

## ADMINISTRATIVE PROGRESS

### Resource Apprenticeship Program

This was the second summer that Denali sponsored a student through the multi-agency Resource Apprenticeship Program for Students (RAPS). The program was designed to give hands-on experience to high school students, especially Native Alaskans, who are interested in natural resource careers.

This year's student was Rená Nicklie, a sophomore from Cantwell, Alaska. Rená joined the staff for 6 weeks. She was exposed to a variety of disciplines in the resource field. Rená helped clean fossils, collected dust and soil samples along with native seed stocks. She learned how to key out plants and spent time in the field observing wildlife. Rená also participated in two interpretative programs. Here she was able to share her cultural background with park visitors. Rená was looking forward to returning to her science classes in 1998 due to her exposure to science while in the field.

### Resource Management Plan

Significant progress was made during 1997 on the preparation of Denali's Resource Management Plan. Writing by resource management staff and reviews in other park divisions were completed. Early in 1998 the plan will undergo state agency and cooperating entity reviews. Public review will follow shortly thereafter and the plan will be finalized.

### Division Administration

Additional personnel changes occurred during 1997. Plant Ecologist Elaine Furbish transferred from the park, leaving that position vacant. Ann Kain transferred from the Alaska Support Office to the park as the Cultural Resource Specialist and Carol McIntyre-Hander was hired as a part-time Wildlife Biologist (Ornithology). Jess Grunblatt was hired as a term Plant Ecologist to work on soils and vegetation mapping.

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## Long-Term Ecological Monitoring

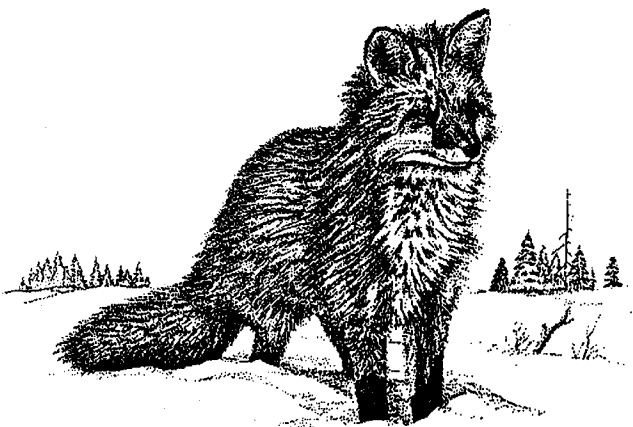
Major work was completed on the LTEM Program Conceptual Design document as well as an abbreviated Strategic Plan form of the document. The LTEM program was expanded with park participation in the Demonstration Intensive Site Project, an important component of the EPA Ecological Monitoring and Assessment Program. This will result in initiation of UV-B monitoring at the park in 1998. Park staff also began negotiations with the USGS regarding potential participation in the National Water Quality Assessment Program.

During 1997, BRD coordinated peer reviews of nine protocols: weather, air quality, stream channel morphometry and water chemistry, glaciers, vegetation, small mammals, landbirds (two protocols) and data management. The NPS carried out field operations for the Rock Creek watershed and glaciers while development continued on the soils and benthic macroinvertebrate monitoring protocols. The NPS also began a major effort to organize, verify and validate backlogged water chemistry, hydrology and vegetation data. Denali continued its long-term efforts to monitor vulnerable populations of management concern: wolves, caribou, Dall sheep, moose, and golden eagles. Two milestones were reached in resource inventories, which will help us stratify watersheds throughout the park. NPS and the U.S. Forest Service finished analyzing data collected during a 3-year park-wide surface water chemistry inventory, and a joint NPS-Natural Resources Conservation Service soils inventory got underway.

## Soils and Landcover/Vegetation Mapping

During 1997, park staff joined forces with staff from the Natural Resources Conservation Service on a multi-year project to prepare a parkwide soils map. The Servicewide Inventory Program is providing funding for this initiative. A term Plant Ecologist was hired to work with the NRCS Soil Scientist. The year was spent determining detailed objectives, methodologies, and implementing the first year of data gathering. The project will take approximately six years to complete.

The Plant Ecologist will also spend approximately fifty percent of his time on development of the park's landcover or vegetation map project. Dedication of staff time to this project resulted in significant progress in assessing data sources currently on hand that can be used to derive a landcover map.



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## Slate Creek Restoration

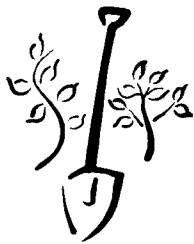
Abandoned mining claims on Slate Creek present a significant threat to water and upland resources in the Kantishna Hills area of the park.

This site was mined for antimony and gold from 1910 through 1983. The site is severely disturbed and was recently listed on the State of Alaska's 303-d listing of impaired waterbodies. In response, the National Park Service initiated a mine restoration project at Slate Creek. The object of the restoration project is to reduce or eliminate the threats to water quality, improve the riparian habitat, and have the watershed removed from the Impaired Waterbodies listing. Phase One of the project began in 1997 and focused on eliminating acid drainage from the mine site. This was accomplished by recontouring the mine area to direct drainage away from the stream channel, and intercepting and modifying groundwater flows. Tailing piles, including the access roads, were moved inside the mine pit and leveled. Tests were begun to investigate moderating acidic soil with lime. Phase Two, scheduled for 1998, will focus on stream channel and floodplain restoration. The project design will include the use of natural methods (bio-revetment and vegetation), located on meanders, to encourage channel stabilization. Riparian areas will be revegetated with willow cuttings and other appropriate vegetation.

