

Dear Editor

Thank you for your patience with our manuscript numbered “BG-2021-313”. Based on the comments from the reviewer and editor, we have revised the manuscript carefully. We found that all the questions and comments are valuable to improving the quality of this manuscript. Here, we submit both a clean and a track changed versions of manuscript to “Biogeosciences”.

The responses to the reviewer’s comments are following:

I am in receipt of an additional review from an expert Referee, pasted below. When preparing a response, please include a response to these insightful comments, which follow.

Overall, I am very excited to see the authors addressing this topic in this system. I especially appreciated the authors integrating a number of measures into their suite of response variables; that should be done more frequently! On the other hand, some of the methods either need to be clarified or better justified, because the current description comes across as potentially biased. Furthermore, I don’t understand why the authors make things (for me, at least) more complex and difficult to understand – instead of simply naming the particular response variable, they have created monikers such as “biodiversity conservation service” that obfuscate meaning and make reading harder. Also, as noted below, I’m not sure that I agree with the authors’ assertion of a threshold, simply because a quadratic relationship exists. Isn’t that the default assumption of niche dynamics and (more relatedly) the Intermediate Disturbance Hypothesis? I don’t see where the bare vs. the vegetated plots in the pika-occupied areas is discussed in the main text. Also, some of the Discussion seems like a pretty strong over-simplification of how to contextualize the study’s results with the broader literature. Also, given that all of the sampling occurred in 1 month of 1 year, and that the entire sampled area spanned 0.1225 km², it would seem appropriate for the authors to acknowledge with a caveat or two the limitations of this spatio-temporal domain. I realize that the sampling scales of biogeochemistry investigations are much more limited than that of animal ecologists, but note that you’re investigating the dynamics of both soils and animal behaviors.

Answer: We are appreciated for your comments which are really helpful for improving our manuscript. There are many comments in this paragraph. We will respond these comments as following one by one.

Comment 1: some of the methods either need to be clarified or better justified, because the current description comes across as potentially biased. **This comment is not specific; therefore, we cannot do anything here. In the next comments, we can clarify and justify the methods when any comments relate to methods.**

Comment 2: I don’t understand why the authors make things (for me, at least) more complex and difficult to understand – instead of simply naming the particular response variable, they have created monikers such as “biodiversity conservation service” that obfuscate meaning and make reading harder. **We are sorry for moniker name of biodiversity conservation service and its name is ecological service of biodiversity conservation. When we had invited English Language Editing Services to polish this manuscript, the editor kept it. In the revision, we have revised “biodiversity**

conservation service” into “ecological service of biodiversity conservation”.

Comment 3: Also, as noted below, I'm not sure that I agree with the authors' assertion of a threshold, simply because a quadratic relationship exists. Isn't that the default assumption of niche dynamics and (more relatedly) the Intermediate Disturbance Hypothesis? **Great comment! It is very accurate that the threshold is a not good expression. In china, plateau pika is considered as a pest and government costs big money to eradicate it every year. We had intended to provide some advices for government to control plateau pikas, rather than eradicate it. Therefore, we propose a threshold for plateau pikas, in which plateau pikas can play positive roles in alpine meadows. Now, we think about it carefully, we just found the Intermediate Disturbance Hypothesis in ecology, and we cannot present a threshold for plateau piaks. Therefore, in revision, we have deleted the threshold description throughout the whole manuscript.**

Comment 4: I don't see where the bare vs. the vegetated plots in the pika-occupied areas is discussed in the main text. **Previous studies have shown that soil nutrient concentration and stock are different between bare soil patches and vegetated surface areas (Pang et al., Geoderma, 2020, 372, 114392; Yu et al., Geoderma, 2017, 307, 98-106). Therefore, this study used plot scale (home range) to whether the presence of plateau pika has an impact on grassland ecosystem services, in which, the percentage of soil bare area and vegetated area in each plot with plateau pikas was to comprehensively calculate the soil nutrient stock and plant biomass at plot level. The difference in nutrient and plant biomass between bare soil patches and vegetated surface areas is not key points, which has been explained in Method sector. This is to say that this study focuses on the plateau pikas disturbance, rather than bioturbation.**

