Summary of Natural Science Investigations:

Undergraduate Research Projects

Undergraduates assisting with the collection of ecological data spun off two separate projects.

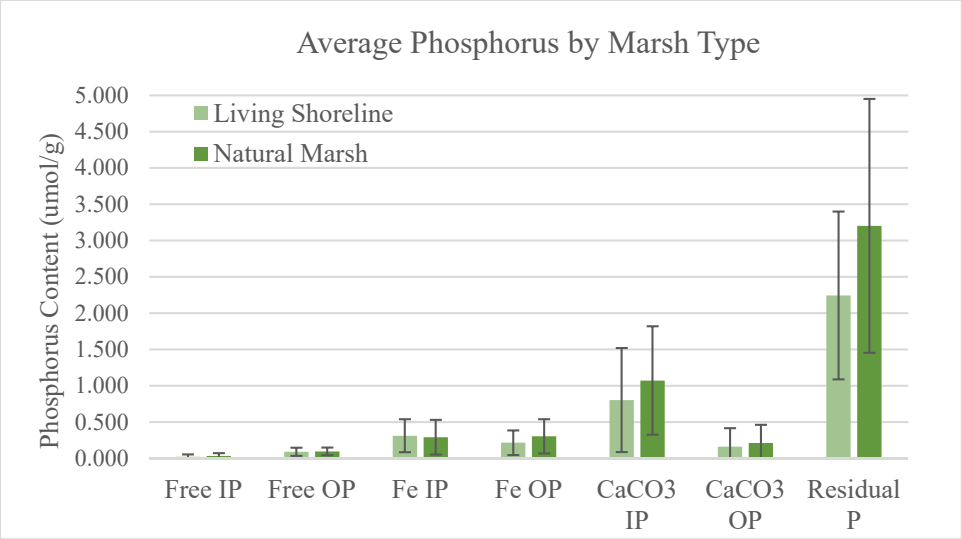
Project Activity: Forms of Phosphorus in Soils from Living Shoreline and Natural Marshes

Objectives: W&M Geology student Jun Shi ’19 completed a senior thesis examining differences in the pools of phosphorus (P) in soils from living shoreline and natural fringing marshes. Her hypothesis was that—because living shoreline marshes have not accumulated much organic carbon, forms of organic P would be lower from soils of living shoreline marshes.

Methods: Soil samples 0-5 cm were subjected to a seven-step, sequential extraction for different forms of inorganic and organic P. All extractions were completed in the Keck Environmental Lab at W&M, and P concentrations were determined colorimetrically using spectroscopy.

Progress to Date: All samples from the 13 living shoreline and 13 fringing natural marsh sites have been extracted and analyzed.

Preliminary Findings: For both living shoreline and natural marshes, the largest pools of P resided in the residual P (recalcitrant organic matter) and the inorganic P bound by calcium carbonate. Although more P on average was extracted from natural marsh soils, the differences between living shoreline and natural marshes were not significant for any of the seven extractions, nor for the total P (the sum of the extractions).



Project Activity: Distribution of Diamondback Terrapin Nesting Habitat in Virginia

Objectives: W&M Environmental Science student Holly Funkhouser '19 completed an Honor's thesis that developed a GIS-based model of the distribution of diamondback terrapin nesting habitat in Virginia, including locations along the shoreline of Chesapeake Bay and the Eastern Shore. Her objective was to identify "hot spots" for terrapin conservation and possible "cold spots" for habitat remediation.

Methods: Using GIS and maximum entropy modeling (MaxEnt), Holly edited and analyzed spatial data to determine optimal nesting habitats and how these locations will change as rising sea level forces land use shifts.

Progress to Date: Holly determined that essential nesting habitat factors include: distance to beaches, distance to core habitat (the marsh habitat terrapins occupy when not nesting), salinity, and placement of roads. Using this information, she created a model displaying the current distribution of terrapin nesting habitat throughout Virginia.

Preliminary Findings: We are currently completing model validation. Ten points were selected at random from each of four area categories where the model predicts 0-25%, 25-50%, 50-75%, and 75-100% terrapin nesting habitat (40 points in total). Researchers will travel to these locations in Virginia and complete a 30-minute visual survey for terrapins in the water (head counts) and nesting on land (evidence of nest crawls by female terrapins; nest predation holes; egg shell remnants).

Holly is still working on applying her model to projected changes in nesting habitat with sea level rise.