MANAGEMENT QUESTIONS FOR MAMMAL INTERACTIONS WITH VEGETATION IN ALASKA BOREAL FOREST

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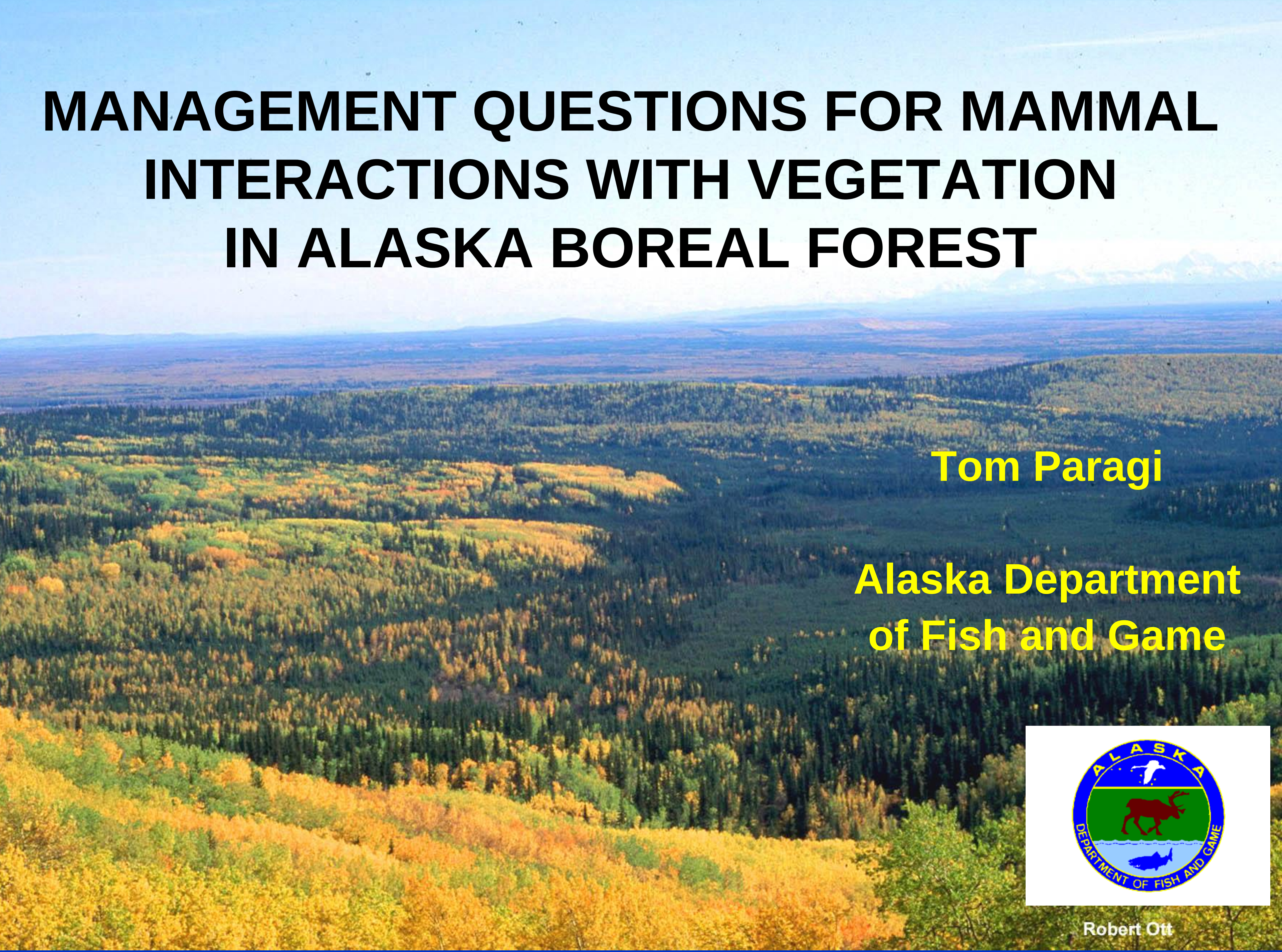
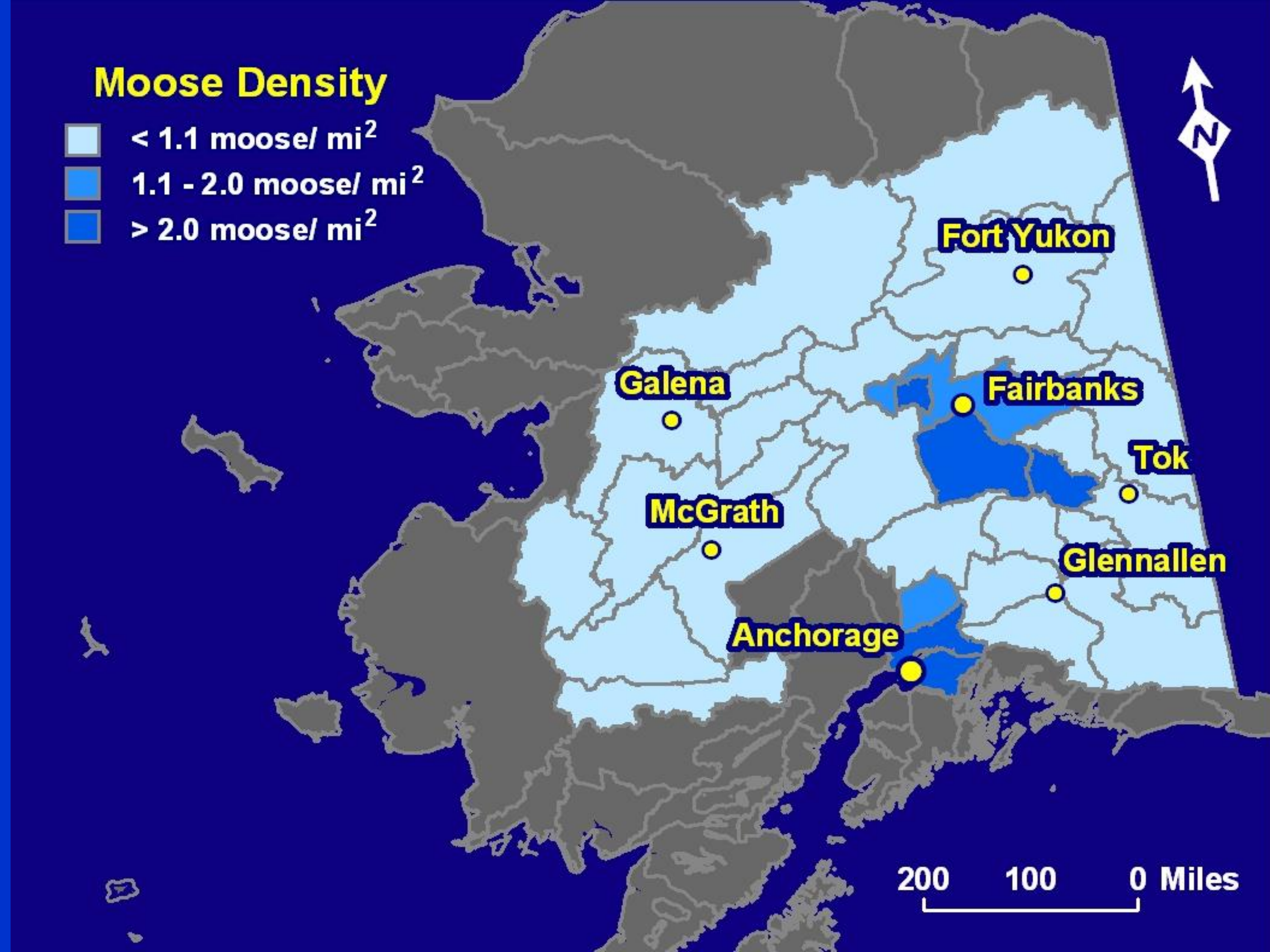
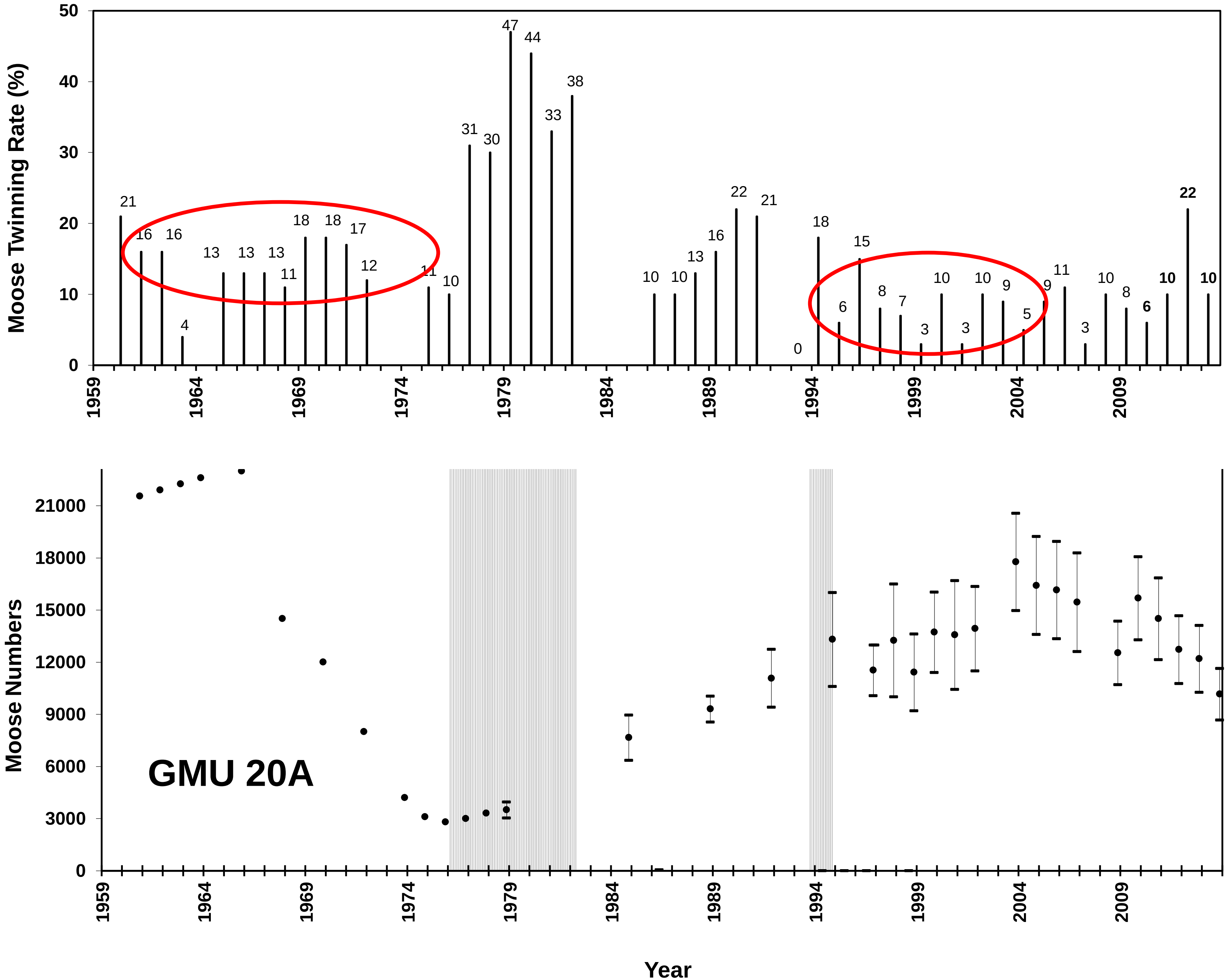


