

Pocket Gopher Surveys in Southwestern Wyoming

2008 Progress Report

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Agreement 000605
PPCAS: CWC - Orgn: 601A

Background

Information on distribution, status and habitat use is needed for the Idaho pocket gopher (*Thomomys idahoensis*) and the Wyoming pocket gopher (*Thomomys clusius*) (e.g., Keinath and Beauvais 2006, WGFD 2005). Both species occur in southwest Wyoming and are listed as Species of Greatest Conservation Need (SGCN) in Wyoming's Comprehensive Wildlife Conservation Strategy (CWCS). Wyoming comprises a substantial portion *T. idahoensis* range and the whole of *T. clusius* range. They are both considered SGCN in part due to lack of information regarding population status, trends, and distribution as well as unknown habitat needs. Since the CWCS was drafted, *T. clusius* has been petitioned for listing under the federal Endangered Species Act, primarily due to the extensive oil and gas development occurring in southern Wyoming.

This project seeks to expand distribution and habitat-use information by extending pocket gopher surveys east into Carbon County and west into Lincoln and Uinta Counties. This will encompass the majority both species' ranges, resulting in a clearer picture of pocket gopher distributions. The following are major objectives of this two-year project:

1. Survey approximately 50 sample sites for the presence of pocket gophers, where sites are dispersed throughout southwest Wyoming.
2. Collect habitat data at sites used by pocket gophers and a comparable, random set of sites to estimate habitat affinities.
3. Collect at voucher specimens from sites where pocket gophers occur, which will be used to conduct morphometric analyses and inform ongoing genetic and chromosomal analyses being conducted by the University of Wyoming to clarify the inter-species relationships of pocket gophers in Wyoming's basins.
4. Use survey results to update estimates of distribution and update existing species databases (e.g., WYNDD and WOS).

Progress and Findings

This project was established in July of 2008, although the bulk of field efforts are expected from May 2009 – June 2010. Efforts in 2008 focused on objectives 1 and 3 (i.e., survey at least 50 sites and collect voucher specimens), but we also compiled a preliminary habitat description.

We developed an updated distribution model for Wyoming pocket gopher (Figure 1). This model was used in combination with expert opinion on information gaps to identify priority areas for Wyoming Pocket Gopher surveys (Figure 2). We hired and directed one field crew which surveyed 70+ sites between 1 July 2008 and 30 August 2008, focusing on priority areas on the western edge of suspected *T. clusius* range (Figure 3). We also developed recommendations for Wyoming Pocket Gopher surveys for use by consultants and resource managers (Appendix). Although the WYNDD field season ended in August, in September we trained and guided additional crews provided by private consultants, notably Hayden-Wing Associates, LLC (Laramie, Wyoming). These crews collectively surveyed more than 100 sites from 5 September 2008 to 10 October 2008 (Figure 3; Hayden-Wing Associated 2008).

Roughly 35 specimens were collected, of which about 10 were likely *T. clusius*, with the remainder likely being Northern Pocket Gopher (*T. talpoides*). Most of these specimens were collected by Hayden-Wing Associates, who had greater success trapping gophers in the eastern portion of suspected *T. clusius* range, particularly in late-season efforts (i.e., late September and October). *T. clusius* specimens were tentatively identifiable in the field based on pelage around the ears (e.g., Figure 4), which seems to be a valid field criteria for future efforts. Preliminary genetic analysis suggests that *T. clusius* is a distinct taxon that is clearly differentiated from sympatric *T. talpoides* at the species level. According to Dr. Dave McDonald (personal communication), specimens identified as *T. clusius* had distinctive chromosome counts ($2N = 46$) and represented a monophyletic clade based on genetic analysis (i.e., Amplified Fragment Polymorphism, or AFLP analysis).

Based on a small sample size (<10 distinct capture sites), we have compiled a tentative habitat description from field observations made by WYNDD and Hayden-Wing employees. Although the recent specimens on the western edge of the suspected range (near Rock Springs), tended to be on ridge-tops and/or swales, which matches historic habitat descriptions (e.g., Clark and Stromberg 1987, Thaeler and Hinesley 1979), recent sites on the eastern edge of the range (near Rawlins) had more varied topography. Thus, ridge-top topography does not seem to *uniquely* characterize suitable habitat for Wyoming pocket gophers. It seems that *T. clusius* can be found in a variety of soil types, often (but not exclusively) with a substantial rock component, and rarely with a high proportion of clay. It appears that vegetation composition and/or structure may be more important in distinguishing *T. clusius* habitat, as it seems to occur primarily in small ‘islands’ of sparsely vegetated, low-stature vegetation within a big sagebrush and/or silver sage matrix (e.g., Figures 5 and 6). Big sagebrush is often only a minor component of the vegetation where *T. clusius* was found, with cushion plants, grass, rabbitbrush, and other low shrubs and forbs dominating the immediate vicinity. Wyoming pocket gophers have *NOT* been found in flats dominated by greasewood, dense stands of sagebrush, valley bottoms, sand dunes or areas where medium to high big sagebrush dominates the vegetation community.

It seems habitats that do not approximate the above description are unlikely to contain *T. clusius*. However, because *T. talpoides* distribution overlaps with that of *T. clusius*, and it has been

trapped within 200 meters of *T. clusius*, this habitat description will undoubtedly encompass sites where both or either species could occur. Thus, once a pocket gopher site has been found that fits the above description, it is necessary to confirm the presence of *T. clusius* by capturing animals. Field efforts in 2009 will focus on refining and quantifying these habitat notes.

