Monitoring ecosystem dynamics on Varanger peninsula: carnivore-herbivore-vegetation interactions

Yoccoz Nigel G.

Bråthen KA Ravolainen V Ehrich D Henden JA Killengreen S Jensvoll I

Ims Rolf A. (Univ of Tromsø)

Jepsen JU, Stien A, Tveraa T (NINA, Tromsø)

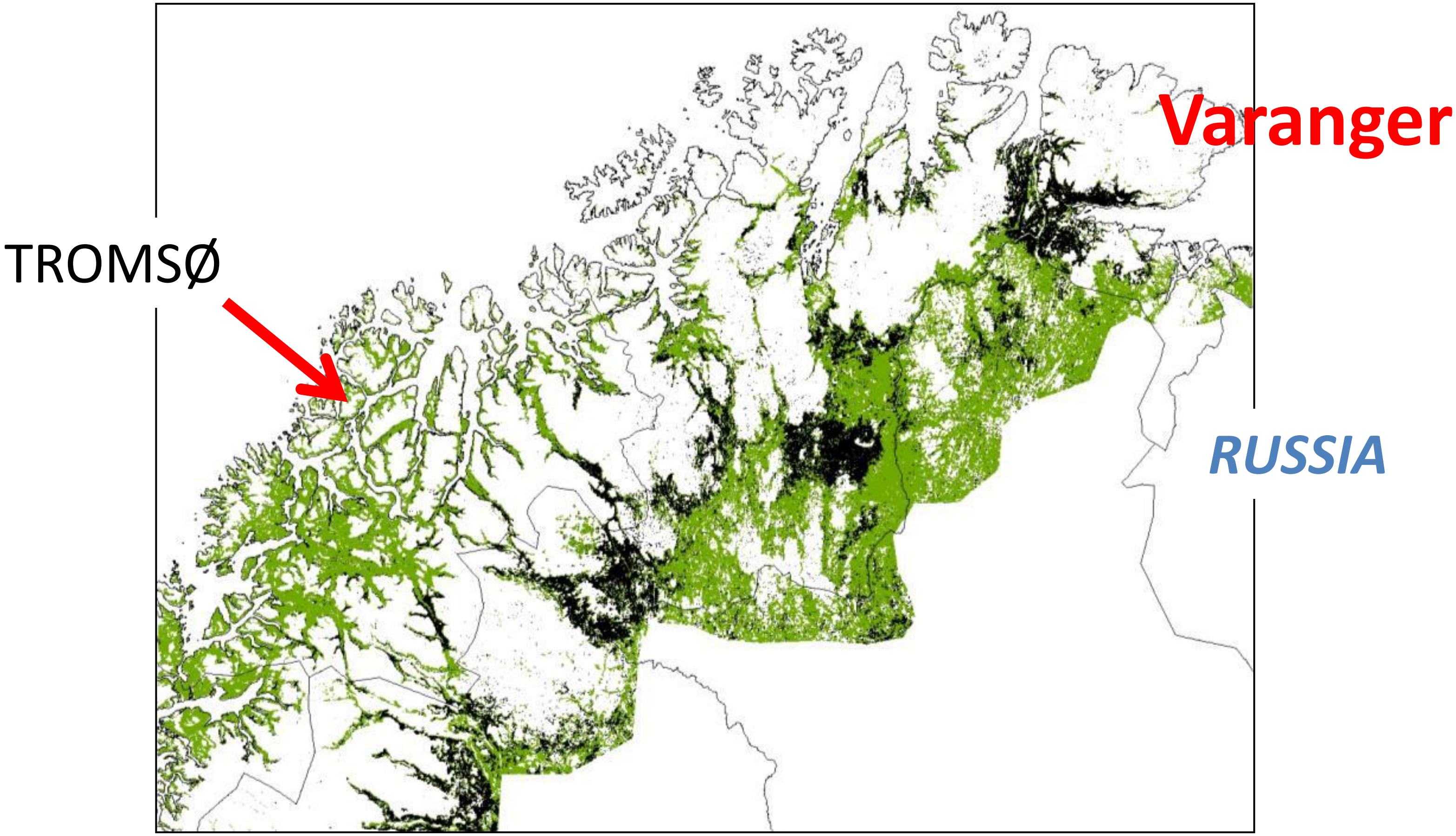
Fuglei E, Pedersen AØ, Kohler J (Norwegian Polar Institute)

Müller E, Eidesen P (UNIS)

Tveito OE (Norwegian Meteorological Institute)

Different projects on Varanger Peninsula
and northern Norway since 2003

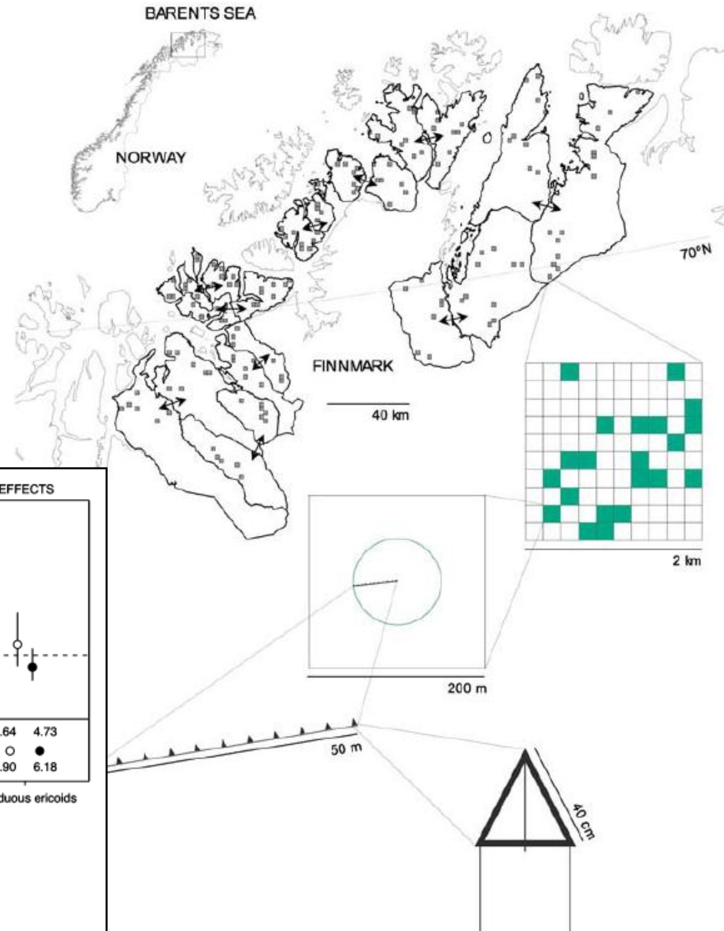
- Effects of small and large herbivores on vegetation
- Dynamics of small and large herbivores
- Conservation biology of Arctic fox and dynamics of carnivore/scavengers communities