## Subsistence Management

Denali's Subsistence Resource Commission held meetings in March and August of 1997. Two new members were appointed to the commission. The commission passed numerous motions to define and clarify their positions regarding subsistence issues, sending letters with their recommendations to the park Superintendent, Federal Subsistence Regional Advisory Councils, Federal Subsistence Board, and the Governor of Alaska.

Park staff managed the Federal subsistence registration permit hunts in wildlife management units 13(E) and 16 (B), issuing a total of 46 moose hunting permits and 102 caribou hunting permits for unit 13(E) and 3 moose hunting permits in unit 16(B). A temporary closure prohibiting the discharge of firearms was implemented for the developed area of Kantishna during a portion of the fall hunting season when the lodges were operating. An Environmental Assessment was prepared and a

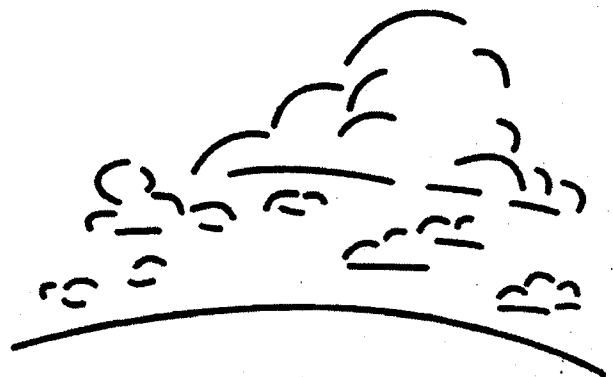


permit issued for the construction of a subsistence trapline cabin on Birch Creek within Denali National Park and Preserve. A subsistence timber harvest permit was issued for gathering cabin logs.

Denali was actively involved in preparing and presenting the NPS Subsistence Issue Paper to several Subsistence Resource Commissions and Regional Advisory Councils for comments and review. Denali staff participated in the annual Subsistence Resource Commission Chairpersons meeting in Anchorage. Two ANILCA Section 810 subsistence and land use analysis (for actions that could potentially impact subsistence users or subsistence resources) were prepared. Park staff prepared and presented analysis for two regulatory proposals requesting an individual exception to Healy's customary and traditional use determination for use of moose on park lands, and a hunting season regulatory change for wolf hunting seasons in the Denali area. Park staff met with members of the Tanana Tribal Council to discuss NPS eligibility and issue subsistence use permits.

## Implementation of Healy Power Plant Agreement

Significant progress was made toward implementing a portion of the Healy power plant mitigation agreement which requires Golden Valley Electric Association to fund a three-year air quality monitoring project. The study will compare air quality near park headquarters, 15 kilometers south of the new power plant, to two background sites in interior Alaska. One station will be located near Trapper Creek on the south side of the Alaska Range, and the other will be installed at the Poker Flat Research Range north of Fairbanks, in cooperation with the University of Alaska Geophysical Institute. Sampling for sulfates and nitrates will begin in 1998.



and Rescue that could be used by staff at the Talkeetna Mountaineering Center. A computer devoted to GIS was acquired for the center with regional office assistance. A license of Arcview GIS was bought for the computer and a number of specialized themes were developed. A specialized interface was developed and past Case Incident Records were digitized to facilitate access to information on a particular climbing route that could aid in rescue efforts.

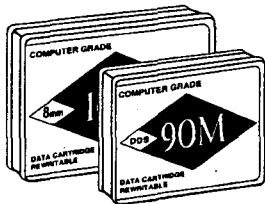
Numerous map products were developed throughout the year for all park divisions. This included a variety of base maps, North Access Study maps, a new Backcountry Unit map, a new trail map for the Alpenglow, the park newspaper, a number of maps for the Concessions Division, and numerous maps for Resource Management use. Assistance was provided to the Alaska Fire Service in mapping a fire near Fort Yukon during the summer using GPS technology and the park's GIS. A number of requests for data were answered.

Several training opportunities were offered in GIS in 1997. AKSO staff provided a two-day training session in the park on the use of Arcview GIS. Fourteen people attended from the Research & Resource Preservation Division, Maintenance, and BRD. Several employees attended a class on the use of the park's PLGR GPS units in Anchorage. The park's GIS Specialist was able to attend a weeklong GIS Conference in San Diego.

Park staff benefited from the efforts of AKSO GIS employees who have been working to develop customized extensions to Arcview that make many of the more common tasks more user-friendly. The park received a number of updates to this browser during the year. The complete GIS and AutoCAD dataset has been provided to the park on CD-ROM as well. Much of the dataset is available to the general public on the internet.

## Data Management

Good progress was made in the area of data management in 1997. The draft Data Management Protocol was submitted for peer review and their recommendations were adopted in the final document.



