

Small Mammal Inventory

At this time all 25 species of *small* mammals expected to occur in Denali have been documented (observed in the park and specimens collected) (Table 3). One goal of the Central Alaska Network inventory of parks is to document as high a percentage of expected species as possible (it is now 100% for Denali's small mammals). The inventory of small mammals at Denali was completed in 2002 by a field crew from the Idaho State University, in cooperation with the University of Alaska Museum. The inventory was part of the Central Alaska Network's efforts to inventory and monitor park resources. Researchers discovered two mammals not previously documented at Denali: the tiny shrew *Sorex yukonicus* and the meadow jumping *Zapus hudsonicus*. The inventory also collected study specimens for 16 other species of small mammals (voles, shrews, hares, mice, squirrels, and pika). By far, Denali's three most common species (based on collections) are northern red-backed voles, tundra voles, and the cinereus shrews.

Table 4. Checklist of the small mammals of Denali National Park and Preserve, Alaska. All species listed have been substantiated with a vouchered specimen.

INSECTIVORA - Shrews

Family Soricidae

- *Sorex cinereus*, cinereus shrew
- *S. hoyi*, pygmy shrew
- *S. monticolus*, montane shrew
- *S. palustris*, water shrew
- *S. tundrensis*, tundra shrew
- *S. yukonicus*, tiny shrew

CHIROPTERA - Bats

Family Vespertilionidae

- *Myotis lucifugus*, little brown bat

CARNIVORA - Carnivores

Family Mustelidae

- *Mustela erminea*, ermine
- *M. nivalis*, least weasel

RODENTIA - Rodents

Family Sciuridae

- *Glaucomys sabrinus*, northern flying squirrel
- *Marmota caligata*, hoary marmot
- *Spermophilus parryii*, arctic ground squirrel
- *Tamiasciurus hudsonicus*, red squirrel

Family Dipodidae

- *Zapus hudsonius*, meadow jumping mouse

Family Muridae

- *Clethrionomys rutilus*, northern red-backed vole
- *Lemmus trimucronatus*, brown lemming
- *Microtus miurus*, singing vole
- *M. oeconomus*, tundra vole
- *M. pennsylvanicus*, meadow vole
- *M. xanthognathus*, taiga vole
- *Ondatra zibethicus*, muskrat
- *Synaptomys borealis*, northern bog lemming

Family Erethizontidae

- *Erethizon dorsatum*, North American porcupine

LAGOMORPHA - Pikas & Hares

Family Ochotonidae

- *Ochotona collaris*, collared pika

Family Leporidae

- *Lepus americanus*, snowshoe hare

Small Mammal Monitoring

Scientists from the Institute of Arctic Biology, University of Alaska, Fairbanks, continue to study population dynamics of small mammals (mice, voles, and shrews) in Denali National Park and Preserve. In 2004, Dr. Eric Rexstad and Ed Debevec of the Institute of Arctic Biology, University of Alaska, Fairbanks, along with a crew of hardy biological technicians, sampled the Rock Creek minigrid and collected the 13th year of data in the Rock Creek watershed (legacy plots), in order to study variation in numbers of small mammals within a year and from year-to-year during the snow-free period of “summer”.

A new trapping configuration, chevrons, was used to perform the spatially extensive sampling. A chevron consists of 40 traps placed in an L-shaped configuration. Traps around the perimeter of the plot were placed 10 m apart making the legs of the plot 20 m wide and 100 m long. This design was created to facilitate the task of checking traps by a two-person crew.

A remarkably low number of red-backed voles were captured, leading to some of the lowest population estimates in the 13 years of this project and a very low conformance index for this species (a 1 in a 100 year event). Conformance reflects how aberrant the population estimates from the current year are when compared with estimates from past years. A small conformance indicates that the current estimate is different (either high or low) compared to other years.

The 2004 field season was remarkable for its lack of precipitation, resulting in very parched conditions. Despite winter and spring conditions favorable to large fall populations of small mammals, these populations failed to materialize. Thus, summer meteorological factors (at least those as extreme as witnessed in 2004) also exert influence upon fall populations of small mammals. Anecdotally, we observed larger than normal abundances of singing voles on our legacy plots, possibly because this high-elevation animal was displaced to lower elevations in search of free water.