Statement of Work for 2009

Field effort will be increased in 2009 and will encompass all stated objectives of this project. This winter we will create an updated potential distribution model for Wyoming Pocket Gopher that incorporates the new observations from 2008. This model will be used in combination with a similar model for Idaho Pocket Gopher to select semi-random survey locations throughout the Wyoming range of both species.

Technicians will search designated sample sites for fresh pocket gopher mounds. Where mounds are found, the extent, density and activity status of the gopher colony will be estimated. Traps will be placed at a representative subset of gopher colonies to capture voucher specimens that will be used to identify the species present. Additionally, we will collect data on habitat (e.g., ground cover, over-story cover, topography, and soil characteristics) and use this data to help clarify the habitat selection of Wyoming and Idaho Pocket Gophers. Morphometric measurements and digital photographs will be taken of all captured gophers, and DNA samples (e.g., tail clippings and/or pelage samples) will be collected and provided to the University of Wyoming genetics lab for subsequent analysis. New occurrences will be used to update potential distribution models for both species.

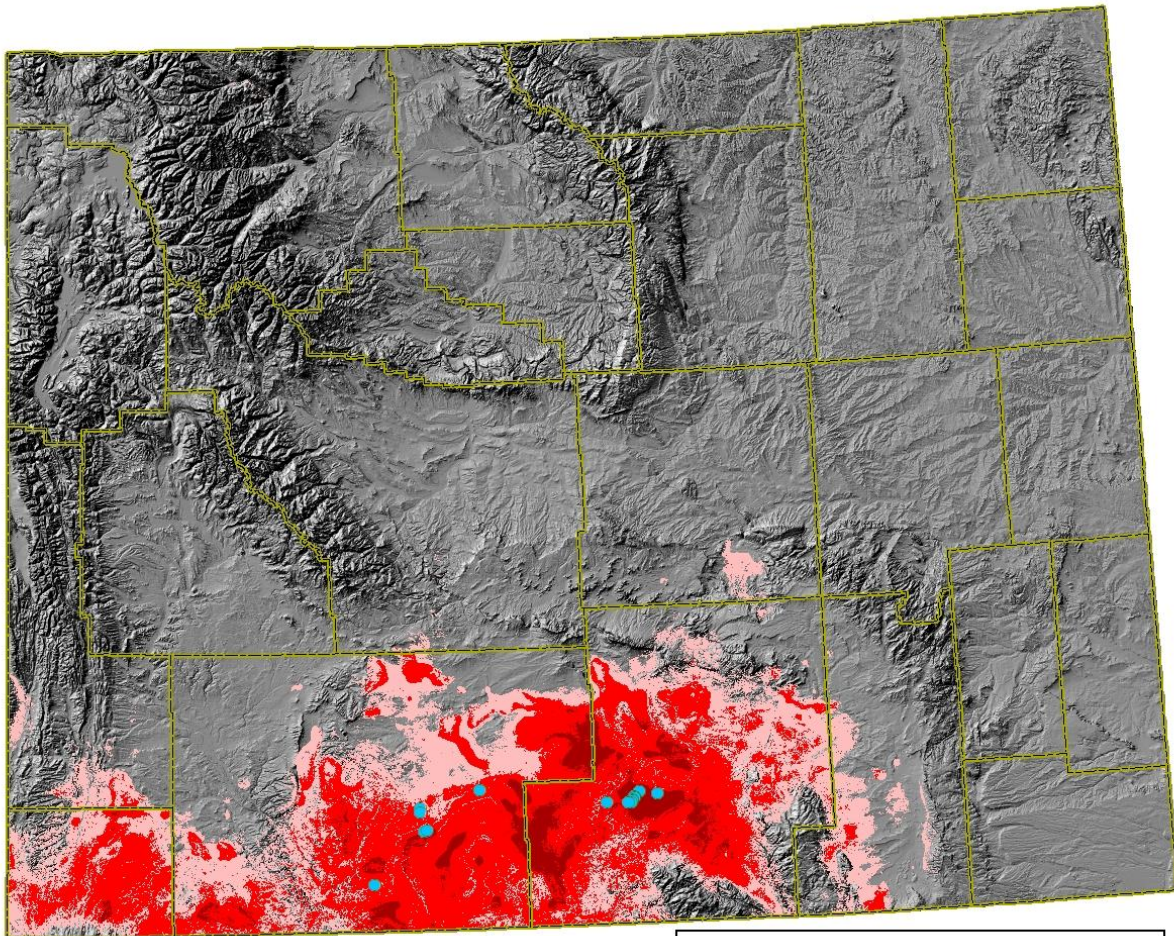
We will provide a final project report by June of 2010. Data will be provided to WGFD for revision of their wildlife atlas, CWCS assessments, and Wildlife Observation System.

References

- Clark, T.W. and M.R. Stromberg. 1987. Mammals in Wyoming. University Press of Kansas, Lawrence, Kansas.
- Hayden-Wing Associates. 2008. Wyoming Pocket Gopher (*Thomomys clusius*) Surveys in South-central Wyoming. Prepared for Petroleum Association of Wyoming, Casper, Wyoming. November, 2008.
- Keinath, D.A. and G.P. Beauvais. 2006. Wyoming pocket gopher (*Thomomys clusius*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Available online: <http://www.fs.fed.us/r2/projects/scp/assessments/wyomingpocketgopher.pdf>.
- Thaeler, C.S., Jr. and L.L. Hinesley. 1979. *Thomomys clusius*, a rediscovered species of pocket gopher. Journal of Mammalogy 60:480-488.
- WGFD. 2005. A Comprehensive Wildlife Conservation Strategy for Wyoming. Wyoming Game and Fish Department, Cheyenne, Wyoming. Approved July 12, 2005. Available online: <http://gf.state.wy.us/wildlife/CompConvStrategy/index.asp>.

