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ARIZONA
MT. GRAHAM RED SQUIRREL MONITORING PROGRAM

**Annual Report
for
2002**

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INTRODUCTION

The University of Arizona's Mount Graham Red Squirrel Monitoring Program continued monitoring the status of Mt. Graham red squirrels (*Tamiasciurus hudsonicus grahamensis*) near the Mount Graham International Observatory (MGIO) in 2002. The MGIO is located along a ridge extending westward from Hawk Peak in the Graham (Pinaleno) Mountains of southeastern Arizona. In 2002, the MGIO site consisted of two operating facilities, the Vatican Advanced Technology Telescope (VATT) and the Sub-Millimeter Telescope (SMT), a maintenance and generator building, and a 3.2 km access road (FR 4556). Construction continued on the Large Binocular Telescope (LBT) throughout 2002, with mainly interior building work.

The Monitoring Program was established in 1989 to meet the requirements of the MGIO Management Plan (USDA Forest Service 1989), with the principal goal of detecting possible effects of construction on the Mt. Graham red squirrel. Four areas encompassing 337.9 ha were defined in the vicinity of the MGIO site to monitor red squirrel populations (Figure 1). These areas include two forest habitat types: transitional (TR) or mixed conifer forest and spruce-fir (SF) forest. The TR habitat, below 3050 m elevation, is composed of Engelmann spruce (*Picea engelmannii*), corkbark fir (*Abies lasiocarpa* var. *arizonica*), Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*), southwestern white pine (*P. strobiformis*) and aspen (*Populus tremuloides*). The SF habitat, above 3050 m elevation, is composed of Engelmann spruce and corkbark fir. In each habitat type, an area within 300 m of the telescope sites and access road was defined as the *construction* area. For comparison, a *non-construction* area beyond 300 m from the MGIO site or the access road was defined in each habitat. This resulted in four monitored areas: TR habitat construction (TRC) (83.6 ha), TR habitat non-construction (TRN) (24.4 ha), SF habitat construction (SFC) (101.0 ha) and SF habitat non-construction (SFN) (128.9 ha). After the Clark Peak fire in spring 1996, the amount of habitat available for use by red squirrels was reduced to 49.1 ha on the TRC area and 76.1 on the SFC area. The amount of available habitat on the TRN and SFN areas remained unchanged. The total amount of available habitat on all four monitored after 1996 was 278.5 ha. In 2000, the size of the four monitored areas was further refined through GPS mapping: TRC - 51.1ha, TRN - 21.0 ha, SFC - 76.0 ha, and SFN - 104.4, for a total of 252.5ha.

A census of all middens within the monitored areas was conducted in March, June, September, and December. In addition, middens within 100 m of the LBT site or the access road were censused during months of construction: January, February, April, May, July, August, October and November. Census data were analyzed to determine the potential effects of construction on squirrel numbers, distribution, and density.

Efforts were continued to describe and quantify other environmental parameters that may affect squirrel populations on Mt. Graham. Conifer seeds and mushrooms (epigeous or above-ground fungi) were collected at all 28 sites (Figure 1).

Weather data was collected by two computerized weather stations, one each in the TR and SF habitats. During the winter months, snow depths were recorded from up to eight sites throughout the monitored areas.

The Monitoring Program has developed and maintains a database using Global Positioning System (GPS) and Geographic Information System (GIS) applications. By the end of 2002, all of the major features on the monitored areas were mapped using GPS, including middens, food resource plots, roads, trails, and MGIO boundaries.

All use of the terms *construction* or *construction areas* refers to those areas within 300 m of previous MGIO construction activity. All use of the terms *red squirrel* or *squirrel* refers to the Mt. Graham red squirrel unless otherwise noted. No part of this report may be used or reproduced in any form without the written permission of the Monitoring Program Supervisor.

Percentages are rounded to the nearest whole number, therefore totals may be slightly more or less than 100%.

METHODS

Red squirrels cache conifer cones in selected locations known as middens. Middens are easily recognized by the presence of cached cones and piles of discarded cone scales. The Monitoring Program defines a midden site as a circular area with a 10 m radius surrounding the center of the primary cache site. Because red squirrels are territorial and generally solitary, counts of occupied middens provide a reasonably accurate estimate of population size (Smith 1968; Vahle 1978).

All known midden sites are marked with numbered metal tags, and black and orange striped flagging. During censuses or other monitoring duties, new activity areas that have the potential to become new middens are often located. Feeding sign, caching and squirrels are seen at these areas. These areas are assigned a temporary number and are assessed for improved sign and the presence of a squirrel during the next quarterly census. If conditions warrant, an activity area will be upgraded to a midden and added to the regular quarterly censuses. If an activity area shows no improvement in the two quarterly censuses following initial location, it will be removed.

At the end of each calendar year, a list of middens to be removed from regular censusing is compiled. If a midden has been censused for at least three years (12 censuses), including at least one “good” cone year, and has not been occupied during that time, it is removed from the regular censusing list. These “removed” middens will be checked once a year during the winter (December) census. If any of these middens become re-occupied, they are added back to the regular censusing list.

All statistical analyses were conducted using standard tests found in SAS and/or SigmaStat statistical software. The significance level for all tests was $P \leq 0.05$.

Red Squirrel Food Resources

Conifer Seed Production

The Monitoring Program began collecting quantitative data in 1993 to determine the abundance of some red squirrel food resources. Conifer seeds and mushrooms were selected because they provide the majority of the red squirrels' diet and are readily sampled. In 2001, seed production was estimated from 28 seedfall plots distributed among the monitored areas (Figure 1). Three 0.25 m² seed traps were randomly placed within a 10 m x 10 m plot at each location. Seeds from the 2001 crop were collected from the seed traps in June 2002. The conifer seeds contained in each trap were separated by species and individually tested (squashed) to determine the proportion

of seeds that were likely to be viable. A viable seed leaves an oily spot on clean paper when squashed. This method is likely to underestimate the total number of viable seeds because some seeds may have been preyed upon within the trap. Estimates of the seedfall for each conifer species were calculated as the average number of viable seeds from all three traps on each plot. The seeds of white pine and ponderosa pine are not readily dispersed by wind due to their large size. Because of this, the crops of these species are under represented in the seed trap samples. Both of these species may be important local food supplies for red squirrels, but at present there is no reliable method for estimating the size of the crops.

Mushroom Production

As in previous years, mushrooms were collected from plots 1 m by 100 m (0.01 ha) at two week intervals, from July through September. Mushrooms were collected from a total of 28 plots including the four plots added on the TRC and SFC in late 1996 (after the Clark Peak fire). In 2002, mushrooms were collected from north-south oriented plots, instead of east-west as in previous years. In 2001, we collected mushrooms from both east-west and north-south plots. There were no significant differences in weight, number, or diversity of mushrooms between the two orientations. We decided to “rest” the east-west plots for several years. Collections were restricted to genera of mushrooms used by red squirrels on Mt. Graham or in other regions (Table 1). Collected mushrooms were separated by plot and genus, and the wet weights were measured. For most genera, dry weight was calculated by multiplying the wet weight by a wet weight/dry weight ratio determined from previous samples on Mt. Graham. Dry weights were still measured for those genera with small numbers of specimens previously collected (<50).

Because seeds for a given year are not collected and analyzed until the following spring, there is a one year delay in the presentation of seed data. For comparison, the previous year's seed and mushroom data are reported **in addition** to the current year's mushroom data.

Population Biology

Midden Occupancy

Census data were used to determine the number and distribution of occupied middens on each monitored area. In March, June, September, and December 2002, all middens were visited at least once to determine occupancy. In addition, middens within 100 m of construction activity or the access road were censused during months of construction activity: January, February, April, May, July, August, October, and November. If a midden appeared to be occupied on the basis of feeding sign (cone scales, dried mushrooms, and conifer clippings) or caching, every attempt was made on subsequent midden visits to observe the squirrel and to determine its sex, age, and reproductive condition. In 2002, most of the animals on or near the monitored areas were ear-tagged and many were fitted with radio collars. This added additional verification to the census data. Very occasionally during winter months, visual verification was not practical, and determination of

occupancy was based on the presence and age of feeding sign, tracks, and snow tunnels.

All middens on the monitored areas were classified as either occupied, unoccupied, or possibly occupied, with an occupied midden representing one squirrel. A midden was considered to be unoccupied when there was no squirrel or squirrel sign present. A midden was considered to be possibly occupied when red squirrel sign was found but the sign was insufficient to clearly indicate occupancy. Possibly occupied middens were considered to be unoccupied when determining population size. Population size estimates are conservative and represent the minimum number known alive (Krebs 1966). Differences in midden occupancy among study areas and midden occupancy relative to distance from construction were compared using data from June and December.

Overwinter Survival

Overwinter survival was estimated for squirrels in the monitored areas. During a complete census in December 2001, the number of occupied middens and the sexes of resident squirrels were determined. The December occupancy was then compared to occupancy for June 2002. A squirrel was considered to have survived the winter if it was a resident of a midden in December and that same midden was found to be occupied by a squirrel of the same sex in June. In addition, if the midden was listed as occupied based on sign or a squirrel of unknown sex was seen, this was also counted as a survival.

Spatial Distribution

Three methods were used to describe the spatial distribution of middens and squirrels: crude density, local density, and nearest-neighbor distance. Crude density represents the total number of middens and squirrels per hectare. No allowance was made for differences in habitat quality among the monitored areas, and statistical tests are not appropriate.

Local density (LD) is a method of describing local population densities for comparisons among populations in which habitat variables are uncontrolled. For this report, LD is defined as the number of *middens* or *squirrels* within 100 m of a focal *midden* or *squirrel*. The mean LD (\bar{x} LD) of *middens* (all middens, occupied and unoccupied) and *squirrels* (all occupied middens) is compared between areas and habitats. The benefit of using LD is that these measurements of density are not influenced by habitat variables, whereas crude density may include large areas not suitable as squirrel habitat, such as clearings and meadows. The LD method is adapted from distance models of neighborhood modeling used by plant ecologists to describe and compare plant populations (Czárán and Bartha 1992). A circle with a radius of 100 m encloses 3.14 hectares, which is approximately the average home range of Mt. Graham red squirrels (Froehlich 1990). It is also about the approximate maximum distance that an observer can recognize and accurately locate a squirrel "chatter" call (P. Young, pers. obs.).

Nearest neighbor distance (NND) is used to describe and compare the spatial distribution of populations and communities of plants and animals (Clark and Evans 1954, Krebs 1989). In this report, NND is the shortest distance, expressed in meters, from a focal *midden* or *squirrel* to the nearest *midden* or *squirrel*. The mean NND (\bar{x} NND) of middens and squirrels was compared between areas and habitats.

Local density and NND were determined for each midden and squirrel from the mapped coordinates and compared among areas and habitats using ANOVA tests. To determine the LDs and NNDs of some of the middens and squirrels on the monitored areas, it was necessary to include some off-area middens that were within 100 m of a focal midden.

Reproductive Activity and Success

In 2002, the breeding condition of adult male and female squirrels, and litter activity was recorded when observed. By examining the squirrel's condition through trapping efforts or binoculars, the reproductive status of a female was determined to be non-lactating, reproductive (vulva visibly swollen or appearance of pregnancy), lactating, or post-lactating. The reproductive status of male squirrels was also determined during trapping or visual assessment and was recorded as "testes non-scrotal" (non-reproductive) or "testes scrotal" (sexually active).

Trapping and Marking

In accordance with Federal Fish and Wildlife Permit #TE041875-1, using accepted methods (Koprowski 2002) red squirrels are trapped using Tomahawk wire-mesh box-type live traps, baited with peanuts, peanut butter, apples, mushrooms, or cones. Once captured, red squirrels are transferred to a cloth-handling cone for tagging and morphological measurements. Squirrels are tagged with small numbered metal ear-tags threaded with colored plastic washers for easy distance identification. Squirrels are normally released within 2-3 minutes of transfer to the cloth-handling bag and are observed for several minutes to ensure good condition.

Mapping

Almost all middens and other physical features on the monitored areas have been mapped using GPS with an accuracy of $\pm 5\text{m}$. Universal Transverse Mercator (UTM) coordinates from the GPS files were used to compute local densities, nearest neighbor distances, and distance to construction. GPS data were collected using the Pathfinder Pro system from Trimble Navigation, Inc. Readings were taken within 5 meters of the midden center. Date, time, and location descriptions were noted in the field for later reference. Final midden locations were based on an average from a minimum of 200 three-dimensional data points. Locations were differentially corrected using base station (Prescott National Forest, 344 S. Cortez St., Prescott, AZ) files provided by the Forest Service. Maps were produced using PC-ARC Info and Arc-View (ESRI 1995).

Weather Data

Weather data were collected using two Davis Instruments weather stations. One station is located along the abandoned Forest Service road north of Emerald Peak on the SFC area; the other is located at the Biology Camp on the TRC area. The stations record air temperature (high, low, and average), wind speed, wind direction, rainfall, relative humidity and barometric pressure. Data were collected at 30 minute intervals until September 2000, when the stations were recalibrated to record at 60 minute intervals. Snow depth (cm) was recorded from four snow pole pairs located in the SF habitat, one pair at the 3050 m level on the access road, and three snow pole pairs in the TR habitat. Each pair consists of a pole in a clearing or canopy opening and a second pole nearby in the forest.

RESULTS

Red Squirrel Food Resources

2001 Conifer Seed Production

The total 2001 seed crop was the largest seen on the monitored since data collection began in 1993. This was mainly due to an extremely heavy corkbark fir crop on all areas except the SFN (Table 2, Figures 2a-c, Appendix A).

For the 2001 corkbark fir seed crop, increases were seen from the 2000 crop all areas. The 2001 crop was the largest (from 2 to 8 times greater than previous highs) ever seen on all areas except the SFN.

A similar pattern was followed for Douglas-fir, with the largest crops ever recorded on all areas.

While there were increases in Engelmann spruce crops on all areas from 2000 to 2001, the overall 2001 crop was only the third highest crop for all years.

The 2001 overall seed crop was 768 times greater than the seed crop seen in 2000. Seed production in 2001 was the highest since data collection began in 1993. (Table 2, Figures 2a-c, Appendix A).

2002 Mushroom Production

Overall annual mean mushroom production in 2002 was approximately 20% of that seen in 2001, and was the lowest since data collection began in 1994. There were decreases in all habitats in 2002 as compared to 2001 (Figure 3). In 2002, there were no differences in annual production (\bar{x} wet weight) within the TR habitat. The production on the SFC area was significantly greater than the SFN area (Table 3).

On the TRC area, three genera, *Auricularia*, *Cortinarius*, and *Pholiota* accounted for 86% of production. On the TRN area, *Auricularia*, *Cortinarius*, and *Clitocybe* accounted for 89% of total production. *Auricularia*, *Lycoperdon*, and *Cortinarius* accounted for 97% of the production on the SFC area. On the SFN area, *Clitocybe*, *Lycoperdon*, and *Cortinarius* accounted for 100% of the total production (Table 4).

Population Biology

Midden Occupancy

Four quarterly censuses (Mar, Jun, Sep, and Dec) of all middens on or near the monitored areas were made in 2002 (Appendix B-1). In addition, the 24 middens (by Dec 02) within 100 m of the access road or construction were censused during months of construction activity (Appendix C).

From December 2001 to December 2002, the number of red squirrels on the monitored areas decreased from 43 to 21, a 51% decrease. On the TRC area, the highest number of squirrels (22 Ad + 23J) was seen in June 2002, and the lowest number was 14 squirrels seen in December. June was the month with the highest number of squirrels (6 Ad + 4J) on the TRN area. The lowest squirrel numbers (4Ad) on the TRN area were seen in December. The highest number of squirrels on the SFC area was seen in September (4 Ad + 2 Juv/SubAd) with the lowest (2 Ad) seen in December. On the SFN area, the highest number of squirrels (4 Ad) was seen in March and the lowest (1 SubAd) was seen in December (Figure 4, Appendix B-1,C,D,E).

One newly established midden was found in 2002. No middens, previously removed from regular censusing because of low occupancy, became reoccupied (Table 5). As a result, the proportion of middens in each of the monitored areas remained fairly stable. The proportion of squirrels in each of the two habitats also remained fairly stable from June to December 2002 (Table 6).

In June 2002, the proportion of middens occupied on the TRC area was significantly greater than on the TRN area. There were no significant differences in the proportion of middens occupied *within* the SF habitat in June. The same pattern of differences was seen in December 2002 (Table 7).

The average distance to construction of occupied middens and unoccupied middens was not significantly different on either the TRC or SFC areas for June and December 2002. On the TRC area in both June and December, occupied middens were slightly closer to construction than unoccupied middens. On the SFC area, in both June and December, occupied middens were slightly farther from construction than unoccupied middens (Table 8).

Overwinter Survival

There were no significant differences in the number of squirrels that survived the winter of 2001-2002 among all the monitored areas (Table 9). The average proportion of survival was 42% in the TR habitat and 63% in the SF habitat. For comparison, the average proportion of survival from the previous winter (2001-2002) was 57% in the TR habitat and 13% in the SF habitat.

Overwinter survival may be overestimated because a midden may be occupied in the spring by a different squirrel of the same sex. This mortality can not be detected among unmarked squirrels. However, this potential underestimate is becoming less likely as more squirrels on the monitored areas are ear-tagged and radio-collared for unique identification.

Crude Density

The crude density of middens and squirrels was plotted to provide a visual representation of the potential (number of middens) versus actual (number of squirrels) midden occupancy (Figure 5). Between December 2001 and December 2002, the crude density of *middens* decreased slightly on all areas due to the removal of low occupancy middens from regular censusing (Figure 5, Appendix F-1a).

The crude density of *squirrels* on all areas decreased from December 2001 to December 2002. The TRC was the exception, with an increase seen in June 2002, followed by decreases to the end of the year (Figure 5, Appendix F1-b).

Local Density

The December 2002 overall mean local density (\bar{x} LD) of *middens* was slightly higher (4.3), than in December 2001 (4.2). There were significant differences in the local density of middens among the four areas. The SFN area had the lowest \bar{x} LD (1.3), and the TRN area had the highest (6.5) (Table 10, Figure 6, Appendix F-2).

