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**ARIZONA**  
MT. GRAHAM RED SQUIRREL MONITORING PROGRAM

**Annual Report  
for  
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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 2000. The MGIO is located along a ridge extending westward from Hawk Peak in the Graham (Pinaleño) Mountains of southeastern Arizona. In 2000, 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 2000. The steel structure above the foundation was completed the previous year, and interior building work took place in 2000.

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 2000, 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.

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 1999, seed production was estimated from 28 seedfall plots distributed among the monitored areas (Figure 1). Three 0.25 m<sup>2</sup> seed traps were randomly placed within a 10 m x 10 m plot at each location. Seeds from the 1999 crop were collected from the seed traps in May 2000. 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). These plots are oriented east to west and centered on seed collection plots. 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 2000, 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. During winter months, visual verification was often not practical, and determination of occupancy, in some cases, 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 1999, the number of occupied middens and the sexes of resident squirrels were determined. The December occupancy was then compared to occupancy for June 2000. 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 2000, the breeding condition of adult male and female squirrels, and litter activity was recorded when observed. By examining the squirrel's condition through 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 by visual assessment and was recorded as "testes non-scrotal" (non-reproductive) or "testes scrotal" (sexually active).

### Trapping and Marking

There was no trapping and marking during the 2000 field season.

### Mapping

Almost all middens and other physical features on the monitored areas have been mapped using GPS with an accuracy of  $\pm 5$ 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 (Federal Building, 300 W. Congress St., Tucson, 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

#### 1999 Conifer Seed Production

The total 1999 seed crop on the monitored areas was, on average, 67% lower than the 1998 seed crop, with the largest decreases seen in the SF habitat.

For the 1999 corkbark fir seed crop, decreases were seen from the 1998 crop in both habitats. In 1999, there was a complete absence of corkbark fir seeds in the samples from the SF habitat. Overall, there was a 79% decrease in the corkbark fir crop from 1998 to 1999.

As was seen in 1998, there were no Douglas-fir seeds in any of the samples from the SF habitat in 1999. There was a 53% decrease in Douglas-fir crops in the TR habitat from 1998 to 1999.

Overall, there was a 24% decrease in 1999 Engelmann spruce crops from the previous year. However, there was a 72% increase in the Engelmann spruce seed crop in the TR habitat from 1998 to 1999. This somewhat offset the large decreases seen in the SF habitat between years.

The 1999 overall seed crop was less than half of the seed crop seen in 1998. Seed production in 1999 was the third lowest since data collection began in 1993. The crops seen in 1994 and 1996 were lower, with about half the production of 1999 (Table 2, Figures 2a-c, Appendix A).

### 2000 Mushroom Production

Overall annual mean mushroom production in 2000 was similar to 1999. In the TR habitat, there were slight increases in 2000 compared to 1999. However, in the SF habitat, the 2000 mushroom production continued to decrease as it has since 1998. In contrast to 1999, the annual production ( $\bar{x}$  wet weight) for the SF habitat in 2000 was significantly lower than in the TR habitat (Table 3). Prior to 1998, the SF habitat generally had a greater (although not always significantly) production than the TR habitat (Figure 3).

On the TRC area, three genera, *Auricularia*, *Cortinarius*, and *Russula* accounted for 61% of production. On the TRN area, the same three genera accounted for 78% of total production. *Lycoperdon*, *Russula*, and *Auricularia* accounted for 79% of the production on the SFC area. On the SFN area, *Lycoperdon*, *Amanita*, and *Russula*, accounted for 73% 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 2000 (Appendix B-1). In addition, the 31 middens (by Dec 00) within 100 m of the access road or construction were censused during months of construction activity (Appendix C).

From December 1999 to December 2000, the number of red squirrels on the monitored areas decreased from 102 to 65, a 36% decrease. On the TRC area, the highest number of squirrels (31 Ad + 3 Juv) was seen in Jun 2000, and the lowest number was 21 squirrels seen in December. June was the month with the highest number of squirrels (29 Ad + 2 Juv) on the TRN area. The lowest squirrel numbers (21) on the TRN area were seen in December. The number of squirrels on the SFC area stayed constant at 12 throughout the year. March had the highest number of squirrels (16) for the SFN area, and December was the lowest month with 11 squirrels. Populations on all of the monitored areas decreased throughout 2000, with the exception of the SFC area, which remained stable (Figure 4, Appendix B-1,C,D,E).

No newly established middens were found in 2000. However two 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 the TR habitat decreased from June to December 2000 as a reflection of the greater population decreases in those areas (Table 6).

In June and December 2000, there were no significant differences in the proportion of middens occupied *within* the TR or SF habitats. However, there was a significantly greater proportion of middens occupied in the TR habitat when compared to the SF habitat, in both June and December 2000. Overall, on all of the monitored areas in 2000, the proportion of occupied middens decreased from 34% in June to 27% in December (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 2000. On the TRC area in both June and December, occupied middens were slightly closer to construction than unoccupied middens. In June 2000, on the SFC area, occupied middens were closer to construction than unoccupied middens by an average of 6 m. In December, however, unoccupied middens were, on average, 10 m closer to construction than occupied middens (Table 8).

### Overwinter Survival

There were no significant differences in the number of squirrels that survived the winter of 1999-2000 within the TR and SF habitats. However, when comparing between habitats, the TR habitat had significantly higher survival (78%) than the SF habitat (41%) (Table 9). For comparison, the average proportion of survival from the previous winter (1998-1999) was 70% in the TR habitat and 79% 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.

### 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 1999 and December 2000, the crude density of *middens* increased slightly on the TRC and SFC areas, while remaining stable on the TRN and SFN areas. The increases were due to the inclusion of two reoccupied middens added back to regular censusing (Figure 5, Appendix F-1a).

The crude density of *squirrels* in the both habitats decreased from December 1999 to December 2000. The SFC was the exception, remaining stable throughout the year (Figure 5, Appendix F1-b).

### Local Density

The December 2000 overall mean local density ( $\bar{x}$  LD) of *middens* was lower (4.6), than in December 1999 (5.2), mainly due to middens removed from regular censusing due to low occupancy. There were significant differences in the local density of middens among the four areas. The SFN area had the lowest  $\bar{x}$  LD (2.2), and the TRN area had the highest (6.7) (Table 10, Figure 6, Appendix F-2).

The  $\bar{x}$  LD of *squirrels* (occupied middens) on all areas in December 2000 was 2.2, which is a decrease from 3.3 in December 1999. The TR habitat had a significantly greater  $\bar{x}$  LD of squirrels than the SF habitat (Table 10, Figure 6, Appendix F-2).

### Nearest Neighbor Distance

The overall  $\bar{x}$  NND of *middens* increased slightly from December 1999 to December 2000 (45.1 to 48.6 m). The  $\bar{x}$  NND in the SF habitat was significantly longer than in the TR habitat in December 2000 (Table 11, Figure 7, Appendix F-2).

The  $\bar{x}$  NND of *squirrels* (occupied middens) in all areas increased from 65.2 m in December 1999 to 85.9 m in December 2000. This increase was a reflection in the drop of overall squirrel numbers on the monitored areas. The  $\bar{x}$  NND of the areas within the TR habitat was similar, but the  $\bar{x}$  NND of squirrels in the SFN area was significantly longer than in the SFC area (Table 11, Figure 7, Appendix F-2).

### Reproductive Activity and Success

Only one breeding chase was observed in 2000. This chase was seen in March, relatively early as compared to previous years (Appendix G-1). The earliest date a scrotal male was seen was 8 March in the TR habitat. Twenty-four out of the thirty-nine males identified during the March census were scrotal. The latest date a scrotal male was seen was 24 September on the SF habitat. No scrotal males were observed during the December census (Appendix G-3b).

The earliest a lactating female was observed was 6 June in the TR habitat and the latest was on 27 June, also in the TR habitat. During the March census, 18 adult females were identified, one was reproductive and none were lactating. By June, 10 of the 23 females observed were classified as lactating, and five were classified as post-lactating. In September, out of 29 adult females seen, none were lactating and nine were post-lactating. Finally, in December, there were no lactating and two post lactating females identified. (Appendix G-3a).

Direct evidence of 3 litters (5 juveniles) was seen during censuses or other monitoring activities. All three litters were seen in June in the TR habitat (Appendix G-2). In September, 5 midden residents were identified as young of the year (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. Because the squirrels are not marked, information is provided only for a general picture of the reproductive and age status of the squirrels on the monitored areas.

### Trapping and Marking

There was no trapping and marking on the monitored areas in 2000.

### Marked Squirrels

There was only one marked squirrel, a male on the SFC area, seen on the monitored areas during part of 2000 (Appendix B-1). In addition to the ear tagged squirrel, there were 13 squirrels on or near the monitored areas in 2000 with natural identifying marks such as an ear notch or a short tail (Appendix H-1).

The single remaining marked animal was seen three times during 2000. The marked male was last seen in his home midden during April, after which an unmarked squirrel was resident. The marked male was known to be living on the monitored area for 54 months (Appendix H-2).

### Mapping



At the end of 2000, all major features on the monitored areas were mapped using GPS. Using GPS / GIS, further refinements in the measured size of the monitored areas were made during 2000. The biggest change was on the SFC area with a decrease of 24.4 ha in the measured size (Table 6). This was mainly due to a more accurate mapping of the northern boundary, a Forest Service hiking trail.

## Weather Data

Weather data were collected nearly continuously in 2000 from two weather stations located at the biology camp (TR habitat) and near Emerald Peak (SF habitat). The collection/averaging interval was changed from 30 minutes to 60 minutes in September to allow for easier maintenance of the stations. The maximum temperature recorded was 35.4°C in May at the biology camp and the minimum temperature recorded was -16.8°C in January on Emerald Peak. The maximum average monthly temperature was 15.1°C in July at the biology camp and the minimum average monthly temperature was -3.5°C in November on Emerald Peak. (Figure 8, Appendix I-1). The maximum total monthly rainfall was recorded in October, with 166.8 mm on Emerald Peak. May was the driest month with no rain recorded at either station (Figure 9, Appendix I-1). Snow depth was recorded from the eight pairs of snow poles on the monitored areas. The average accumulated snow depth from November 1999 through May 2000 ranged from 0 cm to 43.0 cm (Figure 10, Appendix I-2). For comparison, average accumulated snow depths for the same period in 1998-1999 ranged from 0 cm to 37.7 cm, and in 1997-1998 depths ranged from 9.0 cm to 183.4 cm. Data on wind chill temperatures, wind direction and speed, humidity, and barometric pressure were also collected (Appendix I-1).

## Insect Outbreaks on the Monitored Areas

Infestations of bark beetles (*Drycoetes confuses* and *Dendroctonus rufipennis*) and spruce aphid (*Elatobium abietinum*) continued on parts of the monitored areas in 2000, although perhaps to a lesser degree than in previous years. For a detailed report on forest health and continuing research on the insect infestations, please refer to the yearly forest health report prepared by the USFS. The 2000 report will soon be available online at [http://www.for.nau.edu/usfs/r3\\_fpm/](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, 1999. 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	101.4	32.5	80.0	25.6	130.6	41.9
TRN	4	243.3	70.2	23.3	6.7	80.0	23.1
SFC	7	0.0	0.0	0.0	0.0	19.1	100.0
SFN	12	0.0	0.0	0.0	0.0	33.3	100.0
TR Habitat	9	164.4	50.2	54.8	16.7	108.1	33.0
SF Habitat	19	0.0	0.0	0.0	0.0	28.0	100.0

Table 3. Mean annual mushroom production, 2000.

Area/Habitat	n	$\bar{x}$ Wet weight (kg/ha)	$\bar{x}$ Dry weight (kg/ha)
TRC	5	39.67 ± 5.858	4.04 ± 0.481
TRN	4	53.03 ± 20.360	5.39 ± 2.118
SFC	7	18.20 ± 3.033	2.05 ± 0.344
SFN	12	19.35 ± 2.985	2.32 ± 0.361
TR Habitat	9	45.61 ± 9.172	4.64 ± 0.932
SF Habitat	19	18.93 ± 2.142	2.22 ± 0.257

ANOVA among all four areas:Wet Weight  $F= 5.26$  **P= 0.006**Dry Weight  $F= 3.98$  **P= 0.021**ANOVA between SF & TR:Wet Weight  $F= 14.82$  **P= 0.001**Dry Weight  $F= 10.93$  **P= 0.003**

Table 4. Mean annual mushroom production (wet weight kg/ha) of selected mushroom genera known to be food resources for red squirrels, 2000. 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>	2.75	6.9	2.38	4.5	0.46	2.5	<b>2.43</b>	12.6
<i>Auricularia</i>	<b>10.32</b>	26.0	<b>26.45</b>	49.9	<b>3.49</b>	19.2	0.07	0.4
<i>Boletus</i>	1.49	3.8	0.00	0.0	0.00	0.0	0.15	0.8
<i>Clavaria</i>	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
<i>Clitocybe</i>	1.88	4.7	3.31	6.2	0.48	2.7	1.13	5.8
<i>Cortinarius</i>	<b>8.28</b>	20.9	<b>9.37</b>	17.7	1.74	9.6	1.78	9.2
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>	0.03	0.1	0.54	1.0	0.00	0.0	0.03	0.2
<i>Leccinum</i>	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
<i>Lycoperdon</i>	4.50	11.3	4.04	7.6	<b>6.42</b>	35.3	<b>9.75</b>	50.4
<i>Pholiota</i>	1.93	4.9	1.33	2.5	1.17	6.4	0.22	1.1
<i>Ramaria</i>	3.10	7.8	0.04	0.1	0.03	0.2	1.89	9.8
<i>Russula</i>	<b>5.39</b>	13.6	<b>5.43</b>	10.2	<b>4.41</b>	24.2	<b>1.90</b>	9.8
<i>Suillus</i>	0.00	0.0	0.15	0.3	0.00	0.0	0.00	0.0
Total	39.67		53.03		18.20		19.35	

Table 5. Number and discovery status of red squirrel middens on each of the monitored areas, 1999-2000.

		Midden Status				
Year	Area	Old	Newly Found	Newly Established	Re-Occupied <sup>2</sup>	Total
1999	TRC	34	0	7	1	42
	TRN	38	0	4	0	42
	SFC	106	0	1	0	107
	SFN	96	0	1	0	97
	Total	274	0	13	1	288
2000	TRC	40 <sup>1</sup>	0	0	1	41
	TRN	43 <sup>1</sup>	0	0	0	43
	SFC	83 <sup>1</sup>	0	0	1	84
	SFN	75 <sup>1</sup>	0	0	0	75
	Total	241 <sup>1</sup>	0	0	2	243

- 1 The difference in the number of middens from the end of 1999 to the beginning of 2000 reflects middens removed from regular censusing in December 2000 due to low occupancy and new middens found during the March 2000 census.
- 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 squirrels<sup>1</sup> found on each of the monitored areas, 1999-2000.

