

UC Agriculture & Natural Resources

Proceedings of the Vertebrate Pest Conference

Title

Changes in Taxonomic Nomenclature and Conservation Status of Ground Squirrel Species: Implications for Pesticide Labeling and Use of Zinc Phosphide Pesticide Products

Permalink

<https://escholarship.org/uc/item/67q8855k>

Journal

Proceedings of the Vertebrate Pest Conference, 22(22)

ISSN

0507-6773

Authors

O'Hare, Jeanette R.
Eisemann, John D.
Fagerstone, Kathleen A.

Publication Date

2006

DOI

10.5070/V422110121

Changes in Taxonomic Nomenclature and Conservation Status of Ground Squirrel Species: Implications for Pesticide Labeling and Use of Zinc Phosphide Pesticide Products

Jeanette R. O'Hare, John D. Eisemann, and Kathleen A. Fagerstone

USDA APHIS Wildlife Services, National Wildlife Research Center, Fort Collins, Colorado

ABSTRACT: The taxonomic classification of species and their protection status have important pesticide regulatory implications, particularly regarding product label language. Changes in nomenclature may cause confusion for both pesticide applicators and regulators. Such changes may also result in the naming of new species in need of protection, or conversely species whose protected status may no longer be warranted. Over the past several years there have been gradual taxonomic changes within the genus *Spermophilus*. This change has resulted in splitting Townsend's ground squirrel (*Spermophilus townsendii*) into 3 distinct species. In addition to *S. townsendii*, the Piute ground squirrel (*Spermophilus mollis*) and Merriam's ground squirrel (*Spermophilus canus*) are now recognized. The Townsend's ground squirrel, as now classified, is restricted to a small region in southwestern Washington. The species with the largest distribution, that was formally included in *S. townsendii*, is now the Piute ground squirrel (*S. mollis*). Zinc phosphide pesticide products are used to control a number of ground squirrel species including Townsend's. However, based on the revised nomenclature, populations of the 2 new species (Piute and Merriam's ground squirrels) may not be controlled using these zinc phosphide products under existing labels, even though those same populations were previously considered Townsend's ground squirrels and could be controlled with zinc phosphide products. Potential conflicts with state and federal laws regarding protection of certain species must also be considered. The reclassification of Townsend's ground squirrel recognizes new species and existing subspecies that are protected or are being considered for protection. In addition, subspecies of the Idaho ground squirrel (*Spermophilus brunneus*) are afforded various levels of protection under federal and state laws. A discussion of temporal taxonomy changes, geographic distribution, and conservation status of the "Townsend's ground squirrel" complex and the Idaho ground squirrel is presented here to support the decision process needed to develop appropriate label language for zinc phosphide pesticide products.

KEY WORDS: genetics, ground squirrel, Merriam's ground squirrel, nomenclature, pesticide, Piute ground squirrel, *Spermophilus* spp., taxonomy, Townsend's ground squirrel, zinc phosphide

Proc. 22nd Vertebr. Pest Conf. (R. M. Timm and J. M. O'Brien, Eds.)
Published at Univ. of Calif., Davis. 2006. Pp. 450-457.

INTRODUCTION

The taxonomy of species may occasionally be revised, based on new scientific evidence or reinterpretation of existing data. Taxonomic revisions may redefine species distributions and abundance, and consequently they may influence conservation status of species, subspecies, or populations. Such changes may have important pesticide regulatory implications when they affect either the target species of a pesticide product, or species identified as requiring special protection to mitigate potential harm. Modifications to product label use directions and restrictions may be required to maintain sound and effective pest control and to avoid regulatory confusion.

The United States Environmental Protection Agency (EPA) is mandated to review older pesticides by a 1988 amendment to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). The amendment requires EPA to review and determine the registration eligibility of all pesticides initially registered before 1 November 1984. EPA considers existing and new data to ensure products meet current scientific and regulatory standards and that they do not cause unreasonable risk to human and environmental health. EPA's determination of eligibility is announced in a 'Registration Eligibility Decision' (RED). In addition to eligibility determination, the RED contains a summary of the available data, identifies data

gaps, and proposes use or label modifications for eligible pesticide products.

Zinc phosphide was registered in the U.S. as a pesticide in 1947. The reregistration process for zinc phosphide was initiated in 1982, when EPA issued a 'Registration Standard' for zinc phosphide. A data call-in notice was issued in 1987, requesting that registrants submit appropriate data to fulfill the registration data requirements. Following data review, a second data call-in notice was issued in 1991, seeking additional data. In partial response, data were submitted containing a literature review (1942-1998) of zinc phosphide efficacy data for several species, including 3 species of ground squirrel for which zinc phosphide is used for control (Eisemann *et al.* 1999). During this review, ground squirrel field efficacy data were provided for the California ground squirrel (*Spermophilus beecheyi*), the Columbian ground squirrel (*Spermophilus columbianus*), and the Richardson's ground squirrel (*Spermophilus richardsonii*). These data served as surrogate data for a number of ground squirrel species for which use was already authorized on certain zinc phosphide labels prior to the issuance of the data call-in notice. Currently (early 2006), only one zinc phosphide pesticide product is labeled specifically for use in controlling the Idaho ground squirrel, and two zinc phosphide products on the market are labeled specifically

for the control of Townsend's ground squirrel.

