NORTHERN IDAHO GROUND SQUIRREL

Population Monitoring Progress Report for the 2008 Field Season

Threatened and Endangered Species Project E-28-7
Section 6, Endangered Species Act
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TABLE OF CONTENTS

List of Figures

List of Tables

EXECUTIVE SUMMARY

Population monitoring for the federally threatened northern Idaho ground squirrel (*Spermophilus brunneus brunneus;* NIDGS) occurred during April through July 2008. This spring experienced unusually late snow melt, with snow cover persisting into April and delaying emergence from hibernation 2-3 weeks. Our apprehension that there would be corresponding widespread overwinter mortality was unfounded. NIDGS population numbers were similar to previous years and even higher at some sites.

Mark-recapture methods at 5 long-term monitoring sites were revised in 2008. The change in approach was the trade-off from allocating resources to the growing number of occupied sites needing to be surveyed. Collectively, 163 adults and yearlings were live-trapped. Although the number of squirrels was much lower than previous years, the resulting modeled population estimates for each of the monitoring sites were comparable. Squirrel Manor, Lost Valley Reservoir, and Tree Farm maintained or increased; Cold Springs declined for the 2nd year, and Summit Gulch declined for the 4th year.

We revisited another 46 known NIDGS sites to assess if squirrels were present and to record numbers seen or heard. We detected 911 squirrels visually or aurally during these extensive surveys. A newly-delineated site in the Bear Meadow complex resulted from these surveys. In addition, exploratory surveys by IDFG and the Payette National Forest in potentially suitable habitat resulted in 6 new sites, with 106 squirrels detected. All 7 of the new sites were relatively close to currently-occupied habitat.

Columbian ground squirrels (*S. columbianus*) expanded their distribution at 5 NIDGS sites and were present at another 13 sites. A consequence of habitat improvements for NIDGS may be increased Columbian ground squirrel populations where both species are present.

Overall, the outlook for NIDGS improved in 2008, as numbers and distribution increased. The population estimate of 1,512 adults and yearlings was slightly greater than the previous high recorded in 2006, even with limited survey effort at 2 large sites, Price Valley and Round Valley. NIDGS occupied 47 sites in 2008, although about half of these supported ≤20 adults and yearlings. The largest colonies continued to be Squirrel Manor, Squirrel Valley, Lost Valley Reservoir, and Price Valley. The proportion of sites on federally-managed land has decreased as the overall number of sites increased. This changing distribution across ownerships has implications for recovery, as partnerships with private landowners will become more important.

ANNUAL PERFORMANCE REPORT
IDAHO DEPARTMENTOF FISH AND GAME

GRANT NUMBER: E-28
SEGMENT NUMBER: 7
GRANT TITLE: Northern and Southern Idaho Ground Squirrel
AGREEMENT PERIOD: July 1, 2007 – June 30, 2008

PROJECT I: NORTHERN IDAHO GROUND SQUIRREL

INTRODUCTION

Population monitoring of the federally threatened northern Idaho ground squirrel (*Spermophilus brunneus brunneus;* NIDGS) continued in 2008. The NIDGS is a rare, endemic mammal that occurs at <50 sites in Adams and Valley counties in west-central Idaho (Yensen 1991). It was listed under the Endangered Species Act in April 2000, with a Recovery Plan published in 2003 (USDI Fish and Wildlife Service 2003).

NIDGS occupy dry montane meadows, such as open areas of grasses and forbs surrounded by ponderosa pine (*Pinus ponderosa*) or Douglas-fir (*Pseudotsuga menziesii*) forest. Until 2005, all known NIDGS sites were within an elevational range of 1,050-1,675 m (3,440-5,500 ft). Since then NIDGS have been discovered at higher elevations, including Lick Creek Lookout and Smith Mountain Lookout at 2,300 m (7,500 ft) (Evans Mack 2006).

Decline of NIDGS through the 1980s and 1990s was attributed primarily to changes in habitat that isolated populations. Fire suppression allowed forests to encroach into meadows, reducing the amount of habitat available to ground squirrels and closing off dispersal corridors (Sherman and Runge 2002). Fire suppression and land conversions also resulted in poorer quality food plants that lacked the nutritional value squirrels need to sustain prolonged hibernation (Sherman and Runge 2002, Yensen 2004). Other threats to NIDGS populations include competition with the larger Columbian ground squirrel (*S. columbianus;* COGS), loss of habitat to development, and shooting (USDI Fish and Wildlife Service 2003). Natural predators include badger (*Taxidea taxus*), red fox (*Vulpes fulva*), coyote (*Canis latrans*), and diurnal raptors.

Research, monitoring, and recovery efforts for NIDGS are shared among several agencies under a cooperative agreement. The U.S. Fish and Wildlife Service (USFWS) has primary responsibility for recovery. The Payette National Forest (PNF) focuses on maintaining existing sites on national forest lands and restoring habitat to promote population stability and expansion. The Boise National Forest conducts surveys in suitable habitat. The Idaho Department of Fish and Game's (IDFG) primary role is population monitoring. Research support is provided by The College of Idaho (Dr. Eric Yensen) and the University of Idaho (Dr. Lisette Waits).

This report summarizes IDFG's population-monitoring efforts during the 2008 field season. Objectives were to:

1) use mark-recapture techniques to estimate population size at 5 intensive monitoring sites
2) conduct extensive surveys at other known sites not trapped to estimate numbers present
3) conduct surveys in modeled potentially suitable habitat to discover new sites or expansions

STUDY AREAS AND METHODS

The 5 intensive monitoring sites were located northwest of Council near Bear, Idaho (Tree Farm, Summit Gulch, and Squirrel Manor); northeast of Bear within the Lick Creek drainage (Cold Springs); and in Lost Valley southwest of New Meadows (Lost Valley Slaughter Campground). The other known sites that were visited to document presence were distributed from the Council-Cuprum Road northeast to New Meadows in Adams County, and in Round Valley in Valley County. Explorations of modeled potentially suitable habitat occurred primarily in the northern and southwestern extents of the habitat map, from Mann Creek to New Meadows (Figure 1).

Intensive Monitoring

We took an entirely different approach to intensive monitoring in 2008. We continued to use mark-recapture techniques, but with a different application. Prior to this year our objective was to capture all of the squirrels at a site, and that total was the reported population size. We temporarily marked squirrels with dye to avoid recapturing individuals again the same year, and permanently marked squirrels with unique passive integrated transponder (PIT) tags for identification when recaptured in subsequent years. This year we trapped "blind" (i.e., no dye mark), targeting any squirrel we observed on each visit. Thus, some individuals were trapped multiple times, others only once, and the encounter histories across all visits were used to estimate capture probabilities and population size. This change in approach was the trade-off from allocating resources to the growing number of occupied sites needing to be surveyed. The intent was to save time with potentially fewer visits to the intensive monitoring sites while still obtaining a reliable estimate of the number of squirrels present. Also, for the first time we trapped after pup emergence to obtain fecal pellets. Fecal pellets were collected during 2 sampling periods at Summit Gulch and Tree Farm as part of a pilot study on NIDGS diet.

