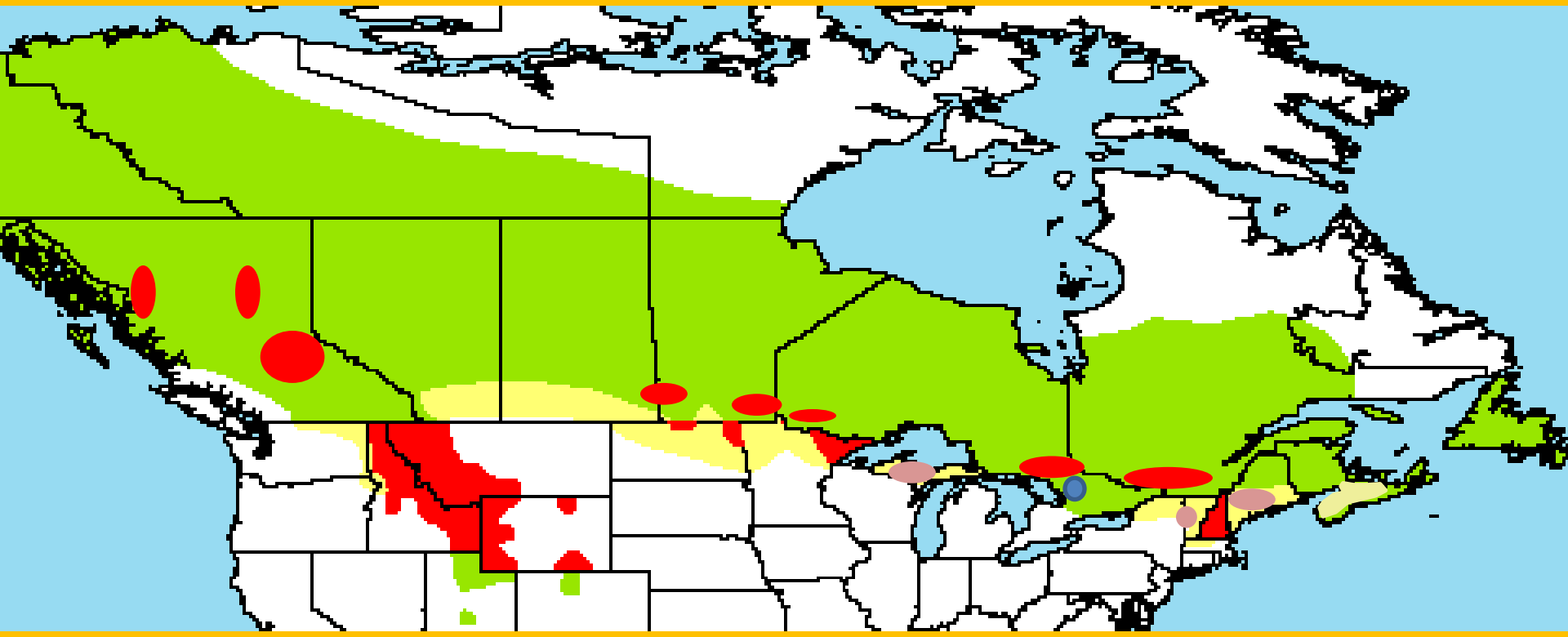
Status of Moose in Minnesota

Moose Advisory Committee
DNR Research and Management Plan
Hunting season closed 2013
Species of Special Concern
Ongoing Research Projects

Moose populations – a broader perspective



New Hampshire – Winter ticks

Quebec – Winter Ticks?

North Dakota – Overharvest / disease

Minnesota – “Tipover” syndrome, Low calf survival, habitat

Michigan, Vermont – not growing as fast as expect

Manitoba – Probably overharvest some populations

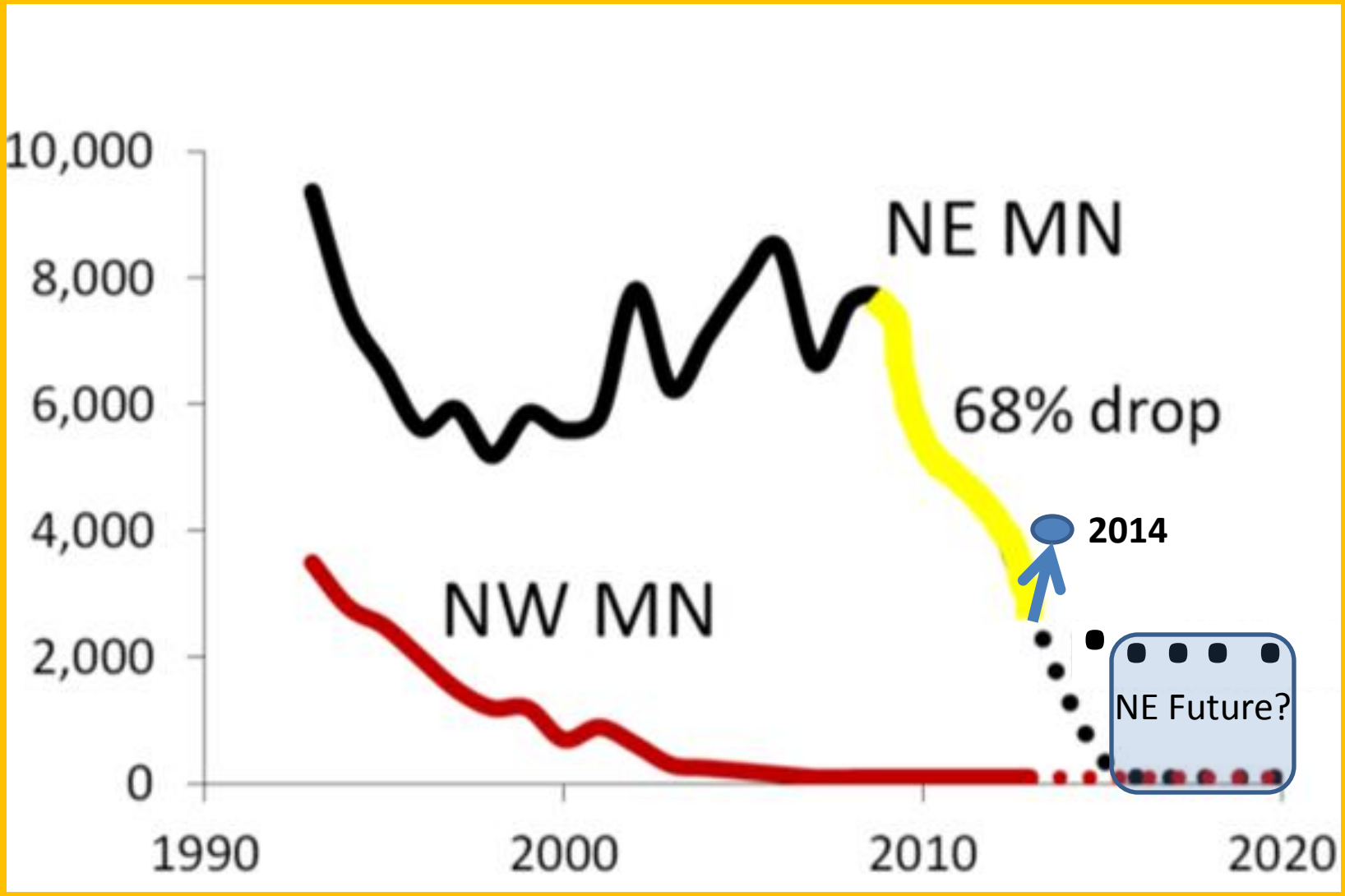
Wyoming – Carotid artery worm (?), Predators

Montana – ??

British Columbia – Bark beetles/climate/Visibility to hunters

Idaho – ??