Tables and Figures

Figure 1: Predictive distribution model for Wyoming Pocket Gopher based on 15 known points of occurrence from the Wyoming Natural Diversity Database.



(c) 2008 - Wyoming Natural Diversity Database



Scale

1:3,000,000

25 12.5 0 25 50 75 100
Miles

County Boundary

T. clusius model points

Probabiliyt of T. clusius Presence

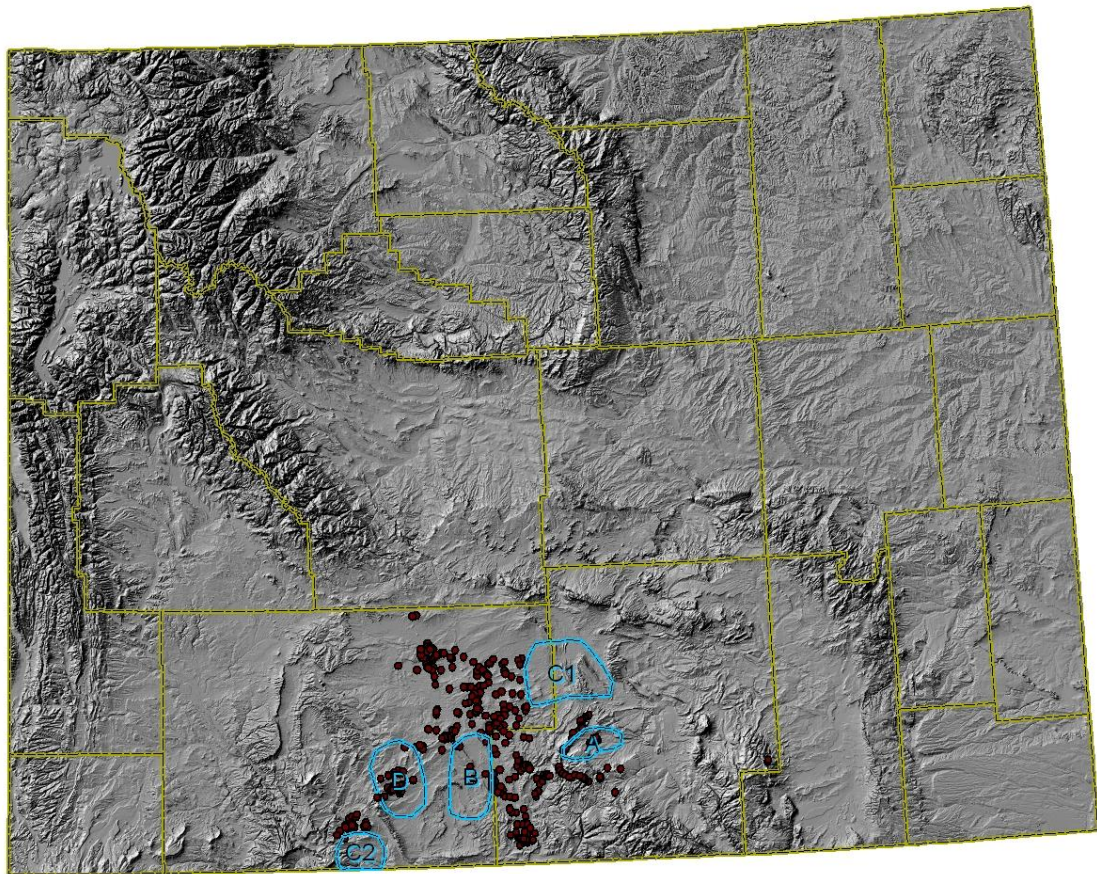
Predicted Absent (High Probability)

Predicted Absent (Marginal)

Predicted Present (Marginal)

Predicted Present (High Probability)

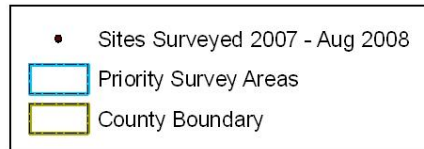
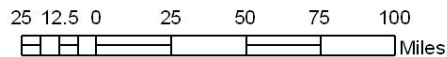
Figure 2: Priority survey areas to refine the distribution of Wyoming Pocket Gopher (see Appendix for details).