Comment 5: Also, some of the Discussion seems like a pretty strong over-simplification of how to contextualize the study's results with the broader literature. **This is a very common question, and it is suitable for any manuscript. We tried to look up literatures for deepen the discussion. Do hope that our revision is acceptable for associate editor and this reviewer.**

Comment 6: also, given that all of the sampling occurred in 1 month of 1 year, and that the entire sampled area spanned 0.1225 km², it would seem appropriate for the authors to acknowledge with a caveat or two the limitations of this spatio-temporal domain. **Plateau pikas is social animal and adapts its habitats. We selected five sites to test the same question and hope to find a general pattern. We are sure that this is similar to other studies (Li et al., Frontiers in plant science, 2021: 2455; Wang et al., Frontiers in plant science, 2022, 13: 830856). This manuscript is to find a general effect of plateau pika disturbance on ecosystem services of alpine meadows, bot focuses on spatio-temporal domain.**

Comment 7: I realize that the sampling scales of biogeochemistry investigations are much more limited than that of animal ecologists. but note that you're investigating the dynamics of both soils and animal behaviors. **Thank you for your comment. The sampling scales in this study has been widely applied into other study cases (Pang et al., Geoderma, 2020, 372, 114392; Pang et al., European Journal of Soil Science, 2020, 71, 706-715). This sampling scales is enough to test the plateau pika disturbance in relate to soil and plant. If we focus on the plateau pika behaviors, the plot size has to become**

bigger, such as 50 m × 50 m or 100 m × 100 m. Because this study is to analyze the plateau pika disturbance, rather than plateau pika behaviors, we think that the sampling scale is acceptable.

Larger, more-important topics that are of greatest concern to the robustness of the study and its conclusions:

1. Line 27 – If this is true, consider adding “linearly”, immediately after “decrease”. Later on in the sentence, note that nowhere in the abstract have you defined what “disturbance” or “disturbance intensity” is, specifically. This 2nd point remains true on line 54 through at least 66, in the Introduction. It appears again on line 152. What is the “disturbance”? Needs to be defined.

Answer: Thanks for your advice. We have added the “linearly” after “decrease” in Line 27. “disturbance” is to be defined to the all activities of plateau pika, including the developing burrow systems, excreting feces and urine, consuming plants, clipping tall plants, and producing bare soil patches. We have added this information into manuscript. “disturbance intensity” is to be defined to the plateau pika populations, which is measured by the density of active burrow entrances. We have presented this information in Method (Line 175). The disturbance intensity of plateau pikas is a common word in this field. Here, we used the disturbance intensity is to simplify the disturbance intensity of plateau pikas, which has been edited by Language services. Now we have revised “disturbance intensity” into “the disturbance intensity of plateau pikas” throughout the manuscript.

2. Line 32-33 and 70-71 – It’s not clear what “provisioning, regulating, supporting” refer to: each needs to be in reference to something else. E.g., provisioning WHAT?, regulating WHAT?, supporting WHAT?

Answer: Thank you for your comment. In the process of revision, we have added the specific details about provisioning, regulating, supporting and cultural services in introduction.

3. Line 49-51 – This sentence needs to be re-phrased; its meaning is not clear, and there are several studies (in just 1 species of pika [*Ochotona princeps*], alone) that show how American pikas are ecosystem engineers, alterers of vegetation composition, a keystone species, etc. These include Aho et al. (1998), several papers by Denise Dearing at the University of Utah (see her thesis: <https://www.proquest.com/docview/304226940?pq-origsite=gscholar&fromopenview=true>), Dearing (1996: *Oecologia*), Hall and Chalfoun (2019; *J. Animal Ecology*), Jakopak et al. (2017, *J. Mammalogy*), among others. Also, it would be important for the authors to cite one or more papers that have noted specifically that the plateau pika is a keystone species. This will help ensure the objectivity and lack of bias in the research, rather than it appearing that plateau pikas are nothing more than a “pest” (see N. Fan, W. Zhou, W. Wei, Q. Wang, and Y. Jiang. 1999. chapter 13. *Rodent Pest Management in the Qinghai-Tibet Alpine Meadow Ecosystem*. 20 pages.). This lack of clarity here is pivotal, because this is where you’re really setting up the goal of the manuscript and why it will be an important contribution.