Robert Ott

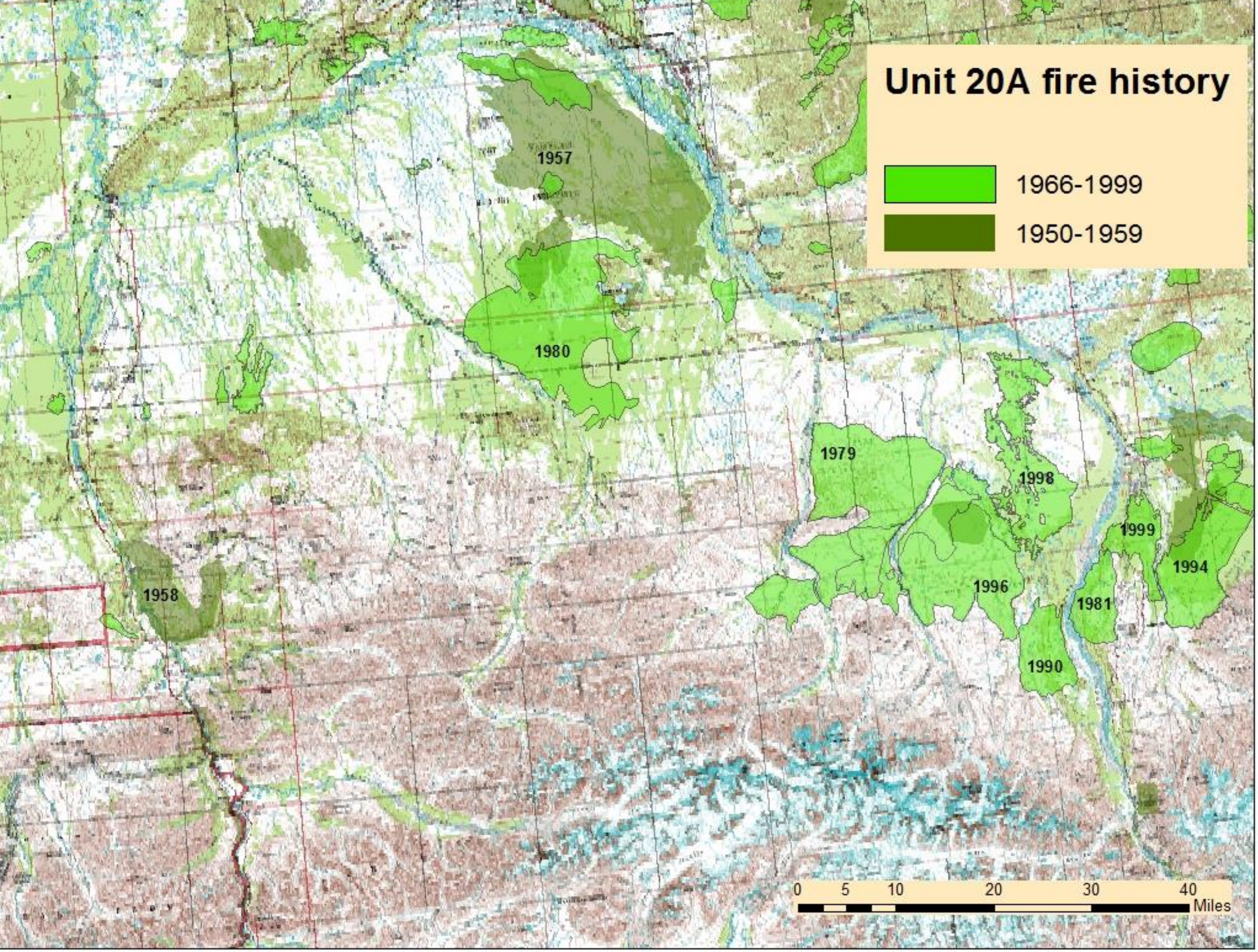
Applied research topics (primarily near road system)

