

Arctic Wildlife Observatories Linking Vulnerable EcoSystems (ArcticWOLVES)

**A study of the impact of climate
change on tundra wildlife**

Gilles Gauthier



Overview of ArcticWOLVES

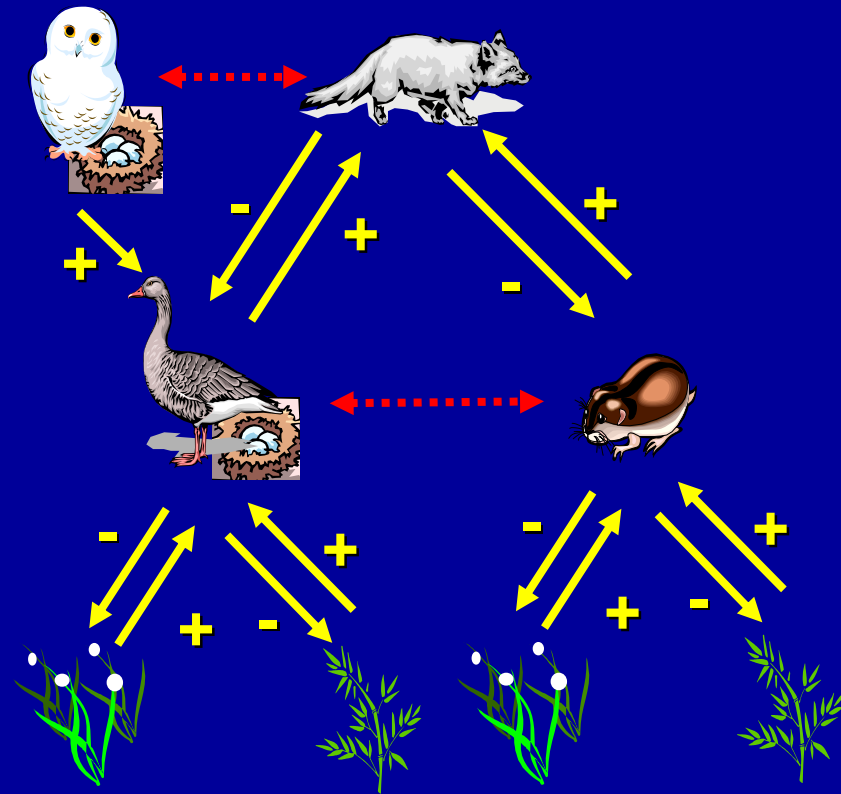
- ArcticWOLVES was developed for the International Polar Year
- The project integrates a circumpolar network of wildlife observatories in order to assess the current state of arctic terrestrial food webs over a large geographical range

