IDAHO DEPARTMENT OF FISH AND GAME

Cal Groen, Director

Threatened and Endangered Species Project
E-28-7 final and E-28-8 interim
Section 6, Endangered Species Act

Progress Report

Southern Idaho Ground Squirrel (*Spermophilus brunneus endemicus*): Year 2009 Results

Prepared By:

Kristin Lohr and Bruce Haak
Idaho Department of Fish and Game
Nampa, Idaho
November 2009

Findings in this report are preliminary in nature and not for publication without permission of the Director of the Idaho Department of Fish and Game.

The Idaho Department of Fish and Game adheres to all applicable state and federal laws and regulations related to discrimination on the basis of race, color, national origin, age, gender, or handicap. If you feel you have been discriminated against in any program, activity, or facility of the Idaho Department of Fish and Game, or if you desire further information, please write to: Idaho Department of Fish and Game, PO Box 25, Boise, ID 83707; or the Office of Human Resources, U.S. Fish and Wildlife Service, Department of the Interior, Washington, DC 20240.

This publication will be made available in alternative formats upon request. Please contact the Idaho Department of Fish and Game for assistance.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

The main objective of this project was to monitor distribution and relative abundance of populations of southern Idaho ground squirrels (*Spermophilus brunneus endemicus*). In 2009, we continued monitoring populations of southern Idaho ground squirrels on public and private lands. We also surveyed public lands for ground squirrels in areas that had not previously been surveyed. Intensive monitoring of 5 sites and extensive monitoring of 7 sites began in 2005 and continued through 2009. Monitoring plots were comprised of 9, 1-ha plots, arranged as 1 center plot surrounded by 8 perimeter plots. Intensive monitoring included 4 mark-recapture trapping events at the center 1-ha plot, from which we estimated population size. At intensive and extensive sites, we ascertained ground squirrel presence within each quarter of the 8 perimeter plots. Presence or absence (i.e., detected or not detected) was determined by visual detection, burrows, or fecal pellets. The 2009 population size estimates were: 1) Bissel 1, 97 squirrels (95% confidence interval [CI] 67-127); 2) Clay Peak, 48 squirrels (95% CI 25-71); 3) Holland Gulch, 3 squirrels (unable to obtain); 4) Sand Hollow, 18 squirrels (95% CI 15-21); and 5) Squaw Butte, 18 squirrels (95% CI 5-31). At intensive and extensive sites, ground squirrels occupied the perimeter plots from a low of 59% at Squaw Butte to 100% at 5 sites. We also surveyed approximately 607 ha of public land for southern Idaho ground squirrels, but we did not detect any squirrels.

INTRODUCTION

Biologists and land managers observed downward trends in numbers of southern Idaho ground squirrels (SIDGS) in the late 1990s. Those declines elicited concern among state, federal, and private entities. In October 2001, the species was declared a "candidate" for threatened or endangered status by the U.S. Fish and Wildlife Service (USFWS 2001), and currently is considered a "species of greatest conservation need" by the Idaho Department of Fish and Game (IDFG) and a "sensitive species" by the Bureau of Land Management (BLM). The SIDGS project is a cooperative effort among IDFG, USFWS, BLM, and private landowners.

Factors contributing to the decline in SIDGS numbers include substantial changes to the composition of habitat and the effects of climatic conditions such as drought on the growth patterns of available vegetation. Historically, these squirrels occupied habitat composed of a diverse selection of native grasses, forbs, and shrubs. However, the habitat of this subspecies has been drastically reduced by agriculture, human development, fire, and the invasion of exotic annual grasses and forbs, which out-compete native vegetation. Characteristics of invasive grasses such as timing of growth and senescence, propagation of range fires, and the resulting increase in dominance by these species have also led to a reduction of the quality and reliability of suitable food resources for SIDGS (Barrett 2005).

Of the 425,629 ha that are considered current, historical, or potential habitat for SIDGS, approximately 85% is private property (USFWS 2005). Therefore, monitoring of SIDGS on private property, along with ongoing monitoring on public lands, is essential to understanding the cyclical patterns and population status of this subspecies.

One conservation measure in place to benefit SIDGS is a Programmatic Candidate Conservation Agreement with Assurances (CCAA) (IDFG, USFWS, and Idaho Governor's Office of Species Conservation 2004). The CCAA is intended to conserve SIDGS on private land through habitat enhancement and protection of existing suitable habitats, and through the protection of individual ground squirrels and ground squirrel local populations (Barrett and Haak 2005). There are currently 5 landowners with individual signed agreements.

