Patterns of variation in small mammal abundance in the Road Corridor, 1992-2000

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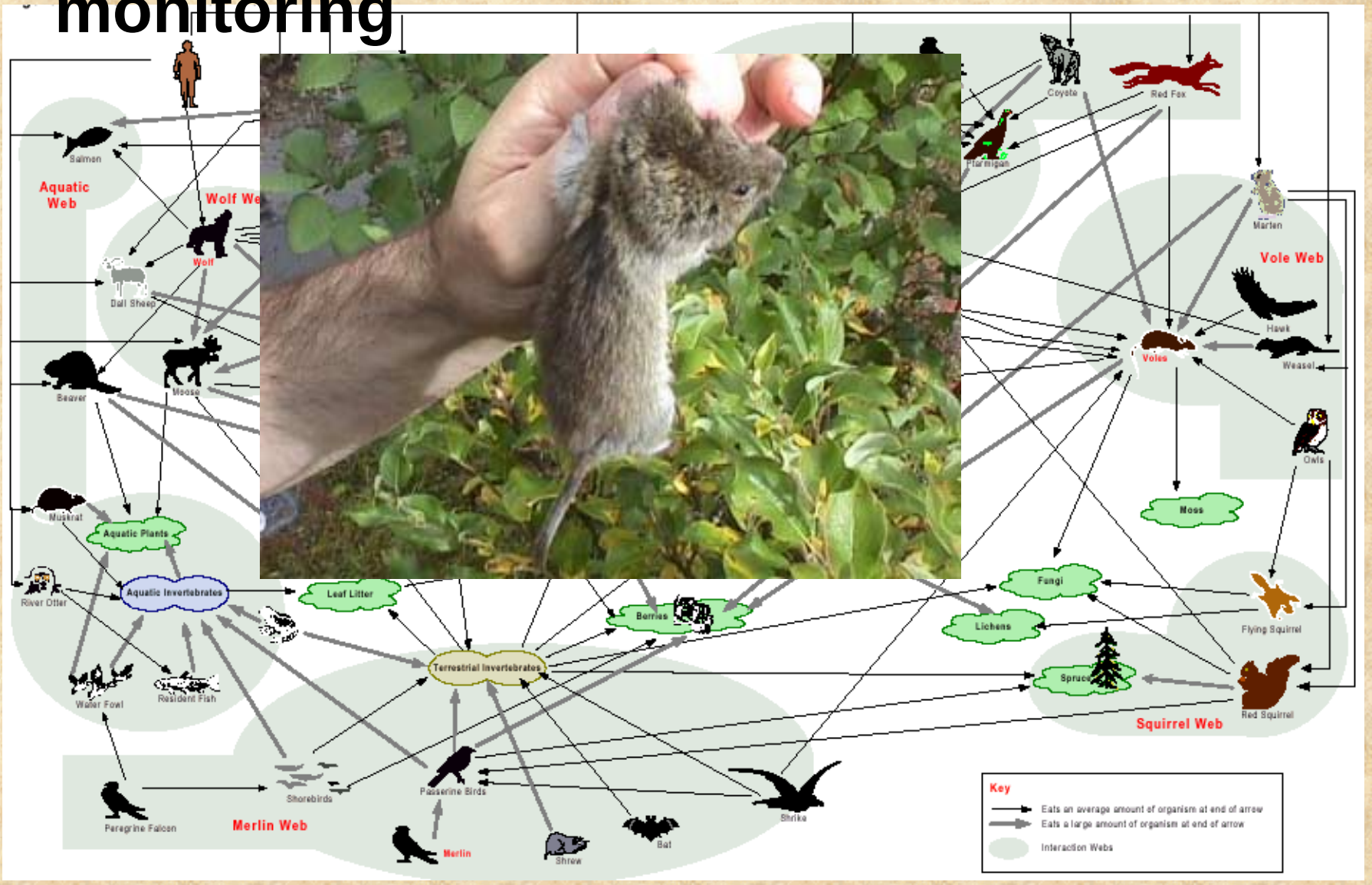
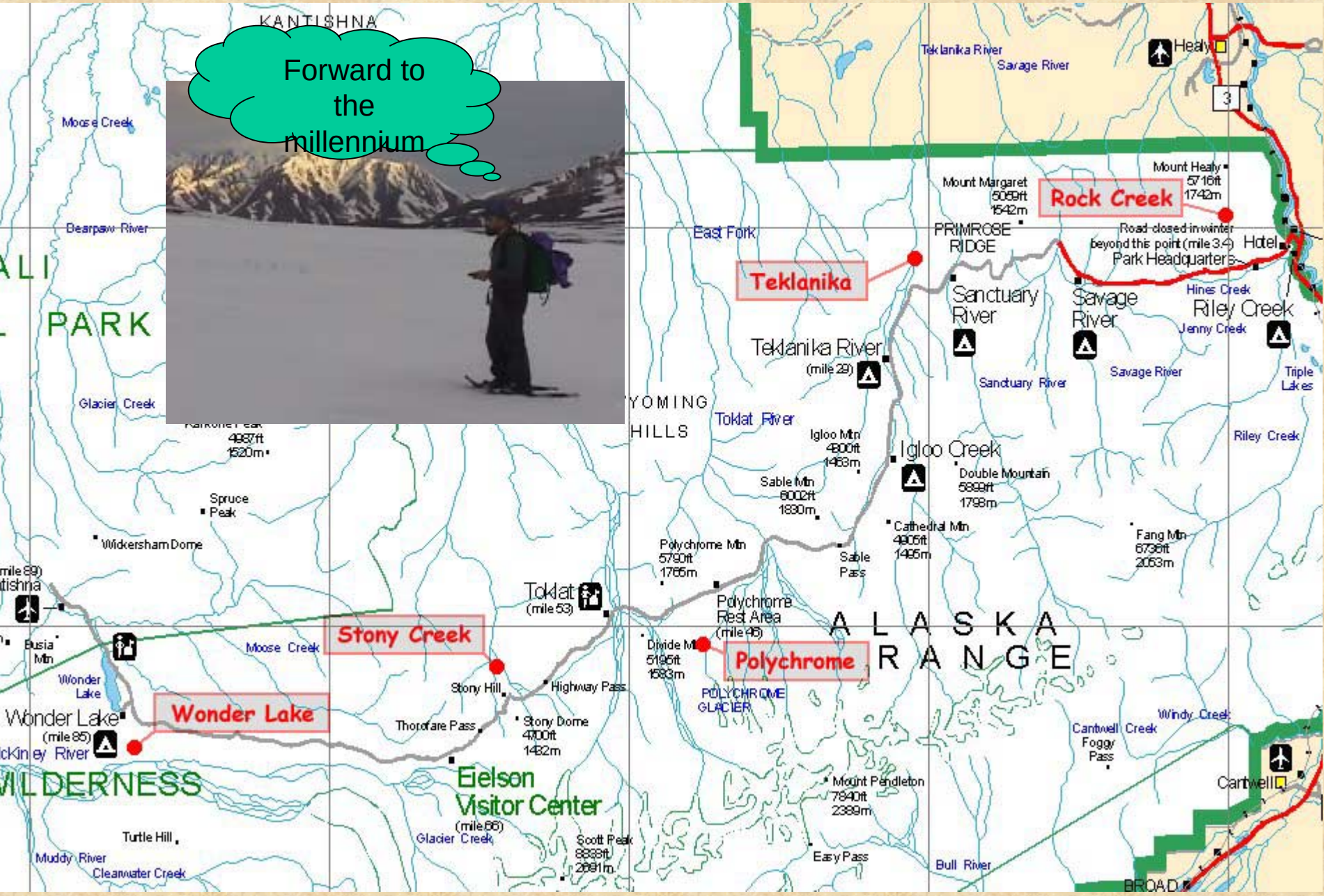
