

## Peer Review Public Comments Index

1/22/08	Douglas C. Anderson	U.S. Geological Survey, Denver, Colorado
1/18/08	Gary P. Beauvais	Wyoming
1/9/08	Steven W. Buskirk	University of Wyoming, Laramie, Wyoming
1/21/08	Jeffery A. Gore	Florida Fish and Wildlife Conservation Commission Panama City, Florida
1/22/08	Douglas A. Kelt	University of California Davis, California
1/21/08	Thomas E. Nupp	Arkansas Tech University Russellville, Arkansas
1/18/08	Wayne D. Spencer	Conservation Biology Institute San Diego, California
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Peter Plage  
U.S. Fish and Wildlife Service  
PO Box 25486  
DFC (MS 65412)  
Denver CO 80225

January 22, 2008

Dear Mr. Plage:

I have reviewed the U.S. Fish and Wildlife Service's revised proposal rule regarding petitioned delisting of the Preble's meadow jumping mouse (*Zapus hudsonicus preblei*) under the Endangered Species Act. The proposed rules and a CD containing copies of cited published and unpublished supporting materials were furnished to me by mail postmarked 12 December 2007.

I have no independent knowledge of the scientific literature dealing with *Zapus* spp., and particularly *Z. hudsonicus preblei*, upon which the document is based. I have had a small amount of experience as an ecological mammalogist with *Z. princeps* and *Z. trinotatus*, and have dealt extensively with other riparian small mammals in semi-arid and arid sites in the western U.S. Based upon the citations included in the document and a cursory examination of the supporting material provided, I have no reason to suspect the accounts of biology, habitat, population trends, and distribution are not accurate. There appeared to be some inconsistency in the units describing population abundances in the **Abundance** section (middle of page 63003). Because the linear length of a meandering stream (measured along either its centerline or the thalweg) is almost always longer than the valley or riparian corridor it occupies (measured along its centerline), it should be made clear whether abundance values are per unit length of stream or per unit length of valley or riparian corridor.

The document appears to provide an accurate and comprehensive review and analysis of the factors affecting Preble's meadow jumping mouse. I wondered, however, whether there is any potential for adverse effects on populations in Wyoming from the recent increase in energy development activity there (e.g., coal bed methane and natural gas exploration and development). The environmental factors affecting hydrology of the riparian areas used by the species were generally well covered. However, there was no mention of the physiological ecology of the species as it relates to habitat use. It would be valuable to know whether the species relies on stream water for drinking, which would provide insight as to whether stream water quality is likely to directly affect individuals and populations. Water quality is clearly and strongly influenced by numerous anthropogenic factors, and often independently of water quantity (e.g., waste water treatment plant effluent returned to streams and irrigation return flows have chemical, including pharmacological, attributes that differ from those for water that never leaves

the channel). Could water quality have a role in the absence of populations downstream of urban centers?

The conclusions you reach regarding delisting the Wyoming populations is a logical result of the evidence that populations there are widespread and under little threat. The choice to use the state boundary and lines of latitude and longitude as demarcation lines for the populations to be listed as threatened also seems reasonable, but it should be justified from the standpoint of how populations interact and are maintained. My concern is whether populations inside the boundary could be dependent on populations outside the boundary. For example, the abundance data and some of the presence-absence data suggest that this species might have a metapopulation structure, with source and sink populations varying in time and space. This structure could strongly rely on dispersal to maintain subpopulations as well as the overall population throughout its range. This structure would also seem reasonable to expect from a consideration of the spatial variability among basins in stream hydrology and thus habitat conditions, and the likely presence of strong interannual variation in hydrology in each (semi-arid) watershed. Presumably there is sharing of genetic material among the populations in each basin through dispersal. If dispersers primarily follow the riparian corridor, then it might be important to include the lower portions of the pertinent basins and the associated confluence of mainstream streams in the range specified as threatened. This doesn't appear to be the case for the three northern basins and perhaps the Big Sandy drainage, based on Figure 2.

Sincerely yours,

Douglas C. Andersen  
Research Ecologist, PhD  
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Mr. Peter Plage  
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18 January 2008

Dear Mr. Plage :

Below are my peer review comments regarding the Revised Proposed Rule To Amend the Listing for the Preble's Meadow Jumping Mouse (Federal Register [7 November 2007] 72:62992-63024), as requested in your letter and attached documents of 11 December 2007.

I appreciate the chance to review the proposed rule and provide comments, and sincerely hope that my input is useful. Please feel free to contact me at your convenience if any clarification is needed, or if I can be of further assistance.

Sincerely,

Dr. Gary P. Beauvais, Director

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3 pages of peer review comments follow

1. In general the Proposed Rule appears to be grounded in the best available science. The USFWS has done an admirable job of compiling and summarizing a rather complex information base.
2. The taxonomic basis for the Proposed Rule appears to be solid. The existing scientific information in this regard, best summarized by King et al. (2006b; all literature referenced in these comments is cited as in the Proposed Rule), establishes that there is a form of *Z. hudsonius* in northern Colorado and southeastern Wyoming that is genetically and morphologically distinct, and likely geographically isolated, from other forms in the region to the degree necessary to define a unique subspecies, which taxonomic conventions designate as *Z. h. prebeli*.
3. I agree with the Proposed Rule in stating that the distribution of *Z. h. prebeli* is still somewhat in question, and more so in Wyoming than in Colorado because of less sampling effort in Wyoming. Further complicating our understanding of distribution in Wyoming is the physical similarity and greater spatial overlap between *Z. hudsonius* and *Z. princeps* in that state.