To assess the results of conservation efforts, baseline population variables must be monitored. While apparent increases in the abundance of SIDGS have occurred for the last 2–3 years in localized areas, long-term monitoring of this subspecies will help determine the trajectory and stability of local populations on private and public lands. Furthermore, information on the current distribution of SIDGS is still needed.

The objective of this project was to monitor distribution and relative abundance of populations of SIDGS on public and private lands in Washington, Payette, and Gem counties in southwestern Idaho.

STUDY AREA

The SIDGS inhabits a small geographic area of southwestern Idaho and is found only in Gem, Payette, Washington, and Adams counties (Figure 1). Their range is bordered by the Payette River to the south and the Snake River to the west. Typically found between 670 m and 975 m in elevation (Yensen and Sherman 1997), local populations of this subspecies are found primarily in lower drainages, basins, and alluvial and colluvial fans with well drained loamy soils that are suitable for a semifossorial life. Most squirrel populations are found in the southern portion of their geographic range.

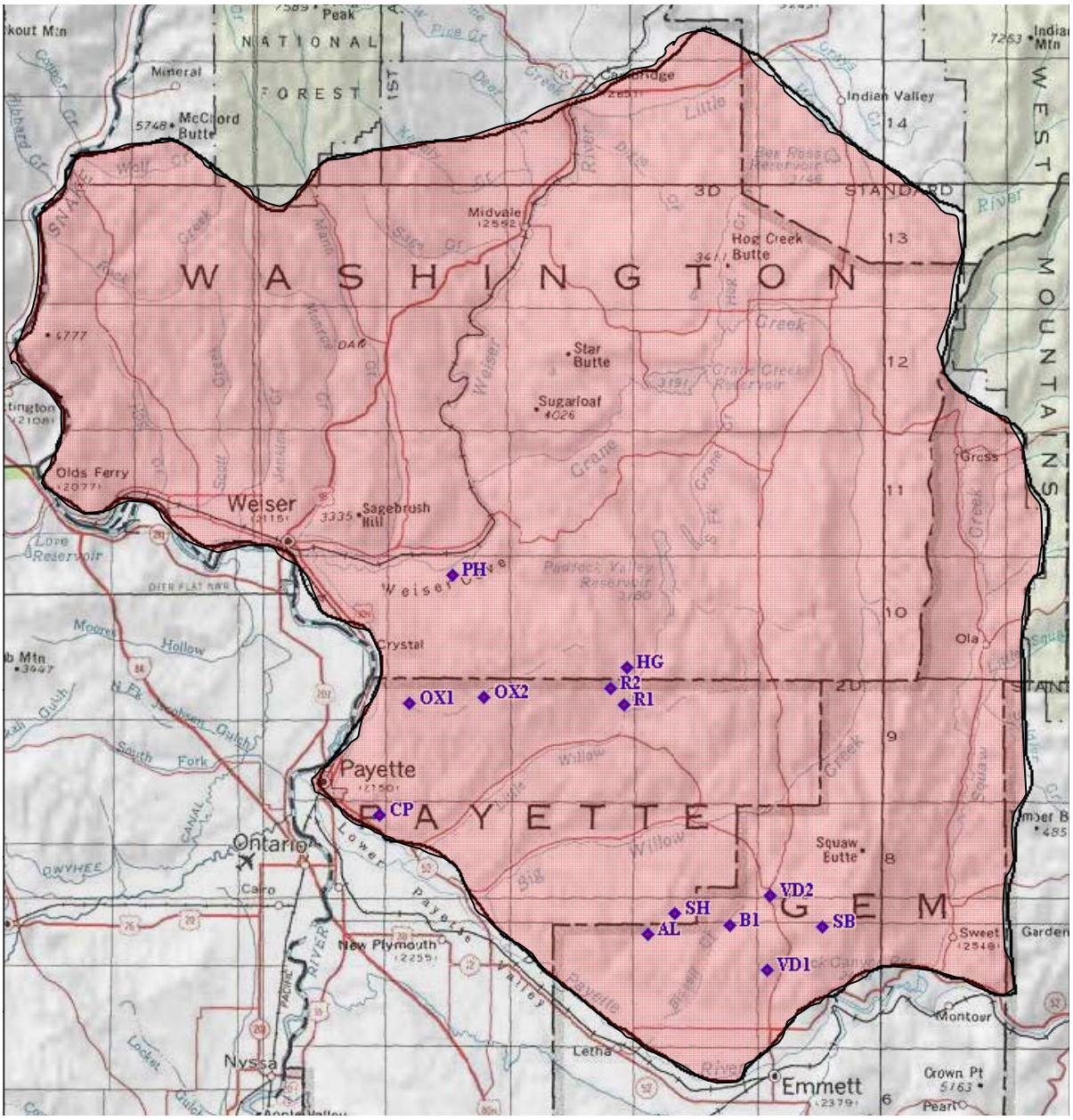

Figure 1. Approximate potential range of SIDGS (shaded) and locations of study sites. Study site abbreviations are: OX1 and OX2 = OX Ranch; HG = Holland Gulch; R1 and R2 = Roberson's Kennels; CP = Clay Peak; AL = AL Cattle; SH = Sand Hollow; B1 = Bissel 1; VD1 and VD2 = V dot Cattle; and SB = Squaw Butte.

METHODS

Monitoring Plots