With these exceptions, trapping followed the same protocol as previous years (Evans Mack 2004). We trapped 3-5 days at each site. A rotation was established to avoid visiting the same site on consecutive days. All animals were sexed, weighed (Avinet 300 g spring scale), and examined for physical condition and breeding status. We tagged unmarked animals with PIT tags. For animals previously marked with ear tags, we added a PIT tag if one ear tag was missing. Captured squirrels were returned to the burrow from which they were caught. Burrow locations were marked with GPS.

In addition to live-trapping squirrels, we set up a scanner to remotely detect PIT tags at Squirrel Manor and Tree Farm. We used a Biomark FS2001 PIT tag reader and set the hoop antenna in front of feeding stations baited with dry dog food. Squirrels that were detected only by the scanner and not live-trapped were not included in our recapture totals or models for population estimates, but were added to the matrix that tracks the encounter history of each individual over time.

We used the POPAN model and a closed captures with heterogeneity model, both run from the Program MARK platform, to estimate population size at each of the monitoring sites (Cooch and White 2007). POPAN is an open model, which allows for recruitment into the population. The closed capture model with heterogeneity assumes no recruitment or loss and allows for a mixture of capture probabilities for each animal across visits. POPAN worked well for most sites, but in 2

cases couldn't estimate beyond the actual number of individuals captured at the site. The closed capture model worked better on these limited data sets.

Pups were captured incidentally at 2 sites, but they were not included in the capture totals and not included in the models used to estimate population size. They were, however, permanently marked for future years and were added to the encounter history matrix.

Extensive Surveys

IDFG and Bill Rautsaw, PNF, visited other known NIDGS sites to document presence and, if possible, estimate population size (monitoring surveys). Observers walked parallel transects or made repeated counts from a stationary point. Squirrels detected visually and aurally were tallied. The locations of many individual squirrels were marked with GPS, particularly at sites with low densities and at large sites to mark the outer locations within the occupied area. GPS locations were downloaded to create shapefiles in ArcGIS v 9.2. Most sites were surveyed only once, but several were visited multiple times to increase the number of squirrels detected.

In addition to monitoring surveys of known sites, IDFG and the PNF conducted exploratory presence/absence surveys in potentially suitable habitat modeled by the Boise National Forest. The model was developed from ecological and physical parameters at known NIDGS sites. It initially included cover type, landtype, slope, and aspect, but was revised in 2007 to replace cover type with existing vegetation types from LANDFIRE models (Crist and Nutt 2008). PNF surveys focused on potential habitat treatment areas north of Lost Valley Reservoir. IDFG surveys focused primarily on the northern and southwestern portion of suitable habitat, from Mann Creek and Indian Valley north and east to Bear and New Meadows. Most locations were surveyed once, but we also established 8 10-ha plots that were visited 3 times in a pseudo occupancy modeling approach to increase the likelihood of detecting squirrels.

RESULTS and DISCUSSION

Intensive Monitoring Sites 2008

A lone NIDGS was first observed above ground on 11 April 2008 near Frank Anderson's driveway on the OX Ranch. It had dug up through ~2 ft of snow and promptly retreated back down. Squirrels began emerging at Squirrel Manor the third week of April. They were out in Price Valley by at least 8 May and at Lick Creek Lookout by 26 June (B. Rautsaw, PNF, personal communication).

Driveway to Frank Anderson's residence (OX ranch) on 25 April 2008. The Squirrel Manor trapping site lies on either side of the driveway.

Trapping began 25 April 2008 at Squirrel Manor, 3 weeks later than in 2007. Tree Farm and Summit Gulch were accessible two week later, and Cold Springs and Lost Valley were accessible 4 weeks later. Trapping ceased on 23 July 2008. We captured

163 adults and yearlings (Table 1). The absolute numbers of trapped squirrels were much lower than previous years but can't be directly compared because of the change in mark-recapture methods. The modeled population estimates for each of the monitoring sites were comparable to numbers estimated from the "catch-every-squirrel" approach used in past years (Figure 2).

Across all monitoring sites, more females were captured than males (Table 1). Of these females, 37% were recaptures of squirrels marked in a previous year; captures of previously marked males were lower (22%). Based on the sample of squirrels captured, Summit Gulch and Lost Valley Slaughter Campground retained a female-biased population equivalent to 2007; Squirrel Manor, Tree Farm, and Cold Springs West moved toward a more even sex ratio compared with 2007; and Cold Springs West West became highly female biased. These comparisons are not completely equivalent due to capturing a smaller proportion of the population in 2008.

Squirrel Manor, OX Ranch - Trapping occurred on 5 days from 25 April to 27 May 2008. A total of 81 individual squirrels were trapped. From the encounters of these 81 squirrels over 5 visits, we obtained a population estimate of 149 with a 95% CI of 119-203 (Table 1). This is comparable to our estimates during 2004-2007 (120-153 squirrels; Figure 1) when we attempted to trap all the adults and yearlings on site. The oldest female was a 6^{+}-year old first captured in 2004. We also recaptured 4 females that had not been captured in 2007. The oldest males captured were 4^{+} years old, both of which had been missed in 2007. Thirty individual NIDGS (37% of the capture population) were recaptured multiple times this season, due to the different trapping approach. One was caught 4 times on the same day. Most of the frequent recaptures were adult males, not surprising given their breeding behavior of visiting multiple burrows to find mates, but a few females also were captured multiple times on the same day. The population continues to thrive at this site, which surrounds Frank Anderson's residence. The continuous supply of supplemental food (dry dog food or sunflower seeds) provided at the entrance to the residence certainly contributes to the high density of squirrels. A red-tailed hawk and prairie falcon were observed foraging over the site on several occasions.

PIT tag reader at feeding station to remotely detect NIDGS and increase "recaptures".

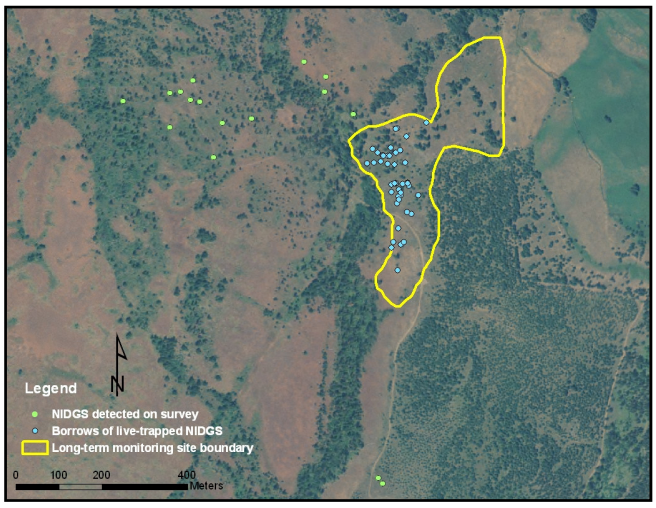
Due to technical difficulties with the remote PIT tag scanner, it recorded detections on only 2 occasions, despite being set up multiple times for 2-4 day intervals. Only 4 different NIDGS were detected, all of which were females. However, none of these squirrels were live-trapped this year, so we gained information on 4 animals we otherwise would have "missed". In addition, 1 had not been detected in 2007. These squirrels traveled 28-70 m from their last known burrows to the feeder.