	Area		<u>Jun 1999</u>				<u>Dec 1999</u>			
			<u>Middens</u>		<u>Squirrels<sup>1</sup></u>		<u>Middens</u>		<u>Squirrels<sup>1</sup></u>	
	<u>ha</u>	<u>%<sup>2</sup></u>	<u>N</u>	<u>%<sup>2</sup></u>	<u>N</u>	<u>%<sup>2</sup></u>	<u>N</u>	<u>%<sup>2</sup></u>	<u>N</u>	<u>%<sup>2</sup></u>
TRC	49.1	18	34	12	26	21	42	14	35	34
TRN	24.4	9	39	14	28	23	42	15	28	27
SFC	76.1	27	106	39	42	34	107	37	21	21
SFN	128.9	46	96	35	27	22	97	34	18	18
Total	278.5		275		123		288		102	

	Area <sup>4</sup>		<u>Jun 2000</u>				<u>Dec 2000</u>			
			<u>Middens</u>		<u>Squirrels<sup>1</sup></u>		<u>Middens</u>		<u>Squirrels<sup>1</sup></u>	
	<u>ha</u>	<u>%<sup>2</sup></u>	<u>N</u>	<u>%<sup>2</sup></u>	<u>N</u>	<u>%<sup>2</sup></u>	<u>N</u>	<u>%<sup>2</sup></u>	<u>N</u>	<u>%<sup>2</sup></u>
TRC	51.1	20	40	17	31	38	41	17	21	32
TRN	21.0	8	43	18	29	36	43	18	21	32
SFC	76.0	30	83	34	12	15	84	35	12	18
SFN	104.4	41	75	31	9	11	75	31	11	17
Total	252.5		241 <sup>3</sup>		81		243		65	

- 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 1999 to June 2000 reflects middens removed from regular censusing due to low occupancy after December 1999 and new middens found during 2000 censuses.
- 4 The new area sizes for 2000 are the result of more accurate GPS mapping of features on the monitored areas.



Table 7. Number and percent of available middens occupied, 2000.

Area/Habitat	<u>June</u>			<u>December</u>		
	# middens	# occupied	%	# middens	# occupied	%
TRC	40	31	78	41	21	51
TRN	43	29	67	43	21	49
SFC	83	12	14	84	12	14
SFN	75	9	12	75	11	15
TR Habitat	83	60	72	84	42	50
SF Habitat	158	21	13	159	23	14
TR + SF	241	81	34	243	65	27

**Chi Square:****JUNE**

within TR	$X^2=1.047$	df=1	$P=0.306$
within SF	$X^2=0.207$	df=1	$P=0.650$
between habitats	$X^2=84.883$	df=1	$P<0.0001$

**DECEMBER**

within TR	$X^2=0.048$	df=1	$P=0.827$
within SF	$X^2=0.005$	df=1	$P=0.946$
between habitats	$X^2=35.420$	df=1	$P<0.0001$

Table 8. Mean distance from construction to occupied and unoccupied middens on the TRC and SFC areas, June and December 2000.

Area	Midden Status	N	<u>June</u>	<u>December</u>	
			$\bar{x} \pm se$ (m)	N	$\bar{x} \pm se$ (m)
TRC	Occupied	31	212.3 $\pm$ 11.20	21	199.0 $\pm$ 14.74
	Unoccupied	9	216.0 $\pm$ 14.07	20	229.4 $\pm$ 9.02
SFC	Occupied	12	143.8 $\pm$ 19.27	12	159.3 $\pm$ 21.02
	Unoccupied	71	150.1 $\pm$ 9.55	72	149.0 $\pm$ 9.44

**ANOVA:**

**JUNE**

TRC                      F = 0.03      df = 1      P = 0.869

SFC                      F = 0.07      df = 1      P = 0.767

**DECEMBER**

TRC                      F = 3.01      df = 1      P = 0.091

SFC                      F = 0.17      df = 1      P = 0.677

Table 9. Overwinter survival of red squirrels on the monitored areas, 1999-2000.

Area/Habitat	Number of Squirrels	Number of Squirrels Surviving	% survival
	Dec 1999	Jun 2000	
TRC	35	26	74
TRN	28	23	82
SFC	21	7	33
SFN	18	9	50
TR Habitat	63	49	78
SF Habitat	39	16	41

Chi-square tests:

within TR       $X^2 = 0.194$        $df = 1$        $P = 0.660$

within SF       $X^2 = 0.531$        $df = 1$        $P = 0.466$

between habitats       $X^2 = 12.530$        $df = 1$        **$P < 0.001$**

Table 10. Mean Local Density of middens and red squirrels (occupied middens) on the monitored areas, 1999 and 2000.

Area/Habitat	December 1999				December 2000			
	Middens		Squirrels		Middens		Squirrels	
	N	$\bar{x} \pm se$	N	$\bar{x} \pm se$	N	$\bar{x} \pm se$	N	$\bar{x} \pm se$
TRC	42	5.9 ± 0.37 <sup>a</sup>	35	5.0 ± 0.41 <sup>a</sup>	41	5.9 ± 0.37 <sup>b</sup>	21	2.8 ± 0.22 <sup>a</sup>
TRN	42	6.6 ± 0.28 <sup>a</sup>	28	4.3 ± 0.28 <sup>a</sup>	43	6.7 ± 0.27 <sup>a</sup>	21	3.4 ± 0.25 <sup>a</sup>
SFC	107	6.1 ± 0.25 <sup>a</sup>	21	1.5 ± 0.25 <sup>b</sup>	84	4.9 ± 0.22 <sup>c</sup>	12	0.7 ± 0.19 <sup>b</sup>
SFN	97	3.2 ± 0.17 <sup>b</sup>	18	0.8 ± 0.17 <sup>b</sup>	75	2.2 ± 0.15 <sup>d</sup>	11	0.2 ± 0.12 <sup>b</sup>
TR Habitat	84	6.3 ± 0.23	63	4.7 ± 0.26	84	6.3 ± 0.23	42	3.1 ± 0.17
SF Habitat	204	4.7 ± 0.18	39	1.2 ± 0.16	159	3.6 ± 0.17	23	0.4 ± 0.12
TOTAL <sup>1</sup>	288	5.2 ± 0.15	102	3.3 ± 0.24	243	4.6 ± 0.16	65	2.2 ± 0.20

**ANOVA:**

**LD of Middens**

among all areas

	1999			2000		
	F=39.20	df=3	<i>P=0.0001</i>	F=68.48	df=3	<i>P&lt; 0.0001</i>

**LD of Squirrels**

among all areas

	F=35.31	df=3	<i>P=0.0001</i>	F=42.46	df=3	<i>P&lt; 0.0001</i>
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a,b,c 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, 1999 and 2000.

Area/Habitat	December 1999				December 2000			
	Middens		Squirrels		Middens		Squirrels	
	N	$\bar{x} \pm se$	N	$\bar{x} \pm se$	N	$\bar{x} \pm se$	N	$\bar{x} \pm se$
TRC	42	41.0 ± 2.51 <sup>a</sup>	35	45.4 ± 2.95 <sup>a</sup>	41	41.9 ± 2.32 <sup>b</sup>	21	58.1 ± 4.81 <sup>c</sup>
TRN	42	39.8 ± 1.93 <sup>a,b</sup>	28	48.7 ± 2.80 <sup>a</sup>	43	40.4 ± 1.95 <sup>b</sup>	21	57.6 ± 3.11 <sup>c</sup>
SFC	107	44.2 ± 1.41 <sup>b</sup>	21	86.2 ± 8.59 <sup>b</sup>	84	48.9 ± 2.32 <sup>a,b</sup>	12	108.7 ± 16.88 <sup>b</sup>
SFN	97	50.1 ± 2.08 <sup>b</sup>	18	104.6 ± 11.11 <sup>b</sup>	75	56.8 ± 2.71 <sup>a</sup>	11	168.0 ± 23.15 <sup>a</sup>
TR Habitat	84	40.4 ± 1.58	63	46.9 ± 2.05	84	41.1 ± 1.50	42	57.9 ± 2.83
SF Habitat	204	47.0 ± 1.25	39	94.7 ± 6.97	159	52.6 ± 1.79	23	137.1 ± 15.19
TOTAL <sup>1</sup>	288	45.1 ± 1.01	102	65.2 ± 3.73	243	48.6 ± 1.33	65	85.9 ± 7.33

ANOVA:	1999			2000		
<b>NND of Middens</b>						
among all areas	F=5.19	df=3	<i>P=0.0017</i>	F=8.25	df=3	<i>P&lt; 0.0001</i>
<b>NND of Squirrels</b>						
among all areas	F=22.47	df=3	<i>P=0.0001</i>	F=20.89	df=3	<i>P&lt; 0.0001</i>

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

1 Includes only middens on the monitored areas.

Figure 2a. Corkbark fir seed fall, 1993-1999. Note: scales are different for figures 2a-c.

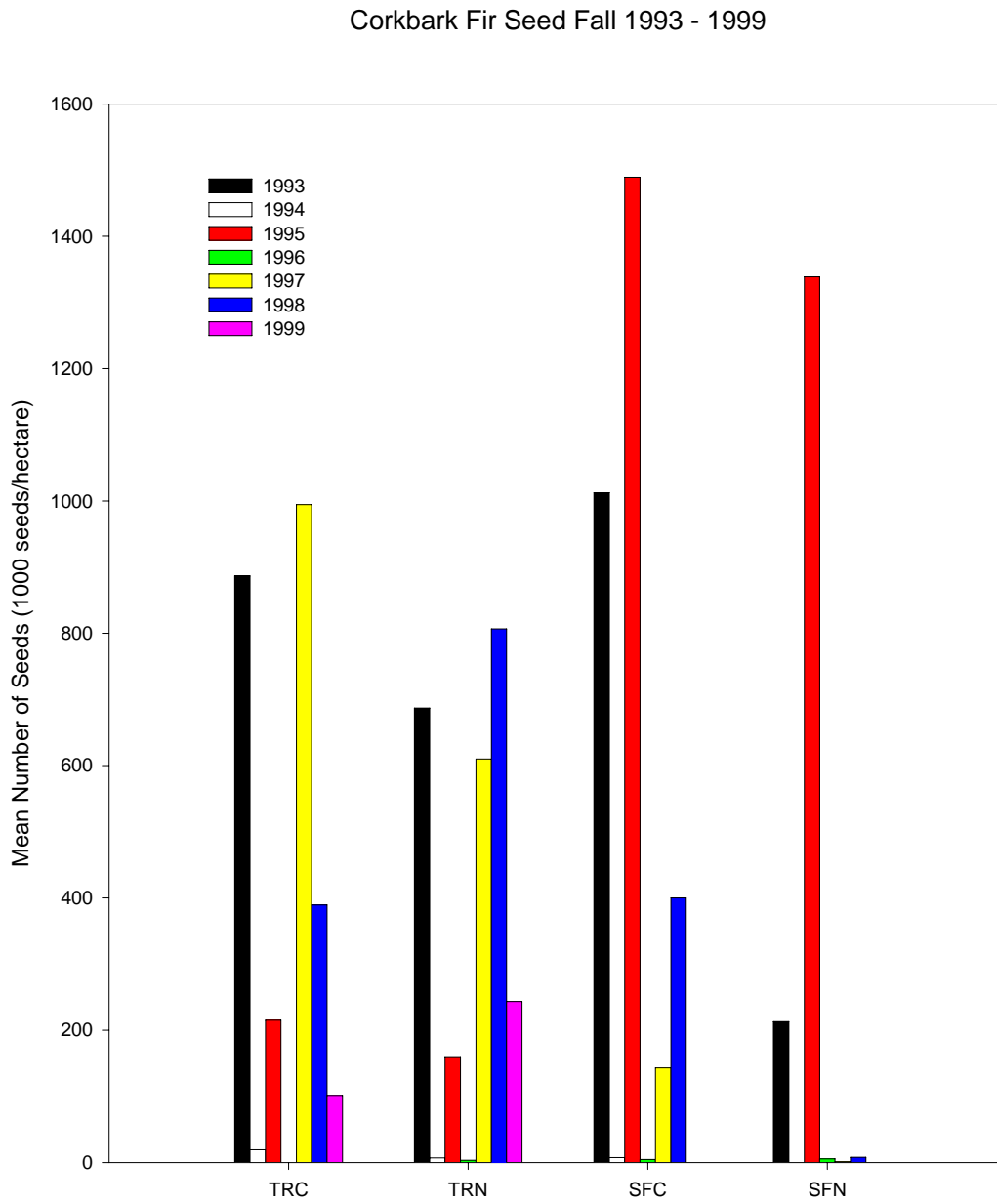


Figure 2b. Douglas-fir seed fall, 1993-1999. Note: scales are different for figures 2a-c.