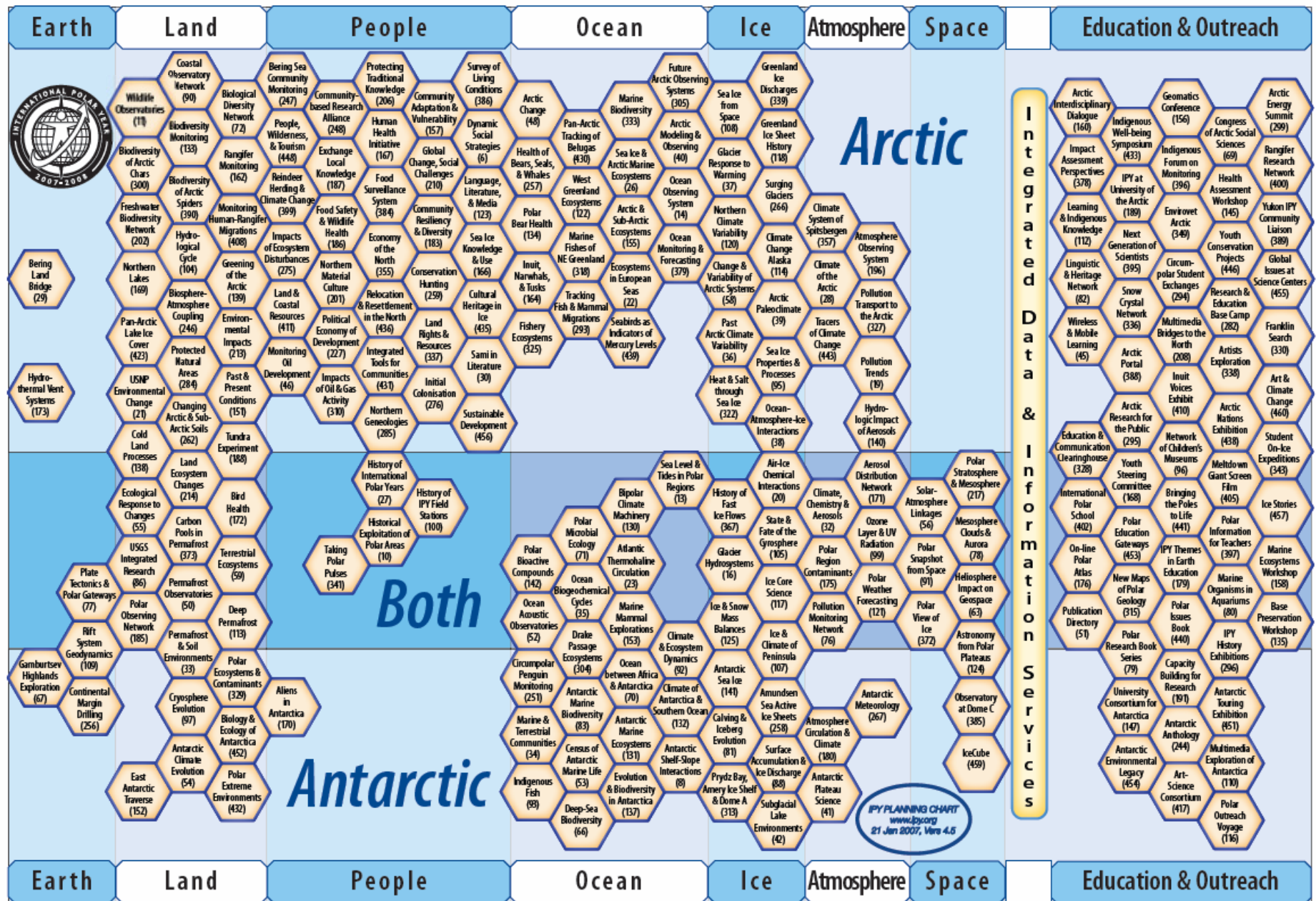


Overview of ArcticWOLVES

Major aims:

- Determine the relative importance of bottom-up (resources) and top-down (predators) forces in structuring arctic food webs
- How climate affects wildlife species and trophic linkages
- Provide baseline information to evaluate current and future population trends for several wildlife species





Originality of ArcticWOLVES

- Study a large array of key wildlife species



Originality of ArcticWOLVES

- Study the INTERACTIONS between these species
 - Predator-prey
 - Herbivore-plant
- Have spatial replicates over a large latitudinal and longitudinal gradient
- Use standard protocols across all sites