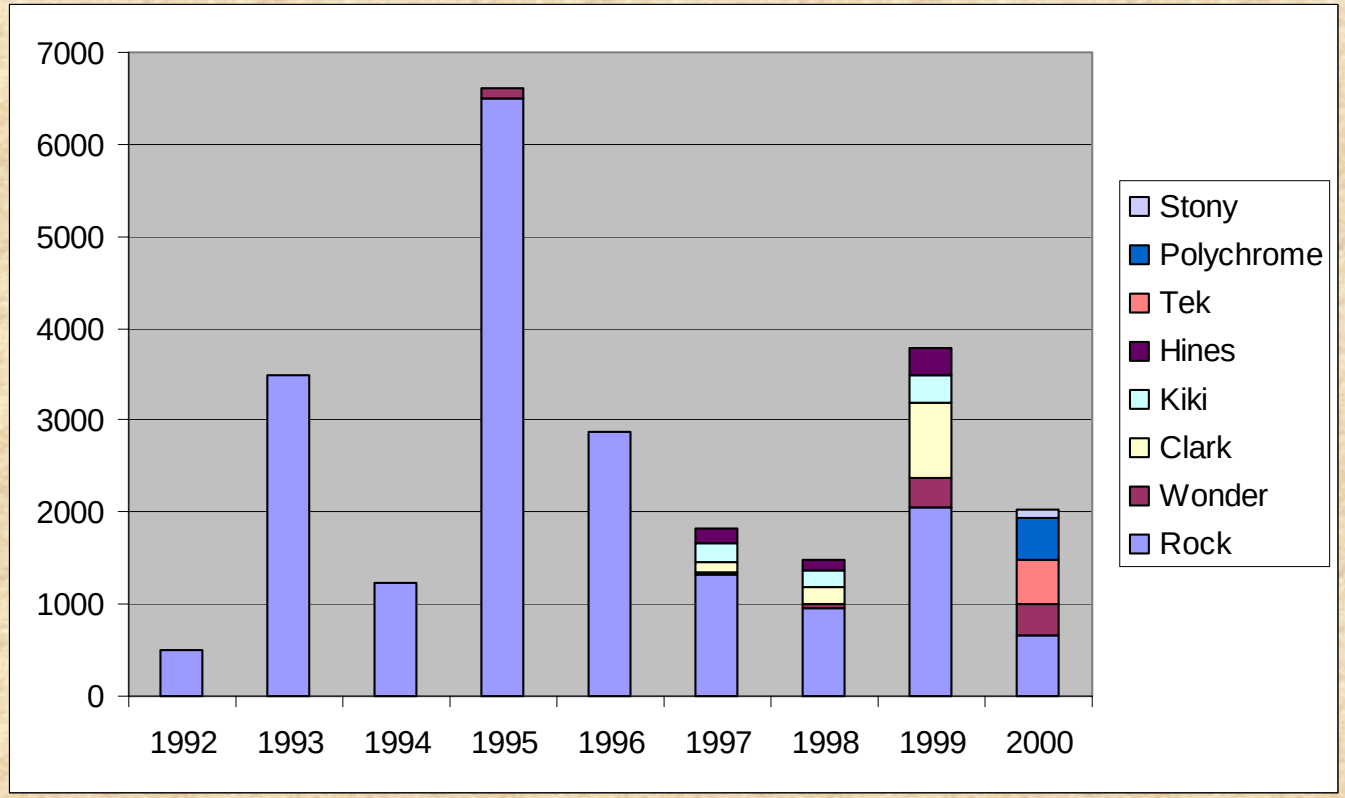
Utility of microtines for ecological monitoring



