells and installation measurements recorded every two hours on a twenty-four hour recording cycle. Depth to ice (active layer) was measured at start up and removal.
- On September 2009, loggers were removed from the wells, and data downloaded.

YEARS OF DATA COLLECTION:

- Year 1 of a multi-year project.

PARTNERS:

- Parks Canada

RESULTS:

- Four level loggers were deployed, in four unique community types (fen inland, fen at Mary Lake, peat plateau at Mary Lake, fen at coast).
- Three loggers recorded complete level and temperature values from June 30 to September 24, 2009; one logger collected values to July 11 and stopped.
- Change in permafrost depths from deployment to removal at the four sites ranged from the 20.0 cm at Mary Lake fen site, to a drop of 33 cm (largest drop) at the adjacent peat plateau.
- Mean water level across all sites ranged from 20 cm to 60 cm from ground surface and mean water temp ranged from -0.16°C to 3.41°C.

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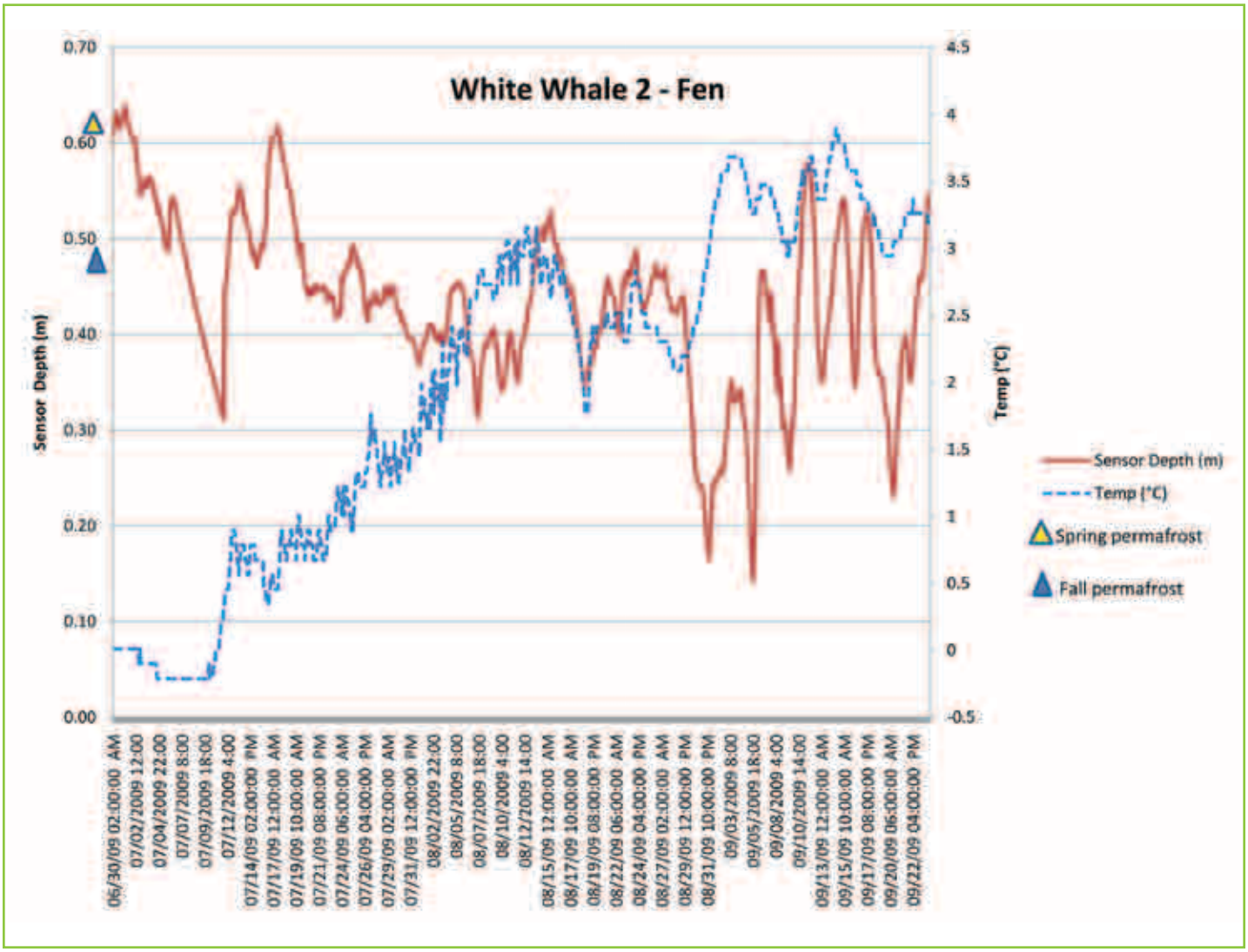

Figure 2: Water Level from White Whale River 2 (Mary Lake Fen).