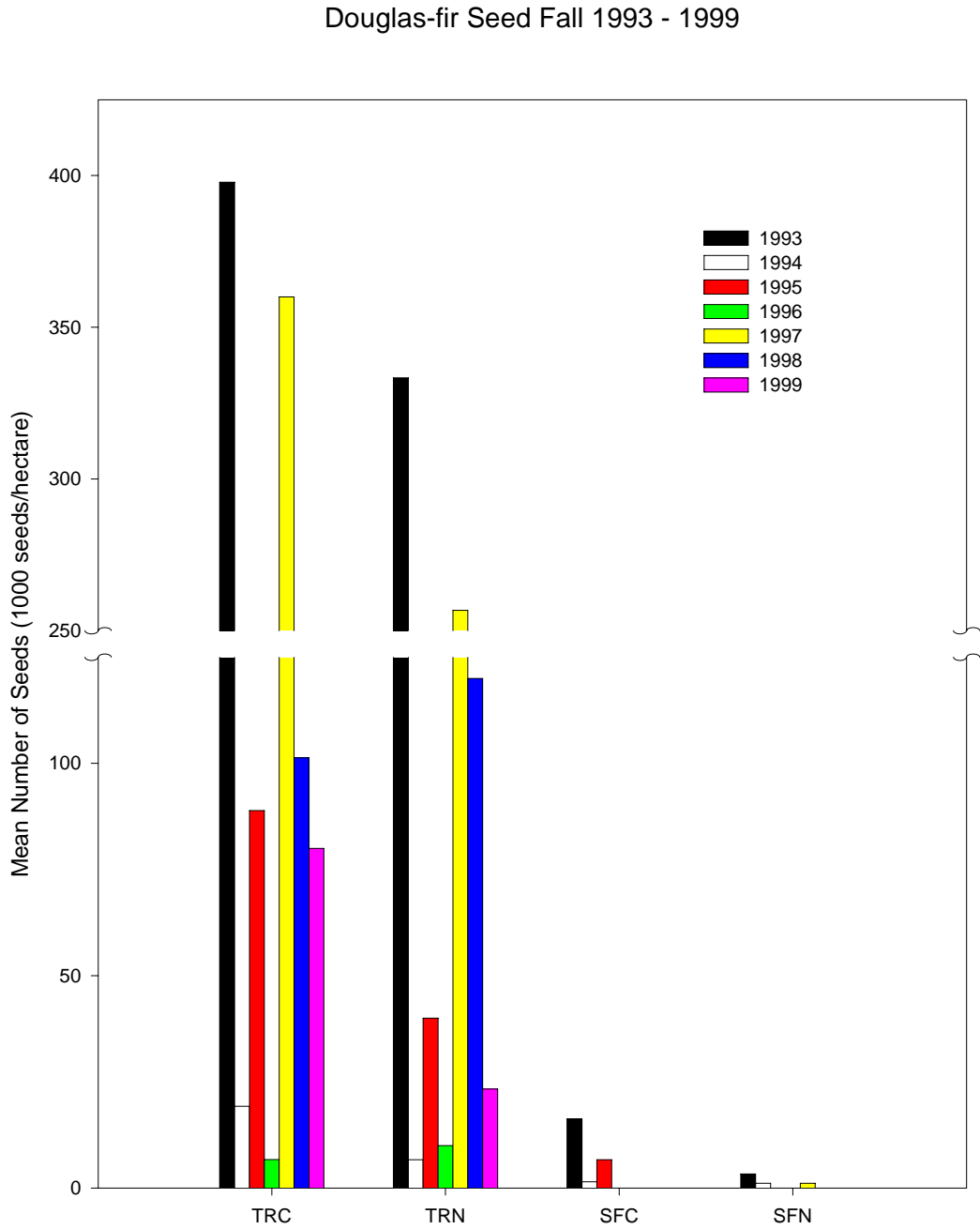


Figure 2c. Engelmann seed fall, 1993-1999. Note: scales are different for figures 2a-c.

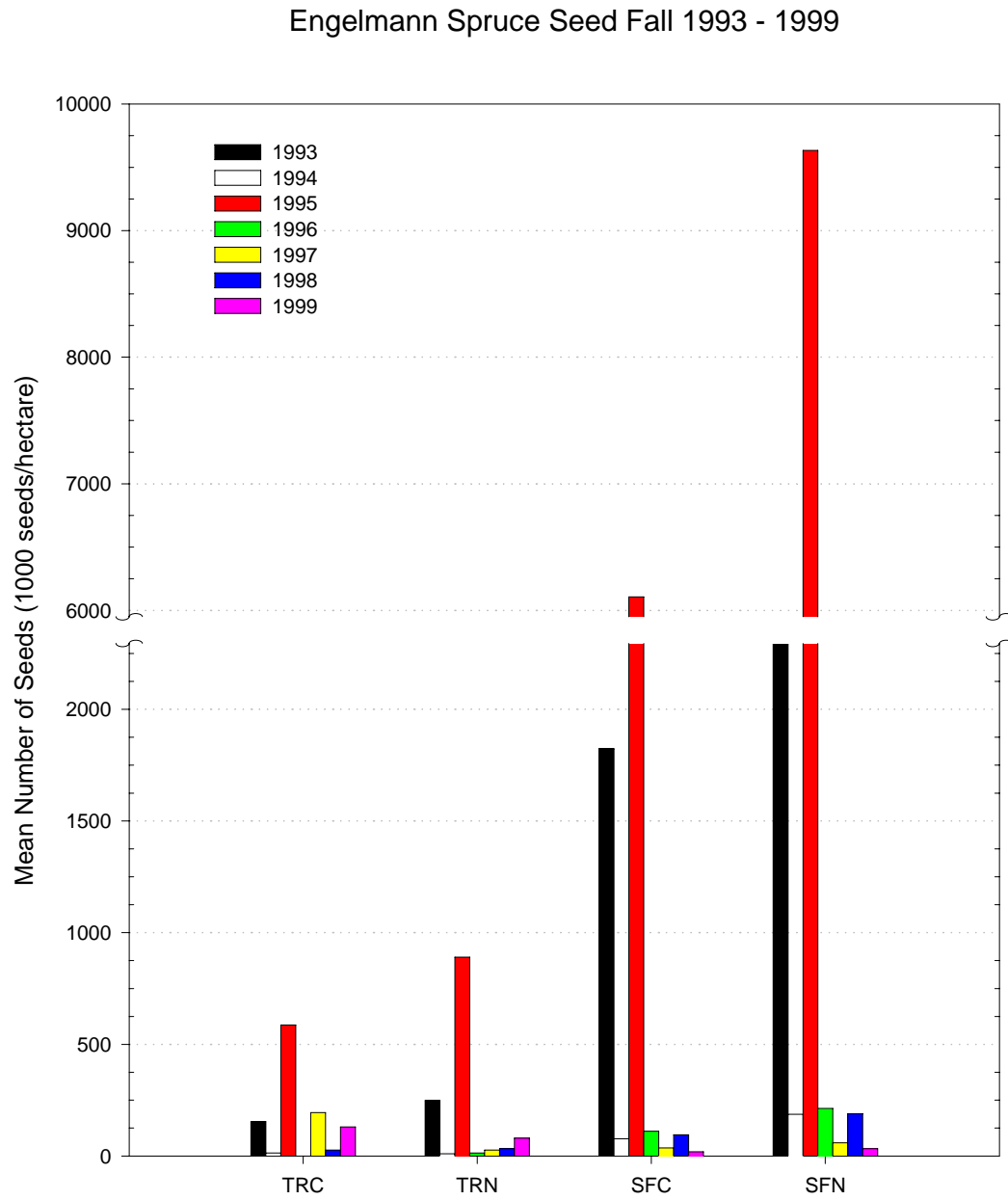




Figure 3. Mushroom crops, 1994-2000.

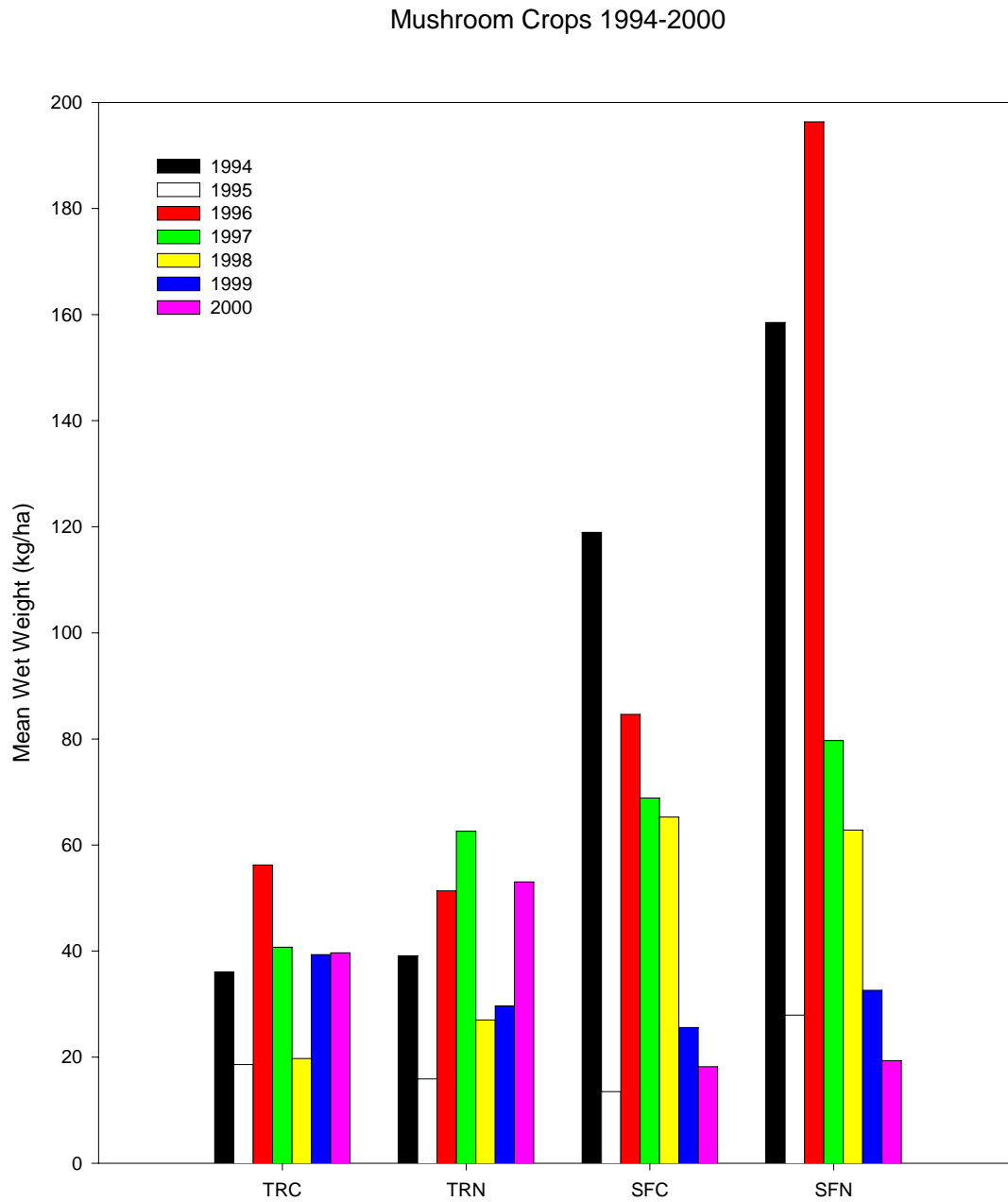


Figure 4. Red squirrel populations (including juveniles) on the monitored areas, December 1999 - December 2000.

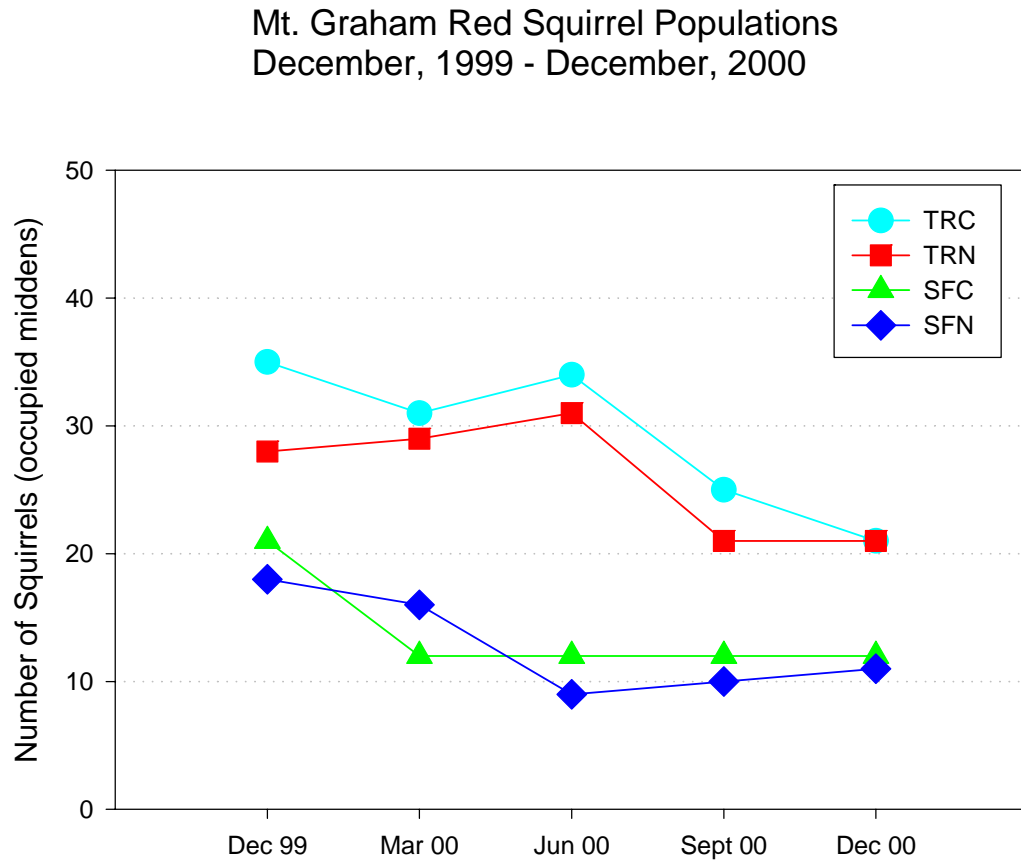


Figure 5. Crude density of middens and squirrels, 1999-2000.

