

# **SPECIES ASSESSMENT FOR WYOMING POCKET GOPHER (*THOMOMYS CLUSIUS*) IN WYOMING**

prepared by

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## Introduction

Pocket gophers are small, vole-like members of the family Geomyidae. They inhabit much of the western half of the United States, a large area of southwestern Canada, and much of Mexico (Bailey 1915). They are powerfully built mammals that are strongly adapted to fossorial living, with small ears, small eyes, fur-lined cheek pouches used to carry food, and very strong front limbs with long nails used for digging. There are several species of pocket gophers in Wyoming and the surrounding states. All look very similar, making it difficult to distinguish specimens to species. Reliable identification has to involve chromosomal analysis (i.e., karyotyping to count chromosome number), with supporting information from geographic location, pelage characters, and overall morphology.

The Wyoming pocket gopher (*Thomomys clusius*) is restricted to a very small portion of southcentral Wyoming (Clark and Stromberg 1987), probably extending slightly into northern Colorado. Very little is known regarding Wyoming pocket gophers; much of their life history is assumed similar to that of the northern pocket gopher (*T. talpoides*). Wyoming pocket gophers are small, with fur that has a distinctive yellow cast, and may prefer to occupy dry and gravelly ridge tops, as opposed to the valley bottoms with deeper soils that are typically associated with *T. talpoides* (Clark and Stromberg 1987). As with other species of *Thomomys*, Wyoming pocket gophers are active throughout the year and feed primarily on forbs and grasses. They live in subterranean burrow systems that allow them to feed underground and maintain their nests. They are thought to breed from May to June, and produce litters of 4-7 young (Verts and Carraway 1999). Population status is generally unknown, due to an extreme paucity of data, but the species is assumed to be rare and has a very restricted distribution. Although considered pests in some

agricultural situations, pocket gophers are important in soil development (adding organic matter), soil aeration, and promoting water storage in soil during spring runoff (Clark and Stromberg 1987). By virtue of the arid and rocky nature of their habitat, it is very doubtful that Wyoming pocket gopher activity detracts from any agricultural production.

## Natural History

### *Morphological Description*

Pocket gophers are powerfully built mammals, characterized by a heavily muscled head and shoulders that taper into relatively narrow hips and short legs. They have small eyes and ears and fur-lined cheek pouches that open external to the mouth. Front feet are strong with claw-like nails used for digging (Verts and Carraway 1999). The Wyoming pocket gopher is smaller and paler than other pocket gophers, with a distinctive yellow cast to the pelage, especially in younger animals (Clark and Stromberg 1987, Thaeler and Hinesley 1979). Dorsal pelage is uniform in color, and the margin of the pinnae are fringed with whitish hairs (Thaeler and Hinesley 1979). Adults may attain the following dimensions: total body length 161-184 mm; tail length 50-70 mm; hind foot length 20-22 mm; ear length 5-6 mm; and a weight of 44-72 grams. There is no sexual dimorphism displayed in this species (Clark and Stromberg 1987).

The range of the Wyoming pocket gopher lies almost entirely within the range of *T. talpoides ocius*, but the two species occupy distinctly different habitats (Thaeler and Hinesley 1979). The Wyoming pocket gopher prefers well-drained, gravelly soils on ridge tops, while *T. t. ocius* occurs in sandy soils proximal to watercourses (Patton *in* Wilson and Reeder 1993). The Wyoming pocket gopher has a hind foot length that varies from 20-22 mm, whereas the hind feet of other pocket gophers in the same geographic range vary from 23-30 mm (Clark and Stromberg 1987).

Because most species of pocket gopher look very similar it can be difficult to identify specimens to species. Positive identification requires karyotype analysis (i.e., a count of the number of diploid chromosomes). The Wyoming pocket gopher has a karyotype of  $2n=46$  chromosomes (Thaeler and Hinesley 1979), while the northern pocket gopher (*T. talpoides*) has a karyotype of  $2n=48$  (Thaeler and Hinesley 1979) and the Idaho pocket gopher (*T. idahoensis*) has a karyotype of  $2n=58$  (Thaeler 1972). The plains pocket gopher (*Geomys lutescens lutescens*) occupies only far eastern Wyoming; aside from this wide geographic separation, *G. lutescens* is easily distinguished from *T. clusius* by distinctive parallel grooves on the front surface of its protruding incisor teeth (Clark and Stromberg 1987).

## *Taxonomy and Distribution*

### **Taxonomy**

In 1857, Dr. W. A. Hammond collected a small, pale-colored, female pocket gopher about 18 miles southwest of Rawlins, Wyoming. Eighteen years later Coues (1875) described this specimen and gave it the name *Thomomys clusius* (Thaeler and Hinesley 1979). Since the name was first proposed in 1875, it has been applied and misapplied to a variety of different pocket gophers since that time as pocket gopher taxonomy has gone through major changes and revisions (see Thaeler and Hinesley 1979 for a complete review of the taxonomic history of *T. clusius*). Using specimens and chromosomal analyses from a variety of pocket gophers from southern Wyoming, Thaeler and Hinesley (1979) described *T. clusius* as a unique species within the *Thomomys talpoides* complex; this description is widely accepted today. The distinctiveness of the species was mainly established on the unique karyotype of  $2n=46$ , with support from the more pale and yellowish pelage and generally small size (Thaeler and Hinesley 1979).

Subsequent to Thaeler and Hinesley (1979), Hall (1981) regarded *T. clusius* as one of 58 subspecies of *T. talpoides*. Currently only 56 subspecies are recognized (Patton 1993), with *T. clusius* and *T. idahoensis* maintained at the species level based on Thaeler and Hinesley (1979) and Thaeler (1972), respectively (see also Jones et al. 1992, Patton in Wilson and Reeder 1993).