With increased funding several individuals were hired or had their seasonal appointments extended to work on

several of the long-term monitoring datasets. These projects included documenting the location of all the monitoring sites in Rock Creek as well as throughout the park. GPS locations were obtained and the information was incorporated into the park's GIS. A catalog of existing resource datasets was also created. This work will provide the basis for additional dataset documentation and metadata development. Several of the water monitoring and other datasets, were researched for quality assurance and documentation.

## Bear-Human Interactions



NPS staff documented 220 bear-human interactions in Denali from April through September 1997. The number of interactions was down slightly from 1996 (243 interactions) and similar to 1995 levels (216 interactions). Interactions in 1997 were classified as 192 encounters, 18 incidents, four control actions (in which bears were hazed), three cases of bears obtaining human food (although these three cases also involved property damage, obtaining food receives priority in the management ratings), two cases of property damage, and one case of human injury. Sixty-five of the interactions occurred in the frontcountry and 155 in the backcountry.

Recommendations were received in 1997 from an expert review panel charged with evaluating Denali's bear management procedures and developing future bear management program direction for Denali. These recommendations are being incorporated into the park's 1998 bear management program, which should enhance its overall effectiveness.

## RESOURCE STEWARDSHIP ACTIVITIES

### Road Wildlife Study Continues

During the 1997 field season, Wildlife Technicians resumed a third year of development and implementation of a long-term road use/wildlife interaction monitoring program along the Denali Park road.

Behavioral and site-specific data were gathered on caribou, Dall sheep, grizzly bears, moose, and wolves within 500 meters of the Park road between Park Headquarters and Eielson Visitor Center. All road-related stimuli and animal behavior were recorded over 15-minute intervals. Detailed site, weather, and animal age, sex, and group statistics were also documented. Between 22 April and 15 September, 26 trips and 131 wildlife behavioral observations were made in an easterly direction (Eielson Visitor Center to Park Headquarters). During the same period, 45 trips and 222 observations were made in a westerly direction (Park Headquarters to Eielson Visitor Center). Species composition was: 43% caribou, 23% bears, 22% sheep, 10% moose, and 1% wolves.

### Denali History

The Historic Resource Study identifies cultural themes associated with the park region; locates, describes and evaluates cultural properties representing those themes; and provides the necessary information to nominate eligible properties to the National Register of Historic Places. The second volume will tie the historical narrative of Volume 1, "A History of Denali - Mount McKinley Region, Alaska" by William E. Brown, to the physical resources in the park. The study will compliment and should be used in conjunction with "An Overview and Assessment of Archeological Resources, Denali National Park and Preserve" by Kristen Griffin which addresses the prehistoric resources.



The topics associated with Denali include Native culture, subsistence, exploration, mountaineering, conservation, hunting/trapping, tourism/recreation, park administration, mining, community/commerce, and transportation. The themes are currently being researched and developed. Each historic site within the park has been linked to one or more of the above themes.

All known historic sites within the park have been summarized in an ACCESS database for quick and easy reference. Although the site information is summarized, detailed information is included which will aid in management decisions.

### Validating Fire Danger Rating Continues

Vegetation sampling was continued by the NPS, Fish and Wildlife Service and the Alaska Fire Service -BLM to estimate fuel moisture content. Denali collected samples near our Minchumina RAWS to help validate the Canadian Fire Behavior Danger Rating system. Protocols were developed from 1996's sampling techniques and the data collected will be consolidated at the Pacific Northwest Research station. This project is expected to continue for at least one more season before a determination of the rating system validity can be made.



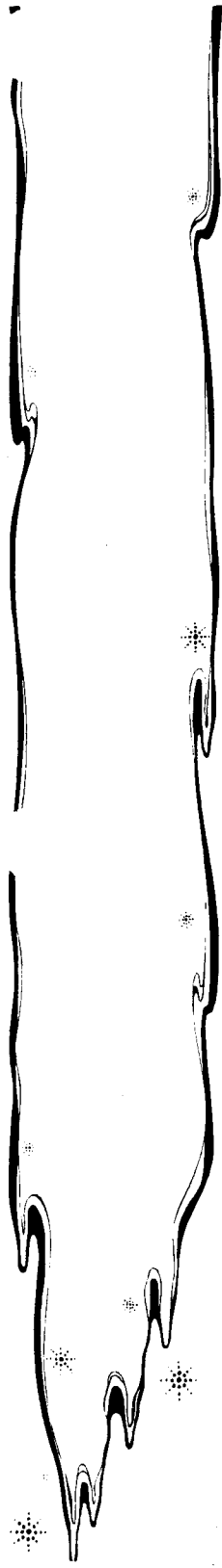
### Geographic Information System

A considerable number of accomplishments were achieved with Geographic Information System (GIS) at Denali in 1997. Work both in-park as well as by the Alaska Regional Support Office (AKSO) GIS staff has helped to make this technology more accessible to park users.

A number of new themes were added to the park dataset and existing themes were updated and improved. The dataset is robust enough that at this point the most commonly requested themes are readily available. This effort is ongoing with more attention being devoted to making the data available to various park users.

