Protocol Development Summary

Protocol: Small mammal assemblages

Parks where this would be implemented: BELA, CAKR, GAAR, KOVA, NOAT

Justification/Issues being addressed:
Small mammals occurring or expected to occur in Arctic Network parks include shrews (*Sorex* spp.), voles (*Clethrionomys* spp. and *Microtus* spp.). lemmings (*Dicrostonyx groenlandicus, Lemmus trimucronatus*, *Synptomys borealis*), weasels (*Mustela* spp.), porcupine (*Erethizon dorsatum*), ground squirrels (*Spermophilus* spp.*),* tree squirrels *Tamiasciurus hudsonicus*), and hares (*Lepus* spp.) (Cook and MacDonald (2006). On park administered lands, species of small and mid-sized mammals unique to the ARCN include tundra hare (*Lepus othus*) and Alaska marmots (*Marmota broweri*). Most small mammals are inconspicuous members of the fauna community in the boreal forest and tundra due to their morphology and daily habits yet these species represent a large proportion of biomass on the landscape (Krebs et al. 2001).

Population parameters and distribution of small mammals in the ARCN are indicators of both short and long term environmental conditions. Small mammals play an important ecological role by influencing species above and below them in the food chain. Population levels of small mammals and fluctuations of these populations are affected by and in turn have large effects on plant communities, bird communities, and mammal communities in boreal and alpine/Arctic areas. Data suggest that annual fluctuations in small mammal populations are strongly related to abiotic factors (Rexstad and Debevec 2002), including fire where they may be more abundant in burned areas (Swanson 1996). Additionally, small mammals are good indicators of environmental toxins.

Specific Monitoring Questions and Monitoring Objectives to be Addressed by the Protocol:
Monitoring questions:

1. How is the relative abundance of common small mammals changing over time?
2. What are the spatial and temporal patterns of small mammal abundance and distribution?
3. What are the level of environmental toxins in selected small mammal species?
4. How is the species richness of small mammals changing over time and space?

The specific objectives for monitoring small mammals are to:

1. Measure the abundance, presence/absence, and distribution of small mammals.
2. Measure reproductive status of small mammals.
3. Monitor environmental toxins in small mammals at selected areas such as along the Red Dog Mine Haul Road.

Basic Approach:
We will use live trapping and, in some case, snap traps to monitor small mammals in the ARCN. Because small mammal populations can vary substantially in time and space, developing abundance estimates across a large landscape is difficult at best. Initial work and protocol development for this vital sign will focus on presence/absence of species and density estimates of common species in defined areas. Areas selected for monitoring will represent a range of

gradients across habitats, elevations, and longitudes. Statistical methods will focus on mark/recapture and occupancy modeling. In areas close to point sources of pollution (i.e., mines), small mammals will be sampled for contaminants.

Principal Investigators and NPS Lead:
The NPS lead on this project will be Jim Lawler (907-455-0624). Principal investigators on this project will include Jay Ver Hoef (Ver Hoef Statistical Consulting) and researchers from the University of Alaska.

Development Schedule, Budget and Expected Interim Products:
Protocol development for this vital sign will start in FY2009. Protocols will be reviewed and finalized by the end of FY 2012. No money was budgeted for this vital sign in FY2008.

Cook, J. A., and S. O. MacDonald. 2004. Mammal inventory of Alaska's National Parks and Preserves: Arctic Network: Bering Land Bridge NP, Cape Krusenstern NM, Kobuk Valley NP, Noatak NP, and Gates of the Arctic NP&P. National Park Service Alaska Region, Inventory and Monitoring Program Final Report 2004. 264 pages.

Krebs, C. J. S. Boutin and R. Boonstra, Eds. 2001. Ecosystem dynamics of the boreal forest: the Kluane project. Oxford University Press.

Rexstad, E and E.M. Debevec. 2002. Small mammal monitoring at the landscape scale: Denali National Park and Preserve. Report to USGS/BRD and National Park Service. 36pp.

Swanson, S. A. 1996. Small mammal populations in post-fire black spruce (*Picea mariana*) seral communities in the upper Kobuk River valley, Alaska. National Park Service, Technical Report NPS/AFARBR/NRTR-96/30. 38 pages.