In the course of the zinc phosphide reregistration review, it was discovered that existing label directions were likely inconsistent with the revised taxonomy of Townsend's ground squirrel. In addition, low population estimates for the Idaho ground squirrel indicated possible cause for concern for this species.

A review of the scientific literature was undertaken, and inquiries were made into the conservation status of these species at both the state and federal level. This manuscript presents a summary of temporal taxonomic changes of Townsend's ground squirrel and a description of the geographic distribution of each taxon within this species complex. The Idaho ground squirrel and its distribution are also discussed. The extent to which each taxon is in need of protection is presented to support the decision process needed to develop appropriate label language for zinc phosphide pesticide products.

TOWNSEND'S GROUND SQUIRREL

Recent Taxonomy

Mammologists, taxonomists, and other scientists having relevant expertise may propose taxonomic changes or evaluate evidence for proposed changes. If acceptance of the taxonomy increases in the literature, resulting in a body of evidence supporting the classification, then the taxonomy may become generally accepted over time. Consequently, changes to mammalian taxonomy usually occur after a number of years.

The complex of ground squirrels known commonly as "Townsend's ground squirrel" has undergone several

revisions (Hall 1981; Table 1). In 1981, Hall followed the classification of Townsend's ground squirrel, *Spermophilus townsendii*, as a single species consisting of 7 subspecies, including *S. t. artemesiaae*, *S. t. canus*, *S. t. idahoensis*, *S. t. mollis*, *S. t. nancyae*, *S. t. townsendii*, and *S. t. vigilis*. The "Revised Checklist of North American Mammals North of Mexico" (Jones *et al.* 1992) also followed the single-species classification. Distributions of these subspecies according to Hall (1981) are shown in Figure 1.

These subspecies are nearly indistinguishable from each other morphologically. Adults are approximately 6.5 to 10.5 inches in length. They have no dorsal spots or stripes. Variations in pelage color range from a pale smoky grey to reddish brown to pinkish buff. Their distribution includes Nevada, western Utah, southern Idaho, central southeastern Oregon, and a small portion of south-central Washington. They prefer desert and grassland communities, as well as pastures and agricultural land where they are considered a pest species.

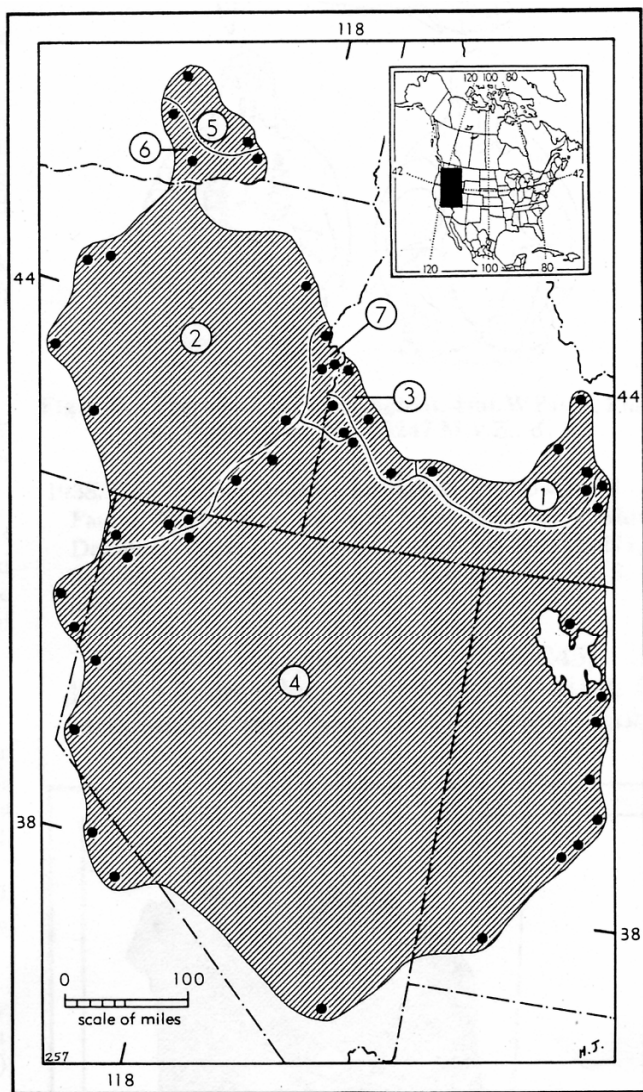
Revised and Current Taxonomy

The current and generally accepted classification of the 7 taxa formerly known as Townsend's ground squirrel now consists of 3 separate species based primarily on distinct genetic differences in the number of chromosomes. These 3 species are the Piute ground squirrel (*Spermophilus mollis*), Merriam's ground squirrel (*Spermophilus canus*), and Townsend's ground squirrel (*Spermophilus townsendii*). The 7 taxa are now considered subspecies of these 3 species (Table 2).

Table 1. Current (2005) generally accepted taxonomic nomenclature of "Townsend's ground squirrel".