One effort to make the technology more available involved the development of an application for Search

## Glaciers



In August and September of 1997 the monitoring program was expanded to include a survey network of 18 index stakes on the East Fork Toklat Glacier (named unofficially), located at the head of the East Fork Toklat River. This new research site is part of an effort to gather glacier information at more than just the two index sites on Kahiltna and Traleika glaciers, so that we may characterize glacier activity on a Park-wide scale. East Fork Toklat Glacier is small in comparison with Kahiltna and Traleika glaciers and it was chosen because a larger stake network, covering the glacier from top to bottom, is much more practical. This comprehensive network will allow a more detailed understanding of how glaciers and climate are interacting in the northeast portion of Denali.

A surge that began in 1996 on a small glacier on Peters Dome, near the North Face of Mt. McKinley, did not continue in 1997. Aerial observations made between January and May did not indicate that the glacier advanced beyond the limit it had reached in late 1996. Thus the surge appears to have ended during the fall of 1996. Most likely this occurred when the supply of meltwater, on which the glacier had been sliding, was cut off by winter freeze-up. A termination at the end of the summer melting season is consistent with what is known about the behavior of most surging glaciers.

Surveys on the Muldrow Glacier continued in 1997 as we neared completion of our study of the

glacier's pre-surge condition. Because the Muldrow is expected to surge again near 2000, we have been collecting data on the glacier's geometry and flow in anticipation of that event. Studies of other surge-type

glaciers have suggested that there may be both a thickening of the ice, and an increase in ice flow velocity, which signal a glacier's readiness to surge. Our survey data shows that the glacier has thickened up to 40 meters since 1976 but that it is still between 10 and 45 meters thinner than it was prior to the last surge in 1956. Annual flow rates, which had decreased steadily since 1982, increased approximately 40% during the 1996-97 measurement year. While it is not certain that the increased flow rate is the precursor of a surge, it is, nevertheless, an exciting possibility and subsequent measurements will show whether there is a building trend that may be signaling the next big advance of the Muldrow Glacier.

Dramatic changes have taken place on the Traleika Glacier since index site monitoring began in 1991. The glacier has thickened up to 25 meters and the rate of surface ice flow has doubled. The Traleika Glacier is the major contributor of ice mass to the Muldrow Glacier and this build up may be in advance of a surge in this glacier system.



## Denali Fault-Finding

Geologic research efforts in Denali were primarily concentrated on two portions of the Denali Fault, a long crustal break that is comparable to California's San Andreas Fault. Geologists have long thought that rocks south of the fault have slid 250 miles or more west to create an "imported" southern portion of the park and the rest of the state of Alaska. Geologic evidence investigated by the Denali Geologic Research Group in the 1997 field season, suggests that the fault stops at Gunsight Pass, at the northern base of Mt. McKinley.



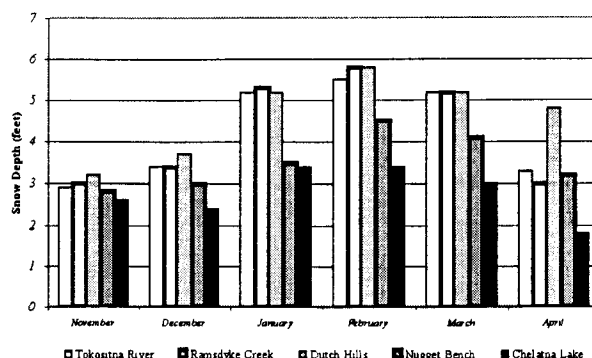
The investigators were expecting to see a fault contact between granitic rocks on the north and sedimentary rocks on the south, but instead an intrusive relationship was identified, suggesting that no faulting has occurred since at least 38 million years ago (the age of the granitic intrusion). Samples of granitic rock were taken for basic chemistry and trace element analysis, and for thin sections to further evaluate the intrusion/fault relationship.

## 1996-97 Snow Surveys

Snow surveys were carried out in Denali during the winter of 1996 and 1997 as a cooperative effort with the USDA Natural Resources Conservation Service. Snow depths and densities were sampled at five snow courses, and snow depths were measured at five aerial markers. Surveys took place at the end of each month between November and April. The snow courses are located in the northern half of the park. There are two courses in the headquarters area; one at the headquarters Air Quality monitoring site (2161'), and another on Rock Creek Ridge (2500'). Snow courses in the west end of Denali are located at Kantishna (1585'), Minchumina (740'), and the Purkeypile Mine airstrip (2025'). The five aerial

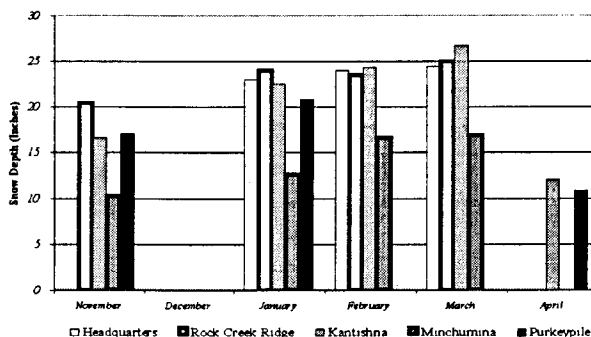
snow depth markers are arrayed along the south slope of the Alaska Range between the Tokositna River (850'), Ramsdyke Creek (2220'), the Dutch Hills (3100'), Nugget Bench (2010'), and Chelatna Lake (1450'). See Figure 1.