Tree Farm - Trapping occurred on 5 days between 15 May and 16 July 2008. We captured 21 adult and yearlings, which yielded an estimate of 43 (Table 1). This estimate is higher than 2007 and 2006, but similar to 2005 (Figure 2). Trapping continued past pup emergence to collect scat samples for the pilot diet study. During the 2 trapping days in July, 14 pups were trapped and PIT tagged but

they were not counted in the overall capture total. Seven squirrels, 33% of the capture population, were caught multiple times in 2008. Tree Farm was the only site where females marked in a previous year outnumbered the new captures. Previously-marked males declined compared with previous years. The oldest squirrel captured was an 8^{+}-year old female first marked in 2001 as a yearling and caught every year since. The oldest male captured was 3^{+} years old, first captured in 2007 as an adult.

We established 3 feeding stations to support the remote PIT tag scanner, but pulled 1 after a short time. The other 2 were located outside the northeast corner of the exclosure and just north of the road bisecting the site. Again due to technical problems, the remoter reader worked only once, at the station by the exclosure. Three squirrels were detected, all of which also were captured by the trapping crew in 2008. One squirrel had been trapped ~120 m away; the other 2 squirrels had burrows much closer (15 and 35 m, respectively) to the station.

Since 2003, when Mike Henon observed about 5 NIDGS in Calf Pen Gulch north of Tree Farm, we have speculated that dispersal could partly explain the apparent decline in numbers within the boundaries of the Tree Farm monitoring site. In 2008 ~15 NIDGS were observed west and north of the site, from 40-500 m away, and another 2 (possibly pups) were observed south of the site at the road junction. At least 8 more squirrels were detected farther north in Calf Pen Gulch. Several of these were pups. We plan to devote some trapping effort next year outside of the Tree Farm site to determine if any of these neighboring squirrels were originally marked in Tree Farm. If so, we might learn whether a certain segment of the population moved (age or gender) at a particular time or if it's more likely explained by juvenile dispersal.



Representative locations of NIDGS detected outside the Tree Farm monitoring site in 2008.

Summit Gulch - Trapping occurred on 5 days between 8 May and 23 July 2008. From the 13 adults and yearlings captured over the first 3 visits, 4 of which were trapped more than once, the modeled population estimate was 21 (Table 1). This represents a continued decline in numbers (Figure 2). We also trapped 5 pups in the last 2 visits to collect pellet samples for the diet study. This site continued to be an enigma. The squirrels, especially the pups, were not as vocal with alarm calls as squirrels at other trapping sites. Recapturing previously-marked animals remained hit or miss, with a higher incidence of missing squirrels for a year or 2. One female caught in 2008 had been missed in 2004, 2005, and 2007. Yet Summit Gulch also has some of the oldest squirrels, suggesting that survival is high for at least some individuals. Two females caught this year were first marked in 2003, 1 as an adult, making it 7^{+} years old. The oldest male captured was only 2 years old. The female:male ratio was 2:1, similar to 2007.

Rattlesnake in entrance of NIDGS burrow at Summit Gulch, 22 July 2008.

On 3 separate occasions (13 June, 22 July, and 23 July 2008), we observed western rattlesnakes (*Crotalus viridis*) at the Summit Gulch monitoring site. Given that we saw a snake on 2 consecutive days in 2 different locations ~160 m apart, it's likely that at least 2 different individuals occupied the site. The Summit Gulch site is ~6.5 ha, which could accommodate >1 snake based on mean western rattlesnake summer activity ranges obtained from several locations (2.9 ha for males, 1.8 ha for females; Macartney et al. 1988). Rattlesnakes feed primarily on small mammals, including ground squirrels. They are sit-and-wait ambush predators, so they could remain in an individual squirrel's home range for a considerable time (Swaisgood et al. 1999). We had been told that Summit Gulch was "snakey", but we hadn't encountered them in previous years because monitoring was finished by mid May, presumably before the snakes' arrival from a winter hibernaculum. This year, trapping continued in June and July, which gave us a completely new perspective.

It's possible that rattlesnake predation is contributing to the apparent population decline at Summit Gulch. We examined the literature on interactions between California ground squirrels (*S. beecheyi beecheyi*) and northern Pacific rattlesnakes (*Crotalus viridis oreganus*). Studies found that rattlesnakes were the major source of pup mortality but did not normally kill adults (Swaisgood et al. 1999). In fact, adults have developed a number of defensive activities to effectively ward off snakes, including alarm calls, bipedal posture, substrate throwing, snake-directed tail flagging (in which they super heat their tails to make them appear larger), and even pouncing and biting the snake. Squirrels also have blood proteins that bind to and neutralize venom (Swaisgood et al. 1999). Some even perform 'snake scent application' where they chew shed snake skins or carcasses then lick their own fur to apply the substances (Clucas et al. 2008).

If rattlesnakes are having an impact on the Summit Gulch population, we would expect fewer yearlings caught each year compared with other monitoring sites (i.e., fewer pups survive to following spring), and a higher proportion of older animals in the population overall. On average over the last 3 years, Summit Gulch did have a higher proportion of 5^{+}-year old squirrels compared to the other sites (45% vs. 16-20%). However, the proportion of yearlings was no lower.

Cold Springs - Cold Springs includes 3 subsites delineated as East, West, and West West. The 2 'west' subsites are ~200 m apart. East and West are about 275 m apart separated by a creek. Trapping occurred on 3 days between 23 May and 5 June 2008, but only once at the East subsite. We captured 17 adults and yearlings, with only 1 of these from East (Table 1). Either the timing of our visit was exceptionally poor or the East subsite crashed. The POPAN model was based on the 16 squirrels trapped at West & West West combined (Table 1). The resulting population estimate of 24 is comparable to previous years for West/West West. A similar number of females and males were trapped at West, but males were scarce at West West. The oldest female caught was a 7^{+}-year old first marked in 2003 at West and caught every year except 2004. The oldest male was a 3^{+}-year

old marked in 2006. Monitoring Cold Springs will be a priority in 2009 to determine the status of the East subsite.

Lost Valley Slaughter Campground - Trapping occurred on 3 days: 31 May, 9 June, and 16 June. In addition to the 30 animals captured within the monitoring site (Table 1), 1 squirrel was captured just outside the southeast corner, where we placed traps to determine if marked squirrels were dispersing beyond the study area. This squirrel did not have a PIT tag or ear tags and was released without being tagged. Recaptures were high for females and low for males compared to previous years. Although we trapped fewer individuals overall, among those captured was an 8-year old female that was first marked in 2001 and only recaptured in 2004 and 2008. The oldest male captured was a 5^{+}-year old first tagged in 2005 and captured every year since. The growth or decline of this population is more difficult to track because of the potential for dispersal into surrounding habitat that is becoming more suitable due to the Payette National Forest's ongoing enhancements. In 2008, additional trapping efforts outside of the trapping site were limited because of time constraints but this should still be a priority in 2009.

