5-YEAR REVIEW
Northern Idaho Ground Squirrel (*Urocitellus brunneus*)
August 2022

GENERAL INFORMATION:

Species: *Urocitellus brunneus*
Date listed: April 5, 2000
FR citation(s): 65 FR 17780-listed as threatened; 80 FR 35860-Revised taxonomy from *Spermophilus brunneus brunneus* to *Urocitellus brunneus*.
Classification: Threatened

BACKGROUND:

Previous status reviews:
U.S. Fish and Wildlife Service. 2017. Status Review for the Northern Idaho Ground Squirrel (*Urocitellus brunneus*). Idaho Fish and Wildlife Office, Boise, Idaho. 10 pp. March 21, 2017.

U.S. Fish and Wildlife Service. 2011. Status Review for the Northern Idaho Ground Squirrel (*Spermophilus brunneus brunneus*). Idaho Fish and Wildlife Office, Boise, Idaho. 29 pp. September 13, 2011.

FR Notice citation announcing this status review: U.S. Fish and Wildlife Service. 2021. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 77 species in Oregon, Washington, Idaho, and Hawaii. Federal Register 86 (120): 33726–33728. June 25, 2021.

ASSESSMENT:

Information acquired since the last status review:
This 5-year review was conducted by the U.S. Fish and Wildlife Service's (USFWS), Idaho Fish and Wildlife Office (IFWO). Data for this review were solicited from interested parties through a Federal Register notice announcing this review on June 25, 2021. We also contacted the Northern Idaho Ground Squirrel Technical Working Group, which consists of biologists from the U.S. Forest Service's Payette National Forest (PNF), the Idaho Department of Fish and Game (IDFG), the Idaho Governor's Office of Species Conservation, the University of Idaho, and one species expert to request any data or information we should consider in our review. Additionally, we conducted a literature search and a review of information in our files.

We reviewed IDFG annual survey and monitoring reports for northern Idaho ground squirrels (NIDGS), an IDFG report on current and future distributions of NIDGS, final reports from University of Idaho research projects we have funded, and NIDGS-specific literature that has been published since the last status review. The results from these reports and published literature indicate the overall distribution and abundance of this species remains relatively consistent with the information reported in our 2017 5-year review (Appendix B) and threats (e.g., forest encroachment into meadows, land use changes, motorized recreation, and

recreational shooting) remain consistent with those reported in our 2011 5-year review (USFWS 2011, pp. 9–18). Further, the information will be used to inform conservation and recovery of this species. Citations for the IDFG reports, University of Idaho final reports, and published literature can be found in Appendix A.

Updates since the last status review:

Survey and Monitoring

We have continued to fund IDFG to coordinate NIDGS recovery activities including survey and monitoring work. Survey and monitoring results indicate that NIDGS populations have remained relatively stable (Fig. 1) and occupy approximately the same areas since the last 5-year status review. IDFG employs a monitoring design that was developed in 2013 and combines grid-based, line-transect distance sampling assigned to three strata within occupied squirrel sites to provide a statistically valid, repeatable approach for estimating population size and trends every year for a time frame of 20–30 years (IDFG 2013, pp. 1–2). The strata are based on known squirrel densities using data prior to 2013; stratum 1 contained >10 NIDGS, stratum 2 contained <10 NIDGS, and stratum 3 was established along the perimeter of NIDGS sites and was intended to be surveyed in subsequent years to capture population shifts or expansions associated with occupied sites (IDFG 2013, p. 4). Stratum 3 was added to surveys in 2018.