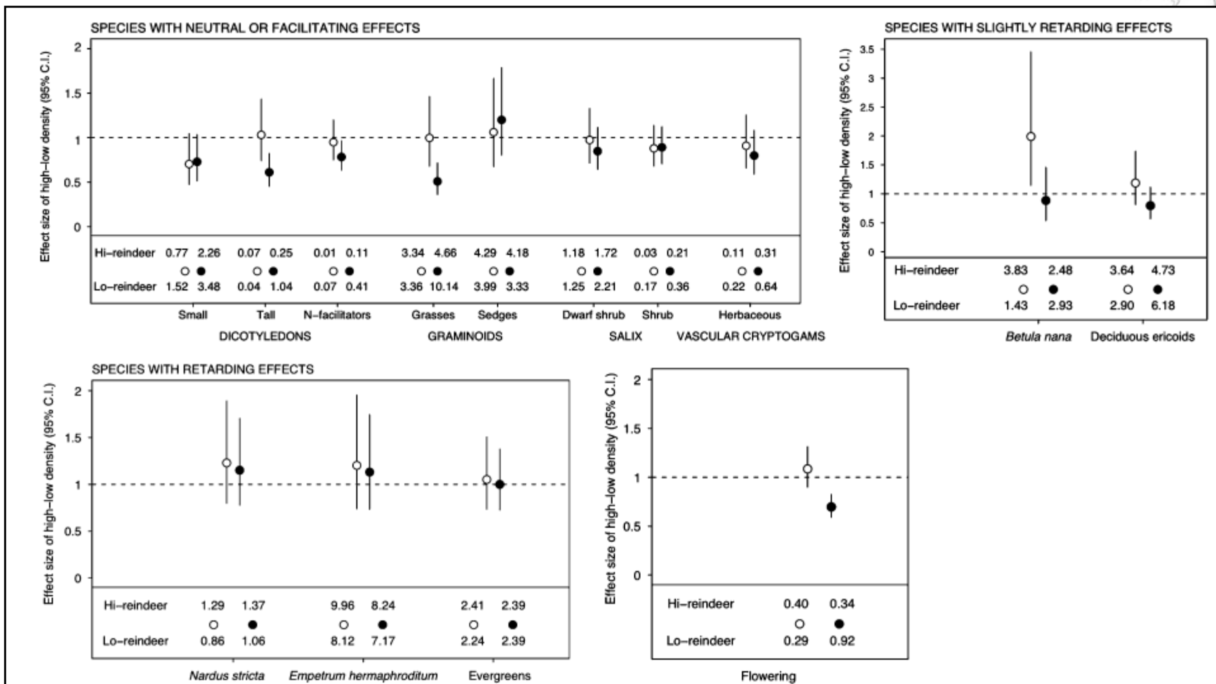


Induced Shift in Ecosystem Productivity? Extensive Scale Effects of Abundant Large Herbivores

Kari Anne Bråthen,[1,*] Rolf A. Ims,[1] Nigel G. Yoccoz,[1] Per Fauchald,[2] Torkild Tveraa,[2] and Vera H. Hausner[1]

ECOSYSTEMS





Journal of Vegetation Science 15: 653-660, 2004

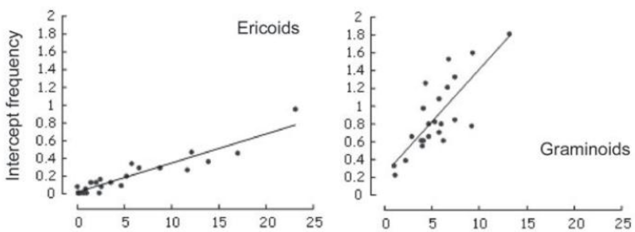
More efficient estimation of plant biomass

Bråthen, Kari Anne[1*] & Hagberg, Oskar[2]

Journal of Vegetation Science 21: 1035–1047, 2010
DOI: 10.1111/j.1654-1103.2010.01216.x

Reproducibility of species lists, visual cover estimates and frequency methods for recording high-mountain vegetation

Pascal Vittoz*, Neil Bayfield*, Rob Brooker, David A. Elston, Elizabeth I. Duff, Jean-Paul Theurillat & Antoine Guisan