1) Assessing condition of moose winter forage (effects of moose density)


Moose Density
< 1.1 moose/ mi2
1.1 - 2.0 moose/ mi2
> 2.0 moose/ mi2
N
Fort Yukon
Galena
Fairbanks
Tok
McGrath
Glennallen
Anchorage
200 100 0 Miles



Moose Twinning Rate (%)
50
40
30
20
10
0
21
16
16
4
13
13
13
11
18
18
17
12
11
10
31
30
47
44
33
38
10
10
13
16
22
21
0
18
6
15
8
7
3
10
3
10
9
5
9
11
3
10
8
6
10
22
10
1959
1964
1969
1974
1979
1984
1989
1994
1999
2004
2009
Moose Numbers
21000
18000
15000
12000
9000
6000
3000
0
GMU 20A
Year


Unit 20A fire history
1966-1999
1950-1959
1957
1980
1979
1998
1999
1994
1996
1981
1990
1958
0 5 10 20 30 40
Miles

Applied research topics (primarily near road system)

1) Assessing condition of moose winter forage (effects of moose density)

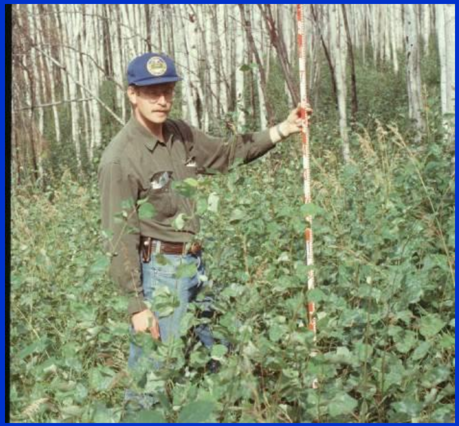
Where moose density has been elevated, wildlife managers seek thresholds for when to recommend corrective interventions (moose harvest strategies, habitat enhancement) to prevent long-term range degradation

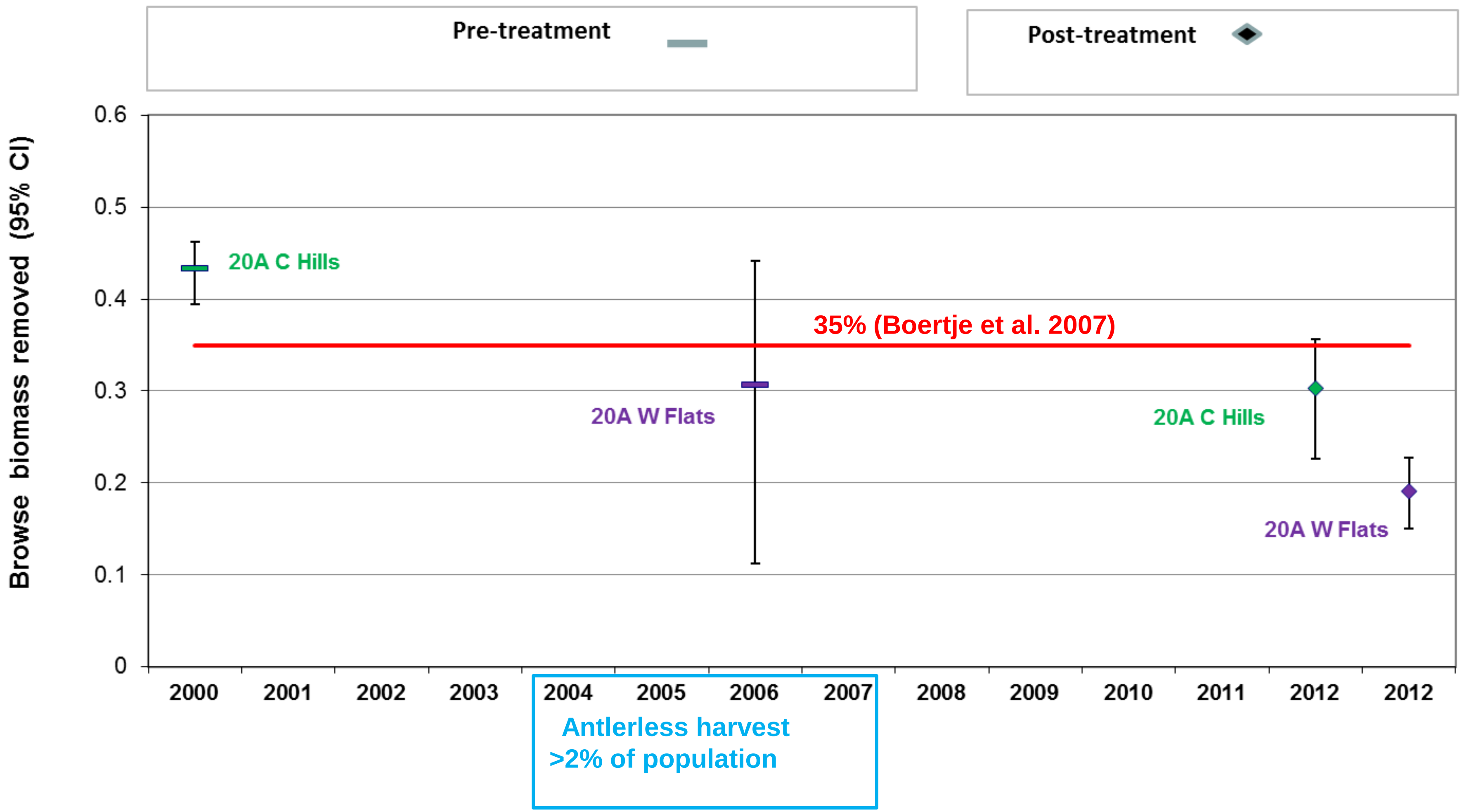
- **What metrics of browse plant condition should be monitored?**

