

**THE UNIVERSITY OF
ARIZONA**
MT. GRAHAM RED SQUIRREL MONITORING PROGRAM

2007 Annual Report

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EXECUTIVE SUMMARY

In 2007, the University of Arizona Mt. Graham Red Squirrel Monitoring Program continued efforts to document aspects of red squirrel population biology and food resources in the established study areas around the Mt. Graham International Observatory in the Pinaleno Mountains, Graham County, Arizona. A complete census of the study areas was made in March, June, September, and December 2007.

Overall annual mean mushroom production in 2007 was two times lower than in 2006, and was the seventh highest crop since data collection began in 1994. Seed production for 2006 (1 year delay in reporting due to methodology), was over 14 times greater than in 2005, and the 2006 seed crop was the fourth highest seen since data collection began in 1993.

Overwinter survival, calculated as animals surviving from December 2006 to June 2007, was moderate in TR habitat (58%) and higher in SF habitat (71%). Five litters were confirmed on or near the monitored areas in 2007. From these 5 litters, 12 juveniles were known to emerge from natal nests and 11 of them were live-trapped and marked with small metal ear tags for future identification.

Squirrel populations in September 2007 (38 Adults + 3 Juveniles) were the highest seen in the last five years of quarterly censuses. However by December 2007, numbers (26 Adults) were less than seen in December 2006 (33 Adults). If the squirrels near the monitored areas (within 100m) are included, an overall decrease was still seen from December 2006 (44 squirrels) to December 2007 (33 squirrels).

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INTRODUCTION

The Mt. Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*) is the southernmost subspecies of the wide-ranging red squirrel and is endemic to the Pinaleño (Graham) Mountains of southeastern Arizona (Hoffmeister 1986). Believed restricted to ≤ 12200 ha of mixed-conifer and spruce-fir forest at elevations > 2360 m (Hatten 2000), Mt. Graham red squirrels were federally protected as endangered in 1987 with critical habitat defined in 1990 and a recovery plan published in 1993 (United States Fish and Wildlife Service 1993). The University of Arizona's Mt. Graham Red Squirrel Monitoring Program (RSMP) was established in 1989 to meet the requirements of the Mount Graham International Observatory (MGIO) Management Plan (USDA Forest Service 1989) by monitoring the population of this endangered species in the highest peaks of the Pinaleño Mountains near the MGIO ($32^{\circ} 42' N$, $109^{\circ} 53' W$). In 2007, 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 activities at the Large Binocular Telescope (LBT) in 2007 were mainly interior building work. Herein, we report on the monitoring efforts from 1 January to 31 December 2007.

All use of 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, Dr. John L. Koprowski.

Study Area

Four areas were defined in the vicinity of the MGIO to monitor red squirrel populations (Figure 1) and include two forest habitat types: transitional (TR) or mixed conifer forest and spruce-fir (SF) forest. The TR habitat, between 2680 and 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, ≥ 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 (TRC, SFC). For comparison, a *non-construction* area beyond 300 m from the MGIO or the access road was defined in each habitat (TRN, SFN). The size of monitored areas has changed several times due to construction and fire events (Table 1).

METHODS

Red squirrels cache conifer cones in locations known as middens. Middens are easily recognized by presence of cached cones and piles of discarded cone scales. The RSMP defines a midden site as a circular area with 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 revisited to assess 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 no improvement occurs in the two quarterly censuses following initial location, the activity area is removed.

Prior to 2003, at the end of each calendar year, a list of middens to be removed from regular censusing was compiled. If a midden had been censused for at least three years (12 censuses), including at least one good cone year, and was not occupied during that time, the midden was removed from the list for regular censusing and revisited only in December. If any removed middens became re-occupied, the sites are returned to the list for regular census. However, in 2003, because a large number of middens were removed in some areas as a result of insect damage, we began visiting all removed middens during each census. This change was made so as not to leave large parts of the monitored areas unvisited for an entire year. Removed middens, if still unoccupied, are simply checked off a tally sheet, while complete notes are taken on middens considered to be in the regular census.

Red Squirrel Food Resources

Conifer Seed Production

The RSMP began collecting quantitative data in 1993 to determine the abundance of major red squirrel food resources: conifer seeds and mushrooms. In July 2004, 14 of the original seed plots in SFC (7) and SFN (7) were in areas destroyed by the Nuttall Fire. We added 3 new plots in late summer 2004 (SFC - 2, SFN - 1) in remaining unburned areas. Therefore, seed production for 2006 was estimated from 20 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 2006 crop were collected from the seed traps in June 2007. Conifer seeds contained in each trap were separated by species and individually tested 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 total number of viable seeds because some seeds may have been preyed upon within the seed trap. Estimates of seedfall for each tree species were calculated as the average number of viable seeds from all three traps on each plot. Seeds of white pine and ponderosa pine are not readily dispersed by wind due to their large size. As a result, seed crops of these species are

under represented in seed trap samples. Both species may be important local food supplies for red squirrels, but at present no reliable method exists to estimate size of seed crops.

Mushroom Production

As in previous years, mushrooms were collected from plots 1m by 100m (0.01 ha) at two week intervals during periods of mushroom production. Fourteen of 28 food resource plots were destroyed in the Nuttall Fire in July 2004, however, three new plots were established in remaining unburned areas on the SFC and SFN. Mushrooms (epigeous or above-ground fungi) were collected at these 20 sites (Figure 1) from mid-July through early October 2007. In 2007, mushrooms were collected from east-west oriented plots, instead of north-south as in 2002-2006. We alternate plot collection orientation every five years in order to avoid any possible impacts of long-term harvest on plots. Prior to beginning the alternating orientations, we collected mushrooms from both east-west and north-south plots in 2001 and detected no significant differences in weight, number, or diversity of mushrooms between the two orientations. Collections were restricted to genera of mushrooms used by red squirrels on Mt. Graham or in other regions (Table 2). Collected mushrooms were separated by plot and genus, and weighed wet. For most genera, dry weight was calculated by multiplying wet weight by a wet weight/dry weight ratio determined from previous samples on Mt. Graham. Dry weights were measured directly for genera with small numbers of specimens previously collected (<50).

Because seeds for a given year are not collected and analyzed until the following spring, seed data are delayed by one year. 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 number and distribution of occupied middens on each monitored area. In March, June, September, and December 2007, all middens were visited at least once to determine occupancy. If a midden appeared to be occupied based upon feeding sign (cone scales, dried mushrooms, and conifer clippings) or caching, every attempt was made on subsequent midden visits to observe the resident and to determine its sex, age, and reproductive condition. In 2007, most animals on or near monitored areas were ear-tagged and many were fitted with radio collars, further assisting census efforts.

All middens on the monitored areas were classified as either occupied, unoccupied, or possibly occupied, with each occupied midden representing one squirrel (except for females with dependant juveniles). A midden was considered unoccupied when no squirrel or squirrel sign was present. A midden was considered possibly occupied when red squirrel sign was found but 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 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 2006, the number of occupied middens and the identity of resident squirrels were determined. December 2006 occupancy was compared to occupancy for June 2007. For unmarked animals, a squirrel was considered to have survived 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 surviving individual. For marked squirrels, survival was generally known with a fair degree of certainty using available trapping and telemetry information.

Spatial Distribution

We used three methods to describe 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. We made no allowance for differences in habitat quality among 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*. Mean LD (\bar{x} LD) of *middens* (all middens, occupied and unoccupied) and *squirrels* (all occupied middens) are compared between areas and habitats. The benefit of using LD is that measurements 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) and is also 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 (m) from a focal *midden* or *squirrel* to the nearest *midden* or *squirrel*. 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 using mapped coordinates and compared among areas and habitats using ANOVA. To determine the LD and NND of some middens and squirrels on the monitored areas, we included off-area middens within 100 m of a focal midden.

Reproductive Activity and Success

In 2007, we recorded breeding condition of adult male and female squirrels, and litter size when observed. By examining the squirrel's condition through trapping efforts or binoculars, we determined the reproductive status of a female as non-reproductive (small unpigmented teats), reproductive (vulva visibly swollen or appearance of pregnancy), lactating (swollen, elongated teats with surrounding alopecia), recently lactating (elongated black tipped teats), or lactating in past seasons (small black tipped teats). We determined reproductive status of male squirrels during trapping or visual assessment as testes non-scrotal (non-reproductive) or testes scrotal (reproductive).

Trapping and Marking

In accordance with our Federal Fish and Wildlife Permit, using accepted methods (Koprowski 2002), we trapped red squirrels using Tomahawk wire-mesh box-type live traps, baited with peanuts and/or peanut butter. Once captured, we transferred squirrels to a cloth-handling cone for marks and measurements. We tagged squirrels with small numbered metal ear-tags threaded with colored plastic washers and affixed to ears for easy distance identification. We also fitted some adult animals with radio collars. Squirrels were released at the capture site.

Mapping

All middens and other physical features on the monitored areas have been previously mapped using GPS with an accuracy of ± 5 m. Universal Transverse Mercator (UTM) coordinates from GPS files were used to compute local densities and nearest neighbor distances. New GPS data (nests, habitat plots, etc.) were collected using a GeoExplorer II system from Trimble Navigation, Inc. Readings were taken within 5 meters of the location center. Date, time, and location descriptions were noted in the field for later reference. Final GPS locations were based on an average from a minimum of 200 three-dimensional data points. Locations were differentially corrected using base station (Continuously Operating Reference Station, CORS-COT1, Tucson, Arizona). Maps were produced using Arc-View 3.2 (ESRI 1995).

Weather Data

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

All statistical analyses were conducted using standard tests found in SAS, StatsDirect, or Minitab statistical software. Because sample sizes were sometimes small due to endangered status, significance for statistical tests was implied when $P \leq 0.05$ and potential biological significance was noted when $P < 0.10$.

RESULTS

Red Squirrel Food Resources

2006 Conifer Seed Production

The total 2006 seed crop was fourth highest on the monitored areas since data collection began in 1993. Corkbark fir was the most abundant seed in 2006. When comparing the 2006 seed crop to all previous years of study for each species, corkbark fir and Douglas-fir were the second highest reported seed crop, and Engelmann spruce was the tenth lowest reported seed crop. However, the 2006 overall seed crop was over 14 times greater than the seed crop in 2005 (Table 3, Figures 2a-c, Appendix A).

2007 Mushroom Production

Overall annual mean mushroom production in 2007 was two times lower than in 2006, and was the seventh highest crop since data collection began in 1994. Production generally decreased in both TR and SF habitats in 2007 as compared to 2006 (Figure 3). In 2007, mushroom production (\bar{x} wet weight) did not differ between the TR and SF habitats (Table 4). On TRC, three genera, *Russula*, *Clitocybe*, and *Auricularia* accounted for 61% of production. On TRN, *Russula*, *Hydnum*, and *Lycoperdon* accounted for 66% of total production. *Russula*, *Amanita*, and *Cortinarius* accounted for 81% of the production on SFC. On SFN, *Clitocybe*, *Russula*, and *Lycoperdon* accounted for 95% of the total production (Table 5).

Population Biology

Midden Occupancy

Four quarterly censuses (Mar, Jun, Sep, and Dec) of all middens on or near monitored areas were made in 2007 (Appendix B). From December 2006 to December 2007, the number of red squirrels decreased, from 33 to 26. On TRC, the highest number of squirrels (17 Ad + 3J) was in September 2007, and the lowest number was 11 Ad in December. The highest numbers (13 Ad) on TRN were also in September and the lowest was 9 Ad in March and June. The highest number of squirrels on SFC was in June (7 Ad) with the lowest (2 Ad) in December. On SFN, 5 Ad were found to be living on the area during March and June censuses, and 2 squirrels were found in September and December (Figure 4, Appendix B, C, D). The squirrel populations on the monitored areas in 2007 increased by September to the highest numbers seen in the past five years (38Ad + 3J), but declined somewhat by December (Figure 5).

Two middens on the TRC area, previously removed from regular censusing due to low occupancy, became re-occupied in 2007 (Appendix B). In June and December 2007, there was no difference in the proportion of middens occupied among areas in both TR and SF habitats (Table 6).

Overwinter Survival

The number of squirrels that survived the winter of 2006-2007 did not differ among all areas (Table 7); survival was 58% in TR habitat and 71% in SF habitat. For comparison, survival from the previous winter (2005-2006) was 50% in TR habitat and 100% in 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 overestimate is minimal as most squirrels on the monitored areas are ear-tagged and radio-collared for unique identification.

Crude Density

Between December 2006 and December 2007, crude density of *middens* on TRC increased slightly, as two previously removed middens became reoccupied (Appendix E1-a). Crude density of *squirrels* decreased from December 2006 to December 2007 on all areas except TRN (Appendix E1-b).

Local Density

The December 2007 overall mean local density (\bar{x} LD) of *middens* (3.7) was slightly higher than in December 2006 (3.5). Local density of middens differed among the four areas. The SFN had the lowest \bar{x} LD (1.3), and TRC had the highest \bar{x} LD (5.0). The mean \bar{x} LD of *squirrels* (occupied middens) on all areas in December 2007 was 1.4, which is a decrease from 1.7 in December 2006. The \bar{x} LD of *squirrels* also differed among areas, with SFC and SFN the lowest \bar{x} LD (0.0) and TRN the highest (2.0) (Table 8, Appendix E-2).

Nearest Neighbor Distance

Overall \bar{x} NND of *middens* decreased slightly from December 2006 to December 2007 (57.7m to 56.2m) (Table 9, Appendix E-2). Nearest neighbor distance of *middens* differed among the four areas; the longest \bar{x} NND on SFN (78.3m) and the shortest on TRC (43.7m). The \bar{x} NND of *squirrels* (occupied middens) for all areas increased from 117.5m in December 2006 to 135.5m in December 2007. The \bar{x} NND of *squirrels* also differed among areas, with the longest \bar{x} NND on SFC (654.2m) and the shortest on TRN (66.8m) (Table 9, Appendix E-2).