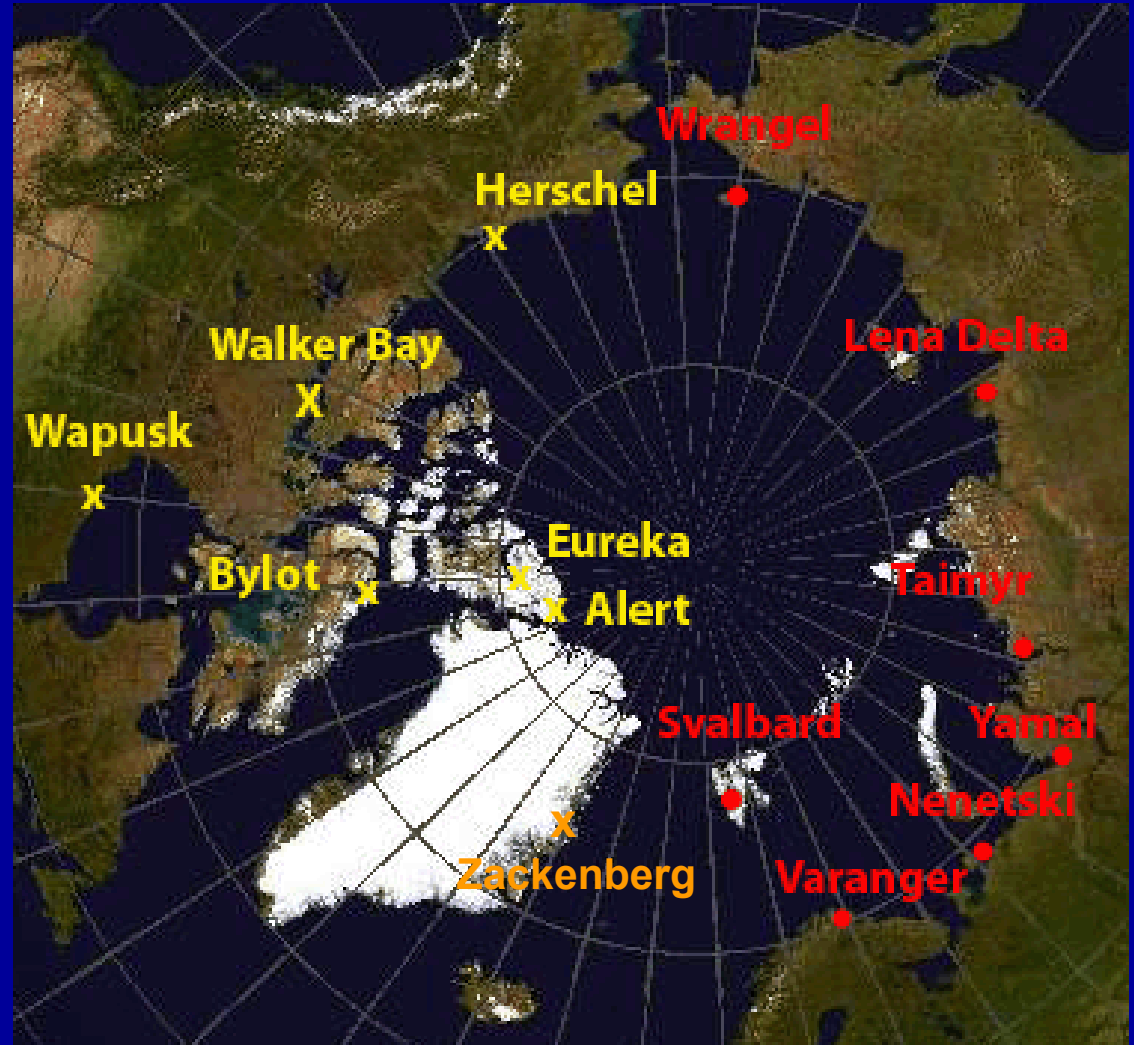


International scope

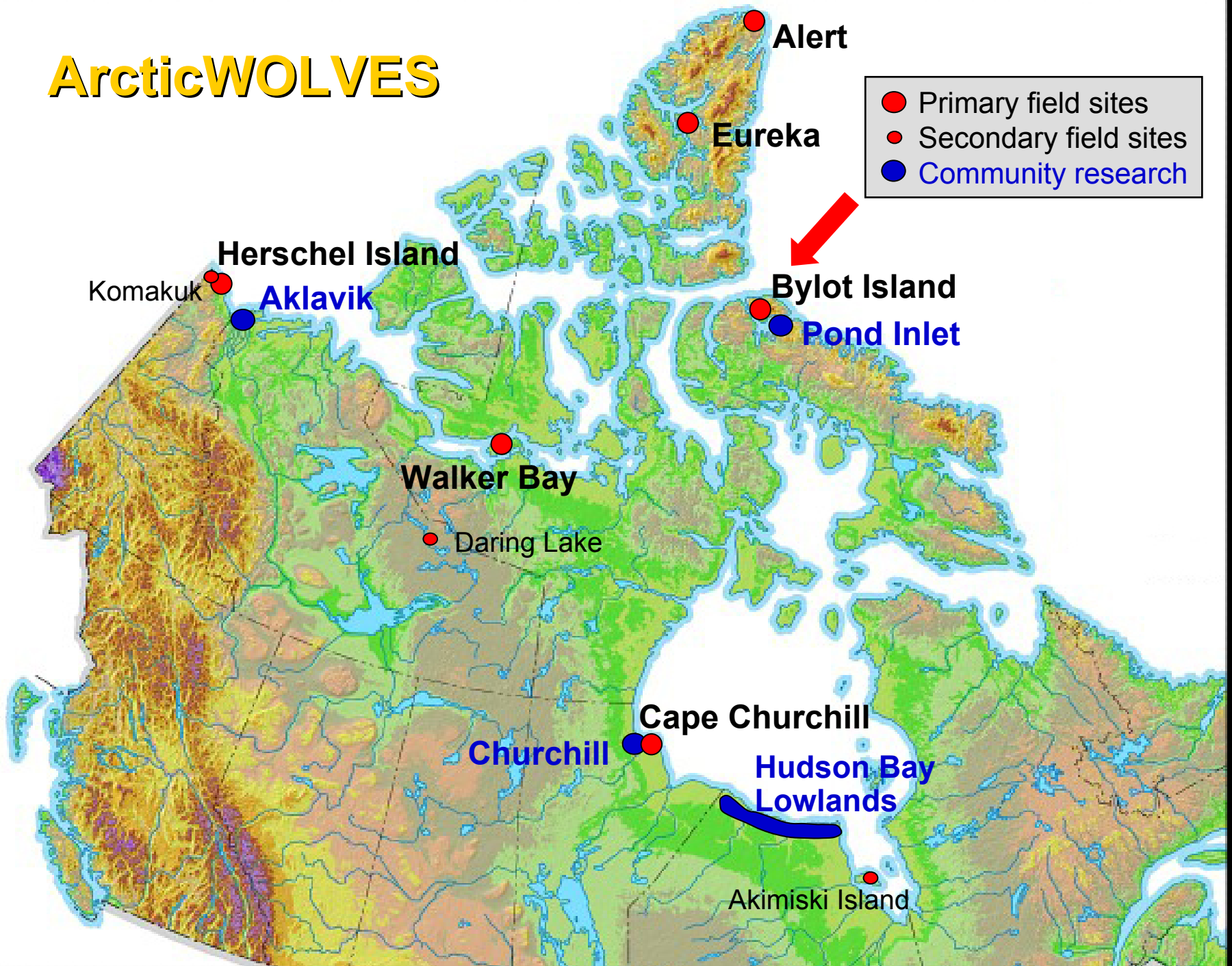
- The project currently involves more than 40 researchers from 9 countries:
 - Canada, USA, Norway, Sweden, Denmark, Netherlands, Finland, Russia and UK
- Closely linked to several other IPY projects
 - Bird Health (Netherlands)
 - Arctic Predators (Norway-Russia)
- Over 14 field sites in the circumpolar world
- In Canada:
 - 12 principal investigators
 - Over 20 scientific and northern collaborators
 - 6 primary field sites

ArcticWOLVES network

- Sites were selected based on:
 - History of wildlife related studies
 - Infrastructure available
 - Long-term commitment of key researchers



ArcticWOLVES



Themes of ArcticWOLVES

- Trophic dynamics of Arctic food webs
 - A dominant view is that resource abundance controls Arctic terrestrial food webs
 - Our hypothesis is that top-down processes driven by predators may be the primary forces structuring arctic communities



Themes of ArcticWOLVES

- Impacts of climate change on terrestrial animal biodiversity
 - Measure the abundance, distribution, and phenology of reproduction of several wildlife species to build a spatially-explicit database
 - Assess recent changes in wildlife abundance and use by northern people in relation to climatic change
 - Conduct field experiments to measure the effects of key climatic events on herbivores
 - Combine western science with traditional knowledge

Study of trophic dynamic

Approach 1

Intensive studies/ manipulations on key species

- Grazing impact
- Habitat use
- Numerical response
- Functional response
- Demography
- Movements