The \bar{x} LD of *squirrels* (occupied middens) on all areas in December 2002 was 1.8, which is a decrease from 2.4 in December 2001. There were no statistical differences in the \bar{x} LD of *squirrels* among all of the monitored areas (Table 10, Figure 6, Appendix F-2).

Nearest Neighbor Distance

The overall \bar{x} NND of *middens* increased slightly from December 2001 to December 2002 (53.3 to 56.4 m). The \bar{x} NND on the SFN area was significantly longer than on the SFC area in December 2002, and both SF areas were significantly greater than the TR areas (Table 11, Figure 7, Appendix F-2).

The \bar{x} NND of *squirrels* (occupied middens) for all areas increased from 83.3 m in December 2001 to 126.7 m in December 2002. The \bar{x} NND among all the areas was significantly different in

December 2002, with the TRC area having the shortest and the SFN area having the longest (Table 11, Figure 7, Appendix F-2).

Reproductive Activity and Success

Two potential breeding chases were observed in 2002, in June in the SF habitat (Appendix G-1). The earliest date a scrotal male was seen was 5 March in the TR habitat, slightly earlier than seen in previous years. Fourteen of the 19 resident males (including nearby off-area middens) identified during the March census were scrotal. The latest date a scrotal male was seen was 20 June in the TR habitat (Appendix G-3b). Again, this seems slightly earlier than observations in previous years.

The earliest a lactating female was observed was 21 May on the SFC area and the latest was on 29 July, also on the SFC area. During the June census, of the 31 adult females (including nearby off-area middens) identified as residents, two were reproductive and 19 were lactating. By September, none of the resident females were classified as lactating, and 21 were classified as post-lactating (Appendix G-3a).

Direct evidence of 16 litters (46 juveniles) was seen on or near the monitored areas during censuses or other activities. The earliest litters were seen during the beginning of June in both habitats, and the latest was seen in late July on the SFC area (Appendix G-3c).

For reproductive status and age information, it must be noted that the numbers do not necessarily represent the residents of the same middens from census to census. This information is provided only for a general picture of the reproductive and age status of the squirrels on or near the monitored areas.

Trapping and Marking

Marked Squirrels

By the end of 2002, nearly all the residents on or near the monitored areas were fitted with colored ear tags and most of these were radio-collared (Appendix B). In addition, 27 juveniles were caught while still at natal middens and fitted with small numbered metal ear tags to aid in the collection of dispersal information.

Mapping

No significant changes in maps of the monitored areas were made in 2002, as all major features (middens, roads, trails, construction areas, etc.) have been mapped in previous years.

Weather Data

Weather data were collected nearly continuously in 2002 from two weather stations located at the biology camp (TR habitat) and near Emerald Peak (SF habitat). The maximum temperature recorded was 25.2°C in June at the biology camp and the minimum temperature recorded was -18.0°C in January on Emerald Peak. The maximum average monthly temperature was 15.7°C in June at the biology camp and the minimum average monthly temperature was -4.9°C in December on Emerald Peak. (Figure 8, Appendix H-1). The maximum total monthly rainfall was recorded in July, with 127.2 mm at Emerald Peak. The actual maximum is likely to be higher, as there was a failure of the rain gauge for half of July. June was the driest month with 0.2 mm recorded at the biology camp and 0.0 mm on Emerald Peak (Figure 9, Appendix H-1). Snow depth was recorded from the eight pairs of snow poles on the monitored areas. The average accumulated snow depth from December 2001 through Mar 2002 ranged from 0 cm to 30.7 cm (Figure 10, Appendix H-2). For comparison, average accumulated snow depths for November - May in 2000-2001 ranged from 0 cm to 132.5 cm, and in December - May 1999-2000, depths ranged from 0.0 cm to 43.3 cm. Data on wind chill temperatures, wind direction and speed, humidity, and barometric pressure were also collected (Appendix H-1).

Insect Outbreaks on the Monitored Areas

Infestations of bark beetles (*Drycoetes confuses* and *Dendroctonus rufipennis*) continued on parts of the monitored areas in 2002, although to a lesser degree than in previous years. Spruce aphid (*Elatobium abietinum*) were seen, but in much reduced numbers. For a detailed report on forest health and continuing research on the insect infestations, please contact the USFS Southwestern Region Entomology and Pathology Office in Flagstaff, AZ. http://www.for.nau.edu/usfs/r3_fpm/.

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Table 1. Mushroom genera known to be food resources of red squirrels, and collected from the food resource plots.

MUSHROOM GENUS	SOURCE(S)
<i>Amanita</i>	Buller 1920, M.C. Smith 1968
<i>Auricularia</i>	Monitoring Program personal observations
<i>Boletus</i>	Buller 1920, C.C. Smith 1968, M.C. Smith 1968
<i>Clavaria</i>	M.C. Smith 1968
<i>Clitocybe</i>	Monitoring Program personal observations
<i>Cortinarius</i>	C.C. Smith 1968, Froehlich 1990, Uphoff 1990
Gastroid sp.	Monitoring Program personal observations, States 1990
<i>Hydnum</i>	C.C. Smith 1968, M.C. Smith 1968
<i>Lactarius</i>	Buller 1920, C.C. Smith 1968
<i>Leccinum</i>	Monitoring Program personal observations
<i>Lycoperdon</i>	Monitoring Program personal observations
<i>Pholiota</i>	C.C. Smith 1968
<i>Ramaria</i>	Monitoring Program personal observations
<i>Russula</i>	M.C. Smith 1968, C.C. Smith 1968
<i>Suillus</i>	C.C. Smith 1968

Table 2. Mean filled conifer seed production, 2001. The percent column represents the proportion of each seed species on an individual area.

Area/Habitat	n	<u>Corkbark fir</u>		<u>Douglas-fir</u>		<u>Engelmann spruce</u>	
		\bar{x} 1000 seeds/ha	%	\bar{x} 1000 seeds/ha	%	\bar{x} 1000 seeds/ha	%
TRC	5	8295.8	81.4	1615.9	15.9	253.2	2.5
TRN	4	6033.2	70.4	1519.9	17.8	996.5	11.6
SFC	7	3222.7	94.2	144.7	4.2	55.1	1.6
SFN ¹	11	83.6	12.2	16.3	2.4	566.6	82.5
TR Habitat	9	7290.2	77.0	1573.2	16.6	583.6	6.2
SF Habitat ¹	18	1304.4	74.5	66.2	3.8	367.7	21.0

1 There are 12 total seed plots on the SFN area. However in 2001, one plot (SFN-4) was either not collected or the samples were misplaced.

Table 3. Mean annual mushroom production, 2002.

Area/Habitat	n	\bar{x} Wet weight (Kg/ha)	\bar{x} Dry weight (Kg/ha)
TRC	5	20.49 ± 7.465	1.94 ± 0.689
TRN	4	27.55 ± 4.204	2.71 ± 0.497
SFC	7	8.96 ± 2.090	1.02 ± 0.274
SFN	12	0.22 ± 0.106	0.03 ± 0.015
TR Habitat	9	23.63 ± 4.468	2.28 ± 0.438
SF Habitat	19	3.44 ± 1.237	0.39 ± 0.148

Wilcoxon Test within TR:Wet Weight $Z = 0.8573$ $P = 0.3913$ Dry Weight $Z = 0.8573$ $P = 0.3913$ Wilcoxon Test within SF:Wet Weight $Z = 3.5968$ **$P = 0.0003$** Dry Weight $Z = 3.5968$ **$P = 0.0003$**

Table 4. Mean annual mushroom production (wet weight Kg/ha) of selected mushroom genera known to be food resources for red squirrels, 2002. The proportions of the three most available genera on each area are in bold.

Genus	<u>TRC</u>		<u>TRN</u>		<u>SFC</u>		<u>SFN</u>	
	\bar{x} Kg/ha	%	\bar{x} Kg/ha	%	\bar{x} Kg/ha	%	\bar{x} Kg/ha	%
<i>Amanita</i>	1.36	6.6	0.33	1.2	0.00	0.0	0.00	0.0
<i>Auricularia</i>	10.80	52.8	14.17	51.4	3.44	38.4	0.00	0.0
<i>Boletus</i>	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
<i>Clavaria</i>	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
<i>Clitocybe</i>	0.17	0.8	2.04	7.4	0.14	1.5	0.10	44.8
<i>Cortinarius</i>	4.53	22.1	8.42	30.6	1.11	12.4	0.05	21.2
Gastroid sp.	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
<i>Hydnum</i>	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
<i>Lactarius</i>	0.73	3.6	0.57	2.1	0.10	1.1	0.00	0.0
<i>Leccinum</i>	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
<i>Lycoperdon</i>	0.73	3.6	0.58	2.1	4.17	46.6	0.07	34.0
<i>Pholiota</i>	2.16	10.6	0.00	0.0	0.00	0.0	0.00	0.0
<i>Ramaria</i>	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
<i>Russula</i>	0.00	0.0	1.43	5.2	0.00	0.0	0.00	0.0
<i>Suillus</i>	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
Total	20.49		27.55		8.96		0.22	

Table 5. Number and discovery status of red squirrel middens on each of the monitored areas, 2001-2002.

		Midden Status				
Year	Area	Old	Newly Found	Newly Established	Re-Occupied ²	Total
2001	TRC	40	0	0	0	40
	TRN	42	0	0	0	42
	SFC	68	0	0	2	70
	SFN	51	0	0	0	51
	Total	201	0	0	2	203
2002	TRC	39 ¹	0	1	0	40
	TRN	41 ¹	0	0	0	41
	SFC	62 ¹	0	0	0	62
	SFN	37 ¹	0	0	0	37
	Total	179 ¹	0	1	0	180

1 The difference in the number of middens from the end of 2001 to the beginning of 2002 reflects middens removed from regular censusing after the December 2001 census due to low occupancy.

2 These are middens that were previously removed from regular censusing due to low occupancy, but have become re-occupied.

Table 6. Proportion of the total area, total number of middens, and total number of squirrels¹ found on each of the monitored areas, 2001-2002.

	<u>Area</u>		<u>Jun 2001</u>				<u>Dec 2001</u>			
			<u>Middens</u>		<u>Squirrels¹</u>		<u>Middens</u>		<u>Squirrels¹</u>	
	<u>ha</u>	<u>%²</u>	<u>N</u>	<u>%²</u>	<u>N</u>	<u>%²</u>	<u>N</u>	<u>%²</u>	<u>N</u>	<u>%²</u>
TRC	51.1	20	40	20	19	49	40	20	22	56
TRN	21.0	8	42	21	12	31	42	21	9	23
SFC	76.0	30	69	34	4	10	70	34	4	10
SFN	104.4	41	51	25	4	10	51	25	4	10
Total	252.5		202		39		203 ³		39	
	<u>Area</u>		<u>Jun 2002</u>				<u>Dec 2002</u>			
			<u>Middens</u>		<u>Squirrels¹</u>		<u>Middens</u>		<u>Squirrels¹</u>	
	<u>ha</u>	<u>%²</u>	<u>N</u>	<u>%²</u>	<u>N</u>	<u>%²</u>	<u>N</u>	<u>%²</u>	<u>N</u>	<u>%²</u>
TRC	51.1	20	40	22	22	65	40	22	14	67
TRN	21.0	8	41	23	6	18	41	23	4	19
SFC	76.0	30	62	34	4	12	62	34	2	10
SFN	104.4	41	37	21	2	6	37	21	1	5
Total	252.5		180 ³		34		180		21	

- 1 Juveniles living with their mothers are not counted in the number of squirrels. Number of squirrels is equal to the number of occupied middens.
- 2 All percentages are rounded to the nearest whole number.
- 3 The difference in the number of middens from December 2001 to June 2002 reflects middens removed from regular censusing due to low occupancy after the December 2001 census.

Table 7. Number and percent of available middens occupied, 2002.

Area/Habitat	<u>June</u>			<u>December</u>		
	# middens	# occupied	% occ	# middens	# occupied	% occ
TRC	40	22	55	40	14	35
TRN	41	6	15	41	4	10
SFC	62	4	7	62	2	3
SFN	37	2	5	37	1	3
TR Habitat	81	28	35	81	18	22
SF Habitat	99	6	6	99	3	3
TR + SF	180	34	19	180	21	12

JUNE**Chi Square**

within TR $X^2=14.59$ df=1 ***P=0.0001***

Fisher Exact Test*

within SF *P=1.000*

DECEMBER

within TR $X^2=7.465$ df=1 ***P=0.006***

Fisher Exact Test*

within SF *P=1.000*

* Fisher Exact Test was used for this analysis due to the small sample sizes in these areas.

Table 8. Mean distance (in meters) from construction to occupied and unoccupied middens on the TRC and SFC areas, June and December 2002.

Area	Midden Status	n	<u>June</u>	<u>December</u>	
			$\bar{x} \pm se$	$\bar{x} \pm se$	
TRC	Occupied	22	207.3 \pm 12.7	14	194.6 \pm 17.0
	Unoccupied	18	225.7 \pm 13.0	26	226.8 \pm 10.1
SFC	Occupied	4	163.8 \pm 12.3	2	177.5 \pm 33.5
	Unoccupied	58	143.2 \pm 10.2	60	143.4 \pm 9.8

ANOVA:

JUNE

TRC F = 1.01 df = 1 P = 0.322

SFC F = 0.28 df = 1 P = 0.600

DECEMBER

TRC F = 2.99 df = 1 P = 0.092

SFC F = 0.39 df = 1 P = 0.532

Table 9. Overwinter survival of red squirrels on the monitored areas, 2001-2002.

Area/Habitat	Number of Squirrels	Number of Squirrels Surviving	% survival
	Dec 2001	Jun 2002	
TRC	22	10	45.5
TRN	9	3	33.3
SFC	4	3	75.0
SFN	4	2	50.0
TR Habitat	31	13	42.0
SF Habitat	8	5	62.5

Fisher Exact Test*

within TR P = 0.696

within SF P = 1.000

between TR & SF P = 0.432

* Fisher Exact test was used for this analysis due to the small sample size in these areas

Table 10. Mean Local Density of middens and red squirrels (occupied middens) on the monitored areas, 2001 and 2002.

Area/Habitat	December 2001						December 2002					
	Middens			Squirrels			Middens			Squirrels ¹		
	n	$\bar{x} \pm se$	n	$\bar{x} \pm se$	n	$\bar{x} \pm se$	n	$\bar{x} \pm se$	n	$\bar{x} \pm se$	n	$\bar{x} \pm se$
TRC	40	5.8 ± 0.39 ^b	22	3.1 ± 0.34 ^a	40	5.9 ± 0.44 ^a	14	2.3 ± 0.38 ^a				
TRN	42	6.6 ± 0.27 ^a	9	2.2 ± 0.43 ^{a,b}	41	6.5 ± 0.28 ^a	4	1.3 ± 0.63 ^a				
SFC	70	3.9 ± 0.21	4	0.5 ± 0.29 ^b	62	3.5 ± 0.21	2	0 ^a				
SFN	51	1.5 ± 0.17	4	0.5 ± 0.29 ^b	37	1.3 ± 0.18	1	0 ^a				
TRHabitat	82	6.2 ± 0.24	31	2.9 ± 0.28	81	6.2 ± 0.26	18	2.1 ± 0.34				
SFHabitat	121	2.9 ± 0.18	8	0.5 ± 0.19	99	2.7 ± 0.18	3	0				
TOTAL ¹	203	4.2 ± 0.18	39	2.4 ± 0.27	180	4.3 ± 0.2	21	1.8 ± 0.3				
ANOVA:												
LD of Middens												
among all areas	F=72.35	df=3	P < 0.0001	F=62.29	df=3	P < 0.0001						
LD of Squirrels												
among all areas	F=7.03	df=3	P = 0.0008	F=2.55	df=3	P=0.0900						

a,b,c,d Means within the same category, with the same letter(s), within the same year, are not significantly different.

1 Includes only middens on the monitored areas.

Table 11. Mean Nearest Neighbor Distance of middens and red squirrels (occupied middens) on the monitored areas, 2001 and 2002.

Area/Habitat	December 2001				December 2002			
	Middens		Squirrels		Middens		Squirrels ¹	
	n	$\bar{x} \pm se$	n	$\bar{x} \pm se$	n	$\bar{x} \pm se$	n	$\bar{x} \pm se$
TRC	40	42.1 ± 2.43 ^a	22	51.9 ± 4.04 ^a	40	41.5 ± 2.63 ^a	14	62.2 ± 7.75 ^a
TRN	42	40.8 ± 2.06 ^a	9	66.1 ± 7.41 ^a	41	41.0 ± 2.10 ^a	4	108.5 ± 26.3 ^{abc}
SFC	70	54.4 ± 2.81	4	115.6 ± 43.30 ^a	62	59.24 ± 3.28	2	104.4 ± 0 ^{bd}
SFN	51	70.7 ± 5.02	4	262.2 ± 108.37	37	84.96 ± 8.78	1	1146.7 ^{cd}
TR Habitat	82	41.5 ± 1.58	31	56.0 ± 3.71	81	41.3 ± 1.66	18	72.5 ± 9.20
SF Habitat	121	61.3 ± 2.76	8	188.9 ± 60.71	99	68.9 ± 4.05	3	452.0 ± 347.00
TOTAL ¹	203	53.3 ± 1.89	39	83.3 ± 14.95	180	56.4 ± 2.56	21	126.7 ± 51.60
ANOVA:								
NND of Middens								
among all areas		F=15.05	df=3	P < 0.0001		H=55.19	df=3	P < 0.0001
NND of Squirrels								
among all areas		F=10.44	df=3	P < 0.0001		H=8.03	df=3	P = 0.0450

a,b,c Means within the same category, with the same letter(s), of the same year, are not significantly different. Kruskal-Wallis test was used as 2002 data are not normal. Means are shown for comparison with previous year.

¹ Includes only middens on the monitored areas.

Figure 2a. Corkbark fir seed fall, 1993-2001. Note: scales are different for figures 2a-c.

