

Improving Water Quality Utilizing Green Infrastructure

Initiative Summary Statement:

Improve water quality through a coordinated water quality improvement assessment, policy recommendations, and direct actions that advance nature-based solutions and green infrastructure.

Initiative Description:

Objective: Invest in regional actions and policies to improve water quality by addressing historical and potential challenges faced throughout the area. Advancements include but are not limited to leveraging current and planned Lee County areas in need of water quality improvement to identify regional goals, policy recommendations, and projects through nature-based solutions and green infrastructure.

The County's freshwater and estuarine resources are at risk of contamination from pollutants (which include nutrients like nitrogen and phosphorus, as well as bacteria, sediment, and heavy metals and other pollutants) from various sources, including urban runoffs, human wastewater byproducts, and excess fertilizer. The Florida Department of Environmental Protection regulates water quality by setting standards for the maximum amount of pollution, known as Total Maximum Daily Loads (TMDLs), that are present in the environment. "Nutrient loading" - the amount of nutrients in the water - in excess of the TMDL standards means that a water body is considered impaired. The quality of the groundwater and surface waters has direct implications for public health and quality of life, the environment including wildlife, and the economy of the region.

Communities can implement a wide range of green infrastructure solutions to minimize pollution and nutrient loading for the purpose of improving and protecting water quality including land acquisition, permeable pavements, greenways, wetlands, stormwater parks and more. Green infrastructure incorporates nature-based solutions like soil, ponds, and plants - into human-made environments; this infrastructure helps to retain and treat excess water from stormwater, which slows runoffs, allows water to percolate and be treated naturally, while increasing groundwater recharge instead of being directly discharged to nearby waterbodies. This train of various nature-based processes built as long-term infrastructure overall contributes to reducing pollutant overflows. However, possible solutions may come with alternate risks; conducting a cost-benefit analysis on proposed projects that address water quality will help identify the most appropriate path forward with the least implications.

Need: Hurricane Ian contributed to existing water quality deterioration and pollution in many of the County's waterways. The storm stirred up already present pollution on land and in waterways, and the storm debris contributed to hazardous conditions that rendered some beaches and waterways unusable for a time. Floodwaters (including from storm surge and stormwater) picked up many materials and substances and then distributed those pollutants throughout the watershed. The excess nutrient pollution from the storm was compounded with pre-existing water quality impairments in the region. Blue-green algae blooms occurred within the Caloosahatchee River and Estuary during the 2023 wet season, following Hurricane Ian, although not as widespread and impactful as both Blue Green Algae (Caloosahatchee) and red tide (SWFL Gulf of Mexico) blooms that occurred in 2018 following Hurricane Irma (2017). In 2018, Governor Rick Scott declared a red tide state of emergency for seven counties, including Lee, after green blue algae plagued the area's waterways. Water levels became toxic washing high levels of dead sea life on shores damaging natural resources and impacting regional economic sectors including fishing, agriculture, and tourism. Experiences illustrate a historical challenge, requiring significant investment to protect areas from threats. Compared to Hurricane Irma, Hurricane Ian did not bring as much rainfall and associated runoffs throughout the Lake Okeechobee and Caloosahatchee River and Estuary drainage basins. As each storm is different in nature, the most recent experience in reduced algae blooms does not indicate a lower threat from future incidents. In addition, regional water management of lake Okeechobee discharges halted harmful discharges from lake Okeechobee towards the Caloosahatchee River and Estuary. Therefore, mostly pollutants runoffs within the Caloosahatchee River and Estuary basins affected water quality between Ian's landfall in 2022 throughout 2023. These algae blooms negatively impact human health, harm wildlife, disrupt tourism, and depress the economy.

Regional Approach: Regional stakeholders can share knowledge to efficiently understand water quality risk and implement coordinated solutions that support the long-term health of shared natural water resources. At the one-year anniversary of Hurricane Ian, multiple entities had already completed and/or initiated new research efforts that can contribute to an in-depth understanding of the post-hurricane stormwater and water quality dynamics of the region. In 2017, Lee County recognized the impact of flooding on the region and commissioned the Southern Lee County Flood Management Plan (SLCFMP). The SLCFMP identified conceptual projects that allow for water storage, improved flood control, and conveyance that reduces the risk of flooding during storm events. The projects that incorporate green infrastructure also provide secondary benefits that improve water quality by slowing the flow of runoff leading to improved environmental outcomes. Additionally, the County also plans to complete a Comprehensive Vulnerability Assessment, which will

provide updated predictive modeling to account for worsening natural hazard risk through the year 2070.

These analyses provide a solid foundation on which to develop Regional Green Infrastructure Engineering Design Standards for establishing common green infrastructure policies and programs across the region to enhance water quality. Technical experts in planning and green infrastructure who are familiar with local regulations and infrastructure systems could develop regional policy recommendations to provide jurisdictions with a “tool kit” of locally feasible options. While focused on water quality improvements, the design standards could also include strategies that also support the restoration of historic flow ways and contribute to the conservation of open lands critical to groundwater recharge and water resources protection to improve water quality while reducing flood risk. By aligning on feasible projects and creating a similar regulatory framework, jurisdictions would be well positioned to complete green infrastructure water quality improvements at scale.

Impact: Creating and implementing evidence-based green infrastructure policy recommendations could increase the number of green infrastructure projects to safeguard long-term water quality in the region. Improving and protecting water quality across the region can have multiple social, economic, and environmental benefits. The region would also benefit from the advantages of green infrastructure, which can include reduced flood risk, enhanced water supply, and lower development capital costs.²⁶

Co-Sponsoring Branches:

Natural Resources, Infrastructure, Planning and Capacity, Economic Recovery

Stakeholders:

- County departmental experts on natural resources, parks, and recreation.
- Municipal departmental experts on natural resources, parks, and recreation.
- South Florida Water Management District
- Florida Department of Environmental Protection
- United States Army Corps of Engineers

²⁶ U.S. Environmental Protection Agency, *Benefits of Green Infrastructure*, September 2023, <https://www.epa.gov/green-infrastructure/benefits-green-infrastructure>

- University Partnerships

Potential Funding Sources:

- Federal Emergency Management Agency
- United States Environmental Protection Agency
- United States Fish and Wildlife Service
- United States Department of Transportation
- United States Army Corps of Engineers
- National Oceanic and Atmospheric Administration
- The Land and Water Conservation Fund Coalition
- Florida Division of Emergency Management
- Florida Department of Environmental Protection
- Florida Department of Transportation

Resources:

- Lee County [Our Water Story](#)