### Crude Density of Middens and Squirrels 1999 - 2000

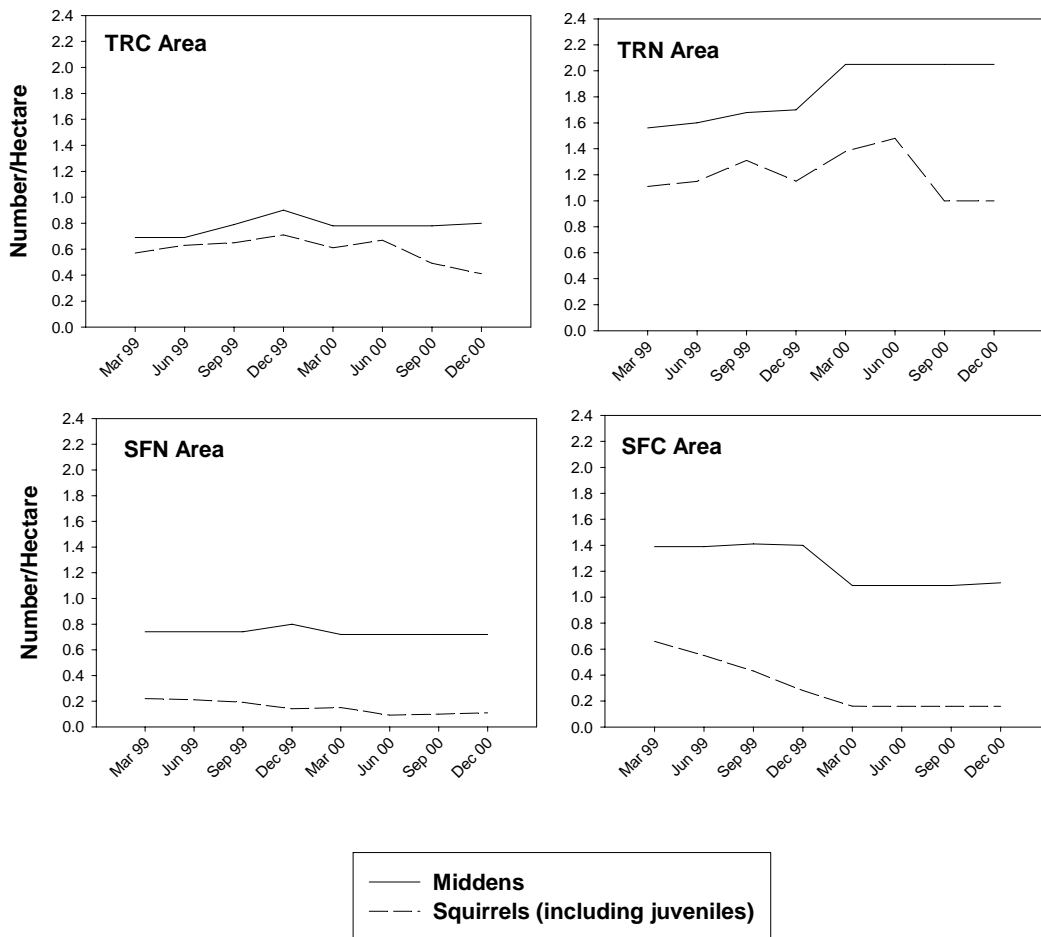


Figure 6. Local density of middens and squirrels, 1999-2000.

### Local Density of Middens and Squirrels 1999 - 2000

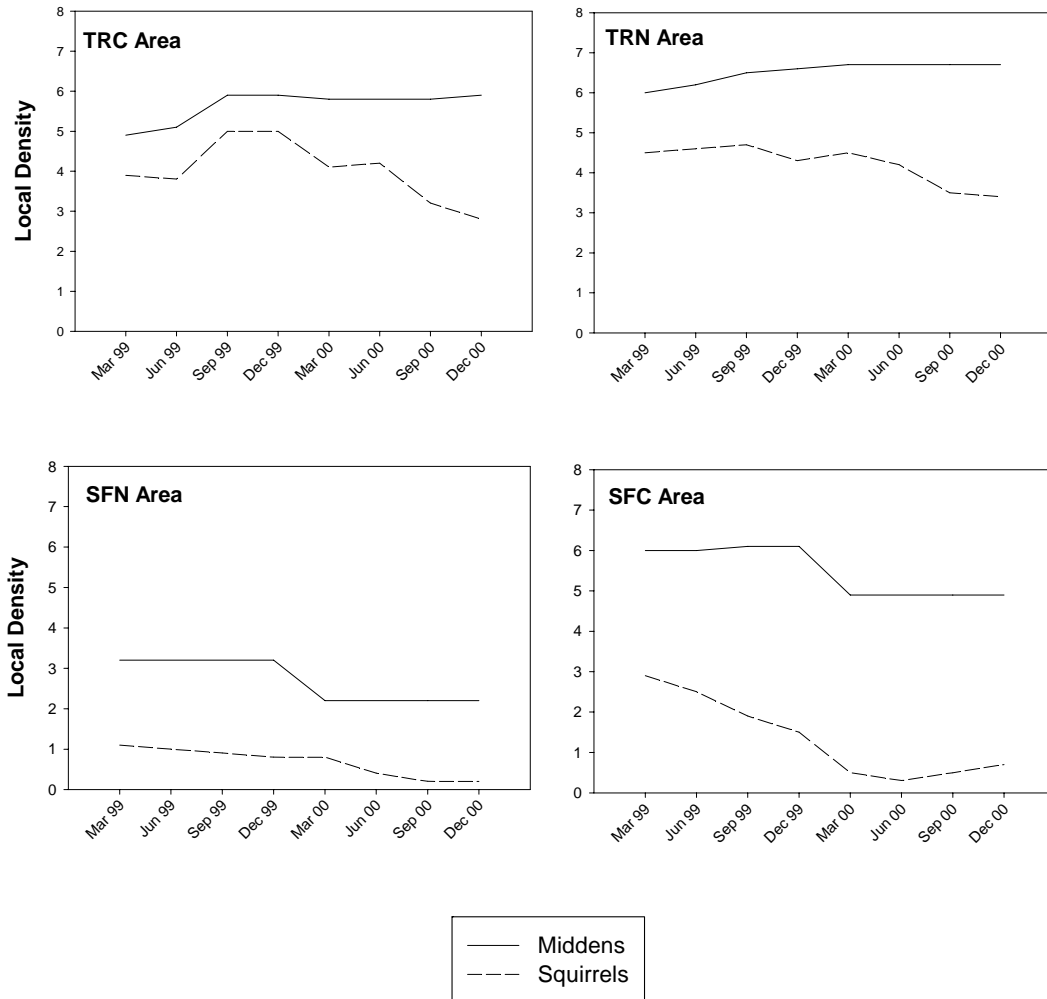


Figure 7. Nearest neighbor distance of middens and squirrels, 1999-2000.

## Nearest Neighbor Distance - Middens and Squirrels 1999 - 2000

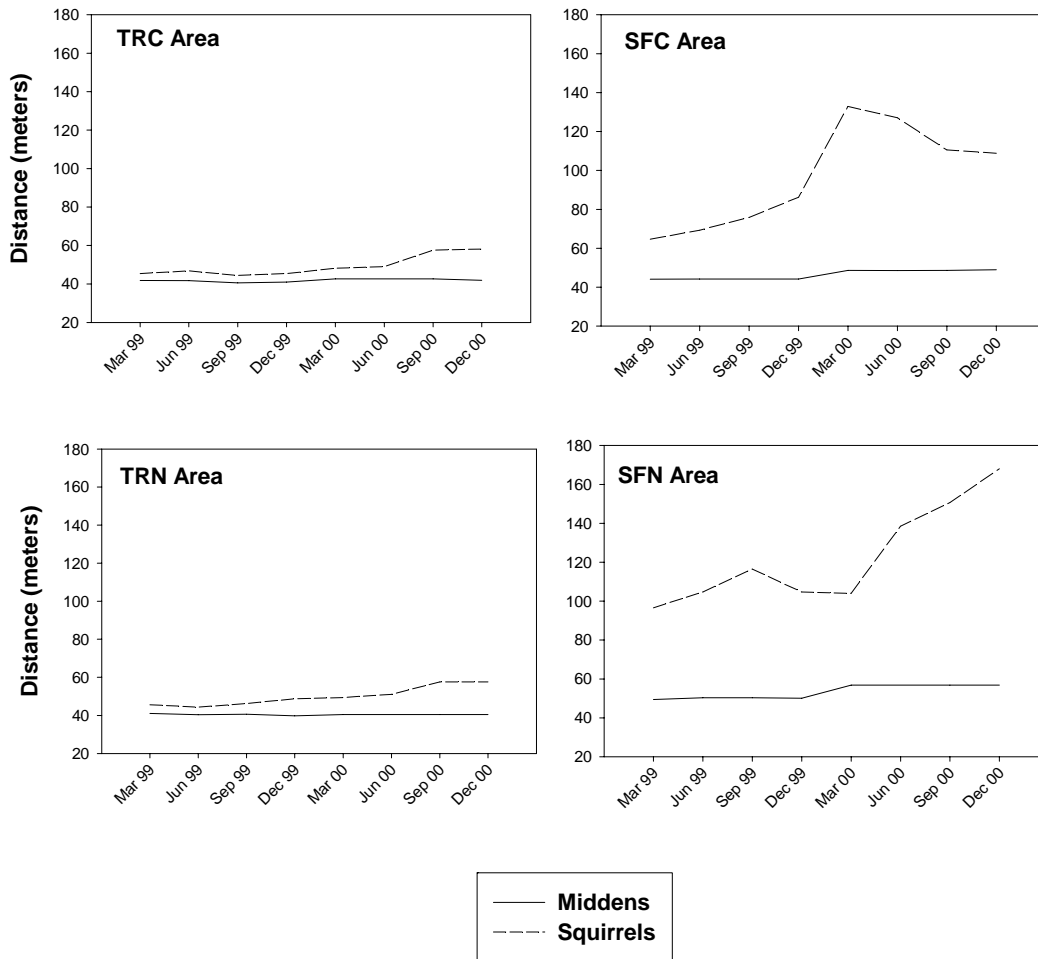


Figure 8. Monthly temperatures on the monitored areas, 2000.

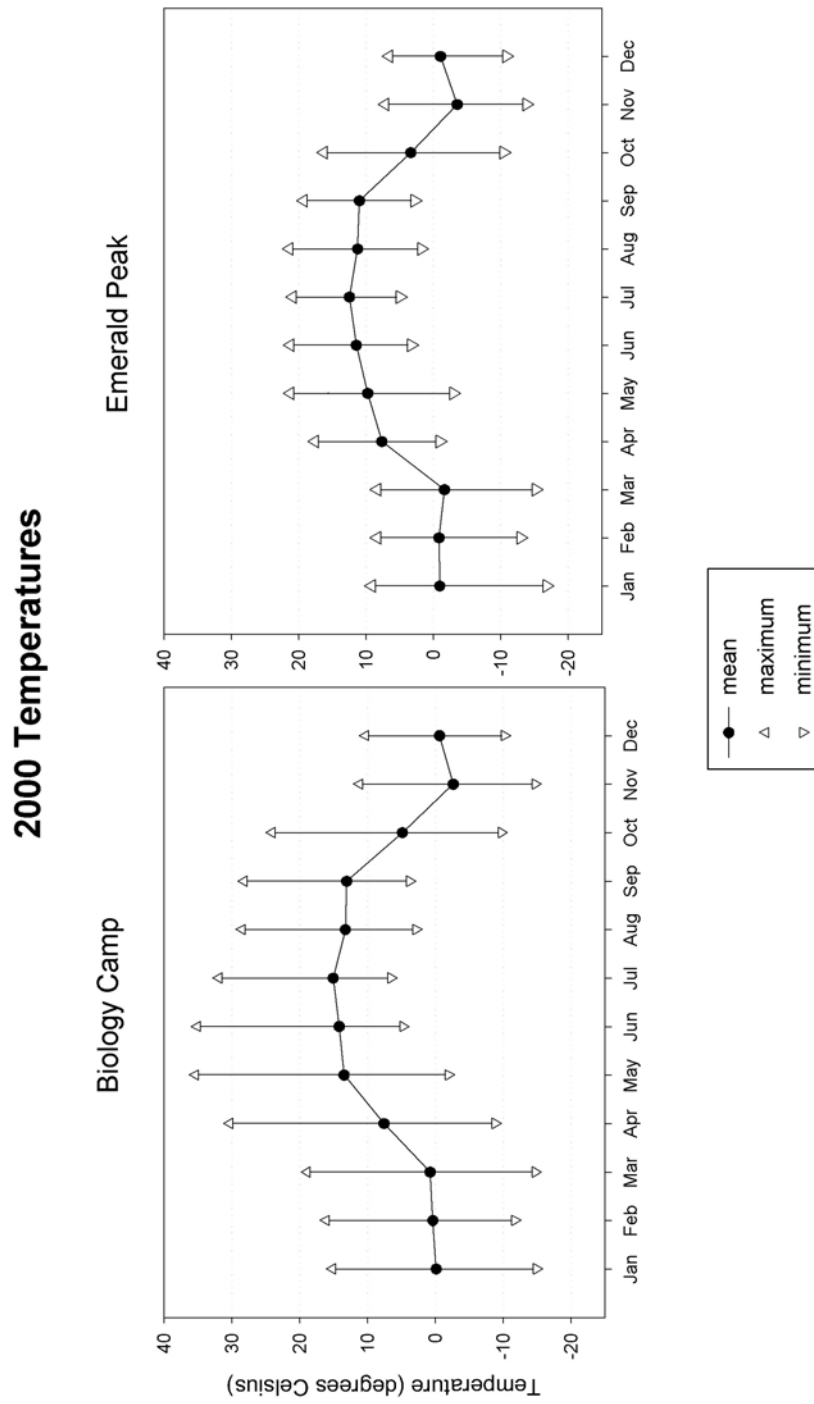


Figure 9. Total monthly precipitation as rain, 2000.