(c) 2008 - Wyoming Natural Diversity Database

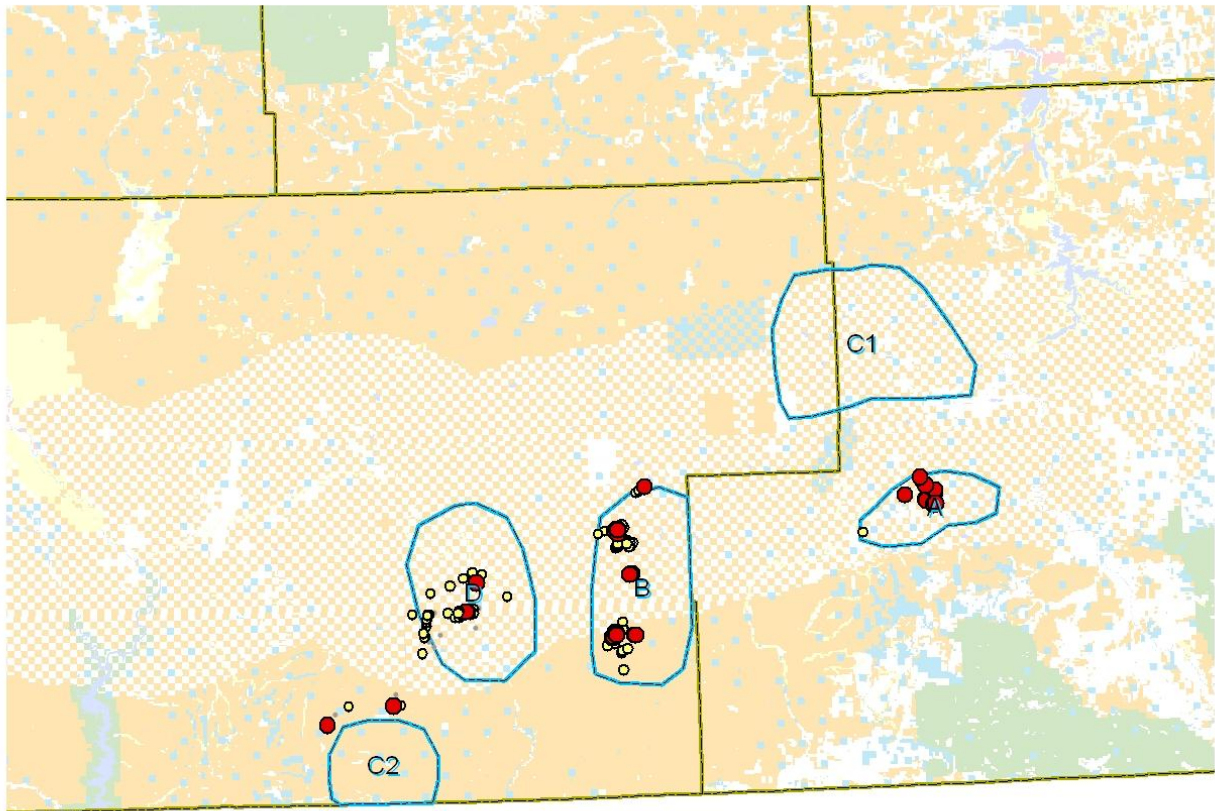


Scale
1:3,000,000



- A. **TOP PRIORITY TRAPPING REGION:** Surveys in likely habitat on private land or isolated public land in the Bridger Pass region will contribute the most to our understanding of current *T. clusius* distribution in the state.
- B. **SECOND PRIORITY TRAPPING REGION:** Surveys in suitable habitat between Bridger Pass and Bitter Creek - essentially the region south of Wamsutter - intended to address the question of continuous occupation (at a coarse scale, at least) between the 2 aforementioned sites.
- C. **THIRD PRIORITY TRAPPING REGION:** Surveys on the likely northern and southern bounds of predicted *T. clusius* distribution, with the intent of better identifying extremes of occupation.
- D. **FOURTH PRIORITY TRAPPING REGION:** If current efforts fail to document any additional specimens from Bitter Creek, it might be wise to place some priority on increased trapping in that area.

Figure 3: Pocket gopher survey sites visited in 2008. Sites on the western edge of the range (points near priority areas C2 and D) were surveyed by WYNDD, while those on the eastern edge of the range (points near priority areas A and B) were surveyed by Hayden-Wing Associates. All gophers captured (red dots on map) were provided to the University of Wyoming's Zoology Department for genetic analysis.



(c) 2008 - Wyoming Natural Diversity Database



Scale

1:1,364,420

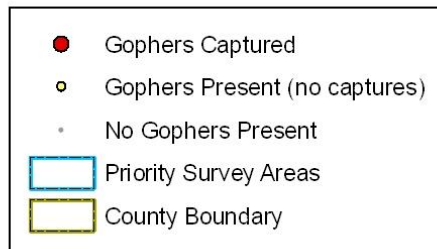
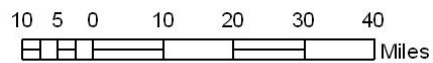


Figure 4: Photographs of the oricular area of confirmed specimens of a) *Thomomys clusius* and b) *T. talpoides*. Note how *T. clusius* has a light-colored fringe of hair on the outer edge of the pinnae and no contrasting pelage around the ear. In contrast, *T. talpoides* has darker hair on the pinnae and darker pelage around the ear.



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Figure 5: Photographs of *T. clusius* habitat from the western edge of its suspected range, near Bitter Creek, Wyoming. The area circled in red on the first photograph contains a small aggregation of *T. clusius* mounds, a close-up of which is shown in the second photograph.



Figure 6: A photograph of *T. clusius* habitat from the eastern edge of its suspected range, near Rawlins, Wyoming. Photograph provided by Craig Okraska of Hayden-Wing Associates and used here with permission.



APPENDIX

THOMOMYS TRAPPING IN WYOMING: August 2008 recommendations

THOMOMYS TRAPPING IN WYOMING: August 2008 recommendations

G. Beauvais (Director) and D. Keinath (Lead Zoologist)
Wyoming Natural Diversity Database
University of Wyoming

28 July 2008

Wyoming pocket gopher (*Thomomys clusius*) is a poorly-known species purported to exist only in south-central Wyoming and is currently the target of a petition to list as Endangered under the U.S. Endangered Species Act. The potentially large management and regulatory impacts of such a listing have led to increased interest in generating more data on the species' distribution. Two units within the University of Wyoming - the Wyoming Natural Diversity Database (WYNDD) and the Department of Zoology and Physiology (DZP) - are currently pursuing field and laboratory studies of *T. clusius*, but information beyond these targeted studies is needed in the near future.