During this study, SIDGS were monitored at 2 levels: 1) intensive sites where biologists estimate and monitor abundance and 2) extensive sites where they track presence or absence (Figure 1, Table 1). This monitoring plot design has been in place since 2005. Biologists selected these particular local populations for a number of reasons. First, some of these sites have been intensively trapped and monitored since 2002, and these data will substantially add to the detection of long-term population patterns. Second, these local populations were on lands that are representative of the habitats and land uses within the range of SIDGS, yet differed from each other in current vegetation composition. Finally, many of these sites were associated with lands enrolled in the programmatic CCAA, while others were on lands administered by the BLM and the Idaho Department of Lands (IDL).

Table 1. Intensive and extensive monitoring sites for SIDGS.

Study site	Owner/lessee	Type	Location (easting/northing)[a]
Bissel 1	BLM/AL Cattle/V dot Cattle	Intensive	536419/4869786
Sand Hollow	AL Cattle	Intensive	532169/4870622
Squaw Butte	BLM/V dot Cattle	Intensive	543600/4869714
Holland Gulch	IDL and BLM/Robertson	Intensive	528279/4889582
Clay Peak	BLM/Payette County	Intensive	509096/4878181
Vdot1	V dot Cattle	Extensive	539420/4869338
Vdot2	V dot Cattle	Extensive	539556/4872025
Robertson1	Robertson Kennels	Extensive	528290/4887667
Robertson2	Robertson Kennels	Extensive	527733/4888267
OX1	OX Ranch	Extensive	511384/4886869
OX2	OX Ranch	Extensive	517246/4887412
ALCattle1	AL Cattle	Extensive	530067/4868974

[a] UTM coordinates in NAD 83.

Each intensive and extensive site was comprised of 9, 1-ha plots. Eight of the 1-ha plots were perimeter plots, which surrounded a central 1-ha plot with approximately 100 m x 100 m dimensions (Figure 2). At intensive sites, the central plot was used to determine ground squirrel abundance and to quantify and measure changes in vegetation. At both extensive and intensive sites, we surveyed for presence or absence of SIDGS in the 8 perimeter plots.