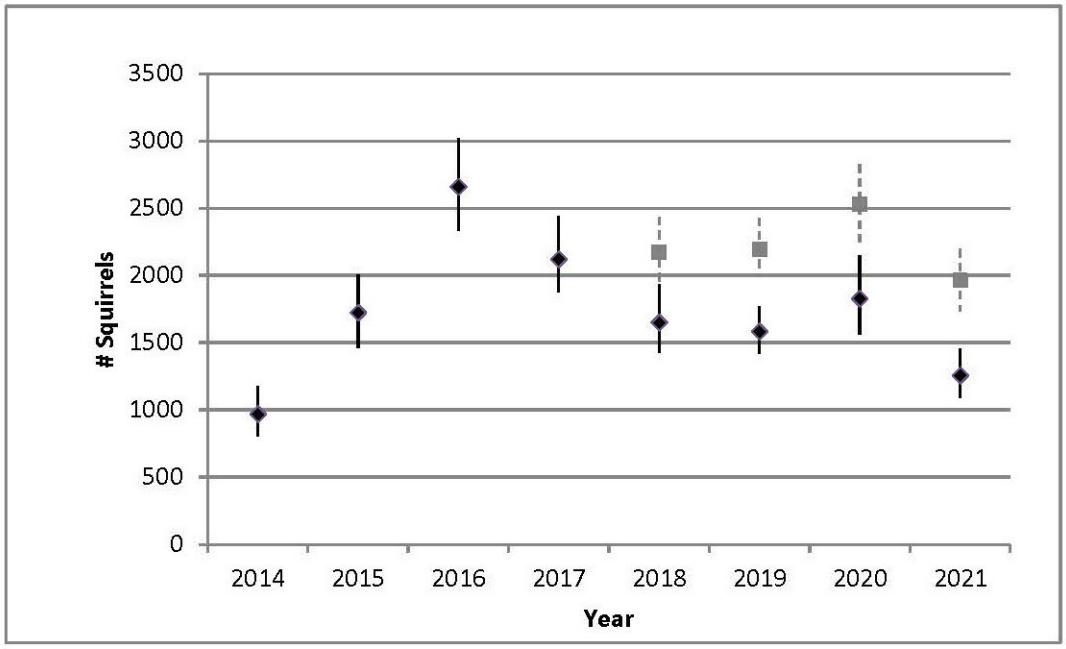

Figure 1. Unadjusted population estimates and 95% confidence intervals using program DISTANCE for strata 1 and 2 only (black); strata 1, 2, and 3 shown in gray for 2018 – 2021. (IDFG 2021, p.10)

University of Idaho Research

The University of Idaho's Idaho Cooperative Fish and Wildlife Research Unit has continued to receive funding from IFWO, IDFG, and PNF to conduct research on NIDGS. Most of this research has been published in peer reviewed journals covering topics such as diet, overwintering habitat selection and behavior, sylvatic plague, genetics, and predicted distribution modeling. See Appendix A for a list of publications.

Plague

From 2014 to 2018, researchers investigated whether sylvatic plague was present in NIDGS populations. Sylvatic plague is a flea-borne bacterial disease found in wild rodents. It is caused by the nonnative bacterium, *Yersinia pestis*. In our 2017 5-year status review, we described sylvatic plague research that was in progress and concluded that while preliminary results indicated that plague may be present in the range of NIDGS and could be reducing survival of the species, we were unable to determine whether this disease constituted a threat to NIDGS. The final study results were published in 2021 (Goldberg et al. 2021, entire). Similar to what was reported in the last status review, the final results suggest that NIDGS may be experiencing low levels of the disease in some individuals that could affect survival, but we cannot determine if this potential stressor rises to the level of a threat that could affect the species.

Genetics

Researchers collected DNA samples from 232 NIDGS in 2016 to analyze demographic and adaptive (genes influenced by environmental factors) genetic variation. Results from this study were published in 2021 (Barbosa et al. 2021, entire). There was evidence for both demographic and adaptive genetic differentiation in NIDGS. Demographic differentiation was likely due to low connectivity between populations, while the main driver of adaptive differentiation was elevation.

In 2020, IFWO and IDFG provided funding to the University of Idaho for additional demographic genetics research on NIDGS (Garrett et al. 2022, entire). Previous genetic studies used differing methods, and many of the DNA samples were too poor of quality to be analyzed using the older genotyping methods, but these same samples can be analyzed in this study using newer methods. Final results from this study are near completion and will provide consistent genetic data across the species' entire range.

In 2021, University of Idaho researchers received a grant for a whole genomic sequencing (WGS) study of NIDGS. WGS identifies the complete DNA of a species and will provide information on the precise genetic variation of NIDGS populations. Results are anticipated in 2023.

Forest Restoration Study

Research on forest treatments for the benefit of NIDG began in 2013 and is expected to be completed by 2027. The forest restoration research objectives are to measure the response of NIDGS to two forest treatments: 1) forest thinning followed by prescribed fire, and 2) prescribed fire only. Specifically, PNF will implement forest treatments that will be evaluated by

researchers to determine their effect on the size and location of NIDGS colonies, reproductive output, pre-hibernation body mass, overwinter survival, and natal recruitment. Two treatments remain to be implemented at NIDGS sites, Lower Butter and Rocky Top. These sites are expected to be treated by 2025 followed by two years of post-treatment monitoring.

Overwintering Habitat

Research on summer versus winter habitat of NIDGS was conducted from 2013-2017 and the results of this study were published in 2020 (Goldberg et al. 2020, entire). Results indicate that NIDGS hibernation locations had greater canopy cover compared to active season locations, and most of the hibernacula were located outside of the active-season area (meadows) in sparsely to heavily forested areas. Because these results have expanded our knowledge of the life-history characteristics of NIDGS and could have management implications, the University of Idaho is continuing to investigate overwintering behavior and habitat in adult and juvenile NIDGS.