Reproductive Activity and Success

In 2007, only one breeding chase involving squirrels resident on the monitored areas was observed, in June on the TRC area (Appendix F-1). Based on information from census and trapping records, most resident adult males were scrotal from early March through late June (Appendix F-3b).

The first lactating female was observed 15 May on TRC and the latest was on 13 September, also on TRC. During the June census, of the 16 adult females identified as residents (including nearby off-area middens), 7 were reproductive, 5 were lactating, 2 were non-reproductive, and 1 was unknown. By September, of 18 resident females, only 1 was lactating, and most of the remainder were non-reproductive (Appendix F-3a). Direct evidence of 5 litters (12 juveniles) was seen on or near the areas during censuses or other activities. Litters were confirmed from July through early September, however, some may have emerged slightly earlier as those juveniles were a larger size and roaming further from the nest when first detected (Appendix F-2).

Trapping and Marking

By the end of 2007, nearly all residents on or near monitored areas were fitted with colored ear tags and radio-collared (Appendix B). In addition, 11 of the 12 juveniles were caught at or near 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 2007, as all major features (middens, roads, trails, construction areas, etc.) have been mapped in previous years. New nests or habitat plots were GPS located and added to databases and maps.

Weather Data

Weather data were collected for most of 2007 from two weather stations located at the biology camp (TR habitat) and near Emerald Peak (SF habitat). Data from Emerald Peak were missing between October and December 2007 due to equipment failure. From available data, maximum temperature recorded was 25.4°C in July at the biology camp and the minimum temperature recorded was -20.1°C in January on Emerald Peak. The maximum average monthly temperature was 14.3°C in July at the biology camp and the minimum average monthly temperature was -3.0°C in February on Emerald Peak (Appendix G-1). The maximum total monthly rainfall was recorded in August on Emerald Peak, at 160.2mm and October was the driest month at 1.6mm at biology camp (Appendix G-1). Snow depth was recorded from the eight pairs of snow poles. The average accumulated snow depth from January 2007 through April 2007 ranged from 10.0cm to 79.3cm (Appendix G-2). For comparison, average accumulated snow depths for February - April in

2005-2006 ranged from 0cm to 47.7cm, and in December - May 2004-2005, depths ranged from 0.2cm to 155.3cm. Data on wind chill temperatures, wind direction and speed, humidity, and barometric pressure were also collected (Appendix G-1).

Insect Outbreaks on Monitored Areas

Infestations of bark beetles (*Drycoetes confusus* and *Dendroctonus rufipennis*) continued on parts of the monitored areas in 2007, 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.fs.fed.us/r3/resources/health/>

2007 Publications by Monitoring Program Personnel - Mt. Graham and Sky Islands

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Uphoff, K.C. 1990. Habitat use and reproductive ecology of red squirrels (*Tamiasciurus hudsonicus*) in central Arizona. M.S. Thesis, Arizona State University, Tempe, 64 pp.

Table 1. Changes in the areas monitored by the University of Arizona's Red Squirrel Monitoring Program as influenced by construction and fire events. TRC = transitional forest in the construction zone, TRN = transitional forest outside of the construction zone, SFC = spruce-fir forest in the construction zone, SFN = spruce-fir forest outside of the construction zone. All area measures are in hectares.

Event and Date	TRC	TRN	SFC	SFN	All Areas
September 1989	85.19	20.86	88.28	104.81	299.14
LBT Site Expansion 1993	85.19	20.86	100.42	104.81	311.28
After Clark Peak Fire April 1996	51.12	20.85	75.90	104.81	252.68
After Nuttall Fire July 2004	51.12	19.81	58.49	34.14	163.56

Table 2. Mushroom genera known to be food resources of red squirrels, and collected from the food resource plots on the RSMP study areas, Pinaleno Mountains, Arizona.

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 3. Mean filled conifer seed production, on the RSMP study, Pinaleno Mountains, Arizona, 2006. 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	634.56	50.0	621.12	48.9	13.28	1.0
TRN	4	1286.60	80.0	306.50	19.1	13.30	0.8
SFC	5	1399.92	92.0	7.92	0.5	114.64	7.5
SFN	6	93.20	29.0	102.13	31.7	126.53	39.3
TR Habitat	9	924.36	65.1	481.29	33.9	13.29	0.9
SF Habitat	11	687.16	79.2	59.31	6.8	121.13	14.0

Table 4. Mean annual mushroom production on the RSMP study areas, Pinaleno Mountains, Arizona, 2007.

Area/Habitat	n	\bar{x} Wet weight \pm se (Kg/ha)	\bar{x} Dry weight \pm se (Kg/ha)
TRC	5	21.6 \pm 3.5	2.7 \pm 0.6
TRN	4	62.5 \pm 13.6	7.5 \pm 2.1
SFC	5	51.1 \pm 12.8	5.6 \pm 1.3
SFN	6	20.5 \pm 4.6	2.8 \pm 0.7
TR Habitat	9	39.8 \pm 9.3	4.8 \pm 1.2
SF Habitat	11	34.4 \pm 7.7	4.0 \pm 0.8

Student's T- Test within TR*:

Wet Weight $t = -4.47$ **P = 0.003**

Dry Weight $t = -3.28$ **P = 0.014**

Student's T- Test within SF*:

Wet Weight $t = 2.37$ **P = 0.042**

Dry Weight $t = 2.07$ P = 0.068

Wilcoxon Test between TR and SF:

Wet Weight $Z = 0.30$ P = 0.761

Dry Weight $Z = 0.23$ P = 0.820

* Note: Log-transformed data were used for within habitat analyses to better meet assumptions of normality. Transformed values did not deviate from a normal distribution so parametric t-tests were used to compare mushroom production within TR and SF habitats.

Table 5. Mean annual mushroom production (wet weight Kg/ha) of selected mushroom genera known to be food resources for red squirrels, 2007. 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>	1.61	7.5	4.22	6.7	8.17	16.0	0.00	0.0
<i>Auricularia</i>	3.37	15.6	8.64	13.8	0.16	0.3	0.00	0.0
<i>Boletus</i>	1.09	5.0	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>	5.62	26.0	5.36	8.6	3.36	6.6	6.98	34.0
<i>Cortinarius</i>	1.42	6.6	0.97	1.5	3.39	6.6	1.07	5.2
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	9.60	15.4	0.00	0.0	0.00	0.0
<i>Lactarius</i>	1.15	5.3	0.00	0.0	1.83	3.6	0.00	0.0
<i>Leccinum</i>	0.00	0.0	8.69	13.9	0.00	0.0	0.00	0.0
<i>Lycoperdon</i>	1.36	6.3	1.72	2.7	2.67	5.3	5.84	28.5
<i>Pholiota</i>	0.80	3.7	0.00	0.0	0.00	0.0	0.00	0.0
<i>Ramaria</i>	0.16	0.7	0.13	0.2	0.00	0.0	0.00	0.0
<i>Russula</i>	4.17	19.3	23.20	37.1	30.60	59.9	6.63	32.3
<i>Suillus</i>	0.84	3.9	0.00	0.0	0.89	1.7	0.00	0.0
Total	21.58		62.54		51.11		20.52	

Table 6. Number and percent of available middens occupied by Mt. Graham red squirrels (*Tamiasciurus hudsonicus grahamensis*) on the RSMP study areas, Pinaleno Mountains, Arizona, 2007.

Area/Habitat	<u>June</u>			<u>December</u>		
	# middens	# occupied	% occ	# middens	# occupied	% occ
TRC	37	14	38	39	11	28
TRN	29	9	31	29	11	38
SFC	22	7	32	22	2	9
SFN	15	5	33	15	2	13
TR Habitat	66	23	35	68	22	32
SF Habitat	37	12	32	37	4	11
TR + SF	103	35	34	105	25	24

Chi Square:

JUNE

within TR $X^2 = 0.331$ df = 1 P = 0.565
 within SF* P = 1.00

DECEMBER

within TR $X^2 = 0.720$ df = 1 P = 0.397
 within SF* P = 1.00

* Fisher's Exact Test was used due to small sample sizes.

Table 7. Overwinter survival of Mt. Graham red squirrels (*Tamiasciurus hudsonicus grahamensis*) on the RSMP study areas, Pinaleño Mountains, Arizona, 2006-2007.

Area/Habitat	Number of	Number of	% survival
	Squirrels	Squirrels Surviving	
	Dec 2006 ¹	Jun 2007	
TRC	11	6	55
TRN	8	5	63
SFC	10	7	70
SFN	4	3	75
TR Habitat	19	11	58
SF Habitat	14	10	71

Fisher Exact Test*

within TR*			P = 0.759
within SF*			P = 0.900
between habitats	$X^2 = 0.638$	df = 1	P = 0.4244

* Fisher Exact test was used due to the small sample size.

¹ Of the 33 animals resident on the area in Dec 06, 9 were ear-tagged and/or radio collared thus enabling unique identification and determination of their fate by Jun 07 even if they moved to a different midden or off the area. Marked animals in the population increases the accuracy of survival calculations.

Table 8. Mean Local Density (# within 100m radius) of middens and Mt. Graham red squirrels (*Tamiasciurus hudsonicus grahamensis*) on the monitored areas, Pinaleno Mountains, Arizona, 2006 and 2007.

Area/Habitat	December 2006				December 2007			
	Middens		Squirrels ¹		Middens		Squirrels ¹	
	n	$\bar{x} \pm se$	n	$\bar{x} \pm se$	n	$\bar{x} \pm se$	n	$\bar{x} \pm se$
TRC	36	4.4 ± 0.40 ^a	13	2.2 ± 0.44 ^a	39	5.0 ± 0.41 ^a	11	1.5 ± 0.31 ^a
TRN	28	4.7 ± 0.32 ^a	8	1.8 ± 0.37 ^{a,b}	29	4.9 ± 0.29 ^a	11	2.0 ± 0.30 ^a
SFC	22	1.8 ± 0.31 ^b	8	1.3 ± 0.49 ^{a,b}	22	1.8 ± 0.30 ^b	2	0.0 ± 0.00 ^{a,b}
SFN	15	1.3 ± 0.19 ^b	4	0.5 ± 0.29 ^b	15	1.3 ± 0.18 ^b	2	0.0 ± 0.00 ^b
TR Habitat	64	4.6 ± 0.26	21	2.1 ± 0.30	68	5.0 ± 0.27	22	1.7 ± 0.22
SF Habitat	37	1.6 ± 0.20	12	1.0 ± 0.35	37	1.6 ± 0.20	4	0.0 ± 0.00
TOTAL ¹	101	3.5 ± 0.23	33	1.7 ± 0.24	105	3.7 ± 0.24	26	1.4 ± 0.22

Kruskal-Wallis

LD of Middens

among all areas

2006

H = 42.19

df = 3

P < 0.001

2007

H = 46.78

df = 3

P < 0.001

LD of Squirrels

among all areas

H = 5.38

df = 3

P = 0.146

H = 9.14

df = 3

P = 0.027

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 9. Mean Nearest Neighbor Distance of middens and Mt. Graham red squirrels (*Tamiasciurus hudsonicus grahamensis*) on the monitored areas, Pinaleño Mountains, Arizona, 2006 and 2007.

Area/Habitat	December 2006			December 2007		
	Middens	Squirrels		Middens	Squirrels	
	n	$\bar{x} \pm se$	n	$\bar{x} \pm se$	n	$\bar{x} \pm se$
TRC	36	44.6 ± 4.04 ^a	13	72.9 ± 13.73 ^a	39	43.7 ± 3.75 ^a
TRN	28	49.0 ± 3.06 ^a	8	59.0 ± 9.45 ^a	29	46.2 ± 2.78 ^a
SFC	22	76.4 ± 9.09 ^b	8	175.1 ± 58.52 ^{a,b}	22	76.4 ± 9.09 ^b
SFN	15	78.3 ± 17.04 ^b	4	265.8 ± 154.40 ^b	15	78.3 ± 17.04 ^b
TR Habitat	64	46.5 ± 2.64	21	67.6 ± 9.18	68	44.8 ± 2.44
SF Habitat	37	77.2 ± 8.63	12	205.3 ± 61.53	37	77.2 ± 8.63
TOTAL ¹	101	57.7 ± 3.84	33	117.7 ± 25.38	105	56.2 ± 3.73

2006

Kruskal-Wallis:

NND of Middens

among all areas

H=19.13

df = 3

P < 0.001

P < 0.001

NND of Squirrels

among all areas

H=6.62

df = 3

P = 0.085

P = 0.019

2007

a,b,c,d 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 (*Abies lasiocarpa* var. *arizonica*) seed fall on RSMP study areas, Pinaleno Mountains, Arizona, 1993-2006. Note: scales are different for figures 2a-c.