### **Distribution**

The general distribution of the Geomyidae family in North America is limited only by suitable soils, although a particular species may also be limited by climatic factors or other factors associated with altitude and latitude (Miller 1964). Pocket gophers of the genus *Thomomys* can be found in much of the central and southern Rocky Mountains, and from the Pacific coast in Washington to Minnesota and Manitoba in the central plains (Tryon and Cunningham 1968, Hall 1981).

The Wyoming pocket gopher is known to occur only in Sweetwater and Carbon counties in Wyoming, although there is some indication (pending further investigation) of occurrences in northern Colorado (Clark and Stromberg 1987, WYNDD 2003). In comparison, the Idaho pocket gopher is found in southwestern Wyoming (Lincoln, Uinta and Sublette counties) and adjacent portions of Idaho, the northern pocket gopher occurs throughout Wyoming and adjacent states in virtually all vegetation types underlain by loose soil, and the plains pocket gopher occupies true grasslands of the Great Plains including far eastern Wyoming (Clark and Stromberg 1987). It is important to recognize that all *Thomomys* in this region are undersampled, and additional field inventory may dramatically increase the limits of known range for any taxon, including *T. clusius*.

## *Habitat Requirements*

### **Year-round**

Pocket gophers are strongly fossorial, living in burrow systems and underground tunnels. Very little is known regarding the natural history of Wyoming pocket gophers; it is assumed to resemble that of the northern pocket gopher in most respects.

Northern pocket gophers are very adaptable and occur across much of the western U.S. at various elevations, vegetation types, and soil types (Miller 1964, Tryon and Cunningham 1968, Clark and Stromberg 1987, Verts and Carraway 1999). They apparently prefer deep and tractable soils, but also occupy heavily compacted soils and shallow gravels (Miller 1964). In many regions the northern pocket gopher occupies a unique topography consisting of 25-50 mounds/hectare, each mound being about 2 meters high and 20-30 meters in diameter (Cox and Hunt 1990). These “mima mounds” are thought by some to be formed by the burrowing activities of pocket gophers, although others believe they are the result of seismic activities (Hansen 1962, Verts and Carraway 1999). In general, pocket gopher habitat appears to be limited only by a soil layer deep and tractable enough to hold burrow systems, and enough succulent plants to form a food base.

Based on the very limited information base to-date, Wyoming pocket gophers appear to segregate from northern pocket gophers by preferentially occupying dry, gravelly, shallow-soil ridge tops rather than deeper soiled swales and valley bottoms (Clark and Stromberg 1987). Many existing capture locations are from greasewood (*Sarcobatus*), rather than sagebrush (*Artemisia*), communities on the edges of eroding washes (Clark and Stromberg 1987, Thaeler and Hinesley 1979).

Pocket gophers use burrow systems consisting of a network of feeding tunnels connected to a smaller and deeper system of chambers that are used for nesting and food storage (Miller 1964). In general, pocket gopher tunnels vary from 6 inches to a foot below the surface of the ground and are 1.5-3 inches in diameter, depending on the size of the gopher (Bailey 1915). Burrow entrances are kept plugged with loose soil (Clark and Stromberg 1987). Pocket gopher burrow systems are typically found in areas with large herbage yields of succulent forbs with fleshy underground storage structures, such as alfalfa fields (Reid 1973). Fields of alfalfa and other crops with large yields of succulent above- and below-ground parts can be very favorable pocket gopher habitat (Reid 1973). However, it is assumed that because such cultivation is relatively rare in southern Wyoming and occurs primarily in valley bottoms occupied by northern pocket gophers, such habitats do not substantially influence populations of Wyoming pocket gophers. Pocket gophers are very restricted to specific habitats and do not move a great deal during their lifetime (Bailey 1915).

### **Territoriality and Area Requirements**

The burrow system of a pocket gopher is both its home range and territory, and is typically vigorously defended against intrusion (Ingles 1952), although during the breeding season this is somewhat relaxed. The defense and maintenance of a territory invariably involves some form of aggressive behavior or display. Once a pocket gopher establishes a territory and has lived in its burrow for one breeding season, it tends to remain in that burrow for life with only minor boundary changes (Miller 1964).

Known home ranges of *T. talpoides* are very small. Banfield (1974) documented the home range of the northern pocket gopher to be 0.015 hectares. In Utah, density estimates for populations of *T. talpoides* in early summer were 5.3-16.9 per hectare (2 years) in meadow, 2.1-

14.4 per hectare (3 years) in aspen, 6.3 per hectare (1 year) in fir, and 0.4 per hectare (1 year) in spruce (Anderson and MacMahon 1981). During a 3 year study at 3,020 meters in subalpine parks in Colorado, densities of *T. talpoides* in early summer were 6.2-12.4 per hectare and 14.8-34.6 per hectare in late summer; much of the variation in late summer was attributed to differences in survival of young (Vaughan 1969). Howard and Childs (1959) observed that male territories in a population of *T. bottae* averaged 2,700 ft<sup>2</sup> and were about twice the size of female territories. They also noted that the territories of subadults were considerably smaller than those of adults (Howard and Childs 1959). The home ranges of Wyoming pocket gophers are assumed to be similar in size and nature to those of the northern pocket gopher.

### **Landscape Pattern**

Considering that very little information is known regarding pocket gopher habitat use in general, it is hard to say what may constitute a good landscape pattern for Wyoming pocket gophers. Miller (1964) stated that “soil depth and texture, and interspecies competition are clearly the most critical factors in both the geographic and habitat distributions of pocket gophers”. Also, population density and body size of pocket gophers is related to food quantity and quality (Smith and Patton 1988). For example, because fields of alfalfa produce more and more consistently available food than fields of annual cereals, they support more and larger pocket gophers (Reid 1973). In this context, a suitable landscape for Wyoming pocket gophers may be loosely defined as a dry upland with gravelly, yet still tractable, soils (i.e., favoring *T. clusius* over *T. talpoides*) and relatively high productivity of grasses and forbs (i.e., high food availability).

## *Movement and Activity Patterns*

### **Migration**

Pocket gophers are considered resident species and do not migrate. Once pocket gophers establish territories and burrows, they move very little over the course of their entire lives, except for minor boundary changes (Miller 1964).