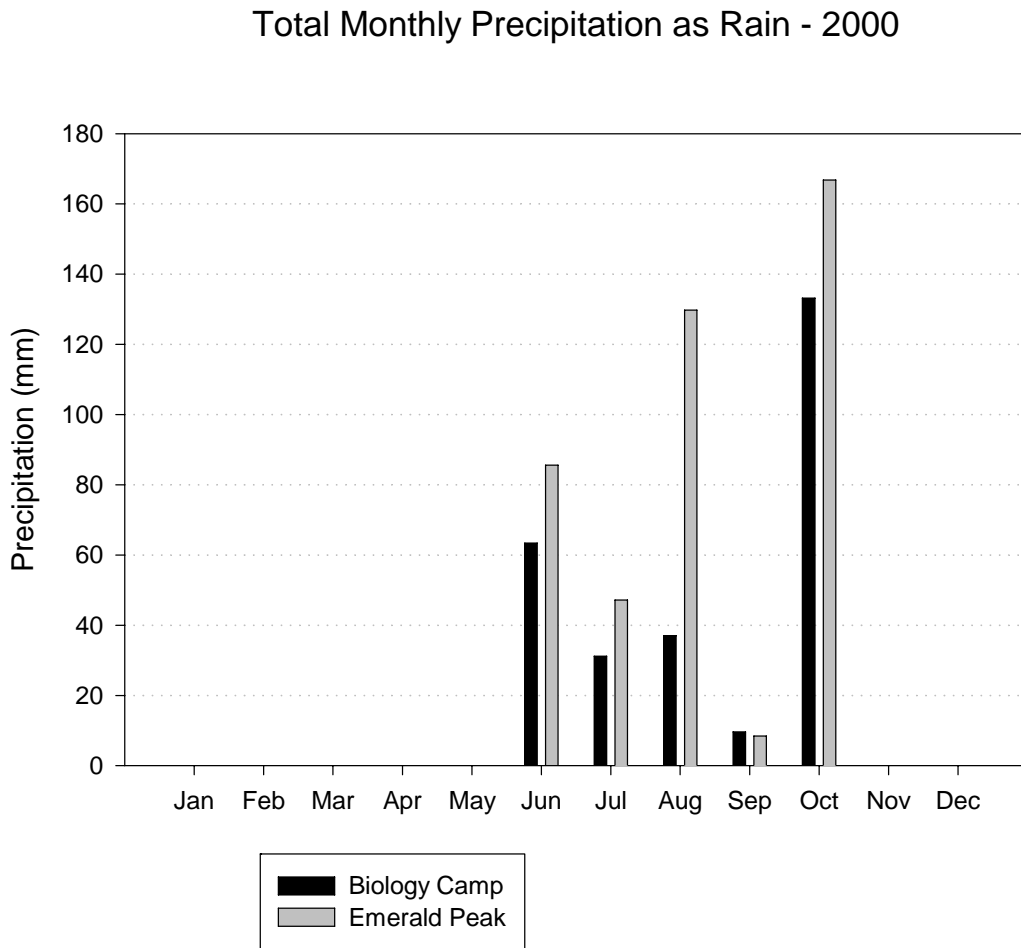
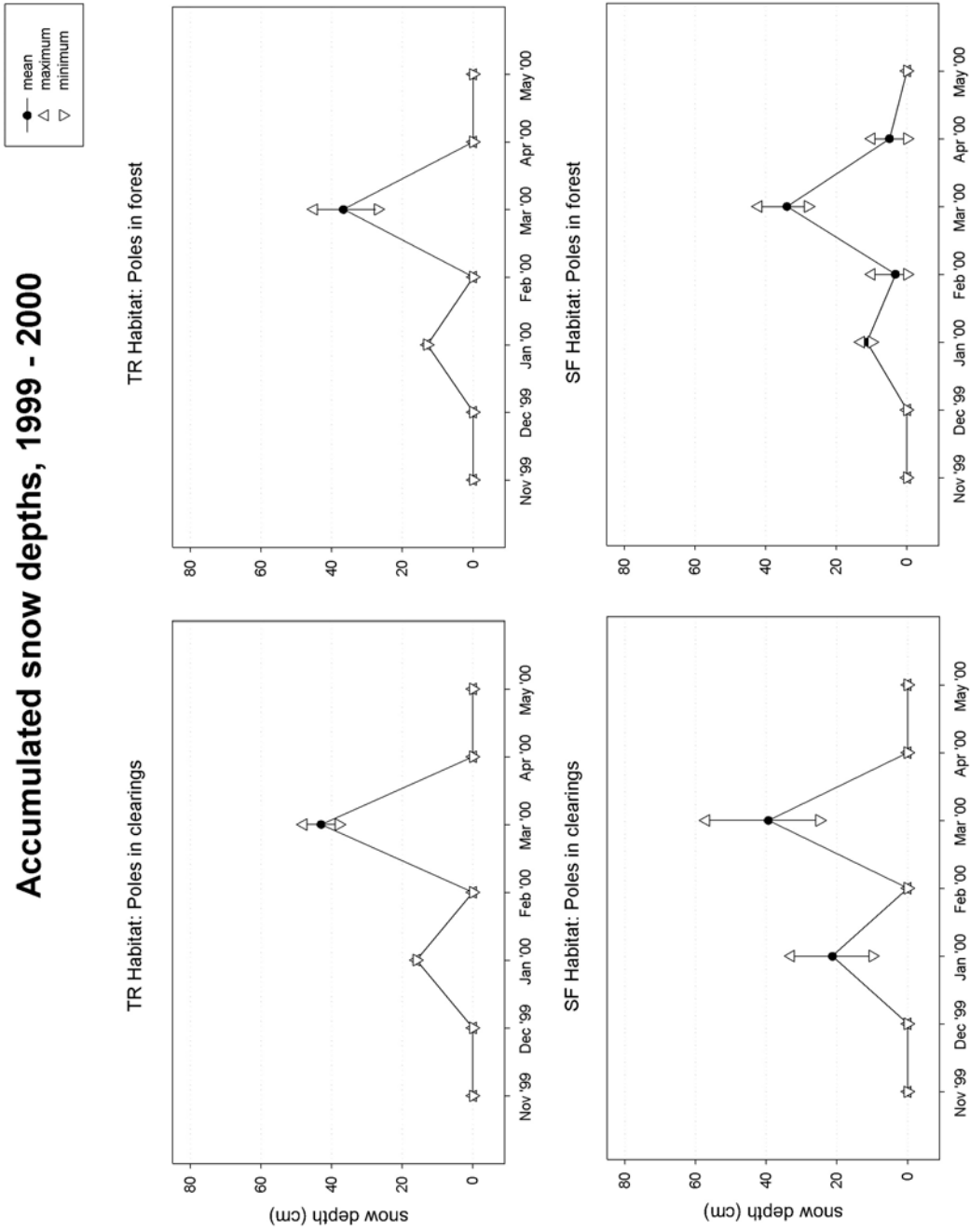


Figure 10. Accumulated snow depths, 1999-2000.





Appendix A. Mean numbers and weights for 1999 seeds and 1999 mushrooms.

A-1: By transect

A-2: By area and habitat

Appendix A-1: Mean number of seeds and weights, for 1999 seeds and 1999 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	306.8	26.8	0.0	333.6	35.2	4.0
	4				burned		
	5	186.8	13.2	13.2	213.2	57.5	7.1
	6				burned		
	7				burned		
	8				burned		
	9				burned		
	10	13.2	26.8	13.2	53.2	42.5	4.4
	11	0.0	160.0	613.2	773.2	38.1	3.6
	12	0.0	173.2	13.2	186.4	23.3	2.4
TRN	1	320.0	26.8	13.2	360.0	24.1	2.7
	2	106.8	53.2	80.0	240.0	14.9	2.1
	3	293.2	0.0	40.0	333.2	49.8	8.7
	4	253.2	13.2	186.8	453.2	29.9	3.1
SFC	1	0.0	0.0	26.8	26.8	15.0	1.8
	2				burned		
	3	0.0	0.0	40.0	40.0	35.8	4.3
	4	0.0	0.0	13.2	13.2	37.0	4.1
	5	0.0	0.0	26.8	26.8	31.3	3.9
	6	0.0	0.0	0.0	0.0	29.8	3.7
	7				burned		
SFC	8				burned		

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
	9	burned					
	10	0.0	0.0	0.0	0.0	12.9	1.9
	11	0.0	0.0	26.8	26.8	17.4	2.1
SFN	1	0.0	0.0	13.2	13.2	6.8	0.9
	2	0.0	0.0	40.0	40.0	10.1	1.4
	3	0.0	0.0	0.0	0.0	19.6	2.7
	4	0.0	0.0	53.2	53.2	70.2	6.9
	5	0.0	0.0	80.0	80.0	28.9	3.2
	6	0.0	0.0	13.2	13.2	53.6	5.5
	7	0.0	0.0	13.2	13.2	8.4	1.0
	8	0.0	0.0	26.8	26.8	30.7	4.2
	9	0.0	0.0	13.2	13.2	29.6	3.8
	10	0.0	0.0	13.2	13.2	37.1	5.1
	11	0.0	0.0	93.2	93.2	26.7	3.6
	12	0.0	0.0	40.0	40.0	69.7	6.5

Appendix A-2: Mean number of seeds, and weights, for 1999 seeds and 1999 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	101.4	80.0	130.6	311.9	39.3	4.3
TRN $\bar{x}$	4	243.3	23.3	80.0	346.6	29.7	4.1
SFC $\bar{x}$	7	0.0	0.0	19.1	19.1	25.6	3.1
SFN $\bar{x}$	12	0.0	0.0	33.3	33.3	32.6	3.7
TR $\bar{x}$	9	164.4	54.8	108.1	327.3	35.0	4.2
SF $\bar{x}$	19	0.0	0.0	28.0	28.0	30.0	3.5

Appendix B. Midden occupancy records for the monitored areas, 2000.

B-1. Quarterly occupancy records

B-2. Activity area information

## Appendix B-1. Midden occupancy records for the monitored areas, 2000.

## KEY

For Midden Numbers:

###<sup>89\*</sup> Midden Number<sup>Year Found</sup> '\*' 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
A	Abert's Squirrel using area, no Red Squirrel present
XX	Remains of Red Squirrel found
*	Squirrel is tagged
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 (Arizona Game and Fish Study)



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

Transition Construction Area (TRC), 2000				
Midden	Mar	Jun	Sep	Dec
1101 <sup>89</sup>	located off-area, new number - 5101			
1102 <sup>89</sup>	♂	♂	♂	S
1103 <sup>89</sup>	♂	S	N	N
1104 <sup>89</sup>	♀	♀PL	S	S
1105 <sup>89</sup>	burned in Clark Peak fire			
1106 <sup>89</sup>	♀	♀	♀	Y
1107 <sup>89</sup>	burned in Clark Peak fire			
1108 <sup>89</sup>	removed from census - low occupancy <sup>1</sup>			
1109 <sup>89</sup>	burned in Clark Peak fire			
1110 <sup>89*</sup>	burned in Clark Peak fire			
1111 <sup>89</sup>	removed from census - low occ. <sup>1</sup>			♀ <sup>6</sup>
1112 <sup>89*</sup>	♀	♀	♀PL	♀
1113 <sup>89</sup>	S	♂	♂	♂
1114 <sup>89</sup>	located off-area, new number - 5114			
1115 <sup>89</sup>	P	Y	N	N
1116 <sup>89*</sup>	♂	♂	♂	S
1117 <sup>89</sup>	burned in Clark Peak fire			
1118 <sup>89</sup>	♂	♂	♂	♂
1119 <sup>88</sup>	burned in Clark Peak fire			
1120 <sup>89</sup>	burned in Clark Peak fire			
1121 <sup>89*</sup>	♂	♀L+ 2J	S	N
1122 <sup>89</sup>	burned in Clark Peak fire			
1123 <sup>95*</sup>	burned in Clark Peak fire			
1124 <sup>95*</sup>	burned in Clark Peak fire			
1125 <sup>95*</sup>	burned in Clark Peak fire			
1126 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
1130 <sup>90</sup>	burned in Clark Peak fire			
1131 <sup>90*</sup>	♀	S	♂	S
1132 <sup>90*</sup>	removed from census - low occupancy <sup>1</sup>			
1134 <sup>91*</sup>	removed from census - low occupancy <sup>1</sup>			
1135 <sup>91*</sup>	burned in Clark Peak fire			
1136 <sup>91*</sup>	burned in Clark Peak fire			
1137 <sup>91*</sup>	burned in Clark Peak fire			

Transition Construction Area (TRC), 2000				
Midden	Mar	Jun	Sep	Dec
1138 <sup>91*</sup>	removed from census - low occupancy <sup>1</sup>			
1139 <sup>91*</sup>	burned in Clark Peak fire			
1140 <sup>91*</sup>	burned in Clark Peak fire			
1142 <sup>91*</sup>	burned in Clark Peak fire			
1143 <sup>91*</sup>	burned in Clark Peak fire			
1144 <sup>91*</sup>	♀	S	♀	S
1145 <sup>91*</sup>	located off-area, new number - 5145			
1146 <sup>91*</sup>	removed from census - low occupancy <sup>1</sup>			
1147 <sup>91*</sup>	♂	♂	♂ <sup>NAT 4</sup>	♂
1148 <sup>91*</sup>	burned in Clark Peak fire			
1149 <sup>91*</sup>	♀	S	♀	S
1150 <sup>91*</sup>	located off-area, new number - 5150			
1151 <sup>91*</sup>	♀	♀	N	N
1152 <sup>91*</sup>	burned in Clark Peak fire			
1153 <sup>92*</sup>	N	N	♀	P
1154 <sup>92*</sup>	♂	♂	♂	S
1155 <sup>93*</sup>	located off-area, new number - 5155			
1156 <sup>93*</sup>	P	N	N	N
1157 <sup>93*</sup>	located off-area, new number - 5157			
1159 <sup>93*</sup>	burned in Clark Peak fire			
1160 <sup>96*</sup>	S	♀	♀PL	S
1161 <sup>96*</sup>	N	N	N	N
1162 <sup>96*</sup>	♂	Y	♀ <sup>NAT 5</sup>	Y
1163 <sup>98*</sup>	♀	♀PL+1J	♀	♀
1164 <sup>98*</sup>	N	N	N	N
1165 <sup>98*</sup>	N	N	N	N
1166 <sup>98*</sup>	S	♀	N	N
1167 <sup>98*</sup>	S	♀PL	♀PL	S
1168 <sup>98*</sup>	♂	♂	♂	♂
1169 <sup>98*</sup>	♂ <sup>NAT 2</sup>	Y	N	N

Transition Construction Area (TRC), 2000				
Midden	Mar	Jun	Sep	Dec
1170 <sup>98*</sup>	♂	♂	♂	S
1171 <sup>98*</sup>	N	N	N	N
1172 <sup>90*</sup>	N	N	N	N
1173 <sup>99*</sup>	♀	Y	N	N
1174 <sup>99*</sup>	N	N	N	N
1175 <sup>99*</sup>	♀	S	♀	N
1176 <sup>99*</sup>	♂	N	♀	N
1177 <sup>99*</sup>	♂	♂	♂	N
1178 <sup>99*</sup>	♂ <sup>NAT 3</sup>	S	N	N
1179 <sup>99*</sup>	♀	♀	♂	S
1180	♀	S	♂	S
1181	♀	S	P	N
# Mid	40	40	40	41
# Occ	31	31	25	21
% Occ	78	78	63	51
# Sq	31	31+3J	25	21

- 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 Male at 1169 has a natural mark - rip in right ear.
- 3 Male at 1178 has a natural mark - short tail.
- 4 Male at 1147 has a natural mark - triangular notch back of right ear.
- 5 Female at 1162 has a natural mark - a black spot or pitch mark on right shoulder.
- 6 Midden 1111 appears to have been re-occupied: fresh feeding sign and squirrel seen in midden several times.