Answer: As the reviewer says, several studies show how American pikas (*Ochotona princeps*) are ecosystem engineers, alters of vegetation composition, as the keystone

species. However, American pika are the rock-dwelling, whereas plateau pika are meadow-dwelling (Smith et al., *Lagomorph biology*, 2008: 89-102.). in addition, no study is to test the effect of American pikas on grassland ecosystem services. At present, the European rabbit and prairie dog was verified to have impact on grassland ecosystem services in arid and semiarid regions (we have presented this information in introduction sector). Delibes-Mateos et al (Delibes-Mateos et al., *Biological Conservation*, 2011, 144(5): 1335-1346.) review the small rodent in relate to soil and vegetation, just speculate that small rodents possibly affect the ecosystem services, but this paper does not quantify the effect of small rodent on ecosystem services of grasslands. This study used five site data to test the effect of plateau pika (*Ochotona curzoniae*) on meadow ecosystem services in alpine regions, which will richen the small mammalian herbivores in relation to grassland ecosystem services.

There are many papers to describe the role of plateau pika in alpine meadows (Smith and Foggin, *Animal Conservation*, 1999, 2(4): 235-240; Lai and Smith, *Biodiversity & Conservation*, 2003, 12(9): 1901-1912; Delibes-Mateos et al., *Biological Conservation*, 2011, 144(5): 1335-1346; Sun et al., *Grassland Science*, 2015, 61(4): 195-203; Smith et al., *Integrative Zoology*, 2019, 14(1): 87-103.), in which plateau pikas are considered as ecological engineering and a keystone species, or plateau pikas are considered as a pest. We supplemented this information into introduction sector.

4. Lines 85-93 – I very much like that you have laid out your hypotheses and cited one or more studies that found a certain result. However, unless the reader goes and reads all five of those papers, it's not clear whatsoever why those predictions are being made, nor by which processes or mechanisms those results were created. It would be helpful if you provided concise descriptions of those.

Answer: Another reviewer suggest that this manuscript had better to delete the references in hypothesis, because it seems redundant. In this revision, we combined two reviewers' comments as following. First, we had summarized the existing research progress with references, and then we present the hypothesis.

5. Lines 103-105 – Excellent that you provide the reader some overview of conditions at the site. However, it would be much, much more informative, and relevant to your study objectives and interpretation of your results, if you were to provide understanding of how much of the annual precipitation falls as snow (either % or amount during the warm season, and % or amount as snow during cold season), and what the temperatures are in the warm and cold seasons. Pikas generally do not respond to any annual-average measure.

Answer: Thank you for your comment. We have added the percentage of annual precipitation during the warm season. We presented the average temperatures in the warm season, cold season, and all year.

6. Lines 114-115 – I'm not sure what it means that "... many plant species are found until late summer."

Answer: The growing season for plants is short on the Qinghai-Tibetan Plateau, and temperature is low. Different plants are regreened at different time. Some plants are turned green in July due to higher temperate in study regions. This sentence is to say that field survey and sampling in August is optimal because August is good time to identify all plants. We have revised it.

7. Line 116 – It’s not a “census”; it’s a “sample” or a “survey”.

Answer: Thank you for your comment. We have revised “census” into “survey”.

8. Line 116-118 – Yak grazing appears that it could be a confounding influence, here. Given that effects in low-productivity systems such as this are likely to have ecological memory (or legacy effects), this sentence does not make sense logically to me.

Answer: Thank you for your comment. We have deleted this sentence.

9. 119 – “only a small burrowing herbivore” ... what does this mean? It’s not important?