Current Nomenclature (Wilson and Ruff 1999)		Recent Synonyms and Date (Hall 1981)	Geographic Distribution (Wilson and Ruff 1999)
Species	Subspecies		
Piute ground squirrel <i>Spermophilus mollis</i>	<i>S. m. artemesiaae</i>	<i>Citellus mollis artemesiaae</i> (1913) <i>C. mollis [sic] pessimus</i> (1913) <i>C. townsendii artemesiaae</i> (1938) <i>S. townsendii artemesiaae</i> (1981)	Snake River Plain north of the Snake River in central Idaho.
	<i>S. m. idahoensis</i>	<i>C. idahoensis</i> (1913) <i>C. townsendii idahoensis</i> (1939) <i>S. townsendii idahoensis</i> (1981)	Northeast of the Snake River in west central Idaho.
	<i>S. m. mollis</i>	<i>S. mollis</i> (1863) <i>C. townsendii mollis</i> (1938) <i>S. mollis stephensi</i> (1898) <i>C. leurodon</i> (1913) <i>C. mollis washoensis</i> (1913) <i>S. townsendii mollis</i> (1981)	Most of Nevada except for extreme southern and northwestern areas; portions of extreme northeastern California; extreme southeastern Oregon; south of the Snake River in southern Idaho; and western Utah.
	<i>S. m. nancyae</i> ^a	<i>S. townsendii nancyae</i> (1968) <i>S. townsendii nancyae</i> (1981)	South central Washington north of the Yakima River and west of the Columbia River.
Merriam's ground squirrel <i>Spermophilus canus</i>	<i>S. c. canus</i>	<i>S. mollis canus</i> (1898) <i>C. townsendii canus</i> (1938) <i>S. townsendii canus</i> (1981)	Central and southeastern Oregon, and extreme northwestern Nevada.
	<i>S. c. vigilis</i>	<i>C. canus</i> (1913) <i>C. townsendii vigilis</i> (1938) <i>S. townsendii vigilis</i> (1981)	West of the Snake River in extreme west central Idaho; and extreme eastern Oregon.
Townsend's ground squirrel <i>Spermophilus townsendii</i>	<i>S. t. townsendii</i>	<i>S. townsendii</i> (1839) <i>S. mollis yakimensis</i> (1898) <i>S. townsendii townsendii</i> (1981)	Extreme south central Washington south of the Yakima River and north of the Columbia River.

^a Provisionally included as a subspecies of *S. mollis* (Wilson and Ruff 1999). Yenson and Sherman (2003) consider this population a subspecies of *S. townsendii* but acknowledge it may be a different species, citing differences in chromosome number and pelage color.



Map 257. *Spermophilus townsendii*.

- | | |
|----------------------------|----------------------------|
| Guide to subspecies | 4. <i>S. t. mollis</i> |
| 1. <i>S. t. artemesiae</i> | 5. <i>S. t. nancyae</i> |
| 2. <i>S. t. canus</i> | 6. <i>S. t. townsendii</i> |
| 3. <i>S. t. idahoensis</i> | 7. <i>S. t. vigilis</i> |

Figure 1. Geographic distribution of *Spermophilus townsendii* and subspecies. (from Hall 1981)

Rickart (1987) reviewed the genetics of the *Spermophilus townsendii* species complex. He discussed Nadler *et al.*'s (1982) proposal that the complex consisted of 3 species or semispecies within the superspecies *S. townsendii*. The justification for reclassifying the group was the identification of 3 cytotypes observed in 6 of the 7 taxa (Nadler 1966, 1968a). The seventh taxon, *artemesiae*, as well as several other taxa previously examined by Nadler, were investigated by Rickart *et al.* (1985 [1987]), who confirmed the genetic differences reported by Nadler and his colleagues. The cytotypes identified were based on differences in diploid and fundamental chromosome numbers (FN): *S. t. mollis* ($2n = 38$, FN = 66), *S. t. vigilis* ($2n = 46$, FN = 66 and 68), and *S. t. townsendii* ($2n = 36$, FN = 68). The cytotypes (species or semispecies) and subspecies are shown in Table 2.

The fundamental chromosome number is useful in describing chromosome morphology. FN is the total number of chromosome arms observed in a karyotype. The number of arms is determined by the number of chromosomes in the karyotype and the position of the centromere. The centromere may be located at the end of the chromosome (acrocentric), in which case the number of arms of the chromosome is counted as a single arm. The placement of the centromere in the middle of the chromosome (metacentric) or between the middle and the end (submetacentric) are each considered to have two arms. Table 2 shows the numbers of acrocentric arms of *S. mollis* (6), *S. vigilis* (20 and 22), and *S. townsendii* (0). The position of the centromere identifies distinctions in chromosome morphology among the 7 cytotypes; such distinctions are masked when FN alone is considered.

Based on genetic differences, Rickart (1987) concluded that a revision of the group was needed. This rationale for reclassification was the identification of the 3 cytotypes and the fact that no chromosomal intermediates between the cytotypes had yet been identified. In addition, Rickart cited studies (Nadler 1968b; Nadler *et al.* 1974, 1982) that found greater than expected isozyme variation in several taxa. The loci showing the greatest polymorphism were transferrin, hemoglobin, albumin, and 6-phosphogluconate dehydrogenase.