Browse production is related in part to sunlight penetration of canopy

Tall Shrub	Open Forest	Closed Forest
200 kg/ha	20 kg/ha	2 kg/ha



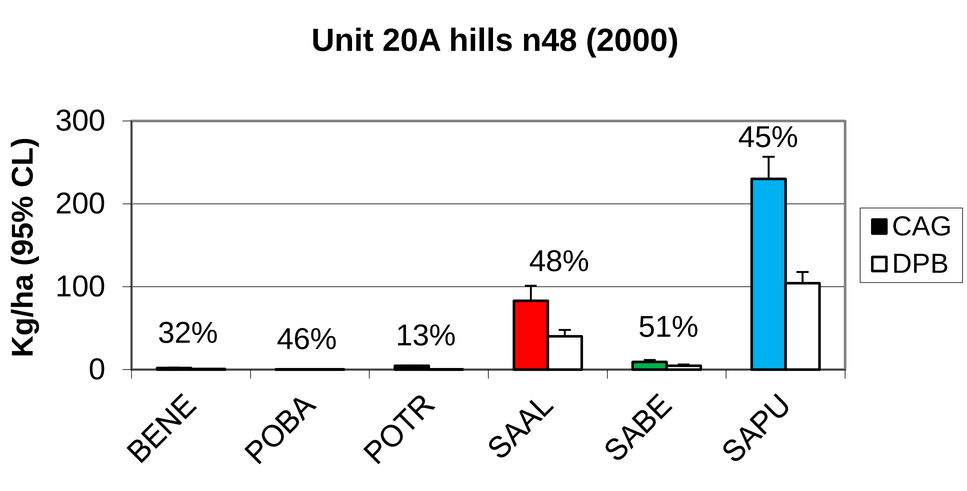


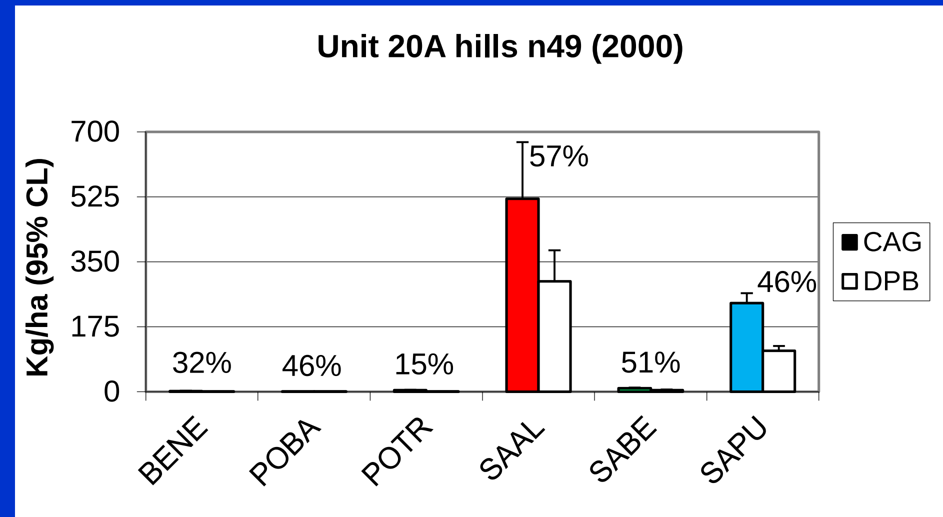
Pre-treatment
Post-treatment
Browse biomass removed (95% CI)
0.6
0.5
0.4
0.3
0.2
0.1
0
20A C Hills
35% (Boertje et al. 2007)
20A W Flats
20A C Hills
20A W Flats
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2012
Antlerless harvest
>2% of population