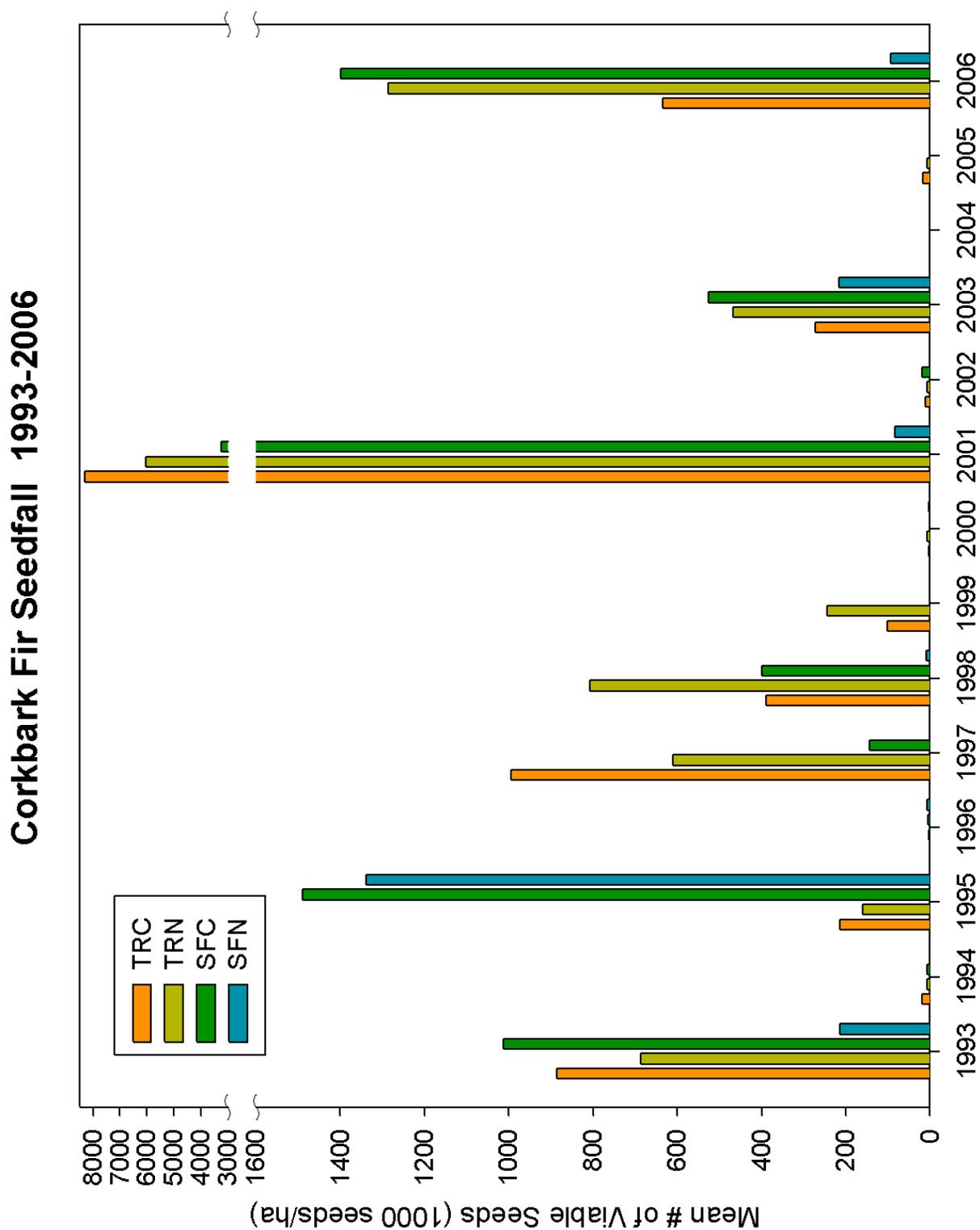


Figure 2b. Douglas-fir (*Pseudotsuga menziesii*) seed fall on RSMP study areas, Pinaleno Mountains, Arizona, 1993-2006. Note: scales are different for figures 2a-c.

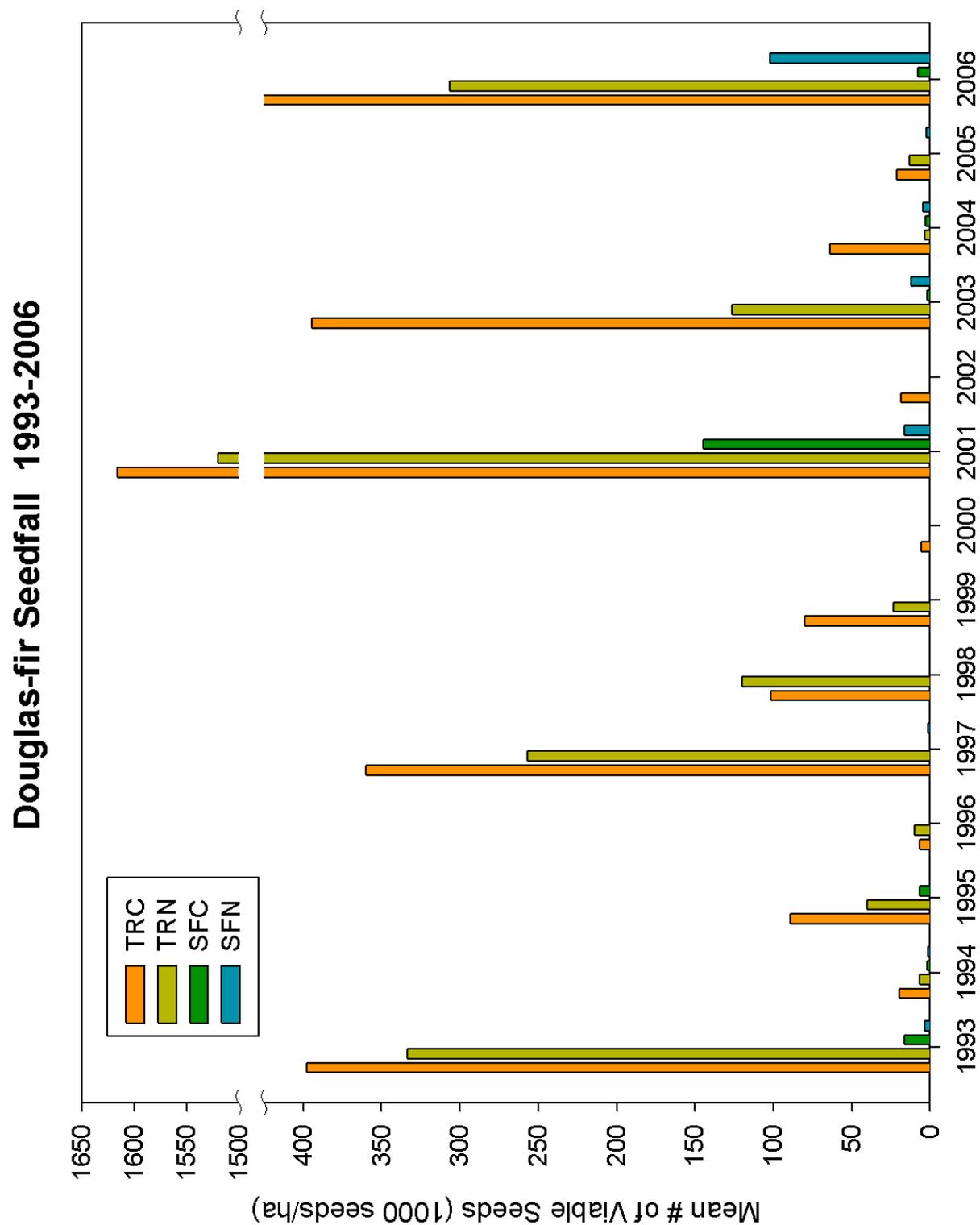


Figure 2c. Engelmann spruce (*Picea engelmannii*) seed fall on RSMP study areas, Pinaleno Mountains, Arizona, 1993-2006. Note: scales are different for figures 2a-c.

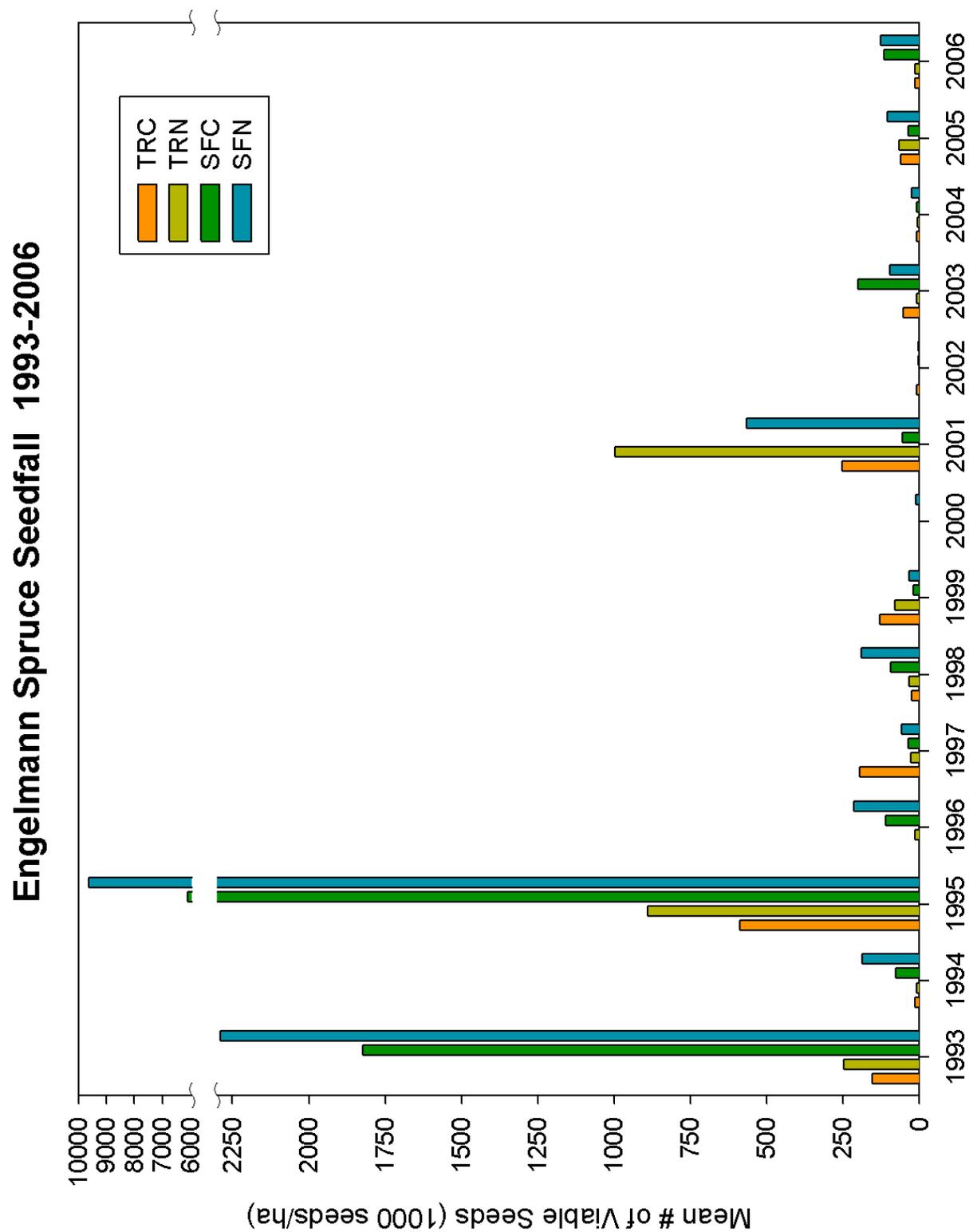


Figure 3. Mushroom crops collected on RSMP study areas, Pinaleno Mountains, Arizona, 1994-2007.

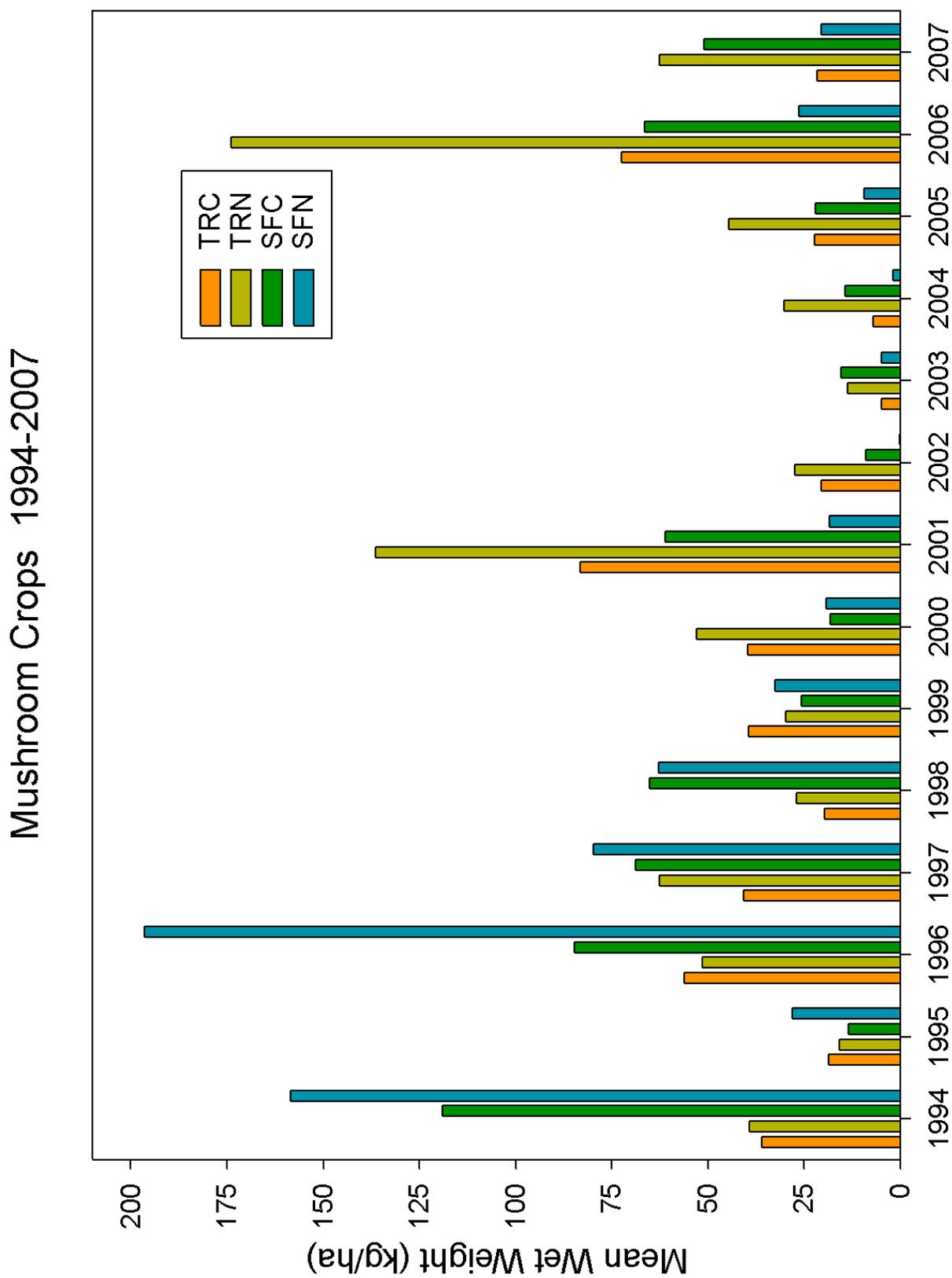


Figure 4. Quarterly Mt. Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*) populations (including juveniles) on RSMP study areas, Pinaleno Mountains, Arizona, March 2003 - December 2007.