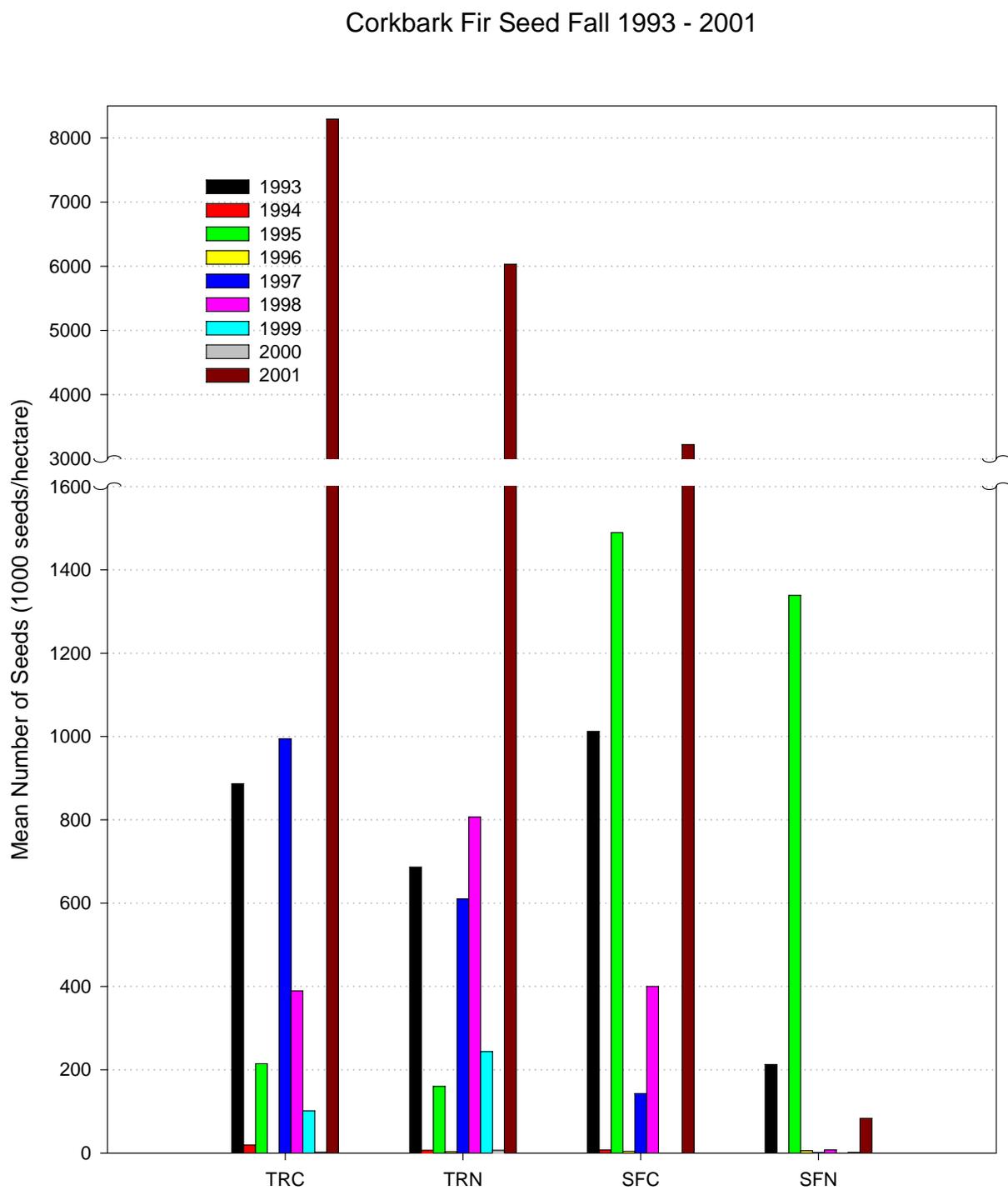


Figure 2b. Douglas-fir seed fall, 1993-2001. Note: scales are different for figures 2a-c.

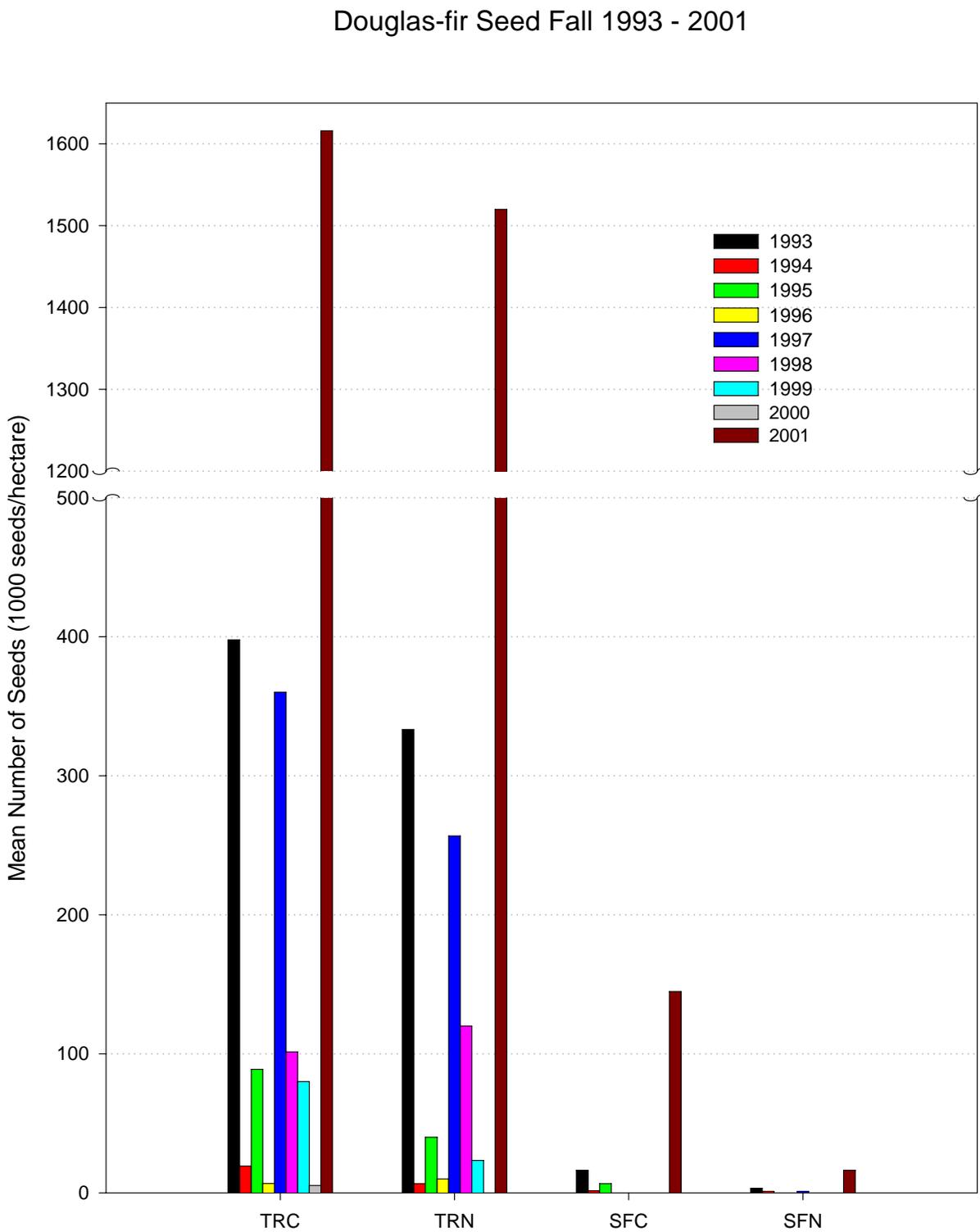


Figure 2c. Engelmann spruce seed fall, 1993-2001. Note: scales are different for figures 2a-c.

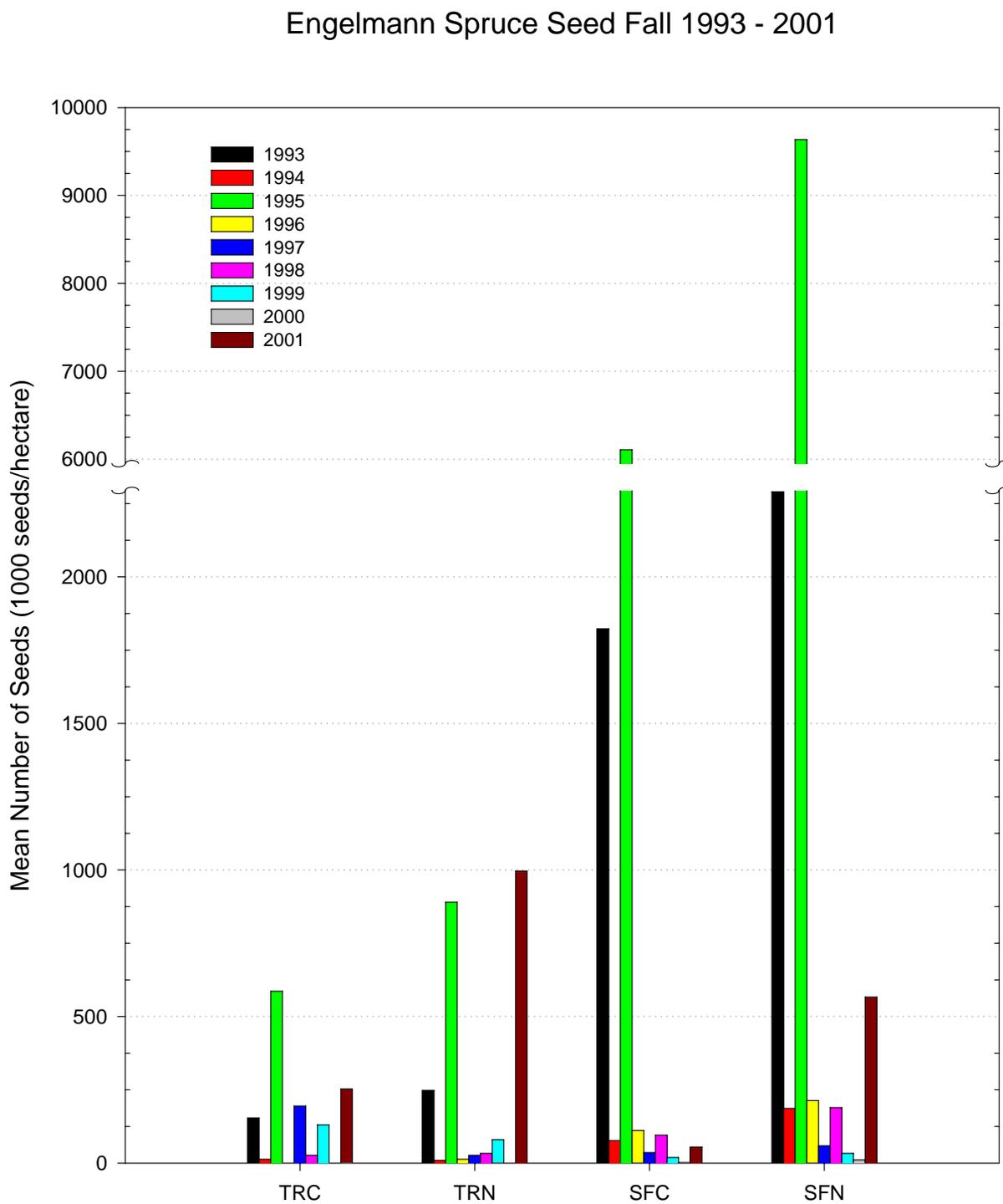


Figure 3. Mushroom crops, 1994-2002.

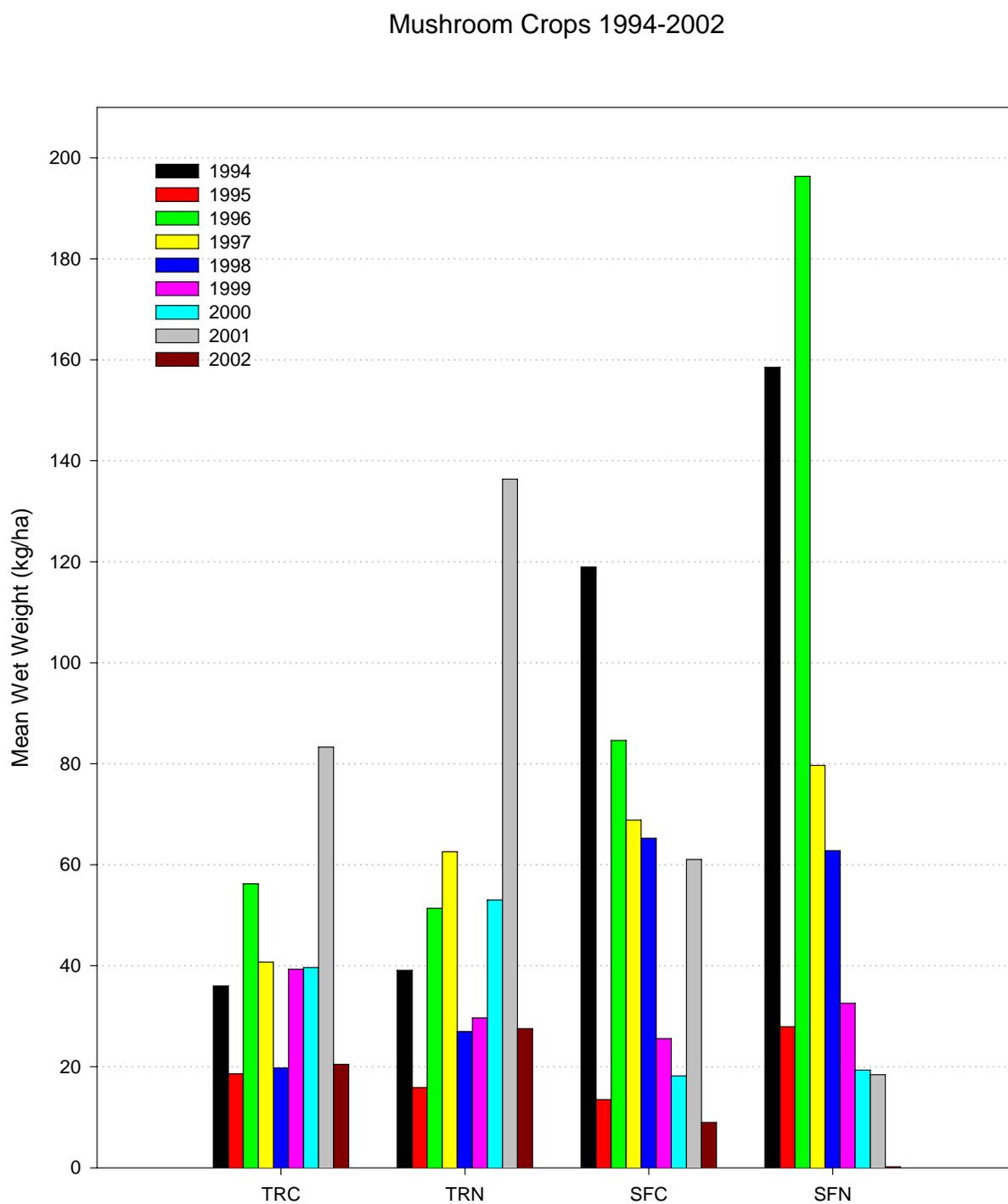


Figure 4. Red squirrel populations (including juveniles) on the monitored areas, December 2001 - December 2002.

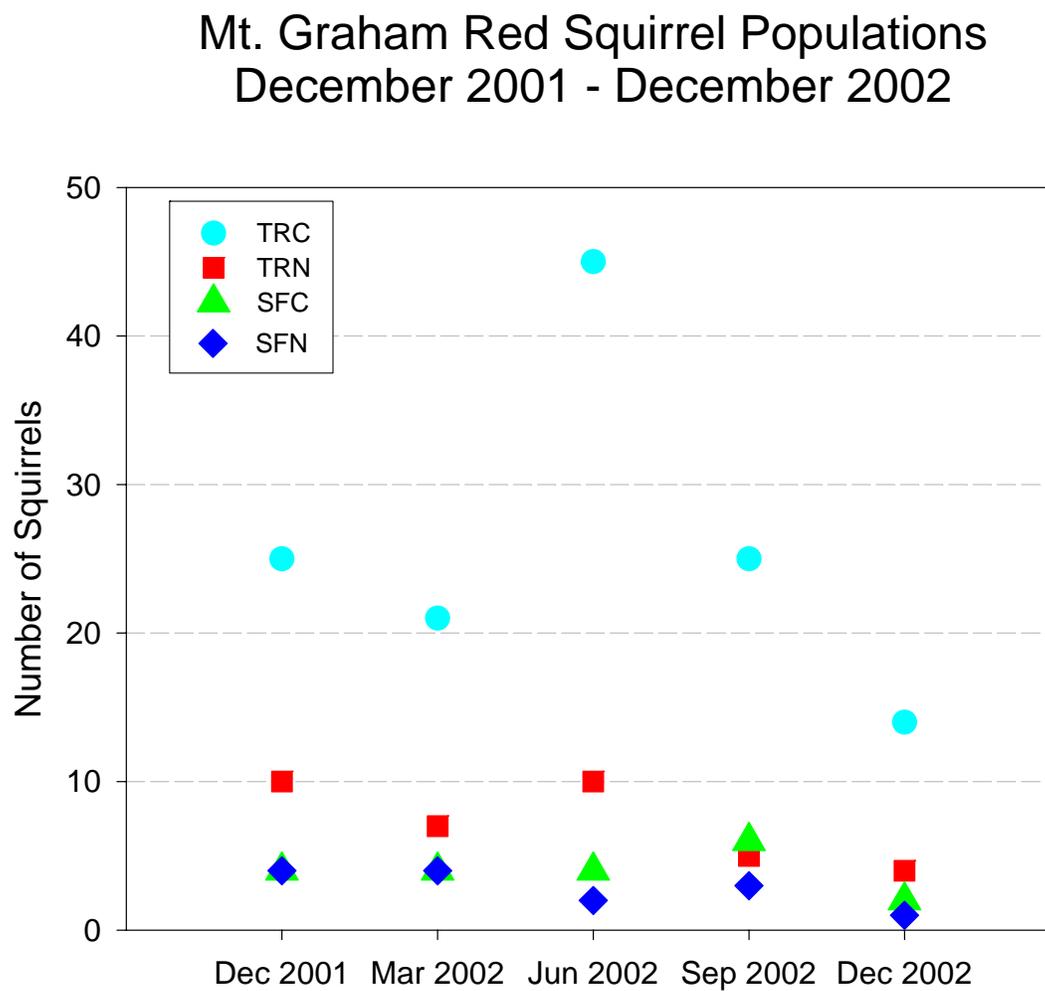


Figure 5. Crude density of middens and squirrels, 2001-2002.