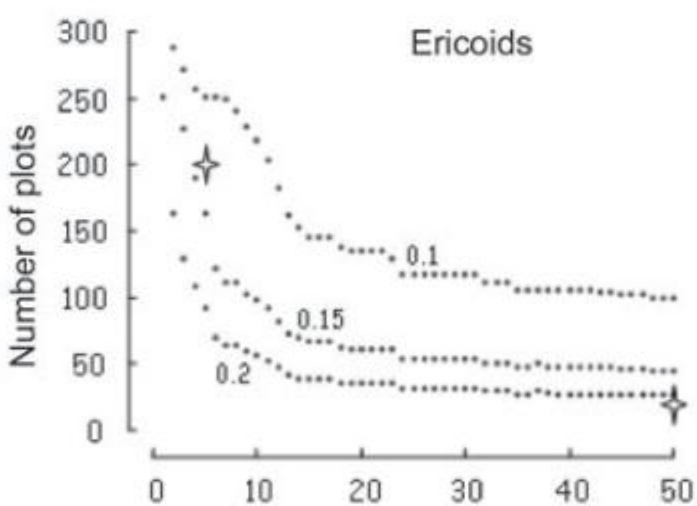


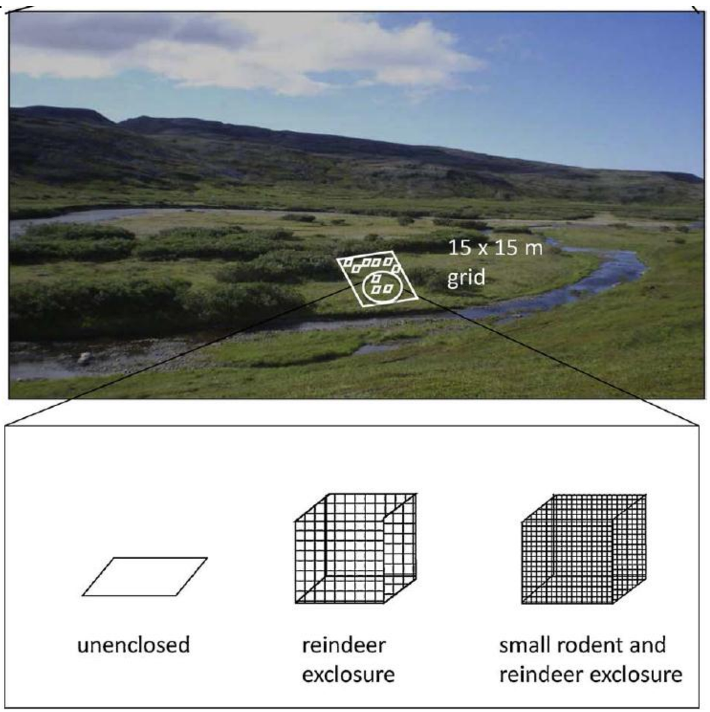
Table 8. Overview of coefficients of variation (CV) calculated by previous authors in testing variations between observers with visual cover estimates and frequency methods (point method, step pointing, frequency counts in grids). All the data are for vascular species.

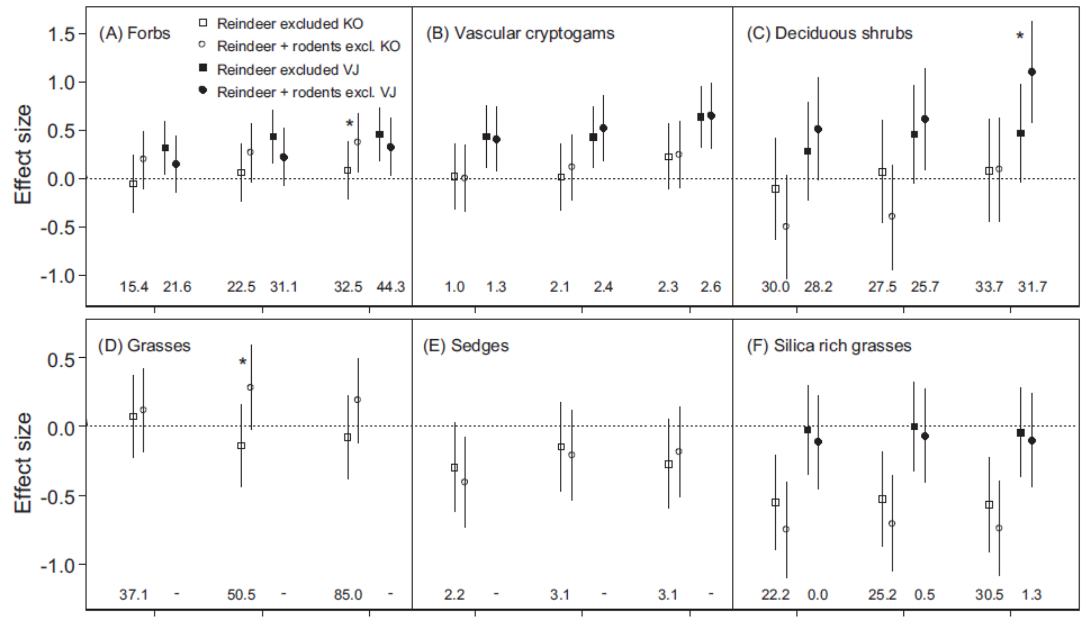
Reference	Method	No. of observers	Mean CV
This article	Visual estimate in % (large sections; > 100 m^2)	8	108.2 ± 50.7
van Hees & Mead (2000)	Visual estimate in % (100 m^2)	6	89.5 ± 25.5
Vittoz & Guisan (2007)	Visual estimate in % (4 m^2)	4–7	80.8 ± 40.0
Klimeš (2003)	Visual estimate in % (4 m^2)	5	~50–60
This article	Visual estimate in % (1 m^2)	8	66.2 ± 6.1
Helm & Mead (2004)	Visual estimate in % (1 m^2)	6	172.4 ± 121.6
This article	Frequency count (100 cells)	8	19.4 ± 7.1
This article	Point method (200 pts)	8	20.4 ± 3.3
Stampfli (1991)	Point method with fixed points (176 pts)	10	28.8 ± 16.3
Vittoz & Guisan (2007)	Point method (100 pts)	4–6	38.9 ± 16.0
Helm & Mead (2004)	Point method (40 pts)	6	79.2 ± 47.7
Everson & Clarke (1987)	Point method	6	31.7 ± 11.3

Rapid, landscape scale responses in riparian tundra vegetation to exclusion of small and large mammalian herbivores

Virve Tuulia Ravolainen*, Kari Anne Bråthen, Rolf Anker Ims, Nigel Gilles Yoccoz, John-André Henden, Siw T. Killengreen