Movement and dispersal capabilities are very limited. The average and maximum distances dispersed by *T. talpoides* was 239m and 790m, respectively (Vaughan 1963). Longer-distance dispersals may occur beneath the snow (Marshall 1941).

### **Phenology**

Pocket gophers are active year-round. They stay underground a majority of the time and forage above ground only at night or on overcast days (Verts and Carraway 1999). They are solitary creatures, except during the breeding season (Miller 1964). They are accomplished excavators and are capable of rapid and extensive tunneling (Verts and Carraway 1999).

## *Reproduction and Survivorship*

### **Breeding Behavior and Phenology**

Studies of the reproduction of the Wyoming pocket gopher are lacking, but presumably its reproductive biology closely resembles that of the northern pocket gopher. Male northern pocket gophers are polygamous, exploring the burrows of females living next to them, but females will only permit the males to remain in their burrow during the breeding season (Miller 1964). Very little is known regarding the courtship practices of pocket gophers. Sex ratios for adult pocket gophers is generally close to 50:50, but may vary depending upon when sampling is done in the

annual population cycle (Reid 1973). The breeding season of *T. talpoides* in Colorado is thought to extend from mid March to mid June (Hansen 1960), but Vaughan (1969) claimed that it occurred in May or June at elevations of 3,020 meters, and that one female captured in August was pregnant. Vaughan (1964) found that most litters of *T. talpoides* in Colorado are probably born in June. Pregnant *T. talpoides* have been captured in June in Sweetwater County, Wyoming, and in July in the Black Hills (Clark and Stromberg 1987).

### **Fecundity and Survivorship**

The northern pocket gopher is thought to have a gestation period of 19-20 days (Andersen 1978, Reid 1973), and litter size is highly variable (averaging 4-6 young in Wyoming; Wirtz 1954, Tryon and Cunningham 1968, Anderson 1978, Verts and Carraway 1999). Young are born hairless into subterranean nests within the burrow system; eyes do not open until 26 days of age (Andersen 1978). In the *T. talpoides* complex in general, young remain with the maternal parent for 6-8 weeks (Criddle 1930). Young are kept in a maternal burrow and may disperse as early as early June (Sweetwater County; Clark and Stromberg 1987).

It has been suggested that some females may produce more than one litter per year based on the synchronous capture of pregnant females and juveniles in the same burrow systems (Burt 1933). However, Hansen (1960) found no evidence of more than one annual litter per female in the Rocky Mountain region. It is believed that in southern climates pocket gophers may indeed produce more than one litter per year, but in northern climates only one annual litter is produced (Miller 1964). Young northern pocket gophers are able to reproduce in the calendar year following their birth (Moore and Reid 1951).

The proportion of females that produce litters every year can vary greatly (Verts and Carraway 1999). In a study conducted in Utah, 62.5-100% of small samples bred annually during a 4-year period, but differences among the years were not significant (Andersen and MacMahon 1981). Wight (1930) reported that only 79% of 112 females collected from mid March to mid April were found to be reproductively active.

Very little is known regarding survivorship and mortality in pocket gophers. In Oregon, repeated trapping within individual burrow systems resulted in an average of 2.8 young being captured, causing Wight (1930) to suggest that young experienced heavy mortality or dispersed before sampling occurred. Howard and Childs (1959) stated that subadults often have to live in marginal habitats, and that as a result they seem to be exposed to unusually heavy mortality. In a 4-year Utah study of northern pocket gophers, weekly survivorship was greater in summer than winter, and annual survival rates were  $\geq 0.27$ , 0.18, 0.23, and 0.70 (Anderson and MacMahon 1981). In Colorado, Hansen (1965) studied an introduced population of northern pocket gophers in a 930m<sup>2</sup> enclosure; mortality was approximately 10% per month from June through September and approximately 13% per month from September through June. Sixty-three percent of the study population survived the summer, but only 17% survived the winter. Pocket gophers in the wild generally only live 18-20 months, but can live as long as 5 years (Reid 1973, Clark and Stromberg 1987).

## *Population Demographics*

### **Limiting Factors**

The extremely varied diets of various pocket gopher species has led to the conclusion that food is seldom a limiting factor in pocket gopher distributions, although the nature and amount of vegetation may affect local population densities (Miller 1964).

### **Metapopulation Dynamics**

There is not enough known about pocket gophers in general, and Wyoming pocket gophers in particular, to confidently assess the spatial dynamics of populations.

### **Genetic Concerns**

Limited dispersal ability and a resultant high rate of inbreeding in some pocket gopher species may facilitate development of karyotypic differences in the genus *Thomomys* (Patton and Dingman 1970). For especially small and isolated taxa, possibly including the Wyoming pocket gopher, such inbreeding may also raise the risk of local extinction.

## *Food Habits*

### **Food items**

The food habits of Wyoming pocket gophers have not been studied, however, they are probably similar to that of the northern pocket gopher. Pocket gophers can subsist on a very wide variety of plant species, although they have a strong preference for forbs (Miller 1964). Forbs and grasses are also probably the main diet of the Wyoming pocket gopher. Pocket gophers eat roots and tubers while underground, and some surface vegetation that occurs near burrow entrances is cut and pulled into the burrow systems (Verts and Carraway 1999). Alfalfa fields are known to

provide large amounts of high quality, succulent vegetation to pocket gophers in Colorado (Reid 1973). In a short-grass prairie region of Colorado, *T. talpoides* consumed 67% forbs, 30% grasses, and 3% shrubs; the major components of the diet included *Opuntia polyacantha* (49.9%), needle-and-thread (*Stipa comata*) (12.1%), *Sphaeralcea coccinea* (10.3%), bluestem wheatgrass (*Agropyron smithii*) (10.1%), blue grama (*Bouteloua gracilis*) (3.0%), and *Atroplex canescens* (2.5%) (Vaughan 1967). At elevations of 2,750-3,050 meters in Utah, the species consumed most frequently and in the greatest amounts were dandelion, penstemon (*Penstemon rydbergii*), sweet sage (*Artemisia discolor*), meadowrue (*Thalictrum fendleri*), and slender wheatgrass (*Agropyron trachycaulum*) (Aldous 1951).