Crude Density of Middens and Squirrels 2001 - 2002

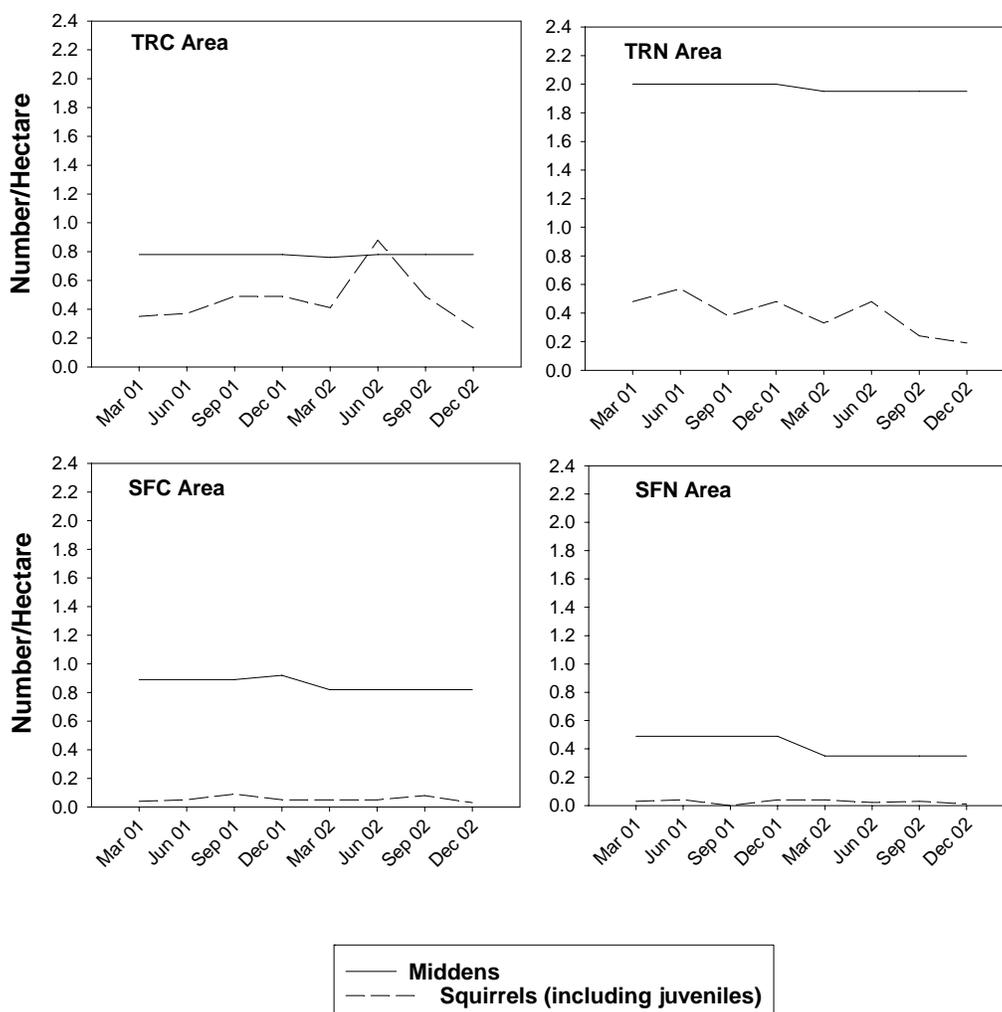


Figure 6. Local density of middens and squirrels, 2001-2002

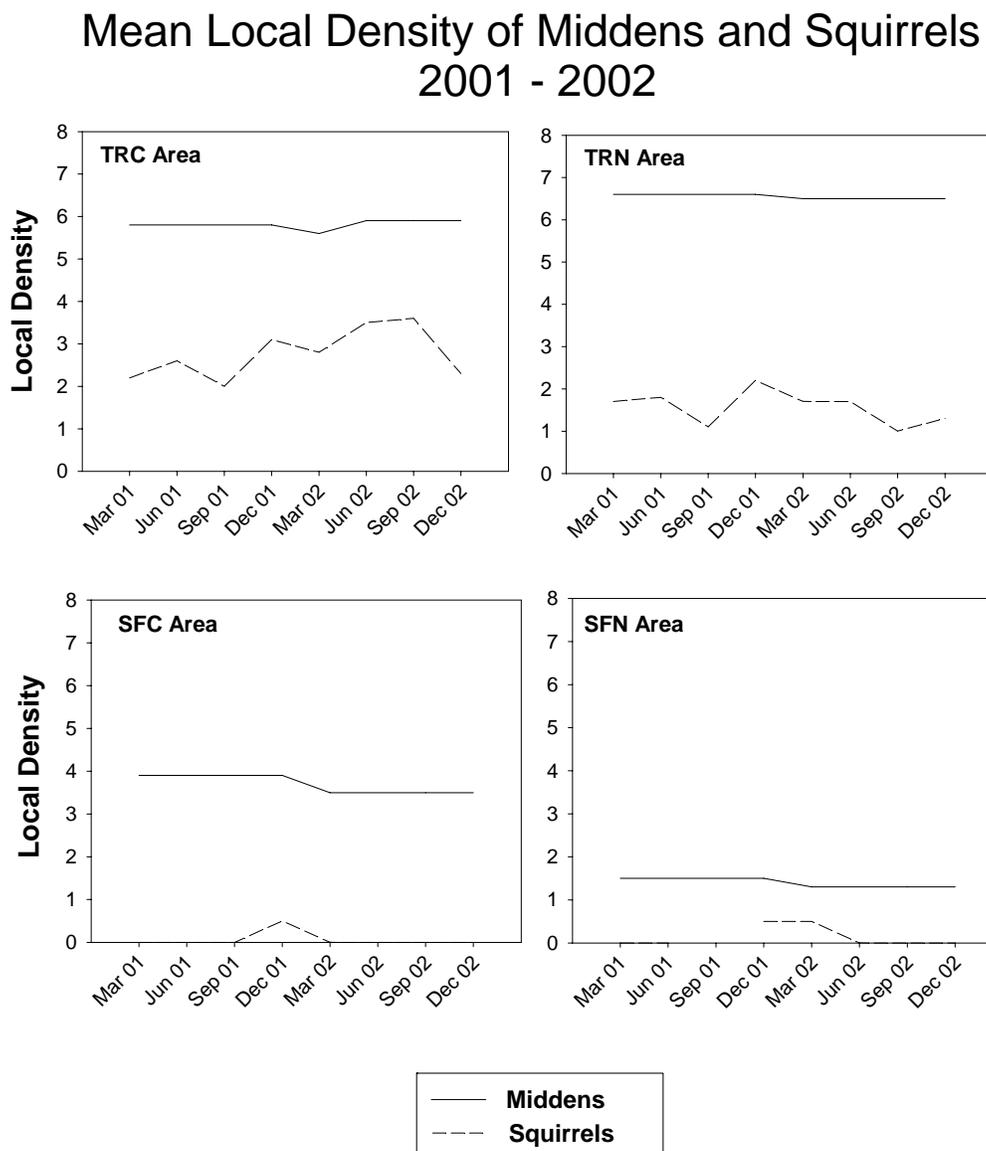


Figure 7. Nearest neighbor distance of middens and squirrels, 2001-2002.

Mean Nearest Neighbor Distance - Middens and Squirrels 2001 - 2002

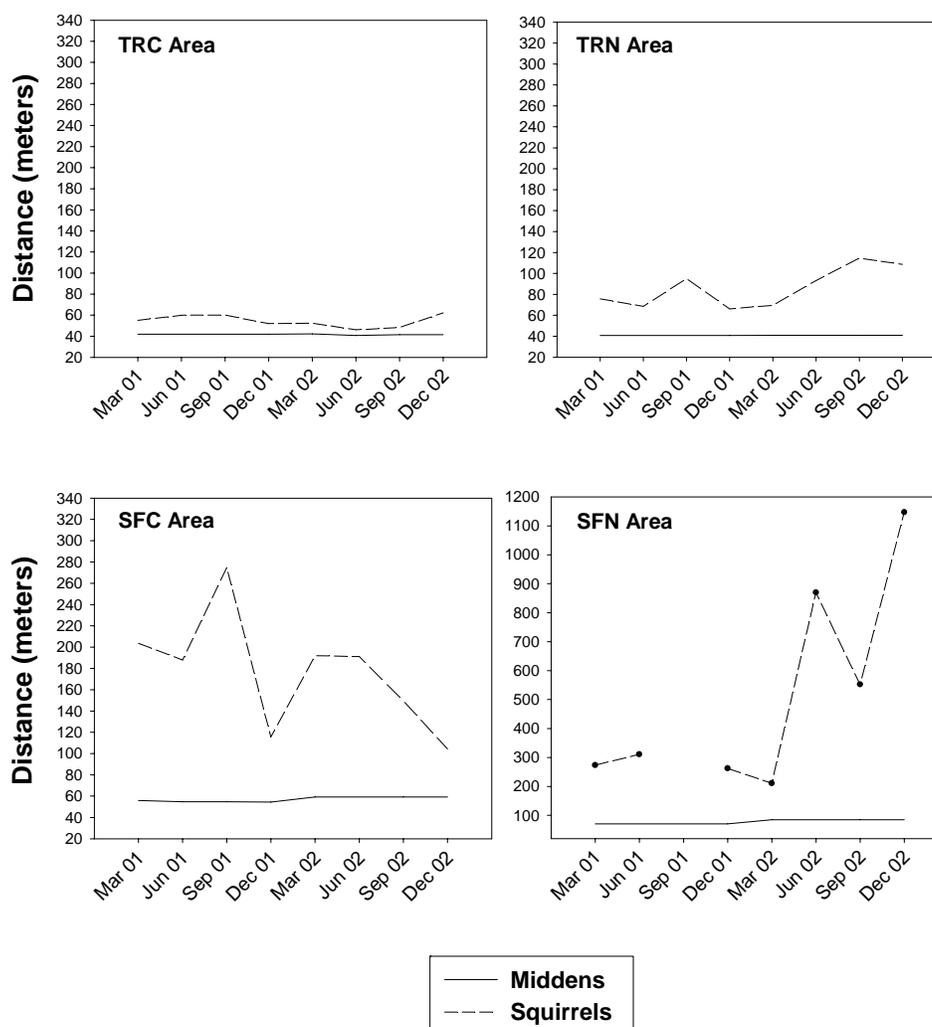


Figure 8. Monthly temperatures on the monitored areas, 2002.

2002 Temperatures

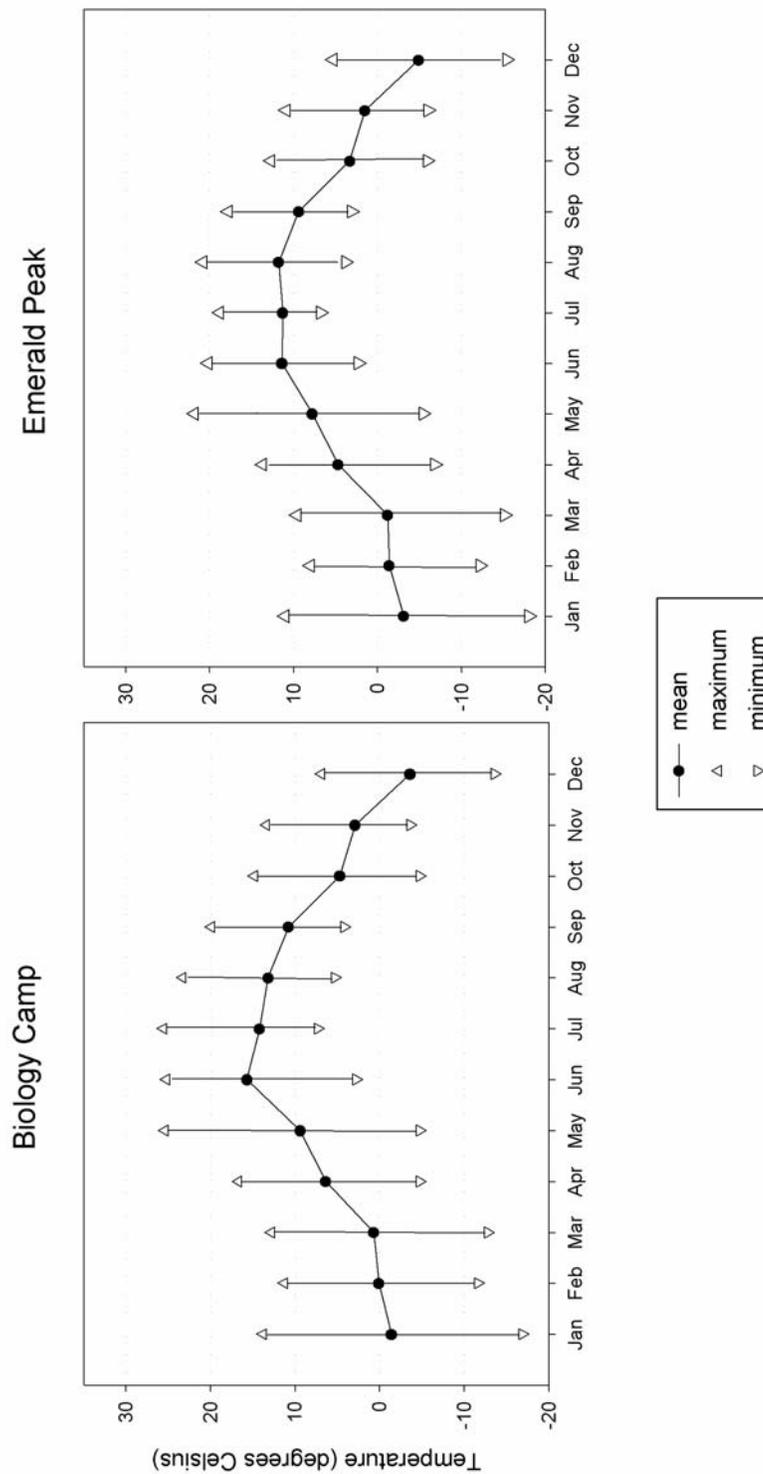


Figure 9. Total monthly precipitation as rain, 2002.

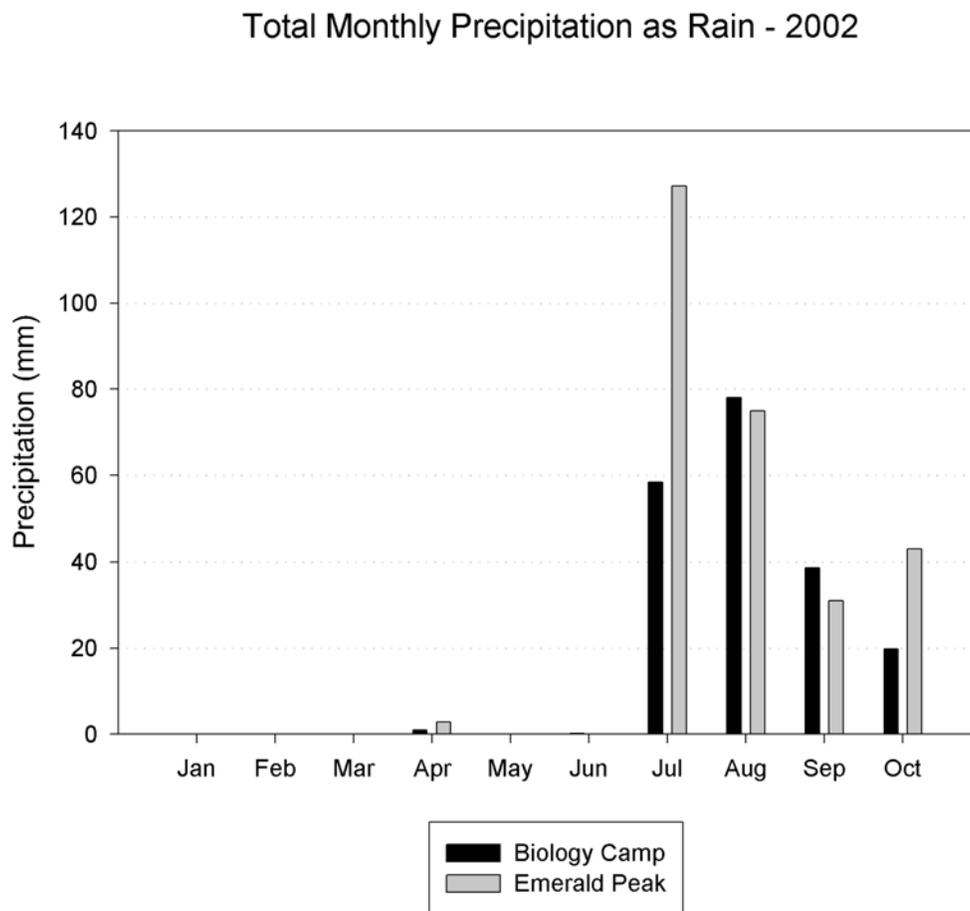
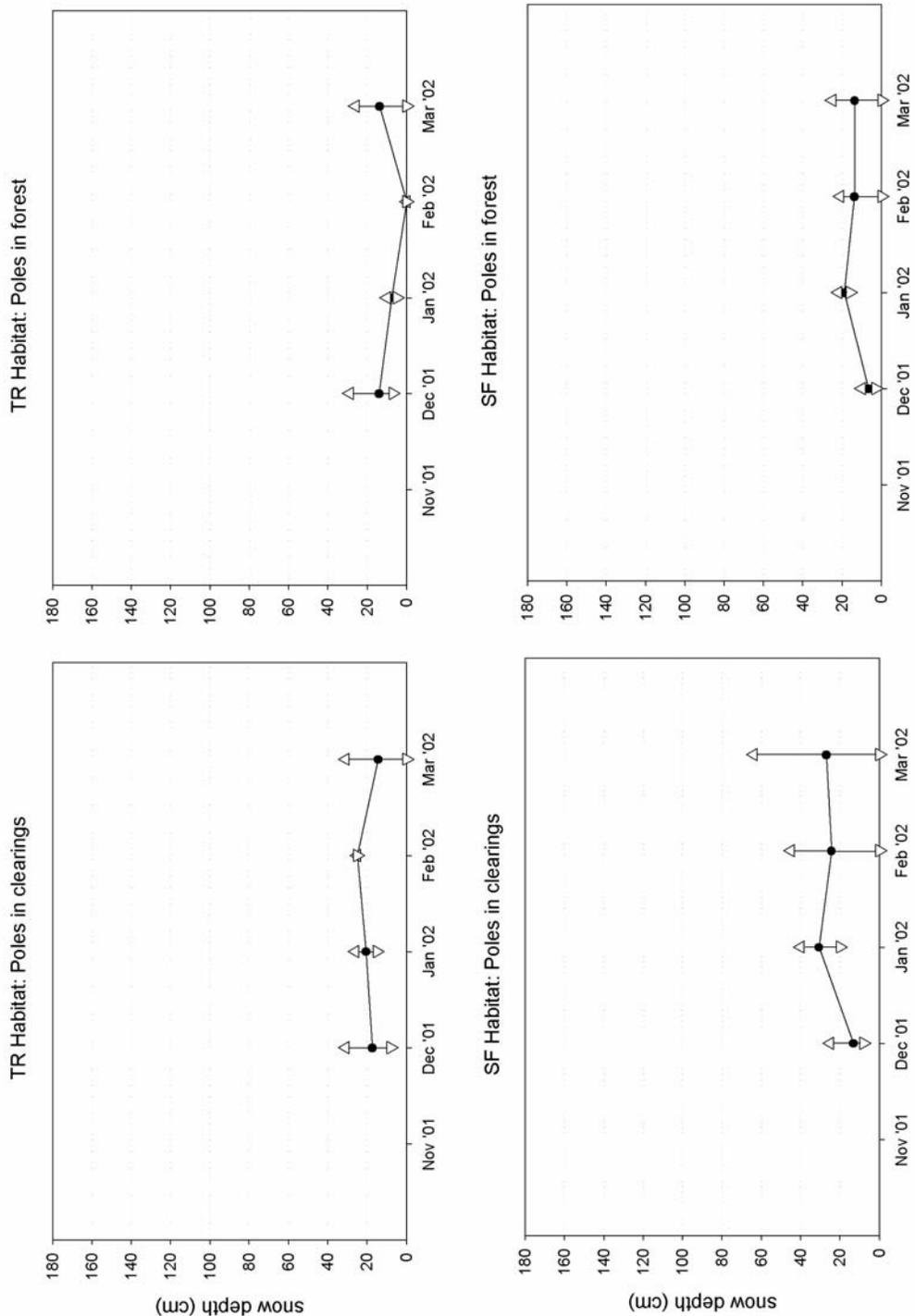
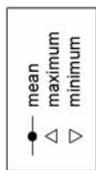