Transition Non-Construction Area (TRN), 2000				
Midden	Mar	Jun	Sep	Dec
2201 <sup>89</sup>	N	N	N	N
2202 <sup>89</sup>	N	N	♂	S
2203 <sup>89</sup>	♂	♂	♂	Y
2204 <sup>89</sup>	N	N	P	N
2205 <sup>89</sup>	♂	S	♂	S
2206 <sup>89</sup>	S	♂	♂	S
2207 <sup>89*</sup>	N	P	N	N
2208 <sup>89*</sup>	♂ <sup>NAT 2</sup>	♂ <sup>NAT 2</sup>	♂ <sup>NAT 2</sup>	S
2209 <sup>89</sup>	N	N	N	N
2210 <sup>90</sup>	S	♂	♂	Y
2211 <sup>90*</sup>	♂	S	♂	S
2212 <sup>90</sup>	♂	S	N	N
2213 <sup>90</sup>	removed from census - low occupancy <sup>1</sup>			
2214 <sup>90*</sup>	located on TRC, new number - 1172			
2215 <sup>90*</sup>	♂ <sup>NAT 3</sup>	♂	♂	S
2216 <sup>90*</sup>	S	S	N	N
2217 <sup>90*</sup>	♀	S	N	N
2218 <sup>91*</sup>	♂	♀PL	N	N
2219 <sup>91*</sup>	S	Y	N	N
2220 <sup>91*</sup>	♂	S	N	N
2221 <sup>91*</sup>	located off-area, new number - 5221			
2222 <sup>91*</sup>	removed from census - low occupancy <sup>1</sup>			
2223 <sup>91*</sup>	♀	♀L	♂	♂
2224 <sup>93*</sup>	removed from census - low occupancy <sup>1</sup>			
2225 <sup>94*</sup>	N	N	N	N
2226 <sup>95*</sup>	S	N	N	N
2227 <sup>95*</sup>	S	S	♂	S
2228 <sup>95*</sup>	N	N	N	N
2229 <sup>96*</sup>	♀	♂	♂	S
2230 <sup>96*</sup>	N	N	P	N
2231 <sup>96*</sup>	located off-area, new number - 5231			

Transition Non-Construction Area (TRN), 2000				
Midden	Mar	Jun	Sep	Dec
2232 <sup>96*</sup>	located off-area, new number - 5232			
2233 <sup>96*</sup>	removed from census - low occupancy <sup>1</sup>			
2234 <sup>97*</sup>	♀	♀L	♀PL	Y
2235 <sup>98*</sup>	♂	♂	♂	♂
2236 <sup>98*</sup>	♂	♂	♂	♂
2237 <sup>98*</sup>	N	♀L+2J	N	N
2238 <sup>98*</sup>	N	N	N	N
2239 <sup>98*</sup>	N	N	N	N
2240 <sup>98*</sup>	N	N	N	N
2241 <sup>98*</sup>	S	S	♂	S
2242 <sup>98*</sup>	S	♂	♂	S
2243 <sup>98*</sup>	N	N	N	N
2244 <sup>99*</sup>	S	S	♀	S
2245 <sup>99*</sup>	N	N	N	N
2246 <sup>99*</sup>	♀	♀L	♀	♀PL
2247 <sup>99*</sup>	♂	Y	N	N
2248 <sup>99*</sup>	S	♂	S	Y
2249 <sup>99*</sup>	S	S	♂	S
2250 <sup>00*</sup>	S	S	♀	♀
2251 <sup>00*</sup>	♂	♂	N	P
# Mid	43	43	43	43
# Occ	29	29	21	21
% Occ	67	67	49	49
# Sq	29	29+2J	21	21

## Appendix B-1 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 Male at 2208 has a natural mark - large triangle shaped notch in left ear.
- 3 Male at 2215 has a natural mark - notch on top of left ear.

Spruce-Fir Construction Area (SFC), 2000				
Midden	Mar	Jun	Sep	Dec
3000 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
3001 <sup>95*</sup>	N	N	N	N
3002 <sup>95*</sup>	N	N	N	N
3003 <sup>95*</sup>	N	N	N	N
3004 <sup>95*</sup>	burned in Clark Peak fire			
3005 <sup>95*</sup>	N	N	N	N
3006 <sup>95*</sup>	N	N	N	N
3007 <sup>95*</sup>	removed from census - too far off area, new # 5307			
3008 <sup>95*</sup>	removed from census - low occ. <sup>1</sup>			S <sup>5</sup>
3009 <sup>95*</sup>	N	N	N	N
3010 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
3011 <sup>95*</sup>	located off-area, new number - 5311			
3012 <sup>95*</sup>	burned in Clark Peak fire			
3013 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
3014 <sup>95*</sup>	N	N	N	N
3015 <sup>95*</sup>	burned in Clark Peak fire			
3016 <sup>95*</sup>	burned in Clark Peak fire			
3017 <sup>95*</sup>	burned in Clark Peak fire			
3018 <sup>95*</sup>	burned in Clark Peak fire			
3019 <sup>96*</sup>	removed from census - low occupancy <sup>1</sup>			
3020 <sup>96*</sup>	N	N	N	N
3021 <sup>96*</sup>	burned in Clark Peak fire			
3022 <sup>96*</sup>	N	N	N	N
3023 <sup>98*</sup>	N	N	N	N
3024 <sup>98*</sup>	N	N	N	N
3025 <sup>98*</sup>	♂	♂ <sup>NAT 3</sup>	N	N
3026 <sup>98*</sup>	N	N	N	N
3027 <sup>99*</sup>	N	N	N	N
3028 <sup>99*</sup>	P	N	N	N
3029 <sup>99*</sup>	N	N	N	N
3030 <sup>99*</sup>	N	N	N	N
3031 <sup>99*</sup>	N	N	N	N
3032 <sup>99*</sup>	N	N	N	N

Spruce-Fir Construction Area (SFC), 2000				
Midden	Mar	Jun	Sep	Dec
3300 <sup>86</sup>	N	N	N	N
3301 <sup>94*</sup>	removed from census - low occupancy <sup>1</sup>			
3302 <sup>94*</sup>	located off-area, new number - 5302			
3303 <sup>94*</sup>	♀	Y	P	N
3304 <sup>94*</sup>	N	N	P	N
3305 <sup>94*</sup>	N	N	N	N
3306 <sup>94*</sup>	N	N	N	N
3307 <sup>94*</sup>	removed from census - low occupancy <sup>1</sup>			
3308 <sup>95*</sup>	N	N	N	N
3309 <sup>95*</sup>	N	N	N	N
3310 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
3311 <sup>95*</sup>	N	N	N	N
3312 <sup>95*</sup>	P	♂	Y	N
3313 <sup>95*</sup>	located off-area, new number - 5313			
3314 <sup>95*</sup>	N	N	N	N
3315 <sup>95*</sup>	N	N	N	N
3316 <sup>95*</sup>	N	N	N	N
3317 <sup>95*</sup>	N	N	N	N
3318 <sup>95*</sup>	N	N	N	N
3319 <sup>95*</sup>	S	P	N	N
3320 <sup>95*</sup>	N	N	N	N
3321 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
3322 <sup>95*</sup>	N	N	N	N
3323 <sup>95*</sup>	N	Y	N	N
3324 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
3325 <sup>95*</sup>	N	N	N	N
3326 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
3327 <sup>95*</sup>	N	N	N	N
3328 <sup>95*</sup>	N	N	N	N
3329 <sup>95*</sup>	N	N	N	N
3330 <sup>95*</sup>	N	N	N	N
3331 <sup>95*</sup>	N	N	N	N
3332 <sup>95*</sup>	N	N	N	N

Spruce-Fir Construction Area (SFC), 2000				
Midden	Mar	Jun	Sep	Dec
3333 <sup>95*</sup>	N	N	N	N
3334 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
3335 <sup>95*</sup>	N	N	N	N
3336 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
3337 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
3338 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
3339 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
3340 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
3341 <sup>95*</sup>	N	N	S	♀PL
3342 <sup>95*</sup>	N	N	P	N
3343 <sup>95*</sup>	N	N	N	N
3344 <sup>95*</sup>	N	N	N	N
3345 <sup>95*</sup>	removed from census - low occupancy			
3346 <sup>95*</sup>	removed from census - low occupancy			
3347 <sup>95*</sup>	removed from census - low occupancy			
3348 <sup>95*</sup>	removed from census - low occupancy			
3349 <sup>95*</sup>	removed from census - low occupancy			
3350 <sup>87</sup>	N	N	N	N
3351 <sup>87</sup>	N	N	N	N
3352 <sup>86</sup>	removed from census - low occupancy			
3353 <sup>87</sup>	N	N	N	N
3354 <sup>86</sup>	removed from census - low occupancy			
3355 <sup>95*</sup>	N	P	N	N
3356 <sup>86</sup>	P	♂	♂	N
3357 <sup>86</sup>	removed from census - low occupancy			
3358 <sup>87</sup>	burned in Clark Peak fire			
3359 <sup>87</sup>	burned in Clark Peak fire			
3360 <sup>86</sup>	Y	♂	S	Y
3361 <sup>86</sup>	N	N	N	N
3362 <sup>86</sup>	S	P	♂	Y
3363 <sup>86</sup>	N	N	♀	N
3364 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
3365 <sup>86</sup>	♂ <sup>2</sup>	S	♂	S

Spruce-Fir Construction Area (SFC), 2000				
Midden	Mar	Jun	Sep	Dec
3366 <sup>86</sup>	♂	Y	♂	S
3367 <sup>87</sup>	N	N	N	N
3368 <sup>86</sup>	N	N	N	N
3369 <sup>86</sup>	Y	Y	♂	N
3370 <sup>86</sup>	N	N	N	S
3371 <sup>87</sup>	Y	Y	♀PL	S
3372 <sup>89</sup>	S	N	P	S
3373 <sup>87</sup>	N	N	P	N
3374 <sup>89</sup>	Y	♂	♂	S
3375 <sup>86</sup>	N	N	N	N
3376 <sup>86</sup>	located off-area, new number - 5376			
3377 <sup>87</sup>	located off-area, new number - 5377			
3378 <sup>90*</sup>	P	N	N	N
3379 <sup>90*</sup>	N	N	N	N
3380 <sup>90*</sup>	removed from census - low occupancy			
3381 <sup>90*</sup>	removed from census - low occupancy			
3382 <sup>91*</sup>	♂	S	♂ <sup>NAT 4</sup>	S
3383 <sup>91*</sup>	N	N	N	N
3384 <sup>91*</sup>	burned in Clark Peak fire			
3385 <sup>91*</sup>	removed from census - low occupancy			
3386 <sup>91*</sup>	N	N	N	N
3387 <sup>91*</sup>	N	N	N	Y
3388 <sup>92*</sup>	located off-area, new number - 5388			
3389 <sup>93*</sup>	N	N	N	N
3390 <sup>93*</sup>	N	N	N	N
3391 <sup>93*</sup>	removed from census - low occupancy			
3392 <sup>93*</sup>	N	N	N	N
3393 <sup>93*</sup>	N	N	N	N
3394 <sup>93*</sup>	N	N	N	N

Spruce-Fir Construction Area (SFC), 2000				
Midden	Mar	Jun	Sep	Dec
3395 <sup>94*</sup>	removed from census - low occupancy <sup>1</sup>			
3396 <sup>94*</sup>	removed from census - low occupancy <sup>1</sup>			
3397 <sup>86</sup>	N	N	N	N
3398 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
3399 <sup>94*</sup>	N	N	N	N
# Mid	83	83	83	84
# Occ	12	12	12	12
% Occ	14	14	14	14
# Sq	12	12	12	12

- 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 March 2000: A resident male squirrel was seen in midden 3365. From behavior and habits, it was thought to be the same male as seen in previous months. But the metal tag seen in January was not readily apparent. Further attempts to observe this squirrel in March were unsuccessful. April 2000: The metal tag in the left ear of the male at midden 3365 was observed on 12 April during the construction census. June 2000: a squirrel of unknown sex was observed sticking its head out of the main midden snag, no metal tags or ear rips were observed.
- 3 Male at midden 3025 has a natural mark - rip in right ear.
- 4 Male at midden 3382 has a natural mark - rip in right ear.
- 5 Midden 3308 appears to have become re-occupied: observed feeding sign and a red squirrel defending the midden.

Spruce-Fir Non Construction Area (SFN), 2000				
Midden	Mar	Jun	Sep	Dec
4000 <sup>95*</sup>	S	Y	♀ NAT 2	Y
4001 <sup>95*</sup>	N	N	N	N
4002 <sup>95*</sup>	♂	Y	♀	Y
4003 <sup>95*</sup>	N	N	N	N
4004 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
4005 <sup>95*</sup>	N	N	N	N
4006 <sup>95*</sup>	N	N	N	N
4007 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
4008 <sup>95*</sup>	N	N	N	N
4009 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
4010 <sup>95*</sup>	♂	P	N	N
4011 <sup>95*</sup>	N	N	N	N
4012 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
4013 <sup>96*</sup>	N	N	N	N
4014 <sup>96*</sup>	removed from census - low occupancy <sup>1</sup>			
4015 <sup>96*</sup>	removed from census - low occupancy <sup>1</sup>			
4016 <sup>96*</sup>	Y	P	N	N
4017 <sup>96*</sup>	removed from census - low occupancy <sup>1</sup>			
4018 <sup>96*</sup>	removed from census - low occupancy <sup>1</sup>			
4019 <sup>96*</sup>	N	N	N	N
4020 <sup>96*</sup>	N	N	N	N
4021 <sup>96*</sup>	N	N	N	N
4022 <sup>98*</sup>	N	N	N	N
4023 <sup>98*</sup>	N	N	N	N
4024 <sup>98*</sup>	N	N	N	N
4025 <sup>99*</sup>	P	N	N	N
4400 <sup>89</sup>	removed from census - low occupancy <sup>1</sup>			
4401 <sup>94*</sup>	N	N	N	N
4402 <sup>94*</sup>	N	N	N	N
4403 <sup>94*</sup>	removed from census - low occupancy <sup>1</sup>			
4404 <sup>95*</sup>	N	N	N	Y
4405 <sup>95*</sup>	N	N	N	N
4406 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			

Spruce-Fir Non Construction Area (SFN), 2000				
Midden	Mar	Jun	Sep	Dec
4407 <sup>95*</sup>	N	N	N	N
4408 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
4409 <sup>95*</sup>	N	N	N	N
4410 <sup>95*</sup>	located off-area, new number - 5410			
4411 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
4412 <sup>95*</sup>	N	N	N	N
4413 <sup>95*</sup>	located off-area, new number - 5413			
4414 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
4415 <sup>95*</sup>	N	N	N	N
4416 <sup>95*</sup>	N	N	N	N
4417 <sup>95*</sup>	S	S	♂	♂
4418 <sup>95*</sup>	N	P	N	N
4419 <sup>95*</sup>	N	N	N	N
4420 <sup>90</sup>	N	N	♂	Y
4421 <sup>86</sup>	N	N	N	N
4422 <sup>86</sup>	N	N	N	N
4423 <sup>86</sup>	N	N	N	N
4424 <sup>86</sup>	N	N	N	N
4425 <sup>87</sup>	removed from census - low occupancy <sup>1</sup>			
4426 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4427 <sup>86</sup>	Y	P	N	N
4428 <sup>86</sup>	N	N	N	N
4429 <sup>86</sup>	Y	P	N	S
4430 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4431 <sup>86</sup>	N	N	N	N
4432 <sup>86</sup>	N	N	N	N
4433 <sup>87</sup>	removed from census - low occupancy <sup>1</sup>			
4434 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4435 <sup>86</sup>	N	N	N	N
4436 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4437 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
4438 <sup>90*</sup>	N	N	N	N
4439 <sup>90*</sup>	removed from census - low occupancy <sup>1</sup>			