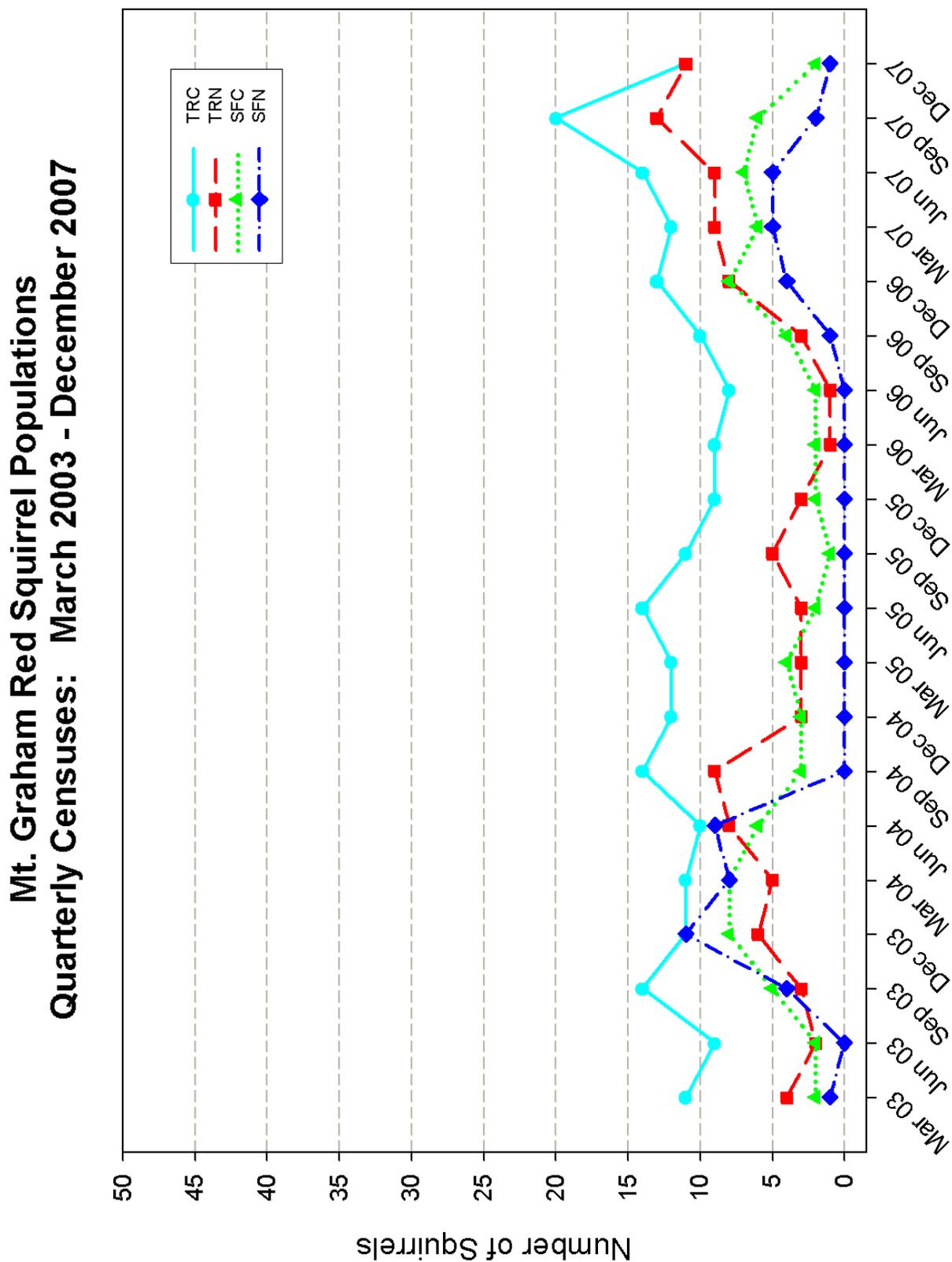
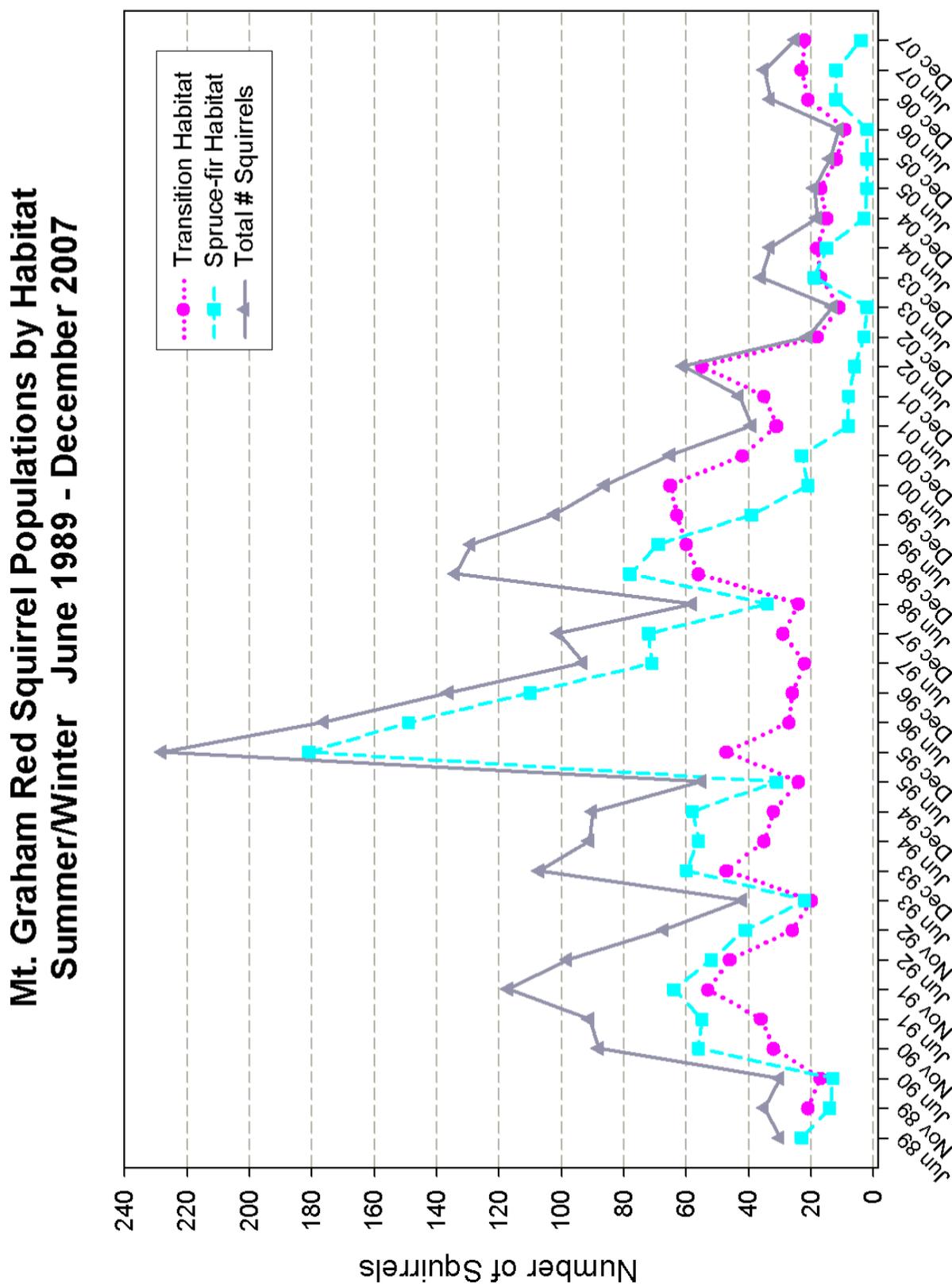


Figure 5. Summer and winter Mt. Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*) populations (including juveniles) on RSMP study areas, by habitat, June 1989 through December 2007.



Appendix A. Annual conifer seed and mushroom production on RSMP study areas, Pinaleno Mountains, Arizona, 2006.

A-1: By transect

A-2: By area and habitat

Appendix A-1: Mean number of viable seeds and weights for 2006 seeds and 2006 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 - Clark Peak Fire, 1996					
	2	burned - Clark Peak Fire, 1996					
	3	426.4	760.0	0.0	1186.4	109.3	12.2
	4	burned - Clark Peak Fire, 1996					
	5	1653.2	26.4	40.0	1719.6	95.0	10.4
	6	burned - Clark Peak Fire, 1996					
	7	burned - Clark Peak Fire, 1996					
	8	burned - Clark Peak Fire, 1996					
	9	burned - Clark Peak Fire, 1996					
	10	920.0	106.4	26.4	1052.8	58.4	5.7
	11	13.2	1186.4	0.0	1199.6	5.8	0.8
	12	160.0	1026.4	0.0	1186.4	94.2	10.6
TRN	1	2600.0	173.2	0.0	2773.2	288.3	40.1
	2	733.2	973.2	0.0	1706.4	207.0	20.3
	3	520.0	66.4	53.2	639.6	149.0	17.1
	4	1293.2	13.2	0.0	1306.4	51.2	5.5

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	burned - Nuttall fire, 2004					
	2	burned - Clark Peak Fire, 1996					
	3	burned - Nuttall fire, 2004					
	4	burned - Nuttall fire, 2004					
	5	1240.0	0.0	0.0	1240.0	111.4	11.7
	6	2333.2	0.0	480.0	2813.2	60.3	6.3
	7	burned - Clark Peak Fire, 1996, Nuttall fire, 2004					
	8	burned - Clark Peak Fire, 1996, Nuttall fire, 2004					
	9	burned - Clark Peak Fire, 1996, Nuttall fire, 2004					
	10	burned - Clark Peak Fire, 1996, Nuttall fire, 2004					
	11	920.0	0.0	0.0	920.0	103.1	13.0
	12	1653.2	13.2	0.0	1666.4	2.0	0.3
	13	853.2	26.4	93.2	972.8	55.5	6.6
SFN	1	burned - Nuttall fire, 2004					
	2	burned - Nuttall fire, 2004					
	3	burned - Nuttall fire, 2004					
	4	186.4	66.4	13.2	266.0	71.8	11.1
	5	26.4	40.0	573.2	639.6	0.0	0.0
	6	0.0	40.0	26.4	66.4	15.3	1.4
	7	burned - Nuttall fire, 2004					
	8	burned - Nuttall fire, 2004					
	9	burned - Nuttall fire, 2004					
	10	burned - Nuttall fire, 2004					
	11	40.0	0.0	53.2	93.2	0.0	0.0
	12	186.4	0.0	13.2	199.6	0.1	0.0
	13	120.0	466.4	80.0	666.4	71.3	11.6

Appendix A-1: Mean number of seeds and weights for 2006 seeds and 2006 mushrooms, by area and habitat.

		Corkbark Fir	Douglas-fir	Englemann Spruce	Total Seeds	Total Mushrooms	
AREA	N	# 1000 seeds/ha	# 1000 seeds/ha	# 1000 seeds/ha	# 1000 seeds/ha	ww Kg/ha	dw Kg/ha
TRC \bar{x}	5	634.6	621.1	13.3	1269.0	72.5	7.9
TRN \bar{x}	4	1286.6	306.5	13.3	1606.4	173.9	20.8
SFC \bar{x}	5	1399.9	7.9	114.6	1522.5	66.5	7.6
SFN \bar{x}	6	93.2	102.1	126.5	321.9	26.4	4.0
TR \bar{x}	9	924.4	481.3	13.3	1418.9	117.6	13.6
SF \bar{x}	11	687.2	59.3	121.1	867.6	44.6	5.6

Appendix B: Midden occupancy records for the monitored areas, 2007.