Figure 10. Accumulated snow depths, 2001-2002.

Accumulated snow depths, 2001-2002



Appendix A. Mean numbers and weights for 2001 seeds and 2001 mushrooms.

A-1: By transect

A-2: By area and habitat

Appendix A-1: Mean number of seeds and weights for 2001 seeds and 2001 mushrooms, by transect.

AREA	TRAN #	Corkbark Fir	Douglas-fir	Englemann Spruce	Total Seeds	Total Mushrooms	
		# 1000 seeds/ha	# 1000 seeds/ha	# 1000 seeds/ha	# 1000 seeds/ha	ww Kg/ha	dw Kg/ha
TRC	1				burned		
	2				burned		
	3	7640.0	2023.4	93.2	9759.6	74.0	8.1
	4				burned		
	5	8106.4	960.0	200.0	9266.4	113.8	11.2
	6				burned		
	7				burned		
	8				burned		
	9				burned		
	10	14226.4	1413.2	231.2	15852.8	88.2	8.4
	11	9613.2	1360.0	693.2	11746.4	39.8	4.2
	12	1893.2	2320.0	66.4	4319.6	100.7	9.7
TRN	1	8506.4	3453.2	906.4	12879.2	84.8	8.7
	2	6386.4	2293.2	2680.0	11359.6	47.8	4.3
	3	5040.0	253.2	13.2	5306.4	268.9	25.9
	4	4200.0	80.0	386.4	4692.8	144.0	13.0

AREA	TRAN #	Corkbark Fir	Douglas-fir	Englemann Spruce	Total Seeds	Total Mushrooms	
		# 1000 seeds/ha	# 1000 seeds/ha	# 1000 seeds/ha	# 1000 seeds/ha	ww Kg/ha	dw Kg/ha
SFC	1	8040.0	840.0	13.2	8893.2	78.3	8.0
	2				burned		
	3	4160.0	93.2	0.0	4253.2	76.8	9.5
	4	3466.4	13.2	40.0	3519.6	121.1	14.0
	5	333.2	0.0	26.4	359.6	62.8	8.1
	6	986.4	26.4	40.0	1052.8	50.0	6.2
	7				burned		
	8				burned		
	9				burned		
	10	13.2	40.0	66.4	119.6	6.1	0.7
	11	5560.0	0.0	200.0	5760.0	32.4	3.7
SFN	1	80.0	0.0	13.2	93.2	8.1	0.9
	2	53.2	13.2	80.0	146.4	1.8	0.3
	3	160.0	13.2	0.0	173.2	37.8	5.4
	4	1..	1..	1..	1..	12.1	1.5
	5	0.0	0.0	186.4	186.4	5.7	0.8
	6	40.0	20.0	900.0	1040.0	2.4	0.4
	7	13.2	13.2	40.0	66.4	12.8	1.7
	8	320.0	26.4	453.2	799.6	55.5	5.5
	9	13.2	0.0	13.2	26.4	29.9	3.4
	10	66.4	0.0	173.2	239.6	14.0	1.6
	11	40.0	40.0	360.0	440.0	10.6	1.7
	12	133.2	53.2	4013.2	4346.0	30.5	3.6

- 1 The samples for transect SFN-4 were missing. It is unknown whether the samples were lost or not collected.

Appendix A-2: Mean number of seeds and weights for 2001 seeds and 2001 mushrooms, by area and habitat.

AREA	N	Corkbark Fir	Douglas-fir	Englemann Spruce	Total Seeds	Total Mushrooms	
		# 1000 seeds/ha	# 1000 seeds/ha	# 1000 seeds/ha	# 1000 seeds/ha	ww Kg/ha	dw Kg/ha
TRC \bar{x}	5	8295.8	1615.9	253.2	10189.0	83.8	7.2
TRN \bar{x}	4	6033.2	1519.9	996.5	8559.5	136.4	2.2
SFC \bar{x}	7	3222.7	144.7	55.1	3422.6	61.1	8.3
¹ SFN \bar{x}	(11)12	83.6	16.3	566.6	687.0	18.4	13.0
TR \bar{x}	9	7290.2	1573.2	583.6	9464.8	106.9	10.4
¹ SF \bar{x}	(18)19	1304.4	66.2	367.7	1750.8	34.2	4.0

- 1 There were only 11 transects on the SFN area for seeds in 2001, as the samples for SFN-4 were lost or not collected. There were 12 transects for mushrooms.

Appendix B. Midden occupancy records for the monitored areas, 2002.

B-1. Quarterly occupancy records

B-2. Activity area information

Appendix B-1: Midden occupancy records for the monitored areas, 2002.

For Midden Numbers:

###^{89*} Midden Number ^{'Year Found'} '* ' following year indicates a newly established midden

For Monthly Occupancy cells:

N	Not Occupied
P	Possibly Occupied, Red Squirrel sign found but unsure of residency
Y	Occupied, Red Squirrel sign indicates resident
S	Occupied, Red Squirrel sighted
♀	Occupied, Adult female Red Squirrel
♂	Occupied, Adult male Red Squirrel
J	Occupied, Juvenile Red Squirrel sex unknown
SA	Occupied, Sub-adult Red Squirrel
A	Abert's Squirrel using area, no Red Squirrel present
XX	Remains of Red Squirrel found
* or ^(R/R)	Squirrel is tagged (letters indicate ear tag colors - left ear/right ear) [B - blue, G - green, M - metal, O - orange, P - pink, R - red, Y - yellow, W - white]
NAT	Squirrel is naturally marked - ear notch, short tail, etc.
-	Midden not checked, no data
♀L	Adult female Red Squirrel, lactating
♀+'#'	Adult female Red Squirrel with '#' juveniles
RC	Radio-collared Red Squirrel



Shaded cell indicates a midden that has been renumbered or removed from censusing.

Transition Construction Area (TRC), 2002				
Midden	Mar	Jun	Sep	Dec
1101 ⁸⁹	located off-area, new number - 5101			
1102 ⁸⁹	♀	♀(W/O)	♀(W/O)	♀(W/O)
1103 ⁸⁹	♀	♀(O/B)L + 1	♀(O/B RC)	♀(O/B RC)
1104 ⁸⁹	♂	♀L + 2	♀(W/Y RC)	♀(Y/P RC) 11
1105 ⁸⁹	burned in Clark Peak fire			
1106 ⁸⁹	P	N	N	N
1107 ⁸⁹	burned in Clark Peak fire			
1108 ⁸⁹	removed from census - low occupancy ¹			
1109 ⁸⁹	burned in Clark Peak fire			
1110 ^{89*}	burned in Clark Peak fire			
1111 ⁸⁹	♀	♀(G/R)	♀(G/R RC)	N ¹²
1112 ^{89*}	S	N	N	N
1113 ⁸⁹	♀	♀(O/O RC)L + 3	♀(O/O RC)	♀(O/O RC)
1114 ⁸⁹	located off-area, new number - 5114			
1115 ⁸⁹	♂	♀(B/W)	♀(B/W RC)	♀(B/- RC) 13
1116 ^{89*}	♂	♂	♂	♂
1117 ⁸⁹	burned in Clark Peak fire			
1118 ⁸⁹	♂	♂(Y/Y)	♂(Y/Y RC)	♂(Y/Y RC)
1119 ⁸⁸	burned in Clark Peak fire			
1120 ⁸⁹	burned in Clark Peak fire			
1121 ^{89*}	N	♀(Y/P RC)L	♀(Y/P RC) + 2	N ¹¹
1122 ⁸⁹	burned in Clark Peak fire			
1123 ^{95*}	burned in Clark Peak fire			
1124 ^{95*}	burned in Clark Peak fire			
1125 ^{95*}	burned in Clark Peak fire			
1126 ^{95*}	removed from census - low occupancy ¹			
1130 ⁹⁰	burned in Clark Peak fire			
1131 ^{90*}	♂	♂(Y/B)	N-XX ⁶	N
1132 ^{90*}	removed from census - low occupancy ¹			
1134 ^{91*}	removed from census - low occupancy ¹			
1135 ^{91*}	burned in Clark Peak fire			
1136 ^{91*}	burned in Clark Peak fire			
1137 ^{91*}	burned in Clark Peak fire			

Transition Construction Area (TRC), 2002				
Midden	Mar	Jun	Sep	Dec
1138 ^{91*}	removed from census - low occupancy ¹			
1139 ^{91*}	burned in Clark Peak fire			
1140 ^{91*}	burned in Clark Peak fire			
1142 ^{91*}	burned in Clark Peak fire			
1143 ^{91*}	burned in Clark Peak fire			
1144 ^{91*}	♀	♀ ^(P/W) L	♀ ^(P/W)	♀ ^(P/W)
1145 ^{91*}	located off-area, new number - 5145			
1146 ^{91*}	removed from census - low occupancy ¹			
1147 ^{91*}	♀	P	P	N
1148 ^{91*}	burned in Clark Peak fire			
1149 ^{91*}	♂	♀ ^(W/W) L	♀ ^(W/W RC) 7	N ¹⁴
1150 ^{91*}	located off-area, new number - 5150			
1151 ^{91*}	N	♀ ^(P/Y RC) L + 2	♀ ^(P/Y RC)	N ¹⁵
1152 ^{91*}	burned in Clark Peak fire			
1153 ^{92*}	♂	♂ ^(W/R)	♂ ^(W/R RC)	♂ ^(W/R RC)
1154 ^{92*}	♂	P	N	N
1155 ^{93*}	located off-area, new number - 5155			
1156 ^{93*}	♀	N ³	♀ ^(P/P) 3	♀ ^(P/P) 3
1157 ^{93*}	located off-area, new number - 5157			
1159 ^{93*}	burned in Clark Peak fire			
1160 ^{96*}	♀* ²	♀ ^(R/R) L + 3	♀ ^(R/R RC)	♀ ^(R/R RC)
1161 ^{96*}	removed from census - low occupancy ¹			
1162 ^{96*}	♂	♂	♂ ^(R/O RC)	♂ ^(R/O RC)
1163 ^{98*}	N	♀ ^(O/R)	N-XX ⁸	♂ ^(B/P)
1164 ^{98*}	removed from census - low occupancy ¹			
1165 ^{98*}	N	N	N	N
1166 ^{98*}	N	N	N	N
1167 ^{98*}	N	♀ ^(B/O) L + 4	♀ ^(B/O RC) + 1SA ^(M/M) ⁹	N ¹⁶
1168 ^{98*}	S	♀ ^(P/P) L + 3 ³	♀ ^(M/M) 3	N
1169 ^{98*}	N	N	N	N
1170 ^{98*}	♂	♂ ^(R/B)	♂ ^(R/B)	N ¹³
1171 ^{98*}	N	N	N	N
1172 ^{90*}	N	N	N	N

Transition Construction Area (TRC), 2002				
Midden	Mar	Jun	Sep	Dec
1173 ^{99*}	N	♀ (Y/O RC) L + 3 ⁴	♀ (Y/O RC)	N ¹⁷
1174 ^{99*}	N	N	N	N
1175 ^{99*}	N	N	N	N
1176 ^{99*}	N	N	N	N
1177 ^{99*}	N	N	♂ (O/G RC)	♂ (O/G RC)
1178 ^{99*}	N	N	N	N
1179 ^{99*}	N	N	N	N
1180	♂	N	N	N
1181	N	N	N	N
1182 ^{02*}	new	♀ (R/P) L + 2 ⁵	♀ (R/P) ¹⁰	N
# Mid	39	40	40	40
# Occ	21	22	22	14
% Occ	54	55	53	35
# Sq	21	22 + 23J	22 + 3J/SA	14

Table 2 - TRC (cont.)

- 1 These middens have been removed from regular censusing due to low occupancy. These middens were unoccupied for at least 12 consecutive quarterly censuses (three years) prior to removal. All middens removed due to low occupancy are checked once per year (usually in December) for activity. Any middens that become reoccupied are added back to regular censusing.
- 2 The female at midden 1160 was trapped on 8 Sep 01. She is now marked with 174Red/174Red (Left Ear/Right Ear) tags.
- 3 Through behavior observations and trapping efforts in June, it appeared that the marked female (P/P) was defending and using both middens 1156 and 1168. Her maternity nest was just north of midden 1168. [By September it appeared that the marked female (P/P) was centered mainly in midden 1156. A sub-adult female with metal ear tags appears to be the resident at 1168. It is possible that this sub-adult female is the daughter of marked female (P/P), but this has not been confirmed by trapping and positive identification of the metal ear tag numbers.] In December, the subadult female was not seen at 1168, and the adult female (P/P) from 1156 again appears to be using both middens.
- 4 The three juveniles listed for midden 1173 were first seen on 3 Jul 02. By their size (likely emerged within previous two weeks or so), they were clearly present during the June census, but not seen.
- 5 1182 is a new midden that was added during the June census, due to the presence of a marked female with two juveniles. She remained in this midden throughout the summer, therefore the midden met the "validation" criteria.
- 6 The tail and collar of the marked male (Y/B RC) resident of 1131 were found on 23 Sep 02, approximately 150 m North of midden 1131.
- 7 Three small sized juveniles were seen at midden 1149 on 26 Jul 02. They were out of the nest but not wandering far. Two of these juveniles were captured and marked with small metal ear tags. Only the marked adult female was seen in the midden during the September census.
- 8 The tail and radio collar of the marked female (O/R RC) resident of midden 1163 were found on 23 Sep 02, approximately 75 meters West of midden 1162.
- 9 Both a marked (B/O RC) adult female and a marked (M/M) older juvenile/sub-adult female were seen in midden 1167 around the nest area. Both appeared to be residents. There were 4 juveniles seen in this midden during the previous (June 2002) census.
- 10 The marked female (R/P) was determined to be the resident of midden 1182. In addition, a marked (M/M) sub-adult was seen in the midden, but it was unclear if this squirrel was resident.
- 11 The previous resident, female (W/Y), has not been seen or radio signal detected since 17 Nov 02. The female (Y/P) that was the former resident of 1121 has now apparently moved to midden 1104. She has been located by radio telemetry in the nest snag at 1104.

- 12 The stomach, scat, and radio collar of the female (G/R RC) resident of midden 1111 was found at midden 1163 on 11 Nov 02.
- 13 The female (B/- RC) resident of midden 1115 is using the nest snag at midden 1170 (located by telemetry). There is more sign at midden 1115, and it appears to still be her primary residence.
- 14 The marked female (W/W RC), former resident of 1149, has not been seen or radio signal detected since 10 Oct 02.
- 15 The radio collar of (P/Y) female, former resident of 1151, was found in a pack rat midden approximately 10 meters southeast of midden 1176 on 8 Nov 02.
- 16 The collar of female (B/O RC), former resident of 1167, was found under a thin layer of snow approximately 30 meters northwest of midden 5126 on 30 Oct 02.
- 17 The radio collar of female (Y/O RC), former resident of 1173, was found on the ground approximately 20 meters southwest of midden 2233 along with some tufts of fur on 25 Nov 02. Avian whitewash was also observed near the area.