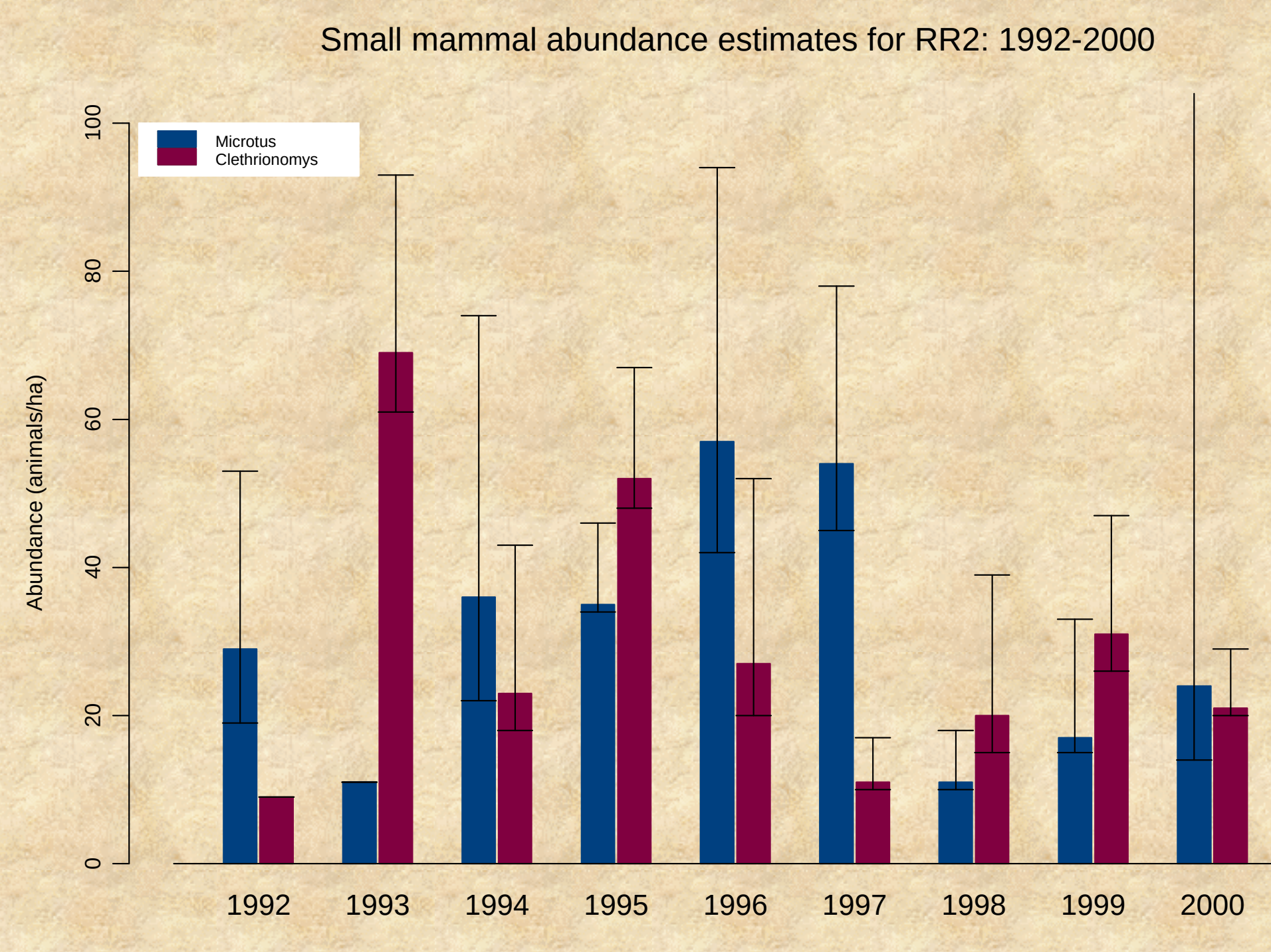
Challenges of monitoring small mammals in Denali National Park and Preserve