### **Foraging Strategy and Variation**

Pocket gophers are strictly herbivorous (Reid 1973). *Thomomys talpoides* probably eats most species of succulent plants within its range, but is capable of selecting plants with higher levels of protein and fat from those available (Tryon and Cunningham 1968). The northern pocket gopher forages in underground burrows, but occasionally forages above ground at night or on overcast days. Plants are cut into small pieces and carried in the cheek pouches back to the burrow where they are consumed or stored for winter (Verts and Carrrawy 1999).

The percentage of available vegetation taken varies greatly between subspecies of *T. talpoides*, location of individual gophers, and season. Pocket gophers tend to change their diet seasonally in response to habitat conditions and the availability and nutritional quality of food (Reid 1973). In summer months they tend to eat green plants with succulent leaves and stems, but in the winter months they switch primarily to roots (Reid 1973). In a subalpine habitat in Colorado (3,020 m), 87% of the summer diet of *T. talpoides* consisted of leaves of forbs, 1% grasses, and 12% roots (Vaughan 1974). However, in another location in Colorado, the summer diet of *T. talpoides*

consisted of 6% grasses, 93% forbs, and 1% shrubs; 74% of the diet was aboveground parts of plants and only 26% of the diet was composed of roots (Verts and Carraway 1999). In a Colorado short-grass prairie region, 70% of foods consumed by *T. talpoides* were aboveground parts of plants (Vaughan 1967), but in montane regions of Utah, most foods eaten were underground parts of plants (Aldous 1951).

Pocket gophers cache food collected in late summer. In Utah, 5 food caches of *T. talpoides* collected in late summer contained an average of 380 g of stored food items (Aldous 1945).

There are no studies of diet and foraging strategy of the Wyoming pocket gopher. Diet is assumed to be similar in variety and opportunistic composition to that of northern pocket gophers in the region, with a general reliance on roots, shoots, and leaves of forbs and grasses (Clark and Stromberg 1987).

## *Community Ecology*

### **Predation**

There are a variety of predators known to prey on pocket gophers, including gopher snakes (*Pituophis catenifer*), rattlesnakes (*Crotalus viridis*), long-tailed weasels (*Mustela frenata*), coyotes (*Canis latrans*), bobcats (*Lynx rufus*), martens (*Martes americana*), badgers (*Taxidea taxus*), foxes, skunks, and numerous owls (Vaughan 1961, Hansen and Ward 1966, Young 1958, Criddle 1930, Bull and Wright 1989, Marti 1969, Clark and Stromberg 1987).

### **Interspecific interactions**

Species of pocket gophers are generally distributed so that their ranges do not overlap (Bailey 1915, Vaughan 1967, Thaeler 1968a), but in some instances they live in close proximity.

Proximal populations usually do not become sympatric, but instead exclude one another from particular environments in a classic competitive exclusion manner based on differential habitat preferences and requirements (i.e. soil type and depth) (Miller 1964).

### **Parasites and Disease**

Parasites of northern pocket gophers include various species of fleas (Siphonaptera) and chewing lice (Mallophaga); refer to Verts and Carraway (1999) for a detailed list of parasites. Miller and Ward (1964) found that rates of infestation of *T. talpoides* by lice and fleas was significantly related to the body mass of the individual gopher. Mites, ticks, and a few endoparasites have also been found to parasitize northern pocket gophers (Verts and Carraway 1999). The northern pocket gopher has been found to be infested with warbles of the botfly, and occasionally infestations can involve 25-37% of populations and be sufficiently intense to cause mortalities (Richens 1965).

## **Conservation**

### *Conservation Status*

#### **Federal Endangered Species Act**

The U.S. Fish and Wildlife Service does not give any special status to the Wyoming pocket gopher at this time.

#### **Bureau of Land Management**

The Wyoming BLM developed their sensitive species list in 2001, and the Wyoming pocket gopher was assigned to that list. The BLM developed the list to “ensure that any actions on public lands consider the overall welfare of these sensitive species and do not contribute to their decline.”

The BLM's sensitive species management will include: determining the distribution and current habitat needs of each species; incorporating sensitive species in land use and activity plans; developing conservation strategies; ensuring that sensitive species are considered in NEPA analysis; and prioritizing what conservation work is needed (BLM Wyoming 2001).

### **Forest Service**

Region 2 of the U.S. Forest Service includes Wyoming pocket gopher on its Sensitive Species list. Sensitive species are defined by the Forest Service as “those animal species identified by the Regional Forester for which population viability is a concern as evidenced by: (a) significant current or predicted downward trends in population numbers or density, and/or (b) significant current or predicted downward trends in habitat capability that would reduce a species’ existing distribution” (USDA Forest Service 1994). The Region 2 area in Wyoming includes the Bighorn, Black Hills, Medicine Bow, and Shoshone National forests and Thunder Basin National Grassland. Based on known distribution, the Medicine Bow National Forest is the only USFS unit that possibly supports *T. clusius*.

### **State Wildlife Agencies**

The Wyoming Game & Fish Department classifies the Wyoming pocket gopher as NSS4. In general, this ranking means that although populations appear to be restricted in distribution, habitat does not appear to be declining and there are no known sensitivities to human disturbance (Oakleaf *et al.* 2002).

### **Heritage Ranks and WYNDD’s Wyoming Significance Rank**

The Wyoming pocket gopher has been assigned a rank of **G2/S2** by the Wyoming Natural Diversity Database (WYNDD; University of Wyoming). The G2 refers to a relatively high

probability of global extinction, based primarily on the taxon's extremely small global range. The S2 rank refers to a relatively high probability of extinction from Wyoming, again based mostly on range restriction. Importantly, this species has not been adequately inventoried in the field; it is possible that concerted surveys will identify a wider global range than is now assumed.