This document provides recommendations to trapping crews pursuing additional field inventories of *T. clusius* in 2008. All recommendations are based on knowledge of the species to-date, which is represented by Keinath and Beauvais (2006) as modified by Keinath et al. (2008) and the as-yet unpublished results of ongoing WYNDD and DZP studies. They are also based on the field experiences of WYNDD and DZP in conducting *T. clusius* research in 2007 and 2008.

There is very little existing information about *T. clusius* taxonomy, morphology, habitat use, distribution, abundance, or threats. The studies currently being conducted by WYNDD and DZP represent the first research directly targeted to this species since it was first described about 30 years ago. Therefore all recommendations provided herein are to be considered tentative and subject to modification as new information is collected.

We recommend that additional field studies of *T. clusius* in 2008 be organized in 3 phases.

Literature Cited:

Keinath, D.A. and G.P. Beauvais. 2006. Wyoming pocket gopher (*Thomomys clusius*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Available online: <http://www.fs.fed.us/r2/projects/scp/assessments/wyomingpocketgopher.pdf>.

Keinath, D.A., H. Griscom., and A. Redder. 2008. Survey for Wyoming pocket gopher (*Thomomys clusius*) in central Wyoming. Report prepared for The Nature Conservancy - Wyoming Field Office by the Wyoming Natural Diversity Database - University of Wyoming, Laramie, Wyoming.

APPENDIX (continued)

PHASE I - TRAINING AND PREPARATION

Trapping and processing *Thomomys* specimens for the purposes of elucidating the distribution of *T. clustus* more complex and involved than standard small mammal trapping. Detailed preparation is one key to eventual success. The following steps are necessary:

1. To become familiar with the scope of the issue we recommend that field personnel first review this document, and then review Keinath and Beauvais (2006). Subsequently, we recommend that field personnel spend a minimum of 3 days in the field with experienced trappers from WYNDD and/ or DZP. Also, field personnel should spend a minimum of 1 day at the University of Wyoming inspecting recently captured *Thomomys* specimens and discussing *Thomomys* issues and projects with relevant contacts (see Attachment A- Contacts List).
2. Field personnel should also prepare for transporting live specimens of likely *T. clustus* to the University of Wyoming and transferring them to one of the contacts listed in Attachment A. Live specimens are currently necessary to conduct karyotype analysis, which is currently the only way to conclusively identify *T. clustus*. Once the genetics study being conducted by DZP is complete, live specimens will likely no longer be required. Basic equipment and protocols are discussed in Attachment B- Live Specimen Transport.
3. Field personnel should prepare for collection and preservation of tissue from captured *Thomomys* specimens, and delivery of that tissue to one of the contacts listed in Attachment A. Basic equipment and protocols are discussed in Attachment C- Collecting and Preserving Dead Specimens and Tissue.
4. Specialized traps are necessary to live-capture pocket gophers. These traps are not commercially available. Arrangements should be made for manufacture of these traps while the above training activities are being completed, so they are available upon completion of training, thus allowing field personnel to quickly transition to independent field work. WYNDD personnel can provide design specifications for effective *Thomomys* traps.

PHASE II - PLANNING FOR FIELD WORK

Zoologists at WYNDD have summarized the state-of-knowledge of *T. clustus* distribution, and also the distribution of recent (2007, 2008) trapping efforts. This summary is represented in Attachment D- Maps. We recommend that trapping efforts be conducted in accordance with these maps, as discussed below.

Although existing information is sparse, it suggests that 2 general areas are occupied by *T. clustus*: the region centered on Bitter Creek southwest of Table Rock, and the region centered on Bridger Pass southwest of Rawlins. Ongoing WYNDD and DZP studies are currently focused in the Bitter Creek area, where probable *T. clustus* specimens have been captured in 2008. In 2007 WYNDD and DZP workers failed to capture any probable *T. clustus* in the Bridger Pass area (but did capture several individuals of *T. talpoides* subspecies, likely *T. t. oculus* and *T. t. rostralis*), but these surveys were constrained primarily to publicly-accessible parcels. There is much habitat still to be surveyed in the Bridger Pass area, either on private land or on public land requiring access across private parcels.

We have identified four priority areas for conducting *T. clustus* surveys:

1. **TOP PRIORITY TRAPPING REGION:** We suggest that field surveys in likely habitat on private land or isolated public land in the Bridger Pass region will contribute the most to our understanding of current *T. clustus* distribution in the state. We consider such surveys to be the top priority for additional field work. General locations in this context are represented by polygon A in Attachment D- Maps.
2. **SECOND PRIORITY TRAPPING REGION:** Next in priority would be surveys in suitable habitat between Bridger Pass and Bitter Creek - essentially the region south of Wamsutter - intended to address the question of continuous occupation (at a coarse scale, at least) between the 2 aforementioned sites. General locations in this context are represented by polygon B in Attachment D- Maps.