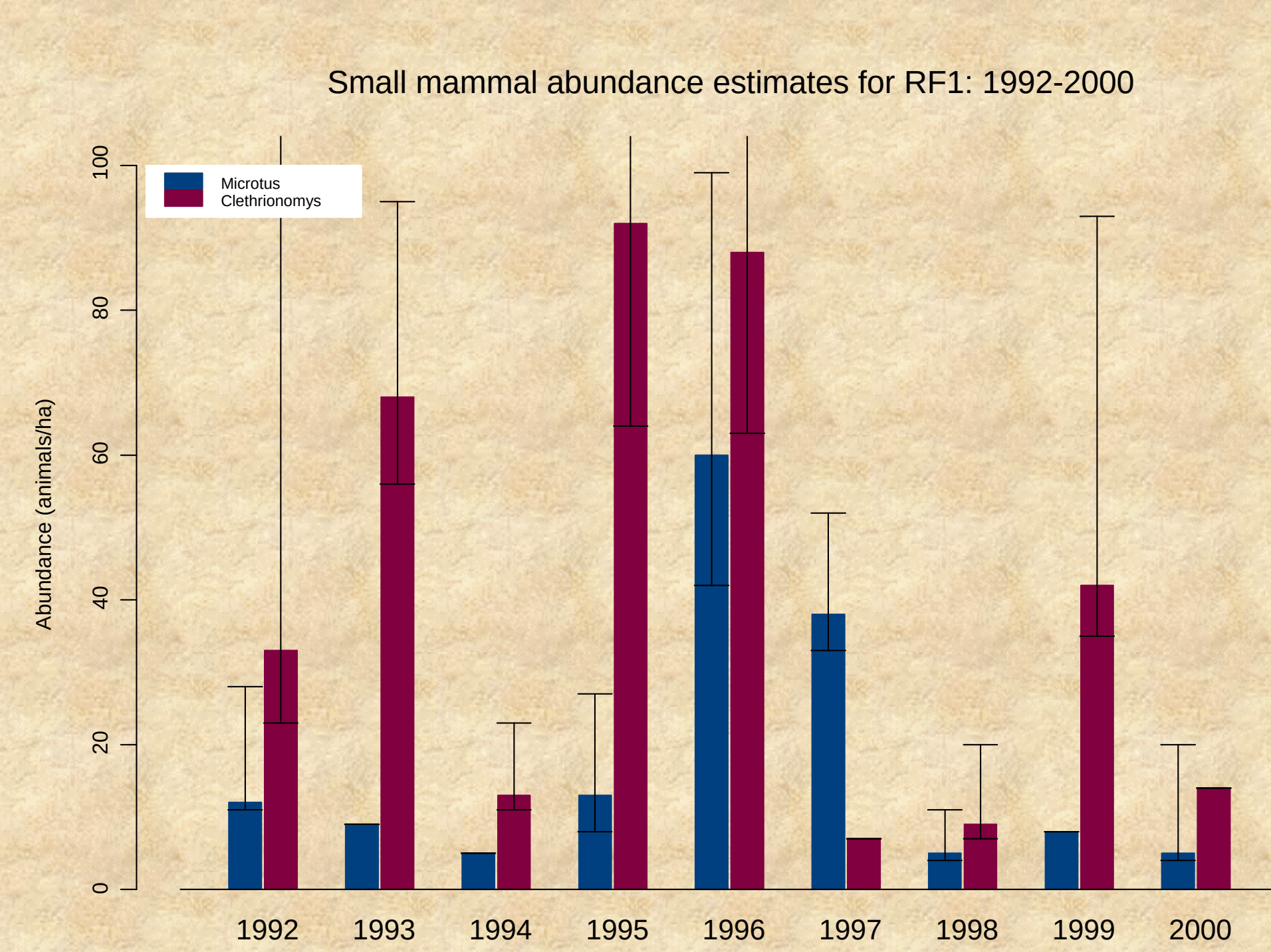

Forward to the millennium
KANTISHNA
Moose Creek
Bearpaw River
PARK
Glacier Creek
Spruce Peak
Wickersham Dome
Busia Mtn
Wonder Lake
Wonder Lake (mile 85)
WILDERNESS
Turtle Hill
Muddy River
Clearwater Creek
Stony Creek
Moose Creek
Stony Hill
Highway Pass
Thorofare Pass
Stony Dome 4700ft 1432m
Eielson Visitor Center (mile 66)
Glacier Creek
Scott Peak 8838ft 2691m
Toklat (mile 53)
Polychrome Rest Area (mile 46)
Divide Mtn 5195ft 1583m
Polychrome
POLYCHROME GLACIER
Polychrome Mtn 5790ft 1765m
Sable Pass
Cathedral Mtn 4905ft 1495m
Sable Mtn 6002ft 1830m
Igloo Mtn 4800ft 1463m
Igloo Creek
Double Mountain 5899ft 1798m
Toklat River
YOMING HILLS
East Fork
Teklanika
Teklanika River (mile 29)
Mount Margaret 5059ft 1542m
PRIMROSE RIDGE
Sanctuary River
Savage River
Rock Creek
Mount Healy 5716ft 1742m
Road closed in winter beyond this point (mile 3.4)
Park Headquarters
Hotel
Hines Creek
Riley Creek
Jenny Creek
Triple Lakes
Riley Creek
Fang Mtn 6736ft 2053m
Mount Pendleton 7840ft 2389m
Easy Pass
Bull River
Windy Creek
Cantwell Creek
Foggy Pass
Cantwell
BROAD
ALASKA RANGE
Teklanika River
Savage River
Healy
3

