

Interactive comment on “The distribution pattern of desert riparian forests and its relationship with soil moisture and soil properties in the low reaches of Heihe River Basin, China” by J. Ding et al.

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Received and published: 1 August 2016

We thank reviewer for the detailed comments. We have gone through all the comments and will amend the original manuscript based on the suggestions and comments. In the following pages we provide brief answers to the review comments and we will make corresponding changes after we receive the editorial decision.

General Comment: Reviewer: Desert riparian forests are highly fragile ecosystem to climate and environmental changes. On the other hand, they serve as a haven for deteriorating desert ecosystems until their being threatened by impacts of changes. And,

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it is timely and relevant to have many studies on desert riparian vegetation ecology and function, as this one. The paper is well-structured and written, as well. However, the introduction lacks a clear definition of a problem. The introduction is full of background information; like, what has been done and what is already there... Such statements cannot justify a problem of a scientific work. There has to be a strong explanation of gaps, drawbacks... those pertinent to the subject of the work.

Authors: We thank the reviewer's suggestion and we will carefully rewrite the Introduction section to clearly emphasize the knowledge gaps (i.e. the distribution range of desert riparian forests, the influence of soil properties on the desert riparian forests and the variation pattern of biodiversity along water availability gradients), which will help justify the problem of our scientific works.

Reviewer: Moreover, simple richness and classification analysis could imply "the same old story". It feels to me that more can be done with existing data beyond analysis of richness and diversity of riparian vegetation. An example is combining with current affairs like climate and environmental change, resilience, elasticity...

Authors: We thank the reviewer's constructive suggestion on further delving into the data. As suggested by the reviewer, we will try to include climate change, environmental change, resilience, and diversity indices into our revision. As community characteristics (i.e. species richness and community diversity) could improve community stability during a disturbance, these factors are usually used as indicators for vegetation resilience (Fischer et al., Philosophical Transactions B, 2016 and Samantha et al., Journal of Vegetation Science, 2016). In our sampling, the desert riparian forests were distributed along the gradient of water availability (the distance from river channel). Research on the variation of community characteristics (i.e. species richness and community diversity) along the decrease of water availability could help to discuss the vegetation resilience with the increasing drought stress and further provide reference for the ecological management under drought scenario caused by climate change. In our revision, we will recreate the Fig 3-4 and add the comparison of community charac-

teristics among different gradients of water availability in the Results section. Furthermore, we will add discussion on the variation of vegetation resilience along the water availability gradient and provide management suggestion under changing environment by redeveloping the first and third section of the Discussion.

Reviewer: What is “low reaches”? This is not a professional wording; better to use simply “oasis” or “downstream”, or give explanation for what “low reaches” is. It has to keep consistency, as well, in some places printed as “lower”?

Authors: Following the reviewer’s suggestion, we will replace the “low reaches” with the word “downstream” throughout the manuscript to make the description accurate and consistent.

Reviewer: The method needs more explanation how all the sampling and data collection was accomplished in one month (July 2015). Quadrants were set for collection of data on herbaceous vegetation just after the rain; what about desert-herbs those can be found before the rain?

Authors: We thank the reviewer for the suggestion. Water availability in our study site was greatly affected by regulated water conveyance (which we will add in the Methods section) rather than the scarce precipitation of the region. Our study area belongs to hyperarid zone with mean annual precipitation below 39 mm and only 9.11 mm falls in July. There was only one rainy day on July 21 2015 when we conducted the sampling from July 10 2015 to July 30 2015. The surface soil quickly dried up before the next day due to the high evaporation (approximately 600 mm during the July). Water conveyance in the early July was therefore the only source of water for the area. Based on this condition, germination of desert herb merely benefit from the scarce precipitation, so we did not take into account the desert-herbs that can be found before the rain. As suggested by the reviewer, we will add the explanation on sampling and data collection in the Methods section.

Detail comments:

Reviewer: Title: delete the second “soil” in the second line

Authors: Following the reviewer’s suggestion, we will delete this word.

Reviewer: Page 2 Line 3: delete “of”

Authors: Following the reviewer’s suggestion, we will delete this word.

Reviewer: Page 6 line 8: “this area”, which area?

Authors: The “this area” means the downstream of Heihe River. We will replace “this area” with “the downstream of Heihe river” to make it more clear.

Reviewer: Page 6 line 17-18: please provide professional soil-type names; “grey desert soil” is not in nomenclature of soils.

Authors: We will replace “grey desert soil” with professional soil-type names (i.e. shrubby meadow soil and aeolian soil)

Reviewer: Page 7 line 4-6: seems part of introduction, not methods

Authors: We will delete these lines.

Reviewer: Page 7 line 9: please define what “desert riparian forests” are in your research area?

Authors: As suggested by the reviewer, we will add the detailed definition of “desert riparian forests” in the downstream of Heihe.

Reviewer: Page 8 line 1-8: preferable to put in table

Authors: Following the reviewer’s suggestion, we will put Page 8 line 1-8 in the table annotation.

Reviewer: Page 10 line 1-14: Why Monte Carlo run needed? Can’t Principal Component Analysis handle that size of data?