Geographic distributions of the 3 cytotypes and their respective diploid chromosome numbers, as well as the distribution of each taxon, are shown in Figure 2,

Table 2. Proposed taxonomic classification of the Townsend's ground squirrel complex based on diploid chromosome number and chromosome morphology. (Nadler 1966 and 1968a, Nadler *et al.* 1982, and Rickart *et al.* 1985 [1987])

Proposed Nomenclature		Diploid Chromosome Number	Fundamental Chromosome Number	Acrocentric Chromosome Number
Species	Subspecies			
<i>Spermophilus mollis</i>	<i>S. m. artemesiae</i>	$2n = 38$	66	6
	<i>S. m. idahoensis</i>	$2n = 38$	66	6
	<i>S. m. mollis</i>	$2n = 38$	66	6
	<i>S. m. nancyae</i>	$2n = 38$	66	6
<i>Spermophilus vigilis</i> ^a	<i>S. v. vigilis</i>	$2n = 46$	66	22
	<i>S. v. canus</i>	$2n = 46$	68	20
<i>Spermophilus townsendii</i>	<i>S. t. townsendii</i>	$2n = 36$	68	0

^aSubsequently named *Spermophilus canus* (Wilson and Reeder 1993, Jones *et al.* 1997, and Wilson and Ruff 1999).

which is modified from Rickart (1987). Rickart had modified Hall's (1981) distribution of the taxon *canus* by intentionally showing a gap of more than 100 km between the ranges of *canus* and *townsendii*, where no populations of either taxon are known to exist. It is interesting to note that in several cases, rivers likely form effective barriers to dispersal and migration among certain subspecies. In the state of Washington, the range of *S. t. townsendii* is bordered by the Columbia River on the south and the Yakima River on the north, separating it from *S. m. nancyae*, which is restricted to the north side of the Yakima. The Snake River in Idaho also forms a barrier separating *S. m. idahoensis* and *S. m. artemesiaae* from *S. m. mollis*, and also separating *S. m. idahoensis* from *S. c. vigilis*.

The current generally accepted classification as 3 separate species and 7 subspecies (Table 2) follows the cytotypes identified by Nadler *et al.* (1982) with one distinction. Nadler *et al.* referred to the 3 cytotypes as

mollis, *vigilis*, and *townsendii*. More recently, Wilson and Reeder (1993), Jones *et al.* (1997), and Wilson and Ruff (1999) all referred to the cytotype *vigilis* by the species name *Spermophilus canus*. The reason for this change is not clear. The geographic range of the taxon *canus* is considerably larger than *vigilis*, however, and may account for the change. Yensen and Sherman (2003), while following the classification of 3 separate species, differed in the designation of one of the 7 subspecies. These authors considered the taxon *nancyae* (along with *townsendii*) to be a subspecies of *Spermophilus townsendii*. Yensen and Sherman do acknowledge slight differences in pelage color, and most importantly, the difference in chromosome numbers. They recognized the 2 taxa may in fact belong to separate species (Table 2) but did not accept that classification.

Conservation Status

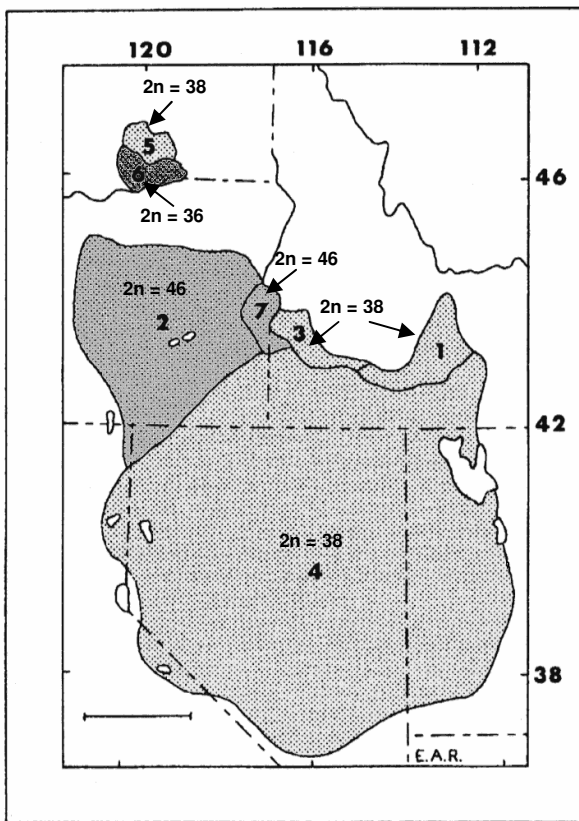
The states of Washington and Idaho have either provided for the protection of certain species or subspecies within the group formerly known as Townsend's ground squirrel, or have indicated a concern and are considering protection. The status of those taxa that may have declined below sustainable population sizes, or are considered at risk of decline, are discussed below and summarized in Table 3.

PIUTE GROUND SQUIRREL (*Spermophilus mollis*)

The geographic range of the Piute ground squirrel is the most widespread of the 3 species and includes most of Nevada, and parts of Utah, Idaho, California, Oregon, and Washington. *S. mollis* is not federally listed under the Endangered Species Act. Only the state of Idaho has indicated a concern for this species. A supplement to a memorandum of understanding dated March 3, 2003, between the Idaho Department of Fish and Game and the U.S. Bureau of Land Management (BLM), concerning certain species occurring on lands administered by BLM, categorizes *S. mollis* as a "sensitive species" and designates it a "Regional/State Imperiled Species (Type 3)". In addition, the subspecies *S. m. artemesiaae* is also designated as a "Protected Nongame" species under Idaho state law. This designation is defined by the state as "protected nongame species for which it is illegal to collect, harm, or otherwise remove from its natural habitat except as provided under Idaho Code or Commission [Idaho Department of Fish and Game] Regulations."