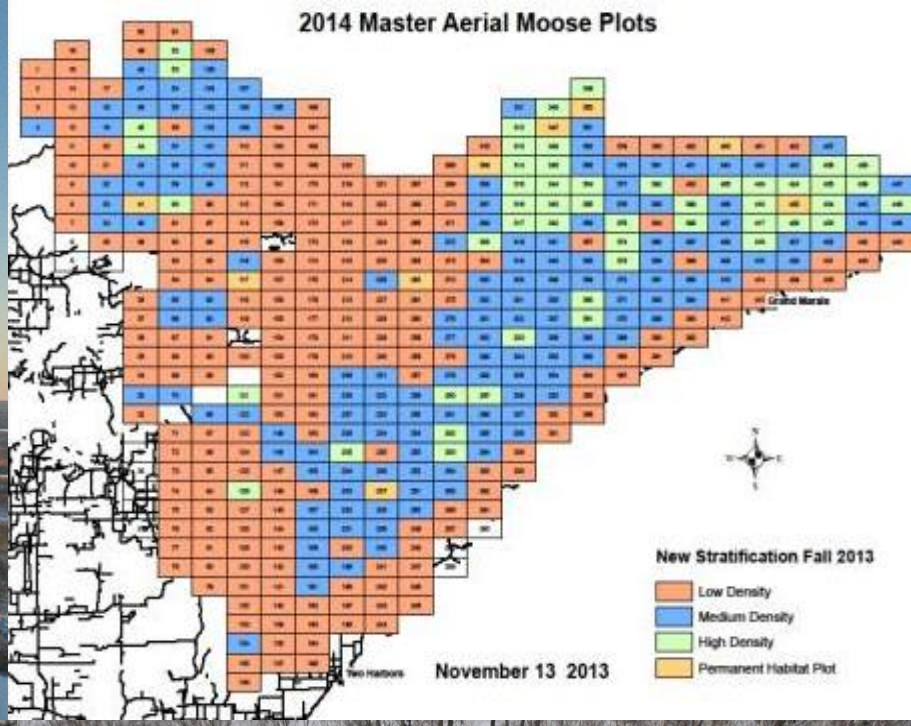
Minnesota Moose Population



Windels, McCann, Fieberg

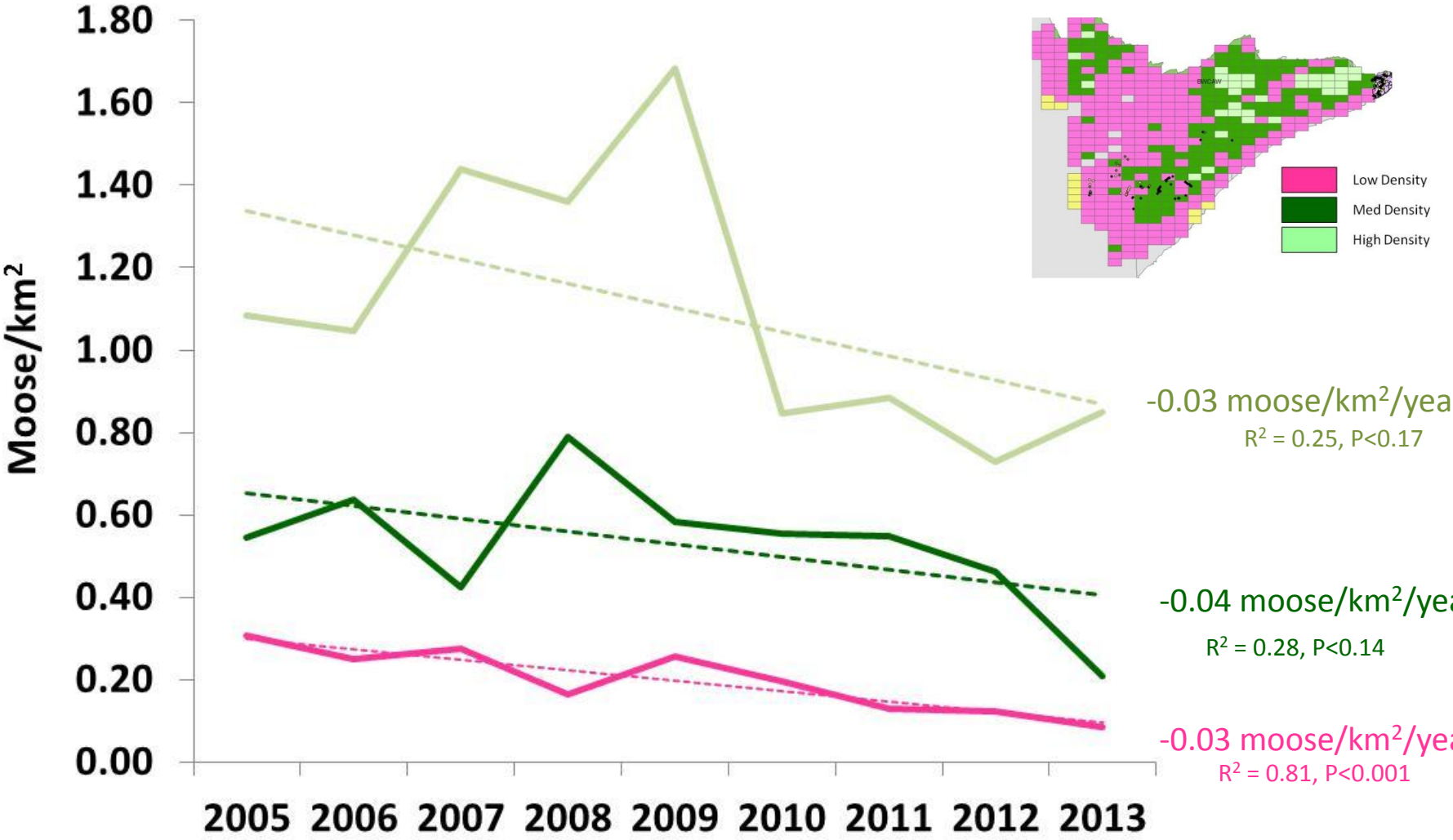
Derived from Lenarz et al. 2010 data

Annual aerial moose survey

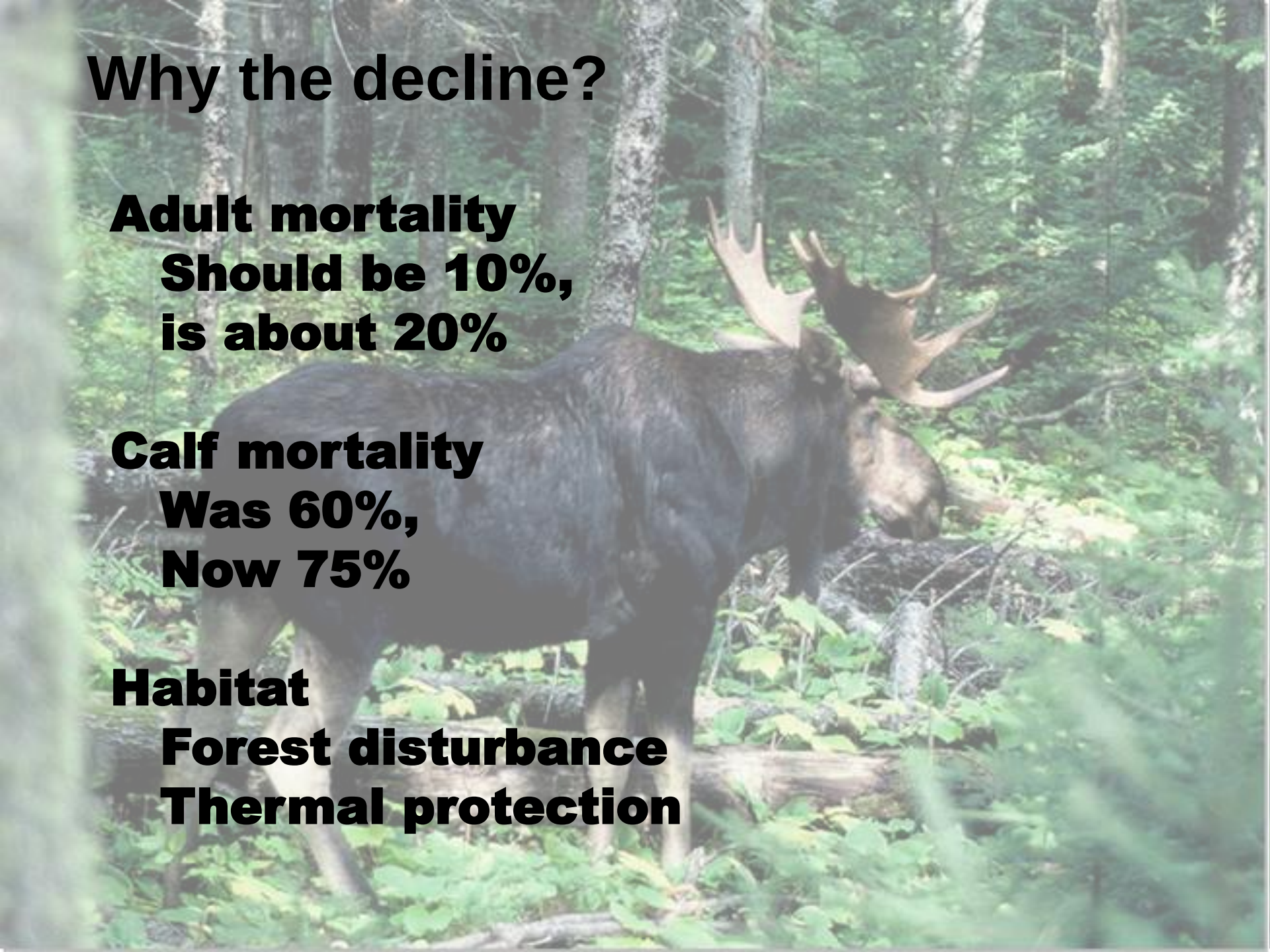


DelGiudice

Rates of Decline Across Moose Density Strata



Windels, Edwards



Why the decline?