This directly challenges the central purpose of the Proposed Rule - how can one conclude that a taxon is unthreatened in a significant portion of its range if the size and shape of that range portion is understood only coarsely? It is therefore extremely important for the Proposed Rule to demonstrate that *Z. h. prebeli* range is known well enough to make critical policy decisions. I don't think this has been demonstrated as convincingly as is possible.

In Figure 1 it is not clear whether the dark circles (labeled "Confirmed Preble's Meadow Jumping Mouse Locations") are *known* to be *Z. h. prebeli* based on modern genetic or morphological analysis - OR - are *presumed* to be *Z. h. prebeli* because they were *Zapus* captured below a certain elevation, or identified to subspecies by older techniques (e.g., total length) that are now known to be unreliable, or simply assumed by trappers to be of their targeted taxon. If the former (identification confirmed by modern analyses), then the Figure is a usable tool and a fair depiction of best available information. If the latter (identification presumed through untrustworthy techniques), then it is not.

The most useful map, and the best depiction of best available science, would show locations of (1) confirmed *Z. h. prebeli*, (2) suspected *Z. h. prebeli*, (3) confirmed *Z. princeps*, (4) suspected *Z. princeps*, (5) unknown *Zapus*, and (6) points of suspected *Zapus* absence, all throughout the area in question. This should be readily produced given the database cited as:

U.S. Fish and Wildlife Service. 2007. *Zapus hudsonius preblei* and *Zapus princeps princeps* database. USFWS 2007.

I assume this is the full citation for the in-text reference "Service 2007", as on page 62998. This database should be *the* critical summary of best available information on distribution, should be used to its full capacity in the Proposed Rule, should be directly cited as the basis for a map as described above, and should be made available to the public and to peer reviewers. I assume that the text description of current *Z. h. preblei* distribution beginning on page 63000 is drawn from this database, but that is not clear, nor is it nearly as effective as a map expression of the database.

4. I agree with the statement (page 62998), "the recent increase in sites of Preble's meadow jumping mouse occurrence likely represents an improvement in our understanding of the subspecies range as a result of increased trapping effort rather than any actual expansion of the range of the Preble's meadow jumping mouse". However, the most complete interpretation of this information would also explicitly recognize that just as we cannot assume a range expansion, we also cannot assume there has been no range contraction. It is possible that *Z. h. prebeli* range has declined in Wyoming, but the paucity of pre-listing data has masked our ability to document it. For example (all numbers following are for illustration

purposes only!), imagine that 100 Wyoming sites were occupied by PMJM in 1990, but we had documented only 2 of them. By 2007 there were only 50 sites occupied, and we had documented 40 of them. My point here is that an increase in the number of sites known to be occupied means only that current range is likely larger than previously assumed range, and no trends (in either direction) can be reliably inferred.

5. The Proposed Rule does not appear to discuss the possibility of hybridization between *Z. h. prebeli* and *Z. princeps*, a process that could be occurring in areas of sympatry. Conner and Shenk (2003b) documented a south-to-north (i.e., northern Colorado to southern Wyoming) decline in skull size for high-elevation *Zapus* (presumed *Z. princeps*). Given that sympatry between the 2 species increases from south-to-north as the rather abrupt prairie-montane transition along the Front Range breaks down into a more gradual, interdigitated pattern starting at about the Cache La Poudre River, species-level hybridization is one possible explanation for more similar skull size to the north. Similarly, Riggs et al. (1997) found that *Zapus* specimens from low elevations (suspected to be *Z. h. prebeli*) formed a relatively distinct genetic group, but the northernmost samples in the study (vicinity of Cheyenne, Wyoming) were more closely allied with *Z. princeps* - again raising the possibility of hybridization, especially in Wyoming and extreme northern Colorado. Other authors have suggested such hybridization in various contexts (e.g., Hafner 1997, Pague and Grunau 2000, Schorr 2001).

The work of Ramey et al. (2005) apparently included more specimens from southern Wyoming than did the work of King et al. (2006b), but neither study was targeted towards species-level differentiation. I do not know the degree to which Ramey et al. (2005) or King et al. (2006b) could inform questions of *Z. hudsonius* x *Z. princeps* hybridization.

The discussion on page 63016 acknowledges that *Z. h. prebeli* is in direct contact with *Z. princeps* in much of its range, especially in Wyoming, and that the two species may be competing. I suggest that (1) hybridization is another form of interaction that may be occurring; (2) hybridization can be interpreted as a threat to *Z. h. prebeli*; and (3) to the extent that it occurs, hybridization is one of the very few threats that is more prevalent in Wyoming than in Colorado. The Proposed Rule needs to address this issue.