To learn more about this project, visit the web site:

http://mercury.bio.uaf.edu/~eric_rexstad/denali04/annual2004.pdf

Birds

Wildlife biologists are conducting short-term and long-term studies focusing on different ecological aspects of bird life in Denali National Park and Preserve. Several projects are aimed at protecting avian resources (birds, bird habitat, and prey sources) in and outside of Denali. Other projects such as the Breeding Bird Survey provide information for national monitoring programs. There are also several Citizen Science projects focusing on birds in the local area. For more information about Denali birds,

check out the article “Birds, Bird Studies, and Bird Conservation in Denali National Park and Preserve” in the Fall/Winter 2002 issue of *Arctic Research of the United States* published by the Interagency Arctic Research Policy Committee or visit the website <http://www.nps.gov/dena/home/resources/wildlife/birdweb/index/homebirdpage.htm>

✧ **Assessing the spatial and temporal variation in passerines (songbirds):** The objective of this project is to assess changes in songbird populations at Denali in both space and time. A primary objective of the passerine monitoring is to assess how bird communities (composition, distribution, and abundance) respond to changes in landscape structure and vegetation. Therefore, the passerine monitoring program uses the same spatial sampling design as the vegetation monitoring program in Denali. Carl Roland (NPS), Karen Oakley (USGS) and Trent MacDonald (Western Ecosystems Technology (WEST) developed this probabilistic sampling design, commonly referred to as the minigrad design, in 2000. Each 2.5 km x 2.5 km minigrad includes 25 sampling points located 500-m apart. By co-locating our sampling points with those sampled by the vegetation crew, we eliminated the need for the bird crew to collect data on vegetation and/or habitat and generated an integrated data set containing measurements of vegetation and passerine birds across the landscape in Denali.

We sample for birds at each minigrad point using a 10-minute point-transect with data grouped by distance interval. All birds seen or heard at each plot are recorded during a 10-minute sampling period. Detections of birds are separated into four time segments: 0-3 minutes, 3-5 minutes, 5-8 minutes, and 8-10 minutes. All birds detected within 150-m of the observer are recorded at 10-m intervals up to 100 m, then at 25 m intervals to 150-m.

In 2004, we conducted surveys for passerine birds on four minigrads in Denali. We sampled all points on the Teklanika and Savage minigrads one time in June and all sample points on two minigrads, Rock Creek and Primrose Ridge, three times (early, mid-, and late) during June to assess within-season variation of count results across an elevation gradient. Experienced bird surveyors, who completed a two-week distance sampling training course before the field season, conducted the surveys. We conducted all surveys between 0300 and 0930 daily from June 1 to June 28, 2004.

Similar to our results in the past four years, we detected 19 to 25 species per grid and passerine birds were the most common group of birds detected on the counts. We detected most birds (• 70%) in the first five minutes of the count and detected most birds (• 80%) by their calls or songs. Our preliminary results from the multiple sampling events on the Rock Creek and Primrose Ridge minigrads in June 2004 suggest that we should conduct future surveys in alpine areas before June 15; the number of species and number of individual birds detected on points at higher elevation on both grids decreased after June 15.

Highlights of the 2004 season included many observations of White-winged Crossbills on the middle Teklanika minigrad that is dominated by large white spruce, the first documentation of a Baird's Sandpiper nest in over 40 years in Denali on the Primrose Ridge minigrad, and many observations of Surfbirds on the Primrose Ridge minigrad.

We are awaiting the results of a formal peer-review of our monitoring plan and standard operating procedures. In 2005, we plan to sample eight to 12 minigrads, with most sampling focused on minigrads within 5 km of the Denali park road and in the wetlands in the northwest region of Denali. In autumn 2005, we plan to generate a report summarizing our findings from 2002-2005.

- ✧ **Breeding Bird Survey (BBS):** The North American Breeding Bird Survey (BBS) is a large-scale survey of North American birds. Denali has two of the approximately 3,700 active BBS routes across the continental U.S. and Canada (about 2,900 are surveyed annually). The BBS has accumulated over 30 years of data on the abundance, distribution, and population trends of more than 400 species. These data can reveal whether major population changes of a species in certain states are related to a continental decline or merely represent population shifts within their breeding range. We conduct two standardized Breeding Bird Survey (BBS) routes in Denali. Both routes are located along the Denali Park Road.

The Savage BBS route was completed on June 16, 2004. The survey started at the west end of Savage River bridge at 0301 and ended near Sable Pass at 0815. All 50 points were surveyed in 2004. The starting temperature was 12° C and the ending temperature was 16° C. The wind at ground level ranged from a slight breeze to intermittent gusts > 15 mph. This was the second year that Blackpoll Warblers were detected on the Savage BBS route and the first year that Semipalmated Plover and Belted Kingfisher were detected on the route. The Belted Kingfisher was detected by its call and one week later, the nest was discovered along the Teklanika River within 0.25 miles of the BBS point where it was first detected.