Adult mortality
- **Should be 10%,**
- **is about 20%**

Calf mortality
- **Was 60%,**
- **Now 75%**

Habitat
- **Forest disturbance**
- **Thermal protection**

Adult Moose Mortality Project

Maintain sample size at 100 for 3 years

- 2013: 111 moose (84 females, 27 males)
- Over 30% “thin” or “very thin”
- Pregnancy rate 75%, was 83% in 2002

Assess body condition at capture

Assess nutritional condition via snow urine

Screen for diseases. Exposure to:

- WNV (16%), no EEE, MCF (50%)
- Borreliosis (23%), *Leptospira* sp.(12%)
- Nematodes & tapeworms (37%)

Microfilarial infections, high tick loads

Field investigation within 24 hours of death

Extract entire intact carcass if possible

Cause of death in Adult moose

Mortalities to date = 22/107 (20%)

- **8 wolf kills – Predisposed in 3**
- **2 wolf injury / 2º lethal infection**
- **10 health-related**
  - **1 brainworm in brain and eye**
  - **3 winter tick**
  - **1 liver fluke / 2º lethal infection**
  - **5 unknowns – results pending**
- **1 trauma – compound fracture and subsequent septicemia**
- **1 unknown. Collar only, no carcass**

3 moose euthanized

8 carcasses removed intact and full necropsies at UM-VDL

Response time < 24 hours in 16 of 22 moose deaths

Tick Collection

Sample Habitat Types:
Mixed wood
Conifer
Deciduous
Bog
Regenerating/Cut

Total 48 sites (Ticks 52%)

21 bed sites (Ticks 33%)

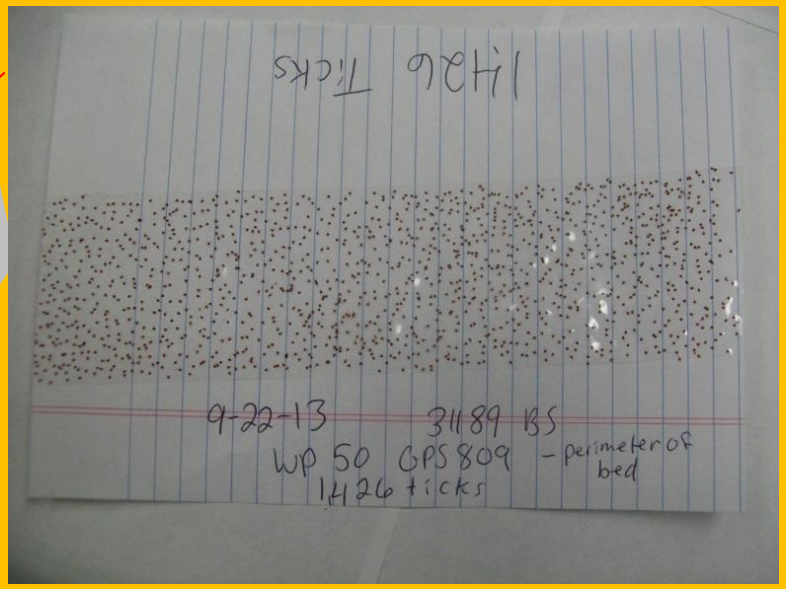
27 foraging paths (Ticks 66%)

Tick abundance (28,730 ticks)

Bed sites 21%

Foraging paths 79%

Terry, Moen

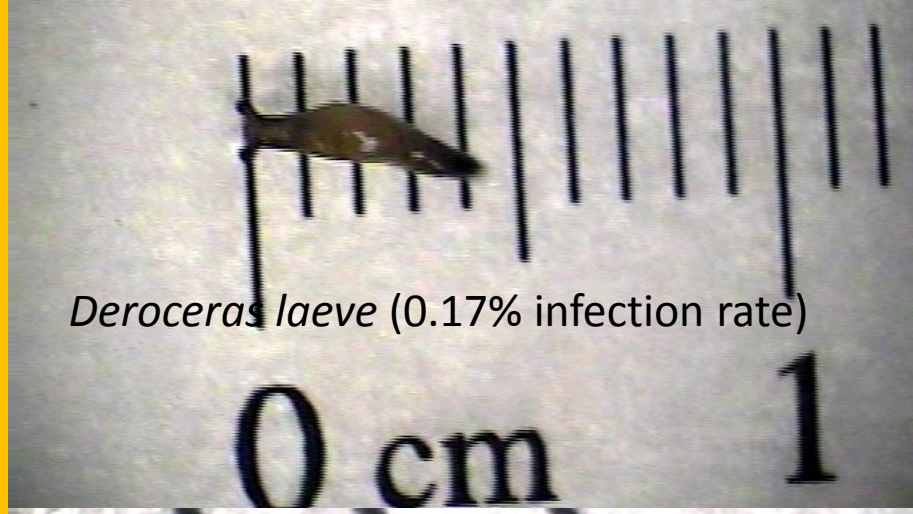


Prevalence of *P. tenuis* in gastropods of Northeastern Minnesota

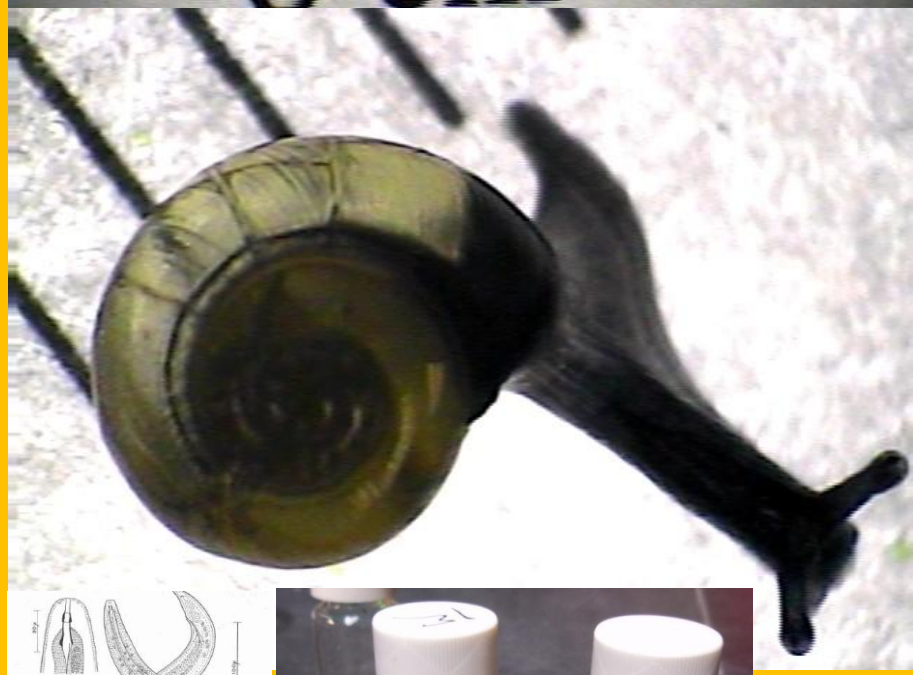
1,449 Snails, 2,301 Slugs

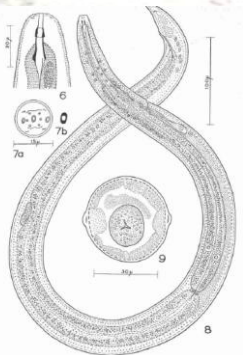
Hand Search on Shrubs

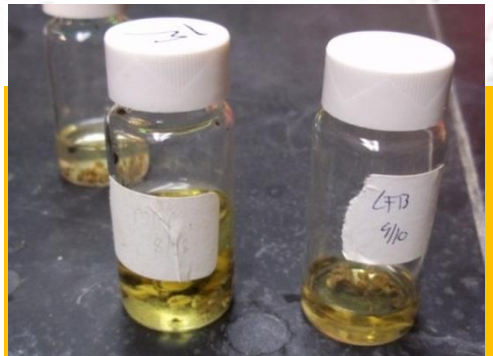
- 13 Slugs – 6 to 100 cm
- 3 Snails – 4 to 95 cm



Deroceras laeve (0.17% infection rate)