Basic and Applied Ecology 12 (2011) 643–653



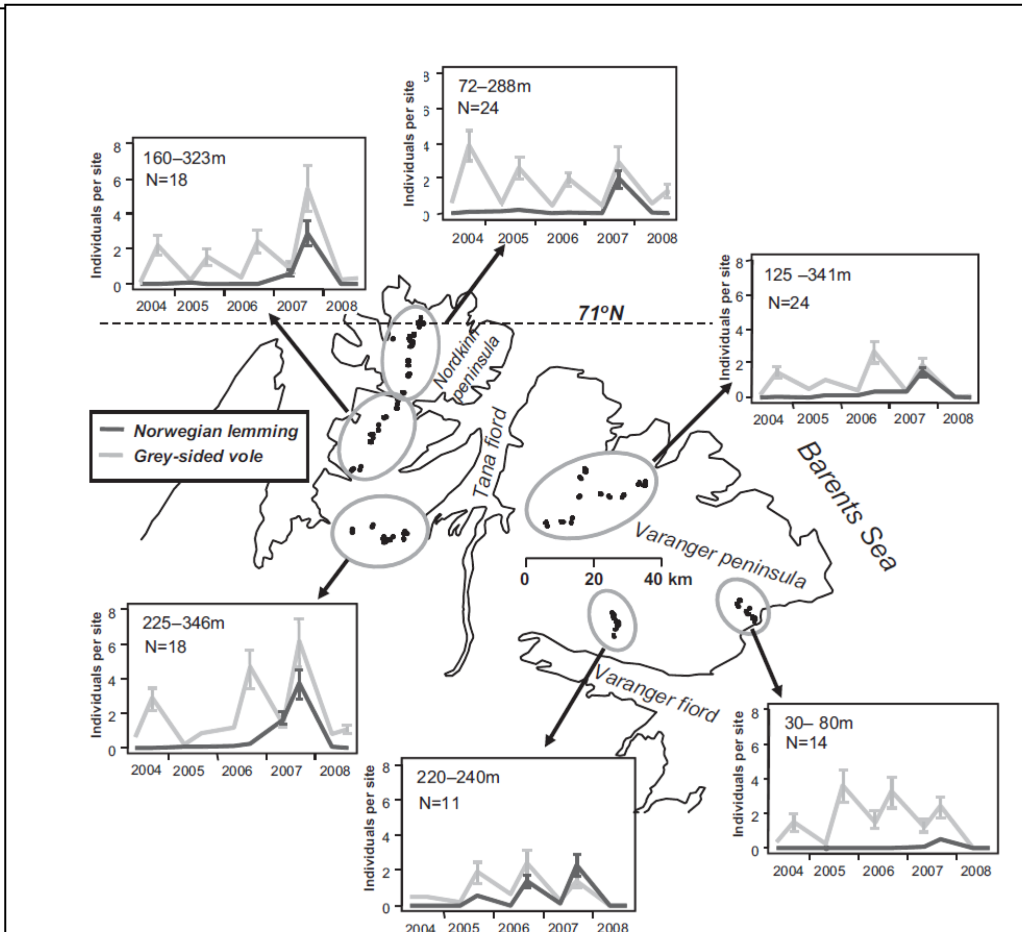


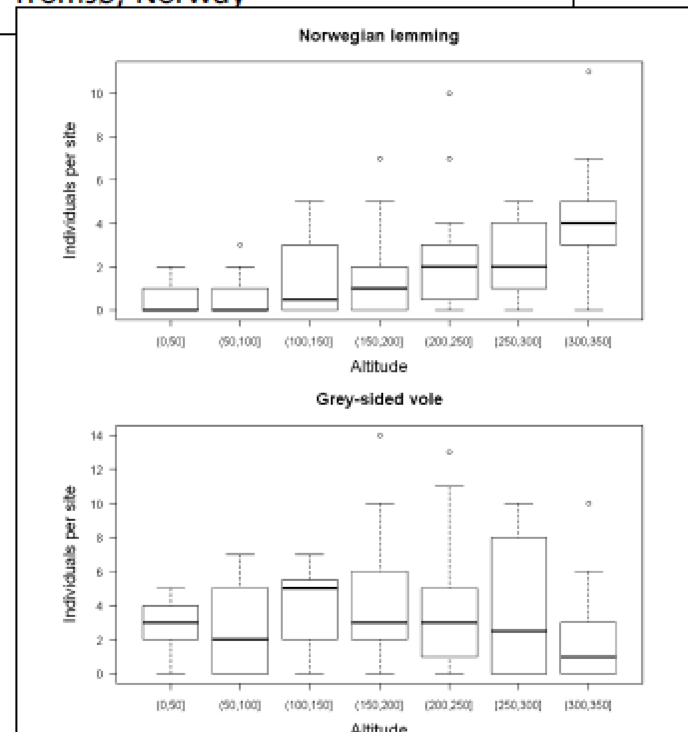
1970–1974 | PNAS | February 1, 2011 | vol. 108 | no. 5

Determinants of lemming outbreaks

Rolf A. Ims[1], Nigel G. Yoccoz, and Siw T. Killengreen

Department of Arctic and Marine Biology, University of Tromsø, N-9037 Tromsø, Norway

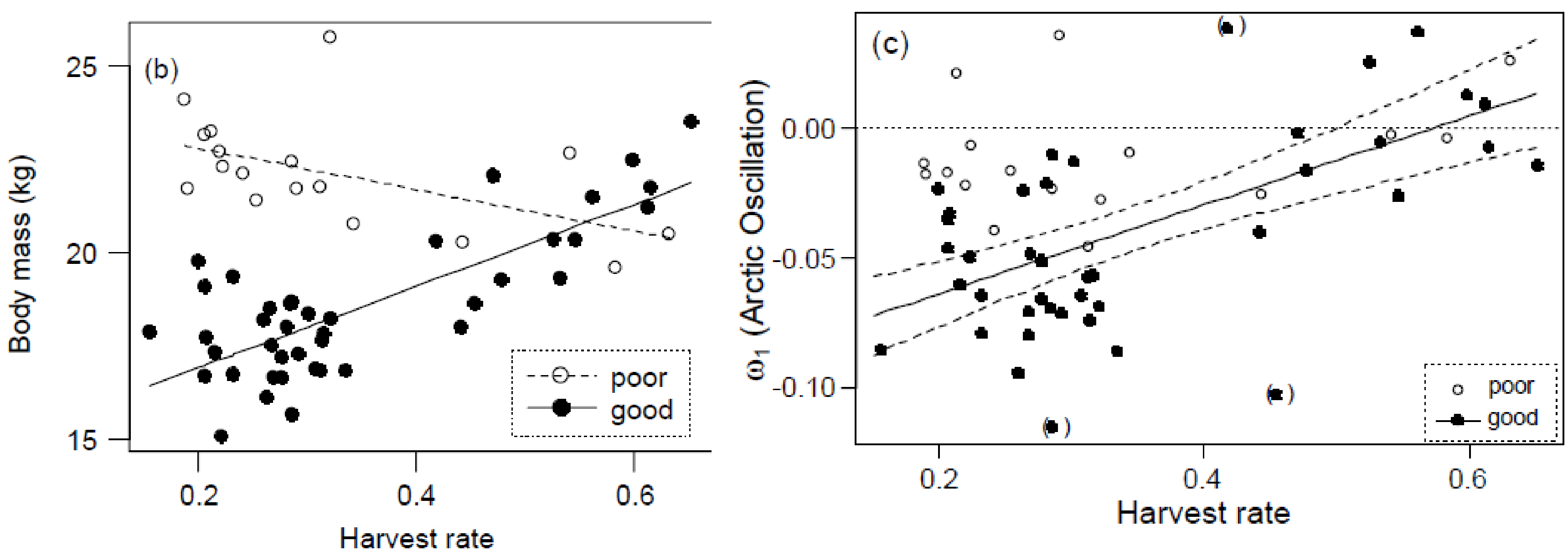




What regulate and limit reindeer populations in Norway?