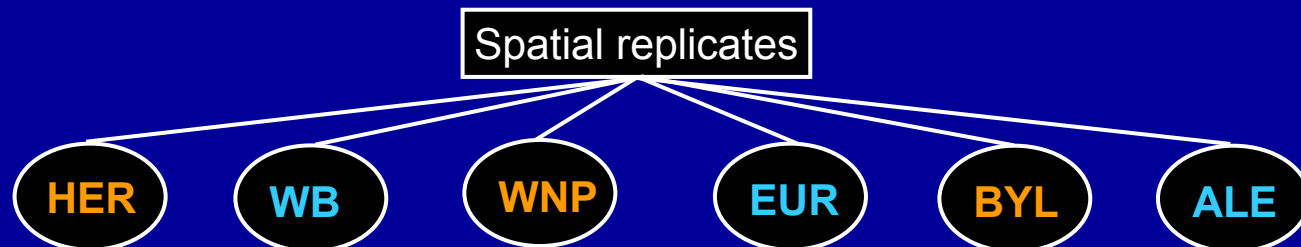
Selected sites

Approach 2

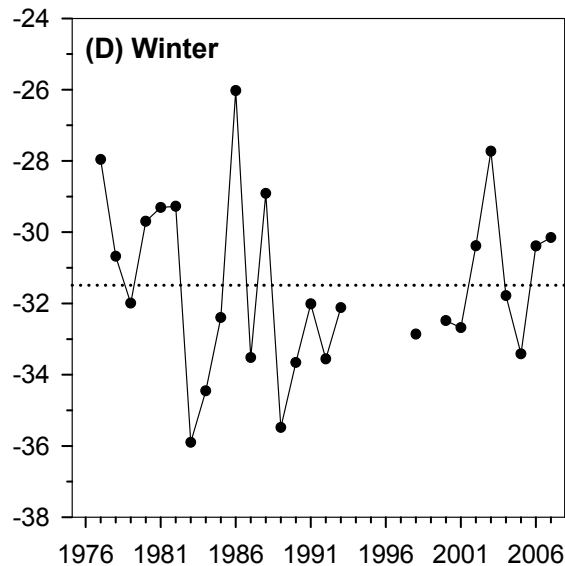
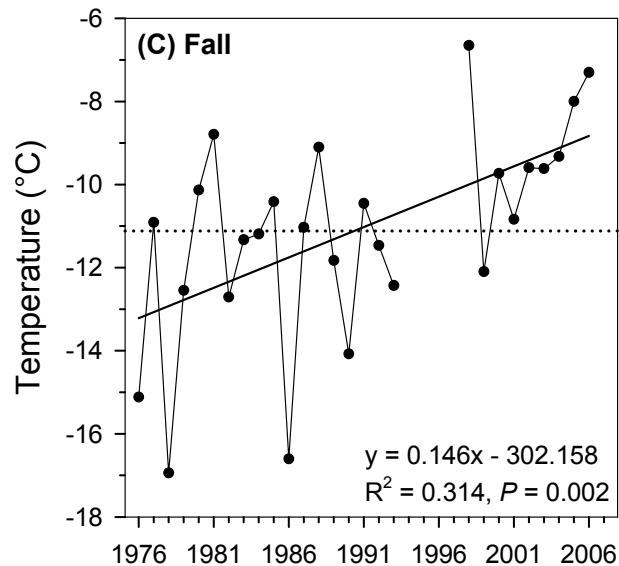
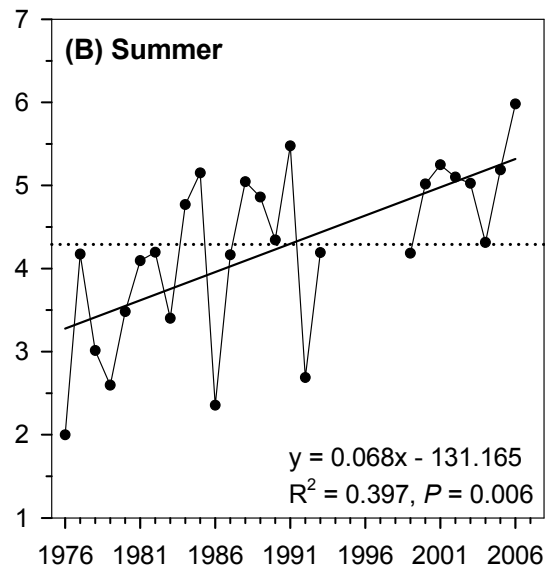
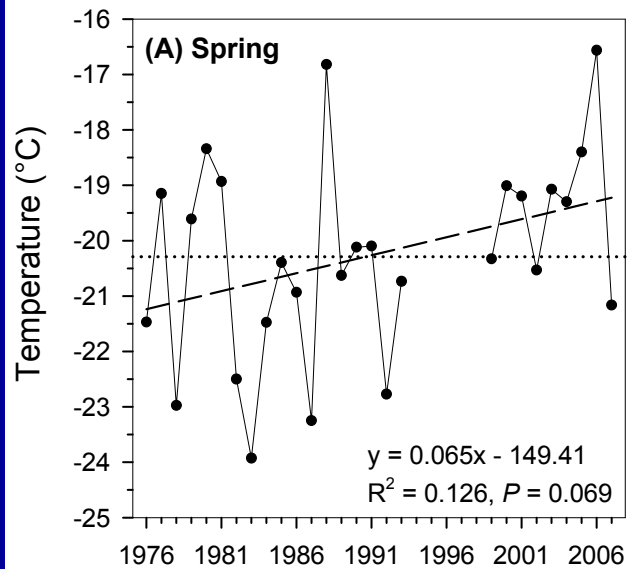
Extensive monitoring (all species)