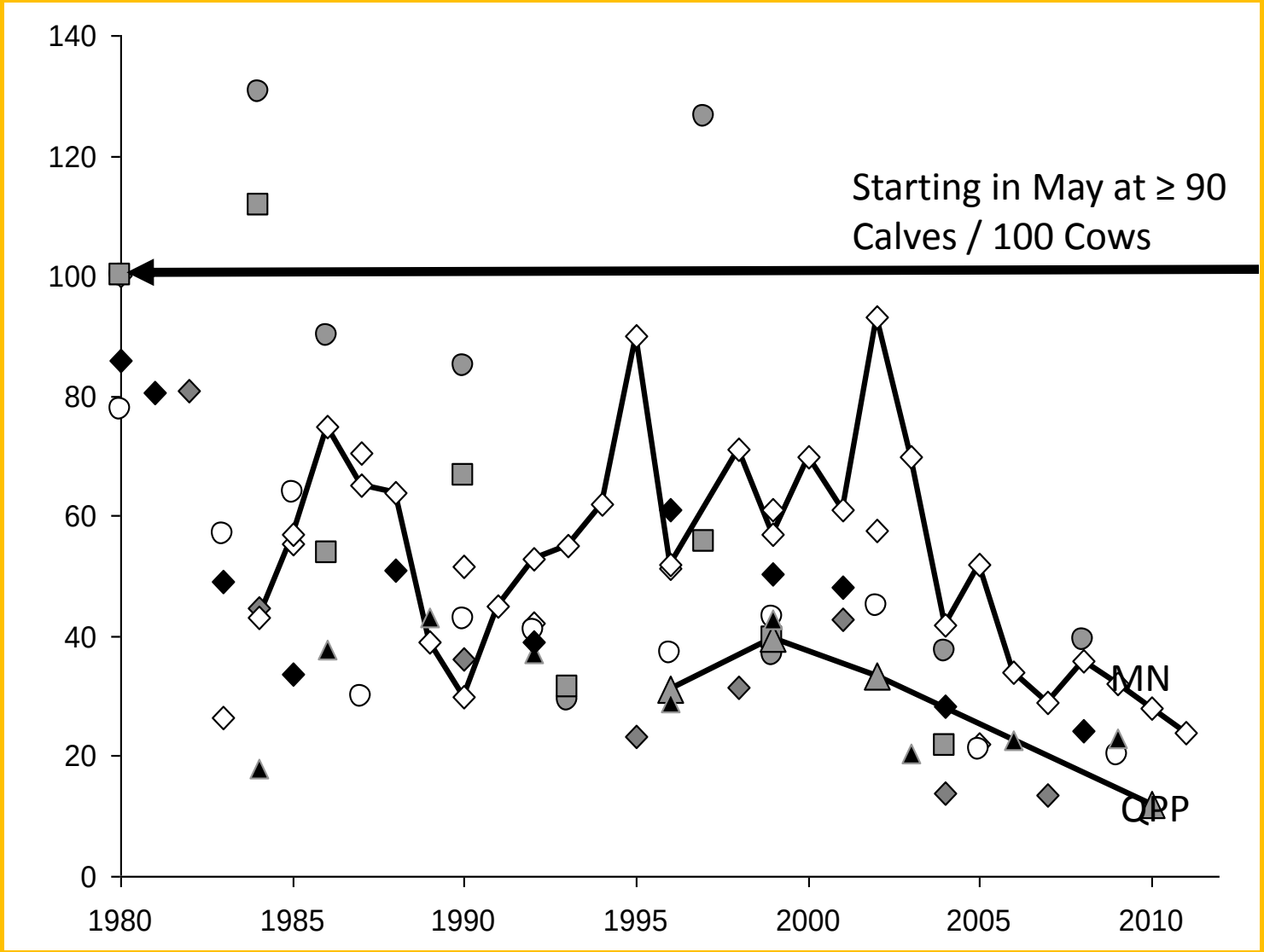




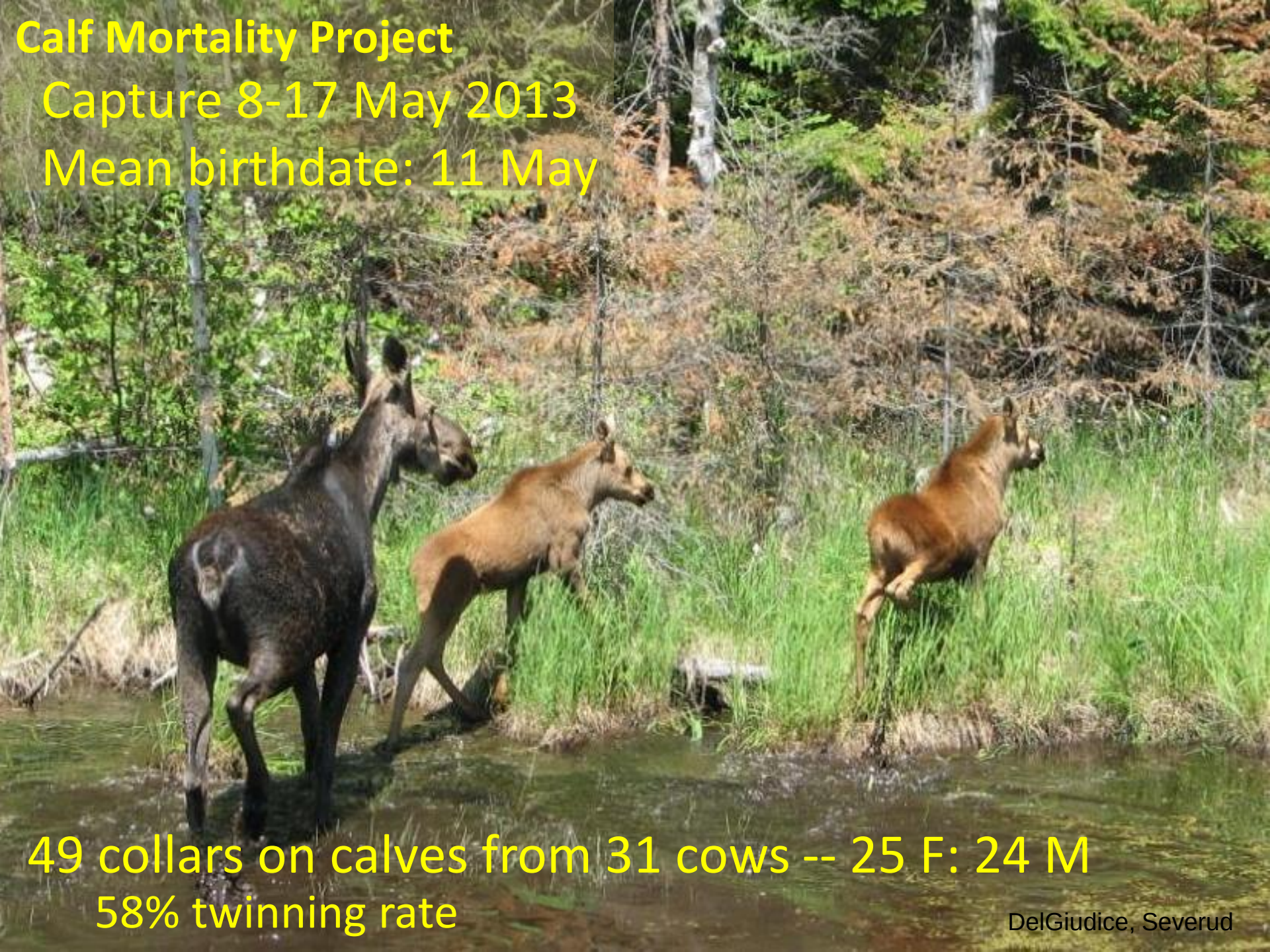


January Calf:Cow Ratio in MMU's in Ontario and MN

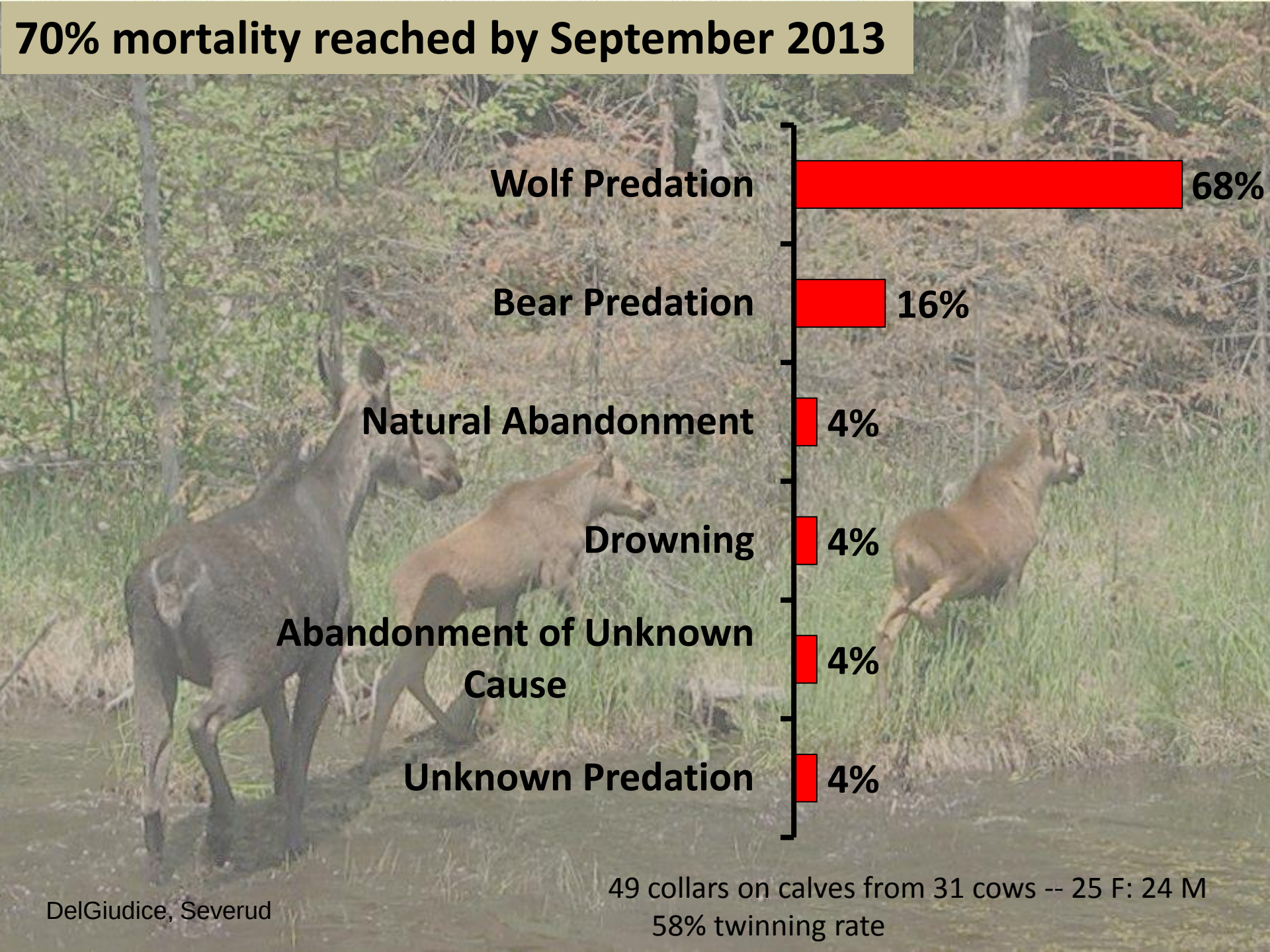
Calf:Cow Ratio in January



OMNR data


Calf Mortality Project
Capture 8-17 May 2013
Mean birthdate: 11 May
49 collars on calves from 31 cows -- 25 F: 24 M
58% twinning rate
DelGiudice, Severud