MERRIAM'S GROUND SQUIRREL (*Spermophilus canus*)

Merriam's ground squirrel is found primarily in Oregon, with small portions of its geographic range extending into far western Idaho, extreme northwestern Nevada, and extreme northeastern California. This species is not federally listed but is listed by the state of Idaho as a "Protected Nongame" species. Idaho listed the species *S. canus* for protection, referring to the only subspecies found in Idaho, *S. c. vigilis*. Merriam's ground squirrel is not identified as a species of concern by the other states within its geographic range.



Distribution of Cytotypes and Taxa

Piute (<i>Spermophilus mollis</i>)	Merriam's (<i>Spermophilus canus</i>)	Townsend's (<i>Spermophilus townsendii</i>)
1. <i>artemesiaae</i>	2. <i>canus</i>	6. <i>townsendii</i>
3. <i>idahoensis</i>	7. <i>vigilis</i>	
4. <i>mollis</i>		
5. <i>nancyae</i>		

Figure 2. Geographic distribution of the 3 cytotypes and 7 taxa of the Townsend's ground squirrel complex, and the corresponding diploid chromosome number of each taxon. (Modified from Rickart 1987)

Table 3. Conservation status of the Piute (*Spermophilus mollis*), Merriam's (*Spermophilus canus*), Townsend's (*Spermophilus townsendii*), and Idaho (*Spermophilus brunneus*) ground squirrel species and subspecies.

Species	Subspecies	Conservation Status
Piute ground squirrel (<i>Spermophilus mollis</i>)	<i>S. m. artemesiaae</i>	A "Protected Nongame" species under Idaho state law. <i>Spermophilus mollis</i> is managed as a sensitive species on BLM land in Idaho.
	<i>S. m. idahoensis</i>	<i>Spermophilus mollis</i> is managed as a sensitive species on BLM land in Idaho.
	<i>S. m. mollis</i>	<i>Spermophilus mollis</i> is managed as a sensitive species on BLM land in Idaho.
	<i>S. m. nancyae</i> ^a	Considered a subspecies of <i>Spermophilus townsendii</i> by the state of Washington. Designation as a "candidate species" for listing in Washington is rescinded.
Merriam's ground squirrel (<i>Spermophilus canus</i>)	<i>S. c. canus</i>	No concerns identified for this subspecies by the states within its range.
	<i>S. c. vigilis</i>	A "Protected Nongame" species under Idaho state law.
Townsend's ground squirrel (<i>Spermophilus townsendii</i>)	<i>S. t. townsendii</i> ^a	A "candidate species" for listing in the state of Washington.
Idaho ground squirrel (<i>Spermophilus brunneus</i>)	<i>S. b. brunneus</i>	Federal and State "threatened" species of Idaho.
	<i>S. b. endemicus</i>	A "Protected Nongame" species under Idaho state law.

^a The Washington Department of Fish and Wildlife includes the taxon *nancyae* as a subspecies of *S. townsendii*, as does the classification of Yensen and Sherman (2003). This is not the most common classification found in the current literature.

TOWNSEND'S GROUND SQUIRREL (*Spermophilus townsendii*)

Townsend's ground squirrel is limited to south-central Washington State and has the smallest geographic range of the 3 species. The Washington Department of Fish and Wildlife includes the taxon *nancyae* as a subspecies of *S. townsendii*, as does the classification of Yensen and Sherman (2003). The most common designation in the current literature, however, identifies *nancyae* as a subspecies of *S. mollis*, based on chromosome number (Table 2 and Figure 2). Although *S. townsendii* is not federally listed as a threatened or endangered species, the state of Washington has designated it as a "State Candidate" for listing that includes both taxa, *nancyae* and *townsendii*, as subspecies of *S. townsendii*. Recently, additional colonies of *nancyae* have been identified in Washington. As a result, the Washington Department of Fish and Wildlife is removing the subspecies *nancyae* from the list of "State Candidate" species, but it is retaining *S. t. townsendii* as a "State Candidate" for listing (D. Stinson, pers. commun., April 3, 2006).

IDAHO GROUND SQUIRREL

The Idaho ground squirrel was first described by A. H. Howell (1928) as a subspecies of the Washington ground squirrel (currently *Spermophilus washingtoni*) and named *Citellus townsendii brunneus*. Howell (1938) revised the designation, elevating the Idaho ground squirrel to a unique species (*Citellus brunneus*). Since then, other species synonyms have included *Cynomys brunneus* and currently *Spermophilus brunneus* (Yensen 1991a). Yensen identified two subspecies, primarily on the basis of morphological characteristics, but also with consideration given to differences in annual activity cycles and habitat use. These subspecies included the northern Idaho ground squirrel *S. brunneus brunneus* and the southern Idaho ground squirrel *S. brunneus endemicus* (Yensen 1991b, and Yensen and Sherman 1997).