Torkild Tveraa, Per Fauchald, Nigel Gilles Yoccoz, Rolf Anker Ims, Ronny Aanes and Kjell Arild Høgda

Oikos 116: 706–715, 2007



Journal of Animal Ecology 2008, **77**, 257–264 doi: 10.1111/j.1365-2656.2007.01339.x

Climate change and outbreaks of the geometrids *Operophtera brumata* and *Epirrita autumnata* in subarctic birch forest: evidence of a recent outbreak range expansion

Jane U. Jepsen*, Snorre B. Hagen, Rolf A. Ims and Nigel G. Yoccoz

PROCEEDINGS OF THE ROYAL SOCIETY B

Phase-dependent outbreak dynamics of geometrid moth linked to host plant phenology

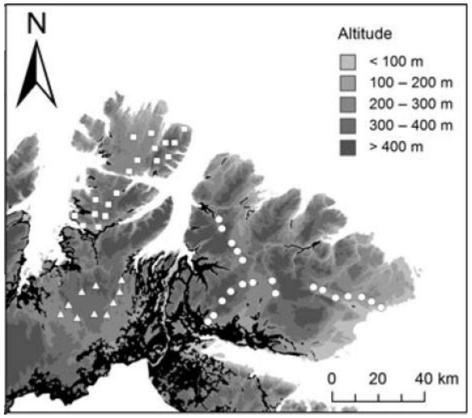
Jane U. Jepsen[1,2,*], Snorre B. Hagen[1], Stein-Rune Karlsen[3] and Rolf A. Ims[1]

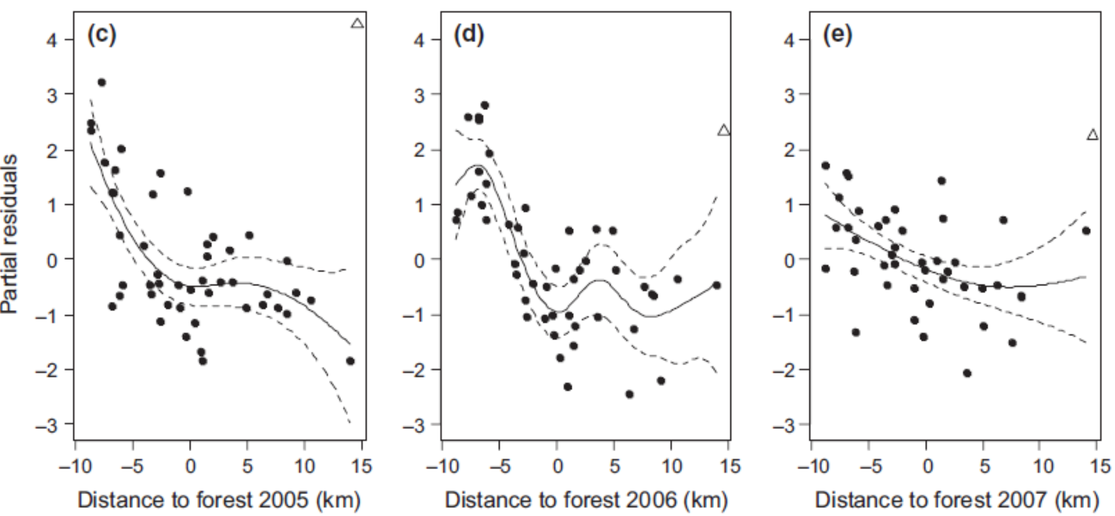
Diversity and Distributions, (Diversity Distrib.) (2011) 1–12

BIODIVERSITY RESEARCH

How ecological neighbourhoods influence the structure of the scavenger guild in low arctic tundra