KEY

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, numbers indicate RSMP Animal ID) [B - blue, G - green, M - metal, O - orange, P - pink, R - red, Y - yellow, W - white N - none, - - rip] [tag shape is round unless noted: sq - square, tr - triangle]
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), 2007				
Midden	Mar	Jun	Sep	Dec
1101 ⁸⁹	located off-area, new number - 5101			
1102 ⁸⁹	♂ (M/M ID?) 2	♂ (M/M ID?) 2	♂ (M/M ID?) 2	♂ (M/M ID?) 2
1103 ⁸⁹	♀ (M/M 783)	♀ (Gsq/Bsq 783)	♀ (Gsq/rip 783)	♂ (R/B 784) 12
1104 ⁸⁹	♂ (R/B 784)	♂ (R/B 784)	♂ (R/B 784)	P ¹²
1105 ⁸⁹	burned in Clark Peak fire - April 1996			
1106 ⁸⁹	N	N	N	N
1107 ⁸⁹	burned in Clark Peak fire - April 1996			
1108 ⁸⁹	removed from census - low occupancy ¹			
1109 ⁸⁹	burned in Clark Peak fire - April 1996			
1110 ^{89*}	burned in Clark Peak fire - April 1996			
1111 ⁸⁹	N	N	N	N
1112 ^{89*}	N	N	N	N
1113 ⁸⁹	N	P	S	N
1114 ⁸⁹	located off-area, new number - 5114			
1115 ⁸⁹	N	P	N	N
1116 ⁸⁹	♂	S	♂ (Wsq/Ysq 829)	♂ (M/M 854) 13
1117 ⁸⁹	burned in Clark Peak fire - April 1996			
1118 ⁸⁹	♂ ³	♀	♀	Y
1119 ⁸⁸	burned in Clark Peak fire - April 1996			
1120 ⁸⁹	burned in Clark Peak fire - April 1996			
1121 ^{89*}	♀ (M/M ID?) 4	♀ (Gsq/Psq 728) 4	♀ (Gsq/Psq RC 728)	♀ (Gsq/Psq RC 728)
1122 ⁸⁹	burned in Clark Peak fire - April 1996			
1123 ^{95*}	burned in Clark Peak fire - April 1996			
1124 ^{95*}	burned in Clark Peak fire - April 1996			
1125 ^{95*}	burned in Clark Peak fire - April 1996			
1126 ^{95*}	removed from census - low occupancy ¹			
1130 ⁹⁰	burned in Clark Peak fire - April 1996			
1131 ^{90*}	N	Y	♂	N
1132 ^{90*}	removed from census - low occupancy ¹			
1134 ^{91*}	removed from census - low occupancy ¹			
1135 ^{91*}	burned in Clark Peak fire - April 1996			
1136 ^{91*}	burned in Clark Peak fire - April 1996			
1137 ^{91*}	burned in Clark Peak fire - April 1996			
1138 ^{91*}	removed from census - low occupancy ¹			

Transition Construction Area (TRC), 2007				
Midden	Mar	Jun	Sep	Dec
1139 ^{91*}	burned in Clark Peak fire - April 1996			
1140 ^{91*}	burned in Clark Peak fire - April 1996			
1142 ^{91*}	burned in Clark Peak fire - April 1996			
1143 ^{91*}	burned in Clark Peak fire - April 1996			
1144 ^{91*}	N	N	N	N
1145 ^{91*}	located off-area, new number - 5145			
1146 ^{91*}	removed from census - low occupancy ¹			
1147 ^{91*}	N	N	♂ (rip/M ID?) 8	N
1148 ^{91*}	burned in Clark Peak fire - April 1996			
1149 ^{91*}	N	N	N	N
1150 ^{91*}	located off-area, new number - 5150			
1151 ^{91*}	N	♀ (O/W RC 788)	♀ (rip/rip RC 788) 9	♀ (rip/rip RC 788) 9
1152 ^{91*}	burned in Clark Peak fire - April 1996			
1153 ^{92*}	♀ (M/M ID?) 5	♀ (P/B RC 743) 5	♀ (P/B RC 743) + 3J ¹⁰	♂ (M/M RC 14) 14
1154 ^{92*}	N	N	N	N
1155 ^{93*}	located off-area, new number - 5155			
1156 ^{93*}	N	P	♂ (W/B 852)	♀ (P/B RC 743)
1157 ^{93*}	located off-area, new number - 5157			
1159 ^{93*}	burned in Clark Peak fire - April 1996			
1160 ^{96*}	N	P	♀	Y
1161 ^{96*}	removed from census - low occupancy ¹			
1162 ^{96*}	P	P	P	N
1163 ^{98*}	N	N	N	N
1164 ^{98*}	removed from census - low occupancy ¹			S ¹⁵
1165 ^{98*}	removed from census - low occupancy ¹			
1166 ^{98*}	removed from census - low occupancy ¹			
1167 ^{98*}	♂ (B/B 772)	♂ (M/M RC 14) 7	P ⁷	N
1168 ^{98*}	N	N	N	N
1169 ^{98*}	removed from census - low occupancy ¹		♂ (M/M RC 14) 7	N
1170 ^{98*}	♀ ⁶	♂ (Bsq/Ysq RC 799) 6	♂ (Bsq/Ysq RC 799)	♂ (Bsq/Ysq RC 799)
1171 ^{98*}	N	N	N	N
1172 ^{90*}	S	♀	P	N
1173 ^{99*}	N	N	N	N
1174 ^{99*}	removed from census - low occupancy ¹			

Transition Construction Area (TRC), 2007				
Midden	Mar	Jun	Sep	Dec
1175 ^{99*}	removed from census - low occupancy ¹			
1176 ^{99*}	removed from census - low occupancy ¹			
1177 ^{99*}	♀	Y	♂	N
1178 ^{99*}	removed from census - low occupancy ¹			
1179 ^{99*}	N	N	N	N
1180 ^{99*}	N	N	N	N
1181 ^{99*}	removed from census - low occupancy ¹			
1182 ^{02*}	♀ (B/G 773)	♀ (B/G 773)	♀ (B/M 773) 11	N
1183 ^{04*}	N	N	N	N
1184 ^{04*}	N	N	N	N
1185 ^{05*}	N	N	N	N
1186 ^{05*}	N	N	N	N
1187 ^{05*}	N	N	N	N
# Mid	37	37	38	39
# Occ	12	14	17	11
% Occ	32.4%	37.8%	44.7%	28.2%
# Sq	12	14	17 + 3J	11

Appendix B - 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. After 2003, all of the removed-low occupancy middens are checked each census. Any middens that become re-occupied are added back to regular censusing.
- 2 The resident at midden 1102 for Mar, Jun, Sep, and Dec 07, had metal/metal ear tags. This may have been animal # 748, who was trapped at 1102 in December of 2006. But the ID was not confirmed for Mar, Jun, Sep, and Dec 07, as the animal was not trapped for an ear tag check.
- 3 Male #666 (met/Ysq RC) was resident at midden 1118 in early March (also trapped at 1118 on 2 March). On 18 Mar 07, the collar along with small amounts of blood and hair were found far to the SE of midden 1118. Very shortly thereafter, an unmarked male appeared to be resident at midden 1118.
- 4 The resident at midden 1121 for March, had metal/metal ear tags. This may have been animal # 728. But the ID was not confirmed for March, as the animal was not trapped for an ear tag check. Female # 728 was trapped in early June as a resident at midden 1121. Her ID was confirmed and colored ear tags and radio collar were fitted.
- 5 The resident at midden 1153 for March, had metal/metal ear tags. This may have been animal # 743. But the ID was not confirmed for March, as the animal was not trapped for an ear tag check. Female #743 was trapped in mid May as a resident at midden 1153. Her ID was confirmed and colored ear tags and radio collar were fitted. On 4 Jun 07, over several hours, a large breeding chase was observed at midden 1153: 2 marked females, 1 unmarked female, 3 marked males, and 4 unmarked males were observed in the chase.
- 6 Male #729 (Psq/Psq RC) was resident at midden 1170 during the census period in early March. However, his body was found in a snow tunnel on 31 Mar 07. Cause of death was unknown, with no obvious signs of trauma or predation. An unmarked female was seen in the midden on 29 and 31 Mar 07. She appeared to be the new resident of the midden. By June 2007, the unmarked female was not seen and an unmarked male appeared to be resident at midden 1170. He was trapped and tagged (Bsq/Ysq RC, male #749) on 4 Jun 07.
- 7 Male #792 (B/B), former resident of midden 1167shift, had apparently changed residence to midden 5123 by June 07. Male #14 (M/M RC) was seen in midden 1167shift and determined to be the new resident for June 07. Male #14 was last seen on the TRC area in July 2006. His signal was detected to the NE of the SFC area in early August 2006, then not heard after. He has apparently journeyed back to the TRC area (his previous midden in 2006 was 1170.) By Sep 07, male #14 had shifted his center of activity near midden 1169. He was observed foraging and had night nests in the area.
- 8 The marked male at midden 1147 shift (M/rip) is resident, but his ID is not known, as he was not trapped for ear tag confirmation in Sep 07.
- 9 The marked female #788, has lost both her ear tags (was O/W), but her ID was confirmed for Sep 07 with radio signal.

Appendix B - TRC (cont.)

- 10 Three juveniles were observed several times with adult female #743 at midden 1153. The young were agile and attempting to feed on cones. They possibly emerged from the natal nest 2-3 weeks earlier, but this is just an estimation.
- 11 The marked female, #773, at midden 1182, lost her right colored ear tag (was G).
- 12 Female #783, resident of midden 1103 in Sep 07, was last seen in Oct 07. Her fate is unknown. Male #784, resident of midden 1104 shift in Sep 07, moved to midden 1103 by Dec 07. There was a small amount of sign found at midden 1104 shift, so it is possible that male #784 or other squirrels are foraging in the area.
- 13 Male #829 was not seen in midden 1116 in Dec 07. His fate is unknown. A new male, #854, was trapped in the midden in Dec 07 and appears to be the new resident.
- 14 Between Sep 07 and Dec 07, male #14 moved from midden 1169 to midden 1153. Female #743, moved from 1153 to 1156 in the same period. Male #852, previous resident of midden 1153, was not seen in Dec 07 and his fate is unknown.
- 15 Midden 1164, previously removed due to low occupancy was determined to be re-occupied with fresh sign seen and an unmarked resident squirrel.

Transition Non-Construction Area (TRN), 2007				
Midden	Mar	Jun	Sep	Dec
2201 ⁸⁹	removed from census - low occupancy ¹			
2202 ⁸⁹	N	N	N	N
2203 ⁸⁹	N	N	N	N
2204 ⁸⁹	N	N	N	N
2205 ⁸⁹	N	N	N	N
2206 ⁸⁹	♂ (G/P RC 746)	♂ (G/P RC 746)	♂ (G/P RC 746)	♂ (G/P RC 746)
2207 ^{89*}	burned in Nuttall fire - July 2004			
2208 ^{89*}	N	N	♀ (Y/O RC 740) ⁴	♀ (Y/O RC 740)
2209 ⁸⁹	removed from census - low occupancy ¹			
2210 ⁹⁰	N	N	N	N
2211 ^{90*}	♀ (M/M 776)	♀ (M/M 776)	♀ (rip/R RC 776)	♀ (rip/R RC 776)
2212 ⁹⁰	removed from census - low occupancy ¹			
2213 ⁹⁰	removed from census - low occupancy ¹			
2214 ^{90*}	located on TRC, new number - 1172			
2215 ^{90*}	♂ (W/P RC 782)	♂ (W/P RC 782)	♂ (W/P RC 782)	N ⁷
2216 ^{90*}	♂ (Y/W RC 781)	♂ (Y/W RC 781)	♂ (Y/W RC 781)	Y ⁸
2217 ^{90*}	N	S	♂ (M/M ID?) ⁵	N
2218 ^{91*}	N	N	N	N
2219 ^{91*}	♂	♂ (M/M ?) ³	♀ (Y/rip 39) ⁶	♀ (Y/rip 39)
2220 ^{91*}	removed from census - low occupancy ¹			
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	removed from census - low occupancy ¹			
2226 ^{95*}	removed from census - low occupancy ¹			
2227 ^{95*}	N	N	N	N
2228 ^{95*}	removed from census - low occupancy ¹			
2229 ^{96*}	N	N	N	♀ (M/M 875)
2230 ^{96*}	N	N	N	N
2231 ^{96*}	located off-area, new number - 5231			
2232 ^{96*}	located off-area, new number - 5232			
2233 ^{96*}	removed from census - low occupancy ¹			

Transition Non-Construction Area (TRN), 2007				
Midden	Mar	Jun	Sep	Dec
2234 ^{97*}	♀ (M/M 785)	P	♀	♂
2235 ^{98*}	N	N	N	N
2236 ^{98*}	♀ (M/M 780)	♀ (O/G RC 780)	♀ (O/G RC 780)	♀ (O/G RC 780)
2237 ^{98*}	N	N	N	N
2238 ⁹⁸	♀ (M/M 778)	♀ (Gsq/Bsq RC 778)	♀ (Gsq/Bsq RC 778)	♀ (Gsq/Bsq RC 778)
2239 ⁹⁸	removed from census - low occupancy ¹			
2240 ⁹⁸	removed from census - low occupancy ¹			
2241 ^{98*}	N	P	N	N
2242 ^{98*}	N ²	P	♀ (Gsq/Gsq 850)	♀ (M/M 877) ⁹
2243 ⁹⁸	removed from census - low occupancy ¹			
2244 ^{99*}	♂	♂	♂ (Bsq/Bsq 851)	♂ (rip/Bsq 851)
2245 ^{99*}	removed from census - low occupancy ¹			
2246 ^{99*}	N	N	N	N
2247 ^{99*}	burned in Nuttall fire - July 2004			
2248 ^{99*}	N	N	♀ (B/R 849)	P
2249 ^{99*}	N	N	N	N
2250 ^{00*}	N	N	N	N
2251 ^{00*}	removed from census - low occupancy ¹			
# Mid	29	29	29	29
# Occ	9	9	13	11
% Occ	31.0%	31.0%	44.8%	37.9%
# Sq	9	9	13	11

Appendix B - 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. After 2003, all of the removed-low occupancy middens are checked each census. Any middens that become reoccupied are added back to regular censusing.
- 2 In March 2007, there was quite a bit of Abert's squirrel feeding noted in and around the area of midden 2242. No red squirrel sign was seen.
- 3 The resident male (M/M) at midden 2219 in June 07 could be male #750, who was first captured and tagged at midden 2219 in December 06. However, he was not captured in June 07 for positive ear tag identification.
- 4 Female #740 was previously resident in the midden 5124 area. By Sep 07, she was residing at midden 2208, caching and using nests in the area.
- 5 The marked male (M/M) at midden 2217 had metal ear tags, but his ID was unknown, as he was not trapped for positive ID in Sep 07.
- 6 Female #39 was seen alive at midden 2219 shift in Sep 07. She was last seen in spring 07, shortly after her collar was signaling from inside a nearby nest. She was re-collared on 12 Dec 07 and still resides at midden 2219 shift.
- 7 Collar for male #782 was found on the ground 27 Oct 07. There were no signs of predation and the male was not seen during subsequent observations at midden 2215. His fate is unknown.
- 8 Male #781 had his radio collar removed in early Sep 07 due to slight neck wear. He was not observed after this time. Midden 2216 shift did appear to be occupied in Dec 07, based on sign, but no resident red squirrel was seen.
- 9 Female #877 was trapped in Dec 07 at midden 2242. This female had small rips in both ears, so she may have been previously ear tagged, but no way to tell for sure, so she was given new ear tags and animal ID number. Female #850 (Gsq/Gsq) was resident at midden 2242 in Sep 07, so it is possible that this is the same female.