70% mortality reached by September 2013

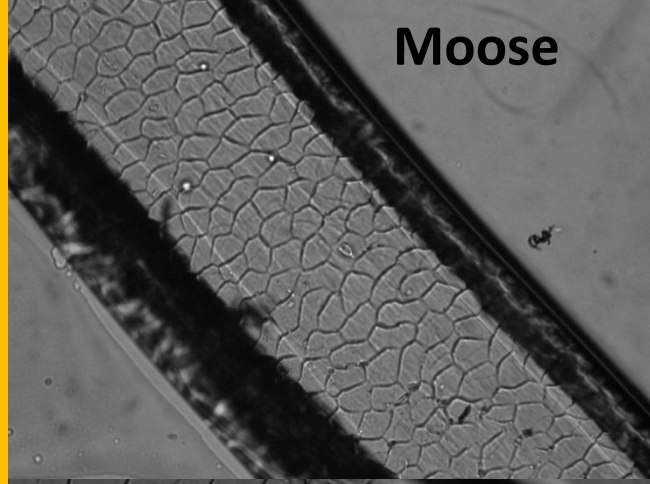


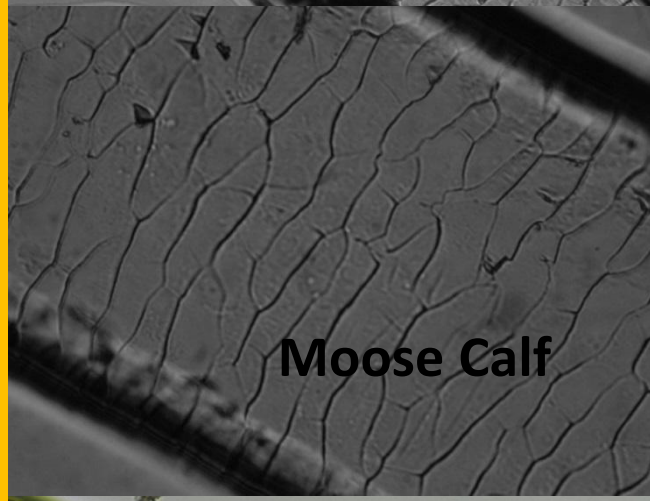
49 collars on calves from 31 cows -- 25 F: 24 M
58% twinning rate

DelGiudice, Severud

Wolf Scat Analysis

- Boil and wash scats
- Identify prey items
  - Color, length, diameter, shape
  - Microscope
- Convert based on body mass