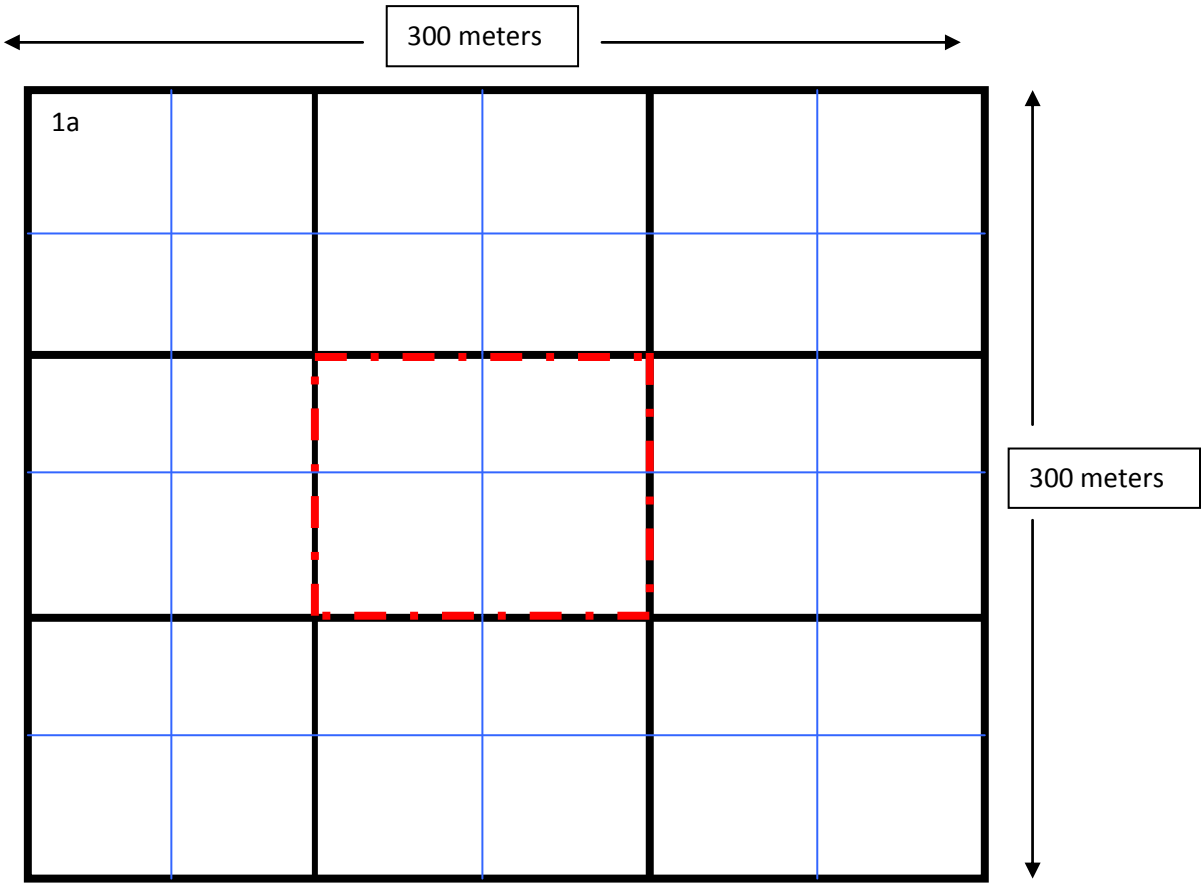

Figure 2. Schematic for monitoring plots for SIDGS. Population monitoring occurs at the center hectare of intensive sites (red, dashed square). Ground squirrel presence/absence was determined within quarter sections of each of the 8 perimeter hectares at both intensive and extensive sites.

Intensive Sites

There are 5 intensive sites: Bissel 1, Clay Peak, Holland Gulch, Sand Hollow, and Squaw Butte. From 2002–2004, BSU graduate students trapped at these sites to gather data on basic life history variables, including emergence weights and breeding population structure. The intensive monitoring protocol was implemented in 2005.

We used a focal trapping method to capture ground squirrels (Yensen and Sherman 2003) within the center 1-ha subplot of the 9-ha plot design. This method entailed searching for active squirrels and following them until they retreated into a burrow. We then set up a trap (Tomahawk Model 102, 13 cm x 13 cm x 40 cm, single door, Tomahawk Live Trap Co., Tomahawk, WI) or burrow-entrance: 8 cm x 40 cm, single hinged door (Wobeser and Leighton 1979) over that burrow entrance. Surrounding and possibly interconnected holes were blocked with empty plastic soda pop bottles (12–32 oz.) to prevent the squirrel from exiting by an

alternate route. We marked the location with fluorescent flagging tape and noted the location in a field notebook. Traps were monitored frequently to reduce stress in trapped squirrels. Trapped squirrels were processed at the trapping location. To process an individual squirrel, we transferred it from the trap into a cloth bag (approximately 25 cm x 46 cm) with a drawstring top. Each individual was weighed to the nearest gram using a 300-g spring scale (Avinet Inc., Dryden, NY). By clasping the squirrel through the cloth bag, with thumb and forefinger around the shoulders of the animal, we were able to expose the head and/or torso for marking and further measurements. Unmarked squirrels were marked with matching unique identification (alpha-numeric) Monel ear tags in each ear (#1005-1, National Band and Tag Co., Newport, KY). We recorded ear tag numbers of previously marked squirrels and replaced any missing ear tags. Squirrels were weighed and examined to determine gender and reproductive status. After processing, squirrels were released into the burrow from which they were trapped.