Surveys

We detected 1,017 NIDGS squirrels visually or aurally on all surveys combined, and discovered 7 new locations (Table 2). Monitoring surveys at known sites were delayed by persistent snow pack that kept NIDGS underground later than usual in 2008. Most of the sites we typically visit earliest in the spring, such as Squirrel Manor, Rocky Comfort Flat, and Squirrel Valley, were not completely snow free on 1 May, when surveys commenced. In all, 46 known NIDGS sites were surveyed, with 911 squirrels detected (Table 2). Two sites in Price Valley were not surveyed due to access but were presumed occupied. A new site in the Bear Meadow complex resulted from these surveys.

Additional exploratory surveys in modeled habitat covered ~2,600 ha on the ground plus ~75 miles of road surveys (Table 3). Six new sites were discovered from these efforts, with 106 squirrels detected. Of the 8 plots established in modeled habitat and visited multiple times, NIDGS were detected at 2 (Table 3). Squirrels were detected on all 3 visits to the West Fourth of July plot. At the Calf Pen North plot, no squirrels were detected on the first 3 visits, but a single squirrel subsequently was observed during a walk-through of the larger Calf Pen site. This multiple-visit survey approach, if applied systematically across more sites, could yield an estimate of detectability that could then be used to determine the probability of a species being present at a site even if not detected.

New Sites

Bill Rautsaw, PNF, further explored the Lost Creek drainage in 2008. A series of open scablands yielded several pockets of NIDGS east of Lost Creek and north of Butter Gulch. These were delineated into 3 new sites: **Middle Lost Creek, Upper Butter Gulch** ('Salt Lick') and **Lower Butter Gulch**. He also found an isolated burrow ~500 m northwest of the Salt Lick group. This site won't be assigned a name until future surveys confirm NIDGS. Bill's surveys also substantially expanded the numbers and distribution of the Lower Lost site discovered in 2007. A new metapopulation area (Butter Gulch) was delineated for the entire Lost Creek complex, including the East Fork Lost Creek sites.

Mike Henon, IDFG, observed approximately 8 NIDGS, 1 of which was a pup, at the head of Lost Creek south of Lick Creek Lookout. This new site was named **Upper Lost Creek** and is located approximately 4 km southwest of Lick Creek Lookout Lower along FS Road #51121 on a south-facing rocky outcrop. Potential habitat between Upper Lost Creek and Lick Creek Lookout should be explored further.

Mike also surveyed suitable habitat around the Fourth of July Creek site and found an encouraging population of approximately 25 NIDGS 1 km west of the known site. The new site was named **Fourth of July Creek West** and lies on the ridgeline between North Hornet Creek and Fourth of July Creek. Mike's assessment was that additional NIDGS could be distributed up and down this ridgeline. This location was 1 of the 8 10-ha plots established in suitable habitat.

Over the past several years the IDFG trapping and survey crew had observed small groups of NIDGS across the fenceline from Bear Cemetery and at several locations along Steve's Creek Road between Squirrel Manor and Squirrel Valley. This year the crew detected >30 NIDGS outside of these known sites. Rather than modify existing boundaries, the area was formalized into a new site named **Bear Meadow North**. It encompasses the meadow east of Bear Cemetery, north of Squirrel Manor, and west of Squirrel Valley/Steve's Creek.

Diane Evans Mack and Mike Scott, IDFG, made a 60-mph observation of a NIDGS on the east side of Hwy 95 across from the mouth of Little Mud Creek. Exploration of this area resulted in a fairly large colony on private land extending 1.5 km southeast along Mud Creek. This site encompasses squirrels reported to Bill Rautsaw in 2007 farther east along Hwy 95. This previously forested location was thinned and roaded several years ago for development. NIDGS likely expanded into this treated habitat from nearby sites across Hwy 95.

Other Sites of Note

One of the biggest surprises of the 2008 season was a jump in the number of NIDGS detected at **Squirrel Valley** -- triple the count from the previous 2 years. We attribute this to timing, in that we by chance happened to survey on a day shortly after emergence when squirrels were most active and visible. It demonstrates how survey results are a function of being at the right place at the right time, and how, in any given season, this happens at only a few sites (Table 4). Detections were higher elsewhere on the OX Ranch, including portions of the **Lick Creek** site, where squirrels were again observed around the hay barn, and the **OX-Bear Creek West** site (Table 2). At least 22 NIDGS were detected in **Calf Pen Gulch North**, the closest within 40 m of the monitoring site at Tree Farm and the farthest ~1.3 km north.

On the east side, squirrels are expanding from the eastern portion of **Price Valley** east to, and across, Hwy 95 to suitable habitat on private land. The 12 squirrels detected at **Rocky Top** was the highest count since the site's discovery in 2006. At **Lost Valley**, squirrel activity increased again this year between the south end of the Reservoir and the former Slaughter Campground along both sides of Forest Service Road 089.

In contrast, some sites still seem to be declining or perhaps have winked out. Squirrel activity was markedly low at **Halfway**, **North Steve's Creek**, and **Chipmunk Springs** (Table 2). No NIDGS were detected at **Riley Ranch** (for the third year surveyed), **Hoo Hoo**, **Upper Hoo Hoo**, **Price**

Valley West Branch, and **Game Cabin**. It's possible that squirrels went undetected because of the late surveying season, not because they were extirpated.

Survey numbers were lower at the main **Price Valley** site compared with 2007, with the most noticeable decline in the grassy meadow west of the Mack Residence. It's possible that the persistent snow and then a thaw-flood occurrence affected burrows in this location. A COGS colony near McCall suffered such a fate (DEM, personal observation). At **Price Valley Guard Station**, there was very little activity at the lower end where the translocation enclosure was placed in 2005. The northern scab, north of the corridor, had more activity and seemed to be the hub of this site now. Detections at the higher-elevation sites, **Smith Mountain Lookout** and **Lick Creek Lookout**, remained consistent with last year's numbers (Table 4). The Bear-Lick Ridgeline northwest of the Lookout was not surveyed this year. Numbers in **Round Valley** were lower this year, presumably a function of reduced survey effort.

While waiting for snow to clear, Mike Henon conducted surveys in the Midvale area within southern Idaho ground squirrel range. He detected squirrels at a new location in the northeast portion of the range near the intersection of Bedrock Flat and Hanthorn roads. Squirrels were using rock jacks along the road. This location is close to Indian Valley, notable for being a potential stepping stone between NIDGS and SIDGS range. An effort to trap and collect hair for DNA analysis is planned for 2009. Mike also observed 3 squirrels, almost certainly SIDGS, at the Knob Hill site discovered in 2006 by a BLM/IDFG survey crew. In all, Mike Henon surveyed along 85 miles of road and walked ~200 ha of SIDGS habitat from Midvale east to Indian Valley and south to Crane Creek Reservoir while waiting for NIDGS sites to become snow-free.