Figure 1. South Slope Aerial Marker Snow Depths, 1996-97



The pattern of variation in snow depths across the park is reflective of the varying climates of the region. Higher snow depths on the south slope of the Alaska Range are the result of the maritime influences of the climate to the south. Snow depths on the north side of the Alaska Range increase from west to east. This is due to the varying degree of continentality in the climate north of the range. The west end of Denali receives the least amount of precipitation throughout the year and experiences the widest range of temperatures. The eastern area from Kantishna to Headquarters has a more moderate climate and receives a greater amount of precipitation. See Figure 2.

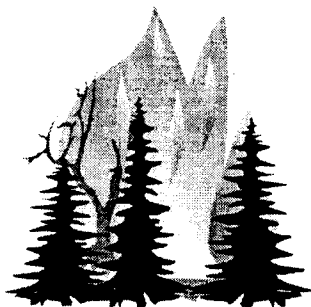
Figure 2. Monthly Average Snow Depths at Snow Courses, 1996-97



species in the Ascomycetes and Basidiomycetes, lichens, mosses and liverworts. Moreover, the proposed work complements research being conducted in both northern (Denali, Columbia Glacier, Aleutian & Pribilof Islands & the Arctic North Slope) and southern (subantarctic Macquarie Island) hemispheres. Further information can be obtained from Dr. Gary Laursen at the University of Alaska-Fairbanks.

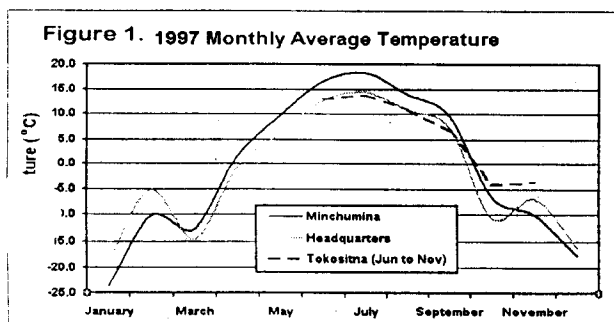
## Wildland Fires

Lightning started six wildland fires in 1997, burning a total of 7,107 acres. The fires started in late June and burned into August creating a mosaic pattern of burns. The Ruth fire started July 4<sup>th</sup> in a modified suppression zone. Holding actions were taken on the south flank of this fire to keep it from a full suppression zone. A two-acre fire on the northeast boundary was suppressed by smokejumpers due to its proximity to two cabins. All other fires were allowed to burn under normal conditions.

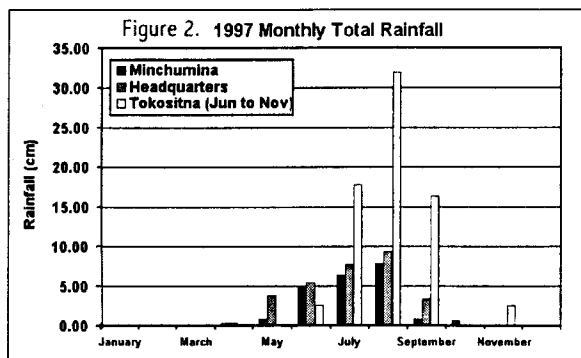


## Watching the Weather

Using Remote Automated Weather Stations (RAWS) that were installed with the assistance of the National Interagency Fire Center, we collect weather information at six locations in the Rock Creek drainage, two locations in northwestern Denali, at the McKinley River, at Lake Minchumina, at Wonder Lake, and at a station on the south slope of the Alaska Range near the Tokositna River. The RAWS have been subjected to a typical range of problems for remote stations, including bear damage and extended down time due to the difficulty of maintaining stations at remote sites. Nevertheless, they have functioned well and have generated useful data for comparing the differences in climate throughout the region.



The data we have collected demonstrates what is commonly understood about the climates of south-central and interior Alaska. To the south a maritime climate exists around Cook Inlet and the Gulf of Alaska. The south slope of the Alaska Range is heavily influenced by that climate and, therefore, has a more moderate range of temperature and receives much more rainfall than any one location in the northern half of the park (see Figures 1&2). The station at Tokositna received as much as 3 times more precipitation in one month during the summer of 1997 than either Lake Minchumina or park headquarters.



The headquarters station is located near the crest of the Alaska Range, but on the lee side relative to the warmer climate to the south. Therefore, it is affected by a downslope wind that causes average temperatures to be higher than in areas farther to the north. Lake Minchumina doesn't experience these lee side affects because it is much farther north of the crest. Proximity to the crest of the Alaska Range has a similar affect on precipitation in the north. Headquarters receives slightly more rainfall than Lake Minchumina

Another factor that affects the degree of continentality in the climate between Lake Minchumina and Denali headquarters is the pattern of regional weather flow along the north slope of the Alaska Range. The western half of the park receives weather that is flowing from the southwest along the range front. Lake Minchumina is affected mostly by this southwesterly flow which originates in the Bering Sea, is colder than the air masses coming up from Cook Inlet on the south slope, and is comparatively dry by the time it reaches the park.