Population Status

Both subspecies of *S. brunneus* are restricted to small, disjunct geographic regions in west-central Idaho (Figure 3). The U.S. Fish and Wildlife Service and the Idaho Department of Fish and Game listed the species as a species of concern in 1978. In response, a study of the Idaho ground squirrel taxonomy and distribution was initiated (Yensen 1991a).

The historical range of the northern Idaho ground squirrel reportedly consisted of 36 known sites (Yensen 1991a). Gavin *et al.* (1999) documented that 24 of those sites were extant in 1998. The recovery plan for the northern Idaho ground squirrel documented 40 historical sites, 8 of which were no longer inhabited by 2003. The estimated population size in 1985 was 5,000 animals at 18 sites. By 2002, the estimate had decreased to 450 to 500 individuals at 29 sites (USFWS 2003). Another estimate in 2002 reported 300 to 500 individuals located at fewer than 30 sites (Sherman and Runge 2002). In 2004, the Idaho Department of Fish and Game (2005a) estimated that about 850 northern Idaho ground squirrels occupied fewer than 40 sites, and that most of those sites were inhabited by fewer than 20 squirrels.

A population survey of the southern Idaho ground squirrel conducted in 1985 found approximately 40,000 individuals located at 180 sites within its range. A 1999 investigation of 147 of the original 180 sites reported that only 53 of the 147 sites were still occupied, and the total number of ground squirrels was estimated at 2,000 to 4,500 animals (Yensen 1985, 2001; Idaho Department of Fish and Game 2005b).

Conservation Status

The northern Idaho ground squirrel (*S. b. brunneus*) is now a federally listed threatened species under the Endangered Species Act (ESA) (Federal Register 2000), while the southern Idaho ground squirrel (*S. brunneus endemicus*) is not federally listed. The U.S. Fish and

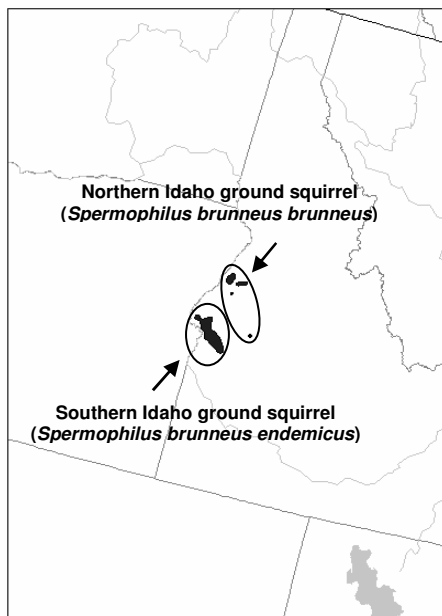


Figure 3. Geographic distribution of *Spermophilus brunneus* and subspecies. (Modified from Patterson *et al.* (2003; map compiled by NatureServe 2005, Yensen 1991a, and Yensen and Sherman 1997)

Wildlife Service (USFWS) was petitioned to list *S. b. endemicus*. Their finding on a resubmitted petition (29 January 2001) to list this subspecies was published in the Federal Register (2004). The USFWS found “that proposed rules to list this species continue to be warranted but precluded by other higher priority listing actions.” The notice also summarized a number of ongoing conservation activities, indicating that the magnitude of the threats to the southern Idaho ground squirrel was being reduced. The northern Idaho ground squirrel is currently a state (as well as federally) threatened species, and the southern subspecies is a “Protected Nongame” species under Idaho state law.

SUMMARY AND LABEL IMPLICATIONS

Townsend’s Ground Squirrel

The current generally accepted taxonomic classification of the complex of ground squirrels formerly classified as a single species and commonly named Townsend’s ground squirrel, now comprises 3 species and 7 subspecies (Wilson and Reeder 1993, Jones *et al.* 1997, Wilson and Ruff 1999):

Species: *Spermophilus mollis* (Piute ground squirrel)

Subspecies: *Spermophilus m. artemesia*;
Spermophilus m. idahoensis
Spermophilus m. mollis
Spermophilus m. nancyae

Species: *Spermophilus canus* (Merriam’s ground squirrel)

Subspecies: *Spermophilus c. canus*
Spermophilus c. vigilis

Species: *Spermophilus townsendii* (Townsend’s ground squirrel)

Subspecies: *Spermophilus t. townsendii*

On the contrary, the Washington Department of Fish and Wildlife identifies the taxon *nancyae* as a subspecies of *Spermophilus townsendii*.

Within this group of 3 distinct ground squirrel species, there is concern for certain species and subspecies. *Spermophilus mollis artemesia*, a subspecies of the Piute ground squirrel, is protected under Idaho state law. In addition, an MOU (March 2003) between the BLM and the Idaho Department of Fish and Game, encompassing the administration of BLM lands, categorized *S. mollis* as a “sensitive species”. The Merriam’s ground squirrel subspecies *S. c. vigilis* is also listed as a “Protected Nongame” species by the state of Idaho. The state of Washington is considering listing *S. t. townsendii* for protection.

Idaho Ground Squirrel

Population sizes of both the northern (*S. b. brunneus*) and southern (*S. b. endemicus*) subspecies of the Idaho ground squirrel (*S. b. brunneus* and *S. b. endemicus*) have decreased considerably in recent years, based on census data collected in 1985 and during subsequent years. Conservation efforts have mitigated some concern for the status of the southern Idaho ground squirrel, although recent population estimates are still considerably below 1985 estimates. The northern Idaho ground squirrel is currently a state and federally threatened species, and the southern subspecies is a “Protected Nongame” species under Idaho state law.