WYNDD assigns a Wyoming Significance Rank of **Very High** to the Wyoming pocket gopher (see Keinath and Beauvais 2002a), which reflects the extremely high contribution of Wyoming population segments to continental persistence of the species. Clearly, because the species is thought to occur only within the state of Wyoming (possibly extending into northern Colorado pending further investigation), the fate of Wyoming populations is synonymous with the fate of the species as a whole.

### *Biological Conservation Issues*

#### **Abundance**

Very little is known regarding abundance of the Wyoming pocket gopher. It may be common within its distributional range, and has no known major threats to its existence, but more information is clearly needed for a confident assessment. The Wyoming Game and Fish Department lists the Wyoming pocket gopher as an uncommon resident (Oakleaf *et al.* 2002). Clark and Stromberg (1987) stated that only 43 specimens of this species were known at that time, but that this species may be abundant within its range. There are now 14 known locations for the Wyoming pocket gopher in the state, representing 21 captured and positively identified individuals. WYNDD currently categorizes the abundance of the Wyoming pocket gopher as rare (Abundance Rank = B; Keinath and Beauvais 2002b); confidence in this rank is **Moderate**.

## **Trends**

Population trends of the Wyoming pocket gopher are essentially unknown across both the historical and recent periods. WYNDD categorizes the abundance trends of the Wyoming pocket gopher within Wyoming as uncertain (Trends Abundance Rank = U; Keinath and Beauvais 2002b); confidence in this rank is **Moderate**.

## **Population Extent and Connectivity Trends**

The Wyoming pocket gopher is essentially endemic to Wyoming, possibly extending into northern Colorado. The overall lack of field inventory for this species suggests that its range extent is still unknown at this time; additional field efforts may document significant range expansions.

## **Trends in Available Habitat**

Very little is known about habitat trends for the Wyoming pocket gopher. A small amount of habitat may have been lost to urbanization and other rather intense disturbances like road and pipeline construction, but a substantial amount of generally undisturbed habitat probably remains.

## **Range Context**

The Wyoming pocket gopher is considered endemic to Wyoming, with possible and as-yet unconfirmed extension into northern Colorado. Therefore WYNDD categorizes the Wyoming range context of the Wyoming pocket gopher as **high** (Range Context Rank = B; Keinath and Beauvais 2002b), with a **high** degree of confidence.

## **Extrinsic Threats and Reasons for Decline**

### Anthropogenic Impacts

It is unlikely that Wyoming pocket gophers are threatened by factors that can affect northern pocket gophers in more agriculturally-active areas. Conversion of native vegetation into agricultural fields, and subsequent poisoning and trapping of pocket gophers, is unlikely on dry and gravelly uplands of southern Wyoming. A more likely threat is soil disturbance and compaction due to increased petroleum exploration and extraction. In this context, increased road densities and abundances that accompany petroleum development may be more of a threat than the construction of well-pads and pipelines.

### Stochastic Factors (e.g., weather events)

Although extreme climatic events can affect pocket gopher populations, their overall affect is not well understood. Runoff from melting snow and high groundwater tables can force temporary redistribution of pocket gophers (Reid 1973). Harsh winters and late spring/ early fall freezes can also affect pocket gopher populations (Reid 1973), probably mostly by increasing juvenile mortality. Howard and Childs (1959) ascribed weather and its influence on food and cover as a dominant factor in determining annual populations of pocket gophers.

### Natural Predation

Pocket gophers are preyed upon by a number of bird and mammal species; however, it is not known if predation is severe enough to threaten population numbers significantly.

### WYNDD Extrinsic Threat Rank

WYNDD categorizes the Wyoming pocket gopher within Wyoming as being slightly threatened by extrinsic threats (Extrinsic Threat Rank = C; Keinath and Beauvais 2002b), meaning

that threats potentially exist but are not likely to affect population numbers in the state to a great degree. The confidence in this rank is **Moderate**.

### **Intrinsic Vulnerability**

#### Habitat Specificity

Wyoming pocket gophers are an upland species, possibly preferring dry ridge tops that are often associated with gravelly loose soils and greasewood (Clark and Stromberg 1987). Although this habitat is apparently widespread in southern Wyoming, the paucity of information on this species requires caution when interpreting habitat patterns. Wyoming pocket gophers may be responding to subtle factors of soil texture or vegetation that are not immediately apparent; more field inventory is needed prior to confident conclusions on habitat use and abundance.

#### Territoriality and Area Requirements

In general, pocket gopher individuals and populations require fairly small areas in which to persist (Banfield 1915, Ingles 1952, Howard and Childs 1959); thus it is likely that areal requirements are not a major limiting factor.

#### Susceptibility to Disease

The literature does not suggest that disease is a major factor in pocket gopher persistence.

#### Dispersal Capability and Site Fidelity

Movement and dispersal capabilities of northern pocket gophers are rather limited (Vaughan 1963); it is assumed that Wyoming pocket gophers are similarly restricted. Because of this limit, it may be relatively easy to fragment suitable habitat; i.e., relatively small habitat disturbances may be movement barriers.

### Reproductive Capacity

The northern pocket gopher has a short gestation of only 19-20 days, and a relatively long breeding season (March to June), but is thought to produce only one litter of 4-7 young per year (Verts and Carraway 1999). Young northern pocket gophers are able to reproduce in the calendar year following their birth (Moore and Reid 1951).

### WYNDD Intrinsic Vulnerability Rank

WYNDD categorizes the intrinsic vulnerability of the Wyoming pocket gopher as being moderate (Trend Rank = B; Keinath and Beauvais 2002b) due to the possibility of habitat specificity, limited distribution, limited movement ability, and unknown population numbers. The confidence in this rank is **Moderate**.