In contrast, headquarters is sometimes influenced by weather from the south moving through Alaska Range passes or over the lower crest of the range to the east of Mt. McKinley. Headquarters is, therefore, a mixing zone between the southwesterly flows that parallel the north slope of the range and the occasional maritime influences of the climate to the south.

During the drive to the Summit airstrip in Broad Pass, Mary recalled her experiences there as a radio operator during 1941-1944. There is a 45-minute audio recording of this interview. During his only visit since 1959, Ted Lachelt shared some of his recollections at the Eagle's Nest, Kantishna. Ted built the Eagle's Nest in 1950, was an early 50's seasonal park ranger, laborer, and naturalist, and conducted a winter wolverine study. He returned in 1959 as the NPS civil engineer overseeing the building of Eielson Visitor Center. This 30-minute audiotope includes memories of Ted's winter visits with Johnny Busia in Kantishna. An interview was conducted with Jim King in Juneau, Alaska in October. Jim was a seasonal park ranger in 1950 and worked for Chief Ranger, John Rumohr. Jim's recollections of seasonal park ranger duties and activities are recorded on 90 minutes of audiotope. During December 1997, these audiotapes were transcribed and review of the transcripts is now in progress. Tapes and some transcripts of these interviews and other oral history recordings are available for use from the Denali National Park Museum, or from Jane Bryant at Park Headquarters.

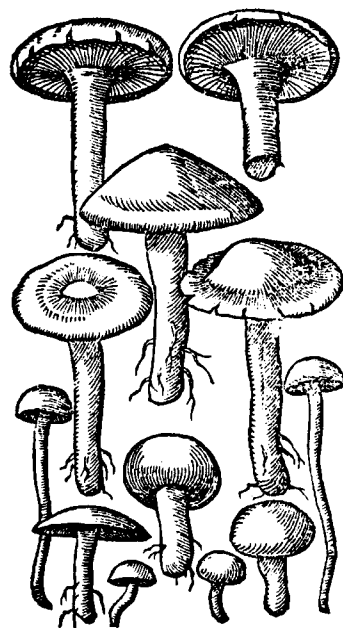
## South Slope Archeological Survey

The objective of the South Slope Archeological Survey is to inspect a sample of lands in the southern foothills of the Alaska Range, in Denali State Park and on other state lands, which may be subject to development for visitor use. Very little is known about historic and prehistoric use of these areas. Through a cooperative agreement with the State of Alaska Office of History and Archaeology, we were able to conduct a pedestrian reconnaissance survey of approximately 2800 acres. We found two archeological sites: an early 20th century placer mining operation and an early 20th century sawmill site. Historic research and literature review was completed. The project will be completed by November, 1998.

## Ethnographic Overview and Assessment

There are three primary purposes for the Ethnographic Overview and Assessment: First, to document and evaluate as completely as possible existing information of the five Alaska Native cultural groups associated with Denali, providing a synthesis of information chronicling the contemporary and historic cultural use of resources in the Denali area, and cultural change since Euroamerican contact. Second, to work cooperatively with neighboring tribal groups and villages to provide an opportunity for them to prepare, or to choose who will prepare, and write their own village or band histories. Third, to gather information regarding proper protocols and contacts for

consultation between local Alaska Native groups, neighboring federally recognized tribes, village councils and Denali. A cooperative agreement with the State of Alaska, Division of Subsistence, was established to conduct the research and writing for the broad overview and assessment of the Alaska Native groups associated with Denali. Meetings have been held with several Native village tribal councils discussing the village history portion of the project and their interest in participating. The project has been introduced and described at a recent meeting of Denali's Subsistence Resource Commission and three Subsistence Regional Advisory Councils for the Denali area. Initial bibliographic searches have been conducted.



## Mycological Assessments

Mycological investigations have emphasized inventorying mycetes for biodiversity and constructing a database that includes select microfungi (the slime molds, both dictyostelid or cellular slime molds, and the plasmodial slime molds; zygomycetes as endomycorrhizal fungi; aquatic hycomycetes and hyphomycetes; deuteromycetes or imperfect fungi), higher fungi (macrofungi; i.e., wood

rotters, saprobic decomposers and ectomycorrhizal fungi) composing the ascomycete and basidiomycete flora, and lichenized fungi. Fungal inventories are critical to the understanding of plant-soil-microbe interactions and their ecology. Work has resulted in 37 publications. Data have contributed significantly toward understanding fungal biodiversity, range, distribution, associations, and fundamental ecological roles played within cold-dominated, high-latitude boreal forests, montane, and tundra ecosystems.