Transition Non-Construction Area (TRN), 2002				
Midden	Mar	Jun	Sep	Dec
2201 ⁸⁹	N	N	N	N
2202 ⁸⁹	N	N	N	N
2203 ⁸⁹	N	N	N	N
2204 ⁸⁹	N	N	N	N
2205 ⁸⁹	♀	♀L	N	N
2206 ⁸⁹	♂	N	N	N
2207 ^{89*}	N	N	N	N
2208 ^{89*}	♂	♀ ^(W/G) L + 4	♀ ^(W/G RC)	♀ ^(W/G RC) 3
2209 ⁸⁹	removed from census - low occupancy ¹			
2210 ⁹⁰	N	N	N	N
2211 ^{90*}	N	N	N	N
2212 ⁹⁰	N	N	N	N
2213 ⁹⁰	removed from census - low occupancy ¹			
2214 ^{90*}	located on TRC, new number - 1172			
2215 ^{90*}	N	N	N	N
2216 ^{90*}	N	N	N	N
2217 ^{90*}	N	N	N	N
2218 ^{91*}	N	N	N	N
2219 ^{91*}	N	N	N	N
2220 ^{91*}	N	N	N	N
2221 ^{91*}	located off-area, new number - 5221			
2222 ^{91*}	removed from census - low occupancy ¹			
2223 ^{91*}	N	N	N	N
2224 ^{93*}	removed from census - low occupancy ¹			
2225 ^{94*}	N	N	N	N
2226 ^{95*}	N	N	N	N
2227 ^{95*}	N	N	N	N
2228 ^{95*}	removed from census - low occupancy ¹			
2229 ^{96*}	P	♂ ^(O/Y)	♀	N
2230 ^{96*}	N	N	N	N
2231 ^{96*}	located off-area, new number - 5231			
2232 ^{96*}	located off-area, new number - 5232			

Transition Non-Construction Area (TRN), 2002				
Midden	Mar	Jun	Sep	Dec
2233 ^{96*}	removed from census - low occupancy ¹			
2234 ^{97*}	♀	P	N	♀ (Y/G RC) ⁴
2235 ^{98*}	N	N	N	N
2236 ^{98*}	N	N	N	N
2237 ^{98*}	N	N	N	♂ (Y/B RC)
2238 ^{98*}	N	N	N	N
2239 ^{98*}	N	N	N	N
2240 ^{98*}	N	N	N	N
2241 ^{98*}	N	N	N	N
2242 ^{98*}	♀	♀	♀ (P/G)	♀ (P/G)
2243 ^{98*}	N	N	N	N
2244 ^{99*}	♂	♂	♀ (B/P RC) ²	N ²
2245 ^{99*}	N	N	N	N
2246 ^{99*}	N	N	N	N
2247 ^{99*}	N	N	N	N
2248 ^{99*}	P	N	N	N
2249 ^{99*}	N	N	N	N
2250 ^{00*}	Y	♀ (Y/G)	♀ (Y/G RC)	N ⁴
2251 ^{00*}	N	N	N	N
# Mid	41	41	41	41
# Occ	7	6	5	4
% Occ	17	15	12	10
# Sq	7	6 + 4J	5	4

Table 2 - TRN (cont.)

- 1 These middens have been removed from regular censusing due to low occupancy. These middens were unoccupied for at least 12 consecutive quarterly censuses (three years) prior to removal. All middens removed due to low occupancy are checked once per year (usually in December) for activity. Any middens that become reoccupied are added back to regular censusing.
- 2 The tail and radio collar of the marked (B/P RC) adult female resident at midden 2244 were found in a semi open area 25 meters south of midden 2244 on 4 October 02. She was seen in her midden twice during the September census, so was counted as resident for that month.
- 3 On several occasions the female (W/G RC) resident of midden 2208 was found nesting with female (Y/G RC) resident of 2234. They were found nest sharing in two unique nests.
- 4 The female (Y/G RC) was previously the resident of midden 2250 and was determined to be residing at midden 2234 in December. On several occasions the female (W/G RC) resident of midden 2208 was found nesting with female (Y/G RC) resident of 2234. They were found nest sharing in two unique nests.

Spruce-Fir Construction Area (SFC), 2002				
Midden	Mar	Jun	Sep	Dec
3000 ^{95*}	removed from census - low occupancy ¹			
3001 ^{95*}	N	N	N	N
3002 ^{95*}	removed from census - low occupancy ¹			
3003 ^{95*}	removed from census - low occupancy ¹			
3004 ^{95*}	burned in Clark Peak fire			
3005 ^{95*}	removed from census - low occupancy ¹			
3006 ^{95*}	removed from census - low occupancy ¹			
3007 ^{95*}	removed from census - too far off area, new # 5307			
3008 ^{95*}	N	N	N	N
3009 ^{95*}	N	N	N	N
3010 ^{95*}	removed from census - low occupancy ¹			
3011 ^{95*}	located off-area, new number - 5311			
3012 ^{95*}	burned in Clark Peak fire			
3013 ^{95*}	removed from census - low occupancy ¹			
3014 ^{95*}	N	N	N	N
3015 ^{95*}	burned in Clark Peak fire			
3016 ^{95*}	burned in Clark Peak fire			
3017 ^{95*}	burned in Clark Peak fire			
3018 ^{95*}	burned in Clark Peak fire			
3019 ^{96*}	removed from census - low occupancy ¹			
3020 ^{96*}	N	N	N	N
3021 ^{96*}	burned in Clark Peak fire			
3022 ^{96*}	N	N	N	N
3023 ^{98*}	N	N	N	N
3024 ^{98*}	N	N	N	N
3025 ^{98*}	N	N	N	N
3026 ^{98*}	N	N	N	N
3027 ^{99*}	N	N	N	N
3028 ^{99*}	N	N	N	N
3029 ^{99*}	N	N	N	N
3030 ^{99*}	N	N	N	N
3031 ^{99*}	N	N	N	N
3032 ^{99*}	N	N	N	N
3300 ⁸⁶	N	N	N	N

Spruce-Fir Construction Area (SFC), 2002				
Midden	Mar	Jun	Sep	Dec
3301 ^{94*}	removed from census - low occupancy ¹			
3302 ^{94*}	located off-area, new number - 5302			
3303 ^{94*}	N	N	♀ (B/R RC) ⁴	♀ (B/R RC)
3304 ^{94*}	N	N	N	N
3305 ^{94*}	removed from census - low occupancy ¹			
3306 ^{94*}	N	N	N	N
3307 ^{94*}	removed from census - low occupancy ¹			
3308 ^{95*}	removed from census - low occupancy ¹			
3309 ^{95*}	removed from census - low occupancy ¹			
3310 ^{95*}	removed from census - low occupancy ¹			
3311 ^{95*}	removed from census - low occupancy ¹			
3312 ^{95*}	N	N	N	N
3313 ^{95*}	located off-area, new number - 5313			
3314 ^{95*}	N	N	N	N
3315 ^{95*}	removed from census - low occupancy ¹			
3316 ^{95*}	removed from census - low occupancy ¹			
3317 ^{95*}	N	N	N	N
3318 ^{95*}	N	N	N	N
3319 ^{95*}	N	N	N	N
3320 ^{95*}	removed from census - low occupancy ¹			
3321 ^{95*}	removed from census - low occupancy ¹			
3322 ^{95*}	N	N	N	N
3323 ^{95*}	N	N	N	N
3324 ^{95*}	removed from census - low occupancy ¹			
3325 ^{95*}	removed from census - low occupancy ¹			
3326 ^{95*}	removed from census - low occupancy ¹			
3327 ^{95*}	N	N	N	N
3328 ^{95*}	N	N	N	N
3329 ^{95*}	removed from census - low occupancy ¹			
3330 ^{95*}	N	N	N	N
3331 ^{95*}	N	N	N	N
3332 ^{95*}	removed from census - low occupancy ¹			
3333 ^{95*}	removed from census - low occupancy ¹			
3334 ^{95*}	removed from census - low occupancy ¹			

Spruce-Fir Construction Area (SFC), 2002				
Midden	Mar	Jun	Sep	Dec
3335 ^{95*}	removed from census - low occupancy ¹			
3336 ^{95*}	removed from census - low occupancy ¹			
3337 ^{95*}	removed from census - low occupancy ¹			
3338 ^{95*}	removed from census - low occupancy ¹			
3339 ^{95*}	removed from census - low occupancy ¹			
3340 ^{95*}	removed from census - low occupancy ¹			
3341 ^{95*}	N	N	N	N
3342 ^{95*}	N	N	N	N
3343 ^{95*}	N	N	N	N
3344 ^{95*}	removed from census - low occupancy ¹			
3345 ^{95*}	removed from census - low occupancy ¹			
3346 ^{95*}	removed from census - low occupancy ¹			
3347 ^{95*}	removed from census - low occupancy ¹			
3348 ^{95*}	removed from census - low occupancy ¹			
3349 ^{95*}	removed from census - low occupancy ¹			
3350 ⁸⁷	N	N	N	N
3351 ⁸⁷	N	N	N	N
3352 ⁸⁶	removed from census - low occupancy ¹			
3353 ⁸⁷	N	N	N	N
3354 ⁸⁶	removed from census - low occupancy ¹			
3355 ^{95*}	N	N	N	N
3356 ⁸⁶	♀ + ♀ SA ³	♀ (P/B RC)L	♀ (P/B RC) + 2 ⁵	N ⁷
3357 ⁸⁶	removed from census - low occupancy ¹			
3358 ⁸⁷	burned in Clark Peak fire			
3359 ⁸⁷	burned in Clark Peak fire			
3360 ⁸⁶	♂ ^{NAT 2}	♂ (B/G RC)	♂ (B/G RC)	♂ (B/G RC)
3361 ⁸⁶	removed from census - low occupancy ¹			
3362 ⁸⁶	N	N	N	N
3363 ⁸⁶	N	N	N	N
3364 ⁸⁶	removed from census - low occupancy ¹			
3365 ⁸⁶	N	N	N	N
3366 ⁸⁶	N	N	N	N
3367 ⁸⁷	removed from census - low occupancy ¹			
3368 ⁸⁶	N	N	N	N

Spruce-Fir Construction Area (SFC), 2002				
Midden	Mar	Jun	Sep	Dec
3369 ⁸⁶	N	N	N	N
3370 ⁸⁶	♀	♀L	♀ (G/P RC)	N ⁸
3371 ⁸⁷	N	N	N	N
3372 ⁸⁹	N	♂ (O/P RC)	N-XX ⁶	P
3373 ⁸⁷	N	N	N	N
3374 ⁸⁹	N	N	N	N
3375 ⁸⁶	N	N	N	N
3376 ⁸⁶	located off-area, new number - 5376			
3377 ⁸⁷	located off-area, new number - 5377			
3378 ^{90*}	N	N	N	N
3379 ^{90*}	removed from census - low occupancy ¹			
3380 ^{90*}	removed from census - low occupancy ¹			
3381 ⁹⁰	N	N	N	N
3382 ^{91*}	P	N	N	N
3383 ^{91*}	N	N	N	N
3384 ^{91*}	burned in Clark Peak fire			
3385 ^{91*}	removed from census - low occupancy ¹			
3386 ^{91*}	removed from census - low occupancy ¹			
3387 ^{91*}	N	N	N	N
3388 ^{92*}	located off-area, new number - 5388			
3389 ^{93*}	removed from census - low occupancy ¹			
3390 ^{93*}	N	N	N	N
3391 ^{93*}	removed from census - low occupancy ¹			
3392 ^{93*}	N	N	N	N
3393 ^{93*}	N	N	N	N
3394 ^{93*}	N	N	N	P
3395 ^{94*}	removed from census - low occupancy ¹			
3396 ^{94*}	removed from census - low occupancy ¹			
3397 ⁸⁶	N	N	N	N
3398 ⁸⁶	removed from census - low occupancy ¹			
3399 ^{94*}	removed from census - low occupancy ¹			

Spruce-Fir Construction Area (SFC), 2002				
Midden	Mar	Jun	Sep	Dec
# Mid	62	62	62	62
# Occ	3	4	4	2
% Occ	5	6	6	3
# Sq	4 ³	4	4 + 2J/SA	2

Table 2 - SFC (cont.)

- 1 These middens have been removed from regular censusing due to low occupancy. These middens were unoccupied for at least 12 consecutive quarterly censuses (three years) prior to removal. All middens removed due to low occupancy are checked once per year (usually in December) for activity. Any middens that become reoccupied are added back to regular censusing.
- 2 The male at 3360 had a natural mark - buff/white colored spots on the third digit of each front paw. This is likely a temporary mark during molt, but it was useful in distinguishing this male from others seen in the area.
- 3 A subadult female was seen feeding over a large area near midden 3356 but especially at midden 3356 where there is also an adult female. No other middens in the area had good signs of activity. It was thought that this was the same pair seen in December 2001- see Census Notes
- 4 The marked (B/R RC) female changed midden residency between the June and September 2002 censuses. She was living at midden 5350 just off the monitored area, but switched to midden 3303 sometime in July based on trapping and telemetry data. The large nest snag at midden 5350 fell down during this same time period. A marked (P/R RC) male was found to be the resident of midden 5350 in September 2002 (see off-area occupancy table).
- 5 The marked (P/B RC) female at midden 3356 had 3 juveniles, first seen on 29 July, in a nest snag about 35 meters Southeast of the tag tree. Two juveniles were marked with metal ear tags. By September, one marked (M/M) female juvenile/sub-adult and one unmarked male juvenile/sub-adult were seen in the midden along with the marked adult female, and all appeared to be resident.
- 6 On 20 September 02 the collar of (O/P RC) male, former resident of 3372, was found approximately 100 meters North of the midden. This male's radio signal was lost some time in late June or early July.
- 7 The female (P/B RC), former resident of 3356, was last detected by radio signal on 28 July 02 and was last seen during the September quarterly census.
- 8 Radio collar and tail of female (G/P RC), former resident of 3370, were found buried in 4 cm of snow in semi-open area approximately 20 meters northeast of midden 3342.

Spruce-Fir Non Construction Area (SFN), 2002				
Midden	Mar	Jun	Sep	Dec
4000 ^{95*}	N	N	N	N
4001 ^{95*}	removed from census - low occupancy ¹			
4002 ^{95*}	N	N	N	N
4003 ^{95*}	removed from census - low occupancy ¹			
4004 ^{95*}	removed from census - low occupancy ¹			
4005 ^{95*}	removed from census - low occupancy ¹			
4006 ^{95*}	removed from census - low occupancy ¹			
4007 ^{95*}	removed from census - low occupancy ¹			
4008 ^{95*}	removed from census - low occupancy ¹			
4009 ^{95*}	removed from census - low occupancy ¹			
4010 ^{95*}	N	N	N	N
4011 ^{95*}	removed from census - low occupancy ¹			
4012 ^{95*}	removed from census - low occupancy ¹			
4013 ^{96*}	removed from census - low occupancy ¹			
4014 ^{96*}	removed from census - low occupancy ¹			
4015 ^{96*}	removed from census - low occupancy ¹			
4016 ^{96*}	N	N	N	N
4017 ^{96*}	removed from census - low occupancy ¹			
4018 ^{96*}	removed from census - low occupancy ¹			
4019 ^{96*}	removed from census - low occupancy ¹			
4020 ^{96*}	removed from census - low occupancy ¹			
4021 ^{96*}	removed from census - low occupancy ¹			
4022 ^{98*}	N	N	N	N
4023 ^{98*}	N	N	N	N
4024 ^{98*}	N	N	N	N
4025 ^{99*}	N	N	N	N
4400 ⁸⁹	removed from census - low occupancy ¹			
4401 ^{94*}	removed from census - low occupancy ¹			
4402 ^{94*}	removed from census - low occupancy ¹			
4403 ^{94*}	removed from census - low occupancy ¹			
4404 ^{95*}	N	N	N	N
4405 ^{95*}	removed from census - low occupancy ¹			
4406 ^{95*}	removed from census - low occupancy ¹			
4407 ^{95*}	removed from census - low occupancy ¹			

Spruce-Fir Non Construction Area (SFN), 2002				
Midden	Mar	Jun	Sep	Dec
4408 ^{95*}	removed from census - low occupancy ¹			
4409 ^{95*}	removed from census - low occupancy ¹			
4410 ^{95*}	located off-area, new number - 5410			
4411 ^{95*}	removed from census - low occupancy ¹			
4412 ^{95*}	removed from census - low occupancy ¹			
4413 ^{95*}	located off-area, new number - 5413			
4414 ^{95*}	removed from census - low occupancy ¹			
4415 ^{95*}	removed from census - low occupancy ¹			
4416 ^{95*}	removed from census - low occupancy ¹			
4417 ^{95*}	N	N	N	N
4418 ^{95*}	N	N	N	N
4419 ^{95*}	♂ ²	N	N	N
4420 ⁹⁰	N	N	N	N
4421 ⁸⁶	removed from census - low occupancy ¹			
4422 ⁸⁶	removed from census - low occupancy ¹			
4423 ⁸⁶	N	N	N	N
4424 ⁸⁶	removed from census - low occupancy ¹			
4425 ⁸⁷	removed from census - low occupancy ¹			
4426 ⁸⁶	removed from census - low occupancy ¹			
4427 ⁸⁶	N	N	N	N
4428 ⁸⁶	removed from census - low occupancy ¹			
4429 ⁸⁶	N	N	N	N
4430 ⁸⁶	removed from census - low occupancy ¹			
4431 ⁸⁶	removed from census - low occupancy ¹			
4432 ⁸⁶	removed from census - low occupancy ¹			
4433 ⁸⁷	removed from census - low occupancy ¹			
4434 ⁸⁶	removed from census - low occupancy ¹			
4435 ⁸⁶	N	N	♂	♂
4436 ⁸⁶	removed from census - low occupancy ¹			
4437 ^{95*}	removed from census - low occupancy ¹			
4438 ^{90*}	removed from census - low occupancy ¹			
4439 ^{90*}	removed from census - low occupancy ¹			
4440 ⁹¹	removed from census - low occupancy ¹			
4441 ⁸⁶	removed from census - low occupancy ¹			
4442 ^{95*}	removed from census - low occupancy ¹			