### Protected Areas

The Wyoming pocket gopher occurs primarily on BLM surface managed for multiple use, intermixed with smaller parcels of private land. It is possible that future inventories will document the species on multiple-use Forest Service lands.

### WYNDD Protected Areas Rank

WYNDD categorizes the protected area rank of the Wyoming pocket gopher as being only moderate (Trend Rank = C; Keinath and Beauvais 2002b). The confidence in this rank is **Moderate**.

### Population Viability Analyses (PVAs)

The authors are unaware of any formal population viability analyses that have been conducted for the Wyoming pocket gopher.

## **Conservation Action**

### *Conservation Elements*

This is a difficult topic to address since very little is known about Wyoming pocket gopher life history, especially habitat requirements. In general, minimizing disturbance to upland soils in areas of known occupation is recommended. Only relatively small areas (ca. 1 ha) are needed to support small populations; however, limited dispersal capabilities suggest that small and seemingly minor disturbances may fragment habitat and populations. In this context, and without further information, long-term viability may be best served by minimizing soil compacting activities across large and inter-connected upland forms (i.e., large ridges, mesas, and plateaus that are not dissected by permanent streams).

### **Inventory and Monitoring**

There are generally two methods used to inventory pocket gophers. One involves counting “visible sign” of pocket gophers (diggings), and using abundance of such sign to index abundance of the animals themselves. However, this is applicable only where populations are small, burrow systems are sufficiently separated to be recognized as belonging to individual pocket gophers, and species identification is known or unimportant (Reid 1973). The second method is to directly trap pocket gophers using various live/ kill traps. This is the most accurate method for estimating abundance, and yields specimens that can be analyzed in detail and classified to species. However, it requires considerable time and effort (Reid 1973). Proulx (1997) offers a detailed discussion of various live traps that can be used for pocket gophers.

Live trapping should be routinely used in environmental assessments to better assess Wyoming pocket gopher distribution. The best time to conduct trapping sessions is believed to be in the early fall, after the young of the year have been born but have not yet dispersed (Reid 1973).

Ideally, pocket gophers should be trapped in as many environments and settings as possible across southern Wyoming, with detailed habitat data also collected at trapping sites. This will be the best way to confirm habitat preferences of Wyoming pocket gophers, and increase understanding of the factors that separate them from *T. talpoides* and *T. idahoensis*.

## **Information Needs**

### *Rangewide and Wyoming Needs*

Basic field inventories are most needed to elucidate the distributional limits, habitat preferences, and population status of Wyoming pocket gophers. As discussed above, pocket gopher surveys conducted broadly across southern Wyoming will be the most efficient way to inform management of Wyoming pocket gophers as well other forms in the region. Also, trapping should be extended into northern Colorado, especially in the vicinity of the Upper Laramie River watershed and points west, to determine if *T. clusius* occurs there. Following basic surveys, the responses of Wyoming pocket gophers to soil disturbing actions such as road and pipeline construction should be investigated.

## Figures

Figure 1. All documented locations of Wyoming pocket gophers; the known global range of the taxon falls completely within the state of Wyoming. Large black circles indicate the approximately 14 unique capture locations of the 21 pocket gopher specimens ever positively identified as Wyoming pocket gopher. Smaller X's indicate locations of other specimens that were initially believed to be Wyoming pocket gophers, but then reclassified to other species or determined to be accompanied by insufficient evidence for positive identification. All data on file at the Wyoming Natural Diversity Database (University of Wyoming).