Implications for Zinc Phosphide Product Use

The extent to which each species and subspecies is considered a pest is difficult to quantify and may be subjective. Ground squirrels can cause damage in a wide variety of settings, both agricultural and non-agricultural. Thus, determining pest status requires investigation across many disciplines. Another confounding factor is that temporal increases in local population size may occur rapidly in some vertebrate species with high fecundity. Alternatively, species or population abundance can decrease rapidly to precariously low numbers. The definition of a pest problem is therefore spatially and temporally dynamic, resulting in a constantly moving target.

It is a challenge to balance the need to resolve a wildlife conflict and to protect populations or species in need of protection. FIFRA provides a means to protect potentially at-risk species by mandating the inclusion of pesticide label language to protect threatened and endangered species. Federally “threatened” or “endangered” species are fully protected under federal law and may not be harmed or harassed. Individual states may also have a variety of regulatory mechanisms to protect species of concern, in addition to federal designations under the Endangered Species Act. Once pesticide products have obtained an EPA registration, each state lead agency for pesticide regulation is responsible for registering the products for use in its state. The consideration of state species designations can be incorporated into the pesticide label directions.

A revision of the USDA zinc phosphide product label (EPA Reg. No. 56228-6) is necessary with regard to

ground squirrel control in response to the taxonomic reclassification of the *S. townsendii* into 3 distinct species, including *S. townsendii* (already on the label), Merriam's ground squirrel (*Spermophilus canus*), and the Piute ground squirrel (*Spermophilus mollis*). The addition of two new species names to the label would not expand the use area, but would merely accommodate the nomenclatural change to encompass the ground squirrel populations already included on the existing label.

While this taxonomic change would have no bearing on efficacy, it might influence which populations could be controlled using pesticides, due to federal and state restrictions. Another confounding factor when crafting product label language is multiple interpretations of the taxonomy of a species. Under the current taxonomic classification, *S. townsendii* occurs only in the state of Washington. The inclusion of the taxon *nancyae* within the species *S. townsendii* by the state of Washington could result in some confusion on a national level. But the authority to enforce pesticide label directions resides with the state lead agency for pesticide regulation, and Washington State includes both *nancyae* and *townsendii* as subspecies of *S. townsendii*. In this case, it is necessary to defer interpretation of pesticide use restrictions to the state. At this time, *S. t. townsendii*, as a "State Candidate" for listing, is not afforded protection under Washington state law. USDA will retain *S. townsendii* on the product label.

The southern Idaho ground squirrel, as well as *S. m. artemesiaae* and *S. c. vigilis*, are "Protected Nongame" species under Idaho state law. While it is illegal to collect, harm, or otherwise remove a "Protected Nongame" species, the Idaho Administrative Code 13.0.06 states "Protected Nongame status is not intended to prevent ... protection of personal health and/or safety, limit property or building management, or prevent management of animals to address public health concerns or agricultural damage." Thus, a registered, legally applied pesticide product may be used in accordance with Idaho law as a management tool to mitigate certain types of damage caused by a "Protected Nongame" species.

USDA proposes to remove the Idaho ground squirrel from the USDA product label because the northern subspecies is a federally and state listed "threatened" species. As an additional precaution, the Endangered Species Attachment of the label will prohibit use of the product within 0.5 miles of habitat occupied by the northern Idaho ground squirrel. The small population size of the southern subspecies has been judged by USDA to warrant voluntary removal of this subspecies from the label, even though management is allowed under Idaho state law.

ACKNOWLEDGEMENT

We thank Dr. James P. Gionfriddo of the USDA National Wildlife Research Center for his careful review of this manuscript.

LITERATURE CITED

EISEMANN, J. D., R. S. TALLEY, AND K. A. FAGERSTONE. 1999. A literature review (1942-1998): efficacy of zinc phosphide for controlling Norway rat, roof rat, house mouse, *Peromyscus*, prairie dog, and ground squirrel. Unpubl.

