GUANA NUTRIENTS BUDGETS & BIVALVES

Recommendations for the Guana Estuary

A final product of the "Guana Nutrients: Budgets and Bivalves" project is a list of water quality restoration recommendations for the impaired waters of the Guana Estuary. To ensure that the recommendations are relevant and actionable, the project team worked with members of the GTMNERR Technical Advisory Group and stakeholders of the Guana Estuary to identify best management practices (BMPs) to incorporate into scenario testing that reduce estimated pollutant inputs into the Guana Estuary. Based on data collected from the project team and stakeholder engagement, the project team's recommendations are outlined in this document.

Manage nutrient loads above weir

The Guana Estuary watershed above the Micklers weir is 19% natural land and 81% developed (of which 55% is categorized as highly developed). There are 2 golf courses and 1 WWTF. Based on projected development, there could be a 60-80% increase in nitrogen loads from the Ponte Vedra community by 2050. It is imperative to consider new ways to manage stormwater.

Create local model for scenario testing

The Pollution Load Estimation Tool (USEPA) can estimate load reductions associated with BMPs; however, BMP implementation would need to be applied at a large scale and could cost $250-$350M. A locally-based model would identify locally-relevant BMPs.

Invest in load and discharge data

Physical challenges limited the collection of hydrological discharge data. Without this data, it was difficult to identify how changes in watershed management alter nutrients. Through a strong collaboration with Alberto Canestrelli, University of Florida, modeling data was collected and is utilizing nutrient data from this project to develop a hydrodynamic model. It is recommended to install gauge systems at Mickler's weir and upstream in Ponte Vedra.

Project team members exploring the headwaters of the Guana Estuary, May 2022.

Guana Estuary stakeholders and project team members discussing management opportunities during The Watershed Game play, May 2022.

Recommended citation: Smyth, A., Reisinger, A.J., Angelini, C., Baker, S., Ifju, P., Dix, N., Dietz, K., Fischman, H., Reimer, J., Dacey, J., and Perez, K. (2025). Recommendations for the Guana Estuary. https://nerrssciencecollaborative.org/project/Smyth20.

Identify organic nitrogen sources

There is a lot going on in the Guana and many contributing factors to water quality. Nitrogen levels are high and are mostly in the dissolved organic form which is from the breakdown of organic matter, and possibly from stormwater.

Manage hog populations

Feral hogs, (Sus scrofa), consume mussels and trample cordgrass which reduces marsh primary and secondary productivity; however, they enhance denitrification. It is important to manage hog populations, but populations may not need to be completely eliminated.

Feral hogs consuming mussels along the Guana Estuary.

Harvest in-lake vegetation

Plant biomass stores nitrogen and traditional vegetation management actions have the potential to release nitrogen back into the water. It is important to consider alternative vegetation removal methods that would permanently remove plant nitrogen from the system.

Avoid extreme changes in salinity

By varying the salinity within the system, there is a potential for nitrogen fixation to be increased which produces nitrogen. By limiting the extreme changes of salinity, the ecosystem function can be preserved by reducing nitrogen.

Support & enhance shellfish populations

Both oysters and mussels play a crucial role in cleaning water. Over 6% of upstream nitrogen is assimilated into shellfish shell and tissue each year (mostly by oysters north of harvest area). Mussels have a higher weight-specific filtration rate, but their overall contributions are limited due to shorter inundation periods. Overall, compared to saltmarsh and mudflats, bivalves double denitrification rates.

Consider restoration aquaculture

Oyster populations in the Guana River are not at carrying capacity and the system can support additional bivalves. Shellfish restoration aquaculture could be considered in the upper half of the Guana where growth rates are highest because harvesting can remove N permanently in Guana River.

Continue to collect data and engage with the community

Many actions can be taken to slow the transport of or treat nutrients before the enter the Guana Estuary. It is crucial to maintain communication between entities and the community.

Left: Project team members, Jenna Reimer and Dr. Shirley Baker, checking the nitrate sensor at the Mickler's Weir.

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