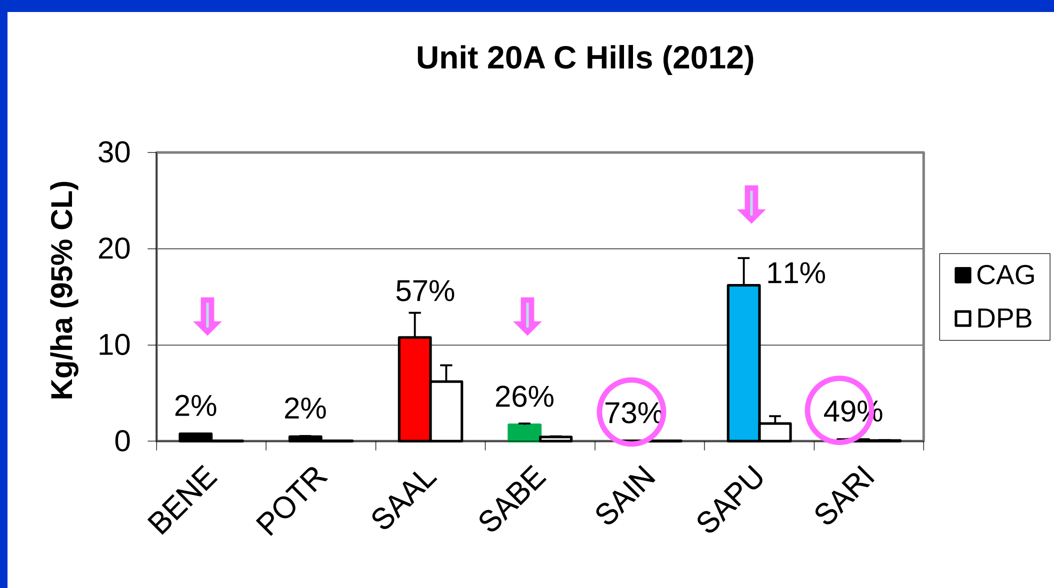
Implications of browsing intensity to plant health and production

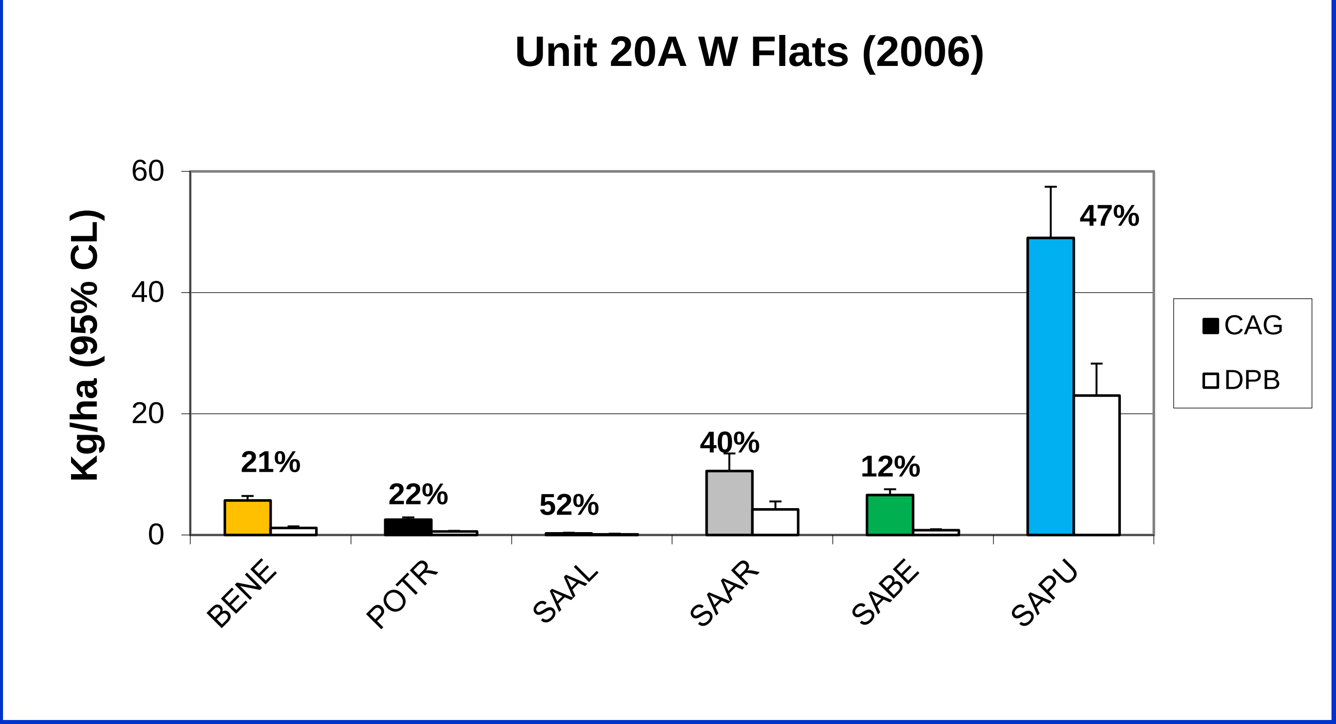
- Singer and Zeigenfuss 2003:
  - Winter biomass removal >25% led to decline in willow production (up to 47% observed) where elk and moose coexist in Wyoming
  - Re-development of willow thickets from elk hedged stands took 6-8 years after stocking density reduced on feeding grounds (WY)
  - Optimal biomass removal in Colorado was ca. 21% with decline in production at >37%