NIDGS Population Status

NIDGS occupied 47 sites in 2008. Combining the modeled population estimates from the intensive monitoring sites with the 1,017 squirrels detected on surveys, and assuming not all squirrels were detected, the minimum adult/yearling (i.e., pre-pup) population estimate for 2008 was **1,512** (Table 2). This represents a 45% increase over 2007 and is slightly greater than the previous high recorded in 2006. New sites represented ~27% of the increase.

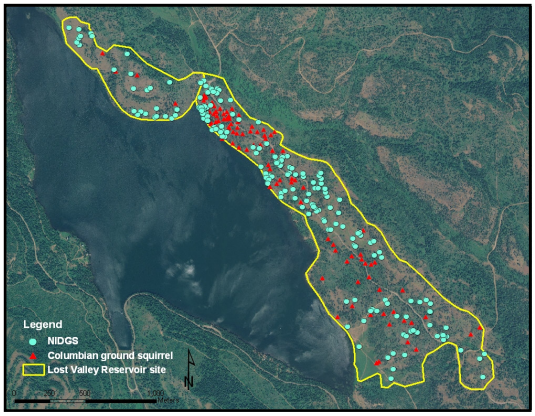
Of the 47 occupied sites, 25 (53%) were on federally-managed land, 16 (34%) on private land, and 6 (13%) on state or mixed state/private land. About half of the occupied sites supported ≤20 adults and yearlings. Only 3 -- Lost Valley Reservoir, Squirrel Manor, and Squirrel Valley -- supported >100 squirrels, although Price Valley and Round Valley may support this many as well if the 2006 numbers remained stable. Overall, the NIDGS population appears to be increasing in both numbers and distribution.

RELATED ISSUES

Columbian Ground Squirrels

COGS continued to expand within several NIDGS sites. We counted >25 different COGS burrow complexes at Cold Springs, where it appeared they were taking over central West West and western West. Previously limited to the rocks just below the upper road at Huckleberry, COGS expanded

down into the meadow in 2008. At Fawn Creek they were numerous along both sides of the road and well into the site. At this density, they could be displacing NIDGS. COGS occupied the lower part of the meadow at Lower Lost Creek**.** At Price Valley Guard Station, COGS were common on the east, west, and southern portions of the site. At Lost Valley Reservoir**,** COGS were scattered throughout the area, especially within the long-term monitoring site (the former Slaughter Campground). Their presence may be pushing NIDGS closer to the edge of the reservoir in this area.



Locations of Northern Idaho ground squirrels (blue) and Columbian ground squirrels (red) detected at Lost Valley, spring 2008.

COGS presence also was observed, in lower numbers, at 12 other sites, including Lick Creek and Rocky Comfort Flat on the OX Ranch, Butterfield Gulch, Hoo Hoo Gulch, East Fork Lost Creek, YCC, Chipmunk Springs, Smith Mountain Lookout, and state/private land in Price Valley and the Little Mud Creek drainage.

COGS expansion at Price Valley Guard Station was clearly a response to habitat changes; this may be the case at Lost Valley as well. Sherman and Yensen (1994) found COGS associated with the presence of stumps and soil depth, among other variables. They also demonstrated, through removal experiments, that COGS can limit the distribution of NIDGS through direct competition. We should recognize that a consequence of habitat improvements for NIDGS may be increased COGS populations where both species are present.

Predator Management

Many of the known NIDGS populations are small and isolated, making them especially vulnerable to predation pressure. Badger activity was noted at 10 of the NIDGS monitoring sites. Early in the season, fresh badger digs were observed at the Lick Creek site east of the OX office, corresponding to where most of the NIDGS occurred. Badger sign was observed elsewhere in the Bear Meadow complex from Squirrel Valley to Rocky Comfort Flat. Other sites included Summit Gulch, Price Valley Guard Station, and Lower Lost Creek. A badger actually was seen walking the fenceline near the Cottonwood Corrals site on 25 August 2008 (M. Henon, personal communication).

Reported badger home ranges varied from 2.4-8.5 km^2 , with male ranges larger than females and summer ranges larger than winter (Long 1973, Messick and Hornocker 1981, Sullivan 1996). To put this in perspective, a badger with a home range of 3.5 km^2 could potentially forage through the Lick Creek, Squirrel Manor, Steve's Creek, and Squirrel Valley sites. All of the Lost Valley and Slaughter Gulch sites could be covered by a badger with a 5-km^2 home range.

Because of the potentially lethal effect on small NIDGS colonies, the USFWS contracted with Wildlife Services, a federal program within the U.S. Department of Agriculture, to control mammalian predators at NIDGS sites on an as-needed basis. In November 2007, traps were set for badgers at Cold Springs Campground at the southern end of Lost Valley Reservoir in response to fresh sign, but no badgers were removed. In July 2008, traps were set just north of Lost Valley

Reservoir in the Slaughter Gulch area, from which 1 coyote and 2 foxes were removed (D. Hansen, Wildlife Services, personal communication). Subsequently, in September 2008 fresh badger digs were observed in the Lost Valley long-term monitoring site at the former Slaughter Campground. Wildlife Services removed 2 badgers and 1 fox (B. Rautsaw, Payette National Forest).

Development

Although the development boom in Valley and Adams counties slowed in the latter part of 2008, development of occupied NIDGS habitat on private land poses a potential long-term risk to the NIDGS population. The Boy Scouts of America explored the viability of a land swap with the Idaho Department of Lands to acquire the section encompassing the Slaughter Gulch site near Lost Valley Reservoir. While that particular location was ultimately passed over, the concept of a land trade and summer camp in the Lost Valley area may still be alive. On the positive side, a Safe Harbor Agreement between the USFWS and the OX Ranch is close to completion. The commercial node proposed by the Valley County scenic corridor subcommittee for the intersection of Herrick Lane and Hwy 55 at Round Valley has been removed from the table, although Valley County may reinitiate a scenic corridor assessment in the future. IDFG continues to comment on individual proposals coming before Adams and Valley County Planning and Zoning Commissions, but a comprehensive conservation strategy for NIDGS on private land in Round Valley and Price Valley should be considered.

RECOMMENDATIONS

- Visit all known extant sites annually during the period when squirrels are most visible.

This is becoming more difficult as the number of occupied sites increases but the number of prime survey days stays the same. Surveys should be assessed across a multi-year time frame, such that sites not surveyed on a day of peak squirrel activity in one year become a priority the following year.

- Continue to devote some effort (if funding allows) to finding new sites, using modeled suitable habitat to focus surveys.

Of the 6 new sites discovered this year, 5 were a direct result of exploring suitable habitat. All of the new sites were near occupied habitat. Focusing within the current NIDGS distribution (i.e., filling in the gaps) may be more productive than the effort spent in outlying areas. Surveys should be formalized into a multi-year strategy based on occupancy modeling theory.