Diet

Two studies were published on the diet of NIDGS since the last 5-year review. Yensen and others (Yensen et al. 2018, entire) analyzed fecal pellets from five study sites and found that NIDGS consumed a high diversity of plants but over 86% of their diet consisted of forbs. Likewise, Goldberg and others (Goldberg et al. 2020, entire) analyzed fecal pellets from 11 NIDGS sites and found that forbs dominated their diet followed by grasses, shrubs, trees, rushes, and sedges. Additionally, they found that one forb species, yampah (*Perideridia spp.*), was associated with overwinter survival in NIDGS (Goldberg et al. 2020, p. 7638).

Current and Future Distribution Models

IFWO provided funding to the University of Idaho with the objective to develop species distribution models using multiple cross-validation approaches to understand the intricacies of predicting habitat suitability for NIDGS (Helmstetter et al. 2021, entire). They used 11 environmental variables in their models such as topographic features, tree canopy cover, and soil composition. The study concluded that subtle differences in modeling could create substantial differences in predicting suitable habitat, particularly for locations where presence data is limited or not available or for species with larger distributions.

IFWO also provided funding to IDFG's spatial ecologists to develop robust models to predict current and future distributions of NIDGS using bioclimatic variables such as land cover, topography, soil properties, climate, and phenology (IDFG 2020, entire). The modeled current distribution of NIDGS captured 99.7% of NIDGS individual locations and all known populations, providing for more rigorous data input into the models. Future distribution models were developed using mid-century (2040 to 2069) climate projections under a moderate emission scenario (RCP 4.5) and a high emission scenario (RCP 8.5). Future NIDGS distribution is projected to increase slightly under RCP 4.5 and remain stable under RCP 8.5. Both models predict a northward range expansion.

Payette National Forest Habitat Restoration

Between 2017 and 2021, the PNF thinned approximately 32 acres (ac) (13 hectares (ha)) and treated approximately 293 ac (119 ha) with prescribed fire in or adjacent to occupied NIDGS sites. This work was carried out to maintain and enhance occupied NIDGS habitat.

Private Land Conservation

In 2020, we renewed a Safe Harbor Agreement (SHA) with OX Ranch. Approximately 7,783 ac (3,150 ha) are enrolled under this agreement. The SHA is in effect until 2024, which corresponds with the expiration date of the Section 10(a)(1)(A) permit associated with it. These enrolled lands continue to support the largest population of NIDGS in the entire range. Roughly 1/3 of all individual NIDGS are found on these lands. OX Ranch has been a valuable conservation partner, and we will continue to work with them to facilitate future conservation for NIDGS.

In 2016, a private landowner bought approximately 100,000 ac (40,469 ha) of land from a timber company in central Idaho. This land contained 15 known occupied NIDGS sites. The previous landowner (Potlatch Forest Holdings) had a Memorandum of Agreement with IDFG to carry out NIDGS conservation actions on their private lands. In 2017, a letter was sent from the IFWO to the present landowner informing them of the presence of NIDGS on their property, along with the previous monitoring and research efforts carried out on these lands (USFWS in litt. 2017). The private landowner allowed continued access to NIDGS sites by University of Idaho researchers until their study concluded in 2018. Since that time, no access has been granted for NIDGS monitoring, surveys, or further research. Given the lack of access, we do not have updated status data for these 15 affected occupied NIDGS sites. The landowner is managing the land for timber extraction and realty sales.

Smaller parcels of lands containing NIDGS colonies remain available for development. Notably, the disjunct Round Valley population of NIDGS occurs solely on private land. However, we are not aware of any development occurring in any NIDGS sites rangewide from 2017 to 2021.

Species Status Assessment

We are in the process of conducting a species status assessment (SSA) for NIDGS which will culminate in an SSA report. The SSA report is intended to be a concise review of the species' biology and factors influencing the species, an evaluation of its biological status, and an assessment of the resources and conditions needed to maintain long-term viability. The intent is for the SSA report to be easily updated as new information becomes available and to support all functions of the Endangered Species Program. The SSA is expected to be completed by the end of 2022 and will inform our recovery plan revision.

Conclusion:

After reviewing the best available scientific information, we conclude that the NIDGS remains a threatened species. The evaluation of threats affecting the species under the factors in 4(a)(1) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.;[Act]) and analysis of the status of the species in our 2011 and 2017 5-year status reviews remains an accurate reflection of the species' current status.

RECOMMENDATIONS FOR FUTURE ACTIONS:

1. Continue habitat treatments for NIDGS to address the primary threat to the species – loss of meadow habitat due to conifer forest encroachment. Engage the NIDGS Technical

Working Group to develop site-specific plans for these treatments to meet the habitat objectives of active season sites while considering overwintering habitat requirements.
2. Collect native plant seeds, primarily forbs, from NIDGS sites and adjacent areas and explore options to grow out these native seeds. These locally sourced native seeds can then be used to restore NIDGS sites, as needed.
3. Explore and initiate conservation options on private lands.
4. Revise the Recovery Plan based on the SSA and recommendations from the NIDGS Technical Working Group.
5. Develop an MOU with IDFG to outline the IDFG project coordinator and USFWS recovery coordinator roles.
6. Assist IDFG in securing funding for the NIDGS project coordinator position and annual NIDGS surveys.

