Spring Stream Sampling in Maryland’s Coastal Bays
2006 - 2015
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Background
Mid-Atlantic Coastal Lagoons, specifically known as Maryland’s Coastal Bays, have been acknowledged to be facing threats from intense development, excess nutrients and sediments, and other stresses associated with human activities. Spring water quality samples at non-tidal sites at each of the major tributary streams also revealed high nutrient levels. The purpose of this study was to evaluate ambient water quality conditions in non-tidal surface waters to target degraded streams for restoration. Over a ten year timeframe, 2006-2015, water samples were collected each April from 58 perennial streams to measure nutrient and chlorophyll a concentrations. In the absence of established nutrient criteria, a statistical analysis of the decadal data set revealed 25th and 75th percentile thresholds that were used to measure individual stream site medians for categorization (Best, Good, Fair, Poor and Very Poor). An index of these thresholds for total nitrogen, total phosphorus, nitrate/nitrite, ortho-phosphate, chlorophyll a, and dissolved oxygen concentrations was created defining relative health among stream sites. A sum of score values revealed one stream that should be considered as a reference (lowest concentration which was equated to least anthropogenically impacted), 12 were in good condition, 37 in fair condition, and 8 were in poor condition. While individual water quality parameters have been found to exceed the 95th percentile of the data set, collectively all parameters, when viewed together in the index, did not result in the category of very poor condition. The thresholds for each parameter are compared to other studies within and near the watershed as well as literature values for relevance. In addition, land use is incorporated where ever possible to ascertain pollution source for evaluation of potential for remediation and restoration.

Methods
Sampling occurred every April under baseflow conditions from 2006 through 2015. Whole water and filtered water grab samples were collected, iced and analyzed for total phosphorus, total nitrogen, ammonia, nitrate/nitrite, orthophosphate and chlorophyll a (fluorometry) concentrations at the University of Maryland Horn Point Laboratory using EPA standard methods. Field blanks were utilized daily and analyzed for potential cross contamination among samples and/or supplies. Field measurements for dissolved oxygen, conductivity, salinity, and temperature were collected using a YSI Pro2000; turbidity, pH and stream flow were measured with Hach, LaMott and Geopacks field equipment. Samples were collected after a minimum of 72 hours without precipitation to minimize storm flow influence.

Analysis
Nutrient results were analyzed based on a modified EPA method. Reference sites were defined as sites whose 75th percentile of data fell below the 25th percentile of all sites combined, for every parameter examined, excepting chlorophyll. Impacted sites were defined as sites whose 25th percentile exceeded the 75th percentile of all data, for more than one nutrient. Results were log scaled to show differences in magnitude, and increasing or decreasing trends were identified.

Results
At the subwatershed scale trends are more discernable, however each stream tells a different story.

Abstract

Issues

Conclusions

This study reveals a closer sub-watershed scale is needed for targeting restoration efforts. Individual reference streams should be targeted for preservation, while impaired streams should be targeted for restoration. Five reference streams were identified, one of which was the most pristine and serves as a model for good stream health. Eight impaired streams were identified for restoration, three of which exceeded the nutrient threshold in three or more parameters. Attention should be paid to which nutrient is in excess, as only Sand Branch, Robins Creek, and Riley Creek are high in both. Red indicates a median above the 75th percentile of the entire dataset, green indicates a median value below the 25th percentile. Arrows show increasing or decreasing concentrations over time, two arrows represent a significant trend.

Streams with multiple nutrient parameters >75th percentile: target for restoration

Spanishwoman Back Creek @ Catepiller Lane 0.056 0.060 0.060 0.056
Chincoteague Powell Creek 0.058 0.058 0.058 0.058
Chincoteague Sand Branch 0.07 0.07 0.07 0.07
Chincoteague Robins Creek UT 0.291 0.291 0.291 0.291
Chincoteague Riley Creek 0.242 0.242 0.242 0.242
Chincoteague Dorrer UT to Brookenort 0.698 0.698 0.698 0.698
Newport Marshall Creek UT 2.624 2.624 2.624 2.624
Impaired Eagles Landing Golf Course 2.642 2.642 2.642 2.642

Conclusions

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