6. The discussion of threats on page 63007 refers to a “lack” of development pressure in Wyoming *Z. h. prebeli* habitat. This implies that there is no development pressure at all, which is easily refuted by direct observation. The Proposed Rule should be clear in that there is *less* development pressure in Wyoming relative to Colorado at this time. Also, it should be noted that the small increases in human population and associated development forecasted for southern Wyoming will likely be disproportionately sited in rural areas, and some of that in *Z. h. prebeli* habitat.

7. Given that the main threats to *Z. h. prebeli* stem from human population growth and associated development, the apparent threat disparity between Colorado and Wyoming outlined in the Proposed Rule seems to be based on the assumption that growth and development estimated for one state will affect the landscapes in only that state. That assumption is not defensible. It is clear that the massive increase in human population forecasted for northern Colorado will result in increased natural resource use, development, and disturbance in southern Wyoming.

--- Rural residential (“ranchette”) development obviously spills over state lines quite readily in the form of “second” houses, recreational cabins and trailers, new resorts and guest ranches and similar facilities (and growth of existing ones) seeking to accommodate greater demand, etc.

--- The increasing human population in northern Colorado will require much water, and it is no secret that states are quite willing to reach across borders to get water by almost any means (witness the pipeline recently proposed to move Green River water 400 miles from southwest Wyoming to the Colorado Front

Range). It is likely that Colorado urban and exurban water demand will result in development of Wyoming water sources, with attendant effects on Wyoming *Z. h. prebleii* habitat. This should be evaluated in the context of projected climate change, which suggests less overall water availability in the region, which in turn increases the likelihood water development across the region.

--- Aggregate mining can clearly jump state lines as well. Increased demand for road base and building material in northern Colorado will likely result in more mining in southern Wyoming, with attendant effects on Wyoming *Z. h. prebleii* habitat.

--- Recreational impacts clearly spill over state lines, something abundantly clear to long-time southern Wyoming residents who pay attention to license plates at trailheads, campgrounds, parking areas, and similar sites.

The overall issue of growth impacts crossing state lines does not appear to be considered in the Proposed Rule, and speaks directly to the appropriateness (or inappropriateness) of using the state line as the delineator between threatened and unthreatened portions of *Z. h. prebleii* range. Indeed, it could be argued that the implementation of the Proposed Rule might exacerbate the spillover effect - i.e., if it is more difficult to develop Colorado resources due to *Z. h. prebleii* remaining Threatened there, pressure on the relatively unprotected Wyoming resources could increase.

I recognize that using the state line is administratively expedient (as stated on 63018). I cannot comment on the degree to which administrative expediency outweighs the actual geography of threats in listing decisions - that is a matter for policy experts. But it should be addressed in the Proposed Rule.

I also recognize that it is not immediately apparent how to map threats that are functions of human behaviors and land use changes, which do not strictly follow river basins or other classic geographic features. Given the amount of recent research focused on mapping and predicting human land use changes in the region, I would hypothesize that at least some practical techniques are available. The selection of a boundary between threatened and unthreatened range portions needs to be backed by either (1) some attempt to more clearly map the actual geography of threats, including spill-over effects, or (2) a confirmation that practical techniques of such threat mapping are not available or obtainable given project constraints.

8. A complete assessment of agricultural impacts to *Z. h. prebleii* would probably address the likelihood of increased conversion of vegetation types that support *Z. h. prebleii* to unsuitable types producing various bio-fuel substrates. As an example, fallow streamside lands currently enrolled in CRP may increasingly return to cultivation if bio-fuel substrates prove more profitable.

# UNIVERSITY OF WYOMING

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9 January 2008

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Dear Mr. Plage:

This letter responds to your request for a review of the proposed revised rule regarding the Preble's meadow jumping mouse as described in Federal Register 72(215):62992-63024. Specifically, I respond to the questions that you posed in your letter of 11 December 2007:

1. Is our description and analysis of the biology, habitat, population trends, historic and current description of the species accurate?

To the best of my knowledge, your descriptive information is complete and accurate. I am not aware of other substantive aspects of the biology, habitat, population trends, historical and current description of the species that were not covered in the proposed rule.

2. Does our document provide accurate and adequate review and analysis of the factors affecting the species?

Yes, I found that the review of factors affecting the species was complete. I am not aware of any substantive discrepancies between how you characterize the factors affecting the species and what I otherwise know to be correct.

3. Are there any significant oversights, omissions, or inconsistencies in the proposed rule?

The proposed rule is a change in policy, and your letter specifically states that I am "... not to provide advice on policy, but rather to review the science relevant to our decisions and our use of said science, focusing on identifying and characterizing scientific uncertainties." Therefore, I am unable to answer question No. 3 without directly contradicting your written instructions to me.