Spruce-Fir Non Construction Area (SFN), 2000				
Midden	Mar	Jun	Sep	Dec
4440 <sup>91</sup>	removed from census - low occupancy <sup>1</sup>			
4441 <sup>86</sup>	N	N	N	N
4442 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
4443 <sup>86</sup>	N	N	N	N
4444 <sup>86</sup>	N	N	N	N
4445 <sup>86</sup>	N	N	N	N
4446 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4447 <sup>86</sup>	N	N	N	N
4448 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4449 <sup>86</sup>	N	N	N	P
4450 <sup>86</sup>	N	N	N	N
4451 <sup>88</sup>	removed from census - low occupancy <sup>1</sup>			
4452 <sup>86</sup>	N	N	N	N
4453 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4454 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4455 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4456 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4457 <sup>86</sup>	N	N	N	N
4458 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4459 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4460 <sup>87</sup>	S	♂	♂	Y
4461 <sup>91*</sup>	Y	P	♂	N
4462 <sup>90</sup>	removed from census - low occupancy <sup>1</sup>			
4463 <sup>90</sup>	N	N	N	N
4464 <sup>90</sup>	N	N	N	N
4465 <sup>90*</sup>	N	P	N	N
4466 <sup>87</sup>	N	N	N	N
4467 <sup>87</sup>	N	N	N	N
4468 <sup>87</sup>	removed from census - low occupancy <sup>1</sup>			
4469 <sup>87</sup>	N	N	N	N
4470 <sup>87</sup>	S	Y	♂	♂
4471 <sup>87</sup>	N	N	N	N
4472 <sup>87</sup>	Y	♀L	♀PL	S
4473 <sup>87</sup>	Y	♂	P	♂

Spruce-Fir Non Construction Area (SFN), 2000				
Midden	Mar	Jun	Sep	Dec
4474 <sup>86</sup>	♂	♂	♂	S
4475 <sup>87</sup>	located off-area, new number - 5405			
4476 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
4477 <sup>87</sup>	Y	P	N	N
4478 <sup>90*</sup>	removed from census - low occupancy <sup>1</sup>			
4479 <sup>90*</sup>	removed from census - low occupancy <sup>1</sup>			
4480 <sup>90*</sup>	removed from census - low occupancy <sup>1</sup>			
4481 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4482 <sup>86</sup>	N	N	N	N
4483 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4484 <sup>86</sup>	Y	P	♂	N
4485 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4486 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
4487 <sup>86</sup>	located off-area, new number - 5487			
4488 <sup>91*</sup>	removed from census - low occupancy <sup>1</sup>			
4489 <sup>91*</sup>	N	N	N	N
4490 <sup>91*</sup>	N	N	N	N
4491 <sup>91*</sup>	removed from census - low occupancy <sup>1</sup>			
4492 <sup>91*</sup>	♀	S	N	N
4493 <sup>91*</sup>	removed from census - low occupancy <sup>1</sup>			
4494 <sup>91*</sup>	P	N	N	N
4495 <sup>95*</sup>	N	N	N	N
4496 <sup>93*</sup>	N	N	N	N
4497 <sup>93*</sup>	removed from census - low occupancy <sup>1</sup>			
4498 <sup>93*</sup>	N	N	N	N
4499 <sup>93*</sup>	N	N	N	N
# Mid	75	75	75	75
# Occ	16	9	10	11
% Occ	21	12	13	15
# Sq	16	9	10	11

## Appendix B-1 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 Female at midden 4000 has a natural mark - rip in left ear.



Off-Area Midden Occupancy, 2000				
Midden	Mar	Jun	Sep	Dec
TRC Area				
5101 <sup>89</sup>	S	♀	♀	S
5102 <sup>98*</sup>	N	N	N	N
5103 <sup>99*</sup>	S	S	N	N
5104 <sup>99*</sup>	♂	♂	N	N
5114 <sup>89</sup>	removed from census - low occupancy <sup>1</sup>			
5118 <sup>94*</sup>	♂	♂	♂	♂
5119 <sup>89*</sup>	N	♀	♀	♀
5120 <sup>89*</sup>	removed from census - too far off area			
5121 <sup>89*</sup>	♂	S	♀	S
5122 <sup>89</sup>	S	S	N	N
5123 <sup>89</sup>	removed from census - too far off area			
5124 <sup>90*</sup>	removed from census - too far off area			
5125 <sup>89*</sup>	♂	♂	♂	S
5126 <sup>91</sup>	S	S	N	N
5127 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
5145 <sup>91*</sup>	N	N	♀ <sup>NAT 4</sup>	♀ <sup>NAT 4</sup>
5150 <sup>91*</sup>	♀	S	♀PL	♀
5155 <sup>93*</sup>	S	♀L	♂	♀
5157 <sup>93*</sup>	♀	♀L	N	N
TRN Area				
5200 <sup>93*</sup>	♀	S	♂	♂
5201 <sup>99*</sup>	N	N	N	N
5202 <sup>99*</sup>	♂	♂ <sup>NAT 2</sup>	P	N
5203 <sup>00*</sup>	♀	♀PL	♀ <sup>NAT 5</sup>	♀ <sup>NAT 5</sup>
5221 <sup>91*</sup>	S	S <sup>NAT 3</sup>	♀	S
5231 <sup>96*</sup>	♀	♀	♀	S
5232 <sup>96*</sup>	♀	♀L	♀PL	Y

Off-Area Midden Occupancy, 2000				
Midden	Mar	Jun	Sep	Dec
SFC Area				
5302 <sup>94*</sup>	removed from census - low occupancy <sup>1</sup>			
5311 <sup>95*</sup>	P	N	S	P
5313 <sup>95*</sup>	Y	P	N	N
5350 <sup>86</sup>	♀	S	♀	S
5351 <sup>94*</sup>	N	N	N	N
5352 <sup>94*</sup>	removed from census - low occupancy <sup>1</sup>			
5353 <sup>94*</sup>	removed from census - too far off area			
5354 <sup>94*</sup>	N	N	N	N
5355 <sup>94*</sup>	removed from census - low occupancy <sup>1</sup>			
5356 <sup>94*</sup>	N	N	N	N
5357 <sup>95*</sup>	removed from census - low occupancy <sup>1</sup>			
5358 <sup>95*</sup>	removed from census - too far off area			
5359 <sup>95*</sup>	S	P	N	N
5360 <sup>96*</sup>	removed from census - low occupancy <sup>1</sup>			
5361 <sup>96*</sup>	N	N	N	N
5362 <sup>96*</sup>	removed from census - low occupancy <sup>1</sup>			
5376 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			
5377 <sup>87</sup>	♀	P	S	N
5388 <sup>92*</sup>	removed from census - low occupancy <sup>1</sup>			
SFN Area				
5405 <sup>87</sup>	S	Y	♀	♀
5410 <sup>95*</sup>	N	N	N	N
5413 <sup>95*</sup>	♀	♀	♀PL	S
5475 <sup>86</sup>	located on area - new number 4021			
5487 <sup>86</sup>	removed from census - low occupancy <sup>1</sup>			

## Appendix B-1 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 5202 has a natural mark - short tail
- 3 The squirrel at midden 5221 has a natural mark - unusual dark mark near base of tail
- 4 Female at 5145 has a natural mark - injured or diseased right eye. Sep 00 - eye appeared somewhat swollen, reddish, and squinted. Dec 00 - eye was not reddish or swollen, but was still squinted. White eye ring is not as distinct on the right eye.
- 5 Female at midden 5203 has a natural mark - wound on left shoulder, patch of fur missing. Dec 00 - small patch of missing fur still visible.

Appendix B-2: New activity areas on the monitored areas in 2000.

There were no new activity areas located on any of the monitored areas in 2000.

Appendix C: Occupancy status of middens located within 100 meters of construction (telescopes or access road). 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	Mar <sup>1</sup>	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1160	Y	♀	S	S	S	♀	Y	♀	♀PL	Y	Y	S
1179	♀	S	♀	♀	Y	♀	Y	S	♂	S	S	S
3003	N	N	N	N	N	N	N	N	N	N	N	N
3013	N	N	removed from census - low occupancy <sup>3</sup>									
3014	N	N	N	N	N	N	N	N	N	N	N	N
3019	N	N	removed from census - low occupancy <sup>3</sup>									
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	P	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	S	♀	P	P	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	N	N	N	N	N	N	N	N	N	N	N	N
3314	N	N	N	N	N	N	N	N	N	N	N	N
3315	N	N	N	N	N	N	N	N	N	N	N	N
3319	S	N	S	P	N	P	P	N	N	N	N	N
3320	N	N	N	N	N	N	N	N	N	N	N	N
3322	N	N	N	N	N	N	N	N	N	N	N	N
3323	S	P	N	♀	Y	Y	Y	P	N	N	N	N
3324	N	N	removed from census - low occupancy <sup>3</sup>									
3325	N	N	N	N	N	N	N	N	N	N	N	N
3327	N	N	N	N	N	N	N	N	N	N	N	N
3330	N	N	N	N	N	N	N	N	N	P	N	N
3334	N	N	removed from census - low occupancy <sup>3</sup>									
3336	N	N	removed from census - low occupancy <sup>3</sup>									
3337	N	N	removed from census - low occupancy <sup>3</sup>									

Middens within 100m of construction												
Mid #	Jan	Feb	Mar <sup>1</sup>	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3339	N	N	removed from census - low occupancy <sup>3</sup>									
3340	N	N	removed from census - low occupancy <sup>3</sup>									
3345	N	N	removed from census - low occupancy <sup>3</sup>									
3346	N	N	removed from census - low occupancy <sup>3</sup>									
3347	N	N	removed from census - low occupancy <sup>3</sup>									
3350	N	N	N	N	N	N	N	N	N	N	N	N
3354	N	N	removed from census - low occupancy <sup>3</sup>									
3357			removed from census - low occupancy <sup>3</sup>									
3362	S	♀	S	♀	Y	P	P	S	♂	S	Y	Y
3363	N	N	N	N	N	N	N	N	♀	S	P	N
3364			removed from census - low occupancy <sup>3</sup>									
3365	♂ <sup>*2</sup>	S	♂ <sup>*2</sup>	♂ <sup>*2</sup>	Y	S	S	P	♂	♂	Y	S
3368	N	N	N	N	N	N	N	N	N	N	N	N
3379	N	N	N	N	N	N	N	N	N	N	N	N
3382	S	S	♂	♂	Y	S	S	♂	♂ <sup>NATS</sup>	♂	S	S
3383	N	N	N	N	N	N	N	N	N	N	N	N
3385			removed from census - low occupancy <sup>3</sup>									
3389	N	N	N	N	N	N	N	N	N	N	N	N
3391	N	N	removed from census - low occupancy <sup>3</sup>									
# Mid <sup>4</sup>	44	44	31	31	31	31	31	31	31	31	31	31
# Occ	8	6	6	6	6	5	5	4	6	6	5	5
% Occ	18	14	19	19	19	16	16	13	19	19	16	16
# Sq	8	6	6	6	6	5	5	4	6	6	5	5

## Appendix C (cont.)

- 1 A complete census of all areas is conducted in Mar, Jun, Sep, and Dec (see Table 2).
- 2 Marked squirrel at midden 3365: Metal tag - left ear/ No tag - right ear. March 2000: A resident male squirrel was seen in the midden. From behavior and habits, it was thought to be the same male as seen in previous months. But the metal tag seen in January was not readily apparent. Further attempts to observe this squirrel in March were unsuccessful. April 2000: The metal tag in the left ear of the male at midden 3365 was observed on 12 April during the construction census.
- 3 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. Middens 3357, 3364, and 3385 were removed in prior years, and therefore were not checked during the January and February 2000 construction censuses.
- 4 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.
- 5 Male at 3382 has a natural mark - rip in right ear.

Appendix D: Red squirrel populations (including juveniles) on the areas being monitored by the Red Squirrel Monitoring Program, from December 1999 through December 2000.

Date	TRC	TRN	SFC	SFN	TOTAL
Dec 1999	35	28	21	18	102
Mar 2000	31	29	12	16	88
June 2000	31 + 3J	29 + 2J	12	9	81 + 5J
Sep 2000	25	21	12	10	68
Dec 2000	21	21	12	11	65

Appendix E: Midden Occupancy Maps, 2000.



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**

<b>Crude Density (middens/ha) of red squirrel middens in each of the monitored areas for December 1999 through December 2000.</b>				
<b>DATE</b> (post-burn area)	<b>TRC</b> (49.1 ha)	<b>TRN</b> ( 24.4 ha)	<b>SFC</b> (101.0 ha)	<b>SFN</b> (128.9 ha)
Dec 1999	0.90	1.70	1.40	0.80
<b>Area<sup>1</sup></b> (after Jan 2000)	<b>(51.1 ha)</b>	<b>(21.0 ha)</b>	<b>(76.0 ha)</b>	<b>(104.4 ha)</b>
Mar 2000	0.78	2.05	1.09	0.72
Jun 2000	0.78	2.05	1.09	0.72
Sep 2000	0.78	2.05	1.09	0.72
Dec 2000	0.80	2.05	1.11	0.72

**Appendix F-1b: Crude Density of Red Squirrels**

<b>Crude Density (squirrels/ha) of red squirrels (including juveniles) in each of the monitored areas for December 1999 through December 2000.</b>				
<b>DATE</b> (post-burn area)	<b>TRC</b> (49.1 ha)	<b>TRN</b> ( 24.4 ha)	<b>SFC</b> (101.0 ha)	<b>SFN</b> (128.9 ha)
Dec 1999	0.71	1.15	0.28	0.14
<b>Area<sup>1</sup></b> (after Jan 2000)	<b>(51.1 ha)</b>	<b>(21.0 ha)</b>	<b>(76.0 ha)</b>	<b>(104.4 ha)</b>
Mar 2000	0.61	1.38	0.16	0.15
Jun 2000	0.67	1.48	0.16	0.09
Sep 2000	0.49	1.00	0.16	0.10
Dec 2000	0.41	1.00	0.16	0.11

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*.