Logger download in-situ at WW4. Credit: Heather Stewart.

Logger information. Credit: Heather Stewart.

Observation well set up. Credit: Heather Stewart.

RATIONALE:

When Wapusk National Park of Canada (WNP) was established in 1996, Parks Canada inherited not only the land but also various items (fuel drums, rockets and building materials, etc.) that were scattered across the landscape. These items were associated with research, military activity, hunting, trapping and exploration conducted in the region prior to establishment of the park.

The remote nature of WNP has contributed to the build-up of man-made materials on the landscape. The region is only accessible by aircraft during the summer months due to the extensive wetlands, which makes travel by ground very difficult. Winter travel is the preferred method to clean up materials as the harsh climate influences the rate at which materials have been removed. Despite these challenges, Parks Canada and various partners have been working together to clean-up WNP. To guide efforts and track progress, a park clean-up plan was prepared in 2007.

WAPUSK NATIONAL PARK CLEAN-UP PROGRAM

OBJECTIVES:

- To clean up unnecessary fuel drums and other garbage in WNP in an efficient and timely manner.
- Reinforce Parks Canada's first priority to maintain the ecological integrity in the park and enhance the visitor experience for present and future WNP users.

METHODS:

- As part of an environmental assessment (EA), a comprehensive inventory of waste on the landscape was compiled in 2002. Contaminated sites were identified in the inventory, and in 2005 follow-up EAs were conducted.
- To address the remainder of the waste identified in the 2002 inventory, Parks Canada developed a clean-up plan for the WNP in 2007. Since the approval of the plan, Parks Canada along with various partners have been working together to remove the waste.
- When possible, drums and garbage are removed from the park in the winter because access to the sites in the summer is limited to aircraft, which can be costly. Winter removal by snowmobile and Bombardier is more economical with lower greenhouse gases emissions. Since it can be difficult to locate drums in the winter due to snow cover, sites are prepared prior to snow fall. This is done with the help of our partners in concurrence with research or other park management activities.

YEARS OF DATA COLLECTION:

- Year 3 of a 4-year project

PARTNERS:

- Wapusk National Park
- Clifford Paddock
- Manitoba Conservation
- Environment Canada
- Hudson Bay Project
- Various research partners
- Hudson Bay Helicopters
- Gogal Air

RESULTS:

- Eighty-five sites were identified in the initial inventory of which three were classified as contaminated sites. Two of the contaminated sites (Dead Mosquito Point and Campbell's Cabin) were cleaned-up and a remedial action plan was created for the third site which was the Nestor Two research camp.
- Twenty-one new sites were discovered and added to the inventory over the past two years.
- Nineteen sites were removed from the inventory and listed as possible cultural resources which will require further investigation.
- Five sites were designated as active fuel caches and are managed according to the WNP Fuel Cache Protocol. These sites are cleaned up annually.
- To date 62 sites have been cleaned-up. This includes 115 empty drums, 32 full drums, 40 partial drums and other miscellaneous debris.
- The park clean-up program was scheduled to be completed last winter but operational delays necessitated an extension. The 24 remaining sites will require clean-up this winter.

Jill Larkin and Rodney Redhead preparing old fuel drums for winter removal by rolling them up onto a beach ridge. Credit: Parks Canada.

Snowmobile and komatik loaded with old drums that were removed from the Broad River area. Credit: Parks Canada.

Jill Larkin kicking an old empty fuel drum at Cape Churchill, moving it to a more accessible location for winter removal. Credit: Parks Canada.

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RATIONALE:

The sea ice of Hudson Bay melts annually which forces Polar bears ashore from approximately July to November each year. The Polar bears of the Western Hudson Bay sub-population can be observed on the three sites managed by Parks Canada in northern Manitoba: Wapusk National Park, York Factory National Historic Site and Prince of Wales Fort National Historic Site (includes three locations). The chance of observing a Polar bear in Wapusk National Park during the ice-free period is very high but Polar bears can be seen in the park at any season. These interactions present a safety risk that must be monitored and managed.

MONITORING OF POLAR BEAR AND HUMAN INTERACTIONS IN WAPUSK NATIONAL PARK

OBJECTIVES:

- To engage Parks Canada staff and research partners in recording the number of Polar bears observed as well as the number of human/Polar bear interactions in Wapusk National Park. Expand this program in the future to include all visitors to the park.
- To monitor the number of bears observed over time including their locations as well as the number of human/Polar bear interactions.
- To use the information in the development of safety programs and for risk management purposes.

METHODS:

- Polar bears observed from the ground are classified as occurrences or encounters and recorded on standard forms.
- Aerial observations are recorded along with GPS locations when possible.
- A database has been established to manage this information.
- The information is summarized into an annual report which is a requirement of the MFU Polar Bear Safety Plan.