4. Are our conclusions logical and supported by the evidence we provide?

It is unclear whether the “conclusions” to which this question refers comprise all of the interpretations presented in the document, or the final conclusion represented by the proposed rule change, which is a matter of policy. Most of the interpretations in the document seem logical and reasonable. The use of the Wyoming-Colorado state line as the demarcation between the two geographical areas with differing attributes of (1) level of knowledge about mouse distribution, (2) apparent mouse distribution, (3) change in distribution through time, and (4) level of foreseeable human disturbance to habitat seems reasonable. I believe that you have provided persuasive biological evidence to support the use of the state line as the demarcation between areas with differing policies. Although the use of some other boundary might provide some minor improvement of the “fit” of the policy to the biological data, the practical benefit of using the state line seems compelling.

5. Did we include all necessary and pertinent literature to support our assumptions and conclusions?

Yes, I believe that you did so.

Respectfully yours,

Steven W. Buskirk  
Professor  
307-766-5626



January 21, 2008

**Florida Fish  
and Wildlife  
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Commission**

**Peter Plage**  
Colorado Field Supervisor  
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**Brian S. Yablonski**  
Tallahassee

Dear Mr. Plage,

You requested my review of the scientific basis for the proposed amendment of the listing of the Preble's meadow jumping mouse (72 Federal Register 62992; hereafter "proposed rule"), and my comments are presented here. My expertise is in mammal ecology and conservation of wildlife populations, and therefore, my comments focus on those topics. As stated in previous communications, I am not an authority in genetics, systematics, or taxonomy. Therefore, I won't comment on those subjects except to say that the Service appears to have conducted an exceptionally thorough and unbiased review of the taxonomic status of the Preble's meadow jumping mouse and that I concur with the Service's conclusion that the prevailing evidence indicates that Preble's meadow jumping mouse represents a valid subspecies.

**Executive Staff**

**Kenneth D. Haddad**  
Executive Director

**Victor J. Heller**  
Assistant Executive  
Director

**Karen Ventimiglia**  
Deputy Chief of Staff

After addressing the taxonomy question, the proposed rule concluded that the Preble's meadow jumping mouse is not threatened throughout its range, but that it should retain its threatened status in Colorado. Information provided in the proposed rule adequately identifies the variety of real and potential threats to Preble's meadow jumping mouse populations, particularly the loss of habitat that has accompanied the increasing human population on the Front Range. The absence of mice at numerous historical trapping sites is strong evidence that the Preble's meadow jumping mouse is threatened, particularly by the impacts associated with urbanization, and I concur with that conclusion. Whether that threatened status should apply to the entire range of the Preble's meadow jumping mouse is less certain.

**Louie Roberson**  
Regional Director  
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The proposed rule provides substantial evidence that the threats to populations in Wyoming, at least in the North Platte watershed, are minimal compared to the threats to populations in Colorado. However, if a population is small, it can be threatened even by minor impacts or random events and there seems to be no reliable estimate of the size and stability of Preble's meadow jumping mouse populations in the North Platte watershed. Several new sites in Wyoming have been found to support mice and the current distribution covers a large area, which suggests a non-threatened population. However, with little historical data for comparison, little can be said about population or habitat trends. If populations are mostly small and fragmented, they could be readily threatened by random processes or a variety of subtle threats, even if the major urbanization impacts seen in Colorado are not present. For example, the potential displacement of Preble's meadow jumping mouse in Wyoming by western jumping mice (p.

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63016) may have no basis or it may be a significant factor that has severely reduced the distribution of Preble's meadow jumping mouse in recent years. Without additional distribution and abundance data, the conservative conclusion would be that Preble's meadow jumping mouse should be considered throughout its range in both states. The less conservative perspective is that lack of data showing a decline in Preble's meadow jumping mouse populations or range means the taxon is not threatened. Given the apparent restricted distribution of the Preble's meadow jumping mouse in Wyoming, the more conservative approach of rangewide listing seems warranted. That said, the less conservative conclusion is not contradicted by the available evidence.

Separating the subspecies range by political (state) boundaries does not seem justified other than for administrative or political convenience, and the importance of that convenience to conservation of the Preble's meadow jumping mouse is not clear. The draft Recovery Plan called for management of the Preble's meadow jumping mouse by watersheds (river drainages) and background information in the proposed rule is largely presented according to the three watersheds. Discussion of impacts, however, follows state boundaries. Some convincing argument is made that threats to Preble's meadow jumping mouse are lower in Wyoming than Colorado, but grouping all of Wyoming together may well hide differences in potential impacts between the two watersheds in the state. For example, the proposed rule shows how human population increases are high in Colorado versus Wyoming and therefore that expected impacts from urbanization are low in Wyoming. The proposed rule then states (p. 63009) that mice may be absent downstream of areas of extensive urbanization that includes Cheyenne, Wyoming. It also cites (p. 63005) evidence that Preble's meadow jumping mouse populations have been lost near urban areas such as Cheyenne.