Answer: There are many small burrowing herbivores on the Qinghai-Tibetan Plateau. However, in this study, the small burrowing herbivores is only plateau pikas in field survey areas. In order not to cause misunderstanding, we think that it necessary to stress it in manuscript. We have revised it as “the small burrowing herbivore at each survey site was only plateau pikas.”

10. Section 2.2 – You might give just a little more background on the life-history strategy of plateau pikas here, as most readers of the journal will not know the relevant details. E.g., typical body mass, does sexual dimorphism exist?, are they generalist herbivores or if not, what do they eat?, are they burrowers themselves, or do they conscript burrows made by other species?, how deep do their burrows go?, do they hibernate?, etc. May only need to be an extra 2-4 sentences, but this will help the reader immensely.

Answer: Thank you for your advice. Another reviewer proposed that introduction of plateau pikas had better present in introduction. We combined two reviewers’ comments, and supplemented this information (typical body mass, sex dimorphism, plants that plateau pikas like to eat, how to plateau pika burrows, whether plateau pika hibernate) proposed by this reviewer into introduction.

11. 123 – When you say “diffusion”, do you mean “dispersal”? If so, is this natal dispersal, or adult dispersal? If the process is gradual, does the ability to find reference (unused) sites depend on the of your sampling?

Answer: Maybe dispersal is correct. We are not native English speaker. The diffusion and dispersal are same to us. Based on reviewer’s advice, we changed “diffusion” into “dispersal”. Yes, the dispersal is adult. Their babies stay with home together in bearing year. We have revised it. The adult dispersal is not dependent on time, but it is dependent on food resources. In a home range of plateau pikas, when food is insufficient for plateau pika family, and adult plateau pikas often move to a potential habitat with open and low meadows.

12. 133-134 – I don’t understand this sentence at all; the text after the comma is exactly the same as the start of the sentence.

Answer: Great, it is redundant expression. We have revised it in the revision.

13. 134-135 – To make the study repeatable, we need to know what that distance was specifically that you used.

Answer: Good, the distance between the two plots with plateau pikas was more than 3 km, which ensures that the plateau pika of the same family will not appear in two plots with plateau pikas at the same time, the first area with plateau pika presence is found, and it was selected as the first survey plot. And then we continue to find the second area along one direction after 3 km, if alpine meadows with plateau pikas was to design the second plot.

14. 152 – Depending on what “disturbance” means, this assumption may or may not hold true. I would be surprised if it did NOT hold for amount of biomass within a certain distance of the burrow entrance (if the species is a central-place forager), but as noted earlier in the MS, some ecosystem properties are not affected while others are even promoted by the presence of pikas.

Answer: Frankly, we did not catch what reviewer say. The plateau pikas lives in their home range with many behaviors. Different activities often occur at different spatial position. Consuming plant was randomly found in whole home range, while clipping plants were only found at edge of the active entrance, however, excreting feces and urine was found at the edge of active and abandoned entrance. The entrance was randomly founded in home range. Here, “disturbance” is to be defined to the all activities of plateau pika. That is to say, disturbance is comprehensive outcome of plateau pika activities, including forager. This is widely reported in previous studies (Pang et al., *Geoderma*, 2020, 372, 114392; Pang et al., *Land Degradation & Development*, 2021, 32(3): 1205-1212; Li et al., *Frontiers in plant sciwaynce*, 2021, 2455; Wang et al., *Frontiers in plant science*, 2022, 13: 830856). In addition, the density of active burrow entrances was used as a proxy for the disturbance intensity of the plateau pikas has also been widely used in the previous studies (Guo et al., *Acta Ecologica Sinica*, 2012, 32, 104-110; Liu et al., *Plant and Soil*, 2013, 366(1): 491-504; Sun et al., *Grassland Science*, 2015, 61(4): 195-203; Liu et al., *Ecological Engineering*, 2017, 102: 509-518; Yu et al., *Geoderma*, 2017, 307, 98-106; Wang et al., *Ecological Engineering*, 2018, 113: 35-42).

15. 156-160 – The reader does not have enough detail to know what you are doing, to assign causality by plateau pikas. Rather than assume that the reader will just trust your method, you need to provide clear information that both makes the method repeatable, and convinces the reader that you accounted for this in a robust, defensible manner.