Siw T. Killengreen*, Elise Strømseng[†], Nigel G. Yoccoz and Rolf A. Ims

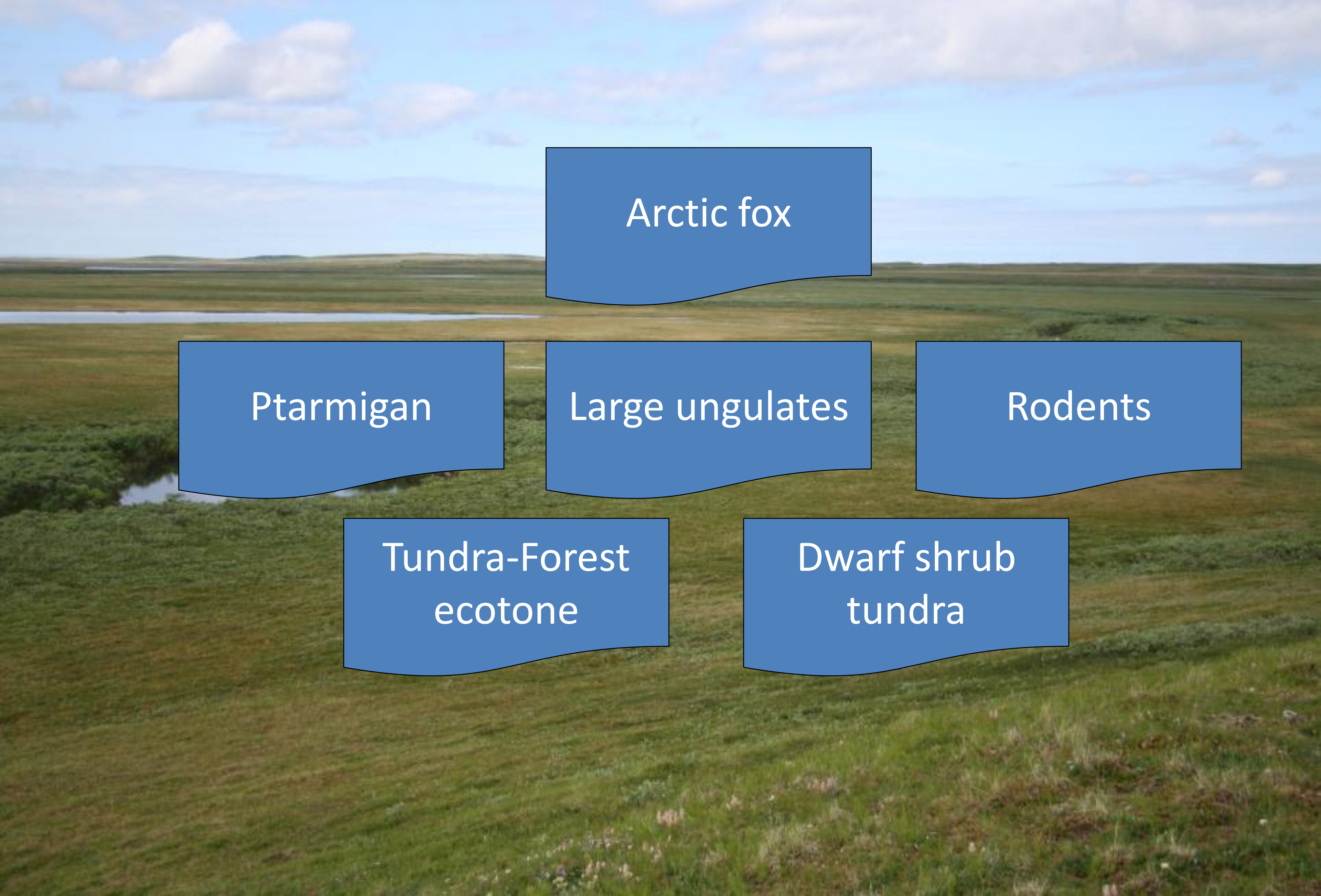




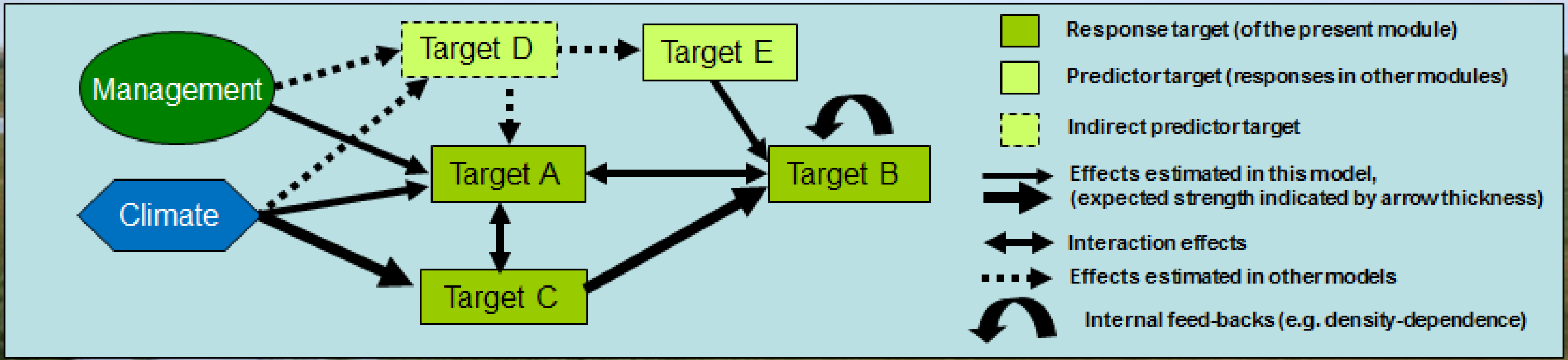
FRAM - High North Research Centre for Climate and the Environment

Science plan for COAT:
Climate-ecological Observatory for Arctic Tundra

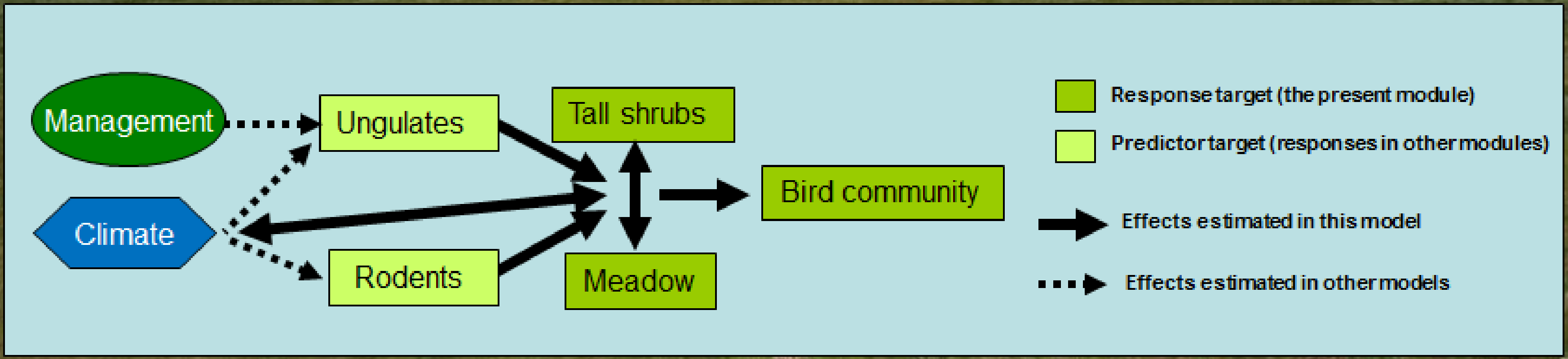
Food web modules in low-arctic Varanger



The choice of response and predictor targets are based on conceptual models of expected climate impact on key components of the food web
= climate impact path models

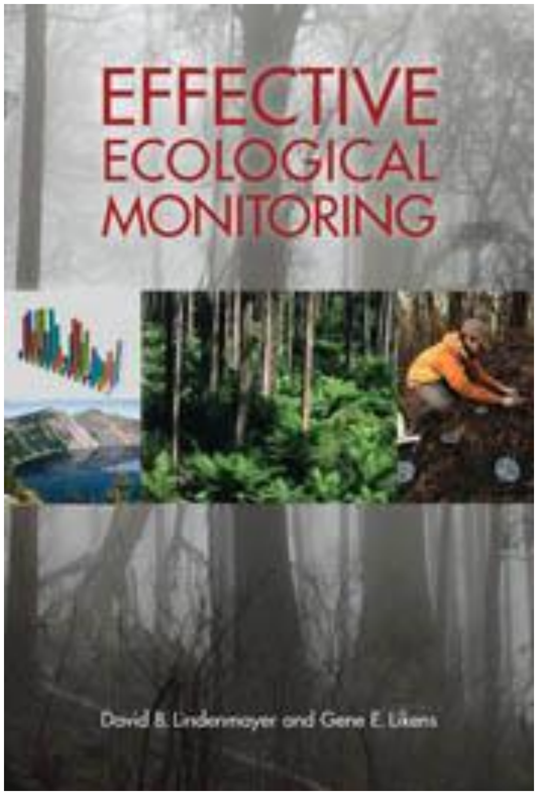


Tall shrub tundra Varanger



Adaptive monitoring: a new paradigm for long-term research and monitoring

David B. Lindenmayer[1] and Gene E. Likens[1,2]