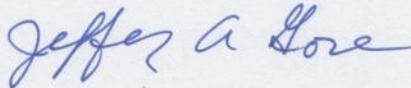
Given those statements and the geographic closeness of Cheyenne and southern Laramie County to the expanding human population and urbanization in the Front Range of Colorado, it seems illogical and inappropriate to exclude the South Platte watershed in Wyoming from the portion of the range where the Preble's meadow jumping mouse is threatened. For that exclusion to be acceptable, expected land use and human population trends near Cheyenne, or southern Laramie County, or the Wyoming portion of the South Platte watershed need to be compared to and shown to be different from those in nearby Colorado counties. (Data in the proposed rule indicates nearly all the expected population increase in Wyoming, though small, will be in Laramie County). Secondly, the distribution and abundance of Preble's meadow jumping mouse in the South Platte watershed in Wyoming needs to be better defined to determine that populations there are stable.

In summary, the proposed rule was thorough and I do not know of significant evidence or literature that was not presented. From my limited perspective, the taxonomic review was thorough and the conclusion was supported by the evidence presented. The proposed listing of the Preble's meadow jumping mouse as threatened was well-substantiated by the available information. The decision to include only a portion of the range was not illogical or unsupported because

known threats are low in parts of Wyoming and few data exist on population or habitat trends. However, given the lack of population and habitat data, the more conservative decision to list the whole range could also have been strongly supported. The decision to delineate the threatened portion of the Preble's meadow jumping mouse population by state boundaries instead of watersheds seemed inconsistent with the data presented for populations in the Wyoming portion of the South Platte watershed. Those populations should be included as threatened.

I hope these comments prove useful and please contact me if you have questions.

Sincerely,

A handwritten signature in blue ink that reads "Jeffery A. Gore". The signature is written in a cursive style with a large, sweeping "J" and "G".

Jeffery A. Gore  
Terrestrial Mammal Research Leader

22 January 2008

TO: Dr. Peter Plage, USF&WS, Colorado Field Office, P.O. Box 25486, DFC (MS 65412), Denver, CO 80225; [peter\\_plage@fws.gov](mailto:peter_plage@fws.gov)  
FR: Douglas A. Kelt, Professor and Chair, Dept. of Wildlife, Fish, & Conservation Biology, University of California, Davis  
RE: Review of revised proposed rule regarding the Preble's meadow jumping mouse, *Zapus hudsonius preblei*.

Dear Dr. Plage,

In June 2005 I provided comments on the USF&WS proposal to delist Preble's meadow jumping mouse. In March 2006 I provided further comments on a revision of this proposal based largely on the availability of a second study on the systematic of this taxon. In November 2006 your office invited me to comment on a further revised proposed ruling in which USF&WS recognizes the taxonomic validity of this subspecies and that it should not be delisted, and is now assessing the area over which this taxon is threatened. Specifically, you asked me to "consider, but not limit [myself] to the following questions:

- 1. Is our description and analysis of the taxonomic status of the species accurate?**
- 2. Are there any significant oversights, omissions or inconsistencies in the taxonomic portion of proposed rule?**
- 3. Are our conclusions logical and supported by the evidence we provide?**
- 4. Did we include all necessary and pertinent literature to support our assumptions and conclusions?"**

I have reviewed the Revised Proposed Rule (Federal Register 72 (215):62992-63024) and consulted the referenced literature that you provided. In the following I will address these four questions to the best of my ability. Because I am not personally familiar with much of the area under consideration, I refrain from assessing some issues/elements.

**1. Is our description and analysis of the taxonomic status of the species accurate?**

I believe that your assessment is comprehensive and accurate. In my comments of 12 March 2006 I expressed my view that the King et al. manuscript exposed fundamental concerns with results of Ramey et al. (2005), and provided substantial evidence for the taxonomic distinctiveness of *Z. h. preblei*. Moreover, the report provided by SEI (2006a) summarized a review by a panel of professional systematists, and concurred with King et al. My assessment of your summary of this issue is that it is accurate and sufficiently complete.

**2. Are there any significant oversights, omissions or inconsistencies in the taxonomic portion of proposed rule?**

None that I can extract. I am an ecologist, however, so urge your office to rely on insights from practicing systematists on this issue.

**3. Are our conclusions logical and supported by the evidence we provide?**

Your conclusions on jumping mouse systematic appear logical and well supported. Much of the revised proposed rule pertains to the spatial area over which current and pending threats to *Z. h. preblei* are likely to warrant maintenance of threatened status. I am not familiar with this region of Colorado or Wyoming, so feel unprepared to comment in detail on the accuracy of these conclusions. Clearly, USF&WS is very concerned with the future of this taxon in Colorado, but considers threats in Wyoming to be qualitatively different and of lower impact (e.g., moderate (not heavy) grazing and limited development of rural areas vs. extensive rural development and associated impacts on riparian and near-riparian habitats). From this, USF&WS concludes that threatened status should remain intact in Colorado, but be lifted in Wyoming.

I am never fully comfortable with application of political or administrative boundaries to biological issues, as mice rarely respect the imaginary lines we draw over our territory. I urge the Service to review this issue in the near future and to further consider threat delineation based on ecologically meaningful criteria such as watersheds. The Service recognizes this potential in the revised proposed ruling, and argues for using State boundaries based on very different current and projected threats in Colorado and Wyoming. This logic seems defensible, but if development in Colorado is hindered by this ruling it may well increase in Wyoming in the absence of federal protection. Such compensatory development would pose a threat in the latter state, and likely should be monitored at some level.