Results include 7 species in 2 genera of Dictyostelid (cellular or false slime molds), 75 species in 20 genera of Myxomycete (plasmodial or true slime molds), 11 species in 10 genera of Mastigomycetes, 7 species in 6 genera of Oomycetes, 58 species in 5 genera of Ascomycetes (aquatic), 2 species Aero-aquatic Hyphomycetes, 20 species of black filamentous fungi the Dematiaceae, 34 species of Ingoldian fungi, 79 species in 21 families of aquatic fungi, several hundred

determined by early June at 20 territories. Time did not allow a proper survey of the west end of the park beyond Toklat. Many of the Merlin territories were monitored for reproductive success in late July. Twenty-six potential territories were surveyed. Of this, at least 21 were determined to be occupied and at least six successfully fledged young.

## Moose

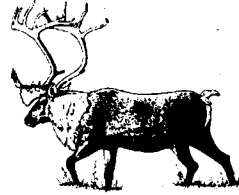
We estimated the number of moose (*Alces alces*) in a 7,068 km<sup>2</sup> area of Denali during October 1997. We observed 997 moose during the aerial survey and estimated 1,630  $\pm$  204 moose for the entire survey area. Overall density was 0.23 moose/km<sup>2</sup>; density by survey unit ranged from 0-2.9 moose/km<sup>2</sup>. The ratio of calves to bulls to cows was 22:63:100. We estimated that 80% of cows were without calves, 18% of cows had one calf, and 2% of cows had two calves present. The estimated number of moose and the calf-to-cow ratio appeared lower than 1996 estimates and similar to estimates obtained during 1986 and 1991. The bull-to-cow ratio appeared higher than the ratio reported in 1996 and lower than ratios reported during 1986 and 1991 surveys.



## Sheep

Ground-based and aerial trend counts for Dall sheep were conducted in 1997 during the week of 30 June. A total of 200 sheep were classified during the ground-based count. One hundred and nine ewes, 26 yearlings, and 59 lambs were counted, resulting in 54 lambs per 100 ewes and 24 yearlings per 100 ewes. The lamb count was similar to the 1996 survey period when 51 lambs per 100 ewes were observed and is slightly higher than the mean ratio over the past 23 years of 48 lambs per 100 ewes. The 1997 yearling count is up from the 1996 survey result of 17 yearlings per 100 ewes and is slightly higher than the 23 year mean ratio of 21 yearlings per 100 ewes. Ground-based counts have been conducted along the park road corridor since 1974.

The sixth annual aerial sheep count was conducted over the Upper Savage, Upper Sanctuary, and Upper Teklanika areas. Unsuitable weather conditions and aircraft unavailability prevented completion of the aerial survey over the Outer Range. Results indicated a total of 242 sheep counted. Of this total, 157 were ewes or "ewe-like" animals, 38 were lambs, and 47 were rams.



## Caribou

The long-term research program on the Denali Caribou Herd posted its fourteenth consecutive year in 1997. Calf survival was again poor with 80% of calves produced dying by late September, resulting in 16 calves per 100 cows in the herd. Of 74 calves produced by radio-collared cows, 40 died in May primarily from wolf and bear predation (16 and 14, respectively) and 19 more had died by late September. The adult sex ratio continued its decline to 29 bulls per 100 cows this fall, down from 56 per 100 during 1984-89. We estimated a fall population size of 2,110 caribou, comparable to estimates since 1993.

The Denali Caribou Herd declined from a high of 3,200 caribou during 1989-90 over a period of severe winters (1988-1994) with above average snowfall that resulted in a low recruitment rate of calves (20 or fewer calves per 100 cows in fall since 1990) and increased winter mortality of adults. Overwinter losses of adult females averaged 15% during 1988-93, compared to only 3% in other years since 1986. Bull losses must have been substantially greater since 1990 based on the 50% reduction in bull:cow ratios.

## Oral Histories of Park Area Elders

In an effort to record and preserve our area elders' historically significant memories for future use, there were four oral history interviews recorded during 1997. A one-hour interview with Beatrice Herning was recorded. Beatrice's father, Frank Fox, was a Civilian Conservation Corps supervisor at McKinley Park in 1938 and 1939, where Beatrice met and later married Harold Herning, a 1938 - 40's park ranger. This couple later held mining claims on Mt. Eielson and built the Herning Cabin, visible today from Eielson Visitor Center. In June, Mary Tallman Lee visited the area with her daughter.

## Golden Eagles

For the 10th consecutive year the NPS, in cooperation with BRD and the Forest and Rangeland Ecosystem Science Center, collected data on the reproductive characteristics of Golden Eagles (*Aquila chrysaetos*) in Denali in 1997. Using two aerial surveys we monitored 72 Golden Eagle nesting areas in the northeastern portion of Denali.



Territorial pairs occupied 63 nesting areas, resulting in an occupancy rate of 88%. Laying rate was 71%, with 45 territorial pairs producing eggs. Nesting success, measured as the number of laying pairs raising at least one fledgling, was 73%. Thirty-six successful pairs raised 57 fledglings. Overall population production, measured as the number of fledglings per territorial pair, was

0.90. This was the second highest year for Golden Eagle productivity on the study area in 10 years. Since 1988, overall annual reproductive output of Golden Eagles in Denali was influenced most strongly by the proportion of pairs that lay eggs. Laying rates for Golden Eagles in Denali are highly correlated with numbers of Snowshoe Hare (*Lepus americanus*) and Willow Ptarmigan (*Lagopus lagopus*) observed on the study area.