The Savage BBS route has been surveyed 16 times since 1986, and every year since 1993. Of the 53 species detected on the Savage BBS route in at least one year, less than half (22) were detected in 50% of the survey years (8 or more years). Eight species were detected every year including Black-billed Magpie, American Robin, Orange-crowned Warbler, Wilson's Warbler, American Tree Sparrow, Savannah Sparrow, White-crowned Sparrow, and Common Redpoll. Of these species, White-crowned Sparrow, American Tree Sparrow, and Wilson's Warblers are the most abundant, averaging more than 40 individuals per survey year. Fourteen species were detected in 8 to 15 of the survey years (number of years are in parenthesis) including Willow Ptarmigan (15), Mew Gull (15), Gray Jay (15), Boreal Chickadee (15), Arctic Warbler (15), Swainson's Thrush (15), Varied Thrush (15), Fox Sparrow (15),

Dark-eyed Junco (15), Hermit Thrush (11), Myrtle Warbler (11), Ruby-crowned Kinglet (9), Harlequin Duck (8), and Golden-crowned Sparrow (8).

The Toklat BBS route was completed on 17 June 2004. The survey started in front of the Toklat Ranger Station at 0322 and ended at 0924. All 50 points were surveyed in 2004. The starting temperature was 9° C and the ending temperature was 12° C. The wind at ground level ranged from a slight breeze to intermittent gusts > 15 mph. This was the first year that Upland Sandpiper, Barn Swallow, and Townsend's Solitaire were detected on the Toklat BBS route. The Barn Swallow was observed flying over beaver ponds just west of Grassy Pass (Mile 70, Denali Park road).

The Toklat BBS route was been surveyed 16 times since 1982 and every year since 1993. Of the 69 species detected on the Toklat BBS route in at least one year since 1993, less than half (25) were detected in 50% of the survey years (6 or more years). Ten species were detected every year including Alder Flycatcher, American Robin, Orange-crowned Warbler, Wilson's Warbler, American Tree Sparrow, Savannah Sparrow, Fox Sparrow, White-crowned Sparrow, Golden-crowned Sparrow, and Common Redpoll, . Of these species, White-crowned Sparrow, American Tree Sparrow, Savannah Sparrow, and Wilson's Warblers were the most abundant, averaging more than 40 individuals per survey year.

Results from the Denali BBS routes are available at:
<http://www.mbr-pwrc.usgs.gov/bbs>.

- ✧ **Developing indices of trends in willow ptarmigan (and snowshoe hare):** Indices of population size of snowshoe hare and willow ptarmigan on a broad scale are obtained by recording the number of each species observed during routine field activities. These data allow the tracking of changes in the abundance of both species over time. The abundance of snowshoe hare and willow ptarmigan was higher in 2004 than in the past three years. Populations of both species are expected to increase in the next couple of years as they enter the increasing stage of their 8-11 year population cycles.
- ✧ **Reproductive success of Golden Eagles and Gyrfalcons:** This was the 17th consecutive year for conducting standardized aerial surveys to determine occupancy of nesting territories and document reproductive activities and nesting success for Golden Eagles and Gyrfalcons in Denali. Both species are of conservation concern—Golden Eagles because of habitat changes and persecution on their lower 48 wintering grounds, and Gyrfalcons because Alaska is the only place they breed in the United States—and this study provides critical information for their conservation. Denali contains the highest reported nesting density of Golden Eagles in North America and our monitoring program and associated research projects have made significant contributions to Golden Eagle ecology in North America.

The occupancy and breeding activity survey was conducted from April 28 through May 2, 2004. This survey is conducted after most pairs complete their clutches but before most nest failures to determine occupancy and breeding activities. The productivity survey was completed July 20, 2004. The productivity survey is conducted late in the nestling period to determine nesting success and productivity. All the surveys were conducted from a Robinson R-44 helicopter.

We surveyed 82 known Golden Eagle nesting territories during the occupancy survey. We documented 71 territorial pairs, resulting in an occupancy rate of 87%. The number of pairs breeding and successfully raising fledglings was lower than most years. We documented 30 of the 71 territorial pairs as breeding pairs (42%) and determined that 17 of the 30 breeding pairs (57%) successfully raised at least one fledgling. The 17 successful pairs produced 19 fledglings. Overall productivity, measured as the number of fledglings per territorial pair, was 0.27 and mean brood size was 1.12.