Spruce-Fir Construction Area (SFC), 2007				
Midden	Mar	Jun	Sep	Dec
3000 ^{95*}	burned in Nuttall fire - July 2004			
3001 ^{95*}	burned in Nuttall fire - July 2004			
3002 ^{95*}	removed from census - low occupancy ¹			
3003 ^{95*}	removed from census - low occupancy ¹			
3004 ^{95*}	burned in Clark Peak fire - April 1996			
3005 ^{95*}	removed from census - low occupancy ¹			
3006 ^{95*}	destroyed by fire suppression in Nuttall fire - July 2004			
3007 ^{95*}	removed from census - too far off area, new # 5307			
3008 ^{95*}	burned in Nuttall fire - July 2004			
3009 ^{95*}	removed from census - low occupancy ¹			
3010 ^{95*}	removed from census - low occupancy ¹			
3011 ^{95*}	located off-area, new number - 5311			
3012 ^{95*}	burned in Clark Peak fire - April 1996			
3013 ^{95*}	removed from census - low occupancy ¹			
3014 ^{95*}	removed from census - low occupancy ¹			
3015 ^{95*}	burned in Clark Peak fire - April 1996			
3016 ^{95*}	burned in Clark Peak fire - April 1996			
3017 ^{95*}	burned in Clark Peak fire - April 1996			
3018 ^{95*}	burned in Clark Peak fire - April 1996			
3019 ^{96*}	removed from census - low occupancy ¹			
3020 ^{96*}	N	N	N	N
3021 ^{96*}	burned in Clark Peak fire - April 1996			
3022 ^{96*}	removed from census - low occupancy ¹			
3023 ^{96*}	burned in Nuttall fire - July 2004			
3024 ^{98*}	removed from census - low occupancy ¹			
3025 ^{98*}	removed from census - low occupancy ¹			
3026 ^{98*}	removed from census - low occupancy ¹			
3027 ^{99*}	removed from census - low occupancy ¹			
3028 ^{99*}	N	N	N	N
3029 ^{99*}	removed from census - low occupancy ¹			
3030 ^{99*}	removed from census - low occupancy ¹			
3031 ^{99*}	removed from census - low occupancy ¹			
3032 ^{99*}	removed from census - low occupancy ¹			
3300 ⁸⁶	burned in Nuttall fire - July 2004			
3301 ^{94*}	burned in Nuttall fire - July 2004			

Spruce-Fir Construction Area (SFC), 2007				
Midden	Mar	Jun	Sep	Dec
3302 ^{94*}	located off-area, new number - 5302			
3303 ^{94*}	N	N	N	N
3304 ^{94*}	removed from census - low occupancy ¹			
3305 ^{94*}	removed from census - low occupancy ¹			
3306 ^{94*}	burned in Nuttall fire - July 2004			
3307 ^{94*}	removed from census - low occupancy ¹			
3308 ^{95*}	burned in Nuttall fire - July 2004			
3309 ^{95*}	removed from census - low occupancy ¹			
3310 ^{95*}	♀	♀	♀ (R/Y 845)	P
3311 ^{95*}	♂	♂	N	N
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*}	burned in Nuttall fire - July 2004			
3317 ^{95*}	removed from census - low occupancy ¹			
3318 ^{95*}	removed from census - low occupancy ¹			
3319 ^{95*}	removed from census - low occupancy ¹			
3320 ^{95*}	removed from census - low occupancy ¹			
3321 ^{95*}	burned in Nuttall fire - July 2004			
3322 ^{95*}	removed from census - low occupancy ¹			
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*}	removed from census - low occupancy ¹			
3328 ^{95*}	removed from census - low occupancy ¹			
3329 ^{95*}	removed from census - low occupancy ¹			
3330 ^{95*}	N	N	N	N
3331 ^{95*}	burned in Nuttall fire - July 2004 ³			
3332 ^{95*}	removed from census - low occupancy ¹			
3333 ^{95*}	removed from census - low occupancy ¹			
3334 ^{95*}	burned in Nuttall fire - July 2004			
3335 ^{95*}	removed from census - low occupancy ¹			
3336 ^{95*}	removed from census - low occupancy ¹			

Spruce-Fir Construction Area (SFC), 2007				
Midden	Mar	Jun	Sep	Dec
3337 ^{95*}	removed from census - low occupancy ¹			
3338 ^{95*}	burned in Nuttall fire - July 2004			
3339 ^{95*}	removed from census - low occupancy ¹			
3340 ^{95*}	removed from census - low occupancy ¹			
3341 ^{95*}	N	N	N	N
3342 ^{95*}	removed from census - low occupancy ¹			
3343 ^{95*}	removed from census - low occupancy ¹			
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*}	N	N	N	N
3349 ^{95*}	burned in Nuttall fire - July 2004			
3350 ⁸⁷	removed from census - low occupancy ¹			
3351 ⁸⁷	burned in Nuttall fire - July 2004			
3352 ⁸⁶	removed from census - low occupancy ¹			
3353 ⁸⁷	removed from census - low occupancy ¹			
3354 ⁸⁶	removed from census - low occupancy ¹			
3355 ^{95*}	burned in Nuttall fire - July 2004			
3356 ⁸⁶	burned in Nuttall fire - July 2004			
3357 ⁸⁶	removed from census - low occupancy ¹			
3358 ⁸⁷	burned in Clark Peak fire - April 1996			
3359 ⁸⁷	burned in Clark Peak fire - April 1996			
3360 ⁸⁶	♂ (Psq/Ysq RC 745)	♂ (Psq/Ysq RC 745)	♂ (Psq/Ysq RC 745)	♂ (Psq/Ysq RC 745)
3361 ⁸⁶	removed from census - low occupancy ¹			
3362 ⁸⁶	P ²	♀ (Y/Y RC 793)	♀ (Y/Y RC 793)	N
3363 ⁸⁶	removed from census - low occupancy ¹			
3364 ⁸⁶	removed from census - low occupancy ¹			
3365 ⁸⁶	S	♂	♂	P
3366 ⁸⁶	♀	♀ (Y/P RC 792)	P ⁴	N
3367 ⁸⁷	removed from census - low occupancy ¹			
3368 ⁸⁶	removed from census - low occupancy ¹			
3369 ⁸⁶	removed from census - low occupancy ¹			
3370 ⁸⁶	N	N	N	N
3371 ⁸⁷	N	N	N	N

Spruce-Fir Construction Area (SFC), 2007				
Midden	Mar	Jun	Sep	Dec
3372 ⁸⁹	N	N	N	N
3373 ⁸⁷	removed from census - low occupancy ¹			
3374 ⁸⁹	P ³	N	♂ (M/M RC 159) ⁵	♀ ⁵
3375 ⁸⁶	removed from census - low occupancy ¹			
3376 ⁸⁶	located off-area, new number - 5376			
3377 ⁸⁷	located off-area, new number - 5377			
3378 ^{90*}	♀	♀	Y	N
3379 ^{90*}	removed from census - low occupancy ¹			
3380 ^{90*}	removed from census - low occupancy ¹			
3381 ⁹⁰	burned in Nuttall fire - July 2004			
3382 ^{91*}	N	N	N	N
3383 ^{91*}	removed from census - low occupancy ¹			
3384 ^{91*}	burned in Clark Peak fire - April 1996			
3385 ^{91*}	removed from census - low occupancy ¹			
3386 ^{91*}	removed from census - low occupancy ¹			
3387 ^{91*}	burned in Nuttall fire - July 2004			
3388 ^{92*}	located off-area, new number - 5388			
3389 ^{93*}	removed from census - low occupancy ¹			
3390 ^{93*}	removed from census - low occupancy ¹			
3390 ^{93*}	removed from census - low occupancy ¹			
3391 ^{93*}	removed from census - low occupancy ¹			
3392 ^{93*}	removed from census - low occupancy ¹			
3393 ^{93*}	destroyed by fire suppression in Nuttall fire - July 2004			
3394 ^{93*}	N	N	N	N
3395 ^{94*}	removed from census - low occupancy ¹			
3396 ^{94*}	removed from census - low occupancy ¹			
3397 ⁸⁶	burned in Nuttall fire - July 2004			
3398 ⁸⁶	burned in Nuttall fire - July 2004			
3399 ^{94*}	burned in Nuttall fire - July 2004			
# Mid	22	22	22	22
# Occ	6	7	6	2
% Occ	27.3%	31.8%	27.3%	9.1
# Sq	6	7	6	2

Appendix B - 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. After 2003, all of the removed-low occupancy middens are checked each census. Any middens that become reoccupied are added back to regular censusing.
- 2 A partial squirrel skull was found in the snow near midden 3362shift during the Mar 07 census. There was small amount of fresher looking sign in the midden area, but a new resident could not be confirmed on subsequent observations. Midden is Possibly Occupied for Mar 07.
- 3 A few red squirrel tracks and some apparent nest debris were located in and around midden 3374. However a resident squirrel was not seen during follow-up observations. Midden is Possibly Occupied for Mar 07.
- 4 Female #792, previously resident at midden 3366, was not seen after Jun 07. Female #795 (last resident at midden 9207, far S side of SFC) was possibly seen one time in midden 3366 in Sep 07, but was never confirmed as resident and not seen again.
- 5 Male #159 (M/M RC) last seen/heard on the study area in Jul 06 in the 3360 area. His ID was confirmed with trapping and he appears to be the new resident at midden 3374. In Dec 07, the signal for male #159 was coming from nest snag in midden, and he was not seen during multiple observations. An unmarked female was seen several times in the midden and appears to be the new resident.

Spruce-Fir Non Construction Area (SFN), 2007				
Midden	Mar	Jun	Sep	Dec
4000 ^{95*}	S	Y	N	N
4001 ^{95*}	burned in Nuttall fire - July 2004			
4002 ^{95*}	removed from census - low occupancy ¹			
4003 ^{95*}	burned in Nuttall fire - July 2004			
4004 ^{95*}	burned in Nuttall fire - July 2004			
4005 ^{95*}	burned in Nuttall fire - July 2004			
4006 ^{95*}	burned in Nuttall fire - July 2004			
4007 ^{95*}	burned in Nuttall fire - July 2004			
4008 ^{95*}	burned in Nuttall fire - July 2004 ⁴			
4009 ^{95*}	burned in Nuttall fire - July 2004			
4010 ^{95*}	N	N	N	N
4011 ^{95*}	removed from census - low occupancy ¹			
4012 ^{95*}	burned in Nuttall fire - July 2004			
4013 ^{96*}	removed from census - low occupancy ¹			
4014 ^{96*}	removed from census - low occupancy ¹			
4015 ^{96*}	burned in Nuttall fire - July 2004			
4016 ^{96*}	N	N	N	N
4017 ^{96*}	burned in Nuttall fire - July 2004			
4018 ^{96*}	burned in Nuttall fire - July 2004			
4019 ^{96*}	burned in Nuttall fire - July 2004			
4020 ^{96*}	removed from census - low occupancy ¹			
4021 ^{96*}	burned in Nuttall fire - July 2004			
4022 ^{98*}	removed from census - low occupancy ¹			
4023 ^{98*}	removed from census - low occupancy ¹			
4024 ^{98*}	removed from census - low occupancy ¹			
4025 ^{99*}	removed from census - low occupancy ¹			
4400 ⁸⁹	N	N	N	N
4401 ^{94*}	burned in Nuttall fire - July 2004			
4402 ^{94*}	burned in Nuttall fire - July 2004			
4403 ^{94*}	removed from census - low occupancy ¹			
4404 ^{95*}	burned in Nuttall fire - July 2004			
4405 ^{95*}	burned in Nuttall fire - July 2004			
4406 ^{95*}	burned in Nuttall fire - July 2004			
4407 ^{95*}	burned in Nuttall fire - July 2004			
4408 ^{95*}	removed from census - low occupancy ¹			