Each site was trapped 4–5 times from early February to early April, 2005–2009, before emergence of pups. In 2005 and 2006, trappers often captured squirrels in an unspecified distance outside the 1-ha center plot. Because this resulted in numbers that might not be comparable among years, we restricted trapping to only the center plot starting in 2007 through the present. The corners of the center plot were visibly marked with survey flags to help trappers stay within the boundary. We also recorded GPS coordinates for each trap location so that we could confirm the location using ArcGIS. Because squirrels can easily run in and out of the center ha, we used several criteria to determine whether a squirrel was inside the plot:

1. We allowed for a 10-m error in GPS location, so squirrels within 10-m of the plot boundary were “in” unless the trapper indicated in the notes that the squirrel was “out.”
2. Squirrels were “in” if a trapper noted that the squirrel was “in” but they chased the squirrel out of the plot, where it was then caught.
3. If a squirrel was trapped “in” on greater than 1 occasion, but trapped “out” on 1 occasion, we assumed the squirrel lived inside the center ha and was considered “in” on all occasions.

We summarized results by total captures and estimated abundance at each site, using mark-recapture methodology. We used a Chapman-modified Lincoln-Petersen formula (Pollock et al. 1990) to estimate the population at each site from 2005–2009. This estimator assumes the population is closed to births/immigrations and deaths/emigrations.

Presence/Absence Surveys

We conducted presence/absence surveys at 7 extensive sites and in the perimeter subplots of the 5 intensive sites. Extensive monitoring consisted of 1 visit per site to determine presence or absence of squirrels within each 1-ha subplot (Figure 2). We ascertained ground squirrel presence, or lack of detected presence, within each quarter (or quadrant) of each subplot (i.e., NW, NE, SW, SE). Center-point coordinates of each quadrant were determined using ArcView version 3.1. Surveyors entered coordinates into a handheld GPS unit and navigated to each quarter subplot. Surveyors determined the presence of ground squirrel by visual observations, burrows, or fresh fecal pellets. Because it was sometimes difficult to determine the distance of

audio responses, only audio responses that were clearly within quadrants were counted as evidence of squirrel presence.

Habitat/Vegetation Monitoring

From 2006-2008, we conducted vegetation surveys at the 5 intensive sites within the central 1-ha plot using the Daubenmire Method (Daubenmire 1959). The purpose was to monitor changes in vegetation, specifically increases or decreases of exotic vegetation. Beginning in 2009, vegetation monitoring will take place once every 5 years. The methods and results of vegetation monitoring are reported in a separate report from the USFWS. These data will allow us to track long-term changes in existing vegetation and resulting effects on SIDGS populations.

We acquired average monthly precipitation data from the U.S. Department of Agriculture-Natural Resource Conservation Service using the "Emmett 2 E" precipitation station (http://nrcs.usda.gov). Data for October 2005 through July 2009 were acquired as well as a 30-year average for this period (obtained from 1971-2000 data). Over the long-term, we recommend precipitation be compared to squirrel numbers and habitat condition to understand how precipitation influences squirrel reproduction and survival.

Surveys on BLM Lands

IDFG and BLM have traditionally coordinated on survey efforts of SIDGS on BLM lands. The goal of this joint effort is to survey approximately 1,416 ha (3,500 acres) annually to document the current distribution of SIDGS on BLM lands. Target areas have been those that have not recently been or have never been surveyed, but were within the predicted range of the species. In 2007, we added an additional criterion of surveying lands with relatively deep soils. BLM selected areas to survey that also contained soil types that would be suitable for constructing burrows, i.e., soils greater than 1 m in depth.

We concentrated our survey efforts in areas with the most suitable habitat, but also surveyed areas that were encountered while walking to and between suitable habitats. Surveyors searched for burrows, listened for whistles, and visually scanned the terrain for squirrels. Surveys were conducted throughout the day, under favorable weather conditions, i.e., without rain or severe wind.