<b>TRC Area</b>										
<b>Middens</b>						<b>Squirrels</b>				
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 99	42	5.9	0.37	41.0	2.51	35	5.0	0.41	45.4	2.95
Mar 00	40	5.8	0.39	42.7	2.44	31	4.1	0.34	48.1	3.34
Jun 00	40	5.8	0.39	42.7	2.44	31	4.2	0.37	49.0	3.62
Sep 00	40	5.8	0.39	42.7	2.44	25	3.2	0.28	57.5	3.91
Dec 00	41	5.9	0.37	41.9	2.32	21	2.8	0.22	58.1	4.81

<b>TRN Area</b>										
<b>Middens</b>						<b>Squirrels</b>				
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 99	42	6.6	0.28	39.8	1.93	28	4.3	0.28	48.7	2.80
Mar 00	43	6.7	0.27	40.4	1.95	29	4.5	0.28	49.4	2.84
Jun 00	43	6.7	0.27	40.4	1.94	29	4.2	0.25	51.0	2.37
Sep 00	43	6.7	0.27	40.4	1.95	21	3.5	0.26	57.6	3.11
Dec 00	43	6.7	0.27	40.4	1.95	21	3.4	0.25	57.6	3.11

## Appendix F-2 (con't.)

<b>SFC Area</b>										
<b>Middens</b>						<b>Squirrels</b>				
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 99	107	6.1	0.25	44.2	1.41	21	1.5	0.25	86.2	8.60
Mar 00	83	4.9	0.22	48.6	2.33	12	0.5	0.15	132.9	29.1
Jun 00	83	4.9	0.21	48.5	2.32	12	0.3	0.19	127.0	16.62
Sep 00	83	4.9	0.22	48.6	2.33	12	0.5	0.15	110.4	10.63
Dec 00	84	4.9	0.22	48.9	2.32	12	0.7	0.19	108.7	16.88

<b>SFN Area</b>										
<b>Middens</b>						<b>Squirrels</b>				
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 99	97	3.2	0.17	50.1	2.08	18	0.8	0.17	104.6	11.11
Mar 00	75	2.2	0.15	56.8	2.71	16	0.8	0.19	103.9	29.1
Jun 00	75	2.2	0.15	56.8	2.71	9	0.4	0.18	138.4	32.82
Sep 00	75	2.2	0.15	56.8	2.71	10	0.2	0.13	150.6	20.80
Dec 00	75	2.2	0.15	56.8	2.71	11	0.2	0.12	168.0	23.15

## Appendix F-2 (con't.)

<b>All Areas Combined</b>										
(including off-area middens within 100m of middens on the monitored areas)										
<b>Middens</b>						<b>Squirrels</b>				
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 99	325	5.1	0.14	45.3	0.97	126	3.3	0.22	65.2	3.29
Mar 00	274	4.5	0.15	49.5	1.26	111	3.1	0.22	69.7	4.73
Jun 00	274	4.5	0.15	49.5	1.26	102	3.3	0.22	68.6	5.02
Sep 00	274	4.5	0.15	49.5	1.26	86	2.4	0.19	79.3	5.14
Dec 00	276	4.5	0.15	49.4	1.25	81	2.2	0.18	82.5	6.32

Appendix G. Reproductive success on the monitored areas, 2000.

- 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. Breeding chases on the monitored areas.

<u>DATE</u>	<u>MIDDEN</u>	
14 Mar 00	1104	A male and resident female red squirrel ran around the midden for a few minutes. She chased him out of the midden and sat in a tree and chattered. Five red squirrels were seen at one time in the drainage -- one set of three chasing each other and one set of two.

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

<u>DATE</u>	<u>MIDDEN</u>	
25 Jun 00	1121	Two juveniles and one lactating female (which was agitated by the observers presence) were seen at the midden.
25 Jun 00	1163	One post-lactating female and one juvenile were seen at the midden.
26 Jun 00	2237	One lactating female and two juveniles were seen at the midden.



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 <sup>1</sup>	Unkn.	Adult	YOY <sup>1</sup>	Unkn.	Adult	YOY <sup>1</sup>	Unkn.	Adult	YOY <sup>1</sup>	Unkn.
reproductive	1											
lactating				10								
post-lactating				5			9			2		
non-reproductive <sup>1</sup>	15			7	1		20	3		7		2
unknown	12			1						1		

<sup>1</sup> 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.

Appendix G-3b. Male reproductive information

Reproductive Status	March			June			September			December		
	Adult	YOY <sup>1</sup>	Unkn.	Adult	YOY <sup>1</sup>	Unkn.	Adult	YOY <sup>1</sup>	Unkn.	Adult	YOY <sup>1</sup>	Unkn.
scrotal	24			25			24					
non-reproductive	9			2			21	1		12		
unknown	6			4		1						

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

March			June			September			December		
Adult	YOY <sup>1</sup>	Unkn.	Adult	YOY <sup>1</sup>	Unkn.	Adult	YOY <sup>1</sup>	Unkn.	Adult	YOY <sup>1</sup>	Unkn.
86		12	77	2	8	78	5	2	42		23

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.

Appendix H. Marked Squirrel Data

- H-1. Squirrels with natural identifying marks.
- H-2. Disappearance of marked squirrels.
- H-3. Sightings of marked squirrels outside their midden.
- H-4. Movements of marked squirrels to new middens.
- H-5. Evidence of marked squirrels using >1 midden.

Appendix H-1. Squirrels with identifying marks (natural and tagged). Only information for resident squirrels is included.

<u>Midden</u>	<u>Squirrel ID</u>	<u>Notes</u>
1147	♂ - triangle notch in back of right ear	seen in Sep
1162	♀ - black spots on right shoulder (temporary)	seen in Sep
1169	♂ - rip in right ear	seen in Mar
1178	♂ - short tail	seen in Mar
2208	♂ - triangle notch in left ear	seen in Mar, Jun, Sep
2215	♂ - notch on top end of left ear but not at tip	seen in Mar
3025	♂ - rip in right ear	seen in Jun
3365	<b>Marked</b> ♂ - White (left ear)/no tag (right ear)	seen Jan, Apr
3382	♂ - rip in right ear	seen in Sep
4000	♀ - rip in left ear	seen in Sep
5145	♀ - injured or diseased right eye	seen in Sep, Dec
5202	♂ - short tail	seen in Jun
5203	♀ - missing patch of fur above left front leg (temporary)	seen in Sep, Dec
5221	S - black stripe on tail closer to tip	seen in Jun

## Appendix H-2. Disappearance of marked squirrels.

<u>Month Last Seen</u>	<u>Capture Location</u>	<u>Squirrel ID</u>	<u>Notes</u>
Apr 00	3361	metal/none ♂ (W/R)	Marked as a sub-adult (non-scrotal) on 23 Oct 1995. Last seen on the monitored areas on 12 Apr 00 (had been living at 3365 since Mar 96). This male was considered to be living on the area for 54.4 months.

## Appendix H-3. Sightings of marked squirrels outside their midden.

No marked squirrels were observed outside their midden in 2000.

## Appendix H-4. Movements of marked squirrels to new middens.

No marked squirrels were observed moving to new middens in 2000.

## Appendix H-5. Evidence of marked squirrels using &gt;1 midden.

No evidence of marked squirrels using more >1 midden in 2000.

Appendix I. Weather Data

I-1. Monthly Weather Summaries for 2000.

I-2. Monthly maxima, minima, and averages from snow poles.

## Appendix I-1. Monthly weather summaries for 2000.

	Month	Biology Camp	Emerald Peak
Temperature (°C) average (max; min)	January	-0.1 (15.2; -14.9)	-0.9 (9.2; -16.8)
	February	0.4 (16.1; -11.7)	-0.8 (8.4; -12.9)
	March	0.8 (18.9; -14.7)	-1.6 (8.4; -15.2) <sup>2</sup>
	April	7.6 (30.3; -8.8)	7.7 (17.6; -0.9) <sup>3</sup>
	May	13.5 (35.4; -1.9)	9.8 (21.3; -2.9)
	June	14.2 (35.1; 4.8)	11.5 (21.3; 3.3)
	July	15.1 (31.9; 6.6)	12.5 (20.9; 5.0)
	August	13.3 (28.5; 2.9)	11.3 (21.4; 1.8)
	September <sup>1</sup>	13.1 (28.2; 3.8)	11.02 (19.3; 2.8)
	October	4.9 (24.1; -9.7)	3.4 (16.3; -10.4)
	November	-2.6 (11.2; -14.7)	-3.5 (7.2; -13.8)
	December	-0.6 (10.3; -10.2)	-1.0 (6.6; -10.8)

	Month	Biology Camp	Emerald Peak
Wind Speed (m/sec), maximum(max. gust)	January	3.6 (11.2)	3.1 (11.6)
	February	3.6 (12.1)	3.1 (13.0)
	March	3.6 (14.8)	3.1 (10.7) <sup>2</sup>
	April	3.1 (11.6)	2.2 (11.2) <sup>3</sup>
	May	3.1 (12.5)	2.2 (9.8)
	June	2.2 (9.8)	2.2 (7.6)
	July	2.2 (9.4)	3.1 (7.2)
	August	1.8 (7.2)	2.2 (6.7)
	September <sup>1</sup>	1.8 (8.5)	4.0 (9.4)
	October	3.1 (9.8)	2.2 (6.7)
	November	2.2 (8.9)	2.7 (9.8)
	December	3.1 (12.1)	3.6 (15.6)



	Month	Biology Camp	Emerald Peak
Wind, Most Common Direction	January	N	WNW
	February	S	SE
	March	S	SE <sup>2</sup>
	April	S	N <sup>3</sup>
	May	S	NNW
	June	N	NNW
	July	NNE	NNW
	August	N	SE
	September <sup>1</sup>	SSW	SE
	October	SSW	SE
	November	N	N
	December	N	WNW

	Month	Biology Camp	Emerald Peak
Rain Fall <sup>5</sup> (mm) (Average/Total)	January	--	--
	February	--	--
	March	--	--
	April	--	--
	May	0.00/0.0	0.00/0.0
	June	0.04/63.4	0.06/85.6
	July	0.02/31.2	0.03/47.2
	August	0.02/37 <sup>4</sup>	0.09/129.8
	September <sup>1</sup>	0.01/9.6	0.01/8.4
	October	0.18/133.2	0.22/166.8
	November	--	--
	December	--	--

	Month	Biology Camp	Emerald Peak
Relative Humidity (%) average (max; min)	January	45.2 (96; 11)	38.1 (94; 4)
	February	43.4 (94; 7)	38.5 (93; 2)
	March	50.5 (94; 13)	47.1 (94; 5) <sup>2</sup>
	April	35.8 (85; 11)	22.5 (52; 10) <sup>3</sup>
	May	29.4 (88; 10)	26.9 (93; 8)
	June	57.7 (100; 11)	55.0 (96; 9)
	July	62.8 (100; 22)	57.0 (96; 19)
	August	75.4 (100; 27)	70.2 (96; 25)
	September <sup>1</sup>	58.5 (96; 19)	52.5 (95; 17)
	October	82.5 (100; 28)	76.6 (97; 24)
	November	62.8 (98; 15)	53.9 (94; 5)
	December	48.8 (92; 10)	36.1 (92; 2)

	Month	Biology Camp	Emerald Peak
Dew Point (°C) average (max; min)	January	-11.8 (-0.9; -28.0)	-15.9 (-1.9; -38.4)
	February	-12.3 (0.3; -31.7)	-16.0 (-0.9; -42.1)
	March	-9.4 (2.6; -23.7)	-13.7 (-2.2; -36.0) <sup>2</sup>
	April	-8.0 (1.4; -21.3)	-13.32 (-7.5; -25.7) <sup>3</sup>
	May	-5.4 (5.8; -19.1)	-9.8 (3.6; -23.3)
	June	4.3 (15; -10.9)	0.8 (10.2; -19.2)
	July	7.31 (14.9; -4.3)	3.5 (11.5; -9.6)
	August	8.5 (15.3; 1.4)	5.5 (10.8; -1)
	September <sup>1</sup>	4.33 (12.4; -11.9)	0.94 (9.8; -18.1)
	October	1.7 (9.4; -12.9)	-0.90 (6.4; -17.7)
	November	-9.6 (0.6; -25.7)	-13.8 (-1.6; -36)
	December	-11.1 (-1.3; -28.2)	-16.6 (-3.9; -43.1)

- 1 The weather stations were changed to record data at 1 hour intervals on 25 September 2000 at 13:00 hours at the Biology Camp and at 13:30 hours at Emerald Peak.
- 2 Seventeen hours of data are missing for 15 March 00; 34 hours of data are missing for 30 March 00 thru 31 March 00.
- 3 Twenty-six and a half days of data missing.
- 4 This probably represents less than the actual amount of rainfall. The rain gauge was clogged with debris and the problem was fixed on 29 August 00. The gauge appeared to be clogged for approximately 6 days.
- 5 Moisture recorded in Jan-Apr, Nov, and Dec 2000 was considered to be snow melt and therefore not included in the rain summaries.

Appendix I-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 <sup>1</sup>	Average snow depth (cm)	Maximum snow depth (cm)	Minimum snow depth (cm)
Nov 1999	TR	C	1	0	0	0
Nov 1999	TR	F	1	0	0	0
Nov 1999	SF	C	3	0	0	0
Nov 1999	SF	F	3	0	0	0
Dec 1999	TR	C	3	0	0	0
Dec 1999	TR	F	3	0	0	0
Dec 1999	SF	C	5	0	0	0
Dec 1999	SF	F	5	0	0	0
Jan 2000	TR	C	1	16.0	16.0	16.0
Jan 2000	TR	F	1	13.0	13.0	13.0
Jan. 2000	SF	C	3	21.3	33.0	10.0
Jan 2000	SF	F	3	11.3	13.0	10.0
Feb 2000	TR	C	1	0	0	0
Feb 2000	TR	F	1	0	0	0
Feb 2000	SF	C	3	0	0	0
Feb 2000	SF	F	3	3.3	10.0	0.0
Mar 2000	TR	C	3	43.0	48.0	38.0
Mar 2000	TR	F	3	36.7	45.0	27.0
Mar 2000	SF	C	5	39.4	57.0	25.0
Mar 2000	SF	F	5	34.0	42.0	28.0

Month	Hab	Loc	N <sup>1</sup>	Average snow depth (cm)	Maximum snow depth (cm)	Minimum snow depth (cm)
Apr 2000	TR	C	1	0	0	0
Apr 2000	TR	F	1	0	0	0
Apr 2000	SF	C	3	0	0	0
Apr 2000	SF	F	3	5.0	10.0	0
May 2000	TR	C	1	0	0	0
May 2000	TR	F	1	0	0	0
May 2000	SF	C	3	0	0	0
May 2000	SF	F	3	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.