**4. Did we include all necessary and pertinent literature to support our assumptions and conclusions?**

As near as I can tell, all relevant literature was incorporated. Indeed, the revised proposed rule appears replete with references to support most statements.

Thank you for allowing me an opportunity to comment on this proposed ruling. I look forward to seeing this issue unfold over the coming decade or so, and hope that suitable application of science to policy will, in this case, have a meaningful impact on the preservation of this species.

January 21, 2008

**RE: Comments on Revised Proposed Rule to Amend the Listing for the Preble's Meadow Jumping Mouse (*Zapus hudsonicus preblei*) to Specify Over What Portion of Its Range the Subspecies is Threatened.**

Dr. Peter Plage  
Colorado Field Office, USFWS  
P.O. Box 25486  
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Dear Dr. Plage:

The following are my comments on the *proposed rule for delisting the Preble's meadow jumping mouse over parts of its range*, November 7, 2007:

In the following several paragraphs I will describe my conclusions regarding the proposed rule including specifically addressing the questions asked in the correspondence dated December 11, 2007. I want to emphasize that my conclusions/suggestions for the listing proposal do not address the taxonomic/genetic issues that are highly controversial and that fall outside of my area of expertise. I am assuming in all of my discussions that the subspecies is indeed a 'good' subspecies or otherwise an entity deserving of conservation concern. In general, I find the document to be suitably written with good coverage of the taxonomic/genetic issues and a rather tedious description of the current distribution of the mouse. I find lack of use of GIS technology and the dearth of maps to be among the greatest limitations of the document. For example the current distribution description in the text could be described in a GIS-based map that would greatly increase comprehensibility of the document. Another substantive criticism I have is in the general lack of description of available habitat throughout the range. This is another issue that may be helped by some GIS-based maps. I will include more specific suggestions in my response to the proposed questions.

**Question 1:** *Is our description and analysis of the biology, habitat, population trends, historic and current distribution of the species accurate?*

I find the information on the biology of the species substantial and complete. Similarly, the historic and current distribution appears accurate and complete given limitations. Historic distribution of a rare species is always going to be incomplete and in this respect I believe the authors did a credible job combining museum collections and past research to provide a clear picture of the past distribution. As mentioned in the previous paragraph, I believe the habitat/potential habitat to be inadequately described. Specifically, I think that amounts of potential Preble's meadow jumping mouse habitat could be quantified though use of remotely sensed data, either satellite imagery or aerial photographs. Once potential critical habitat has been quantified, then threats to that habitat could also be visualized. I find the assessment of threatened status throughout the range particularly weak without some quantification of (1) amount of potential Preble's meadow jumping mouse habitat and (2) quantification of the potential risks to this habitat. The use of population projections is helpful and could be further strengthened by creating maps that demonstrate the extent of urban expansion. Identifying the areas of greatest threat could provide the groundwork for development of models that could assess the long term effects of changing land use patterns such as those completed for cougars

(*Puma concolor*) (see Beier 1993 for southern California cougars and Hoctor et al. 2000, Meegan and Maehr 2002 for Florida panthers).

**Question 2:** *Does our document provide accurate and adequate review and analysis of the factors affecting the species?*

I believe the authors were thorough in their analysis of potential threats to the species. As previously mentioned I think the threat associated with development is probably real and could be quantified with the appropriate analyses. This would add strength to the document's conclusions regarding listing. I think the document should make it clear that some of the potential threats are, at this point in time, largely unsubstantiated and need further study. Just as the authors make it clear that grazing was previously thought to be a more serious threat than current data indicates, the document should make it clear that some potential threats need much more study before definitive recommendations can be made. For example, the assertion that Preble's mice are negatively affected by recreational trails has only weak support as acknowledged by the study's authors (Meaney et al. 2002). Meaney et al. (2002) state that their results, "are merely suggestive and not conclusive." In fact the assertion that there was a 31% lower population density on sites with trails (Meaney et al. 2002, pg 115) was not supported by Table 3 (pg 127) which gives density estimates of 37.2 and 38.8 for grids with and without trails respectively. I hope by pointing out the weakness of this particular data that the USFWS will avoid making the mistake of overstating a threat that might influence policy making in the future.

**Question 3:** *Are there any significant oversights, omissions, or inconsistencies in the proposed rule?*

One omission is the lack of the use of maps to delineate habitat that I addressed in previous paragraphs. I found the section labeled *Abundance* did not give adequate information on the abundance of the subspecies. Listing reported density estimates and estimates per linear distance and other abundance measures do little to elucidate the picture of abundance across the range. I realize that the document is reporting study results, but the lack of standardized reporting of abundances renders the whole section useless. I would suggest that the USFWS report a standard measure of relative trapping success such as captures per 100 trap nights to give a relative measure of abundance at various capture locations. Thereafter, areas with greatest capture rates could be reported or even mapped to demonstrate patterns (if any) of abundance. Although these results would have to be tempered by recognizing seasonal and annual variability recognizing areas of high capture rates may give some insight into habitat quality within the range. Captures per 100 trap nights could also be mapped to demonstrate the location of good habitat. Since the USFWS will be in charge of permitting for future studies there could be a requirement enacted for standardized abundance reporting.

