



Small Mammal Resource Brief

The Status of Small Mammals in The Central Alaska Network



Small mammals are being monitored in 1 Central Alaska Network park: Denali NP& PRES.

During the past 22 years (1992-2014) in Denali National Park and Preserve, three target small mammal species have been monitored at various sites including the Rock Creek legacy plots. Of these species, the northern red-backed vole (*Myodes rutilus*) is a generalist, the most ubiquitous and abundant, and has occurred at every sampling site across the park. The tundra vole (*Microtus oeconomus*) is a specialist occurring in wetter habitats and has been the second most-abundant species present at the Rock Creek legacy plots. The singing vole (*Microtus miurus*) is the least abundant of the three target species and is more adapted to habitats at higher elevations. During some years, this species has not been detected at the Rock Creek legacy plots or at other study sites and is usually the rarest species detected.

2005 and 2008 stand out as the years of highest volumes and activity levels of small mammals at the Rock Creek legacy plots. In 2008, the year with highest total number of vole captures to date, there were approximately 1300 vole captures (new and recaptures) for all three species combined and of these, 411

were new captures. Of these new captures, 352 (85.64%) comprised northern red-backed voles, 40 (9.73%) comprised tundra voles and 19 (4.62%) comprised singing voles. In contrast, the two years with the lowest total capture numbers to date were 1994 and 2006. In 1994, the year with the overall lowest number of new captures to date, just 44 voles were caught. Of these, the northern-red back voles comprised 26 (59.10%), tundra voles comprised 15 (34.09%) and singing voles comprised 3 (6.8%). This represents about a 10-fold increase in the number of new animals captured in 2008 (the highest new capture year) in comparison to 1994 (the lowest new capture year).

Through long-term monitoring and models developed by Rexstad and Debevec (2008), we have learned that small mammal densities in Denali are strongly influenced by environmental factors such as the timing of spring onset and summer dryness.

Photo captions: (top) a northern red-backed vole in a spruce tree, Denali NP& PRES; (near right) a baited live trap on a plot in Rock Creek, (right) a researcher gathering data on a vole at Rock Creek, Denali NP & PRES.



Why This Vital Sign Is Important

Within Denali's ecosystems, voles of the genera *Microtus* and *Myodes* consume seeds, fungi and invertebrates and provide a key prey resource for raptors and carnivorous mammals. Although voles have short life spans, they reproduce prolifically and play an important ecological role by having the ability to influence species above and below them in the food chain. While they are small and not highly visible in the boreal forest,



their collective biomass contributes a larger proportion to the animal community in Denali than that of grizzly bears. Consequently, changes in the abundance or density of small mammals may affect the survival of the species that prey upon them.

Data from Denali suggest that annual fluctuations in small-mammal populations are strongly related to abiotic factors like weather, climate and timing of snowfall. Additionally, the relative abundance of small-mammals species is directly related to the local composition of plant species. Thus, any park-wide changes in weather or plant species will likely affect small-mammal distribution and patterns of abundance. By monitoring populations of voles, we may detect signatures of human-induced change or climate change.

What We Want To Know About This Vital Sign

- Monitor trends in population estimates of density and abundance of three target species at the Rock Creek legacy plots.
- Track how oscillations in small mammal population numbers may affect other organisms in the ecosystem.
- Utilize other CAKN vital sign data (abiotic and biotic) to assess the drivers of small mammal population oscillations.

How We Monitor This Vital Sign

From 1992-2014, we have monitored small mammals annually in Denali using live-trapping and mark-recapture techniques. Park scientists, science interns, and trained student volunteers backpack all camping and scientific equipment into the plots and conduct field work for one week in mid-August. Estimates of population density and abundance are collected for three target species: northern red-backed vole (*Myodes rutilus*), tundra vole (*Microtus oeconomus*) and singing vole (*Microtus miurus*), and when sufficient numbers allow, shrews (*Sorex* spp.).

We deploy four plots at Rock Creek, a drainage located near park headquarters. Each

plot contains 100 live-traps placed 10 meters apart. Traps are baited with microwaved sunflower seeds (to prevent germination) and biodegradable cotton bedding (nestlets) and checked three times daily. By the end of the four-day sampling period, we have conducted 4800 trap checks. When we capture animals, individuals are scanned for a tag, identified by sex and species, weighed and assessed for reproductive status. When we discover unmarked individuals, we implant them subcutaneously with a tiny passive integrated transponder (PIT) tag, scan them for their unique, 10-character, alphanumeric identification code and release them.

How Monitoring This Vital Sign Can Help Park Managers

- Track changes in small mammal population dynamics that represent an important prey base in the ecosystem.
- Monitor fine scale climate change effects by tracking changes in species composition, range expansions and/or hybridization among small mammals occurring at Rock Creek.
- Utilize fine scale patterns in long-term small mammal population fluctuations to integrate data from other CAKN vital signs and better understand the ecology of Denali's ecosystem.

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