RESULTS

Monitoring Plots

Intensive Sites

We trapped ground squirrels at the 5 intensive study sites from 18 February to 11 April 2009. Clay Peak and Squaw Butte were each trapped 4 times; the remaining 3 sites were trapped 5 times. We caught 132 breeding-age squirrels (yearling and older) within the central plot of the 5 sites (Table 2). Of the 132 squirrels found within the central plot, 54% were female and 45%

were male. Bissel 1 had the largest number of squirrels trapped (n = 66), followed by Clay Peak (n = 27), Sand Hollow (n = 19), Squaw Butte (n = 14), and Holland Gulch (n = 6).

We estimated the population size of ground squirrels at each site from 2005–2009 using the Chapman formula (Table 3). Numbers, however, were not comparable because the size of the trapping area varied among years and sites. Therefore, we were not able to interpret population trends. From 2007 to 2009, we limited population estimation to squirrels trapped in the center hectare.

Table 2. Total number of adult SIDGS trapped at 5 intensive sites, 2005–2009. Squirrels trapped in 2005 and 2006 included all squirrels trapped regardless of the center plot. Squirrels trapped 2007-2009 were trapped only within the center plot. Therefore, numbers were not comparable among years.

Site	2005 Total (M,F)	2006 Total (M,F)	2007 Total (M,F)	2008 Total (M,F)	2009 Total (M,F)
Bissel 1	35 (11,24)	60 (23,37)	59 (28,31)	47 (18,29)	66[a] (34,31)
Clay Peak	16 (10,6)	39 (14,26)	26 (11,15)	14 (7,7)	27 (18,9)
Holland Gulch	17 (7,10)	32 (11,21)	10 (3,7)	5 (1,4)	6 (1,5)
Sand Hollow	18 (9,9)	44 (26,17)	24 (10,14)	16 (3,13)	19 (6,13)
Squaw Butte	18 (4,14)	32 (12,20)	12 (5,7)	9 (1,8)	14 (1, 13)
Total	104 (41,63)	207 (86,121)	131 (57,74)	91 (30,61)	132 (60,71)

[a] One squirrel was not sexed.

Table 3. Population size estimate of SIDGS at 5 intensive sites using the Chapman formula for closed populations, 2005–2009. Numbers in 2005 and 2006 were not comparable with 2007 - 2009 numbers because size of trapping area varied among years and sites.

Site	2005 Number (95% CI)	2006 Number (95% CI)	2007 Number (95% CI)	2008 Number (95% CI)	2009 Number (95% CI)
Bissel 1	84 (42-127)	144 (72-217)	85 (64-106)	90 (66-115)	97 (67-127)
Clay Peak	45 (13-77)	91 (45-138)	48 (26-57)	36 (26-46)	48 (25-71)
Holland Gulch	28 (15-41)	58 (31-85)	12 (8-15)	5 (2-8)	3 ([a])
Sand Hollow	29 (16-42)	72 (41-104)	27 (22-32)	25 (13-37)	18 (15-21)
Squaw Butte	34 (13-55)	70 (27-113)	14 (10-17)	8 (6-10)	18 (5-31)

[a] CI could not be calculated.

Presence/Absence Surveys

We conducted presence /absence surveys for SIDGS between 14 April and 20 April in each quadrant of the 8 perimeter subplots of the 9-ha study plot. Site OX 1 and Vdot 2 both contained

quadrants that were located in recently plowed agriculture fields. In 2008 and 2009, we reported percent occupancy including and excluding these agricultural quadrants (Table 4). When excluding the agricultural quadrants in 2009, ground squirrels occupied the perimeter plots from a low of 59% at Squaw Butte to a high of 100% at AL Cattle, Bissel 1, Clay Peak, Robertson 2, and Vdot 1.

Table 4. Results of presence/absence surveys for SIDGS at 12 sites, 2005–2009. Occupancy was determined by presence/absence surveys in 4 quadrants in 8 perimeter subplots for a total of 32 quadrants.

Study Site	Percent Occupied 2005	Percent Occupied 2006	Percent Occupied 2007	Percent Occupied 2008	Percent Occupied 2009
Bissel 1	97	100	100	100	100
Clay Peak	100	97	94	100	100
Holland Gulch	100	87.5	87.5	91	97
Squaw Butte	94	94	81	97	59
Sand Hollow	97	94	100	100	97
Vdot 1	100	100	100	100	100
Vdot 2	100	66	59/93[a]	81/100[a]	84/97[a]
AL Cattle	100	100	100	100	100
OX 1	100	87.5	78/90[a]	84/100[a]	69/94[a]
OX 2	100	69	94	97	97
Robertson 1	100	91	91	91	87.5
Robertson 2	100	91	100	91	100

[a] Smaller percentage represents calculations including quadrants in agriculture fields.