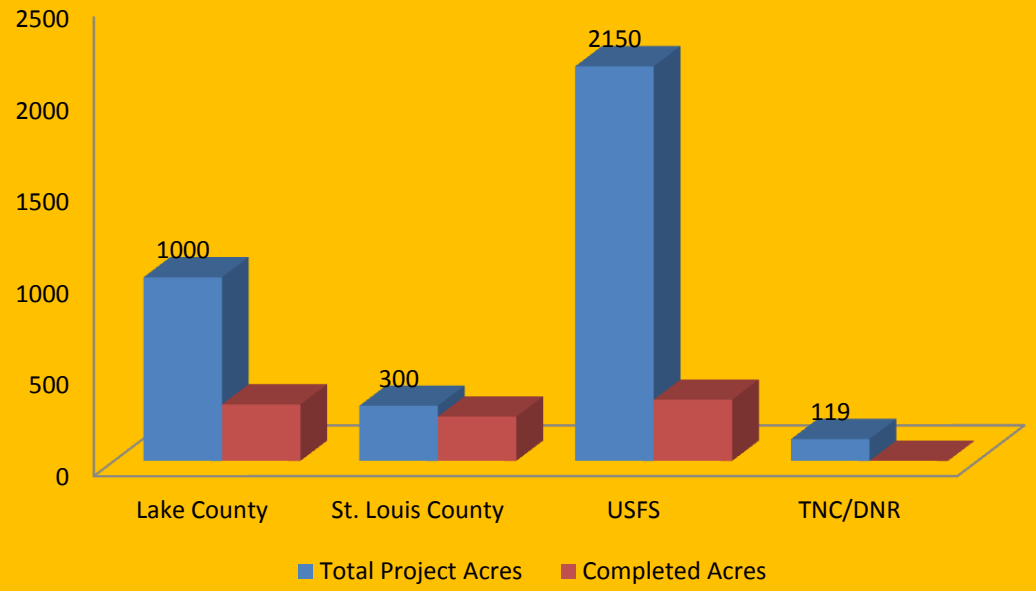
Ibrahim, Moen, Moore

Habitat Issues: Browse, Thermal refuge, Calving

MN Moose Habitat Collaborative

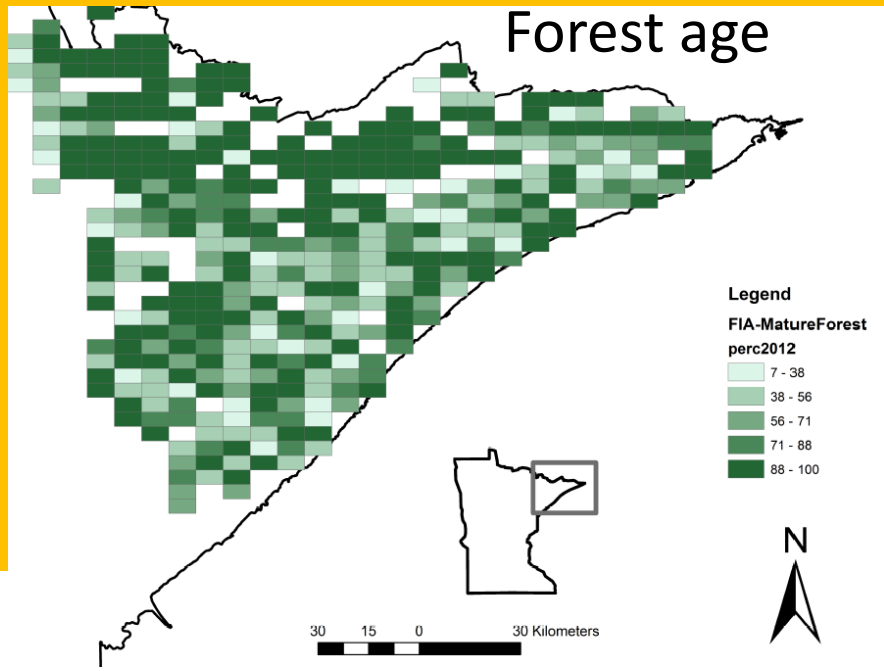
USFS Completed Shear Projects

Johnson

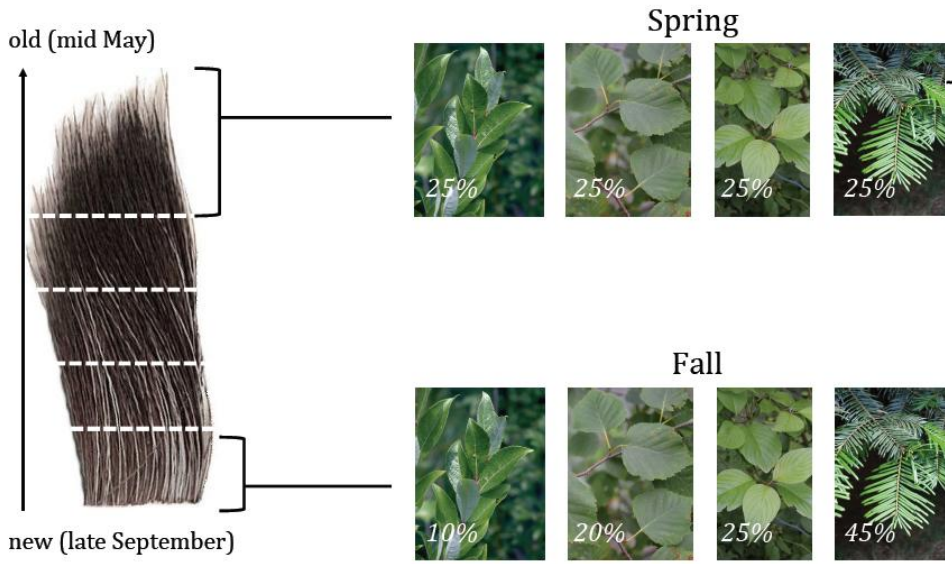


Changes in diet with season and location

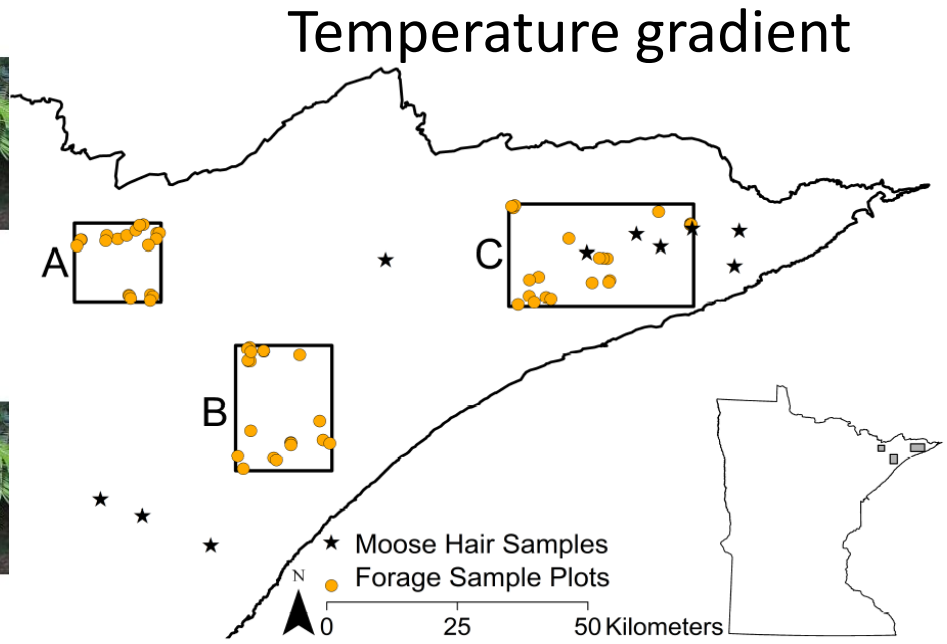
Temperature effects



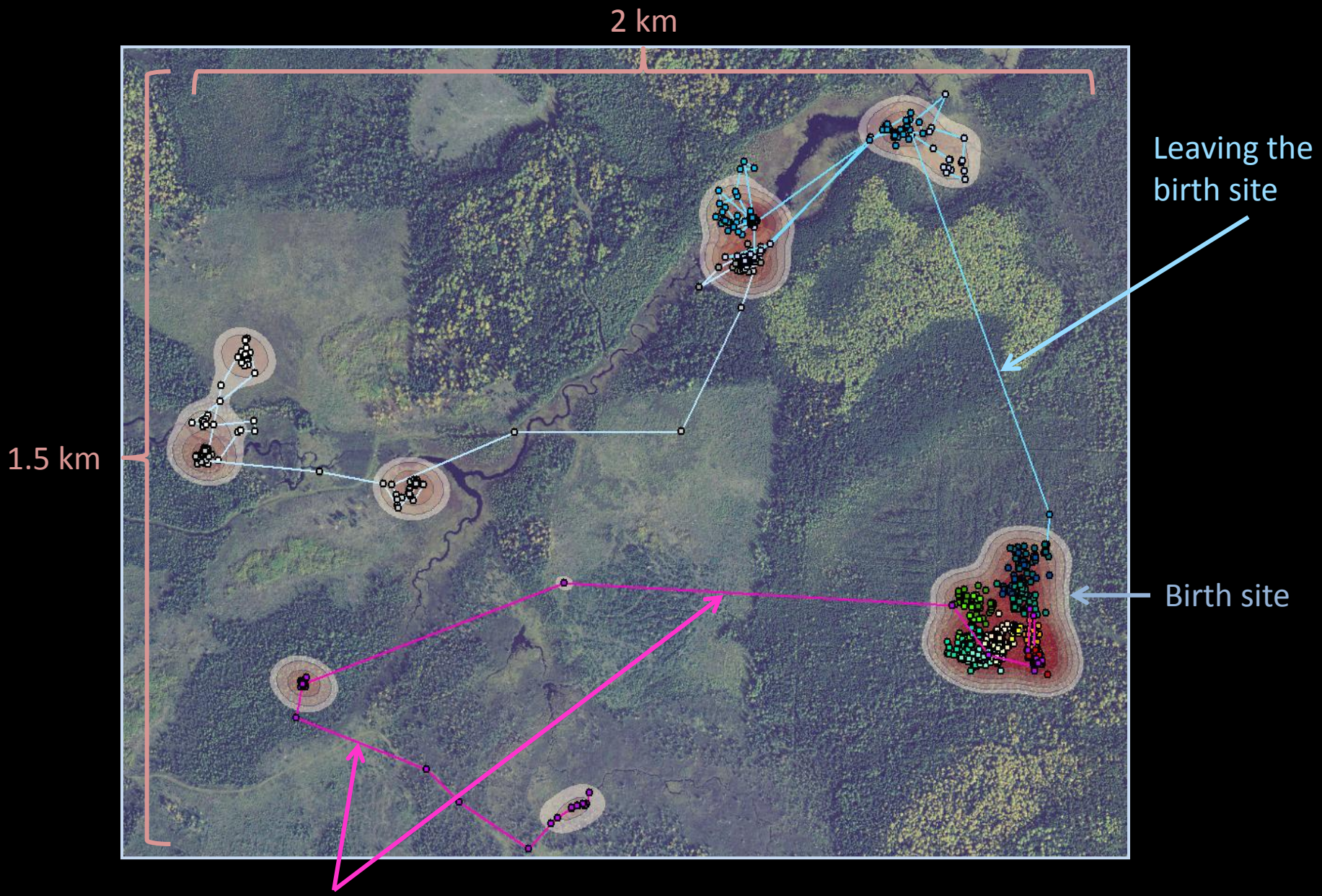
Stable isotope analysis



Forester, Berini



Birth Site Habitats