Vertebrate data geyser

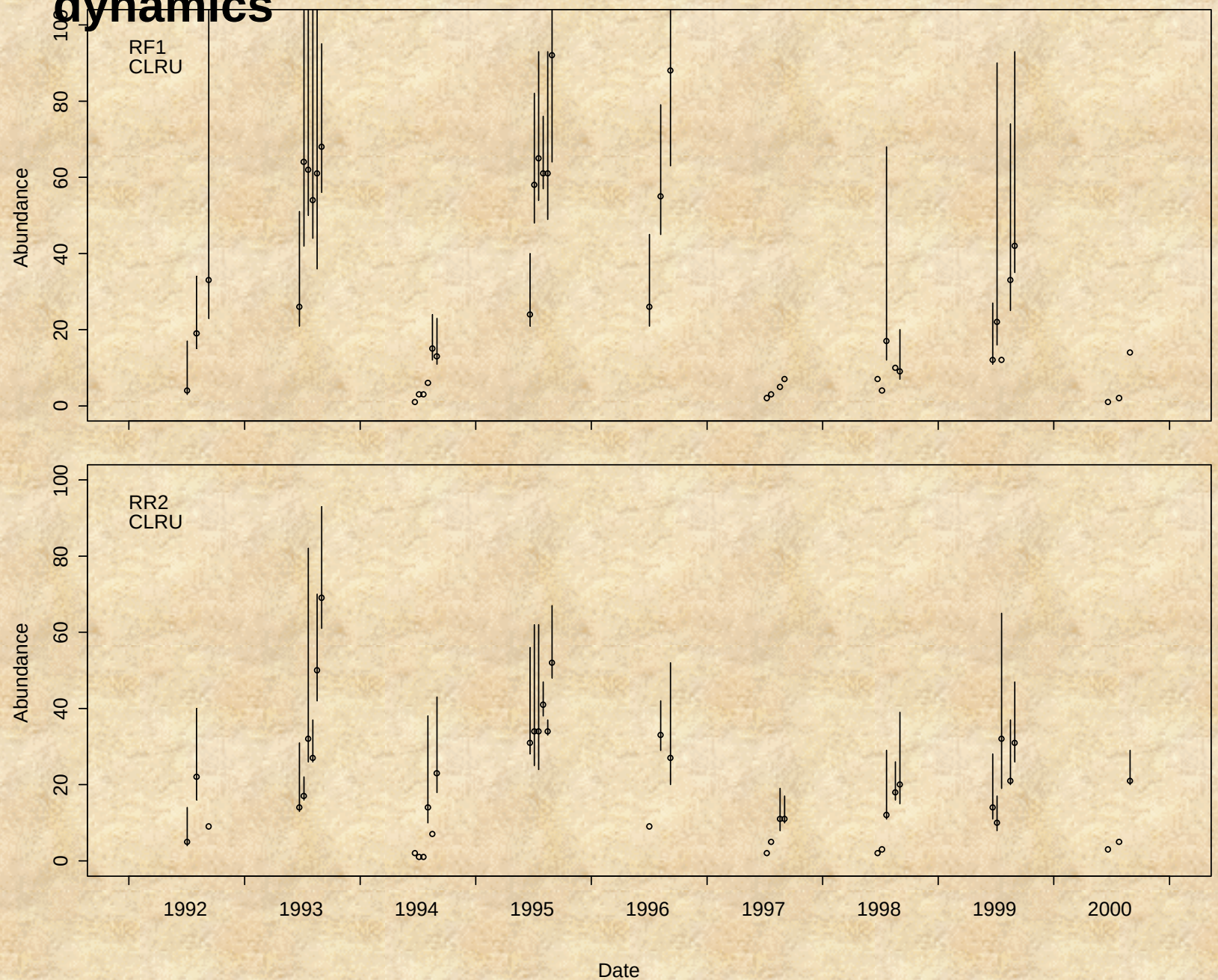


- Two paid technicians have, on average, had >2400 encounters per year
- Totaling 22,000+ encounters during the project

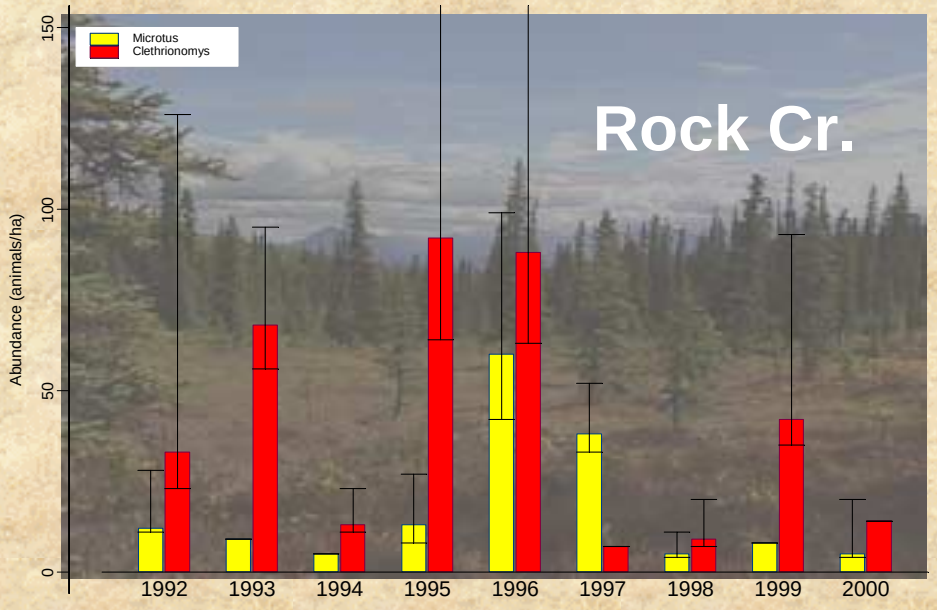

Small mammal abundance estimates for RR2: 1992-2000
Microtus
Clethrionomys
Abundance (animals/ha)
0
20
40
60
80
100
1992
1993
1994
1995
1996
1997
1998
1999
2000