Spruce-Fir Non Construction Area (SFN), 2007				
Midden	Mar	Jun	Sep	Dec
4409 ^{95*}	burned in Nuttall fire - July 2004			
4410 ^{95*}	located off-area, new number - 5410			
4411 ^{95*}	burned in Nuttall fire - July 2004			
4412 ^{95*}	burned in Nuttall fire - July 2004			
4413 ^{95*}	located off-area, new number - 5413			
4414 ^{95*}	burned in Nuttall fire - July 2004			
4415 ^{95*}	burned in Nuttall fire - July 2004			
4416 ^{95*}	burned in Nuttall fire - July 2004			
4417 ^{95*}	N	N	N	N
4418 ^{95*}	burned in Nuttall fire - July 2004			
4419 ^{95*}	burned in Nuttall fire - July 2004			
4420 ⁹⁰	burned in Nuttall fire - July 2004			
4421 ⁸⁶	burned in Nuttall fire - July 2004			
4422 ⁸⁶	burned in Nuttall fire - July 2004			
4423 ⁸⁶	burned in Nuttall fire - July 2004			
4424 ⁸⁶	burned in Nuttall fire - July 2004			
4425 ⁸⁷	burned in Nuttall fire - July 2004			
4426 ⁸⁶	burned in Nuttall fire - July 2004			
4427 ⁸⁶	burned in Nuttall fire - July 2004			
4428 ⁸⁶	burned in Nuttall fire - July 2004			
4429 ⁸⁶	burned in Nuttall fire - July 2004			
4430 ⁸⁶	burned in Nuttall fire - July 2004			
4431 ⁸⁶	burned in Nuttall fire - July 2004			
4432 ⁸⁶	burned in Nuttall fire - July 2004			
4433 ⁸⁷	burned in Nuttall fire - July 2004			
4434 ⁸⁶	burned in Nuttall fire - July 2004			
4435 ⁸⁶	burned in Nuttall fire - July 2004			
4436 ⁸⁶	burned in Nuttall fire - July 2004			
4437 ^{95*}	burned in Nuttall fire - July 2004			
4438 ^{90*}	burned in Nuttall fire - July 2004			
4439 ^{90*}	burned in Nuttall fire - July 2004			
4440 ⁹¹	burned in Nuttall fire - July 2004			
4441 ⁸⁶	burned in Nuttall fire - July 2004			
4442 ^{95*}	burned in Nuttall fire - July 2004			
4443 ⁸⁶	burned in Nuttall fire - July 2004			
4444 ⁸⁶	burned in Nuttall fire - July 2004			

Spruce-Fir Non Construction Area (SFN), 2007				
Midden	Mar	Jun	Sep	Dec
4445 ⁸⁶	burned in Nuttall fire - July 2004			
4446 ⁸⁶	burned in Nuttall fire - July 2004			
4447 ⁸⁶	burned in Nuttall fire - July 2004			
4448 ⁸⁶	burned in Nuttall fire - July 2004			
4449 ⁸⁶	burned in Nuttall fire - July 2004			
4450 ⁸⁶	burned in Nuttall fire - July 2004			
4451 ⁸⁸	burned in Nuttall fire - July 2004			
4452 ⁸⁶	burned in Nuttall fire - July 2004			
4453 ⁸⁶	burned in Nuttall fire - July 2004			
4454 ⁸⁶	removed from census - low occupancy ¹			
4455 ⁸⁶	burned in Nuttall fire - July 2004			
4456 ⁸⁶	burned in Nuttall fire - July 2004			
4457 ⁸⁶	burned in Nuttall fire - July 2004			
4458 ⁸⁶	removed from census - low occupancy ¹			
4459 ⁸⁶	burned in Nuttall fire - July 2004			
4460 ⁸⁷	burned in Nuttall fire - July 2004			
4461 ^{91*}	burned in Nuttall fire - July 2004			
4462 ⁹⁰	burned in Nuttall fire - July 2004			
4463 ⁹⁰	burned in Nuttall fire - July 2004			
4464 ⁹⁰	removed from census - low occupancy ¹			
4465 ^{90*}	S	♂ (Osq/Gsq 802)	♂ (Osq/Gsq 802) 2	♂ (Osq/Gsq 802) 2
4466 ⁸⁷	removed from census - low occupancy ¹			
4467 ⁸⁷	♂	♂ (Psq/Rsq 803)	P 2	P 2
4468 ⁸⁷	removed from census - low occupancy ¹			
4469 ⁸⁷	S	Y	N	N
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	N	N	N	N
4475 ⁸⁷	located off-area, new number - 5405			
4476 ^{95*}	removed from census - low occupancy ¹			
4477 ⁸⁷	N	N	N	N
4478 ^{90*}	removed from census - low occupancy ¹			
4479 ^{90*}	removed from census - low occupancy ¹			
4480 ^{90*}	burned in Nuttall fire - July 2004			

Spruce-Fir Non Construction Area (SFN), 2007				
Midden	Mar	Jun	Sep	Dec
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*}	removed from census - low occupancy ¹			
4490 ^{91*}	burned in Nuttall fire - July 2004			
4491 ^{91*}	S	♀	♂	Y
4492 ^{91*}	removed from census - low occupancy ¹			
4493 ^{91*}	burned in Nuttall fire - July 2004			
4494 ^{91*}	burned in Nuttall fire - July 2004			
4495 ^{95*}	burned in Nuttall fire - July 2004			
4496 ^{93*}	removed from census - low occupancy ¹			
4497 ^{93*}	burned in Nuttall fire - July 2004			
4498 ^{93*}	burned in Nuttall fire - July 2004			
4499 ^{93*}	burned in Nuttall fire - July 2004			
# Mid	15	15	15	15
# Occ	5	5	2	2
% Occ	33.3%	33.3%	13.3%	13.3%
# Sq	5	5	2	2

Appendix B - 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. After 2003, all of the removed-low occupancy middens are checked each census. Any middens that become reoccupied are added back to regular censusing.

- 2 Only a small amount of sign was seen at midden 4467. The male marked here in Jun 07 (Psq/Rsq #803) was not seen during the Sep 07 census. There was more fresh sign visible at midden 4465 - a chatter call was heard to the West of the midden and a few minutes later male #802 (Osq/Gsq - tagged at 4465 in Jun 07) was seen on the NE edge of midden 4467, where he chattered and entered a nest snag. It is possible that he is using both middens 4465 and 4467. In Dec 07, there was more sign seen at midden 4465, but male #802 was again seen in the area of the nest snag near midden 4467. He may be using both middens. Male #803 was not seen in Dec 07 and his fate is unknown.

Off-Area Midden Occupancy, 2007				
Midden	Mar	Jun	Sep	Dec
TRC Area				
5101 ⁸⁹	♂ (M/rip RC 40)	♂ (M/rip RC 40)	♂ (M/rip RC 40)	♂ (M/rip RC 40)
5102 ^{98*}	♀ (M/M ID?) 2	♀ (Wsq/Osq 749) 2	♀ (Wsq/rip 749) 2	♀ (Wsq/rip 749)
5103 ^{99*}	S	P	N	N
5104 ^{99*}	N	N	N	N
5105 ^{02*}	N	N	N	N
5106 ⁰²	N	N	N	N
5107 ⁰²	N	N	N	P
5114 ⁸⁹	removed from census - low occupancy ¹			
5118 ^{94*}	N	Y	♀	N
5119 ^{89*}	♂ (Wsq/Psq RC 742)	♂ (P/Y RC 730) 4	♂ (P/Y RC 730) 4	♀ (rip/M ID?) 4
5120 ^{89*}	removed from census - too far off area			
5121 ^{89*}	♂ (P/Y 730)	P ⁴	♂	♂
5122 ⁸⁹	removed from census - low occupancy ¹			
5123 ⁸⁹	ROA ³ ♀ (Ysq/Psq RC 731)	ROA ³ ♀ (B/B RC 772)	ROA ³ ♀ (B/B RC 772)	P
5124 ^{90*}	ROA ³ ♀ (Ysq/Osq RC 740)	ROA ³ ♀ (Ysq/Osq RC 740)	N ⁶	N
5125 ^{89*}	N	N	N	N
5126 ⁹¹	N	N	N	N
5127 ^{95*}	removed from census - low occupancy ¹			
5145 ^{91*}	N	N	N	N
5150 ^{91*}	N	N	N	N
5155 ^{93*}	♂	♂ (Wsq/Bsq RC 789)	♂ (Wsq/Bsq RC 789)	♂ ⁷
5157 ^{93*}	removed from census - low occupancy ¹			
TRN Area				
5200 ^{93*}	♂ (M/M 778)	♂ (R/P 777)	♂ (R/P 777)	♂ (R/P 777)
5201 ^{99*}	P	N	N	N
5202 ^{99*}	burned in Nuttall fire - July 2004			
5203 ^{90*}	N	N	N	N
5221 ^{91*}	♀ (rip/Y RC 39)	♀ (Gsq/Osq RC 800) 5	♀ (Gsq/Osq RC 800) 5	♀ (Gsq/Osq RC 800)
5231 ^{96*}	N	P	N	N
5232 ^{96*}	N	N	P	N

Off-Area Midden Occupancy, 2007				
Midden	Mar	Jun	Sep	Dec
SFC Area				
5302 ^{94*}	burned in Nuttall fire - July 2004			
5307 ^{95*}	removed from census - too far off area			
5311 ^{95*}	N	N	N	N
5313 ^{95*}	N	N	N	N
5350 ⁸⁶	♀	♂	♂ (Psq/Psq 806)	P
5351 ^{94*}	burned in Nuttall fire - July 2004			
5352 ^{94*}	burned in Nuttall fire - July 2004			
5353 ^{94*}	removed from census - too far off area			
5354 ^{94*}	burned in Nuttall fire - July 2004			
5355 ^{94*}	burned in Nuttall fire - July 2004			
5356 ^{94*}	burned in Nuttall fire - July 2004			
5357 ^{95*}	removed from census - low occupancy ¹			
5358 ^{95*}	burned in Nuttall fire - July 2004			
5359 ^{95*}	burned in Nuttall fire - July 2004			
5360 ^{96*}	burned in Nuttall fire - July 2004			
5361 ^{96*}	N	N	N	N
5362 ^{96*}	removed from census - low occupancy ¹			
5376 ⁸⁶	removed from census - low occupancy ¹			
5377 ⁸⁷	removed from census - low occupancy ¹			
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			

Appendix B - 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. After 2003, all of the removed-low occupancy middens are checked each census. Any middens that become reoccupied are added back to regular censusing.
- 2 The resident at midden 5102 for March, had metal/metal ear tags. This may have been animal # 749. But the ID was not confirmed for March, as the animal was not trapped for an ear tag check. Animal #749 was trapped at midden 5102 in Jun 07 and given colored ear tags (Wsq/Osq).
- 3 Middens 5123 and 5124 are removed from regular censusing as they are too far from the monitored areas. Information is shown as middens were occupied by marked, radio-collared animals. These animals are NOT included in population totals for the monitored areas. Male #772 was previously resident at midden 1167 in March 07. Female #731 was not seen after the March census.
- 4 Male #742 was last seen on 28 March 07 in midden 5119, without a radio collar. His fate is unknown. By May 07, a new male appeared to be resident at midden 5119 - #730. Male #730 was previously resident at midden 5121. Male #730 was not seen in Dec 07 and a female with one metal ear tag appeared to be the new resident. But her ID was unknown as she was not trapped for an ear tag check.
- 5 The radio collar for female #39 was signaling from a nest near 5221. The animal was not seen and her fate was unknown for June 07. A new female (Gsq/Osq RC #800) was trapped and tagged at midden 5221 and appeared to be the new resident.
- 6 By Sep 07, female #740 (Ysq/Osq RC) had moved from midden 5124 to midden 2208, where she was observed caching cones and using nest trees.
- 7 The collar and remains of male #789, resident of midden 5155 in Sep 07, were found near midden 1112 on 2 Oct 07. This appeared to be a captor predation. By Dec 07, there was a new unmarked male resident.

Appendix C. Red squirrel populations (including juveniles still living at maternal middens) on the areas being monitored by the Red Squirrel Monitoring Program, from March 2003 - December 2007.

Date	TRC	TRN	SFC	SFN	TOTAL
Mar 2003	11	4	2	1	18
June 2003	9	2	2	0	13
Sep 2003	7 + 7J	3	1 + 4J	4	26
Dec 2003	11	6	8	11	36
Mar 2004	11	5	8	8	32
Jun 2004	8 + 2J	5 + 3J	6	9	28 + 5J
Sep 2004	12 + 2J	4 + 5J	3	0	19 + 7J
Dec 2004	12	3	3	0	18
Mar 2005	12	3	4	0	19
Jun 2005	14	3	2	0	19
Sep 2005	9 + 2J	4 + 1J	1	0	14 + 3J
Dec 2005	9	3	2	0	14
Mar 2006	9	1	2	0	12
Jun 2006	8	1	2	0	11
Sep 2006	10	3	4	1	18
Dec 2006	13	8	8	4	33
Mar 2007	12	9	6	5	32
Jun 2007	14	9	7	5	35
Sep 2007	17 + 3J	13	6	2	38 + 3J
Dec 2007	11	11	2	2	26

Appendix D: Quarterly occupancy maps for Mt. Graham red squirrels (*Tamiasciurus hudsonicus grahamensis*) on RSMP study areas, Pinaleno Mountains, Arizona, March 2007 - December 2007.

Appendix E: Measures of spatial distribution on the monitored areas, 2007

E-1. Crude Density

a) middens

b) squirrels

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

Appendix E-1a: Crude Density (middens/ha) of *middens*, in quarterly censuses, for each of the monitored areas for December 2006 through December 2007.

DATE	TRC	TRN	SFC	SFN
Area ¹ (after Jul 04)	51.1 ha	19.8 ha	58.5	34.1
Dec 2006	0.70	1.41	0.38	0.44
Mar 2007	0.72	1.46	0.38	0.44
Jun 2007	0.72	1.46	0.38	0.44
Sep 2007	0.74	1.46	0.38	0.44
Dec 2007	0.76	1.46	0.38	0.44

Appendix E-1b: Crude Density (squirrels/ha) of *red squirrels* (including juveniles at natal middens) in each of the monitored areas for December 2006 through December 2007.

DATE	TRC	TRN	SFC	SFN
Area ¹ (after Jul 04)	51.1 ha	19.8 ha	58.5	34.1
Dec 2006	0.25	0.40	0.14	0.12
Mar 2007	0.23	0.45	0.10	0.15
Jun 2007	0.27	0.45	0.12	0.15
Sep 2007	0.33	0.66	0.10	0.06
Dec 2007	0.22	0.56	0.03	0.06

1 The reduction in the size of the monitored areas after July 2004 was due to the Nuttall Fire. The areas removed were severely burned and are no longer suitable habitat.