(Acting) **State Supervisor, Idaho Fish and Wildlife Office, U.S. Fish and Wildlife Service**

Approve _____Sandra M. Fisher_____ Date:_22 August 2022_

Appendix A: References

Idaho Department of Fish and Game

IDFG. 2021. Long-term population monitoring of northern Idaho ground squirrel: 2017 implementation and population estimates. December 31, 2021.

IDFG. 2020. Long-term population monitoring of northern Idaho ground squirrel: 2017 implementation and population estimates. January 18, 2021.

IDFG. 2020. Modeling current and future distributions of the northern Idaho ground squirrel in Idaho. October 31, 2020

IDFG. 2019. Long-term population monitoring of northern Idaho ground squirrel: 2017 implementation and population estimates. January 29, 2020.

IDFG. 2018. Long-term population monitoring of northern Idaho ground squirrel: 2017 implementation and population estimates. January 15, 2019.

IDFG. 2017. Long-term population monitoring of northern Idaho ground squirrel: 2017 implementation and population estimates. December 29, 2017.

IDFG. 2013. Long-term population monitoring of northern Idaho ground squirrel: sampling design, pilot implementation, and 2013 population estimates. December 30, 2013.

University of Idaho

Garrett, M., S. Barbosa, S. Nerkowski, D. Evans Mack, C. Conway, P. Hohenlohe, L. Waits. 2022. Recovery implementation northern Idaho ground squirrel genomics project. University of Idaho. Final report to the USFWS for grant number: F20AC10315-00. January 28, 2022.

Morris, A. E., A. Z. T. Allison, and C. J. Conway. 2021. Effects of forest encroachment on behavior and demography of the northern Idaho ground squirrel: annual progress report–2021. Wildlife Research Report #2021-04. Idaho Cooperative Fish and Wildlife Research Unit, Moscow, Idaho. January 2022.

Allison, A. Z. T., A. E. Morris, and C. J. Conway. 2020. Effects of forest encroachment on behavior and demography of the northern Idaho ground squirrel: annual progress report–2020. Wildlife Research Report #2020-03. Idaho Cooperative Fish and Wildlife Research Unit, Moscow, Idaho. December 2020.

Allison, A. Z. T., A. E. Morris, and C. J. Conway. 2019. Effects of forest encroachment on behavior and demography of the northern Idaho ground squirrel: annual progress report–2019. Wildlife Research Report #2019-02. Idaho Cooperative Fish and Wildlife Research Unit, Moscow, Idaho. December 2019.

Allison, A. Z. T., A. M. Toumpas, A. R. Goldberg, and C. J. Conway. 2018. Effects of forest encroachment on demography of the northern Idaho ground squirrel: annual progress report–

2018. Wildlife Research Report #2018-02. Idaho Cooperative Fish and Wildlife Research Unit, Moscow, Idaho. December 30, 2018.

Goldberg, A.R. 2018. Diet, disease, and hibernation behavior of northern Idaho ground squirrels. University of Idaho, PhD dissertation. 158 pp.

Publications

Several NIDGS-specific research articles have been published on diet, overwintering behavior and habitat, plague, genetics, and predicted distribution. Although the results presented in these publications does not change the listing status of NIDGS, the information will be used to inform conservation and recovery of this species.

Barbosa, S., K.R. Andrews, A.R. Goldberg, D.S. Gour, P.A. Hohenlohe, C.J. Conway, and L.P. Waits. 2021. The role of neutral and adaptive genomic variation in population diversification and speciation in two ground squirrel species of conservation concern. Molecular Ecology. 30: 4673–4694.

Burak, G.S., A.R. Goldberg, J.M. Galloway, D. Evans Mack, and C.J. Conway. 2018. Collaborating to save a tiny threatened species: what does the northern Idaho ground squirrel need to survive? The Wildlife Professional. July/August 2018 edition. Pp. 39–42.

Goldberg, A.R. and C.J. Conway. 2021. Hibernation behavior of a federally threatened ground squirrel: climate change and habitat selection implications. Journal of Mammalogy. 102: 574–587.

Goldberg, A.R., C.J. Conway, and D.E. Biggins. 2021. Effects of experimental flea removal and plague vaccine treatments on survival of northern Idaho ground squirrels and two coexisting sciurids. Global Ecology and Conservation. 26: 1–16.

Goldberg, A.R., C.J. Conway, D.C. Tank, K.R. Andrews, D.S. Gour, and L.P. Waits. 2020. Diet of a rare herbivore based on DNA metabarcoding of feces: selection, seasonality, and survival. Ecology and Evolution. 10: 7627–7643.