We surveyed 13 known Gyrfalcon nesting territories and found a new Gyrfalcon nesting territory during the occupancy survey. The occupancy of nesting territories was lower than most years; we documented 9 territorial pairs resulting in an occupancy rate of 64%. We could not estimate the number of breeding pairs with eggs because we could not find the nest sites of two territorial Gyrfalcons. The number of successful pairs and productivity was lower than most years. We determined that 4 of the 9 territorial pairs (44%) successfully raised at least one fledgling. The 4 successful pairs produced 8 fledglings; overall productivity was 0.89 and mean brood size was 2.00.

The nesting phenology of Golden Eagles and Gyrfalcons was similar to other years. Most clutches were completed by mid-April, most hatching occurred by early June, and most fledglings left their nests by early August.

2004 Highlights: Gyrfalcons once again successfully nested on the east side of Marmot Rock, about 100 meters from the Denali Park road. Tens of thousands of park visitors had a chance to observe both adult Gyrfalcons throughout the summer and the fledgling Gyrfalcons from late July through August. To the best of our knowledge, this appears to be one of the most visible Gyrfalcon nesting territories in Alaska and provides park visitors with truly unique opportunities to observe the world's largest falcon during the nesting season. Gyrfalcons and Golden Eagles often nest on Marmot Rock. The temporary wildlife closure that is established in late May and maintained throughout the nesting season on Marmot Rock and around the valley and ridge immediately to the east of Marmot Rock appears to minimize disturbances by keeping park visitors from approaching too close to the nest.

Proposed activities for 2005 include (1) continuation of Golden Eagle and Gyrfalcon monitoring in the historic study area in Denali, (2) continuation of genetic studies of golden eagles in Denali, and (3) continued public education and outreach efforts.

- ✧ **Examining fidelity of Golden Eagles to nesting areas:** Results from our genetic study on Golden Eagles conducted in conjunction with the USGS-Alaska Science Center Wildlife Genetics Laboratory show that we can identify individual eagles using DNA collected in their shed feathers. This is a non-invasive, cost-effective method for obtaining data to assess the population trends of breeding eagles in Denali. We will continue to collect shed feathers from nesting territories to determine if we can assess fidelity to nesting areas. Feather collections for this research are conducted under the auspices of a U.S. Fish and Wildlife Service Eagle Scientific Collecting Permit and a State of Alaska Scientific Permit. After the DNA material is removed from the feather shafts, all feathers are transferred to the National Eagle Repository in Colorado.
- ✧ **Monitoring Trumpeter Swan populations:** The U.S. Fish and Wildlife Service (FWS) will conduct their five-year statewide Trumpeter Swan surveys in 2005. FWS personnel will use standardized aerial surveys from a fixed-wing aircraft to count the number of adult swans and cygnets from early to mid- August in the northwestern region of the Denali. Survey results from 2000 in this region indicate that well over 200 pairs of swans nest in the area.
- ✧ **Christmas Bird Count:** The National Audubon Society organizes the Christmas Bird Count (CBC) and each year more than 50,000 observers participate each year in this all-day census of early-winter bird populations. The results of their efforts are compiled into the longest running database in ornithology, representing over a century of unbroken data on trends of early-winter bird populations across the Americas. The primary objective of the Christmas Bird Count is to monitor the status and distribution of bird populations across the Western Hemisphere. The count period is from December 14th to January 5th. When data with Christmas Bird Counts and other surveys such as the Breeding Bird Survey are combined, scientists begin to see a clearer picture of how the continent's bird populations have changed in time and space over the past hundred years.

Local naturalist Nan Eagleson organizes and compiles the results of the Denali CBC. Eleven species including Ruffed Grouse, Spruce Grouse, Willow Ptarmigan, Gray Jay, Black-billed Magpie, Common Raven, Black-capped Chickadee, Boreal Chickadee, Pine Grosbeak, White-winged Crossbill, and Redpoll were observed on the 2004 Denali CBC.

Between 1992 and 2004, participants tallied 26 species on the Denali CBC. The number of species tallied annually ranged from nine to 18. The eight species observed in most years included Spruce Grouse, Gray Jay, Black-billed Magpie, Common Raven, Black-capped and Boreal Chickadee, Pine Grosbeak, and Redpoll. The number of individual birds counted annually ranged from 71 to 935. During the years with the highest counts, Redpolls and White-winged

Crossbills accounted for 64 to 76% of all birds detected on the Denali CBC. The counts of these two seed-eating finches were high only in years when viable seeds of White Spruce were abundant. Further, Golden Eagles were detected only in years when snowshoe hares were abundant. Not a surprising result given that some Golden Eagles may overwinter in years when snowshoe hare, one of their primary prey species, are abundant.