Appendix E-2. Local Density (number within 100m radius) and Nearest Neighbor Distances of *middens* and *squirrels* (number of occupied middens), December 2006 through December 2007.

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 06	36	4.4	0.40	44.6	4.04	9	0.4	0.24	115.4	13
Mar 07	37	4.6	0.41	44.1	3.96	12	2.2	0.34	66.3	14.21
Jun 07	37	4.6	0.41	44.1	3.96	14	1.9	0.32	61.6	11.39
Sep 07	38	4.8	0.44	43.9	3.85	17	2.4	0.34	66.6	9.39
Dec 07	39	5.0	0.41	43.7	3.75	11	1.5	0.31	80.5	10.24

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 06	28	4.7	0.32	49.0	3.06	8	1.8	0.37	59.0	9.45
Mar 07	29	4.9	0.30	46.2	2.78	9	2.0	0.29	59.7	4.18
Jun 07	29	4.9	0.30	46.2	2.78	9	2.0	0.24	57.9	3.30
Sep 07	29	4.9	0.30	46.2	2.78	13	2.2	0.22	59.0	3.52
Dec 07	29	4.9	0.30	46.2	2.78	11	2.0	0.30	66.8	5.28

Appendix E-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 06	22	1.8	0.31	76.4	9.09	8	1.3	0.49	175.1	58.52
Mar 07	22	1.8	0.31	76.4	9.09	6	1.0	0.45	151.8	65.4
Jun 07	22	1.8	0.31	76.4	9.09	7	1.4	0.53	139.2	53.37
Sep 07	22	1.8	0.31	76.4	9.09	6	0.7	0.33	206.8	75.79
Dec 07	22	1.8	0.31	76.4	9.09	2	0.0	0.00	654.2	0.0

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 06	15	1.3	0.19	78.3	17.04	4	0.5	0.29	265.8	154.4
Mar 07	15	1.3	0.19	78.3	17.04	5	0.8	0.20	207.6	122.2
Jun 07	15	1.3	0.19	78.3	17.04	5	0.8	0.20	207.6	122.2
Sep 07	15	1.3	0.19	78.3	17.04	2	0.0	0.00	297.7	0.00
Dec 07	15	1.3	0.19	78.3	17.04	2	0.0	0.00	297.7	0.00

All Areas Combined
(including **only** 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 06	101	3.5	0.23	57.7	3.84	33	1.7	0.24	117.7	25.38
Mar 07	103	3.6	0.23	56.6	3.79	21	2.1	0.23	63.5	8.2
Jun 07	103	3.6	0.23	56.6	3.79	35	1.7	0.19	97.0	21.45
Sep 07	104	3.7	0.24	56.4	3.76	38	1.9	0.21	98.3	16.56
Dec 07	105	3.8	0.24	56.2	3.73	26	1.5	0.22	135.5	32.59

Appendix F: Reproductive success on the monitored areas, 2007.

F-1: Breeding chases seen on or near the monitored areas.

F-2: Litters seen on or near the monitored areas.

F-3: Reproductive status and age statistics by census quarter.

Appendix F-1: Breeding Chases Observed - 2007

Descriptions of mating chases observed on or near the monitored areas in 2007.

<u>Date</u>	<u>Midden</u>	<u>Notes</u>
4 Jun 07	1153	During census checks about 10am, came upon a large and noisy breeding chase in progress. Identified several marked animals: ♀740(mid 5124), ♀743(mid 1153), ♂14(mid 5101), ♂ID?(met/met, no collar), and 4 unmarked scrotal males. Female 740 appeared to be the object of the chase, males would buzz call and she would respond with buzzes and let them approach within 0.5m before chasing away. Female743, the resident at the midden, would not let males approach and chased them off with chatters and bark calls. The activity seemed to die down around 12:30pm, with most squirrels leaving the area.

Appendix F-2: Litters observed on or near the monitored areas in 2007.

<u>Date</u>	<u>Midden</u>	<u>Notes</u>
4 Jul 07	2238	2 Juveniles were confirmed for resident female (ID 778). Juveniles were probably recently emerged from natal nest, as they were both trapped and marked with metal ear tags a few days later and were of fairly light weight. A third juvenile was trapped and tagged about 2 weeks later on the edge of the midden, but it was not known if it was from the same litter, as no more than 2 juveniles were ever seen with the mother.
7 Jul 07	2211	3 Juveniles were confirmed for resident female (ID 776). The juveniles were fairly agile and ranging about 10m from the midden center. One appeared to be slightly smaller than the other two. All 3 juveniles were trapped prior to dispersal and marked with metal ear tags.
8 Jul 07	5102	2 Juveniles were confirmed for resident female (ID 749) at maternity nest 15142. The young were moving in nearby trees when first observed, but still appeared fairly small size. Both juveniles were trapped prior to dispersal and marked with metal ear tags.
9 Jul 07	2236	2 Juveniles were confirmed for resident female (ID 780) at maternity nest 12075, to the NW of the midden. The juveniles were larger and agile when first located. Despite several attempts at trapping, neither juvenile was captured.
9 Sep 07	1153	3 Juveniles were confirmed for female (ID 743) at maternity nest 11019. The young were agile and attempting to feed on cones. They possibly emerged from the nest around 2 weeks earlier, but this is only a rough estimation. Two of the three juveniles were trapped prior to dispersal and marked with metal ear tags.

Appendix F-3: Reproductive status and age information for squirrels on or near the monitored areas, for quarterly census months, 2007. Only information on the final resident each month is given. Middens that were determined to be active based on sign alone (Y) are not included. Information gathered on non-resident squirrels 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 (5000s) is included in Appx F3a-c.** Information on reproductive condition is taken from trapping records or visual assessment if no trapping data is available.

Appendix F-3a: Female reproductive information

Reproductive Status	March			June			September			December		
	Adult	J/SA ¹	Unkn.	Adult	J/SA ¹	Unkn.	Adult	J/SA ¹	Unkn.	Adult	J/SA ¹	Unkn.
reproductive ²				7								
lactating ²				5			1					
recent lactation ²							2			4		
past lactation ²							2					
non-reproductive ¹	3	0/10		2			8	0/1		7		
unknown	4		1	4			5	0/1		3		

- 1 J/SA - Juveniles are still living at the maternal midden. Subadult squirrels have dispersed and are living independently. Subadults may be identified by examination during trapping or visual cues: generally smaller size, whiter fur on underside, thinner tail, head may appear slightly large (out of proportion).
- 2 Reproductive may indicate estrus or pregnancy. Lactating indicates current lactation, milk expressed or other visual cues. Recent lactation includes females that have lactated in the current breeding season. Past lactation indicates lactation in a previous breeding season (at least 1 year prior).

Appendix F-3b: Male reproductive information.

Reproductive Status	March			June			September			December		
	Adult	J/SA ¹	Unkn.	Adult	J/SA ¹	Unkn.	Adult	J/SA ¹	Unkn.	Adult	J/SA ¹	Unkn.
scrotal	7	0/2	5	19			1					
partially scrotal												
non-reproductive ¹							14	0/1		7	0/1	
unknown	2		2	2			10			5		

Appendix F-3c: Age information for final monthly resident females, males, and squirrels of unknown sex combined

March			June			September			December		
Adult	J/SA ¹	Unkn.	Adult	J/SA ¹	Unkn.	Adult	J/SA ¹	Unkn.	Adult	J/SA ¹	Unkn.
20	0/12	11	40	0/0	0	44	3/3	0	26	0/1	1

1 J/SA - Juveniles are still living at the maternal midden. Subadult squirrels have dispersed and are living independently. Subadults may be identified by examination during trapping or visual cues: generally smaller size, whiter fur on underside, thinner tail, head may appear slightly large (out of proportion).

Appendix G. Weather information for RSMP study areas, Pinaleno Mountains, Arizona, January - December, 2007.

G-1: Monthly weather summaries

G-2: Accumulated snow depths

Appendix G. Monthly weather summaries - January through December, 2007.

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	-1.3 (6.7; -11.9)	-2.4 (7.7; -20.1)
	February	-2.4 (9.1; -13.1)	-3.0 (7.5; -15.0)
	March	2.0 (14.9; -13.1)	0.5 (12.3; -15.2)
	April	3.9 (13.8; -7.8)	2.1 (10.7; -9.4)
	May	9.0 (22.5; -4.3)	7.3 (16.6; -6.2)
	June	13.7 (23.7; 1.7)	12.4 (20.9; -0.1)
	July	14.3 (25.4; 7.3)	13.0 (22.8; 6.4)
	August	13.3 (21.4; 7.0)	12.3 (18.8; 6.8)
	September	11.0 (19.6; 3.1)	9.9 (17.4; 1.4)
	October	7.7 (16.4; -2.5)	- ¹
	November	4.7 (13.1; -7.8)	- ¹
	December	-2.6 (14.4; -15.7)	- ¹

	Month	Biology Camp	Emerald Peak
Wind Speed (m/sec), maximum(max. gust)	January	1.3 (4.8)	5.4 (19.3)
	February	2.7 (9.6)	3.6 (12.9)
	March	2.7 (9.6)	4.5 (16.1)
	April	2.7 (9.6)	4.5 (16.1)
	May	2.2 (8.1)	4.5 (16.1)
	June	1.2 (8.1)	3.1 (11.3)
	July	1.8 (6.4)	2.7 (9.7)
	August	1.3 (4.8)	3.6 (12.9)
	September	1.8 (6.4)	3.6 (12.9)
	October	2.7 (9.7)	– ¹
	November	2.2 (8.1)	– ¹
	December	3.1 (11.3)	– ¹
Wind, Most Common Direction	January	E	N
	February	NA	NW
	March	E	N
	April	W	N
	May	W	N
	June	E-SE	N
	July	E	N
	August	E	S
	September	W-NW	S-SE
	October	W	– ¹
	November	W-NW	– ¹
	December	E	– ¹

	Month	Biology Camp	Emerald Peak
Maximum Snow Depth (cm) Forest/Clearing	January	70,65	52,44
	February	86,104	88,102
	March	76,95	94,95
	April	28,29	45,35
	May		
	June		
	July		
	August		
	September		
	October		
	November	15,37	39,56
	December	70,85	74,83
Rain Fall (mm) Total	January	_ 2	_ 2
	February	_ 2	_ 2
	March	_ 2	_ 2
	April	_ 2	_ 2
	May	_ 2	_ 2
	June	1.6	33.4
	July	99.0	127.4
	August	138.4	160.2
	September	20.4	28.4
	October	12.2	_ 1
	November	50.4	_ 1, - 3
	December	_ 3	_ 1, - 3

	Month	Biology Camp	Emerald Peak
Relative Humidity (%) average (max; min)	January	67.9 (100.0; 19.0)	63.7 (96.0; 9.0)
	February	56.4 (98.0; 19.0)	53.7 (95.0; 6.0)
	March	52.92 (100.0; 9.0)	52.6 (96.0; 4.0)
	April	56.0 (100.0; 21.0)	49.6 (96.0; 11.0)
	May	52.1 (98.0; 21.0)	43.4 (95.0; 16.0)
	June	44.0 (100.0; 23.0)	33.9 (96.0; 15.0)
	July	74.1 (100.0; 17.0)	66.2 (99.0; 10.0)
	August	87.6 (100.0; 55.0)	78.5 (99.0; 29.0)
	September	80.6 (100.0; 44.0)	71.0 (99.0; 27.0)
	October	56.3 (100.0; 10.0)	– ¹
	November	59.0 (100.0; 13.0)	– ¹
	December	66.0 (100.0; 17.0)	– ¹
Dew Point (°C) average (max; min)	January	-7.4 (0.1; -19.1)	-13.1 (-2.1; -32.8)
	February	-10.9 (-1.2; -24.1)	-12.9 (-1.8; -36.5)
	March	-8.1 (1.4; -29.5)	-12.5 (0.8; -34.4)
	April	-4.9 (6.2; -20.8)	-8.6 (4.5; -28.2)
	May	-1.2 (9.1; -11.9)	-5.5 (5.5; -16.4)
	June	0.9 (9.9; -6.1)	-4.0 (6.0; -10.9)
	July	8.6 (14.5; -9.7)	5.3 (11.7; -18.1)
	August	11.1 (15.5; 7.0)	8.3 (12.5; -0.7)
	September	7.5 (14.3; 0.0)	4.4 (11.3; -5.1)
	October	-1.9 (11.6; -25.5)	– ¹
	November	-3.5 (5.0; -22.2)	– ¹
	December	-9.3 (4.8; -26.7)	– ¹

- 1 For Emerald Peak: no data from October to December 2007 due to equipment failure - ice on station solar panel caused battery to fade.
- 2 The rain gauges were disconnected in Dec 06. All moisture during the winter and spring was in the form of snow. The rain gauges were reconnected in June 07.
- 3 The rain gauges were disconnected in Dec 07 and will be reconnected in the spring after the snow melt. Any precipitation in December was snow, so not included here.

Appendix G-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)
Jan 2007	TR	C	7	22.9	65	0
Jan 2007	TR	F	7	25.6	70	15
Jan 2007	SF	C	7	21.9	44	14
Jan 2007	SF	F	7	18.4	52	7
Feb 2007	TR	C	9	79.3	104	26
Feb 2007	TR	F	9	72.1	86	62
Feb 2007	SF	C	9	71.8	102	37
Feb 2007	SF	F	9	70.1	88	48
Mar 2007	TR	C	9	34.9	95	0
Mar 2007	TR	F	9	50.6	76	10
Mar 2007	SF	C	11	54.3	95	0
Mar 2007	SF	F	11	54.9	94	0
Apr 2007	TR	C	9	10.0	29	0
Apr 2007	TR	F	9	12.3	28	0
Apr 2007	SF	C	9	16.7	35	0
Apr 2007	SF	F	9	25.4	45	0

1 N represents the number of snow pole readings in each area per month. 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. Not all sets of poles may be read every month.