Goldberg, A.R., C.J. Conway, D. Evans Mack, and G. Burak. 2020. Winter versus summer habitat selection in a threatened ground squirrel. The Journal of Wildlife Management. Pp. 1–12.

Helmstetter, N.A., C.J. Conway, B.S. Stevens, and A.R. Goldberg. 2021. Balancing transferability and complexity of species distribution models for rare species conservation. Diversity and Distributions. 27: 95–108.

Yensen, E. and E.J. Dyni. 2020. Why is the northern Idaho ground squirrel rare? Northwest Science. 94: 1–23.

Yensen, E, B.M. Shock, T. Tarifa, and D. Evans Mack. 2018. Forbs dominate diets of the threatened endemic northern Idaho ground squirrel (*Urocitellus brunneus*). Northwest Science. 92: 290–310.

In Litt.

U.S. Fish and Wildlife Service (USFWS). 2017, in litt. Letter from the Idaho Fish and Wildlife Office to DF Development, LLC. Subject: Northern Idaho Ground Squirrel and DF Development, LLC Lands. 2 pp.

Appendix B: 2017 5-Year Status Review

5-YEAR REVIEW
Short Form Summary
Species Reviewed: Northern Idaho Ground Squirrel (*Urocitellus brunneus)*
Current Classification: Threatened

FR Notice announcing initiation of this review: U.S. Fish and Wildlife Service. 2016. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 76 species in Hawaii, Oregon, Washington, Montana, and Idaho. Federal Register 81(29):7571-7573.

Lead Region/Field Office:
Region 1/ Idaho Fish and Wildlife Office, Boise, Idaho.

Name of Reviewer(s):
Greg Burak, Idaho Fish and Wildlife Office, Fish and Wildlife Biologist
Tracy Melbihess, Idaho Fish and Wildlife Office, Chief of Classification and Recovery
Kathleen Hendricks, Idaho Fish and Wildlife Office, Assistant Field Supervisor
Gregory Hughes, Idaho Fish and Wildlife Office, State Supervisor

Methodology used to complete this 5-year review:
This review was conducted by staff of the Idaho Fish and Wildlife Office (IFWO) of the U.S. Fish and Wildlife Service (USFWS), beginning on February 12, 2016. The review was based on a review of current, available information since the last 5-year review for the northern Idaho ground squirrel (NIDGS) in 2011 (Burak 2011, entire). The evaluation conducted by Greg Burak, Fish and Wildlife Biologist, was reviewed by the IFWO Chief of Classification and Recovery. The document was then reviewed by the Assistant Field Supervisor for Endangered Species before submission to the State Supervisor for approval.

Application of the 1996 Distinct Population Segment (DPS) Policy:
The NIDGS is not listed as a DPS.

Background:
For information regarding the species listing history and other facts, please refer to the USFWS Environmental Conservation On-line System (ECOS) database for threatened and endangered species (http://ecos.fws.gov/tess_public).

Review Analysis:
No new threats nor significant new information regarding the species' biological status have become available since the last 5-year review conducted in September 2011 (Burak 2011, entire). Threats identified in the last status review remain the same. One potential threat to the species, sylvatic plague (*Yersinia pestis*), has been more intensively researched since the last 5-year status review, but definitive results are not conclusive at this time (Goldberg et al. 2017, p. 7). New actions that have been implemented or updated since 2011 are described below.

New taxonomic information

In 2012, the NIDGS was identified as a distinct species, *Urocitellus brunneus* (Hoisington-Lopez et al. 2012, entire; Helgen et al. 2009, entire). Subsequently, in 2015, the Service revised the taxonomy of the species under the Endangered Species Act through a rulemaking in the Federal Register (80 FR 35860). The NIDGS's former subspecies, the southern Idaho ground squirrel, is recognized as *Urocitellus endemicus*. This change in taxonomy does not result in the change of the range of the taxon as it was listed.

Monitoring

The Idaho Department of Fish and Game NIDGS recovery coordinator developed a new long-term monitoring design for the species in 2013 (Evans Mack et al. 2013, entire). This more efficient and effective monitoring design was needed since it had become difficult to survey all known occupied sites under the previous monitoring approach (Evans Mack et al. 2013, p. 1). Compared to the previous site-based surveys, the new monitoring design is a layered approach that combines grid-based line-transect distance sampling within a patch occupancy framework to provide a statistically valid, repeatable approach for estimating population size and trends every year for a time frame of 20-30 years (Evans Mack et al. 2013, p. i).