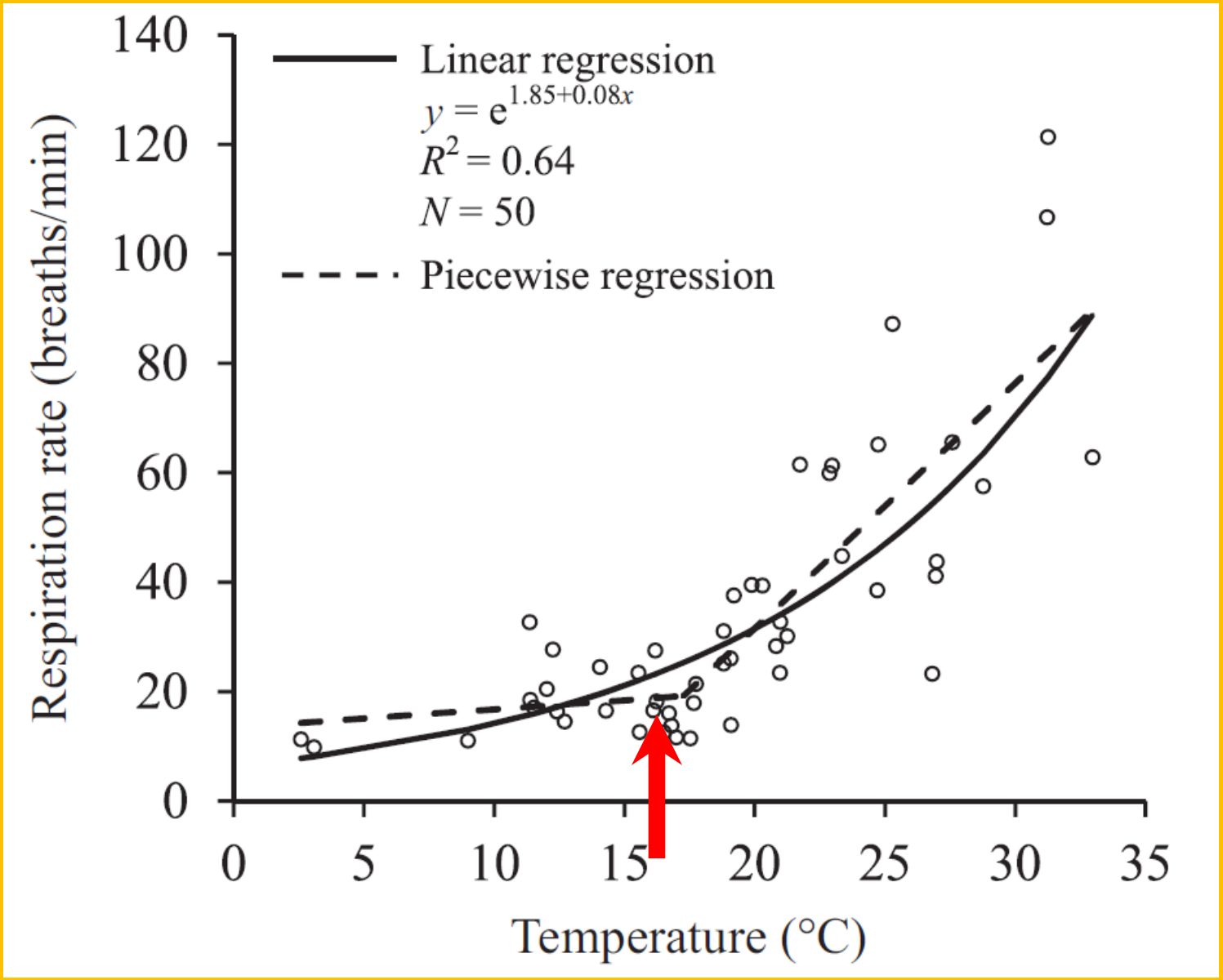


McGraw, Moen, Severud, DelGiudice

Thermal Refugia – Minnesota Zoo

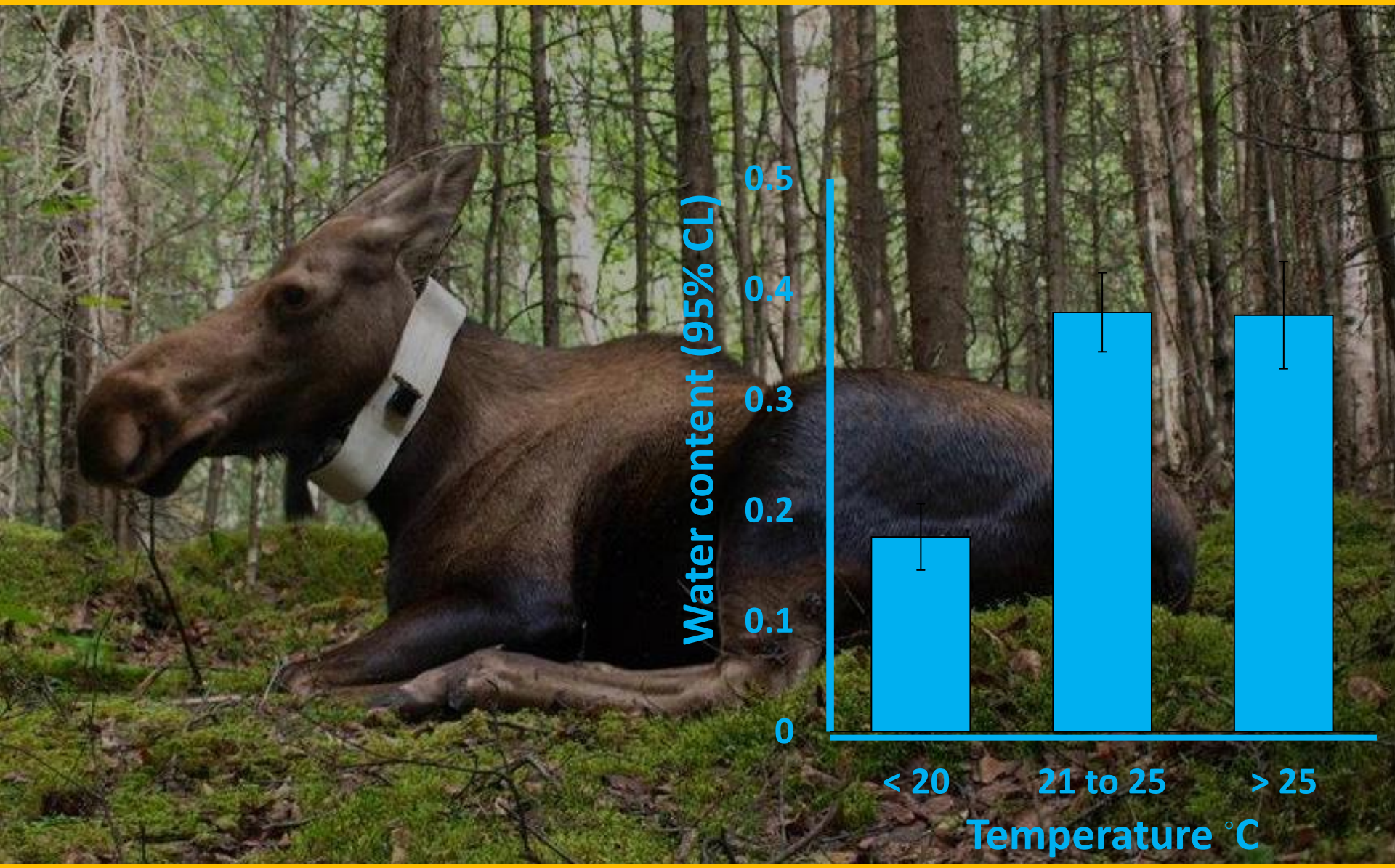
Thermal Refugia – Minnesota Zoo

Respiration rates increased at **17 °C** (63 °F)



McCann, Moen, Harris

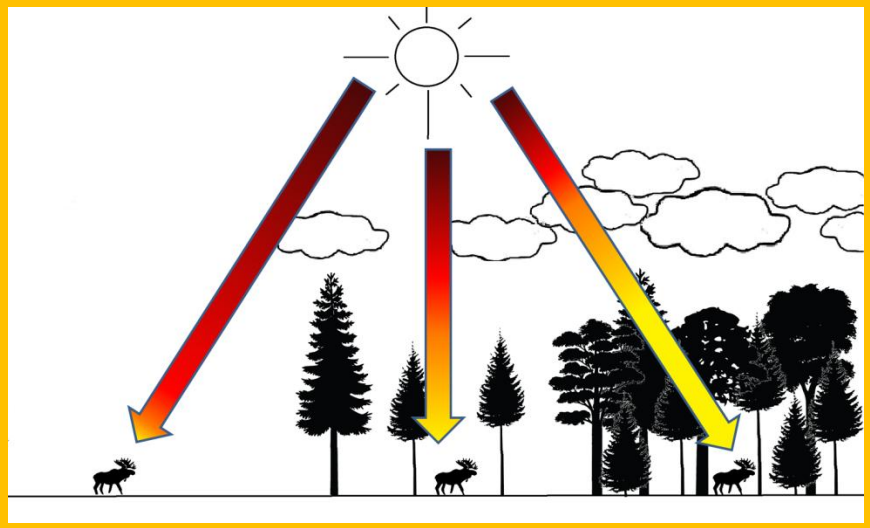
Selected higher substrate water content on warmer days



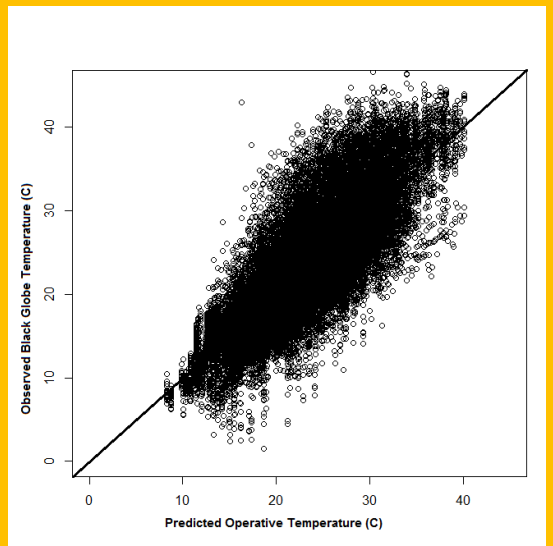
McCann, Moen, Harris

Canopy closure in day 81%, at night 38%
Use opening 3x more at night than during day