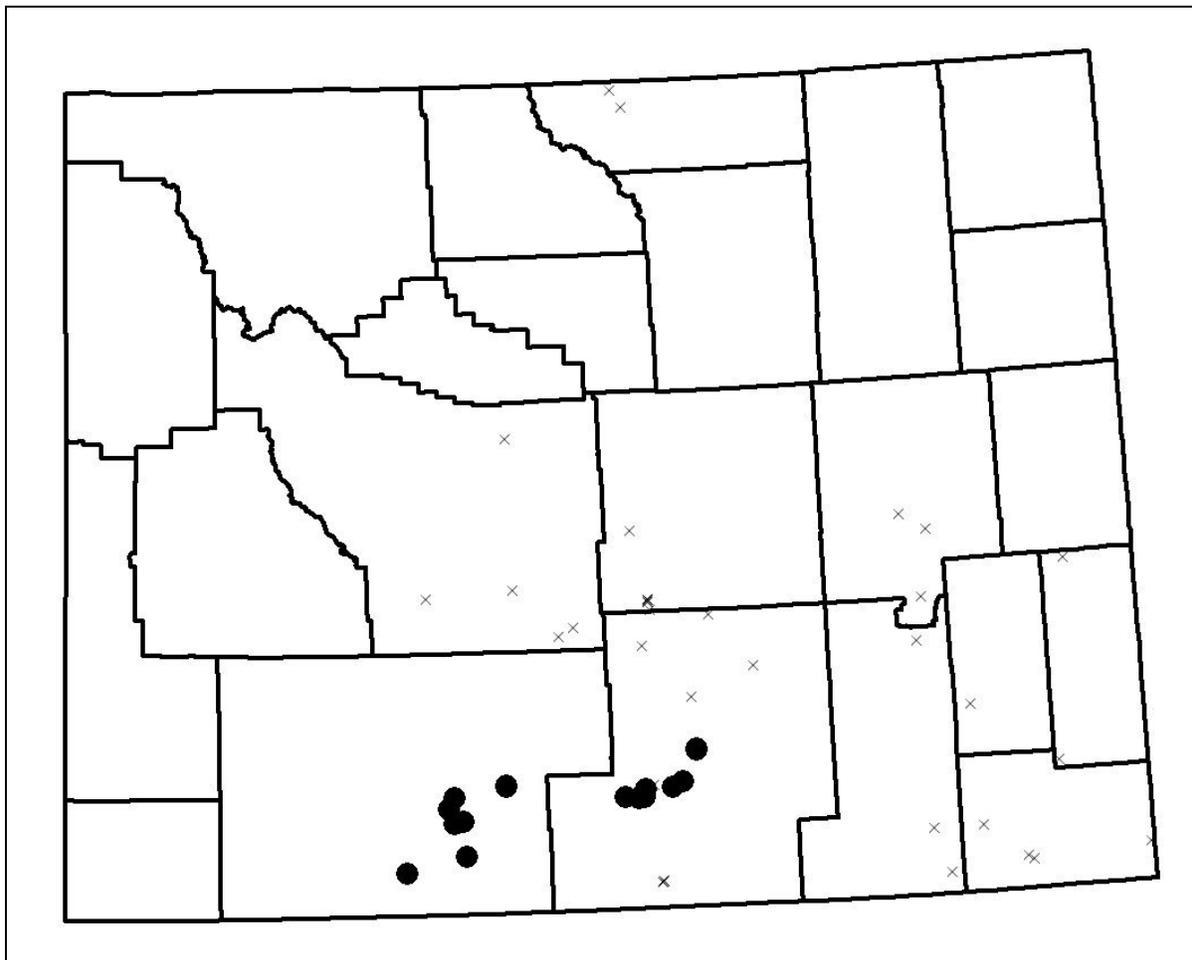


Figure 3: Photo of an adult northern pocket gopher (*Thomomys talpoides*) skull.



## Literature Cited

- Aldous, C. M. 1945. Pocket gopher food caches in central Utah. *The Journal of Wildlife Management* 9:327-328.
- Aldous, C. M. 1951. The feeding habits of pocket gophers (*Thomomys talpoides moorei*) in the high mountain ranges of central Utah. *Journal of Mammalogy* 32:84-87.
- Andersen, D. C. 1978. Observations on reproduction, growth, and behavior of the northern pocket gopher (*Thomomys talpoides*). *Journal of Mammalogy* 59:418-422.
- Andersen, D. C. and J. A. MacMahon. 1981. Population dynamics and bioenergetics of a fossorial herbivore, *Thomomys talpoides*, in a spruce-fir sere. *Ecological Monographs* 51:179-202.
- Bailey, V. 1914. Eleven new species and subspecies of pocket gophers of the genus *Thomomys*. *Proceedings of the Biological Society of Washington* 27:115-118.
- Bailey, V. 1915. Revision of the pocket gophers of the genus *Thomomys*. *North American Fauna* 39:1-36.
- Banfield, A. W. F. 1974. *The mammals of Canada*. University of Toronto Press. 438 pp.
- BLM Wyoming. 2001. Instruction memorandum no. WY-2001-040, sensitive species policy and list. Bureau of Land Management, Wyoming State Office, 5353 Yellowstone Road, PO Box 1828, Cheyenne, Wyoming. Document access: [www.wy.blm.gov/newsreleases/2001/apr/4\\_6\\_sensitivespecies.html](http://www.wy.blm.gov/newsreleases/2001/apr/4_6_sensitivespecies.html)
- Bull, E. L. and A. L. Wright. 1989. Nesting and diet of long eared owls in conifer forests, Oregon. *The Condor* 91:908-912.
- Burt, W. H. 1933. On the breeding habits of pocket gophers. *The Murrelet* 14:42.
- Clark, T. W. and M. R. Stromberg. 1987. *Mammals in Wyoming*. University Press of Kansas, Lawrence, KS.
- Cox, G. W. and J. Hunt. 1990. Farm of Mima mounds in relation to occupancy by pocket gophers. *Journal of Mammalogy* 71:90-94.
- Criddle, S. 1930. The prairie pocket gophers, *Thomomys talpoides rufescens*. *Journal of Mammalogy* 11:265-280.
- Davis, W. B. 1939. *The recent mammals of Idaho*. Caxton Printers, Ltd., Caldwell, Idaho, 400 pp.
- Hall, E. R. 1981. *The Mammals of North America: Second Edition*, two volumes. John Wiley and Sons, New York, New York.
- Hansen, R. M. 1960. Age and reproductive characteristics of mountain pocket gophers in Colorado. *Journal of Mammalogy* 41:323-335.
- Hansen, R. M. 1962. Movements and survival of *Thomomys talpoides* in a Mima-mound habitat. *Ecology* 43:151-154.

- Hansen, R. M. 1965. Pocket gopher density in an enclosure of native habitat. *Journal of Mammalogy* 46:508-509.
- Hansen, R. M. and E. E. Remmenga. 1961. Nearest neighbor concept applied to pocket gopher populations. *Ecology* 42:812-814.
- Hansen, R. M. and A. L. Ward. 1966. Some relations of pocket gophers to rangelands on Grand Mesa, Colorado. *Colorado Agricultural Experiment Station Technical Bulletin* 88:1-22.
- Howard, W. E. and H. E. Childs. 1959. Ecology of pocket gophers with emphasis on *Thomomys bottae mewa*. *Hilgardia* 29:277-358.
- Huntly, N. and R. Inouye. 1988. Pocket gophers in ecosystems: patterns and mechanisms. *BioScience* 38:786-793.
- Ingles, L. 1952. Methods of estimating pocket gopher populations. *Journal of Wildlife Management* 13:311-312.
- Jones, J. K., Jr., et al. 1992. Revised checklist of North American mammals north of Mexico, 1991. *Occas. Pap. Mus., Texas Tech University*. (146):1-23.
- Keinath, D. A., and G. P. Beauvais. 2002a in preparation. Wyoming Animal Element Ranking Guidelines. The Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.
- Keinath, D. A. and G. P. Beauvais. 2002b in preparation. Wyoming Animal Species of Special Concern List and Ranks. The Wyoming Natural Diversity Database, University of Wyoming, Laramie, WY.
- Marti, C. D. 1969. Some comparisons of the feeding ecology of four owls in north-central Colorado. *The Southwestern Naturalist* 14:163-170.
- Marshall, W. H. 1941. *Thomomys* as burrowers in the snow. *Journal of Mammalogy* 22:196-197.
- Miller, R. S. 1964. Ecology and distribution of pocket gophers (Geomyidae) in Colorado. *Ecology* 45:256-272.
- Miller, R. S. and R. A. Ward. 1964. Ectoparasites of pocket gophers from Colorado. *The American Midland Naturalist* 64:382-391.
- Montana Natural Heritage Program. 2003. Sensitive species list of Montana mammals (online version). Accessed on 9/9/2003 at: <http://nhp.nris.state.mt.us>.
- Moore, A. W. and E. H. Reid. 1951. The Dalles pocket gopher and its influence on forage production of Oregon mountain meadows. *United States Department of Agriculture Circular* 884:1-36.
- Oakleaf, B., A. Cerovski, and M. Grenier. 2002. Native species status matrix, March 2002. Appendix IV in A. O. Cerovski, editor. *Threatened, Endangered, and Nongame Bird and Mammal Investigations*. Wyoming Game and Fish Department, Cheyenne, Wyoming.
- Patton, J. L. and R. E. Dingman. 1968. Chromosome studies of pocket gophers, genus *Thomomys*. I. The specific status of *Thomomys umbrinus* (Richardson) in Arizona. *Journal of Mammalogy* 49:1-13.