Utilizing this new survey design, monitoring results for the past 3 years document an increase of NIDGS from an estimated 968 to 2,659 animals, unadjusted for detection probability (Evans Mack and Jaquish 2014, p. i; Wagner and Evans Mack 2016, p. i). Despite the change in survey methodology in 2013, monitoring results since 2011 indicate an apparent increasing trend, despite a dip in 2014 (Figure 1; Evans Mack 2016, p. 6). As reference, the 2010 population estimate reported in the last 5-year status review was 1,560 animals, which was based on previous survey methodology that modeled population results from intensive-monitoring trap sites and squirrels detected on surveys (Evans Mack 2010, p. 6; Burak 2011, p. 6).

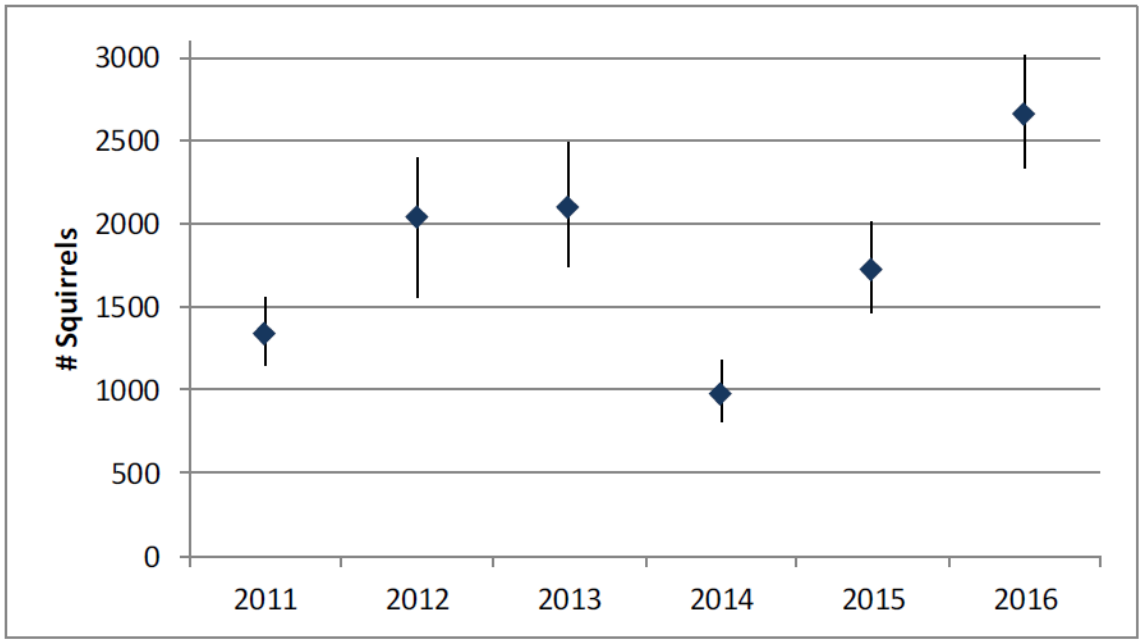

Figure 1. Northern Idaho Ground squirrel population estimates from program DISTANCE using varying survey methods during 2011-2016 (taken out of Evans Mack 2016, p. 6).

Research

Several NIDGS research projects have been initiated since the last 5-year review. The U.S. Geological Survey's Idaho Cooperative Fish and Wildlife Research Unit at the University of Idaho is conducting research on the potential effects of forest restoration and sylvatic plague on the species (Goldberg et al. 2017, entire). The forest restoration component of this research is still in the pre-treatment phase, while the plague research treatments have been ongoing since 2014 (Goldberg et al. 2017, pp. 7-9).

The primary forest restoration research objectives are to evaluate NIDGS demography and other response variables by comparing the effectiveness of 1) forest thinning followed by prescribed fire, and 2) prescribed fire only. These variables include the size and location of NIDGS colonies in response to forest treatments, hibernacula locations, reproductive output, pre-hibernation body mass, overwinter survival, and natal recruitment. Final results will be available after the treatment phase is completed (Goldberg et al. 2017, p. 7). Additionally, this work is providing information on poorly understood aspects of the species' natural history, including NIDGS movements across landscapes through time, and hibernation activity and timing.

The objective for the sylvatic plague research is to determine whether plague reduces survival of NIDGS and/or sympatric species (i.e. species overlapping in distribution that may encounter one another; Goldberg et al. 2017, p. 9). Sympatric species included in this research are yellow-pine chipmunks (*Tamias amoenus*), deer mice (*Peromyscus maniculatus*), montane voles (*Microtus montanus*), and Columbian ground squirrels (*Urocitellus columbianus*), a native species considered to be a competitor to NIDGS (Sherman and Yensen 1994, pp. 7-8). Research to date has provided preliminary indication that plague may be present within the range of NIDGS and may be reducing survival of the species, along with chipmunks and Columbian ground squirrels;

additional research is needed to verify the validity of early results (Goldberg et al. 2017, pp. 7 and 24; Conway in litt. 2016). In addition to the main objectives, ectoparasites and loads (i.e. number of ectoparasites found on animals) are being characterized for these species.

