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Discussions

Interactive comment on "Use of geomorphic, hydrologic, and nitrogen mass balance data to model ecosystem nitrate retention in tidal freshwater wetlands" *by* E. D. Seldomridge and K. L. Prestegaard

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We thank Reviewer 2 for constructive comments to improve the overall quality of this manuscript. All suggestions for clarifications and typos will be addressed in the revised manuscript.

This study used a field-based approach to examine the spatial distributions of geomorphic characteristics (marsh area, channel length, and inlet channel width) in the freshwater tidal wetlands, and to develop relationships among geomorphic characteristics,

hydrologic flux, and nitrate retention for individual marshes and the entire ecosystem. Geomorphic measurements (inlet width, channel length) from aerial photos were compared with in situ field measurements. The relationship between inlet width and inlet cross sectional area was developed from field measurements of 18 channels. Previous studies on the Patuxent River by our research group were also incorporated into the data base for error analysis (Smith-Hall, 2002; Phemister, 2006; Jenner, 2010).

Inlet width was the most easily defined and accurately measured geomorphic parameter. Tidal inlet width for all channels was measured from air photographs. We did not find inlet channels in the field that were too small to be identified on air photos; therefore, the database of inlet channel widths was determined to be the most complete. Although each inlet connects to a channel network with a corresponding channel length and marsh surface area, these length and area measurements could not be accurately identified for all inlets, particularly those with the smallest inlet widths or where marsh vegetation obscured interior marsh channels. Inlet width measurements for which either marsh area and/or channel length could not be measured were identified. The differences among the populations of these three databases provided an evaluation of the missing data. For example in section 3.1, we report 267 measurements of inlet channel width. Associated with these inlet width measurements, only 242 channel length and 142 marsh surface area measurements could be accurately made. The relationship of inlet width to both channel length and marsh surface area (Eqs. 7 and 8; section 3.2) were used to estimate the missing measurements, which completed the length and area datasets (267 measurements). Measurements of channel width in the field were similar to those measured for the same sites on aerial photographs (errors of $\sim$ 0.01% for GPS located sites on recent photographs). Operator error of multiple measurements of channel width measurements produced larger variations, e.g. from 1.72% to 1.29%, due to variations in the choice of location for the inlet width measurement by different operators or the same operator at different times. Operator error on other geomorphic parameters is larger than for inlet width. Although measurement error and missing data were problems associated with the error of air

photo measurements of relatively small features, relationships were developed among the main geomorphic parameters. Field sites were chosen from the range of marsh sizes; therefore, we think it is reasonable to apply geomorphic and hydrologic relationships (Figs. 6 & 7) to the cumulative geomorphic distributions to develop ecosystem estimates for nitrate retention and hydrologic flux for a baseline condition of a single, spring tidal cycle during the fall season. A better ecosystem estimate could be made if additional hydraulic variables were measured, and these results will be addressed in future papers.

Comments 4 and 7 are addressed in the response to Reviewer 1's comments, as well as in Seldomridge (2009).

References

Jenner, B. A.: Hydraulic consequences of invasive Hydrilla (submerged aquatic vegetation) in tidal channels: Implications for wetland maintenance. University of Maryland Geology Senior Thesis, College Park, MD, 2010, http://www.geol.umd.edu/undergraduates/paper/paper_jenner.pdf.

Phemister, K.: Characterization of the spatial differences in hydrological functioning in a tidal marsh, Patuxent River, MD: A framework for understanding nutrient dynamics. University of Maryland M.S. Thesis, College Park, MD, 2006.

Seldomridge, E.: Importance of channel networks on nitrate retention in freshwater tidal wetlands, Patuxent River, MD. University of Maryland M.S. Thesis, College Park, MD, 2009.

Smith-Hall, L.: Channel network and morphology in a tidal freshwater wetland in the Patuxent River. University of Maryland Geology Senior Thesis, College Park, MD,

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