Spruce-Fir Non Construction Area (SFN), 2002				
Midden	Mar	Jun	Sep	Dec
4443 ⁸⁶	N	N	N	N
4444 ⁸⁶	N	N	N	N
4445 ⁸⁶	removed from census - low occupancy ¹			
4446 ⁸⁶	removed from census - low occupancy ¹			
4447 ⁸⁶	removed from census - low occupancy ¹			
4448 ⁸⁶	removed from census - low occupancy ¹			
4449 ⁸⁶	♀	♀	♀	N
4450 ⁸⁶	N	N	N	N
4451 ⁸⁸	removed from census - low occupancy ¹			
4452 ⁸⁶	removed from census - low occupancy ¹			
4453 ⁸⁶	removed from census - low occupancy ¹			
4454 ⁸⁶	removed from census - low occupancy ¹			
4455 ⁸⁶	removed from census - low occupancy ¹			
4456 ⁸⁶	removed from census - low occupancy ¹			
4457 ⁸⁶	removed from census - low occupancy ¹			
4458 ⁸⁶	removed from census - low occupancy ¹			
4459 ⁸⁶	removed from census - low occupancy ¹			
4460 ⁸⁷	Y	N	N	N
4461 ^{91*}	N	N	N	N
4462 ⁹⁰	removed from census - low occupancy ¹			
4463 ⁹⁰	removed from census - low occupancy ¹			
4464 ⁹⁰	N	N	N	N
4465 ^{90*}	N	N	N	N
4466 ⁸⁷	removed from census - low occupancy ¹			
4467 ⁸⁷	N	N	N	N
4468 ⁸⁷	removed from census - low occupancy ¹			
4469 ⁸⁷	removed from census - low occupancy ¹			
4470 ⁸⁷	N	N	N	N
4471 ⁸⁷	removed from census - low occupancy ¹			
4472 ⁸⁷	N	N	N	N
4473 ⁸⁷	N	N	N	N
4474 ⁸⁶	Y	Y	Y ³	P
4475 ⁸⁷	located off-area, new number - 5405			
4476 ^{95*}	removed from census - low occupancy ¹			
4477 ⁸⁷	P	N	N	N

Spruce-Fir Non Construction Area (SFN), 2002				
Midden	Mar	Jun	Sep	Dec
4478 ^{90*}	removed from census - low occupancy ¹			
4479 ^{90*}	removed from census - low occupancy ¹			
4480 ^{90*}	removed from census - low occupancy ¹			
4481 ⁸⁶	removed from census - low occupancy ¹			
4482 ⁸⁶	removed from census - low occupancy ¹			
4483 ⁸⁶	removed from census - low occupancy ¹			
4484 ⁸⁶	N	N	N	N
4485 ⁸⁶	removed from census - low occupancy ¹			
4486 ⁸⁶	removed from census - low occupancy ¹			
4487 ⁸⁶	located off-area, new number - 5487			
4488 ^{91*}	removed from census - low occupancy ¹			
4489 ^{91*}	N	N	N	N
4490 ^{91*}	removed from census - low occupancy ¹			
4491 ^{91*}	removed from census - low occupancy ¹			
4492 ^{91*}	N	N	N	N
4493 ^{91*}	removed from census - low occupancy ¹			
4494 ^{91*}	N	N	N	N
4495 ^{95*}	N	N	N	N
4496 ^{93*}	N	N	N	N
4497 ^{93*}	removed from census - low occupancy ¹			
4498 ^{93*}	removed from census - low occupancy ¹			
4499 ^{93*}	removed from census - low occupancy ¹			
# Mid	37	37	37	37
# Occ	4	2	3	1
% Occ	11	5	8	3
# Sq	4	2	3	1

Table 2 - SFN (cont.)

- 1 These middens have been removed from regular censusing due to low occupancy. These middens were unoccupied for at least 12 consecutive quarterly censuses (three years) prior to removal. All middens removed due to low occupancy are checked once per year (usually in December) for activity. Any middens that become reoccupied are added back to regular censusing.
- 2 Midden 4419 had been previously removed due to low occupancy.
- 3 In July, a sub-adult male was seen twice in or near midden 4474. No squirrel was seen during the September census, but the midden looked occupied throughout the summer based on sign.

Off-Area Midden Occupancy, 2002				
Midden	Mar	Jun	Sep	Dec
TRC Area				
5101 ⁸⁹	♂	♀ ^(R/G) L	♀ ^(R/G)	♀ ^(R/G) + ♂ ^(W/W) 10
5102 ^{98*}	N	N	P	N
5103 ^{99*}	N	N	N	N
5104 ^{99*}	♀	♀ ^(Y/R RC) L	♀ ^(Y/R RC)	♀ ^(Y/R RC)
5105 ^{02*}	new	♂ ^(G/Y) 3	♂	N
5106 ⁰²	new	P 4	P	N
5107 ⁰²	new	♀ ^(O/W) L + 3 5	♀ ^(O/W RC)	♀ ^(O/W RC)
5114 ⁸⁹	removed from census - low occupancy 1			
5118 ^{94*}	♀	♀ ^(G/G)	♀ ^(G/G RC)	♀ ^(G/G RC)
5119 ^{89*}	♀	♀ ^(Y/W RC) L + 5	XX / ♂ ^(M/M) 7	♂ ^(P/O) 11
5120 ^{89*}	removed from census - too far off area			
5121 ^{89*}	♂	♂ ^(G/W)	♂ ^(G/W RC)	♂ ^(G/W RC)
5122 ⁸⁹	N	N	N	N
5123 ⁸⁹	removed from census - too far off area			
5124 ^{90*}	removed from census - too far off area			
5125 ^{89*}	N	N	N	N
5126 ⁹¹	N	N	N	N
5127 ^{95*}	removed from census - low occupancy 1			
5145 ^{91*}	N	P	N	N
5150 ^{91*}	♀	♀ ^(G/B RC) L + 2 6	XX / P 6	N
5155 ^{93*}	♂	♂ ^(W/B)	♂ ^(W/B RC)	♂ ^(W/B RC)
5157 ^{93*}	N	N	N	N
TRN Area				
5200 ^{93*}	N	N	N	♀ ^(O/R)
5201 ^{99*}	N	N	N	N
5202 ^{99*}	♀	N	N	N
5203 ^{00*}	N	N	N	N
5221 ^{91*}	♂ ^{NAT} 2	♂ ^(R/W RC)	♂ ^(R/W RC)	♂ ^(R/W RC)
5231 ^{96*}	N	N	P	N
5232 ^{96*}	♀	N	P	N

Off-Area Midden Occupancy, 2002				
Midden	Mar	Jun	Sep	Dec
SFC Area				
5302 ^{94*}	removed from census - low occupancy ¹			
5311 ^{95*}	S	♀ (G/O RC)	♀ (G/O RC)	♀ (G/O RC)
5313 ^{95*}	♀	♂ (B/Y RC)	N-XX ⁸	N
5350 ⁸⁶	♀	♀ (B/R RC) L + 3	♂ (P/R RC) ⁹	P ¹²
5351 ^{94*}	removed from census - low occupancy ¹			
5352 ^{94*}	removed from census - low occupancy ¹			
5353 ^{94*}	removed from census - too far off area			
5354 ^{94*}	removed from census - low occupancy ¹			
5355 ^{94*}	removed from census - low occupancy ¹			
5356 ^{94*}	removed from census - low occupancy ¹			
5357 ^{95*}	removed from census - low occupancy ¹			
5358 ^{95*}	removed from census - too far off area			
5359 ^{95*}	N	N	N	N
5360 ^{96*}	removed from census - low occupancy ¹			
5361 ^{96*}	removed from census - low occupancy ¹			
5362 ^{96*}	removed from census - low occupancy ¹			
5376 ⁸⁶	removed from census - low occupancy ¹			
5377 ⁸⁷	N	N	N	N
5388 ^{92*}	removed from census - low occupancy ¹			
SFN Area				
5405 ⁸⁷	N	N	N	N
5410 ^{95*}	removed from census - low occupancy ¹			
5413 ^{95*}	N	N	N	N
5475 ⁸⁶	located on area - new number 4021			
5487 ⁸⁶	removed from census - low occupancy ¹			

Table 2 - Off Area (cont.)

- 1 These middens have been removed from regular censusing due to low occupancy. These middens were unoccupied for at least 12 consecutive quarterly censuses (three years) prior to removal. All middens removed due to low occupancy are checked once per year (usually in December) for activity. Any middens that become reoccupied are added back to regular censusing.
- 2 The male at midden 5221 had a natural mark - his tail was short with a long, thin end.
- 3 Midden 5105 was a well established new midden that was located during the June census. It was occupied by a male that was previously caught and marked in the area. Because of the good appearance of the midden and residency by a marked squirrel, the midden was included in the June census.
- 4 Midden 5106 is an old established midden first located by RSMP in September 1998. It was thought at the time to be too far off the area for inclusion in censusing. However, in June 2002 it was re-GPSd, and determined to be within parameters. Several squirrels were seen/ trapped in this midden during the month, but no resident was definitively confirmed.
- 5 Midden 5107 is an old established midden first located by RSMP in September 1998. It was thought at the time to be too far off the area for inclusion in censusing. However, in June 2002 it was re-GPSd, and determined to be within parameters. A marked female and her three juveniles were confirmed as the residents.
- 6 The two juveniles listed for midden 5150 were first seen on 3 Jul 02. By their size (likely emerged within the previous week or so), they were clearly present during the June census, but not seen. On 9 Sep 02 the partially decomposed body and radio collar of the female resident (G/B) were located south of 5150. A sub-adult male with metal ear tags was seen in midden 5150 during the September census, but it was unclear if he was resident.
- 7 On 17 Sep 02 the radio collar of the female (Y/W) resident of midden 5119 was located Northeast of 5119. No remains were found, but the female was not seen or trapped on the area again and the animal is presumed dead. A marked (M/M) male sub-adult appeared to be resident by the end of the month.
- 8 The marked (B/Y RC) male resident of 5313 was seen on 5 Sep 02 and located a few more times via telemetry. On 22 Sep 02, after a weak radio signal was noted, a radio collar and tail were found 150 meters North of midden 5313.
- 9 The marked (B/R RC) female changed midden residency between the June and September 2002 censuses. She was living at midden 5350 just off the monitored area, but switched to midden 3303 sometime in July based on trapping and telemetry data. The large nest snag at midden 5350 fell down during this same time period. A marked (P/R RC) male was found to be the resident of midden 5350 in September 2002.

- 10 The adult female (R/G) resident of midden 5101 and male sub-adult (W/W) were seen cleaning out the nest snag at midden 5101 together on 8 Dec 02 and had been reported to be seen at this midden together in late October as well. The adult female was captured on 13 Aug 02 and was reported to have been recently lactating with teats still swollen, somewhat hairless, and starting to darken. We did not observe that this female had a litter this season, but it is possible that we missed the emergence and this sub-adult is one of her offspring.
- 11 The male subadult (P/O) is the same animal that was the resident of midden 5119 in September 2002. His metal ear tags were changed to colored ear tags on 12 Nov 02.
- 12 The adult male (P/R RC), resident of midden 5350 in September, was presumed dead after finding his radio collar, many tufts of fur, and avian whitewash approximately 75 meters south of the SFC area on 25 Nov 02. The possibly occupied designation was made for December because there were several tracks seen in the midden area, but no other sign was noted.

Appendix B-2: New activity areas on the monitored areas in 2002.

There were no new activity areas located on any of the monitored areas in 2002.

Appendix C: Occupancy status of middens located within 100 meters of construction (telescopes or access road), 2002. These middens are checked during months other than the quarterly full census months (Mar, Jun, Sep, Dec) in which there is construction activity. These middens are checked as an “early warning” indicator of a large population decrease in between the quarterly censuses. See Table 2 for key to symbols.

Middens within 100m of construction												
Mid #	Jan	Feb	Ma	Ap	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1160	♀*4	♀*4	♀*4	Y	♀(R/R)	♀(R/R) ₊₃	♀(R/R)	♀(R/R)	♀(R/R RC)	♀(R/R RC)	♀(R/R RC)	♀(R/R RC)
1179	N	N	N	N	N	N	N	N	N	N	N	N
3003	removed from census - low occupancy ²											
3013	removed from census - low occupancy ²											
3014	N	N	N	N	N	N	N	N	N	N	N	N
3019	removed from census - low occupancy ²											
3020	N	N	N	N	N	N	N	N	N	N	N	N
3024	N	N	N	N	N	N	N	N	N	N	N	N
3026	N	N	N	N	N	N	N	N	N	N	N	N
3027	N	N	N	N	N	N	N	N	N	N	N	N
3028	N	N	N	N	N	N	N	N	N	N	N	N
3030	N	N	N	N	N	N	N	N	N	N	N	N
3031	N	N	N	N	N	N	N	N	N	N	N	N
3032	N	N	N	N	N	N	N	N	N	N	N	N
3309	removed from census - low occupancy ²											
3314	N	N	N	N	N	N	N	N	N	N	N	N
3315	removed from census - low occupancy ²											
3319	N	N	N	N	N	N	N	N	N	N	N	N
3320	removed from census - low occupancy ²											
3322	N	N	N	N	N	N	N	N	N	N	N	N
3323	N	N	N	N	N	N	N	N	N	N	N	N
3324	removed from census - low occupancy ²											
3325	removed from census - low occupancy ²											
3327	N	N	N	N	N	N	N	N	N	N	N	N
3330	N	P	N	N	N	N	N	N	N	N	N	N
3334	removed from census - low occupancy ²											
3336	removed from census - low occupancy ²											
3337	removed from census - low occupancy ²											
3339	removed from census - low occupancy ²											

Middens within 100m of construction												
Mid #	Jan	Feb	Ma	Ap	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3340	removed from census - low occupancy ²											
3345	removed from census - low occupancy ²											
3346	removed from census - low occupancy ²											
3347	removed from census - low occupancy ²											
3350	N	N	N	N	N	N	N	N	N	N	N	N
3354	removed from census - low occupancy ²											
3357	removed from census - low occupancy ²											
3362	N	N	N	N	N	N	N	N	N	N	N	N
3363	N	N	N	N	N	N	N	N	N	N	N	N
3364	removed from census - low occupancy ²											
3365	N	N	N	N	N	N	N	N	N	N	N	N
3368	N	N	N	N	N	N	N	N	N	N	N	N
3379	removed from census - low occupancy ²											
3382	Y	Y	P	Y	P	N	N	N	N	N	N	N
3383	N	N	N	N	N	N	N	N	N	N	N	N
3385	removed from census - low occupancy ²											
3389	removed from census - low occupancy ²											
3391	removed from census - low occupancy ²											
# Mid ³	24	24	24	24	24	24	24	24	24	24	24	24
# Occ	2	2	1	2	1	1	1	1	1	1	1	1
% Occ	8	8	4	8	4	4	4	4	4	4	4	4
# Sq	2	2	1	2	1	1+ 3J	1	1	1	1	1	1

Table 3 (cont.)

- 1 A complete census of all areas is conducted in Mar, Jun, Sep, and Dec (see Table 2).
- 2 These middens have been removed from regular censusing due to low occupancy. These middens were unoccupied for at least 12 consecutive quarterly censuses (three years) prior to removal. All middens removed due to low occupancy are checked once per year (usually in December) for activity. Any middens that become reoccupied are added back to regular censusing.
- 3 The total number of middens does not include middens removed from censusing due to low occupancy. All middens are located on the SFC area, except for middens 1160 and 1179 which are located on the TRC area.
- 4 The female at midden 1160 is tagged - left ear 174Red / right ear 174Red.

Appendix D: Red squirrel populations (including juveniles still living at maternal middens) on the areas being monitored by the Red Squirrel Monitoring Program, from December 2001 through December 2002.

Date	TRC	TRN	SFC	SFN	TOTAL
Dec 2001	23 + 2SA	10	4	4	41 ¹ + 2SA ²
Mar 2002	21	7	4 ³	4	36
Jun 2002	22 + 23J	6 + 4J	4	2	34 + 27J
Sep 2002	22 + 3J/SA	5	4 + 2J/SA	3	34 + 5J/SA
Dec 2002	14	4	2	1	21

Bold Indicates data for this quarter.

- 1 This number includes the 2 subadult females that appeared to be living independently at midden 1171, and the two sub-adult squirrels of unknown sex that appeared to be living independently at midden 2206.
- 2 This number includes the 2 subadults that still were in the area of 1160 (presumed natal midden). The marked female at midden 1160 was seen with two subadults near the midden two weeks prior to the December census. By the December census, it did not appear that they had established a separate midden, so they were included with the adult post-lactating marked female at 1160.
- 3 A subadult female still appears to be associating with the adult female in midden 3356 - see Census Notes.

Appendix E: Midden Occupancy Maps, 2002.

Appendix F: Measures of Spatial Distribution.

F-1. Crude Density

a) middens

b) squirrels

F-2. Local density and nearest neighbor distances of middens and squirrels.

Appendix F-1a: Crude Density of Red Squirrel Middens

Crude Density (middens/ha) of red squirrel middens in each of the monitored areas for December 2001 through December 2002.				
DATE (post-burn area)	TRC (49.1 ha)	TRN (24.4 ha)	SFC (101.0 ha)	SFN (128.9 ha)
Dec 2001	0.78	2.00	0.92	0.49
Area¹ (after Jan 2000)	(51.1 ha)	(21.0 ha)	(76.0 ha)	(104.4 ha)
Mar 2002	0.76	1.95	0.82	0.35
Jun 2002	0.78	1.95	0.82	0.35
Sep 2002	0.78	1.95	0.82	0.35
Dec 2002	0.78	1.95	0.82	0.35

Appendix F-1b: Crude Density of Red Squirrels

Crude Density (squirrels/ha) of red squirrels (including juveniles) in each of the monitored areas for December 2001 through December 2002.				
DATE (post-burn area)	TRC (49.1 ha)	TRN (24.4 ha)	SFC (101.0 ha)	SFN (128.9 ha)
Dec 2001	0.49	0.48	0.05	0.04
Area¹ (after Jan 2000)	(51.1 ha)	(21.0 ha)	(76.0 ha)	(104.4 ha)
Mar 2002	0.41	0.33	0.05	0.04
Jun 2002	0.88	0.48	0.05	0.02
Sep 2002	0.49	0.24	0.08	0.03
Dec 2002	0.27	0.19	0.03	0.01

1 The new area sizes for 2000 and afterwards are the result of more accurate GPS mapping of features on the monitored areas. The greatest change occurred on the SFN area - this was mainly due to more accurate mapping of the northern boundary (a Forest Service hiking trail).

Appendix F-2. Local Density and Nearest Neighbor Distances of *middens* and *squirrels*.