Answer: Sorry, we did not get this comment core. The alpine meadows with plateau pikas consisted of many bare patches and vegetated surface. We are sure that the soil and plant was different between bare patches and vegetated surface. So, we calculated the nutrient and carbon stock, and plant biomass at plot level, which is correct to compare the areas with and without plateau pikas.

16. 163-164 – It seems that if you are only moving the quadrats slightly in the pika-occupied sites (but not in the non-pika-occupied sites), you are biasing the sampling and results. Either clarify or justify this approach. By not having any sites be randomly selected, it causes concern in the reader and in my mind as well. Furthermore, in reading the rest of the main body of the text, I’m not seeing any reference to the comparisons of bare vs. vegetated plots within the plateau pika area

Answer: In this study, the plots with and without plateau pikas were randomly selected; however, the quadrats in each plot was not randomly selected, was selected by “W”. The data of five quadrats in each plot was pooled to representative of that plot. There are many kinds of bare patches in alpine meadows. This study focused on bare patches caused by plateau pikas. In plot with plateau pikas, if quadrat was justly covered with the bare patches caused by plateau pikas, we slightly moved the quadrat. if quadrat was justly covered with the bare patches caused by other factors, we did not move the quadrat. The comparisons between bare vs. vegetated was not core of this study, which

has been reported in other studies (Pang et al., *Geoderma*, 2020, 372, 114392; Yu et al., *Geoderma*, 2017, 307, 98-106). Generally, bioturbation was verified by comparing the bare vs. vegetated.

17. 164-165 – What is the purpose of the paired bare patch vs. the vegetated patch? The reader has no idea about why you are doing this?

Answer: This comment is similar to latest comment. Previous studies have shown that in the presence of plateau pika, there are differences in soil nutrients between bare soil patches and vegetated surface areas (Pang et al., *Geoderma*, 2020, 372, 114392; Yu et al., *Geoderma*, 2017, 307, 98-106). Alpine meadows in home range included bare and vegetated surface. We needed to design the quadrat at bare patches and vegetated surface to measure the soil nutrient and carbon concentrations, and these data was used to calculate the soil nutrient and carbon at plot level. In addition, no plants or sparse plants were found on bare patches, we measured plant biomass at bare and vegetated surface, respectively. This design is beneficial to compare the parameters between plots with and without plateau pikas, and reflect the effect of plateau pika disturbance on ecosystem services in alpine meadows. In revision, we have added relative information about the purpose of the paired bare patch vs. the vegetated patch.

18. 172 – Species richness is simply a tally of the species present in a given area; you mention “their numbers”, which leads me to think that you also measured abundance, so that you could quantify measures like evenness and Hill series.

Answer: Thank you for your advice. Here, species richness is number of plant species. The “their number” is not an accurate word. We changed “their number” into “number of plant species”.

19. 173 – “palatable” and “unpalatable” to which species? Obviously, palatability depends upon the herbivore that one is considering.

Answer: “palatable” and “unpalatable” are for livestock (It mainly refers to yaks and sheep that often graze on alpine meadows) in this study. We have refined this expression in revision.

20. 192 – You need to connect this back to your sampling approach. Consider adding “Because pika-absent sites did not include sampling at bare areas, only” before the start of the “Five soil samples...” sentence.

Answer: Great! We completely agreed with your comments. We have added the expression in revision.

21. 200-201 – What does “artificially removed” mean? I think that you may mean “manually picked out”...?

Answer: Yes, you are right. In the revision manuscript, we have revised “artificially removed” into “manually picked out”.

22. 202-203 – This sentence is nonsensical, as written – passing soil through a sieve does not allow one to estimate any of these concentrations.

Answer: Sorry, this is a bad expression. We changed “Finally, the soil organic carbon, nitrogen, phosphorus, and potassium concentrations were determined by passing through a 0.15 mm sieve” into “Finally, soil samples were sieved at 0.15 mm to analyze soil organic carbon, nitrogen, phosphorus, and potassium concentrations in the laboratory.”