**Question 4:** *Are our conclusions logical and supported by the evidence we provide?*

I find the support for delisting of Preble's meadow jumping mouse in Wyoming and not Colorado is only weakly supported by the document. It seems illogical that the threats to the subspecies would change substantially at the state line between Wyoming and Colorado. The document provides support that the current and foreseeable threats are substantially greater in the areas of rapid development associated with the I-25 corridor. However, if the subspecies is likely to become endangered in the foreseeable future, doesn't it make sense to preserve habitat that is not eminently threatened with destruction? As pointed out in the document the amount of habitat for Preble's mouse is declining in Colorado even under protection from the ESA (section on section 7 consultations pg 63006). It seems to be chasing one's tail to place a degrading

habitat under regulatory protection, while removing protection from a less threatened habitat. I also do not believe that population growth projections portray the complete picture on threats in the foreseeable future to the riparian habitat in Wyoming. It seems rather likely that before 2035 (the 'foreseeable future' in the document), changes in grazing practices, mineral exploration or any number of unforeseen circumstances could threaten the Wyoming portion of the range for Preble's meadow jumping mouse.

**Question 5:** *Did we include all necessary and pertinent literature to support our assumptions and conclusions?*

In addition to the references on cougars mentioned above I believe the USFWS would be wise to acknowledge the controversy surrounding this subspecies and its listing. For example, Borrell (2007) points out the divisions in the scientific community regarding the importance of the subspecies concept in conservation and I think it would be wise for the USFWS to explicitly state their rationale for considering Preble's mouse as an important entity for conservation.

**Conclusions:**

Overall, I would like to see a document that puts in some type of quantifiable terms how likely Preble's meadow jumping mouse is to becoming endangered in the near future. The things I think are requisite for making the case are (1) distribution of the mouse (including abundance information suggested above); (2) distribution and amount of potential habitat, and; (3) likelihood of destruction of the available habitat. As much as possible these items should be addressed with real numbers such as giving the area of the potential habitat and then ranking portions of habitat such that the proportion of habitat facing eminent destruction could be quantified. Although, the proposed rule does not provide all of the information that I would find convincing for listing, it does provide voluminous information (albeit mostly anecdotal) on the likely threats that the Preble's meadow jumping mouse and its habitat faces in the near term. Thus, combined with the fact that potential habitat has likely declined further since listing in 1998, I am convinced that the subspecies and its habitat warrant protection under the ESA. I do not support the proposed delisting of Preble's meadow jumping mouse in the Wyoming portion of its range. Since the mouse is currently protected under the ESA, I believe that the burden is on the USFWS to demonstrate that delisting in Wyoming would not decrease the likelihood for long-term survival of the subspecies. As outlined under my answer of question 4 above, I believe the USFWS has **not** presented a strong argument that substantial threats in the Wyoming portion of the range are unlikely. Please feel free to contact me via phone or email if you need any clarifications or if you have other questions.

Sincerely,

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18 January 2008

Subject: Peer Review of Revised Proposed Rule to Amend the Listing for the  
Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*) to Specify  
Over What Portion of Its Range the Subspecies is Threatened.

Dear Mr. Plage:

I have twice responded to requests from USFWS for scientific peer review concerning proposed listing decisions for the Preble's meadow jumping mouse (*Zapus hudsonius preblei*). This letter responds to a third request for peer review, this time concerning your revised proposed rule (Federal Register, November 7, 2007) which amended the listing to specify over what portion of its range the subspecies is threatened.

I have reviewed the revised proposed rule and much of the supporting documentation you sent. I organize my review using the four questions I was asked to address, which were focused entirely on taxonomic issues concerning the subspecies and not on the rest of the amended proposal. I understand that a separate set of peer reviews has been solicited for the rest of the amended proposal (e.g., those sections concerning over what portion of the subspecies' geographic range it may be threatened), so I restrict my comments to taxonomy.

1. Is our description and analysis of the taxonomic status of the species accurate?

Yes, I find that the Service's description and analysis of the taxonomic status of the subspecies accurately reflects best available science. The taxonomic review provides a factual recounting of the history of taxonomic studies and findings concerning the Preble's jumping mouse amended listing review meadow jumping mice, and it carefully weighs all of the available scientific evidence in retaining the published taxonomy of the species and subspecies.

2. Are there any significant oversights, omissions or inconsistencies in the taxonomic portion of the proposed rule?

I detected no notable oversights, omissions or inconsistencies in the taxonomic portion of the proposed rule. I did note what I believe is one very minor error:

- Page 62995, 3rd full paragraph, 1st sentence: I believe the summary of Krutzsch's analysis should read "... Z. h. campestris in northeastern [not northwestern] Wyoming..."

