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Hydrology and Earth System Sciences Discussions

Interactive comment on "Road and stream network connectivity and potential: northeastern Puerto Rico, an exploratory analysis" *by* K. R. Sherrill et al.

K. R. Sherrill et al.

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Anonymous Referee #1:

In response to the general comments from the Anonymous Referee 1:

Comment # 1: “The work is not well-cited, particularly in the discussion section. It would be helpful to know, how does the authors’ specific results compare to other studies relating stream geomorphic/biotic variables to landscape-level variables? Does explicitly accounting for roads (a more novel aspect of this study) improve the predictive ability of such models, as compared to other studies which did not account for roads?

Response: A more thorough literature review and discussion comparing and contrasting previous research which used landscape level variables would benefit the paper. Likewise as suggested emphasizing the uniqueness of including road characteristic variables should be done. While it is not possible to know how much increased model fit would result from the inclusion of road variables in other related geomorphic/biotic landscape level studies, it would be interesting to perform such an analysis.

Comment # 2: “The logic for the selection of the biotic variables is vague other than they are in use for a related, larger project. However, diversity measures can be quite misleading and problematic if an area is occupied by invasive species. A stream may be quite diverse but this is not necessarily an indicator of any sort of ecological integrity. It is implied that the diversity measures are meant to represent something related to positive stream health conditions or ecological integrity (excuse those loaded terms), but it is not well explained why these measures are useful for documenting the ecological status of the watersheds?

Response: The biota and geomorphology variables were selected because they are part of a larger biocomplexity project. This question really touches on a major limitation of this study, namely we used the best available data to study road and stream network interactions. Unfortunately the stream biota and geomorphology response variables are not directly influenced by road and stream network connectivity but rather they are indirectly influenced, thus we were forced to hypothesize about the relationship between the responses (biota, geomorphology) and road and stream network connectivity. We specifically address the issue of using variables which are indirectly influenced by R/S connectivity on lines 19-25 on page 1742, section 2.4 Modeling Response Variables.

We agree with the statement that “a diverse stream doesn’t necessarily imply a stream with high ecological integrity”. However in order to have an informative discussion about the developed biota models we believed it was beneficial to develop a hypothesized relationship between the biota richness variables and R/S con-

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nectivity where we state “Biota richness variables are expected to be negatively related with R/S connectivity” Lines 20, page 1743, and section 3.2 Response Variables. Further in the paragraph we do emphasize that “It is necessary to emphasize this is a hypothesized response, as not all human induced changes are environmentally damaging, and care should be taken to avoid prejudging all human change as degrading (Lugo and Gucinski, 2000). Lines 23-25, page 1743.

Comment #3: Why do the geomorphic and biotic models have such differing explanatory powers (i.e. R2)? Could this be due to difference in the scale at which hydrologic variability would be expected to influence one set of variables over the other?

Response: It seems very plausible that the scales of influence for the biota and geomorphology variables are different. Likewise the hydrologic scale of variability for Grain Size and Channel Width (with high R2 values) may differ from Channel Depth and Pool Volume (with lower R2 values). Are these large differences due to inappropriate scales of study or the use of poor explanatory variables, or maybe a combination of both? Regarding scale interestingly 13 of the 14 best fit models (6 biota and 8 geomorphology) as measured by AIC and R2 occurred at the all scale of study, suggesting that biota and geomorphology response variables are influenced by processes and patterns which are occurring across numerous scales of influence.

Comment #4: “b. Does the strength of the statistical relationships vary among watersheds with large, medium, small streams? Or roads of various size?

Response: We did not explicitly test for differences by watershed. Our study area consisted of two watersheds, and it would be interesting to perform the analysis on a watershed basis and to compare between watersheds with differing stream orders as well as road densities. In the case of the Rio Mameyes and Rio Espiritu Santo they are relatively similar in stream order and road density composition. In this study we were also limited in our ability to perform analysis on a watershed basis due to a relative small field data sample size of 25 across the two watersheds.

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Comment #5: “c. Lastly, while the logic behind a multi-scale approach for this type of work is quite sound in the published literature, the literature supporting this approach is not discussed well in the paper. There are many paper specifically detailing directly multi-scale interactions of streams and watersheds which are not cited. Instead, more generic Hierarchy Theory papers are cited. Furthermore, in the discussion of the results, no comparison is made of the authors’ findings to those of the other multi-scale papers”

Response: Point noted the addition of a more thorough discussion regarding multi-scale papers dealing with stream interactions and how these papers compare with the results found in this research would be beneficial.

Specific comments 1: “The first paragraph focuses on the impacts of roads on terrestrial ecosystems. Rather, relevant research related to landscape indicators and streams should be discussed.

Response: This comment is noted, and would be accounted for by addressing the comments of 1 and 5, which ask for more in depth literature reviews and subsequent comparisons with the results found in this research.

Specific comments 2: “The last sentence of the abstract should be more compelling to emphasis what is new or novel about this work”

Response: Yes, in order to emphases the more novel aspects of the research it would be desirable to explicitly state in the abstract that road characteristic variables were incorporated to better understand the interplay between environmental and road characteristic variables which lead to R/S connectivity interactions.

Specific comments 3: “Table 3. The header needs to clearly state these are hypothesized relationships (otherwise the looks like a summary of results).

Response: This can easily be corrected, by adding the suggested hypothesized results text in the first row of the table.

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Specific comments 4: “Tables 6 and 7. The emphasis in these tables is on the differences in models seen with X and Y variables versus not; whereas the questions of the paper and methodological design relate more to questions of scale, stream size, and road size.

Response: The inclusion of the modeling results with X and Y included in tables 6 and 7 is not specifically related to our study of R/S connectivity. Due to the strong north-south topographic gradient within the study area we found that the inclusion of the x and y variables resulted in increased model fit, which we thought was an interesting ancillary finding worthy of inclusion in the paper. However that said we are not opposed to the exclusion from the paper as we agree it might be more beneficial to the overall flow of the paper to keep this out.

Specific Comments 5: “Figure 1. Some sort of figure here is probably necessary, but this one is unclear and does not convey the primary points well.”

Response: It is a difficult concept and we believe the figure provides a beneficial visual representation of the concept of Road and Stream Network Connectivity Potential (RSNCP).

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 1731, 2008.

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