BE ON THE TEAM TO THINK DOWNSTREAM:

NITROGEN

WHAT IS THE PARAMETER?

Nitrogen is a key nutrient in water systems and is essential for plant and animal life. Though nitrogen is needed for an ecosystem to thrive, anything in excess can cause impairments. The common forms of nitrogen are nitrate (NO_3^-), nitrite (NO_2^-) and ammonium (NH_4^+). These different forms are present in many types of fertilizers or natural organic matter.

Marsh landscapes inundate water with natural sources of nutrients from runoff and plant decomposition. Photo by M.P. Hayes

WHAT AFFECTS THE PARAMETER?

There are many environmental factors that can aid in the transport of nitrogen from the source to waterways. Whether from natural sources, fertilizers or municipal wastewater, the nitrogen will be converted into different forms by microbial activity, sunlight, soil characteristics and plant uptake. For example, when nitrogen reaches waterways through runoff events or effluent discharge, warm water conditions and high counts of microbial communities will promote the rapid conversion of nutrients into energy. This will yield algae blooms and reduced dissolved oxygen for stagnant systems. Nitrogen can be viewed as a ready source of nutrients for plants and organisms to provide energy and life.

WHERE DOES IT COME FROM BROADLY AND SPECIFICALLY TO LOUISIANA?

Nitrogen enters water bodies from various sources because of the high abundance in natural and synthetic systems. This compound is a key ingredient in fertilizers and industrial products, while also being prevalent in natural organic matter and waste. The balance of nitrogen in the environmental ecosystem is critical for plant and organism health but difficult with a wide range of sources that input excess nutrients. Using the Louisiana Department of Environmental Quality's Water Quality Integrated Report the following sources have been identified as causing nitrogen impairment around the state:

- On-site septic treatment systems
- Industrial point source discharge
- Livestock feed operations
- Natural sources
- Landscape erosion
- Agricultural
- Urban runoff
- Municipal point source discharge

HOW DOES IT AFFECT THE SURROUNDING ENVIRONMENT?

Excessive nitrogen in waterways can promote the growth of algae and aquatic plants, leading to algal blooms that deplete oxygen levels. The enrichment of a waterway with nutrients is called eutrophication and can lead to hypoxic conditions or “dead zones” where oxygen is depleted. Low oxygen levels can lead to fish kills and harm other aquatic organisms, disrupting ecosystems. These conditions can persist in any size waterway from small ponds to the Gulf of Mexico. The conditions can be intensified by warmer temperatures, increased microbial activity and a sufficient concentration of dissolved oxygen.

WHAT ARE TRADITIONAL MANAGEMENT PRACTICES?

The management practices for nutrients like nitrogen involve implementing plans to optimize fertilizer use and reduce nitrogen runoff, including soil testing and precision agriculture techniques. It is critical to carefully read instructions to determine the proper concentrations of fertilizers, timing of applications and what crop types influence nitrogen runoff. Rainfall and irrigation practices can wash nitrogen into waterways if fertilizer is overapplied. Planting cover crops can absorb excess nitrogen and prevent soil erosion during off seasons. Reducing tilling can also reduce erosion. Establishing vegetative buffer strips along waterways and crop fields to intercept and filter runoff before it enters water bodies can help. In Louisiana especially, restoring wetlands to naturally filter and absorb nitrogen from runoff helps reduce nutrient impairment. For additional recommendations, the LSU AgCenter’s Soil Testing and Plant Analysis Lab can provide a service lab platform for sample analysis and recommendations for various nutrients concentrations. From urban runoff, residential users should understand that soil characteristics and landscape features impact nitrogen leaching and runoff. Impervious surfaces and drainage patterns can lead to lawn and garden fertilizers being transported to waterways during rain or watering events. Additionally, improving wastewater treatment processes to remove nitrogen more effectively before discharge is a best practice for Louisiana residents. To prevent excess nutrient release, it is encouraged that individual septic systems in residential areas should be inspected every six years after installation and pumped every eight years or as necessary to ensure the most efficient treatment for septic systems.

RESOURCES

https://www.epa.gov/system/files/documents/2021-07/parameter-factsheet_nutrients.pdf

https://www.epa.gov/nutrientpollution

https://deq.louisiana.gov/assets/docs/Water/Pub2994-G-NPS-Nutrients.pdf

http://www.deq.louisiana.gov/page/louisiana-water-quality-integrated-report

https://www.lsuagcenter.com/portals/our_offices/departments/spess/servicelabs/soil_testing_lab/recommendations/soil-recommendation-sheets

AUTHORS

M.P. Hayes, Assistant Professor in the School of Plant, Environmental and Soil Science and Louisiana Sea Grant
Edward Bush, Professor in the School of Plant, Environmental and Soil Science
Ruth Nolan, Undergraduate Student at LSU College of Agriculture

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