Habitat /Vegetation Monitoring

We did not conduct vegetation sampling in 2009 following USFWS vegetation monitoring protocol. However, we continued to compile precipitation data for the study area. Except for below average precipitation in February when squirrels were emerging from hibernation, precipitation during the rest of the active season was above the 30-year average (Figure 3). Similarly, high precipitation was reported in all years of the study except for 2007 when precipitation fluctuated from below and above the 30-year average in alternating months.

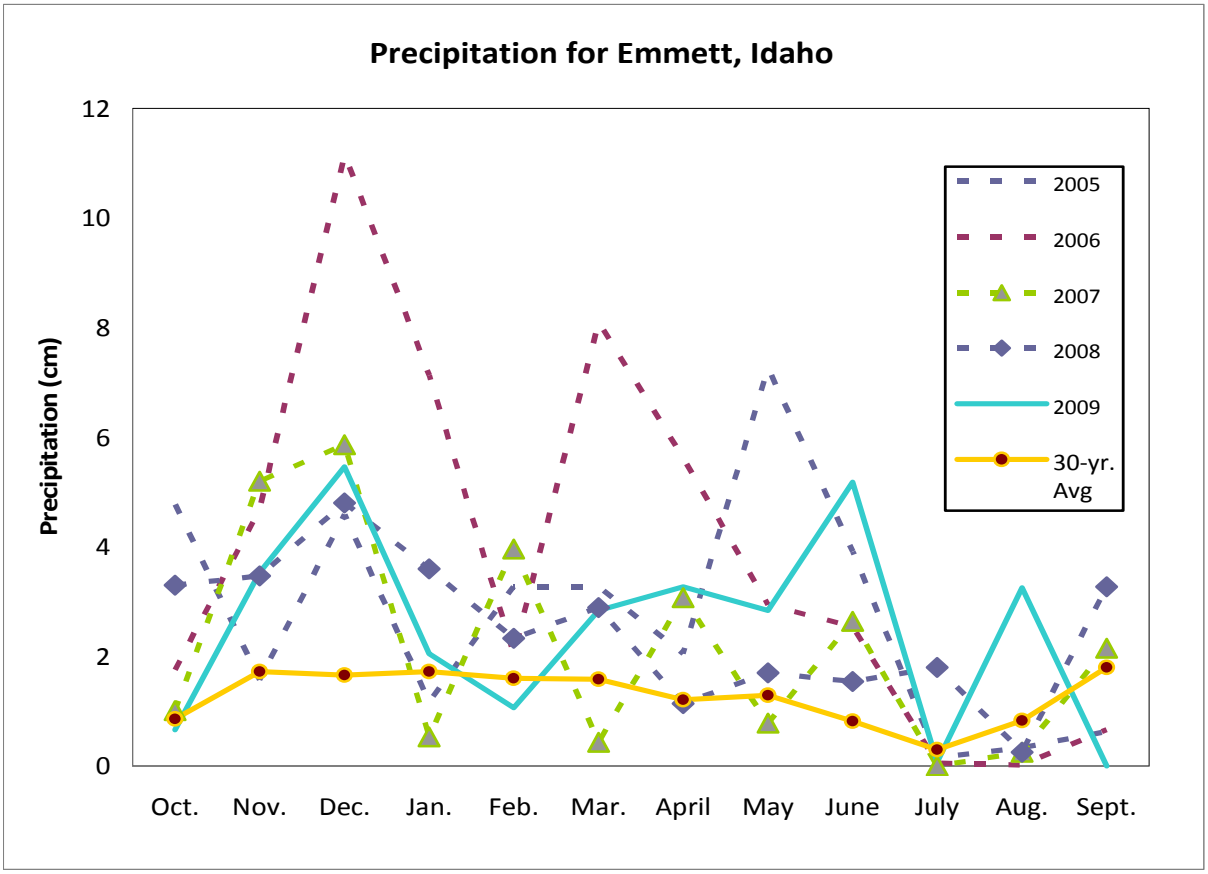

Figure 3. Average monthly precipitation for selected months in water years 2005–2009 and the 30-year average (1971 – 2000), Emmett, Idaho.