Habitat Restoration

Since 2011, the U.S. Forest Service (USFS) Payette National Forest thinned approximately 291 hectares (ha) (720 acres (ac)), and treated approximately 1,544 ha (3,815 ac) with prescribed fire (USFS in litt. 2017). This work was carried out to maintain and enhance occupied NIDGS habitat, and to improve potential habitat that may be adjacent to, or link, occupied habitat patches (USFS in litt. 2017). Additional information gained from ongoing research on the effects of forest restoration on NIDGS will allow for a more refined quantification of NIDGS responses to habitat treatments in the future (Goldberg et al. 2017, p. 8).

In September 2014, the USFS issued a Record of Decision for the Lost Creek-Boulder Creek (LCBC) Landscape Restoration Project (USFS 2014, entire). The LCBC project encompasses approximately 32,375 ha (80,000 ac) in the western portion of the New Meadows Ranger District of the Payette National Forest, within the range of the NIDGS. As part of this project, understory thinning and prescribed fire will be used to improve habitat conditions for the species within and up to ¼ mile outside of occupied NIDGS habitat (Priority #1 Areas). In habitat that was modeled as potentially suitable for NIDGS, but is located outside of occupied areas (Priority #2 Areas), treatments will be identical, but occur after Priority #1 Areas are completed. Potential movement and dispersal corridors may also be treated in Priority #2 Areas to increase connectivity between occupied sites (USFS 2014, p. 11). These treatments have the potential to improve suitable habitat conditions for the species across a large portion of its range, thereby addressing the primary threat to the species (meadow invasion from conifer encroachment) at landscape scales.

Private Land Conservation

Since 2011, one of the largest privately held lands containing NIDGS changed ownership twice. In the spring of 2016, Potlatch Forest Holdings Inc. sold their lands to Southern Pine Plantations (SPP; Idaho Statesman in litt. 2016a). Later that summer, SPP sold those same lands to another private buyer (Idaho Statesman in litt. 2016b). In the past, the Idaho Department of Fish and Game has held a Memorandum of Agreement with the previous landowner (Potlatch Forest Holdings) to carry out NIDGS conservation actions on their lands (Idaho Department of Fish and Game and Potlatch in litt. 2008). In January, 2017 a letter was sent from the IFWO to the present landowner informing them of the presence of NIDGS on their property, along with the previous monitoring and research efforts carried out on these lands (USFWS in litt. 2017). It is unknown at this time what type of land management activities the new owner will undertake on their property.

The existing OX Ranch Safe Harbor Agreement (SHA) remains in effect until 2019, with the associated Section 10(a)(1)(A) permit in effect for an additional 5 years until 2024 (USFWS 2009, entire). This large SHA, which encompasses 3,150 ha (7,783 ac) of enrolled lands, continues to provide valuable habitat for the largest known populations of northern Idaho ground squirrels, while also providing access for continued annual monitoring and research on the species (USFWS 2009, entire; Wagner and Evans Mack 2016, entire; Goldberg et al. 2017,

entire). The Schwisow low-effect Habitat Conservation Plan (HCP), signed in 2007, is a 25-year permit issued by the USFWS for the development of an area approximately 0.81 hectares (2 acres) in size (USFWS 2007, entire). No other conservation agreements have been initiated since the last 5-year status review was completed in 2011.

Smaller parcels of lands containing NIDGS colonies remain available for development, though we do not have specific information on how much land occupied by NIDGS may have been developed since the last 5-year status review. In addition, while we do not know how much private land occupied by NIDGS is presently for sale, a review of real estate listings in proximity to known NIDGS colonies shows multiple (15-20) parcels for sale, primarily near New Meadows and Round Valley (Burak in litt. 2017). Since approximately half of the currently known sites occupied by NIDGS occur on private land lacking some form of long-term protection, the long-term conservation of private lands containing NIDGS continues to be a recovery priority (Evans Mack in litt. 2010, p. 5; Wagner and Evans Mack 2016 p. 11)

Predator Control

Limited mammalian predator (i.e. badger (*Taxidea taxus*)) and competitor (i.e. Columbian ground squirrels) control to benefit NIDGS has occurred since the last 5-year status review, and the effectiveness of these efforts in relation to NIDGS is still currently unknown. Blood samples were taken from a portion of predators and screened for the presence of sylvatic plague in an ongoing effort to investigate whether sylvatic plague is present in the mammalian community within the NIDGS range (Conway in litt. 2016).