Monitoring of biological diversity in space and time

Nigel G. Yoccoz, James D. Nichols and Thierry Boulinier

Ecological Monitoring

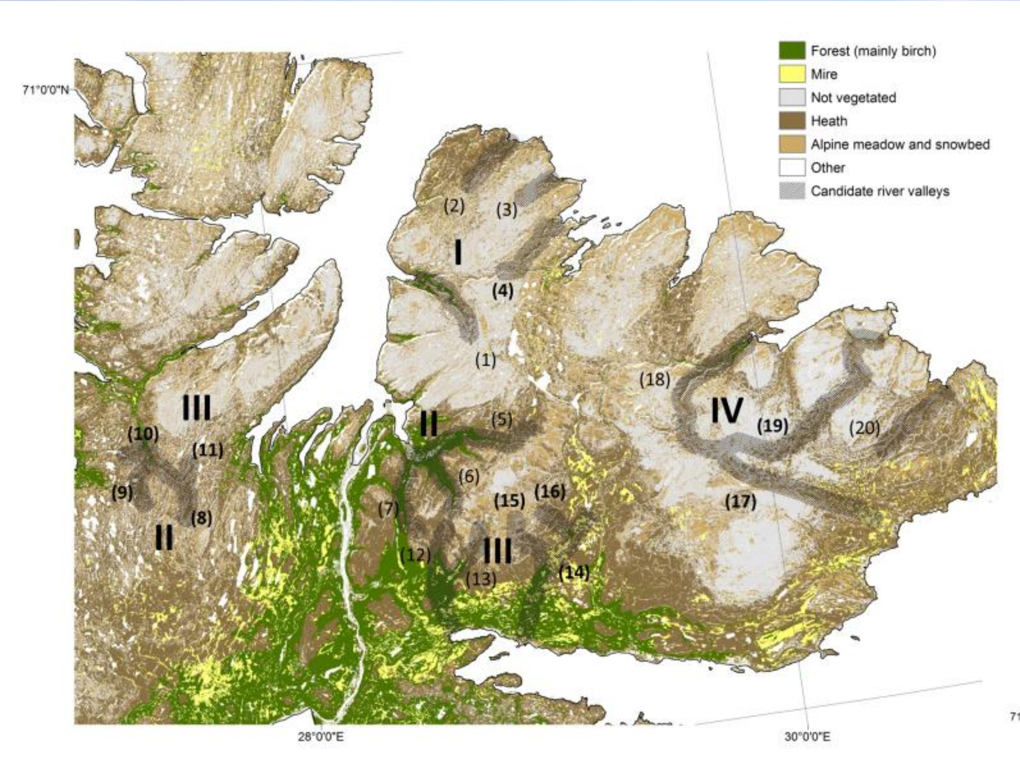
Nigel Gilles Yoccoz, *University of Tromsø, Tromsø, Norway*

Encyclopedia Life Sciences 2012

A list of specific state variables required to address the climate impact predictions are formulated for each target

Target	State variable	Interval	Methods (references)	Module relevance*
Forest/Tall shrubs	Shrub and tree sapling abundance	1 yr	Survey transects along climatic gradients (Ravolainen et al. in prep.). Experimental establishment of shrub and tree saplings. Long-term herbivore exclosures (Ravolainen et al., 2011).	2.2, 2.3, 2.4, 2.5, 2.6
Tall shrub tundra	Surface reflectance	1 yr	Summer/winter albedo for major contrasts in configuration of tall shrubs. Near infrared spectroscopy (NIRS) (Foley et al., 1998)	2.3
Meadows	Meadow phase. Functional group abundance, phenology, plant nutrient content, life history stage of silicate rich grasses	1 yr (2005)	Survey transects (Ravolainen et al. in prep). Long-term exclosures (Ravolainen et al., 2011). Abundance estimates by point intercept methods (Jonasson, 1988; Bråthen & Hagberg, 2004) Nutrient contents by NIRS	2.3
Plant communities	Plant community extent and configuration: tall shrub vs. meadows, dwarf shrub heath vs. snowbeds	1 yr (2006)	Survey transects along climatic gradients. Vegetation height, patch size and patch density (Ravolainen et al., 2010; Henden et al., 2011a Ravolainen et al. in prep.)	2.2, 2.3, 2.4, 2.5, 2.6
	Plant species abundance and community composition: forest, tall shrubs, meadows, dwarf shrub heath, snowbeds	1 yr (2005)	Survey transects along climatic gradients. Abundance estimates by point intercept methods (Ravolainen et al., 2010)	2.2, 2.3, 2.4, 2.5, 2.6
	Norwegian lemming winter grazing impact and moss regrowth in snow beds	1 yr (2009)	Abundance estimates by point intercept methods inside and outside of lemming exclosures (Ravolainen et al., 2011).	2.4
Insect defoliators	Abundance and species of Geometrid moth larvae in birch and dwarf birch	1 yr	Survey transects along climatic gradients (forest to tundra) (Ims et al., 2004)	2.2
Insect communities	Community composition and abundance of saproxylic insects	1 yr	Survey transects along climatic gradients (forest to tall shrub tundra). Flight interception traps (Sverdrup-Thygeson & Birkemoe, 2009)	2.2, 2.3
	Etc.			