- Primary production
- Abundance
- Breeding activity
- Diet

All sites



Seasonal climatic trend Bylot Island

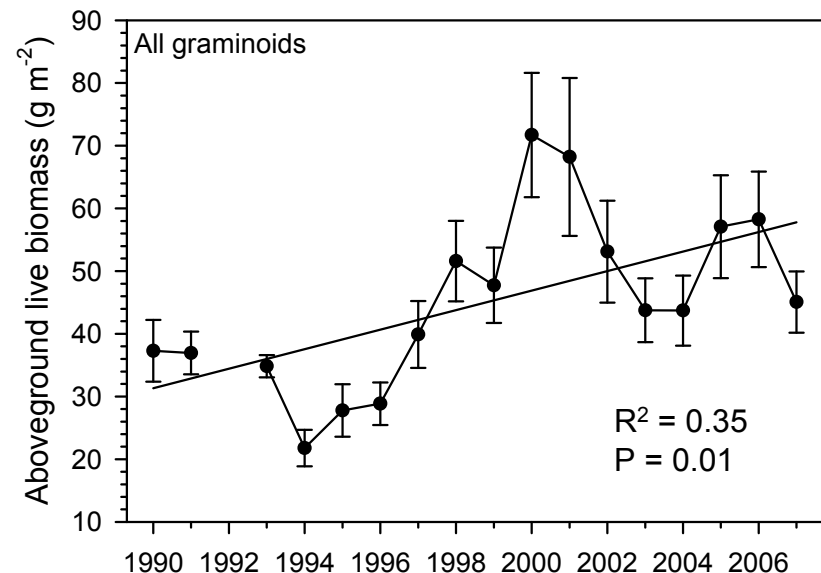


Primary production

- Sampling of plant biomass to measure primary production at all sites
- Some sites have a history of plant production monitoring



Bylot Island wetlands



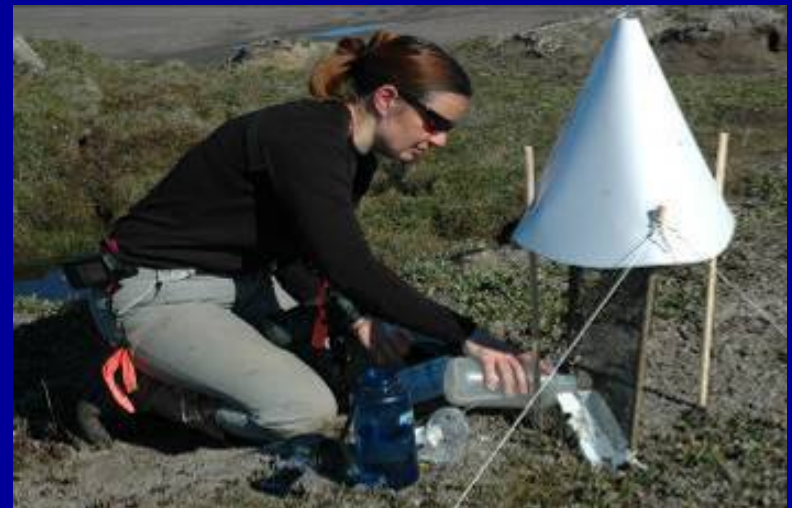
Plant-herbivore interactions

- Goose/plant interaction - Robert Jefferies
 - Comparative response of vascular plants to goose defoliation across sites and habitats
 - Evaluation of habitat degradation caused by goose grazing using exclosures
- Lemming/plant interaction
 - Lemming exclosures also set up at a few sites