APPENDIX (continued)

3. **THIRD PRIORITY TRAPPING REGION:** Third priority might be given to surveys on the likely northern and southern bounds of predicted *T. clustus* distribution, with the intent of better identifying extremes of occupation. General locations in this context are represented by polygons C1 and C2 in Attachment D- Maps.
4. **FOURTH PRIORITY TRAPPING REGION:** If WYNDD and DZP efforts fail to document any additional specimens from Bitter Creek, it might be wise to place some priority on increased trapping in that area. General locations in this context are represented by polygon D in Attachment D- Maps.

Search image for appropriate *T. clustus* habitat in all priority regions: Maps such as those in Attachment D can identify broad trapping regions, but more specific information is needed to identify fine-scale trapping sites within those regions that are likely to support *T. clustus*. Information summarized in Keinath and Beauvais (2006), as modified by that from ongoing WYNDD and DZP studies, suggests that populations of *T. clustus* interdigitate with populations of *T. talpoides* in a rather fine-grained manner. It appears that *T. clustus* occurs in and near gullies/ coulees that drain the sides of gravelly ridges. More specifically, *T. clustus* may prefer the upper portions of such gullies and coulees (i.e., near, but not on top of, ridge crests), where gully bottoms have collected enough fine soil to support shrubs that are taller and denser than those in surrounding uplands. Lower portions of gullies, and the valleys into which they feed, may be occupied by *T. talpoides*, which may exclude the smaller *T. clustus* from exceptionally deep and fine soils.

PHASE III - CONDUCTING FIELD WORK

Once Phase I and II are complete and workers have a good sense of where trapping is to occur, we recommend conducting field work in 2-stages. In both stages it is very important that data and specimens are collected in ways that complement existing datasets.

1. Searching for pocket gopher mounds. The trapping site is surveyed on foot by workers looking for pocket gopher mounds. Search data is recorded on Attachment E- Mound Search Data Form, or a similar data form that records at least the same information.
2. Trapping recently-formed mound complexes. Traps are set in burrow openings beneath mounds that appear to have been recently formed or modified by pocket gophers. Typically, freshly modified mounds have soft, moist, and darker colored soil relative to older mounds. Burrows are located by penetrating the soil with rebar, and then dug open in order to set traps. Trapping data is recorded on Attachment F- *Thomomys* Trapping Data Form, or a similar data form that records at least the same information.

APPENDIX (continued)

ATTACHMENT A - CONTACTS LIST

Gary Beauvais; Director, Wyoming Natural Diversity Database - University of Wyoming. 307 766-3027;
beauvais@uwyo.edu

Hannah Griscom; Assistant Zoologist, Wyoming Natural Diversity Database - University of Wyoming. 307 766-3035; hgriscom@uwyo.edu

Doug Keinath; Lead Zoologist, Wyoming Natural Diversity Database - University of Wyoming. 307 766-3013;
dkeinath@uwyo.edu

David McDonald; Professor, Department of Zoology and Physiology - University of Wyoming. 307 766-3012;
dmcld@uwyo.edu

Tom Parchman; Post Doctoral Research Associate, Department of Zoology and Physiology - University of Wyoming. 307 766-4906; tparchma@uwyo.edu

APPENDIX (continued)

ATTACHMENT B - LIVE SPECIMEN TRANSPORT

Live specimens of likely *T. clustus* are very important for elucidating the species- and subspecies-level taxonomy of *Thomomys* in Wyoming. The character used to originally establish *T. clustus* as a distinct species was a diploid count of 46 chromosomes. Researchers at DZP are currently using nuclear AFLP markers, DNA sequences of nuclear genes, and sequences of mitochondrial genes to characterize genetic variation within and among species and subspecies of Wyoming *Thomomys*, but require diploid counts from at least a few individuals of *T. clustus* to reliably tie their results back to the original species description. The laboratory process used to derive a diploid count requires a culture of live tissue, and therefore a live specimen.

One individual *Thomomys* caught in 2008 has been verified to have a diploid chromosome number of 46. This specimen, along with other morphologically similar individuals, is heavily diverged from sympatric *T. talpoides* in both nuclear and mitochondrial DNA. Consequently, the morphological characteristics of *T. clustus* appear to be reliable in distinguishing the species in the field. In particular, specimens that are small, light in color, with uniformly colored pelage, no black patches around the ears, and with ear pinnae fringed with white hair are likely to be *T. clustus*.

If a live *Thomomys* with the physical appearance of *T. clustus* is captured in the field, workers should immediately and carefully place the specimen in a large, hard plastic container (such as a 5 gal bucket) that has been filled with loose soil from the trapping site. Cut carrots and/ or dandelions should be placed on the soil surface as a food and water supply for the animal. The container should be covered with a secure but well-ventilated top to prevent escape.

As soon as possible following capture, field workers should contact a person listed on Attachment A and arrange for transfer of the specimen to the University of Wyoming.

APPENDIX (continued)

ATTACHMENT C - COLLECTING AND PRESERVING DEAD SPECIMENS AND TISSUE

Tissue from *Thomomys* specimens can be used by researchers at DZP who are investigating DNA sequence variation from the nuclear and mitochondrial genomes. Tissue can come from dead specimens, or live specimens that are subsequently released.