Surveys on BLM Lands

We surveyed approximately 607 ha of BLM land for presence of SIDGS in May 2009. The survey area was located in Washington County, north of Mann Creek Reservoir on the Hixon-Sharptail Preserve. Soil types in most of the area were shallower than 1 m, so surveys were limited to deeper soils. However, the areas with deeper soils were often very shrubby and some contained Ponderosa pine and Douglas fir. These areas were not considered to be SIDGS habitat. Consequently, we did not detect ground squirrels or squirrel sign during these surveys.

DISCUSSION

In 2005, monitoring plots initially comprised a 2-ha area and were not reduced to 1-ha until after trapping had been completed at all sites. The 2-ha area encompassed the historical trapping areas at all of the intensive sites except for Sand Hollow, which was larger than 2-ha. In 2005, although the monitoring plots had been reduced to 1-ha, the intensive sites were still trapped in

roughly the same area as the 2-ha plots with the understanding that the additional area outside of the center ha served as a buffer area since squirrels would frequently run out of the plot (or into it) before entering a burrow. However, previous trappers acknowledged that the "buffer" was often undefined and variable among sites and they did not record trap locations. Therefore, because trapping areas were different among years and among sites, resulting population numbers are not comparable. Starting in 2007, we restricted trapping to the center 1-ha plot and recorded GPS coordinates of each trapped squirrel as verification. It is important that population estimates be restricted to the center 1-ha in the future. This allows valid comparisons among years and sites because resulting data are reported in a "common currency" (i.e., density or number of squirrels/ha).

In previous years, one of our project goals was to identify areas to conduct habitat enhancement projects for squirrels. In theory, habitat improvement projects would occur in small areas to provide good habitat for the reintroduction of squirrels or to provide better quality forage for existing colonies of squirrels. In reality, projects such as these would be very time consuming and costly, and ultimately would most likely fail because of the abundance and aggressive colonization behavior of exotic annual plants that are ubiquitous within the range of the squirrel. The only way that habitat improvement can occur within the range of the squirrel is to aggressively attack exotic annuals with herbicides, and to do so across all of southern Idaho in order to reduce the chance of recolonization of these invasive plants. In the meantime, protection of existing native shrub-steppe habitat from fire, excessive grazing, and off-road vehicle use is extremely important.

REFERENCES

Barrett, J. S. 2005. Population viability of the southern Idaho ground squirrel (*Spermophilus brunneus endemicus*): Effects of an altered landscape. Thesis, Boise State University, Boise, Idaho, USA.

Barrett, J. S., and B. A. Haak. 2005. Southern Idaho ground squirrels (*Spermophilus brunneus endemicus*) within private properties associated with the Programmatic Candidate Conservation Agreement with Assurances. Monitoring Report (field season 2005). Idaho Department of Fish and Game, Boise, USA.

Daubenmire, R. 1959. A canopy-coverage method of vegetational analysis. Northwest Science 33:43-62.

Idaho Department of Fish and Game, U.S. Fish and Wildlife Service, and Idaho Governor's Office of Species Conservation. 2004. Programmatic southern Idaho ground squirrel Candidate Conservation Agreement with Assurances. Idaho Department of Fish and Game, Boise, USA.

Pollock, K. H., J. D. Nichols, C. Brownie, and J. E. Hines. 1990. Statistical inference for capture-recapture experiments. Wildlife Society Monographs 107.

U.S. Fish and Wildlife Service. 2001. Federal Register 66:54808-54832 (30 October).

Wobeser, G. A., and F. A. Leighton. 1979. A simple burrow entrance trap for ground squirrels. Journal of Wildlife Management 43:571-572.

Yensen, E., and P. Sherman. 1997. Mammalian species account for *Spermophilus brunneus*. Mammalian Species 560:1-5.

Yensen, E., and P. W. Sherman. 2003. Ground squirrels: *Spermophilus* spp. and *Ammospermophilus* spp. Pages 211-231 *in* Wild Mammals of North America, 2nd edition, G. Feldhamer, B. Thompson, and J. Chapman, editors. Johns Hopkins University Press, Baltimore, Maryland, USA.