Authors: The Monte Carlo forward selection is a part of RDA (Redundancy Analysis).

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The RDA is an ordination analysis with the aim of finding variables as the best predictors for the vegetation distribution. As the Monte Carlo forward selection can directly shows significance and contribution rate of each factor (Lepš et al., Cambridge University Press, 2003), we chose this method rather than the Principal Component Analysis (PCA). We will explain it more clearly in the Methods section.

Reviewer: Page 10 line 17-22: please give details of TWINSPAN analysis in methods

Authors: As suggested by the reviewer, we will provide detailed description of the method of TWINSPAN analysis in Methods section.

Reviewer: Page 10 line 27-28: what does disturbed community mean?

Authors: The “disturbed” is actually “distributed”, we will check and revise it.

Reviewer: Page 13: Figure 3 and 4 can be combined

Authors: Following the reviewer’s suggestion, we will combine these two figures into one figure.

Reviewer: Page 14 line 2: We know for what SWC stands for, what are those attached numbers stands for? Ok, it is given in the caption, but, is also needed in the main text.

Authors: As suggested by the reviewer, we will add the explanation of SWC when it appears in the main text.

Reviewer: Page 17: the need for Table 3 is clear; why is Table 2 (marginal and conditional effects are not main target of the study)

Authors: Table 2 allows the selection of the key influencing factors from the marginal and conditional effects. Marginal effects reflected the effects of the environmental variable on the community characteristics, while conditional effects reflected the effects of the environmental variables on the community characteristics after the anterior variable was eliminated by the forward selection method. The forward selection in the Table 2 allowed key variables to be determined through the strength of their effects and signifi-

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cance. Based on the key influencing factors selected in the Table 2, we further analyze the variation of community characteristics explained by different groups of key environmental factors, which is the result showed in Table 3. We will revise the title of Table 2 and explain the purpose of Table 2 in the result part to express the meaning clearly.

Reviewer: Page 18 line 17-18: the peculiar result from the vegetation analysis is the bi-modal distribution; do the soil properties show the same pattern; so that to say “variation in soil properties....” Page 19 line 22-24: YES! this can be an inference to the bi-modal distribution (in reference to the above comment)

Authors: We thank the reviewer's suggestion on improving our Discussion on how “variation in soil properties” may affect vegetation community. We will further develop this topic by referring to the results in Page 19 line 22-24.

Reviewer: Page 21 line 11-12: Here it says “vicinity to the main roads”? In the methods, it is indicated sampling was done far from roads; explain why?

Authors: In the Methods section, the description of “we chose sites that were far from farmlands, roads, irrigated channels and reservoirs” means that the general principle we choose plots is distant from the roads and paths as far as possible to minimize the human disturbance (i.e. grazing and firewood cutting) on the vegetation communities. However, in the study area, there is a main road extending across the oasis and almost parallel to the river channel. As the distance of each sampling plots from the river channel is fixed, it is impossible to avoid sampling near the main road which extends parallel to the river channel. Currently, the vegetation community growing nearby the road is unlikely to be disturbed by human as the road is separated from the surrounding by iron wire. So sampling near the main road does not go against with our general principle to minimize the human disturbance (i.e. grazing and firewood cutting) on the vegetation communities. In addition, there are only 4 points located within 300m from the main road, thus the data obtained from those points did not affect the overall analysis result. But the vegetation communities growing nearby the main road may be disturbed by

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human activity in the future due to increasing population living and traveling there. The living range (1000m from river channel) mentioned in Page21 line11-12 is located near to the main road, which means this gradient (1000m from river channel) is likely to be disturbed by human activity in the future due to its easy accessibility. So we described the area that distant 1000m from river channel as “vicinity to the main roads” and listed the possible human influence on this gradient in the following sentences. We will explain it clearly in the Method part and add the main road in the Figure 1 to make it easier to be understood.

Reviewer: Page 21 line 12-15: To give management options for livestock control; there is a need to have socio-economic background information, specifically to livestock, somewhere in the introduction or in methods.

Authors: Following the reviewer's suggestion, we will add the socio-economic background information in the introduction to make this discussion part more complete.

Reviewer: Page 22 line 4: what are “artificial channels”? or take the whole sentence to Introduction; also line 6, if human disturbance is a problem give a brief background in the Introduction

Authors: The “artificial channels” means that the river channel built perpendicular to the river with the aim of delivering the water for irrigation. The channel was built by the concrete which generating little benefit to these vegetation communities, comparing the natural channels that have the seepage property. As we chose points that distant from the roads, farmlands and irrigated channels as far as possible to minimize the human disturbance, the human disturbance mentioned in line 6 is not the main factor that shaped the vegetation community. It is the possible disturbance on the vegetation community that needs to be considered in the future management. As suggested by the reviewer, we will put the sentence of “artificial channel” in the Introduction and add the information of possible human disturbance in the Introduction part.

Reviewer: Page 22 line 21-26: many more services can be told

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Authors: Following the reviewer's suggestion, we will add discussion on more ecosystem service, such as sand fixation, water conservation and carbon sequestration in this discussion part to fully illustrate the importance of conserving ecosystem.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-214, 2016.

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