Modeling Operative Temperature

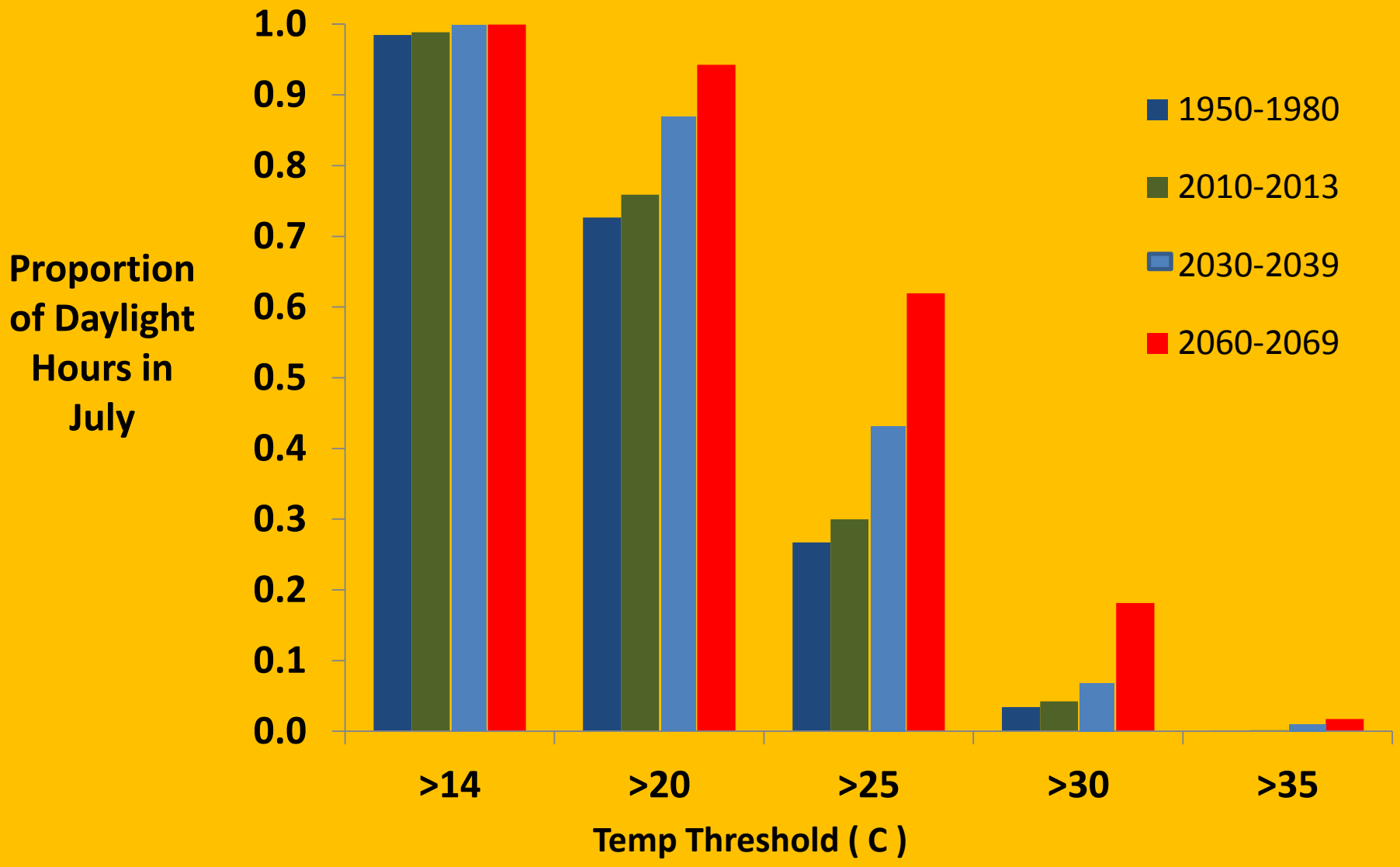


$$T_e = T_a + \frac{R_{abs} - \varepsilon_s \sigma T_a^4}{c_p(g_r + g_{Ha})}$$



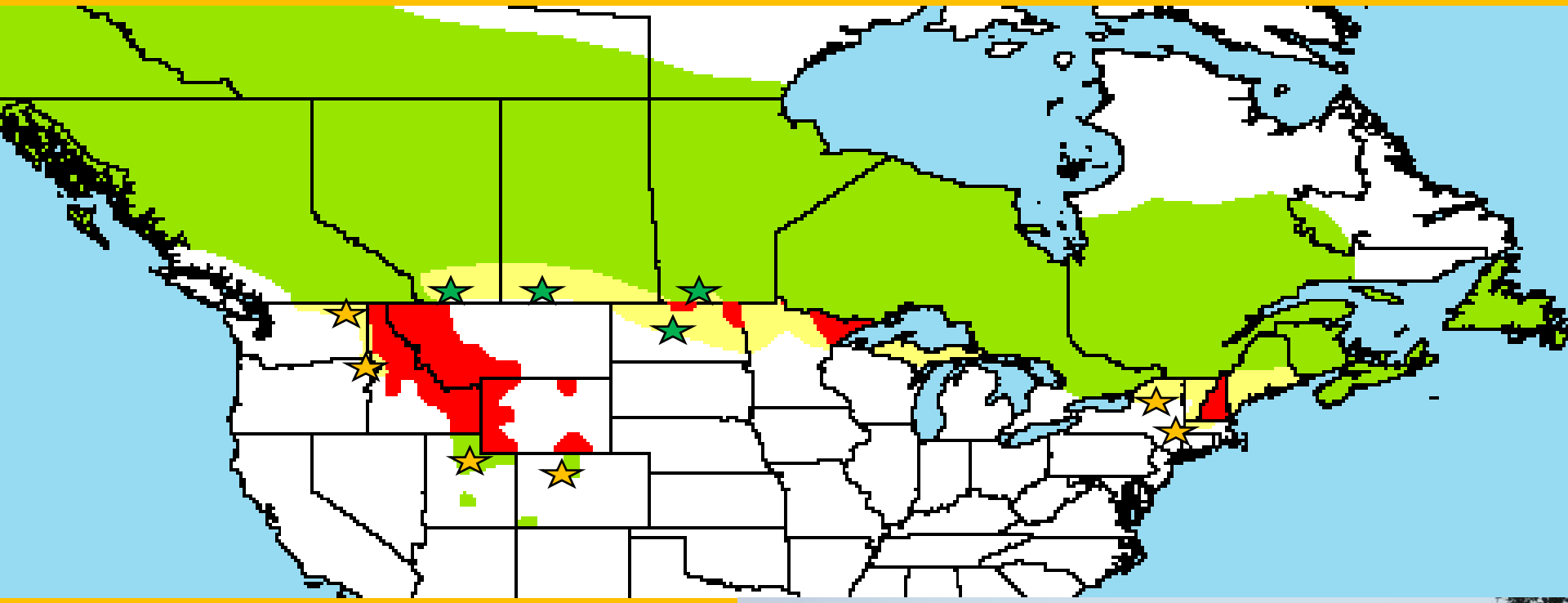
Olson, Windels, Moen

Implications of Climate Change



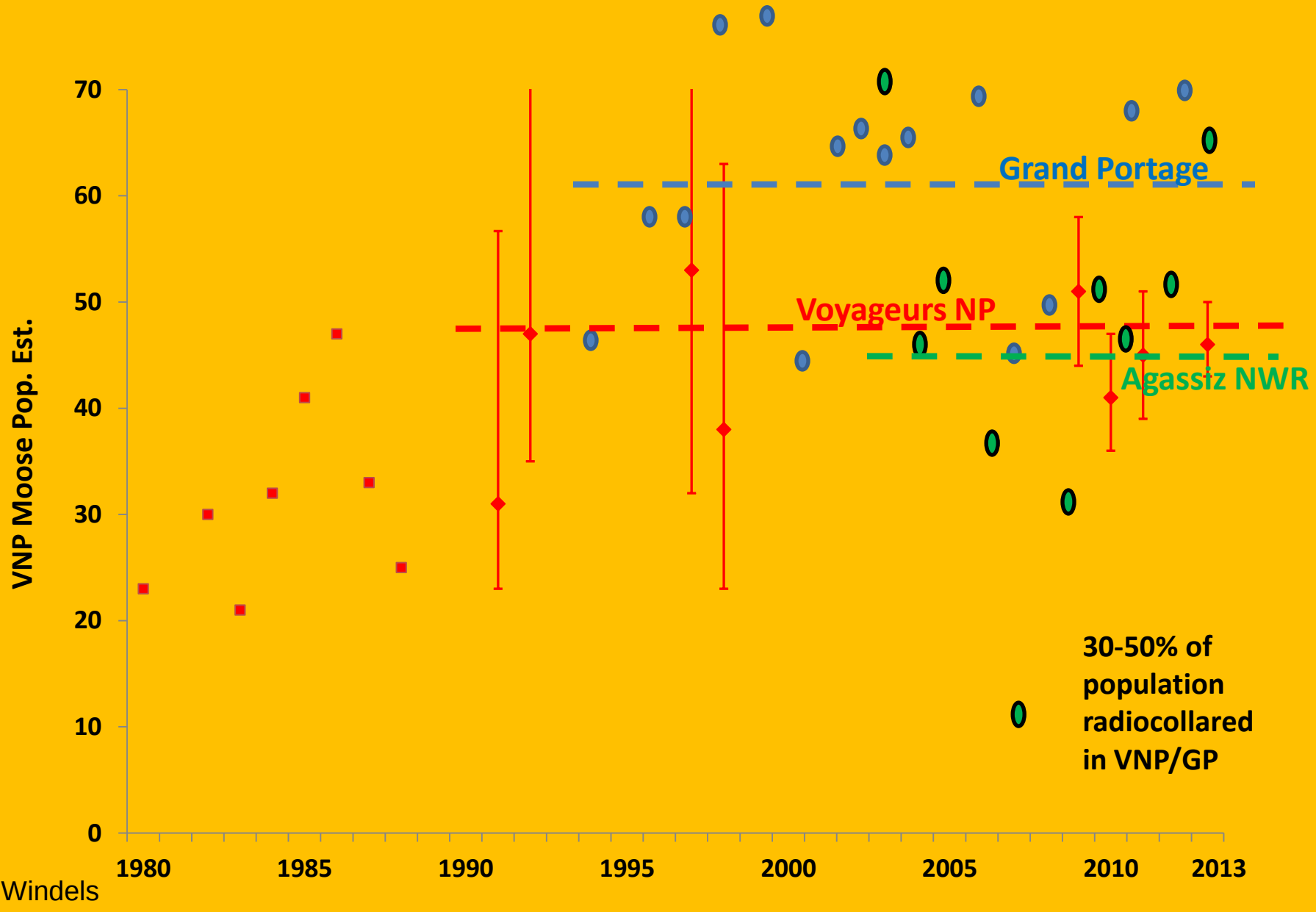
Olson, Windels, Moen

Expanding populations: Low density, Low predation, Unoccupied



Traditional	Agricultural
Connecticut	North Dakota
New York	Saskatchewan
Utah	Manitoba
Oregon	Alberta
Washington	

Future Populations: Stable Low Density?



Windels

Everyone wants to help moose

Enhancements made possible through the LSOHC Project - MN Moose Habitat Collaborative

Cook County

Thank you to all Collaborators!