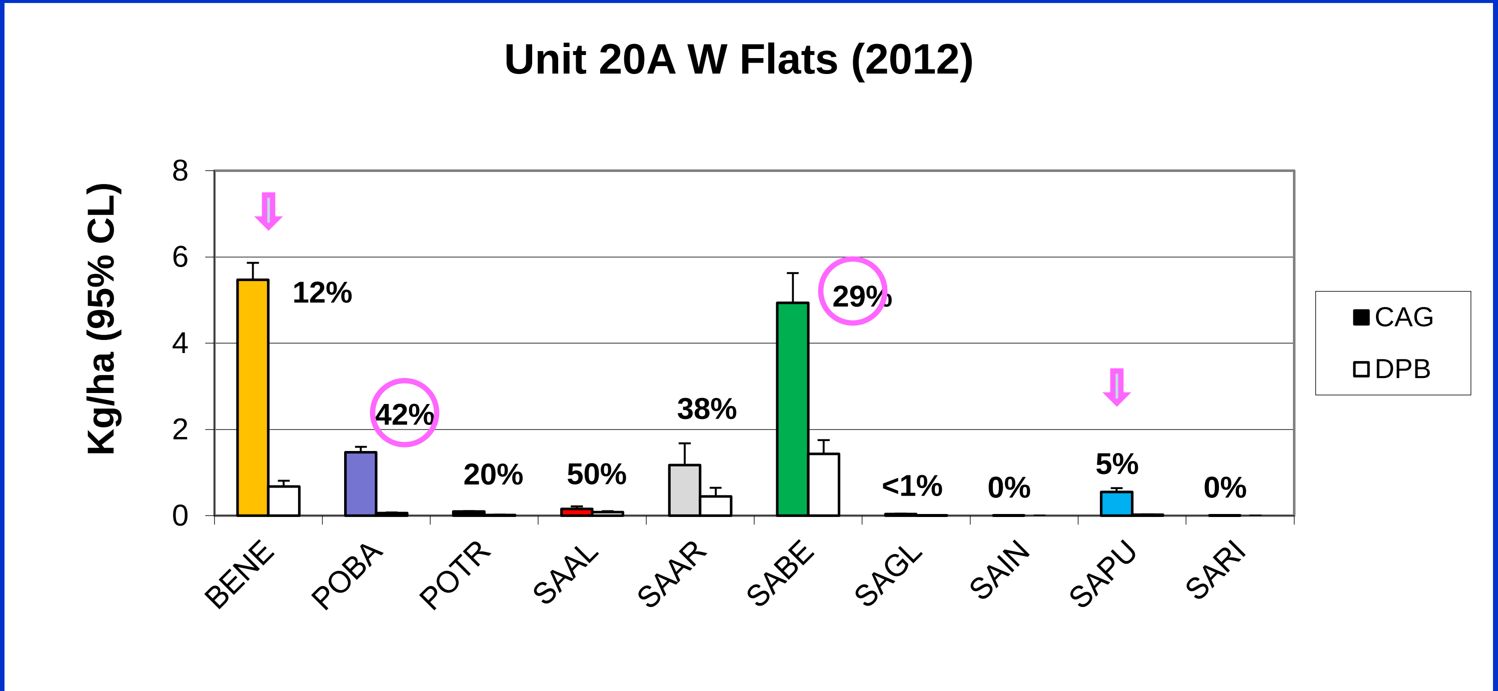
Proportional biomass removal by species








Unit 20A W Flats (2006)
Kg/ha (95% CL)
60
40
20
0
21%
22%
52%
40%
12%
47%
BENE
POTR
SAAL
SAAR
SABE
SAPU
CAG
DPB


Unit 20A W Flats (2012)
Kg/ha (95% CL)
8
6
4
2
0
12%
42%
20%
50%
38%
29%
<1%
0%
5%
0%
BENE
POBA
POTR
SAAL
SAAR
SABE
SAGL
SAIN
SAPU
SARI
CAG
DPB

Potential research questions

- % CAG biomass removal by moose that exceeds optimal compensation (presumed soil nutrient deficit from reduced litter fall)
  - upland (fire, logging)
  - lowland (fluvial, logging)

- Extent of broomed growth structure that reduces intake of remaining live twigs (moose)

- Trends in range productivity (<u>relative</u> <u>to</u> Kcc)
  - Vertebrate browsing
  - Invertebrate herbivory
  - Changes in weather, state factors (e.g., climate)

Wood energy in the Interior

Superior Pellet Fuels, North Pole


HARMAN



2) Assessing effects of moose and hare herbivory on forest regeneration

Forest managers seek thresholds for when to recommend corrective interventions (moose harvest strategies, hare habitat modification) or optimal timing for regeneration activities during low in hare abundance cycle

- **What is optimal tree stocking trajectory to maximize wood biomass for short rotation?**

Scale of landscape context for herbivory effects

Potential research questions

- How is herbivory partitioned by herbivore and by tree species?

- Are there practical relationships of moose density with tolerable herbivory (seedling survival and sapling form) that might inform moose harvest management?

- Are there cover thresholds or landscape disturbance patterns that can be managed to achieve tolerable levels of hare herbivory?