- Proulx, G. 1997. A preliminary evaluation of four types of traps to capture northern pocket gophers, *Thomomys talpoides*. *Canadian Field-Naturalist* 111:640-643.
- Reid, V. H. 1973. Population biology of the northern pocket gopher. Colorado State University Experiment Station Bulletin, 554-S:21-41.
- Richens, V. B. 1965. Larvae of botfly in the northern pocket gopher. *Journal of Mammalogy* 46:689-690.
- Smith, M. F. and J. L. Patton. 1988. Subspecies of pocket gophers: causal bases for geographic differentiation in *Thomomys bottae*. *Systematic Zoology* 37:163-178.
- Streubel, D. 2000. The Wyoming pocket gopher. The Atlas of Idaho's Wildlife (online version). Accessed on 9/9/2003 at: <http://imnh.isu.edu/digitalatlas/>.
- Thaeler, C. S., Jr. 1968a. Karyotypes of sixteen populations of the *Thomomys talpoides* complex of pocket gophers (Rodentia-Geomyidae). *Chromosoma* 25:172-283.
- Thaeler, C. S., Jr. 1968b. An analysis of three hybrid populations of pocket gophers (genus *Thomomys*). *Evolution* 22:543-555.
- Thaeler, C. S., Jr. 1972. Taxonomic status of the pocket gophers, *Thomomys idahoensis* and *Thyomomys pygmaeus* (Rodentia-Geomyidae). *Journal of Mammalogy* 53:417-428.
- Thaeler, C. S., Jr. and L. L. Hinesley. 1979. *Thomomys clusius*, a rediscovered species of pocket gopher. *Journal of Mammalogy* 60:480-488.
- Tryon, C. A., Jr. and H. N. Cunningham. 1968. Characteristics of pocket gophers along an altitudinal transect. *Journal of Mammalogy* 49:699-705.
- Utah Conservation Data Center. 2003. Sensitive species list of Utah mammals (online version). Accessed on 9/9/2003 at: <http://dwredc.nr.utah.gov/ucdc/>.
- USDA Forest Service. 1994. FSM 5670 R2 Supplement No. 2600-94-2; Region 2 Sensitive Species List. USDA Forest Service, Rocky Mountain Region, Denver, Colorado.
- Vaughan, T. A. 1961. Vertebrates inhabiting pocket gopher burrows in Colorado. *Journal of Mammalogy* 42:171-174.
- Vaughan, T. A. 1963. Movements made by two species of pocket gophers. *The American Midland Naturalist* 69:367-372.
- Vaughan, T. A. 1964. Two parapatric species of pocket gophers. *Evolution* 21:148-158.
- Vaughan, T. A. 1967. Food habits of the northern pocket gopher on shortgrass prairie. *The American Midland Naturalist* 77:176-189.
- Vaughan, T. A. 1969. Reproduction and population densities in a montane small mammal fauna. University of Kansas Museum of Natural History, Miscellaneous Publications 51:51-74.
- Vaughan, T. A. 1974. Resource allocation in some sympatric, subalpine rodents. *Journal of Mammalogy* 55:764-795.

- Verts, B. J. and L. N. Carraway. 1999. *Thomomys talpoides*. Mammalian Species 618:1-11.
- Wight, H. M. 1930. Breeding habits and economic relations of the Dalles pocket gopher. Journal of Mammalogy 11:40-48.
- Wilson, D. E. and D. M. Reeder (editors). 1993. Mammal species of the world: a taxonomic and geographic reference. Second Edition. Smithsonian Institution Press, Washington, DC. Xviii + 1206 pp.
- Wirtz, J. H. 1954. Reproduction in the pocket gopher *Thomomys talpoides rostralis*, Hall and Montague. Journal of the Colorado and Wyoming Academy of Science 4:62 (abstract only).
- Wyoming Natural Diversity Database. 2003. Unpublished data, including distributional records, element global rank and element state rank. University of Wyoming, Laramie, Wyoming.
- Young, S. P. 1958. The bobcat of North America: its history, life habitats, economic status and control, with lists of currently recognized subspecies. The Stackpole Company Harrisburg, Pennsylvania and The Wildlife Management Institute, Washington, D.C., 193 pp.

## Additional References

- Thaeler, C. S., Jr. 1974a. Karyotypes of the *Thomomys talpoides* complex (Rodentia-Geomyidae) from New Mexico. Journal of Mammalogy 55:855-859.
- Thaeler, C. S., Jr. 1974b. A study of four contacts between the ranges of different chromosome forms of the *Thomomys talpoides* complex. Systematic Zoology 23:343-354.
- Thaeler, C. S., Jr. 1980. Chromosome numbers and systematic relations in the genus *Thomomys* (Rodentia\_Geomyidae). Journal of Mammalogy 61:414-422.