✧ **Denali Institute Migration Station:** The Denali Institute Migration Station (DIMS) is located near Moose Creek and is operated from early August to early September. The station is maintained on private land, owned by Denali National Park Wilderness Centers. The station was started in 1998 and has operated annually since then, generally from late July through early September. The station was established with two main goals: 1) learn about the migration and abundance of birds migrating through the Moose Creek valley in autumn, and 2) educating the general public about birds and bird conservation using banding demonstrations and evening lectures to the guests of Camp Denali, North Face Lodge, and other visitors. The station will operate in 2005; a full analysis of the eight-year data set and a peer-review of the DIMS will follow in autumn 2005 and winter 2006.

In 2004, DIMS was operated from July 30 to September 7. Ten standard mist nets (2.6 m x 12 m, 30-mm mesh) were opened daily for up to 7 hours, beginning at sunrise, weather permitting. Nets were open on 37 days, with 3 days cancelled due to rain. Net locations along Moose Creek were consistent with those used for the last five seasons. All captured birds were banded with U.S. Fish and Wildlife Service aluminum leg bands and processed according to the protocol established by the Alaska Bird Observatory (ABO). Data recorded for each captured bird included date and time of capture, net number, species, age, sex, amount of skull ossification, length of wing and tail, size of fat deposits, breeding condition (presence of brood patch or cloacal protuberance), molt condition, proportion of juvenal plumage, and mass.

In 2004, 1558 birds of 31 species were captured in 2633.4 net hours at DIMS. Wilson's Warbler was the most abundant species captured (30% of all individuals captured), followed by Ruby-crowned Kinglet (14%) and White-crowned Sparrow (13%). Nearly 80% of the captured birds were hatched in 2004. The busiest day for captures was the first day of operation, July 30, when 79 birds were captured in 67.5 net hours. The peak migratory movements occurred from August 20 to September 4. The slowest days for captures were August 18 and September 8, both with 21 captures during 70 net hours.

Wood Frog Surveys

The wood frog is the only amphibian that occurs (or is expected to occur) in Denali National Park and Preserve. Information on the presence and habitat associations of the wood frog continues to be collected concurrently with many of the ongoing bird and vegetation projects. In 2003, Dr. Grant Hokit, Carroll College, Helena, Montana, conducted pilot field work in the Wonder Lake area that indicated that

further study was merited because wood frogs are relatively widespread across Denali and that populations are relatively dense across the landscape.

Early last summer (June 5 to June 30, 2004), Hokit and his crew conducted extensive surveys for wood frogs from Grassy Pass to the south end of Wonder Lake. They looked for frogs in all still-water sites inside randomly-located 1-km circular plots. By describing habitat information and recording where they found frogs, they learned what features are positively or negatively correlated with use by wood frogs. Of the 41 plots, 22 were within 5 km of the Wonder Lake Campground and 19 plots were within 2 km of the road between Wonder Lake and Grassy Pass. Researchers surveyed a total of 219 still-water sites within the 1-km sampling plots. Wood frogs were observed at 106 sites (48%), breeding activity (the presence of eggs and/or larvae) was observed at 98 sites (45%), and adults and/or juveniles were observed at 17 sites (8%).

A series of statistical analyses revealed that breeding activity occurred more frequently than expected at larger sites that were not isolated from other sites with: 1) maximum water depth between 1 to 2 meters, 2) no connection to moving water, 3) 51-75% of the site less than 50 cm deep, 4) 76-100% of the riparian zone covered with woody vegetation, 4) from one quarter to three-quarters (26 to 75%) of the site covered with emergent vegetation, 6) alder or spruce present in the riparian zone, and 7) no sign of beaver activity. Sites with signs of beaver activity were negatively associated with breeding activity probably because they were generally deeper, with less emergent vegetation and less woody vegetation in the riparian zone, than other sites. No breeding activity was observed at bog sites dominated by sphagnum mats. Breeding activity of wood frogs was *not* associated with elevation or the distance of a site from contiguous boreal forest. In fact, the majority of the sites where wood frogs were present were in shrubby tundra more than 5 km from boreal forest.