TRC Area										
Middens						Squirrels				
Month	# Mid	Mean Local Dens.	Std. Error of the Mean	Mean Nearest Neighbor Dist (M)	Std. Error of the Mean	# RS	Mean Local Dens.	Std. Error of the Mean	Mean Nearest Neighbor Dist (M)	Std. Error of the Mean
Dec 01	40	5.8	0.39	42.1	2.43	22	3.1	0.34	51.9	4.04
Mar 02	39	5.6	0.42	42.3	2.49	21	2.8	0.30	52.4	4.29
Jun 02	40	5.9	0.43	40.9	2.55	22	3.5	0.39	46.1	4.18
Sep 02	40	5.9	0.44	41.5	2.63	22	3.6	0.43	48.3	5.21
Dec 02	40	5.9	0.44	41.5	2.63	14	2.3	0.38	62.2	7.75

TRN Area										
Middens						Squirrels				
Month	# Mid	Mean local Dens.	Std. Error of the Mean	Mean Nearest Neighbor Dist (M)	Std. Error of the Mean	# RS	Mean Local Dens.	Std. Error of the Mean	Mean Nearest Neighbor Dist (M)	Std. Error of the Mean
Dec 01	42	6.6	0.27	40.8	2.06	9	2.2	0.43	66.1	7.41
Mar 02	41	6.5	0.28	41.0	2.10	7	1.7	0.29	69.6	7.00
Jun 02	41	6.5	0.28	41.0	2.10	6	1.7	0.56	93.3	19.73
Sep 02	41	6.5	0.28	41.0	2.10	5	1.0	0.55	114.6	15.83
Dec 02	41	6.5	0.28	41.0	2.10	4	1.3	0.63	108.5	26.28

Appendix F-2 (con't.)

SFC Area										
Middens						Squirrels				
Month	# Mid	Mean Local Dens.	Std. Error of the Mean	Mean Nearest Neighbor Dist (M)	Std. Error of the Mean	# RS	Mean Local Dens.	Std. Error of the Mean	Mean Nearest Neighbor Dist (M)	Std. Error of the Mean
Dec 01	70	3.9	0.21	54.4	2.81	4	0.5	0.29	115.6	43.30
Mar 02	62	3.5	0.21	59.2	3.28	3	0.0	0.00	191.9	2.77
Jun 02	62	3.5	0.21	59.2	3.28	4	0.0	0.00	191.2	1.75
Sep 02	62	3.5	0.21	59.2	3.28	4	0.0	0.00	149.5	26.05
Dec 02	62	3.5	0.21	59.2	3.28	2	0.0	0.00	104.4	0.00

SFN Area										
Middens						Squirrels				
Month	# Mid	Mean Local Dens.	Std. Error of the Mean	Mean Nearest Neighbor Dist (M)	Std. Error of the Mean	# RS	Mean Local Dens.	Std. Error of the Mean	Mean Nearest Neighbor Dist (M)	Std. Error of the Mean
Dec 01	51	2.2	0.17	70.7	5.02	4	0.5	0.29	262.2	108.37
Mar 02	37	1.3	0.18	85.0	8.78	4	0.5	0.29	211.0	93.68
Jun 02	37	1.3	0.18	85.0	8.78	2	0.0	0.00	869.5	0.00
Sep 02	37	1.3	0.18	85.0	8.78	3	0.0	0.00	552.2	99.68
Dec 02	37	1.3	0.18	85.0	8.78	1	0.0	0.00	1146.7	0.00

Appendix F-2 (con't.)

All Areas Combined										
(including off-area middens within 100m of middens on the monitored areas)										
Middens						Squirrels				
Month	# Mid	Mean Local Dens.	Std. Error of the Mean	Mean Nearest Neighbor Dist (M)	Std. Error of the Mean	# RS	Mean Local Dens.	Std. Error of the Mean	Mean Nearest Neighbor Dist (M)	Std. Error of the Mean
Dec 01	231	4.3	0.18	53.5	1.75	52	2.4	0.24	85.3	12.93
Mar 02	207	4.2	0.19	56.8	2.30	48	2.0	0.23	89.0	12.42
Jun 02	211	4.4	0.19	56.3	2.27	47	2.6	0.31	107.5	24.83
Sep 02	211	4.4	0.19	56.4	2.27	45	2..6	0.34	102.5	19.93
Dec 02	211	4.4	0.19	56.4	2.27	31	1.9	0.29	117.37	35.27

Appendix G. Reproductive success on the monitored areas, 2002.

- G-1. Breeding chases seen on the monitored areas.
- G-2. Litters seen on the monitored areas.
- G-3. Reproductive status and age statistics by month.

Appendix G-1. Potential breeding chases on the monitored areas.

<u>DATE</u>	<u>MIDDEN</u>	
8 Mar 02	5350	Two squirrels were seen in this midden during the observation. One was identified as a non reproductive female, resident of this midden, and the other was a scrotal male. The male entered a snag in the female's midden and she watched him and then chased him off. The observer followed the two animals away from the midden and lost them in the canopy. The female returned to the midden and entered the snag ten minutes later.
9 Mar 02	4449	Two squirrels were seen in this midden during the observation. One was identified as a non reproductive female, resident of this midden, and the other was a scrotal male. The observer followed the male to the midden at which point he was chased out by the female resident. He stood at the midden edge, barked, and was joined by another barking squirrel. The second barking squirrel could not be located but was near enough to be heard and assumed to be involved in this interaction.

Appendix G-2: Litters seen on the monitored areas.

<u>DATE</u>	<u>MIDDEN</u>	
4 June 02	5119	A lactating adult female was radio tracked to this midden. She was seen along with five juveniles at a newly discovered nest tree.
4 June 02	1113	A lactating adult female was radio tracked to a nest about 20 meters southwest of the midden. Three juveniles (1 male, 1 female, 1 unknown) were seen exiting the nest cavity and playing on the nest tree trunk.
5 June 02	1168	Three juveniles (1 female, 2 unknown) were observed in a nest snag about 15 meters north of this midden. They emerged during the observation and were playing on the nest tree and a nearby tree. The lactating adult female resident was later seen entering the nest snag followed by the juveniles.
6 June 02	5350	Three juveniles were seen in the area near this midden and other nearby areas but were never directly observed with the female believed to be the mother. However there was very strong circumstantial evidence that there were 3 juveniles for this female who was clearly lactating during this time.
7 June 02	1104	Two juveniles were seen at this midden, but the observer was unable to sex them. The adult lactating female was also observed vocalizing from the midden.
8 June 02	1160	A lactating female was known to be nesting in a snag very near to this midden. Three juveniles (1 female, 2 unknown) were observed playing near the nest entrance and attempting to feed on cones.
9 June 02	2208	An adult lactating female was observed moving four juveniles from one nest snag to another nearby nest snag. One of the juveniles was sexed as a female, the others were unknown.
17 June 02	1182	Two juveniles were seen, but not sexed, with the resident lactating adult female of this midden. They were observed entering the nest cavity.

- 19 June 02 5107 Three juveniles were seen about 10 meter east of a live trap location near midden 5106 where an adult female was being handled. They were traveling in the trees and basking. They were later determined to be the offspring of the adult female, resident of midden 5107.
- 21 June 02 1103 One juvenile emerged from the nest cavity shortly after the adult lactating female. The observer noted that the juvenile was almost the size of an adult, but pelage was very sleek and new. Both adult and juvenile vocalized from the nest tree and then re-entered the cavity.
- 22 June 02 1167 The resident lactating adult female and her four offspring (1 female, three unknown) were found to be nesting in a ground nest near the midden. The juveniles were seen foraging on the ground near the nest. During this observation the female was also seen chasing off an intruding male red squirrel from the area of the nest.
- 24 June 02 1151 Two juveniles were seen poking their heads out of a nest cavity in a tree about 40 meters south-southeast of the midden. The resident lactating adult female was later confirmed to be the mother.
- 3 July 02 1173 Three juveniles (1 female, 1 male, 2 unknown) were seen at this midden along with a lactating adult female. This female was later radio tracked to this midden and determined to definitely be the resident.
- 3 July 02 5150 Two juveniles (1 male, 1 female) were observed playing on the tree near the midden pile and pretending to feed on cones. They didn't stray too far from the tree. The adult lactating female was also present and feeding on the ground. These two juveniles were seen very near this location again on 11 July 02 foraging on the ground.
- 26 July 02 1149 The resident lactating adult female and three offspring (2 females, 1 unknown) were observed near the nest snag during living trapping rounds. Two of the juveniles were caught along with the adult female.
- 29 July 02 3356 The resident lactating adult female was found to be nesting in a snag near midden 3321. While live trapping in this area, three juveniles were observed near this location and determined to be the resident squirrel's offspring.

Appendix G-3. Reproductive status and age statistics by month. For each month, these numbers are based on the final resident of the middens where a squirrel was seen. Middens that were determined to be active based on sign alone and no squirrel was seen are not included. Information gathered on squirrels determined to be non-residents at a midden is also excluded. Therefore the total number of active middens for a given month may be higher than the totals of the numbers seen here. **Information for off-area middens is included in Appendix G-3(a-c).** Information for new activity areas is **NOT** included in Appendix G-3 (a-c).

Appendix G-3a. Female reproductive information

Reproductive Status	March			June			September			December		
	Adult	YOY ¹	Unkn.	Adult	YOY ¹	Unkn.	Adult	YOY ¹	Unkn.	Adult	YOY ¹	Unkn.
reproductive	3			2								
lactating				19								
post-lactating							21					
non-reproductive ¹	17	1 ²		6	5		2	4		11	1	
unknown	2			4			5			6		

1 YOY = Young of year, squirrels that have left the maternal midden. Identified by visual cues: generally smaller size, whiter fur on underside, thinner tail, head may appear slightly large (out of proportion). Young of the year are by definition not reproductively mature. Juveniles caught at natal middens and positively identified may be included in these numbers.

2 A subadult female that is spending time at 3356 where there is an adult female - see Census Notes.

Appendix G-3b. Male reproductive information

Reproductive Status	March			June			September			December		
	Adult	YOY ¹	Unkn.	Adult	YOY ¹	Unkn.	Adult	YOY ¹	Unkn.	Adult	YOY ¹	Unkn.
scrotal	14			10								
non-reproductive ¹	5	1			1		10	5		5	4	
unknown				5			1			5		

Appendix G-3c. Age information for females, males, and squirrels of unknown sex combined.

March			June			September			December		
Adult	YOY ¹	Unkn.	Adult	YOY ¹	Unkn.	Adult	YOY ¹	Unkn.	Adult	YOY ¹	Unkn.
42	3		46	40		39	10		27	5	

¹ YOY = Young of year, squirrels that have left the maternal midden. Identified by visual cues: generally smaller size, whiter fur on underside, thinner tail, head may appear slightly large (out of proportion). Young of the year are by definition not reproductively mature. Normally, by the March census, it is difficult to distinguish young of the previous year from adults. However, in March 2002, there were a few squirrels seen that had the physical characteristics of sub-adult squirrels. This was likely due to the apparent late reproductive effort in Fall 2001. Juveniles caught at natal middens and positively identified may be included in these numbers.

Appendix H: Monthly weather summaries - January through December, 2002.

Note: Averages are calculated based on the total number of records collected per month. As of 25 September 2000, weather stations are recording data at 1 hour intervals: between approximately 600 and 700 records per month.

	Month	Biology Camp	Emerald Peak
Temperature (°C) average (max; min)	January	-1.4 (13.8; - 16.9)	-3.1 (11.0; -18.0)
	February	0.1 (11.3; - 11.6)	-1.4 (8.0; -12.2)
	March	0.7 (12.8; - 12.8)	-1.2 (9.6; -15.1)
	April	6.4 (16.7; - 4.7)	4.7 (13.7; -6.8)
	May	9.4 (25.4; - 4.7)	7.8 (21.8; -5.4)
	June	15.7 (25.2; 2.8)	11.4 (20.2; 2.3)
	July	14.2 (25.6; 7.3)	11.3 (18.8; 6.8)
	August	13.2 (23.3; 5.3)	11.8 (20.8; 3.8)
	September	10.8 (19.9; 4.2)	9.4 (17.8; 3.1)
	October	4.7 (14.8; - 4.7)	3.3 (12.7; - 5.9)
	November	2.9 (13.4; - 3.6)	1.5 (10.9; - 6.0)
	December	-3.6 (6.9; - 13.6)	- 4.9 (5.3; - 15.4)

	Month	Biology Camp	Emerald Peak
Wind Speed (m/sec), maximum(max. gust)	January	2.7 (11.6)	2.7 (11.2)
	February	3.1 (12.1)	3.1 (13.9)
	March	2.7 (17.9)	2.2 (11.2)
	April	2.7 (12.5)	2.2 (10.3)
	May	2.2 (9.4)	2.2 (8.9)
	June	1.8 (12.1)	1.3 (8.5)
	July	1.8 (8.5)	114.0 (114.0)
	August	2.2 (9.8)	2.7 (7.6)
	September	1.8 (9.8)	2.2 (10.7)
	October	1.8 (8.0)	1.8 (0.46)
	November	3.6 (114.0)	3.1 (0.7)
	December	2.7 (12.5)	2.7 (11.2)
Wind, Most Common Direction	January	N	N
	February	N	N
	March	S	N
	April	S	N
	May	S	N
	June	S-SW	N
	July	N	N
	August	N	N
	September	S-SW	N
	October	S-SW	S-SE
	November	N	S-SE
	December	N	N

	Month	Biology Camp	Emerald Peak
Maximum Snow Depth (cm) Forest/Clearing	January	10/26	22/40
	February	0/25	21/45
	March	26/31	25/64
	April		
	May		
	June		
	July		
	August		
	September		
	October		
	November		
	December	25/36	18/19
Rain Fall (mm) Total	January	n/a ¹	n/a ¹
	February	n/a ¹	n/a ¹
	March	n/a ¹	n/a ¹
	April	1.0	2.8
	May	- ²	0.0
	June	0.2	0.0 ³
	July	58.6	127.2 ³
	August	78.0	75.0
	September	38.6	31.0
	October	19.8	43.0
	November	n/a ⁴	n/a ⁴
	December	n/a ⁴	n/a ⁴

	Month	Biology Camp	Emerald Peak
Relative Humidity (%) average (max; min)	January	47.8 (95.0; 9.0)	43.5 (91.0; 3.0)
	February	39.0 (98.0; 10.0)	31.8 (94.0; 5.0)
	March	37.8 (97.0; 10.0)	34.3 (93.0; 3.0)
	April	41.5 (96.0; 9.0)	37.9 (93.0; 5.0)
	May	27.4 (67.0; 9.0)	22.9 (66.0; 5.0)
	June	29.9 (57.0; 10.0)	27.8 (55.0; 9.0)
	July	65.0 (100.0; 14.0)	74.8 (97.0; 30.0)
	August	71.4 (100.0; 20.0)	66.2 (97.0; 13.0)
	September	70.1 (100.0; 27.0)	62.8 (97.0; 21.0)
	October	69.7 (100.0; 23.0)	63.5 (96.0; 7.0)
	November	47.6 (100.0; 9.0)	42.1 (96.0; 2.0)
	December	58.4 (96.0; 15.0)	54.8 (96.0; 7.0)
Dew Point (°C) average (max; min)	January	- 13.1 (- 1.4; - 29.7)	- 17.3 (- 3.7; - 40.6)
	February	- 14.0 (0.7; - 28.1)	- 19.0 (-1.1; - 7.6)
	March	- 14.0 (- 0.3; - 34.2)	- 17.6 (- 3.0; - 48.9)
	April	- 7.3 (2.4; - 29.3)	- 10.6 (0.7; - 35.7)
	May	- 9.3 (2.1; - 25.6)	- 13.4 (- 0.2; - 33.6)
	June	- 2.5 (4.2; - 17.7)	- 7.3 (0.2; - 17.9)
	July	6.5 (- 10.5; 15.2)	6.6 (-2.9; 11.8)
	August	7.3 (- 8.6; 15.8)	4.6 (- 15.5; 11.4)
	September	5.0 (- 3.3; 13.2)	1.8 (- 9.5; 10.4)
	October	- 0.9 (6.2; - 17.0)	- 4.0 (3.9; - 30.3)
	November	- 9.4 (3.0; - 27.7)	- 13.8 (1.1; - 44.9)
	December	- 11.7 (- 1.2; - 24.2)	- 14.3 (- 1.2; - 33.9)

- 1 The rain gauges were disconnected on 7 December 2001. All moisture during the months of January - March of 2002 was in the form of snow. The rain gauges were reconnected on 5 April 2002.
- 2 Data missing: Biology Camp rainfall, May 2002 - equipment failure.
- 3 Data missing: Data between 10 June 02 and 14 July 02 was not included in these calculations due to equipment failure.
- 4 The rain gauges were disconnected on 31 Oct 02. All moisture during the months of November and December 2002 was in the form of snow. The rain gauges will be reconnected in the spring.

Appendix H-2. Monthly maxima, minima and averages for accumulated snow depth. Data are from snow poles in Spruce-Fir (SF) and Mixed Conifer (TR) habitats from locations in the forest (F) and in clearings (C).

Month	Hab	Loc	N ¹	Average snow depth (cm)	Maximum snow depth (cm)	Minimum snow depth (cm)
Dec 2001	TR	C	5	17.4	31.0	8.0
Dec 2001	TR	F	4	14.0	29.0	7.0
Dec 2001	SF	C	5	13.2	25.0	8.0
Dec 2001	SF	F	5	6.6	10.0	3.0
Jan 2002	TR	C	2	20.5	26.0	15.0
Jan 2002	TR	F	2	7.5	10.0	5.0
Jan 2002	SF	C	3	30.7	40.0	20.0
Jan 2002	SF	F	3	19.0	22.0	16.0
Feb 2002	TR	C	1	25.0	25.0	25.0
Feb 2002	TR	F	1	0.0	0.0	0.0
Feb 2002	SF	C	3	24.3	45.0	0.0
Feb 2002	SF	F	3	13.7	21.0	0.0
Mar 2002	TR	C	6	14.3	31.0	0.0
Mar 2002	TR	F	6	13.8	26.0	0.0
Mar 2002	SF	C	10	26.9	64.0	0.0
Mar 2002	SF	F	10	13.6	25.0	0.0

- 1 There are 8 sets of snow poles (a set = 1 forest and 1 clearing) on the monitored areas: 3 in the TR habitat and 5 in the SF habitat. During the months when only a mini-census is conducted, we read a subset of the snow poles: 1 set in the TR habitat and 3 sets in the SF habitat.