Mapping Conservation Opportunities for Nutrient Retention

Erik Rieger | Duke Nicholas School of the Environment | April 2021

Nutrient Pollution in the Chesapeake Bay Watershed

In recent decades, transport of nitrogen and phosphorus to water bodies have created a significant pollution issue in the Chesapeake Bay Watershed (Ator and Denver, 2015). This stems from point and nonpoint sources, including septic, sewage treatment, industry, lawns, and agriculture (US EPA, 2013). Excessive nutrient loading contributes to eutrophication, which has resulted in toxic algal blooms as well as a hypoxic environment capable of fostering harmful bacteria and negatively impacting aquatic and terrestrial biota (MDE, 2021).

Credit: Chesapeake Conservation Partnership

The Role of Conservation in Enhancing Water Quality

Historically, water quality has been the primary ecosystem service used to drive conservation in the Chesapeake Bay Watershed. This is formally accomplished through the U.S. EPA's Total Maximum Daily Load (TMDL), which currently aims to reduce nitrogen and phosphorus loads to the bay by approximately 25%. To date, most nutrient modeling in the watershed has been focused at the regional or sub-regional scale. However, this can make it difficult for local conservation organizations to identify the most critical, nutrient-retaining parcels for land protection. Estimations of nutrient flux at the parcel scale can help conservation organizations support the existing TMDL, the Chesapeake Bay Watershed Agreement, and the now federally mandated "30 by 30" conservation goals.

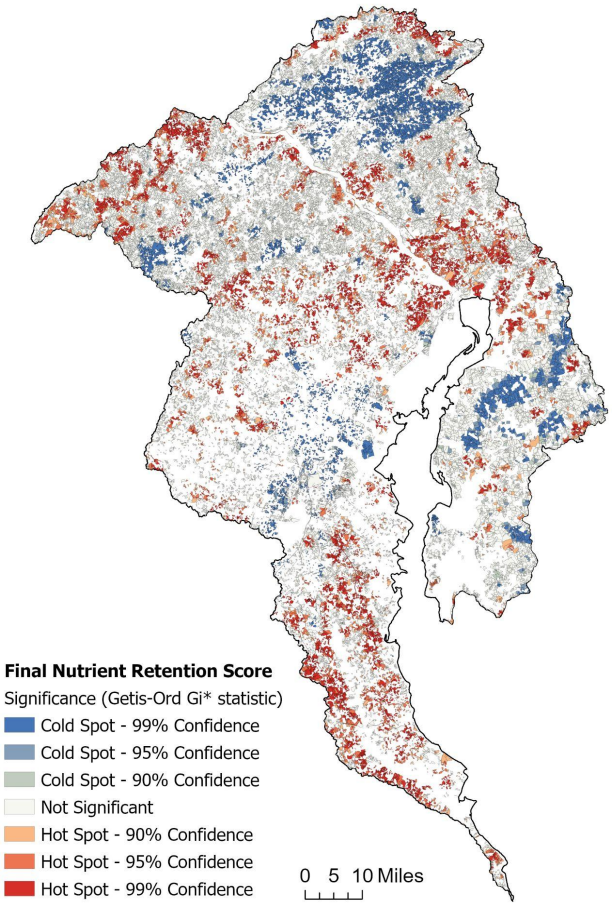

Figure: Parcels shaded orange to red shading (hot spots) reflect clusters with high nutrient retention scores. Parcels shaded grey to blue (cold spots) indicate clusters with low nutrient retention scores.

Spatial Analysis to Support Conservation of Nutrient Retaining Lands

This analysis quantified nutrient retention at the parcel scale. Using a composite nutrient retention score, unprotected parcels over 10 acres in size were identified throughout a sub-area of the watershed that currently provide nutrient retention services and, in some cases, additional co-benefits. Prioritizing these parcels for protection can help provide water quality benefits in the near to long term while providing the acreage necessary to conserve 30% of the watershed by 2030. This analysis also identified parcels with poor nutrient retention, which may afford opportunities for conservation coupled with restoration or other vegetation management. Lastly, the effect of future land use change upon total nutrient export was considered for agriculture, forest, riparian, and developed land uses.

References

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Author contact: Erik Rieger (he/him)
erik.rieger@duke.edu | erikrieger1@gmail.com