Shorebirds

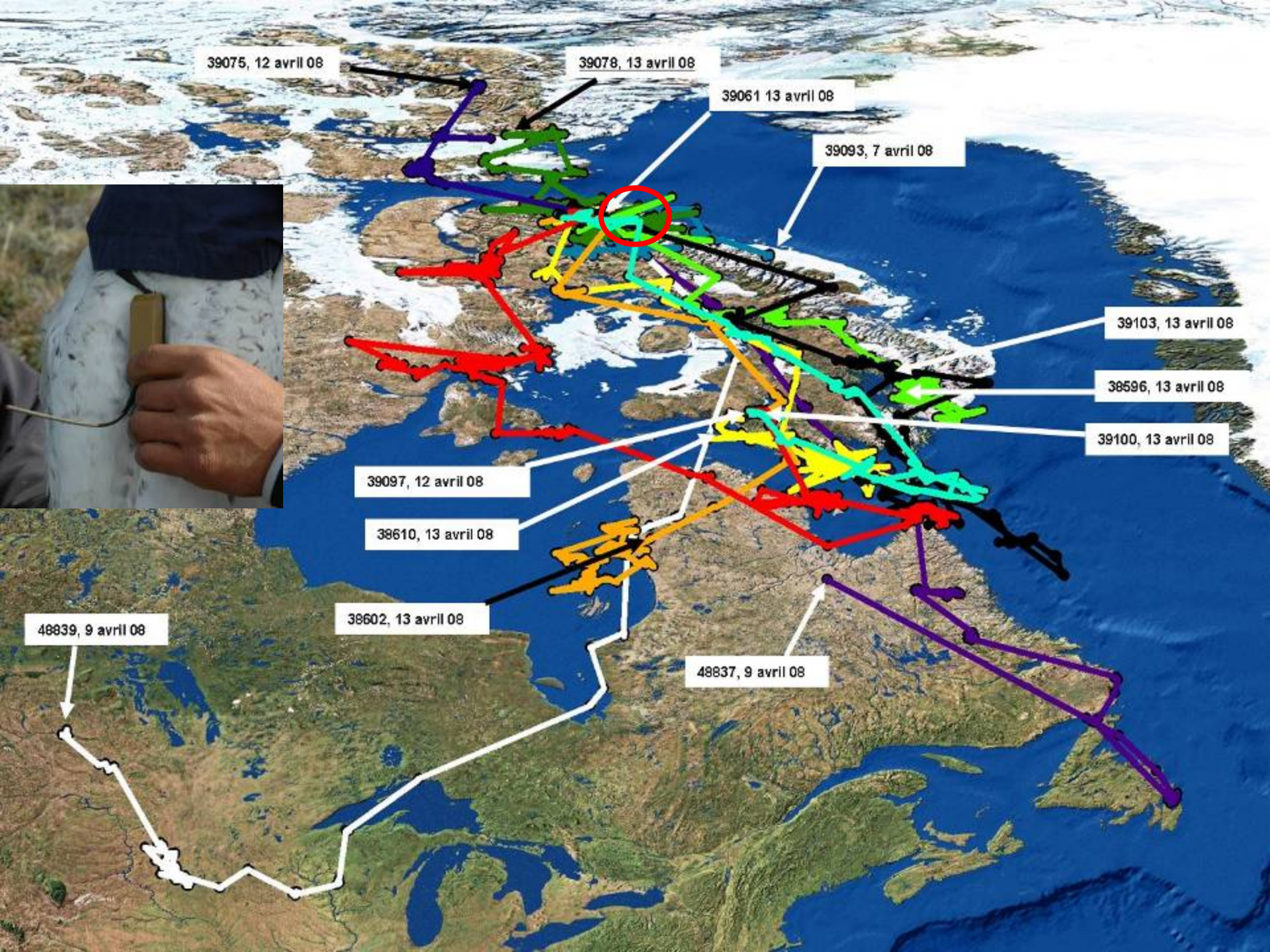
- Project led by Joel Bêty and Guy Morrison
- Impact of predation on reproductive success
 - Measure of nesting density
 - Measure of reproductive success (pre-hatch and post-hatch)
 - Experiments on predation pressure with artificial nests
- Role of food (insects) in reproduction
 - Sampling of seasonal abundance of insects



Avian predators

- Project led by Gilles Gauthier
- Emphasis on raptors (snowy owl and RL hawk), jaegers, gulls
- Numerical response to variations in lemming abundance
 - Nest abundance and reproductive success
 - Tracking of owl and jaeger movements with satellite transmitters
- Functional response to variations in lemming abundance
 - Diet studies (pellets, isotopic analyses of blood samples)
 - Prey delivery rates at nest (observations and cameras)





Arctic/red foxes studies

- Project led by Dominique Berteaux
 - Foraging strategies, habitat use and reproductive success of arctic foxes
 - Impact of expanding red foxes on arctic foxes populations