23. 203-206 – Please specify which technique is associated with which concentration – e.g., Kjeldahl procedure measures total N concentration.

Answer: Thank you for your comment. We have revised the specify technique into “Soil organic carbon was measured using the dichromate heating-oxidation. Soil total nitrogen concentration was measured using the Kjeldahl procedure. Soil total phosphorus concentration was measured using the Molybdenum blue colorimetric method. Soil total potassium concentration was measured using flame photometry”.

24. 216-218 – Yes, but how do you measure the area of a shape that is irregular? Need more details on how you measured areal extent.

Answer: Thank you for your suggestion. We cited a reference in Chinese to describe the segmentation method. To positively respond to this comment, we have supplemented some specific measurement details in section 2.3 Field sampling. The measurement method is as follows: Each bare soil patch was identified as regular shape or irregular shape. If one bare soil patch was identified as regular shape, such as rectangle, circle, trapezoid, etc; a ruler was used to measure its length, width, height, diameter, upper and lower bottom, and these data was used to calculate the area of that bare soil patch. If one bare soil patch was identified as irregular shape, this bare soil patch was divided into several regular shapes; the areas of these regular shapes were calculated, respectively; the area sum of these regular shapes form irregular bare soil patch was considered as the area of that irregular bare soil patch.

25. 219-220 – How close to reality was this consideration? Depending on how far from actual truth it is, this assertion worries me.

Answer: Bare soil patches caused by other factors (no plateau pikas) is simultaneously existed on the vegetated surface in the presence/absence of plateau pikas. To actual quantify the effect of plateau pikas on ecosystem services of alpine meadows, this study only measured the area of bare soil patches caused by plateau pikas, although there exist multiple types of bare soil patches in alpine meadows. Therefore, in each plot without plateau pikas, bare soil areas caused by plateau pikas were considered to be zero.

26. 225-229 – You cannot assume that your reader is going to read all 3 of these papers. You need to provide the key details, here, to convince the reader that you’re doing this robustly.

Answer: Thank you for your suggestion. We have provided readers with more details by adding the computational formulas in the revision.

27. 241 – Is the presence vs. absence of plateau pikas considered your “fixed effect” ?

Answer: What the absence/presence was considered was different in previous studies. Some studies are expressed as predictors (Yu et al., Geoderma, 2017, 307, 98-106; Yang et al., Catena, 2021, 207: 105625), while others are expressed as fixed factors (Pang et al., Geoderma, 2020, 372, 114392; Wang et al., Frontiers in plant science, 2022, 13: 830856). In this study, we originally considered the absence/presence as predictors. In revision, we have revised “predictors” into “fixed factor” according to this comment.

28. 243 – This is a VERY long sentence. Consider ending the first sentence in the middle of line 247. Also, the phrase from middle of line 247 to 251 is not written correctly – you’re not performing a regression analysis between (nor among) all of the response variables.

Answer: Thank you for your comment. We have ended the first sentence in the middle of line 247. We used “The densities of active burrow entrances by plateau pikas were

considered to be the fixed factor, and were used to construct the regression analysis between palatable plant biomass, plant-species richness, soil water storage, soil organic carbon stock, soil total nitrogen stock, soil total phosphorus stock, and active burrow entrances densities.” to substitute for originally “the densities of active burrow entrances were considered a fixed factor, and were used to construct regression analysis between palatable plant biomass, plant species richness, soil water storage, soil organic carbon stock, soil total nitrogen stock, soil total phosphorus stock, soil total potassium stock, and active burrow entrance densities.” Because we did not perform a regression analysis between all of the response variables, just performed a regression analysis between some response variables which were significantly related to plateau pika disturbance.

29. 255 – Given the tens to hundreds of different analyses that you’re performing across this study, please provide a justification of why you are not correcting for experiment-wise error rates (e.g., Bonferroni stepwise correction). That is, if you perform 100 tests, you will likely have 5 tests that will be “statistically significant”, even when there is no pattern nor biological effect whatsoever, just by chance alone.