Analysis Summary

Several conservation actions have been implemented or updated by the U.S. Forest Service, Idaho Department of Fish and Game, and the U.S. Geological Survey since the last 5-year status review. These include updating and implementing new annual survey methods, research, and habitat restoration implementation and planning. However, overall NIDGS are not secure from threats, particularly the primary threat of habitat loss (i.e. meadow invasion by conifers). Additionally, the threat of the development of private land continues in a portion of their range. While research on potential effects of sylvatic plague is ongoing, results are preliminary, and it is therefore difficult to determine whether sylvatic plague constitutes a threat to NIDGS at this time.

Recovery Criteria

The 2003 final Recovery Plan for the NIDGS contains 4 recovery criteria. In addition, the Recovery Plan targets a total effective population of greater than 5,000 individuals (USFWS 2003, entire).

1. Of the 17 potential metapopulations that have been identified within the probable historical distribution, there must be at least 10 metapopulations, each maintaining an average effective population size of greater than 500 individuals for 5 consecutive years.

The new long-term monitoring program (see *Monitoring* section) provides an overall population estimate through a grid-based line-transect sampling design that annually surveys a portion

(approximately 57%) of available cells considered to be currently occupied. Thus, while each annual effort only surveys portions of metapopulations, over 3 consecutive years all portions are surveyed (Evans Mack et al. 2013, entire). The associated patch occupancy component of the new monitoring design provides a longer term measure of occupancy over the entire range. In other words, the existing monitoring approach does not provide annual total estimates at the metapopulation level as was done under the previous monitoring approach, but it does provide an overall population estimate and trend, with patch occupancy providing information of occupancy distribution over time. However, because metapopulation areas are large, it would be possible to post stratify the survey data by metapopulation area during the analysis phase and obtain estimates at the metapopulation level.

Even though we do not presently estimate annual population size at the metapopulation level, monitoring data indicates we do not meet this recovery criterion. In addition, the 2016 total NIDGS population was estimated at 2,659 individuals, 3,590 individuals if adjusted for detection probability (Wagner and Evans Mack 2016, p. i). Therefore, the total effective population target (5,000 individuals) has not been met.

2. The area occupied by a minimum of 10 potential metapopulation sites must be protected. In order for an area to be deemed protected, it must be: (1) owned or managed by a government agency with appropriate management standards in place, (2) managed by a conservation organization that identifies maintenance of the subspecies as the primary objective for the area or, (3) on private lands with a long-term conservation easement or covenant that commits present and future landowners to the perpetuation of the subspecies.

As stated in the previous 5-year status review, 13 of the 17 metapopulations identified in the Recovery Plan are in Federal ownership, or in a combination of Federal, State, and/or private ownership (Burak 2011, p. 4). This remains the same.

3. Plans have been completed for the continued ecological management of habitats for a minimum of 10 potential metapopulation sites.

As stated in the previous 5-year status review, 2 of the 17 metatpopulations have a prescribed fire plan developed, while 1 metatpopulation has a conservation plan drafted (Burak 2011, p. 4). This remains the same.

4. A post-delisting monitoring plan covering a minimum of 10 potential metapopulation sites has been completed and is ready for implementation.

A post-delisting monitoring plan has not been developed given that the above criteria have not been achieved. Regardless, the new long-term monitoring method for NIDGS (see *Monitoring* section) may provide the basis for this post-delisting monitoring plan requirement if the species is delisted.

In summary, the recovery criteria have not been met for the NIDGS. In the last 5-year review it was recommended that the 2003 Recovery Plan be revised (Burak 2011, p. 20), though a revision has not been completed or initiated since that time. The reasons for the revision as identified in

the previous 2011 5-year status review remain valid, and thus revising the Recovery Plan remains a recommended future action.

Recommendations for Future Actions:

1. Continue habitat treatments for NIDGS to address the primary threat to the species – loss of meadow habitat due to conifer forest encroachment.
2. Explore and initiate conservation options on private lands.
3. Revise the Recovery Plan based on recommendations outlined in the 2011 5-year status review.
4. Continue funding the NIDGS coordinator position located with the Idaho Department of Fish and Game.
5. Continue annual NIDGS population monitoring utilizing the long-term monitoring plan developed by Evans Mack et al. (2013, entire).
6. Revise the existing suitable habitat model for the species, initially developed in 2007, utilizing recently collected annual monitoring and habitat data (Crist and Nutt 2008, entire).

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U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of the
Northern Idaho Ground Squirrel (*Urocitellus brunneus)*

Pre-1996 DPS listing still considered a listable entity? _____NA_____

Recommendation resulting from the 5-year review:

_____ Delisting
_____ Reclassify from Endangered to Threatened status
_____ Reclassify from Threatened to Endangered status
_____X_____ No Change in listing status

New Recovery Priority Number: 2C (species, high degree of threat, high recovery potential).

State Supervisor, Idaho Fish and Wildlife Office

Date: March 21, 2017