3. Are our conclusions logical and supported by the evidence we provide?

Yes, the conclusions represent a balanced, transparent, and logical review of the evidence. It properly adhered to taxonomic protocols in finding there was no compelling evidence (genetic, morphological, or ecological) that was contrary to the established taxonomy of the subspecies.

4. Did we include all necessary and pertinent literature to support our assumptions and conclusions?

Yes, I am unaware of any relevant literature or other information bearing on the taxonomy of the species or subspecies that was not included in the Service's review.

I hope you find these comments useful. I commend the Service on your careful, thorough, and balanced review of the available science.

Sincerely,  
Dr. Wayne D. Spencer  
Senior Conservation Biologist

Review of land use science in: “Revised proposed rule regarding petitioned delisting of the Preble’s meadow jumping mouse.”

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My review and comments focus on the assessment of land use and development trends as a factor in the subspecies’ future conservation status.

**1. Is our description and analysis of biology, habitat, population trends, historical and current distribution of the species accurate?**

This is outside of my expertise in human demography and land use.

**2. Does our document provide accurate and adequate review and analysis of the factors affecting the species?**

I will focus on the assessment of land use and development trends as a factor in the subspecies’ future conservation status. I have reviewed the document and examined the literature cited, copies of which were provided to me. I believe that the analysis associated with land use is both accurate and adequate, since it includes typical land use factors such as residential and commercial development, but also considers transportation, recreation, rights-of-way (utility corridor development), and hydrologic changes associated with development. The strength of relevant literature in each area varies, but the review does a good job of laying out the knowledge base and its link to the proposed rule.

Even beyond this literature there is consensus that the Colorado Front Range region will continue to grow and develop land at rates faster than the nation as a whole for the foreseeable future. I agree that this time-horizon extends to the 2030-2040 time frame based on standard demographic methods.

It is my assessment that the distinction between land development trends in the Colorado Front Range and those in Wyoming are logical and real. My own projections, as cited, and those of other land use experts, as well as the empirical, historical record, clearly indicate that the Front Range foothill and nearby prairie zone is and will continue to experience significant spread of residential commercial and infrastructural development driven by a growing economy and population. Indeed, this sub-region, which some scholars now refer to as the Front Range Megapolitan Zone, is among the fastest developing sub-regions of the Interior West (second only to the Phoenix, AZ region).

Two weaknesses in the analysis strike me. First, as noted in the review, there are weaknesses in state-of-the-art land use modeling that make it difficult to project patterns at the resolution often used for habitat assessment. This weakness is off-set by attention in some of the cited biological field studies to the site-specific land use and development and presence or absence of Preble's. Second, as with any ecological assessment, the analysis struggles to weigh the cumulative effects within factors and among all five factors. It is my judgment that cumulative effects are larger than a simple compilation of individual threats, and in most, but not all, cases, cumulative and interactive effects worsen the impact of land use on the Preble's. In only a few interactions might one speculate on a lessening of the effect of regional development: in some cases suburbanization and loss of agricultural land result in a reduction of livestock grazing on nearby lands, and in some cases, which cannot be reliably predicted, spreading development causes demand for protection of open spaces, parks, and greenways, that might, but not always, improve wildlife habitat.

I am less bothered by the notion raised in the review that population and land use projections are sensitive to economic swings, suggesting that projections may not be reliable over the foreseeable future. We already know that the economic slow-down in the early 2000s had very limited effects in dampening growth on the Colorado Front Range, and even during the "energy bust" of the 1980s, the Front Range grew faster than the West and the nation as a whole. At issue here are long term development trends that may be slowed by economic factors, such as the current (2008) rise of mortgage defaults, but where historical experience indicates that such dampening has been modest and short-lived.

**3. Are there any significant oversights, omissions, or inconsistencies in the proposed rule?**

**4. Are our conclusions logical and supported by the evidence we present?**

The science of land use modeling and projection retains significant uncertainties, and work is needed to improve the resolution of land use maps and projections so that patterns of development can be mapped onto habitat patterns at a consistent scale. Nevertheless, the state of the art allows us to project development at the sub-regional scale, and empirical data allows researchers to predict with good reliability the spatial pattern of that development. Next, field researchers can then make empirical links between site-scale development and species data, as evidenced in the document.

In terms of trends into the future, both the empirical record and projections, as cited in the revised proposed rule, show development filling in gaps along the north-south axis of the Front Range Megapolitan Zone, as well as extending eastward further out onto the High Plains as land prices escalate and as transportation network is improved and extended.

The population growth and land development estimates and projections cited in the document are the most reliable available, and the document takes care to cite research and evidence specific to the region, especially with regard to the patterns of low-density

land use and agricultural land conversion. I am aware of no additional evidence that would contradict these conclusions. Indeed, the empirical record of population growth in Colorado since about 1990 has shown that many projections have been conservative. Moreover, while the data clearly showed the most rapid growth in the areas south of Denver during the 1990s, growth has now (in the early 2000s) intensified in the Weld and Larimer counties part of the region.

**5. Did we include all necessary and pertinent literature to support our assumptions and conclusions?**

I am aware of no additional evidence that would contradict the conclusions.