Answer: Thank you for your comment. We have added data analysis are as follows: The Bonferroni’s test used to adjust P values and made to correct for experiment-wise error rates.

30. 259-269 – Consider simply reporting the results of what you found, as opposed to giving everything another name for each predictor. However, what you’ve done makes things more complicated, in my view, because you’ve lumped several response variables into classes of responses (such as “provisioning services”).

Answer: This is great comment. We further explained what variables predict. They are not experimental results. In revision, we deleted some sentence, which simply the results of what this study found. In addition, we move these sentence into discussion sector for clarifying what variables predict.

31. 280-283 – I think that it would be preferable to comment on the fit of the linear vs. the quadratic relationship to the data. Also, does a bell-shaped curve unequivocally indicate a “clear threshold for disturbance”? I’m not sure that it does ... what about the Intermediate Disturbance Hypothesis as an alternative explanation for the pattern?

Answer: Thank you for your comment. We have revised this description and supplemented the Intermediate Disturbance Hypothesis as an alternative explanation for the pattern in discussion.

32. 322 – Although I appreciate the desire to connect plateau pika activity to positive provision of ecosystem services, using terms like “in relation to the forage availability service of grassland ecosystems” makes it confusing for the reader to understand what is really going on in the text. Also, the logic of lines 321-325 is not at all clear to me ... what are you saying is the mechanism causing this context-dependence?, i.e., why are the responses different in the two classes of regions?

Answer: Thank you for your comment. We have revised “in relation to the forage availability service of grassland ecosystems” into “affects the ecological service of forage available to livestock of grassland ecosystems”.

In addition, “the presence of small mammalian herbivores is disadvantageous to the

ecological service of forage available to livestock in semi-arid and alpine regions, but it is beneficial to the ecological service of forage available to livestock in arid regions” is the specific performance of “These results demonstrate that the presence of small mammalian herbivores affects the ecological service of forage available to livestock of grassland ecosystems may be related to environmental conditions”. We have revised this expression. Besides, the responses different in the two classes of regions have been discussed deeply in line 418-424.

33. 326-335 – I am very impressed that you are trying to contextualize your results amidst some studies from the existing literature, but you are really undercutting the value of these comparisons by virtue of how high-level, superficial, or simplistic that they are. E.g., why are the results consistent with the one study, but not the other? What are the magnitudes of the effects?

Answer: Thank you for your comment. We have further improved the discussion as follows: The difference of water conservation services is related to the selection of evaluation indicators. Martínez-Estévez et al (2013) used the water infiltration rates as an index to evaluate the effect of prairie dogs on water conservation services. However, the effects of European rabbit and plateau pika on water conservation services of semi-arid grassland and alpine meadow by evaluating the water storage of topsoil.

34. 349-350 – This sentence makes no sense, given that you define “biodiversity conservation [service]” as species richness of plants.

Answer: We do not define species diversity protection services as plant species richness, just use plant species richness to evaluate the effect of plateau pika disturbance on biodiversity conservation services (Wen et al., (2013), Plos One, 8, e58432). The higher species richness of plants in the presence of plateau pikas reflect that the presence of plateau pikas is beneficial to biodiversity conservation, which is one of our goals.

35. 364-365 – I am not demanding that you do that for this study, but quite a lot of your interpretation (e.g., see lines 394-397) rests on the assumption that number of active burrows serves as an accurate index for disturbance intensity. It sure would be nice (and, for me, more empirically compelling) to correlate number of active burrows with number of pika-hours spent foraging aboveground, on one or a small number of days throughout the season. The latter would be a much more direct measurement of one process (i.e., forage consumption) that can lead to some of the changes that you are suggesting are imposed by pikas.