Monitoring managed landscapes

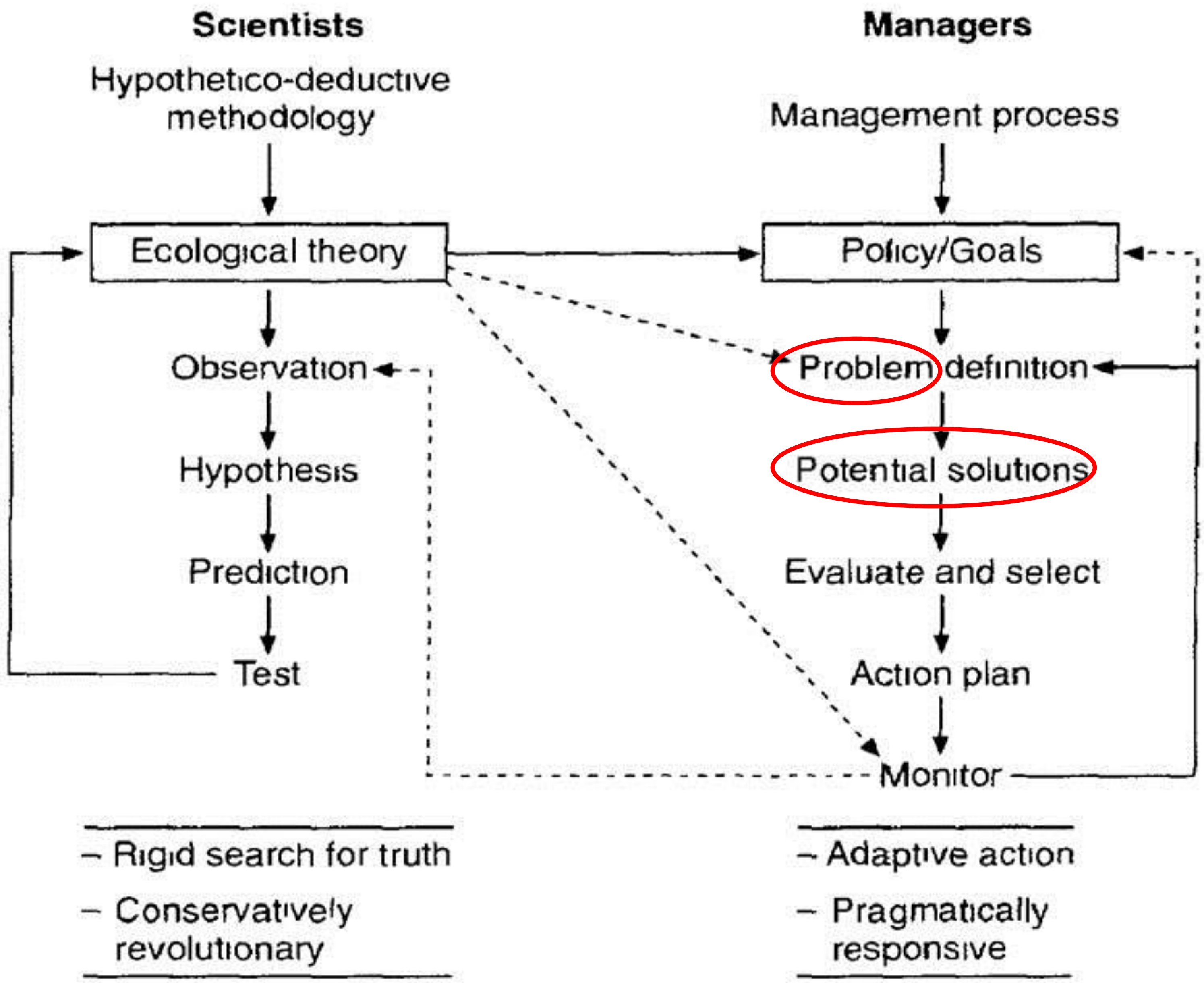
- Herbivore effects on succession and biomass production of woody species in timber harvest units, burned areas, and “climax” communities

- Potential changes in succession and annual biomass production of woody species in the absence of herbivory (state factor changes)

Epilogue…

“Human dimension” limits use of scientific information in management decisions for renewable resources

- **Manager recommendations often based on metrics along an ecological gradient**
- **Even well demonstrated “thresholds” are in a context of environmental or animal condition…**
- **Key issue is conveying “risk” of unintended consequences**



from Andrew S. Pullin, *Conservation Biology, 2002:306*

Management challenge is not lack of pertinent information but engaging public with informed dialog on <u>expectations</u> and understanding of <u>decision options</u>

- **Public buy-in on "acceptable risk" or "socially and economically sustainable" requires expectations for future condition and consensus on what they can <u>tolerate</u>**

- **The process for engaging <u>informed</u> dialog in public forums will remain the limiting factor to incorporating scientific knowledge into renewable resource management**

Academic researcher	Agency manager
Slow variables (state factors)	Fast variables (legal mandates)
Long term: understanding	Short term: demands / problems
Ecological processes	Ecological patterns
General principles “science”	Specific local application “art”
Global / Regional / Landscape	Stand / Patch
Theoretical / mechanistic “why”	Empirical “how, when, where”
Reductionist / design control	Replication / market driven
Peer review / publication	Accomplishment / policy
Credentials as scientist	Respect as problem solver
Embraces change	Change comes slowly
On cutting edge	Continuing education (?)
Need time and $ (overhead)	Often don’t have much $…