- Report QA-728, conducted by the USDA NWRC for the Zinc Phosphide Consortium, Fort Collins, CO. 1,639 pp.
- FEDERAL REGISTER. 2000. Endangered and threatened wildlife and plants; determination of threatened status for the northern Idaho ground squirrel. 5 April. Federal Register 65(66):17779-17786.
- FEDERAL REGISTER. 2004. Endangered and threatened wildlife and plants; 12-month findings on resubmitted petitions to list the southern Idaho ground squirrel, sand dune lizard, and Tahoe yellow cress. 27 December. Federal Register 69(247):77167-77173.
- GAVIN, T. A., P. W. SHERMAN, E. YENSEN, AND B. MAY. 1999. Population genetic structure of the northern Idaho ground squirrel (*Spermophilus brunneus*). J. Mammal. 80:156-168.
- HALL, E. R. 1981. The Mammals of North America, Second Ed. Vol. 1. John Wiley and Sons, New York, NY. 600 + 90 pp.
- HOWELL, A. H. 1928. Descriptions of six new North American ground squirrels. Proc. Biol. Soc. Washington 41:211-214.
- HOWELL, A. H. 1938. Revision of the North American ground squirrels, with a classification of the Sciuridae. N. Amer. Fauna 56:1-256.
- IDAHO DEPARTMENT OF FISH AND GAME. 2005a. http://fishandgame.idaho.gov/cms/tech/CDC/cwcs_appf/Northern%20Idaho%20Ground%20Squirrel.pdf. Accessed 8 February 2006.
- IDAHO DEPARTMENT OF FISH AND GAME. 2005b. http://fishandgame.idaho.gov/cms/tech/CDC/cwcs_appf/Southern%20Idaho%20Ground%20Squirrel.pdf. Accessed 8 February 2006.
- JONES, C., R. S. HOFFMAN, D. W. RICE, M. D. ENGSTROM, R. D. BRADLEY, D. J. SCHMIDLY, C. A. JONES, AND R. J. BAKER. 1997. Revised checklist of North American mammals north of Mexico. 1997. Occ. Papers, Museum of Texas Tech Univ. 173:1-20.
- JONES, J. K., JR., R. S. HOFFMAN, D. W. RICE, C. A. JONES, R. J. BAKER, AND M. D. ENGSTROM. 1992. Revised checklist of North American mammals north of Mexico. 1991. Occ. Papers, Museum of Texas Tech Univ. 146:1-23.
- NADLER, C. F. 1966. Chromosomes and systematics of American ground squirrels of the subgenus *Spermophilus*. J. Mammal. 47:579-596.
- NADLER, C. F. 1968a. The chromosomes of *Spermophilus townsendii* (Rodentia: Sciuridae) and report of a new subspecies. Cytogenetics 7:144-157.
- NADLER, C. F. 1968b. The serum proteins and transferrins of the ground squirrel subgenus *Spermophilus*. Compar. Biochem. Physiol. 27:487-503.
- NADLER, C. F., R. S. HOFFMAN, N. N. VORONTSOV, J. W. KOEPL, L. DEUTSCH, AND R. I. SUKERNIK. 1982. Evolution in ground-squirrels. II. Biochemical comparisons in Holarctic populations of *Spermophilus*. Zeitschrift für Säugetierkunde 47:198-214.
- NADLER, C. F., R. I. SUKERNIK, R. S. HOFFMAN, N. N. VORONTSOV, C. F. NADLER JR., AND I. I. FOMICHOVA. 1974. Evolution of ground squirrels. I. Transferrins in Holarctic populations of *Spermophilus*. Compar. Biochem. Physiol. 47(A):663-681.
- PATTERSON, B. D., G. CEBALLOS, W. SECHREST, M. F. TOGNELLI, T. BROOKS, L. LUNA, P. ORTEGA, I. SALAZAR, AND B. E. YOUNG. 2003. Digital distribution maps of the

- mammals of the western hemisphere, version 1.0. NatureServe, Arlington, VA.
- RICKART, E. A. 1987. *Spermophilus townsendii*. Mammal. Species 268:1-6.
- RICKART, E. A., R. S. HOFFMAN, AND M. ROSENFELD. 1985 [1987]. Karyotype of *Spermophilus townsendii artemesiae* (Rodentia: Sciuridae) and chromosomal variation in the *Spermophilus townsendii* complex. Mammal. Chromosome Newsl. 26:94-102.
- SHERMAN, P. W., AND M. C. RUNGE. 2002. Demography of a population collapse: the northern Idaho ground squirrel (*Spermophilus brunneus brunneus*). Ecology 83(10):2816-2831.
- USFWS. 2003. Recovery plan for the northern Idaho ground squirrel (*Spermophilus brunneus*). U.S. Fish and Wildlife Service, Portland, OR. 68 pp.
- WILSON, D. E., AND D. M. REEDER (EDITORS). 1993. Mammal Species of the World: A Taxonomic and Geographic Reference, Second Ed. Smithsonian Institution Press, Washington, DC. 1,207 pp.
- WILSON, D. E., AND S. RUFF (EDITORS). 1999. Smithsonian Book of North American Mammals. Smithsonian Institution Press, Washington, DC. 750 pp.
- YENSEN, E. 1985. Taxonomy, distribution, and population status of the Idaho ground squirrel, *Spermophilus brunneus*. Final Report prepared for Non-game Species Program, Idaho Dept. of Fish and Game and Office of Endangered Species, USFWS. 41 pp.
- YENSEN, E. 1991a. Taxonomy and distribution of the Idaho ground squirrel, *Spermophilus brunneus*. J. Mammal. 72: 583-600.
- YENSEN, E. 1991b. Population estimate for the southern Idaho ground squirrel (*Spermophilus brunneus endemicus*). Report prepared for USFWS Snake River Basin Office, Boise, ID. 29 pp.
- YENSEN, E. 2001. Population estimate for the southern Idaho ground squirrel (*Spermophilus brunneus endemicus*). Report prepared for USFWS Snake River Basin Office, Boise, ID. 30 pp.
- YENSEN, E., AND P. W. SHERMAN. 1997. *Spermophilus brunneus*. Mammal. Species 560:1-5.
- YENSEN, E., AND P. W. SHERMAN. 2003. Ground-dwelling squirrels of the Pacific Northwest. U.S. Fish and Wildlife Service and U.S. Bureau of Land Management. 25 pp.