

Biogeosciences Discuss., referee comment RC2
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Comment on bg-2022-129

Anonymous Referee #2

Referee comment on "Environmental drivers of spatio-temporal dynamics in floodplain vegetation: grasslands as habitat for megafauna in Bardia National Park (Nepal)" by Jitse Bijlmakers et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-129-RC2>, 2022

The manuscript by Bijlmakers and colleagues presents a nice study on the vegetation dynamics over several decades in a protected area in Nepal, characterized by very dynamic floodplains with mosaics of grassland and forests. The study uses mainly aerial photographs dating back to 1964, LANDSAT imagery from 1993 to 2019, and extensive ground truthing data collected in 2019.

General comments

Overall a very interesting study, rich in detail – perhaps a bit too much, it is a long read and while the detail in some sections will be of interest to a dedicated audience, I would encourage the authors to reflect what might equally well go into a supplement without losing the main message of the manuscript itself. My suggestions are minor and listed below.

Specific comments

- title and elsewhere in the ms: "space-time dynamics": spatio-temporal dynamics ?
- L11: "and the prey of": and for grazers which form the prey of
- L12: for encroachment: to encroachment
- L15: "two annual time series": this is ambiguous, rephrase to better reflect what you did. It's only after reading the Methods section that this was clear. "two annual time series" can equally mean you collected detailed data covering a period of two years.
- L17: "grasslands saw a transition..": grassland patches decreased in size and abundance, and their total areal loss occurred mainly through encroachment by forest ?
- L18: "successional setbacks of grassland": consider rephrasing this term, it only comes back once in the manuscript itself, and I found it not very clear when reading the abstract stand-alone.
- L21: consequence: a consequence
- L24: "is in an increasing trend": "shows an increasing trend" or "is increasing"
- L31: Would suggest to rephrase to "Their global areal extent has decreased by 40% since the Industrial Era." This number surprised me – needs a reference.
- L44: introduce the abbreviation somewhere (TAL)

- L53: "next to": In addition to
- L55: "rhino": use a more specific common name ?
- L57-58: suggest to rephrase to: "...would be greatly affected if changes occur in the composition and areal extent of ..."
- L70: "forestation": forest encroachment ? forest development ?
- L74: "conditions are explicitly analysed": have been explicitly identified ?
- L79: "in earlier times": that could be anything – be more specific
- L95: add comma after 'inundation'
- L110: delete "More region and context specific".
- L111: was tackled: has been tackled
- L112: delete "specifically"
- L137: "of the last three decades": during the last three decades
- L141: "from 1964 to 2019": between .. and ..
- L142: "Sal forest" and L 210 "Khair-Sissoo forest": readers will not be familiar with this. Perhaps describe this in a few words.
- L145: "small time scales": short time scales
- L157: "for its accessibility": due to ..
- L185-186: "are not considered to be of sufficient density": rephrase to : "are considered not to be sufficiently abundant to create and maintain grassland patches (Thapat et al., 2021)."
- top section page 6: there is not much info given on herbivore population densities- only a number for elephants and rhino. Other grazers likely occur in higher densities, and their abundance might have evolved over the several decades since the are received protective status ? Do these grazers also not play a role in vegetation dynamics ? I miss some info on this in the introduction, but also (mainly) in the discussion. The potential role of herbivores as a driver merits some more discussion, or more arguments to dismiss it if the authors are convinced they do not play a role in explaining vegetation dynamics.
- L188: delete "of origin"
- L195: delete "upon"
- L196: comma after "later on"
- L220: no capital C for cylindrica
- L315: Provide more details on the hydrological data. This sentence suggests that you only have access to yearly maximum and minimum discharge but not full, continuous discharge records ? What is the resolution of the measurements (daily, hourly, monthly averages ?). In section 4.2 it becomes clear that there is a continuous discharge record, but we don't really get any feeling of what a typical hydrological year looks like – it would be good to show data for a number of typical years in a supplementary Figure.
- Moreover, the analysis of the influence of discharge is now restricted to looking at peak discharge during a given year, and looking for relationships with vegetation cover between that year and the next one. Is peak discharge the best and only proxy, though ? Would it not be of interest to look at annual discharge, or flood season discharge ? I can imagine it's not just the maximum Q that matters, but also duration of floods ?
- L333: "this is an overestimation": any idea how much this overestimation might be in relative terms ?
- L343: add comma after "time series"
- L350: as a second indicator
- L350: add comma after "dynamics"
- L348-350: something wrong with this sentence, does not seem complete
- L391: "oppositely": in contrast
- L391: between 1964 and 1993
- L413: "observeable": observed
- L414: "entirety of the": entire
- L420: "areal development of land cover": Land cover dynamics ?
- section 4.1.2: I don't find it very obvious to see some of the trends described in Figure 4. Perhaps partially related to the colors used, either way I would suggest to provide some actual numbers in the text rather than only refer to the Figure.

- Figure 4: PD, ED, LSI, AI: took me a while to find back what these abbreviations represent. Write them in full in the Figure caption and/or refer to Table 3. I would suggest to also refer to Table 3 in section page 452-456 to guide the reader.
- section 4.2: see earlier suggestion – might be worth exploring the discharge data beyond simply max Q.
- L479: “the recorded discharges”: annual, peak ? be more specific.
- L479: “of a larger magnitude”: higher
- Figure 5c and 5d: use . as decimal separator
- section 4.3: how should we see such a transition of grassland to bare land – in the floodplains it is basically erosion or sedimentation, correct (based on L548-549)? How about outside the floodplains – what are mechanisms to change from grassland to bare land from one year to the other ?
- L516: space-time: spatio-temporal ?
- L524: “development of land cover”: land cover dynamics ?
- L529-530: use italics for species names
- section 5.2.1: use “higher” rather than “larger” when comparing discharge (L565 and 584)
- L630: “retard”: awkward, rephrase.
- L640: “then”: than
- Discussion, section 5.6: see comments on intro. I feel some discussion on the potential role of herbivores is warranted here.