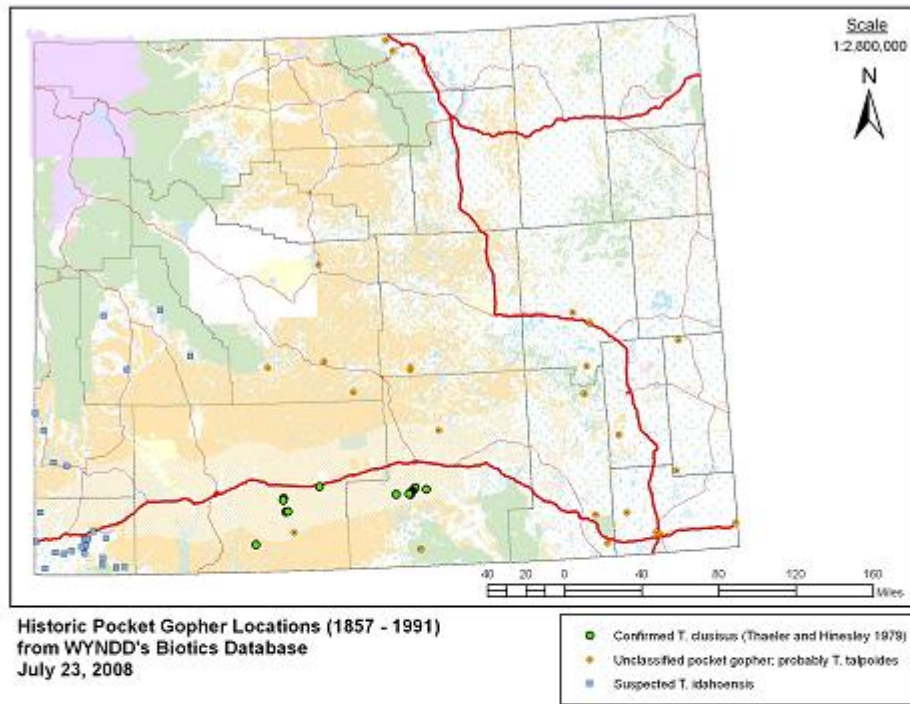
Whole specimens found dead in traps, or deliberately sacrificed by field workers, are additionally helpful in providing standard mammalogical measurements (e.g., skull width, hind foot length) and pelage characters. Whole specimens should be quickly placed in plastic zip-bags that are labeled clearly as to date and location of capture, and kept as cool as possible (frozen, if possible) until transfer to the University of Wyoming.

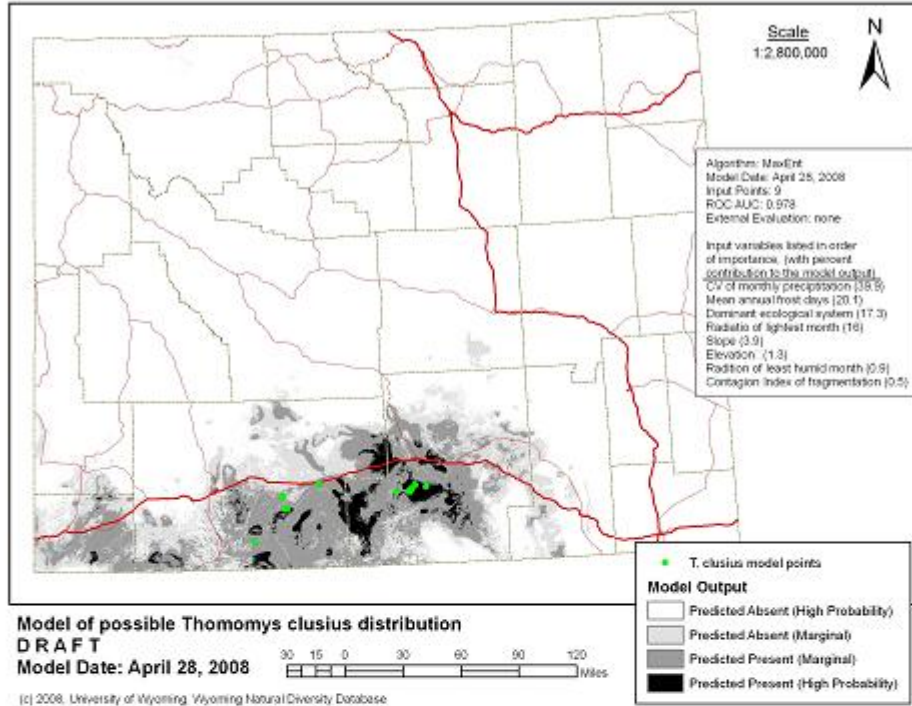
Tissue samples can be acquired from live specimens by trimming the terminal ca. ¼ inch of the tail with a razor blade, and immediately placing the tail tip in a vial of lysis buffer (100 mM EDTA, 100mM NaCl, 100 mM Tris). Pre-prepared cryotubes full of this buffer can be obtained through contact with Dr. MacDonald or Dr. Parchman at DZP. Individual vials, or bags containing individual vials, should be labeled clearly as to date and location of capture, and kept as cool as possible until transfer to the University of Wyoming. It is important that the exact GPS coordinates of the capture location be associated with each specimen. Care should be taken to use a sterile razor blade for each individual gopher sampled.

As soon as possible following acquisition, field workers should contact a person listed on Attachment A and arrange for transfer of whole specimens and tissue samples to the University of Wyoming.