A hierarchical monitoring design with three levels



Intensive: targets with rapid reponse to climate impacts and/or large temporal variability

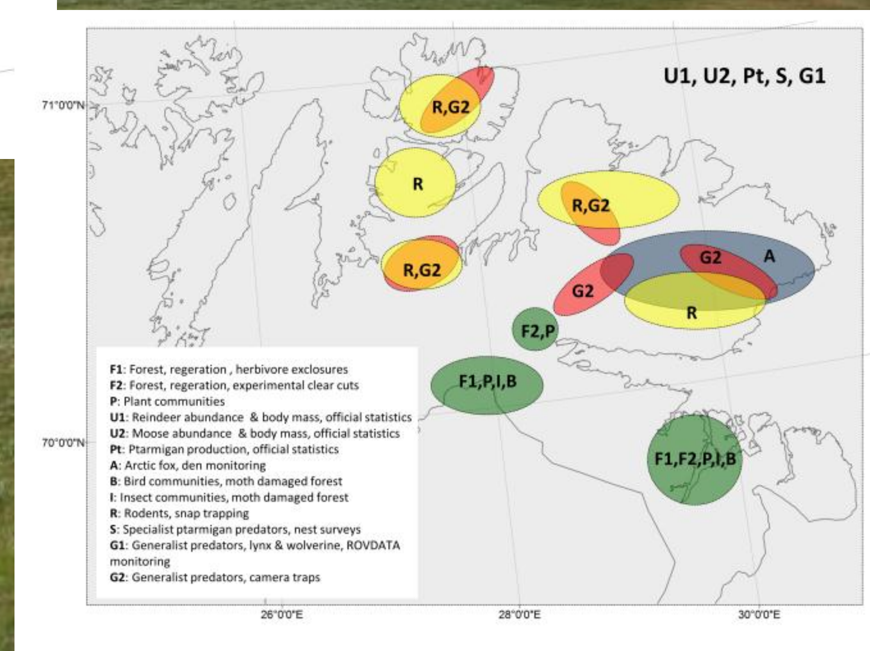
Extensive: targets with slower response

Regional: targets with an inherent design given by their distibution and/or existing time series

River valleys are protruding frontiers from sub-arctic forest into the tundra

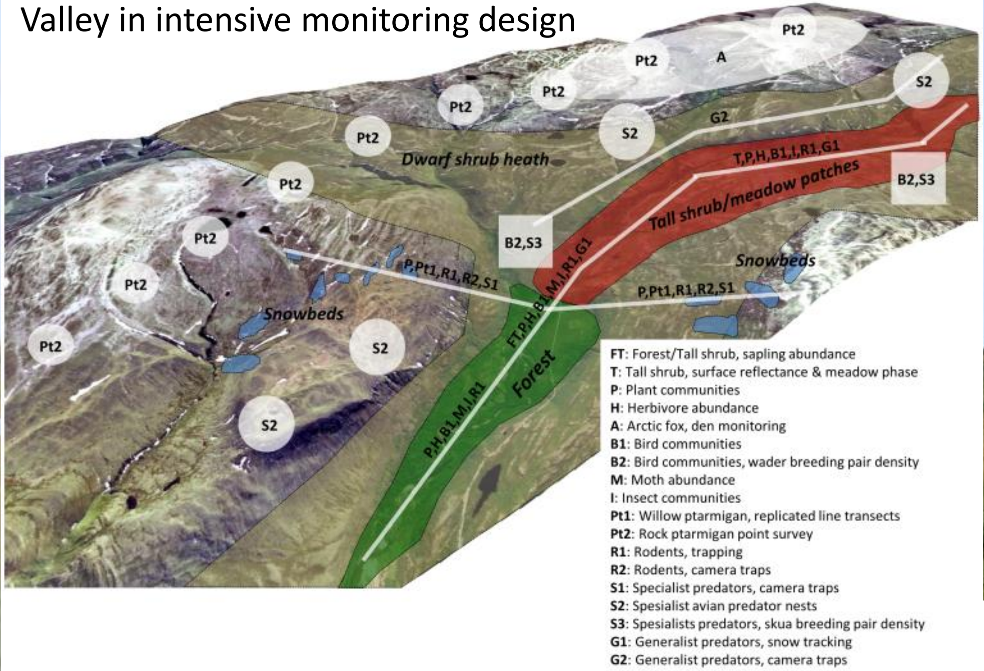
Climatically benign

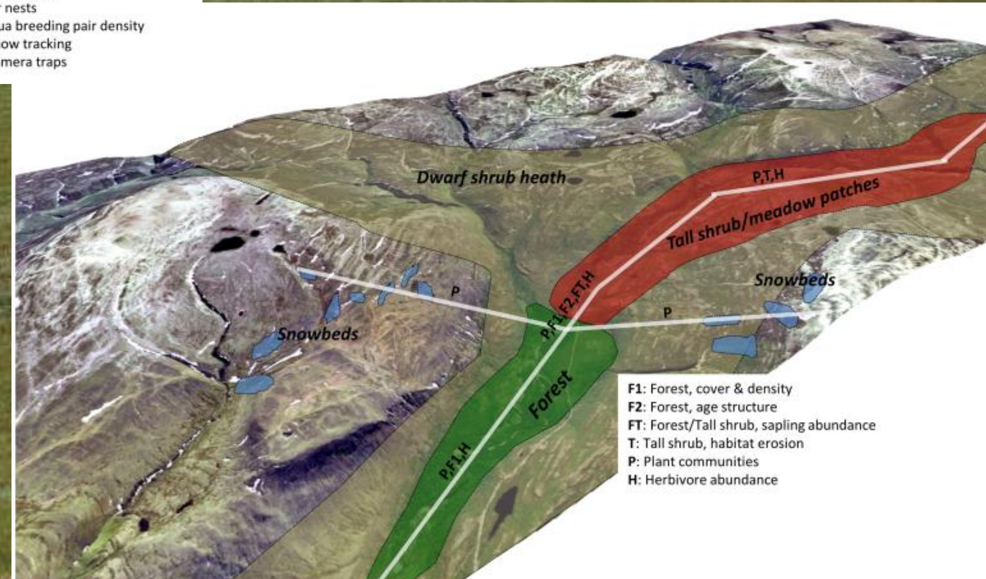
Hot-spots for climate-driven changes in vegetation zonation



Within-valley design

Valley in intensive monitoring design





Valley in extensive monitoring design

MOLECULAR ECOLOGY

Molecular Ecology (2012) doi: 10.1111/j.1365-294X.2012.05545.x

FROM THE COVER

DNA from soil mirrors plant taxonomic and growth form diversity

N. G. YOCCOZ,* K. A. BRÅTHEN,* L. GIELLY,† J. HAILE,‡§ M. E. EDWARDS,¶ T. GOSLAR,** H. von STEDINGK,¶ A. K. BRYSTING,†† E. COISSAC,† F. POMPANON,† J. H. SØNSTEBØ,†† C. MIQUEL,† A. VALENTINI,† F. de BELLO,†,‡‡ J. CHAVE,§§ W. THUILLER,† P. WINCKER,¶¶ C. CRUAUD,¶¶ F. GAVORY,¶¶ M. RASMUSSEN,‡ M. T. P. GILBERT,‡ L. ORLANDO‡ C. BROCHMANN,††[1] E. WILLERSLEV,‡[1] and P. TABERLET,†[1]