- Live-trap beyond the monitoring area at Tree Farm to understand the dynamics at this site.

A substantial number of squirrels were detected outside the monitoring site as it was originally defined. Live-trapping will identify if resident squirrels relocated and the colony is in the process of shifting on the landscape, or if the change is due to dispersal and expansion.

- Live-trap the squirrels detected southwest of Indian Valley for genetics analysis.

This location falls in the extreme northeast of the SIDGS range and <4 km from modeled NIDGS habitat. A genetics analysis will determine the subspecies to which these individuals are assigned and a measure of relatedness to other sites.

- Work toward a comprehensive diet study linked to livestock grazing.

A pilot study was initiated in 2008 to collect fecal pellets and measure vegetation. The study should be continued to achieve the broader objectives of identifying the nutritional quality of plant species used by NIDGS, overlap with plants consumed by livestock, and the potential impacts of grazing.

- Work toward a study of NIDGS response to prescriptive habitat enhancement.

While surveys have shown that NIDGS move into treated areas, we need to quantify NIDGS response to thinning and burning to manage habitat more effectively over the long term. Initiate a study that examines changes in habitat structure, plant species composition, and NIDGS populations.

- Explore conservation options on private lands.

As the number of occupied NIDGS sites increases, the number on private land also has increased. Coordinate with the USFWS to secure long-term protection for these sites, by outright acquisition, (Recovery Land Acquisition grants) or Safe Harbor agreements, particularly in Price Valley, Round Valley, Huckleberry, and around Lost Valley Reservoir.

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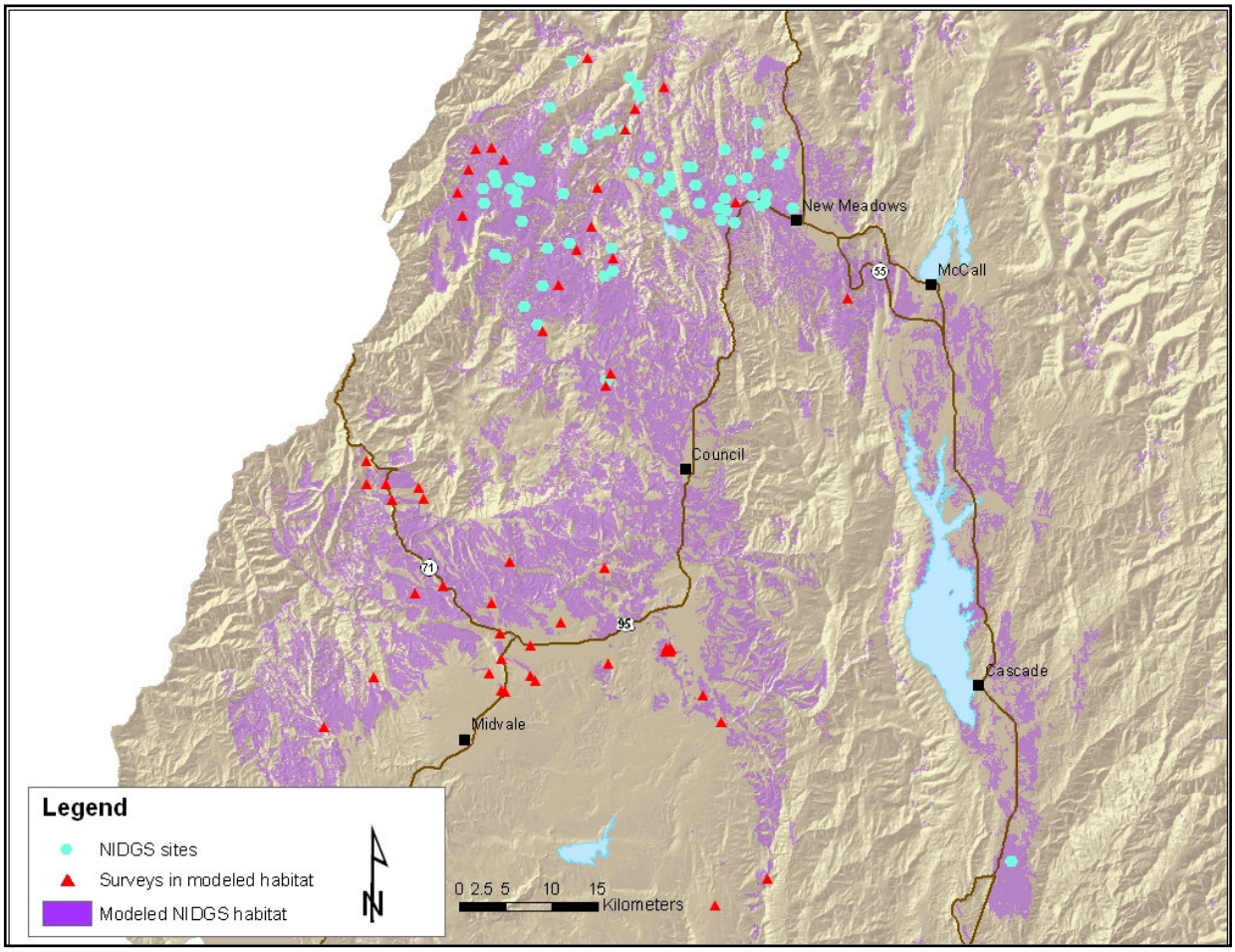

Figure 1. Distribution of northern Idaho ground squirrel sites surveyed for presence and exploratory surveys in modeled potentially suitable habitat.