YEARS OF DATA COLLECTION:

- Ongoing project since 2007

PARTNERS:

- Research Partners
- Parks Canada

RESULTS:

- In 2009, 506 Polar bears were recorded at all Parks Canada sites in northern Manitoba. Of this total, 437 were reported in WNP.
- There were a total of seven Polar bear occurrences in Wapusk National Park which required deterrence action to be taken.
- Data for this project was provided by Parks Canada employees and various researchers who spent 290 and 655 person days respectively in the park from February to November 2009.

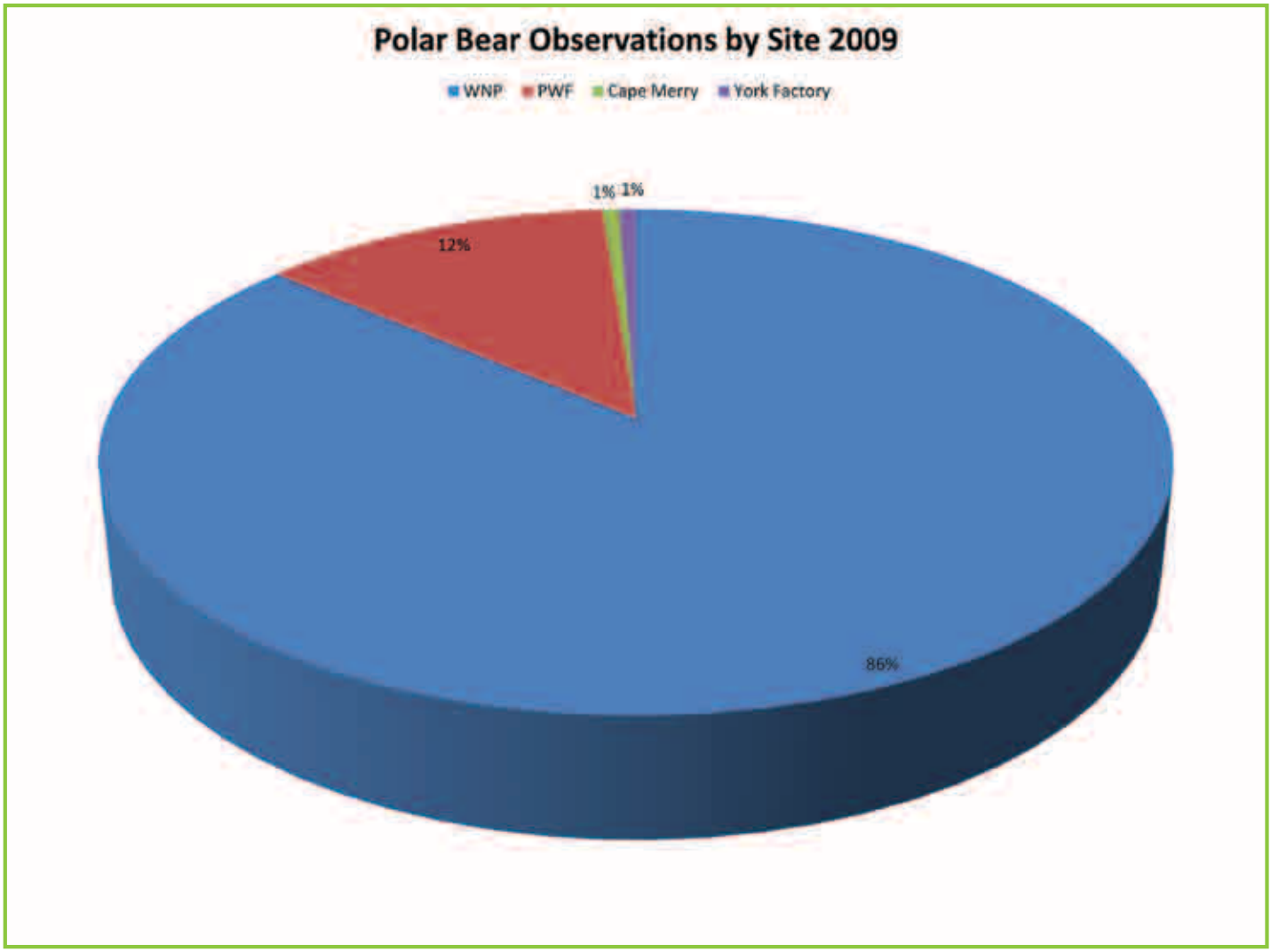

Figure 1: Percentage of Polar bear observations at Parks Canada Agency sites in the 2009 field season (n= 506).

Polar bear at Nester 1 research camp in Wapusk National Park, August 2009.
Credit: Rodney Redhead, Parks Canada.

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- Churchill Northern Studies Centre for providing a "home (and lab) away from home" for many of the researchers who work in the park as well as those working in the greater park ecosystem.
- Manitoba Conservation has kindly made the Nester 1 research camp available to Parks Canada and other research partners on numerous occasions.

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