Answer: The number of active burrows serving as an accurate index for disturbance intensity of plateau pikas is widely in previous studies (Guo et al., Acta Ecologica Sinica, 2012, 32, 104-110; Liu et al., Plant and Soil, 2013, 366(1): 491-504; Sun et al., Grassland Science, 2015, 61(4): 195-203; Liu et al., Ecological Engineering, 2017, 102: 509-518; Yu et al., Geoderma, 2017, 307, 98-106; Wang et al., Ecological Engineering, 2018, 113: 35-42). We guess that reviewer hope us to use consumption plants by plateau pikas to explain the relationship between disturbance intensity and ecosystem services. It is difficult for us to do it. Plants are affected by many factors, just depend on consumption by plateau pikas. As far as consumption is concerned, plateau pika can reduce the plant biomass, whereas it consumption can stimulate the compensatory growth of plants. We also guess that reviewer focus on consumption plant by plateau pikas. The plateau pikas consume plants in morning and sunset. The disturbance intensity is comprehensive

results of all activities of plateau pikas. This study is a survey experiment, rather than control experiment.

36. Lines 389-394 – As mentioned above, this sentence feels like a pretty strong over-simplification of the dynamics of herbivory, given how few studies the authors are citing across the paper, compared to the plethora of studies on the topics listed in this sentence that exist. None of the numerous review articles published over several decades is cited, and the authors are reporting nothing more than directionality.

Answer: These sentences are the summary of our whole discussion. The relative ideas and academic views were appearance in above-mentioned text. So we did not cite any reference.

37. Lines 407-409 – The existence of a quadratic relationship to disturbance intensity does not necessarily indicate an existence of a threshold. Much previous ecological literature has been produced on the topic of thresholds; consider consulting it.

Answer: Thank you for your comment. We have revised the sentence as follow: Furthermore, this study found that the effect of plateau pikas disturbance intensity on ecological services of forage available to livestock, biodiversity conservation, soil maintenance of nitrogen and phosphorus, and carbon sequestration also conformed to the moderate disturbance hypothesis.

Issues that compromise the clarity, readability, and breadth of audience of the article:

1. Line 15 – “pika” is singular; either say “pikas” or “the plateau pika” (also on line 52, 53, 62, 151, etc.). Also, “an example” of what? Maybe instead say “a model organism” or “a focal organism”.

Answer: Thanks for your suggestion. We have revised “plateau pika” into “plateau pikas or “the plateau pika” throughout the manuscript, revised “an example” into “a focal organism”.

2. Line 17 – “forage availability”: does this mean forage available to pikas, livestock, or other herbivores?

Answer: Thanks for your comment. The “forage availability” means forage available to livestock in this study. We have revised it throughout the manuscript.

3. Throughout Abstract and entire MS – Using three or more nouns in a row is called “freight-train wording”. Its usage makes it very difficult for the reader to divine which noun(s) are acting as adjectives, and which one(s) are acting as a noun. For greater clarity, you need to either 1) hyphenate the nouns that are acting as adjectives, or, preferably, 2) use prepositions to clarify the relationships among the nouns. For example, at this point in the MS, I have no idea what “soil nutrient maintenance services”, “soil potassium maintenance service”, or “forage availability service” (line 44) is. I recommend the authors implement these clarifying changes, throughout the MS.

Answer: Thanks for your advice. We have hyphenated the nouns that are acting as adjectives in a row throughout the manuscript.

4. Line 23 – Change “, whereas it ...” to “. In contrast, it ...”

Answer: Thanks for your suggestion. We have revised “, whereas it...” into “. In contrast, it ...”.

5. Line 30 – “richen” should be “richening”, to be parallel with “influencing”; I will stop identifying this type of grammatical error here. The MS will be markedly improved and clearer, when all such issues are resolved.

Answer: Thanks for your comment. We have revised this type of grammatical error throughout the manuscript.

6. Line 80 – “land-use” should be “patterns of habitat use” or simply “habitat use”; the former refers most commonly to how humans use landscapes for anthropogenic activities. Not sure what “the scales” means, on line 81.

Answer: Thanks for your comment. We have revised “land-use” into “habitat use”. “the scales” means “spatial scale”, we have revised this expression.

The manuscript has been revised carefully and strictly according to your comments. We hope our modification and explanation is clear enough, however, if there is still any question, please do not hesitate to contact us.

Yours sincerely

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