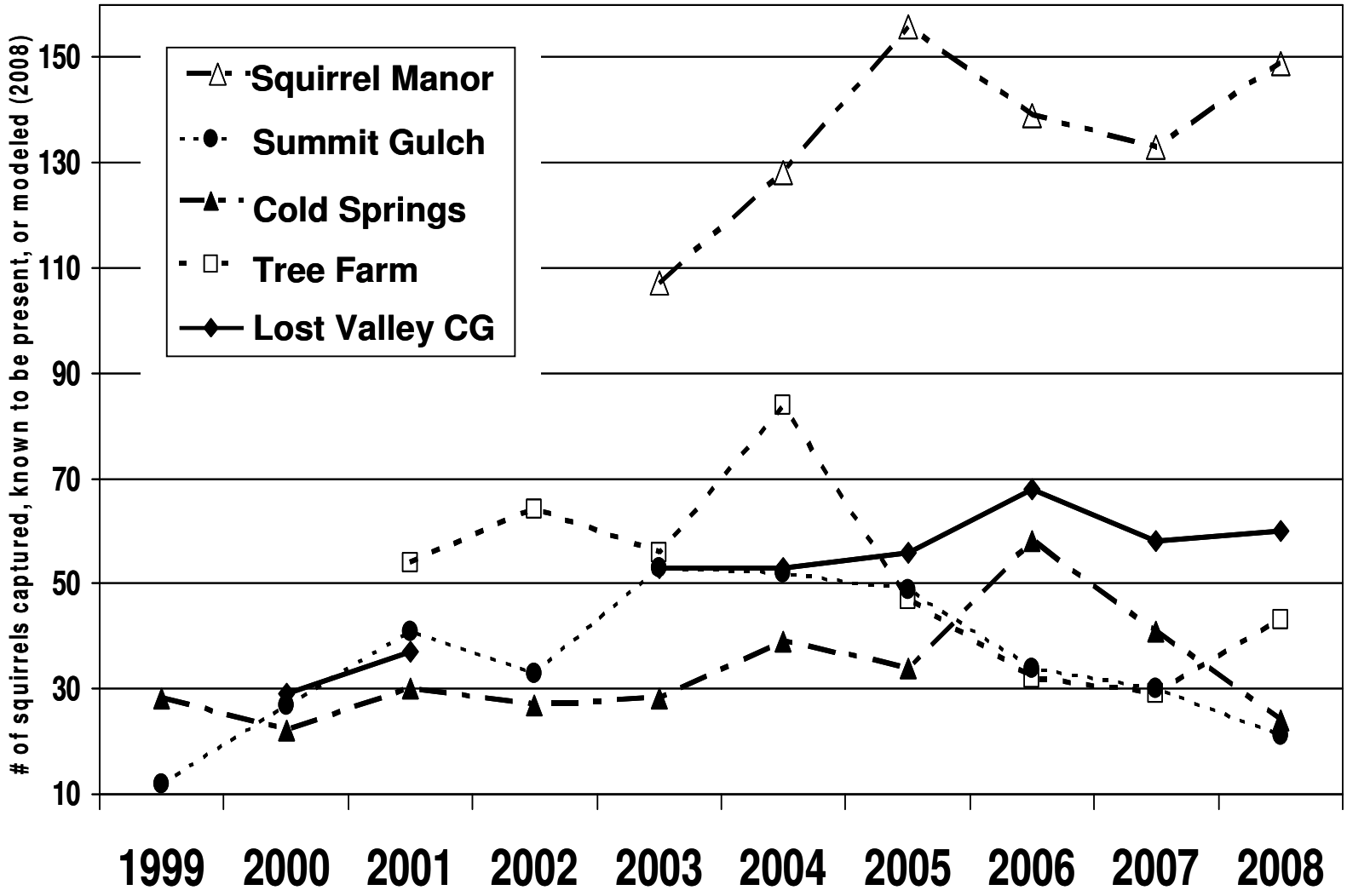

Figure 2. Adult/yearling northern Idaho ground squirrel population estimates at long-term monitoring sites, Adams and Valley Counties, Idaho. Numbers for 1999-2007 based on individuals captured or known to be present (not captured in current year but caught in subsequent year) using a 'catch-every-squirrel' approach. Numbers for 2008 based on models run in Program MARK from repeated capture sessions.

Table 1. Numbers of adult and yearling northern Idaho ground squirrels live-trapped at intensive monitoring sites April-July 2008, and resulting modeled population estimates. Trap numbers lower than previous years (and not directly comparable) due to fewer trap days per site and a change from targeting all animals at a site to targeting any animal seen during a trapping session, regardless of previous capture history.

	New Captures[a]		Recaptures[b]		Total	Population Estimate[c]	95% CI
Site	M	F	M	F			
Squirrel Manor[d]	27	33	8	13	81	149 (P)	119-203
Tree Farm	7	4	2	8	21	43 (C)	24-116
Summit Gulch	3	6	1	3	13	21 (C)	13-54
Cold Springs (all subsites)	4	9	1	3	17		
Cold Springs E	0	1	0	0	1	Incomplete	-----
Cold Springs W	3	5	1	1	10	24[e] (P)	17-53
Cold Springs WW	1	3	0	2	6		
Lost Valley Campground[f]	9	10	2	9	30	60 (P)	40-120
Total	50	62	14	37	163		

[a] Does not included pups captured at the end of the season.
[b] Animals marked in a previous year.
[c] (P) = POPAN model in Program MARK, (C) = Closed Capture with Heterogeneity model in MARK.
[d] Monitoring site is smaller than population site.
[e] West and West West combined.
[f] 1 additional unmarked squirrel captured outside of study area, which was not marked and not included in total.

Table 2. Survey results and population estimates (adult/yearling) for northern Idaho ground squirrel sites, 2008.

Sites[a]	Trapped (MARK est.)	Observed	Minimum Estimate
West Side			
N Hornet Cr			
Greenwood			
Mill Creek		0	0
Halfway		8	10
Harrington property (3 observed)			
Jemmet property (5 observed)			
Cottonwood Corral		9	15
Riley Ranch (PNF only)		0	?
Paradise Flat			
BEAR MEADOW CLUSTER:			
Rocky Comfort Flat		57	60
Lick Creek		47	50
Main (33 observed)			
Road to hay barn (10 observed)			
Feedlot (4 observed)			
*Squirrel Manor	149	45	195
Monitoring Site (81 trapped, 149 est.)			
Remainder of site (45 observed)			
OX–Bear Creek West		11	15
Squirrel Valley		160	170
Squirrel Valley (140 observed)			
Steves Creek[b] (20 observed)			
Bear Cemetery		12	15
Bear Meadow North		31	40
Upper Lick Creek			
*Cold Springs	25		30
Hoo Hoo Gulch		0	?
Upper Hoo Hoo		0	?
Roadside (Butterfield Gulch)		4	5
Fawn Creek		7	10
*Tree Farm	43		43
Calf Pen Gulch North		22	30
*Summit Gulch	21		21
Summit Gulch North			
North Steve's Creek		1	5
Huckleberry		7	10
Mesa			
Smith Mountain Lookout		12	20
Chipmunk Springs		1	5
YCC		2	2

Table 2, cont. Survey results and population estimates (adult/yearling) for northern Idaho ground squirrel sites, 2008.

Sites[a]	Trapped (MARK est.)	Observed	Minimum Estimate
East Side			
Upper Lost Creek		7	10
Lick Creek Lookout		20	25
Lick Creek Lookout Lower		3	5
Bear-Lick Ridgeline			
LOST CREEK COMPLEX:			
Upper Butter Gulch		9	20
'Salt Lick' (9 observed)			
Upper Butter Gulch East (burrow only)			
Lower Butter Gulch		20	30
Middle Lost Creek		1	1
East Fork Lost Creek		6	10
East Fork Lost Creek South		3	5
Lower Lost Creek		9	15
LOST VALLEY COMPLEX:			
Slaughter Gulch ('State Land')		44	50
Lost Valley Reservoir	60	162	230
Eagle's Nest (26 observed)			
*Campground (31 trapped, 60 estimated)			
East of NF 089 (75 observed)			
West of NF 089 (40 observed)			
South End (16 observed)			
Cold Springs Campground (5 observed)			
Fourth of July Creek West		22	25
Fourth of July Creek			
Rocky Top		12	15
PRICE VALLEY COMPLEX:			
Price Valley Guard Station		14	15
Price Valley - West Branch		0	**?**
State/Private (5 sites)		75	95
Game Cabin		0	?
Big & Little Mud Creek drainages – State/Private (8 sites, **1 new**, 4 occ)		125	140
Hot Springs Road		16	20
Round Valley - Main		33	50
Total	298	1,017	1,512

[a] New sites are in bold type; sites not visited are italicized; monitoring sites are marked with an *; locations in gray type are subsites within larger sites, with subtotals in ( ).