Lemming studies

- Lemming-climate studies - Don Reid & Charles Krebs
 - Study of lemming abundance and demography (snap-traps and live-trapping) – June to August
 - Winter habitat use and demography based on winter nests
 - Snow-fence experiment to study effect of winter climate on lemming demography
- Lemming-habitat studies - Doug Morris
 - Habitat use and predation risk

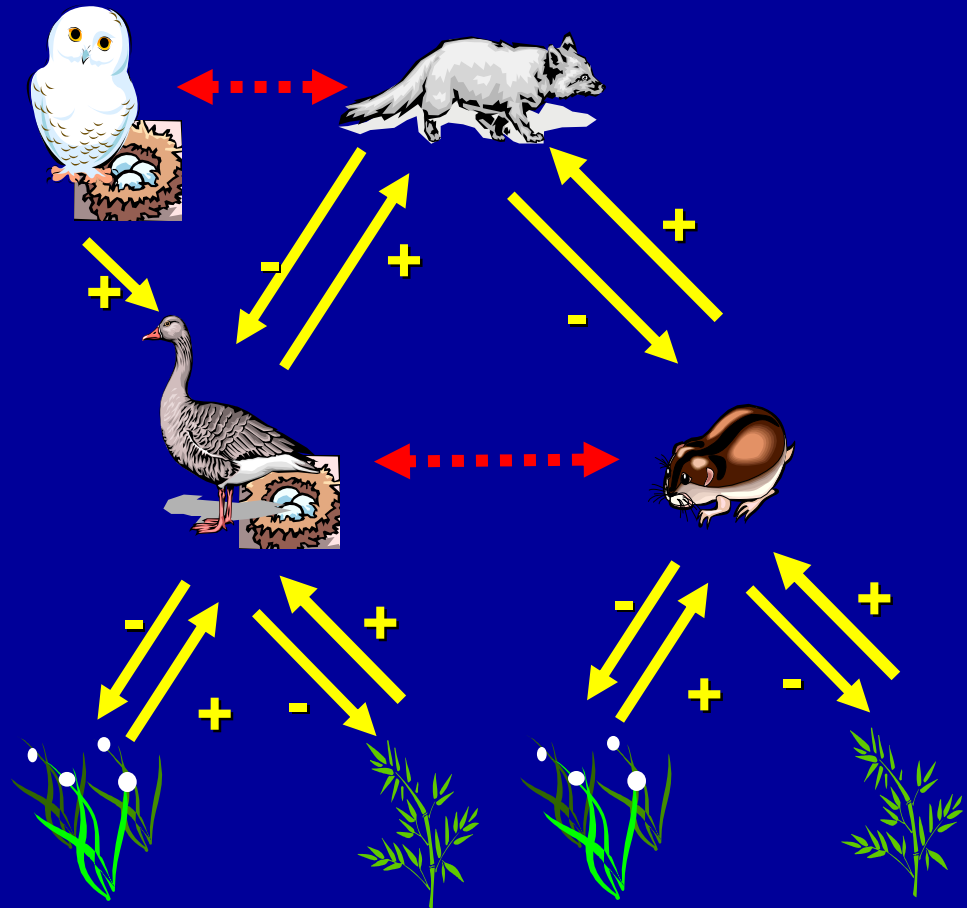


Small mammal snow fence

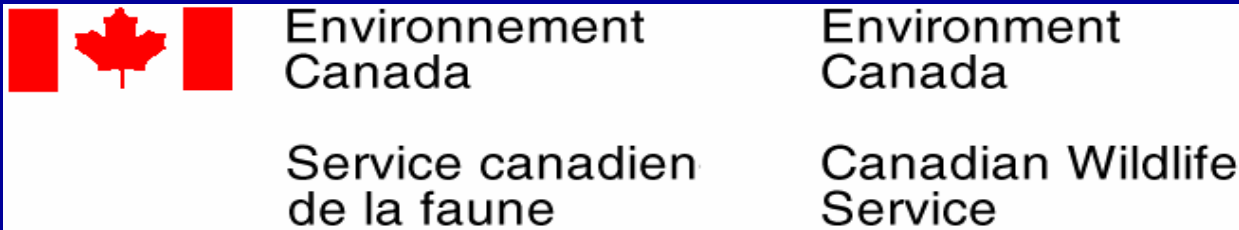


Trophic dynamics

- Ecosystem modelling - Charles Krebs
 - Modelling the strength of bottom-up vs top-down interactions in the tundra ecosystem



Acknowledgements



<http://www.cen.ulaval.ca/arcticwolves/>