In 1997, we began to examine the behavior and movements of juvenile and subadult Golden Eagles from natal areas in Denali. Using satellite-radio telemetry we are collecting data on eagle movements during post-fledgling periods, migration, winter, and subsequent summers. We deployed 22 satellite radio transmitters (PTTs) on 22 juvenile Golden Eagles in late July and early August 1997. PTTs were attached to juvenile eagles using a backpack-harness constructed of Teflon ribbon. The entire package weighed about 102 grams (less than 3% total body weight of the eagles). The duty-cycle for all PTTs is 8 hours on and 72 hours off; PTT life is estimated at three years. We are using Service Argos Data Collection and Location System to obtain locations of the radio-tagged eagles.

## North American Migration Count

May 10, 1997 was a blustery spring day when 14 brave souls battled the cold and wind to count birds for the North American Migration Count (NAMC) in the Dei and Healy areas. The goal of the NAMC is to obtain information on the abundance and distribution of birds across North America during spring migration. This was the fourth year that the NAMC was conducted in the Denali and Healy areas. There were a total of 625 individual birds and 49 different species. This is more individuals than in 1996, but 2 less species and 24 species less than 1994 and 1995. There were no new species added to the count list this year. Willow Ptarmigan were the most abundant birds recorded this year. Greater numbers of waterfowl were seen -- probably a result of folks counting at Railroad Ponds, Eightmile Lake and Otto Lake. Raptor sightings were also up in 1997. Results of the NAMC were sent to Jim Statz, the National Coordinator for the North American Migration Count and Brad Andres, the State Coordinator for the North American Migration Count. The NAMC will be held on the second Saturday in May each year. All interested folks are encouraged to participate in the count!

## Breeding Birds

Two breeding bird survey routes were again run in Denali in 1997. The Toklat route, which runs from the Toklat ranger station to approximately mile 79 on the park road, was conducted on June 17<sup>th</sup> starting at 3:31a.m. and ending at 7:50a.m. A total of 294 individuals of 28 different species were recorded.



The Savage survey route, which runs from the Savage River bridge to Sable Pass, was conducted on June 18<sup>th</sup>. The route was started at 3:27a.m. and ended at 7:27a.m.. A total of 290 individuals of 23 different species were recorded.

## Merlins

During the summer of 1997, the park continued the Merlin monitoring work initiated in 1990. The monitoring effort focused on territorial occupancy and reproductive performance of Merlins found along major river drainages in northeastern Denali. Occupancy was

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STATE OF PARK RESOURCES  
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## RESOURCE CONDITIONS

## Wolves

Wolf and caribou research at Denali National Park & Preserve, Alaska has continued unabated since 1986. In cooperation with the National Park Service (NPS), researchers from the USGS-Biological Resources Division (BRD) are currently studying the population dynamics and predator/prey relationships of gray wolves (*Canis lupus*) and caribou (*Rangifer tarandus*), and are beginning new studies of moose (*Alces alces*) during 1998. To date, this research has provided new information on the population dynamics, predation behavior, social structure and genetic relationships of wolves; population dynamics, reproductive performance and calf survival patterns for caribou; and the influences of weather and landscape use patterns on wolf/caribou relationships.

During our studies, the late-winter Denali wolf population increased from about 54 wolves in March 1987 to 135 wolves by 1990 with the onset of a six-year period of above average snowfall. After 1992, wolf numbers declined to about 95 wolves in late winter with a decline in caribou and a return to near average snowfall. In 1997, we documented further declines in the wolf population to the lowest fall numbers (approximately 100 wolves and 25% below the previous fall estimate) since 1987. The decline in 1997 resulted from lower than average pup production, increases in the occurrence of wolves being killed by other wolves, and probably increased dispersal of young wolves.

## Grizzly Bears

Thirty-seven grizzly bears were captured 49 times during 1997. The 33 captures during May included eight independent males and 17 independent females. In addition, radio transmitters were placed on six 2-year-olds and break-away collars were refurbished on two 3-year-olds. The 16 captures during September were all adult females. Radio collars were retrieved from two male bears that shed them prematurely. We obtained 582 radio locations of bears during 25 days of tracking. Radio tracking efforts were focused on the periods May 7 to July 11 and August 29 through October 30 to measure cub production and annual bear survival to den entrance.

No cubs-of-the-year were produced from three eligible females during 1997. Only one of seven females that lost entire litters during 1996 did so early enough in the year to breed and produce cubs this year. Four females, 6 to 9 years old, have still not produced their first litters. Four adult females were accompanied by a total of eight yearlings. Three females were accompanied by six 2-year-olds; one 2-year-old became independent during June. Two females were each accompanied by a single 3-year-old male at den emergence; both 3-year-olds became independent during June. Yearling and 2-year-old mortality was 75% and 17%, respectively. Of the eight yearlings, three starved in the den, and three disappeared during May and June. Of the six 2-year-olds, one was consumed by a bear in June and was in very poor condition at the time of death. A hunter near the Tonzona River legally killed one adult male west of the park on September 20. The bear had shed its collar while in the den last year.