Small mammal abundance estimates for RF1: 1992-2000
Microtus
Clethrionomys
Abundance (animals/ha)
0
20
40
60
80
100
1992
1993
1994
1995
1996
1997
1998
1999
2000

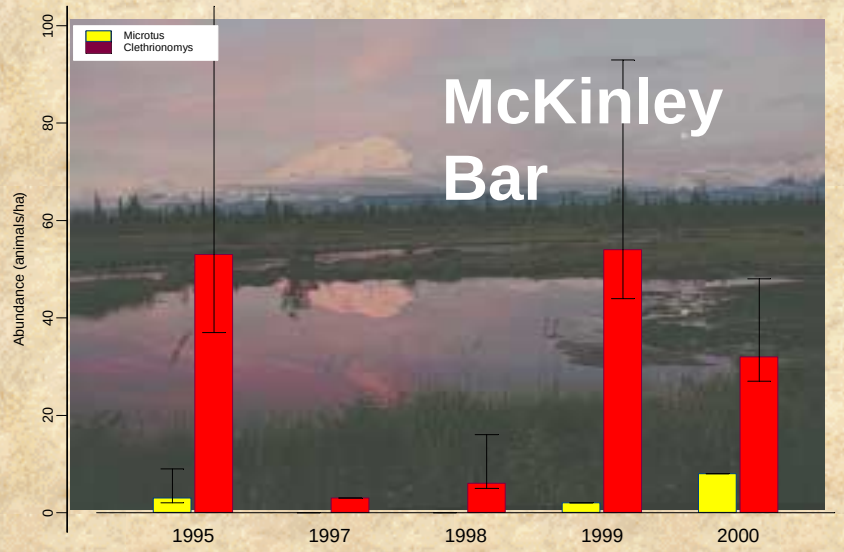
Intra-annual temporal variation in Clethrionomys dynamics



Small mammal abundance estimates for RF1: 1992-2000



Small mammal abundance estimates for W1: 1995-2000

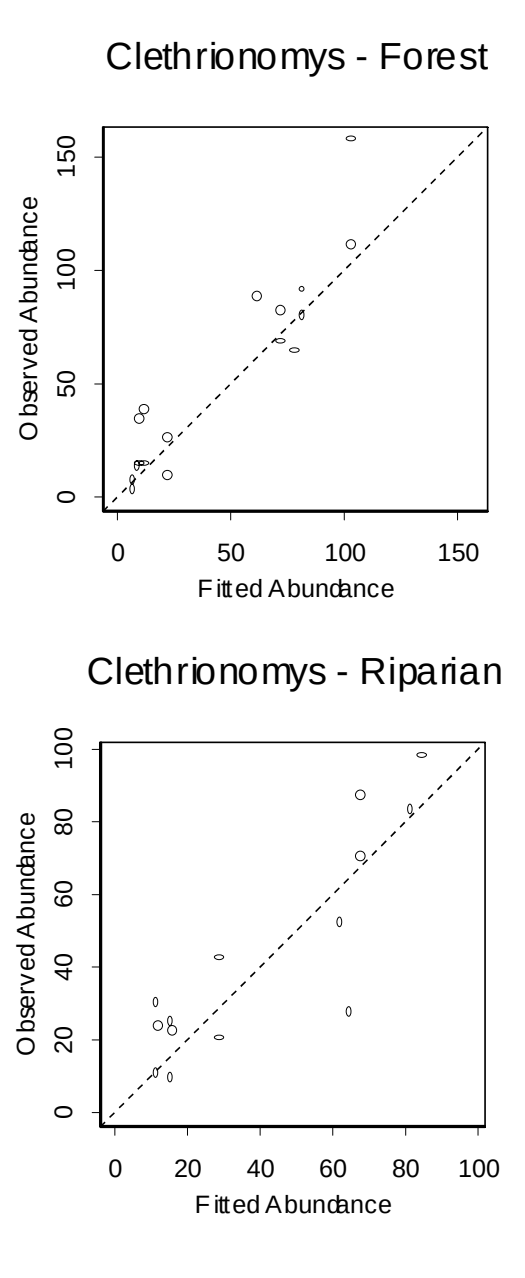


- Contrasting similar habitats at opposite ends of the Road Corridor,
- Clethrionomys appears to have similar temporal patterns,
- Microtus, however exhibit more temporal variation at the eastern end of the road than at the western end