[b] May be expansion or shift of the Squirrel Valley colony.

Table 3. Locations covered by exploratory surveys in modeled northern Idaho ground squirrel habitat, 2008.

Area Surveyed in modeled NIDGS habitat	Miles traveled	Area covered (ha)	Comments
Monday Gulch plot[a]		10	Large portion north facing; some good habitat w/ mixed grass/forbs.
West Pine plot[a] (nw of Cambridge)		10	Excellent-looking habitat.
North Hornet 1 plot[a]		10	Good habitat on some of the public land portions.
North Hornet 2 plot[a]		10	Good habitat on some of the public land portions.
Cuprum Rd plot[a]		10	Good habitat. Blowdown and fire nearby.
Calf Pen North plot[a]		10	Possible NIDGS burrows; DEM saw a NIDGS in the plot 7/1/08.
East Fourth of July plot[a]		10	Probably not suitable NIDGS habitat.
West Fourth of July plot[a] & surrounding area		22	**New Site**. Total colony likely >25 adults. Probably small colonies up and down the ridgeline.
State/BLM land sw of Cambridge, w of Hwy 95		688	Volcanic soils adjacent to alfalfa fields; not the best habitat.
South of Cambridge, e of Highway 95	9		Soils very shallow; lower slopes outside modeled habitat looked better.
North of Cambridge, e of Hwy 95	16		Most of modeled habitat overgrazed or altered by development.
Rush Creek Rd nw of Cambridge	9		Good habitat.
West Pine Creek		62	Columbian GS present. Dense sage; a fire would improve the habitat for NIDGS.
Advent Gulch	10		Some acceptable habitat.
Middle Fork Brownlee Rd. #085	4		Steep slopes on both sides of ridge; good habitat on ridgeline.
Indian Valley-Little Weiser		810	No small mammals of any kind. Soils may be too shallow.
Peck Mtn		81	Good habitat.

Table 3, con't. Locations covered by exploratory surveys in modeled northern Idaho ground squirrel habitat, 2008.

Area Surveyed in modeled NIDGS habitat	Miles traveled	Area covered (ha)	Comments
Cuprum Rd		81	Good habitat in openings; loam soils near conifers. NIDGS should be here!
Flat Creek	10		Feeding signs on rocks -- NIDGS? Chipmunk? Excellent habitat.
Summit Creek Rd to North Hornet Rd	4		Area has had underburns in the past.
North Hornet Creek Rd	4		Some thinning has been done. Fire would enhance this habitat.
Weasel Gulch ridge	1		Good habitat.
Smith Mtn to Bear Saddle		65	Very little good habitat. Columbian GS in all acceptable habitat.
Ant Basin		121	Open habitat between Ant Basin and Lick Creek Lookout. Some good NIDGS habitat.
Grouse Creek drainage	1.5		FS Rd 51312, FS Rd 123. Too brushy for NIDGS.
FS Rd 123 toward Lick Creek Lookout; FS Rd 759	1.5		Some suitable habitat; heavy shrubs in other portions; plantations
Upper Lost Creek	2		**New Site.** FS Road 51121 behind gate leading to Lick Creek Lookout. Some suitable habitat.
Mud Creek e of Hwy 95		99	**New Site**
Butter Gulch/Lost Creek		207	**New Sites** (3)
Ridge between Price Valley & Big Mud Crk	3.5	18	IDL mineral exploration. Habitat looks suitable, although a bit steep.
North of Price Valley Rd / Hwy 95 jct		14	IDL mineral exploration. Steep slopes with some suitable habitat on ridgeline.
Fish Lake area - Sec 16		243	IDL mineral exploration. Limited habitat -- steep and forested w/ some suitable openings.
	75.5	2581	

[a] Visited 3 times.

Table 4. Numbers of northern Idaho ground squirrels detected at locations surveyed multiple years, 2004-2008. Survey effort varied among years.

	# of squirrels				
Sites	**2004**	**2005**	**2006**	**2007**	**2008**
West Side sites ---southern					
Halfway	20	50	34	29	8
Harrington (E side of road)	7	7	16	14	3
Jemmet	13	43	18	15	5
Cottonwood Corral	0	0	50	25	9
Riley Ranch & Paradise Flat		0		0	0
West Side sites --- Bear Meadow cluster					
Rocky Comfort Flat	22	33	49	29	57
Lick Creek	6		11	6	47
Squirrel Manor (excluding trapped portion)				53	45
Squirrel Valley	45	7	62	45	160
Squirrel Valley	20	1	48	42	140
Steve's Creek	25	6	14	3	20
Bear Cemetery	3	2	8	2	12
OX-Bear Creek West			1		11
West Side sites ---northern					
Upper Lick Creek	0		5	0	
Hoo Hoo Gulch	3	9	2	1	0
Upper Hoo Hoo	0	0	0	1	0
Roadside (Butterfield Gulch)	0	0	0	5	4
Fawn Creek	5		6	13	7
Calf Pen Gulch North			14	2	22
North Steve’s Creek			7	4	1
Huckleberry	20	9	24	9	7
Smith Mountain Lookout			15	10	12
Chipmunk Springs	5	1	19	8	1
YCC	1	4	1	0	2
East Side					
Lick Creek Lookout			30	21	20
Lick Creek Lookout Lower			5	0	3
Bear - Lick Ridgeline			19	9	

Table 4, cont. Numbers of northern Idaho ground squirrels detected at locations surveyed multiple years, 2004-2008. Survey effort varied among years.

Sites	# of squirrels 2004	2005	2006	2007	2008
Lost Valley Complex					
East Fork Lost Creek (includes South)			11	5	9
Lower Lost Creek				10	9
Slaughter Gulch	45	48	16	60	44
Lost Valley Reservoir	15	45	112	148	162
Eagle's Nest	5	22	29	13	26
East & West of Rd 089			29	84	115
South End	10	23	54	51	21
Fourth of July Creek	8		2	1	
Rocky Top			8	4	12
Price Valley Complex					
Price Valley (state/private)	162	29	267	61	75
Price Valley Guard Station	8	20	12	8	14
Price Valley West Branch	1	0		0	0
Game Cabin	10		0	1	0
Big & Little Mud Creek drainages	74		70	33	125
Hot Springs Road	3	1	3	7	16
Round Valley cluster					
Herrick Lane North & South	45	58	110	49	33
Sixty Lane		2	1		
Woods Corral		0	0	0	
Totals:	501	318	974	659	927