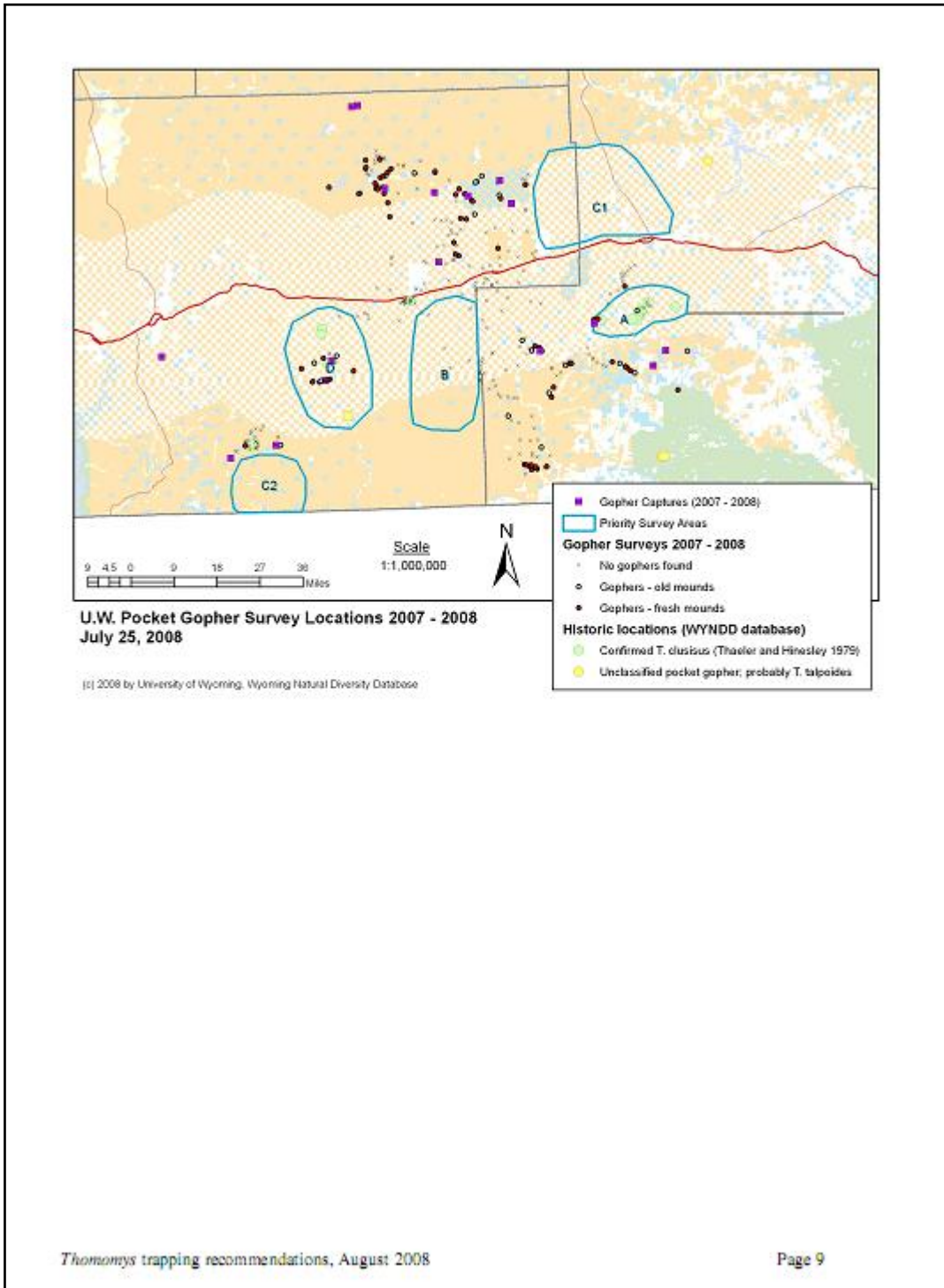
APPENDIX (continued)

ATTACHMENT D - MAPS





APPENDIX (continued)



APPENDIX (continued)

ATTACHMENT E
THOMOMYS MOUND SEARCH DATA FORM

Observer(s):

Date (dd- MMM- yy)	Time (24 hr)	UTM Zone (12,13)	GPS Datum (e.g., NAD 1983)	GPS Easting	GPS Northing	Photo Numbers	Purpose of Waypoint and/or Photographs	Colony Size *	Burrow Density **	Burrow Age ***	Note Code

* Colony Size: N = no burrows; VS = very small (only a few mounds); S = small (less than an acre); M = medium (1 – 5 acres); L = large (5 – 20 acres); VL = very large (>20 acres). *Note: Estimate the contiguous acreage of gopher burrows (i.e., the area where mounds are less than about 20 m apart).*

** Burrow Density: H = high (many mounds very close together); M = medium (some tightly-packed mounds, but most are farther apart); L = low (widely spaced mounds)

*** Burrow Age: F = Fresh, D = Days old, W = Weeks old, M = Months old, Y = Year old or more. *Note: It is acceptable to enter a range (e.g., F – W; M – Y).*

ATTACHMENT F - THOMOMYS TRAPPING AND SPECIMEN DATA FORM

TRAP-SITE

Locality:
Observers (full names)
GPS (UTM Zone: _____; Datum: _____): Easting _____; Northing _____

Trap Type	Number Set	Date Set	Duration Set	Notes

CAPTURES AND SPECIMENS

Date	Trap Type	GPS Easting	GPS Northing	Specimen Number	Specimen Type †	PA Patch (Y/N) **	Pinnae Fringe ***	Sex	Body Length (mm)	Hind Foot Length (mm)	Wt. (g)	Photo No.	Note Code

† Specimen Type: N = None; W = whole animal; TC = tail or toe clip; B = blood; F = fur; O = other (please note).
 ** PA Patch: Is there an evident post-auricular dark patch of fur?
 *** Pinnae Fringe: Is there a fringe of hair on the margins of the pinnae (Dark, White, or None)?