Unraveling the temporal variability in microtine abundance

$$\log[E(N)] = \beta_0 + \beta_1 W + \beta_2 C + \beta_3 R + \beta_4 WSI + \beta_5 SOI + \beta_6 SRI$$
$$+ \beta_7 C * R + \beta_8 C * WSI + \beta_9 + C * SOI + \beta_{10} C * SRI$$
$$+ \beta_{11} R * WSI + \beta_{12} R * SOI + \beta_{13} R * SRI$$
$$+ \beta_{14} C * R * WSI + \beta_{15} C * R * SOI + \beta_{16} C * R * SRI$$

where
N = end-of-summer vole abundance,
W = 1 if web and 0 if grid,
C = 1 if *Clethrionomys* and 0 if *Microtus*,
R = 1 if riparian and 0 if forest,
WSI = winter severity index,
SOI = spring onset index, and
SRI = spring rainfall index.
In fitting the model, we used quasi-likelihood methods to produce variance estimates appropriate for data with probable extra-Poisson variation. Because our response variable was itself an estimate with a measure of uncertainty, we weighted each observation by the inverse of its coefficient of variation.



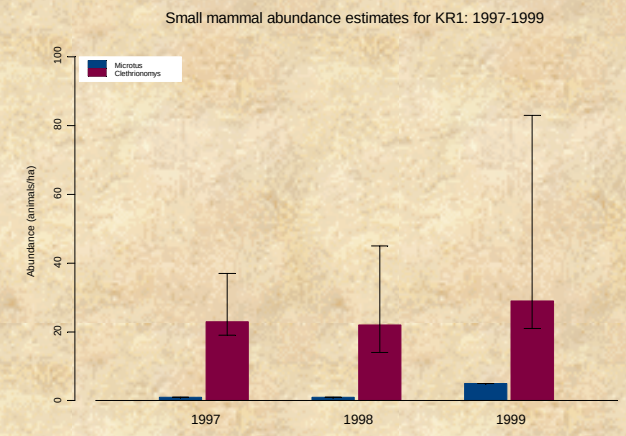
Model performance

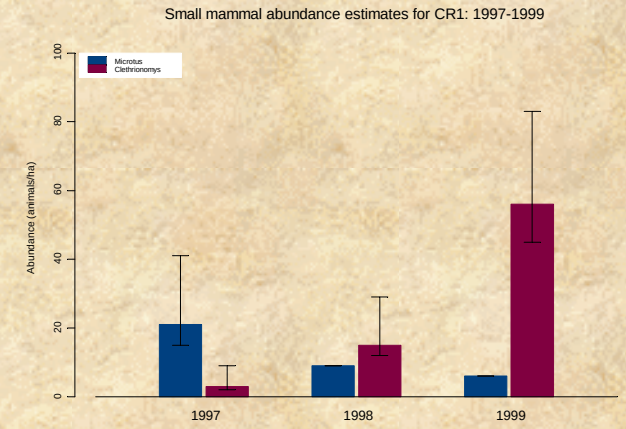
- Our abiotic predictive model "absorbs" variation in microtine abundance attributable to annual variation in climatic factors.
- Remaining variation may be used to detect signs of "stress" in these populations

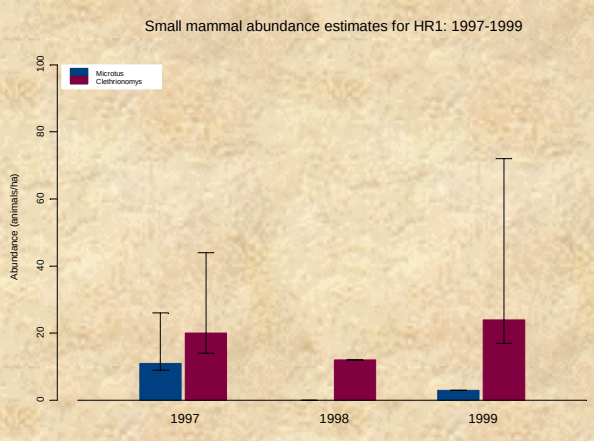
Spatial variation in microtine abundance

•At our intermediate level of spatial sampling (1997-1999), we found no evidence of spatial variation in microtine abundance between watersheds situated within ~50km^2 region directly west of Denali Park headquarters.

•We are still assessing spatial variation from the 2000 field season







Track continued progress at:

http://mercury.bio.uaf.edu/~erexstad.faculty/rexsta

html